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

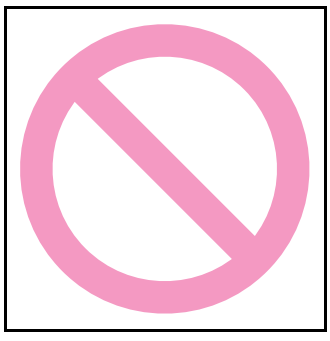
This service manual is intended for authorized Suzuki dealers and qualified service technicians only. Inexperienced technicians or technicians without the proper tools and equipment may not be able to properly perform the services described in this manual.
Improper repair may result in injury to the technician and may render the vehicle unsafe for the driver and passengers.

⚠ WARNING

For vehicles equipped with a Supplemental Restraint (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 (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 GRAND VITARA (JB416/JB420) SERVICE MANUAL.
It has been prepared exclusively for the following applicable model.

Applicable model:
GRAND VITARA with F9Q diesel engine (JB419)

This supplementary service manual describes only different service information of the above applicable model as compared with GRAND VITARA (JB416/JB420) 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.
GRAND VITARA (JB416/JB420) SERVICE MANUAL	99500-64J00-01E

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RECOMMENDATON 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 0

Precautions

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Precautions

Precautions

General Precautions

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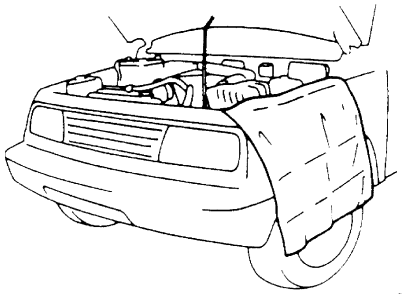
The WARNING and CAUTION describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures, and they will not necessarily be repeated with each procedure to which they apply.

⚠ WARNING

- **Whenever raising a vehicle for service, be sure to follow the instructions under "Vehicle Lifting Points: in Section 0A in related manual".**
- **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.**
- **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.**

⚠ CAUTION

- **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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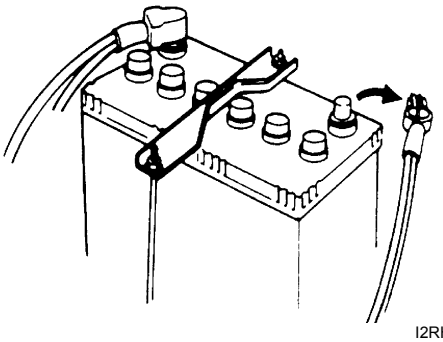
- **When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.**
- **When disconnecting the negative cable from the battery, be careful to the following.**
  - **– Check and record DTCs in immobilizer control module if necessary before disconnecting.**
  - **– Record displayed contents of the clock and/or audio system, etc. before disconnecting and reset it as before after connecting.**
  - **– For vehicle equipped with power sliding roof (sunroof), initialize sliding roof position data in motor unit by performing "How to reactivate the system to prevent being pinched by the sunroof" in Sunroof section of Owner's manual.**



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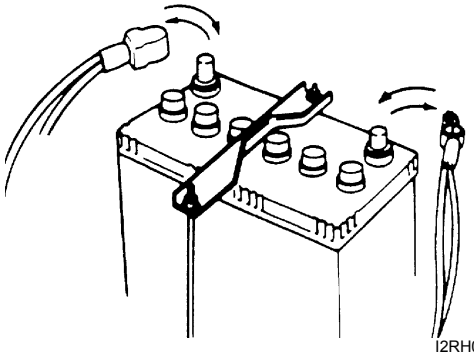
- **When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover.**



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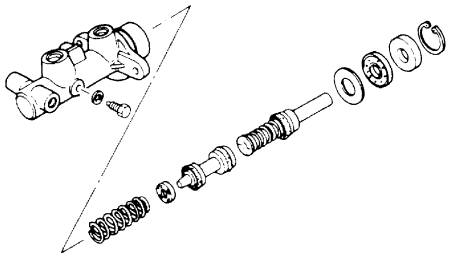
- **When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.**



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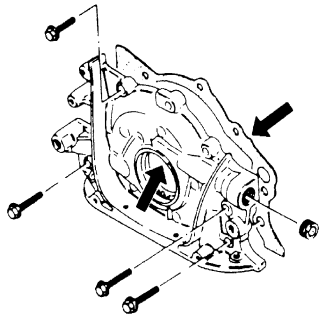
- **Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.**



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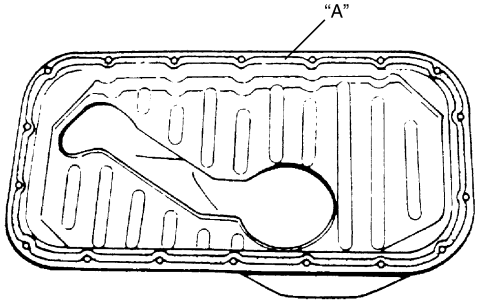
- **Make sure that all parts used in reassembly are perfectly clean.**
- **When use of a certain type of lubricant, bond or sealant is specified, be sure to remove the old one thoroughly and use the specified type.**

  "A": Sealant 99000–31150 (SUZUKI Bond No.1207C)



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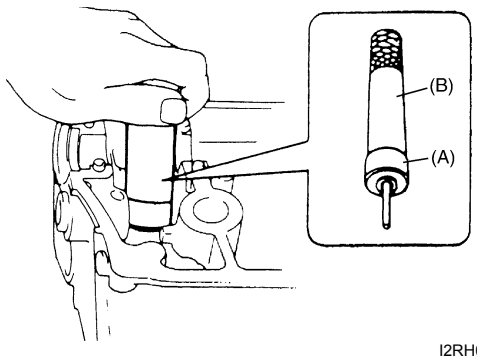
- **Be sure to use special tools when instructed.**

  Special tool
  (A): 09917–98221
  (B): 09916–58210



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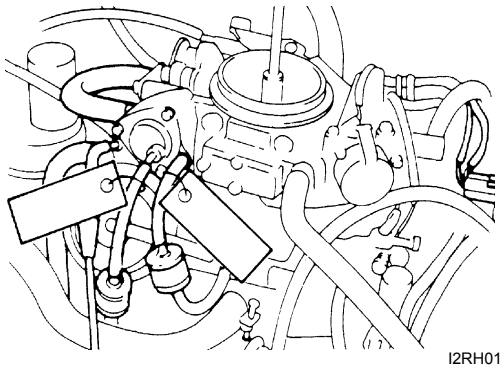
- **When disconnecting vacuum hoses, attach a tag describing the correct installation positions so that the hoses can be reinstalled correctly.**



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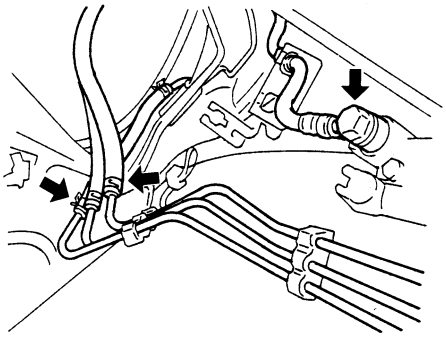
- **After servicing fuel, oil, coolant, vacuum, exhaust or brake systems, check all lines related to the system for leaks.**



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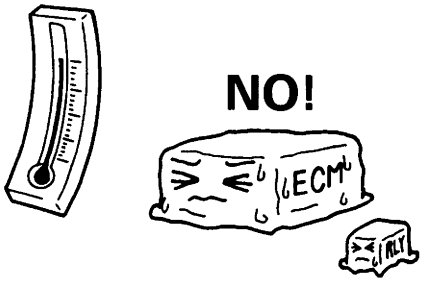
- **When servicing fuel system, be sure to observe WARNING in "Precautions on Fuel System Service: in Section 1G" to reduce the risk of fire and personal injury.**
- **When performing a work that produces a heat exceeding 80 °C in the vicinity of the electrical parts, remove the heat sensitive electrical part(s) beforehand.**



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

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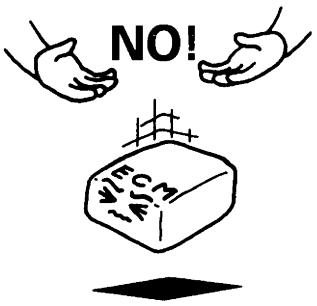
- **Always be careful not to handle electrical parts (computer, relay, etc.) in a rough manner or drop them.**



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Precaution for Vehicle Equipped with ESP® System

S5JB0B0000016

- When testing with any of the following equipments (when vehicle is tested by rotating wheels (tires) under vehicle stop), be sure to deactivate ESP® system referring to “Precautions in Speedometer Test or Other Tests: in Section 4F” to obtain correct data. When vehicle acceleration is not sensed and wheels are rotating, ESP® control module judges that wheels are in slip condition and controls engine torque to reduce by TCS control.
  - 2 or 4-wheel chassis dynamometer
  - Speedometer tester
  - Brake tester
  - Etc.

ESP® control module

- When ESP® control module is removed / installed, do not use impact wrenches which generate shock or impact to avoid damaging sensors in ESP® control module.
- When any of the following operation is done, calibrate steering angle sensor, G sensor and master cylinder pressure sensor (in ESP® control module) referring to “Sensor Calibration: in Section 4F”.
  - When battery or dome fuse is removed.
  - When steering angle sensor is replaced.
  - When ESP® control module is removed.
  - When yaw rate / G sensor assembly is removed.

Precautions for Catalytic Converter and Diesel Particulate Filter

S5JB0B0000004

- Use only specified fuel and be careful not to let a large amount of unburned fuel enter the converter and filter or they can be damaged.
- Be careful not to expose catalytic converter and diesel particulate filter to excessive shock to avoid an damage to them.

Section 0

General Information

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

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General Information

General Description

Abbreviations

S5JB0B0101001

A:
ABDC: After Bottom Dead Center
ABS: Anti-lock Brake System
AC: Alternating Current
A/C: Air Conditioning
A-ELR: Automatic-Emergency Locking Retractor
A/F: Air Fuel Mixture Ratio
ALR: Automatic Locking Retractor
API: American Petroleum Institute
ATDC: After Top Dead Center
ATF: Automatic Transmission Fluid
A/T: Automatic Transmission
AWD: All Wheel Drive
B:
BBDC: Before Bottom Dead Center
BCM: Body Electrical Control Module
BDC: Bottom Dead Center
BTDC: Before Top Dead Center
B+: Battery Positive Voltage
C:
CAN: Controller Area Network
CKP Sensor: Crankshaft Position Sensor
CKT: Circuit
CMP Sensor: Camshaft Position Sensor
CO: Carbon Monoxide
CPP Switch: Clutch Pedal Position Switch (Clutch Switch, Clutch Start Switch)
CPU: Central Processing Unit
CRS: Child Restraint System
D:
DC: Direct Current
DLC: Data Link Connector (Assembly Line Diag. Link, ALDL, Serial Data Link, SDL)
DOHC: Double Over Head Camshaft
DOJ: Double Offset Joint
DRL: Daytime Running Light
DTC: Diagnostic Trouble Code (Diagnostic Code)
E:
EBCM: Electronic Brake Control Module, ABS Control Module
EBD: Electronic Brake Force Distribution
ECM: Engine Control Module
ECT Sensor: Engine Coolant Temperature Sensor (Water Temp. Sensor, WTS)
EFE Heater: Early Fuel Evaporation Heater (Positive Temperature Coefficient, PTC Heater)
EGR: Exhaust Gas Recirculation
EGRT Sensor: EGR Temperature Sensor (Recirculated Exhaust Gas Temp. Sensor, REGTS)
ELR: Emergency Locking Retractor
EPS: Electronic Power Steering
EVAP: Evaporative Emission
EVAP Canister: Evaporative Emission Canister (Charcoal Canister)
F:
FWD: Front Wheel Drive
4WD: 4 Wheel Drive
G:
GEN: Generator
GND: Ground
H:
HC: Hydrocarbons
HO2S: Heated Oxygen Sensor
HVAC: Heating, Ventilating and Air Conditioning
I:
IAC Valve: Idle Air Control Valve (Idle Speed Control Solenoid Valve, ISC Solenoid Valve)
IAT Sensor: Intake Air Temperature Sensor (Air temperature Sensor, ATS)
ICM: Immobilizer Control Module
IG: Ignition
IMT: Intake Manifold Tuning
ISC Actuator: Idle Speed Control Actuator (Motor)
L:
LH: Left Hand
LSPV: Load Sensing Proportioning Valve
M:
MAF Sensor: Mass Air Flow Sensor (Air Flow Sensor, AFS, Air Flow Meter, AFM)
MAP Sensor: Manifold Absolute Pressure Sensor (Pressure Sensor, PS)
Max: Maximum
MFI: Multiport Fuel Injection (Multipoint Fuel Injection)
MIL: Malfunction Indicator Lamp (“SERVICE ENGINE SOON” Light)
Min: Minimum
M/T: Manual Transmission
N:
NOx: Nitrogen Oxides
O:
OBD: On-Board Diagnostic System (Self-Diagnosis Function)
OCM: Occupant Classification module
O/D: Overdrive
OHC: Over Head Camshaft
O2S: Oxygen Sensor
P:
PCM: Powertrain Control Module
PCV: Positive Crankcase Ventilation
PNP: Park / Neutral Position
PSP Switch: Power Steering Pressure Switch (P/S Pressure Switch)
P/S: Power Steering
R:
RH: Right Hand

S:
SAE: Society of Automotive Engineers
SDM: Sensing and Diagnostic Module (Air Bag Controller, Air bag Control Module)
SFI: Sequential Multiport Fuel Injection
SOHC: Single Over Head Camshaft
T:
TBI: Throttle Body Fuel Injection (Single-Point Fuel Injection, SPI)
TCC: Torque Converter Clutch
TCM: Transmission Control Module (A/T Controller, A/T Control Module)
TDC: Top Dead Center
TPMS: Tire Pressure Monitoring System
TP Sensor: Throttle Position Sensor
TVV: Thermal Vacuum Valve (Thermal Vacuum Switching Valve, TVSV, Bimetal Vacuum Switching Valve, BVSV)
TWC: Three Way Catalytic Converter (Three Way Catalyst)
2WD: 2 Wheel Drive
V:
VIN: Vehicle Identification Number
VSS: Vehicle Speed Sensor
VVT: Variable Valve Timing (Camshaft Position Control)
W:
WU-OC: Warm Up Oxidation Catalytic Converter
WU-TWC: Warm Up Three Way Catalytic Converter

Fastener Information

S5JB0B0101005

Metric Fasteners

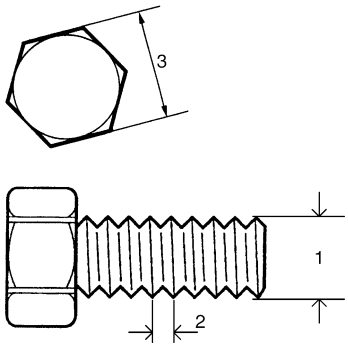
Most of the fasteners used for this vehicle are JIS-defined and ISO-defined metric fasteners. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

⚠ CAUTION

Even when the nominal diameter (1) of thread is the same, the thread pitch (2) or the width across flats (3) may vary between ISO and JIS. Refer to JIS-TO-ISO Main Fasteners Comparison Table below for the difference. Installing a mismatched bolt or nut will cause damage to the thread.
Before installing, check the thread pitch for correct matching and then tighten it by hand temporarily. if it is tight, recheck the thread pitch.

JIS-TO-ISO Main Fasteners Comparison Table

		Nominal diameter				
		M6	M8	M10	M12	M14
JIS	Thread pitch	1.0	1.25	1.25	1.25	1.5
	Width across flats	10	12	14	17	19
ISO	Thread pitch	1.0	1.25	1.5	1.5	1.5
	Width across flats	10	13	16	18	21



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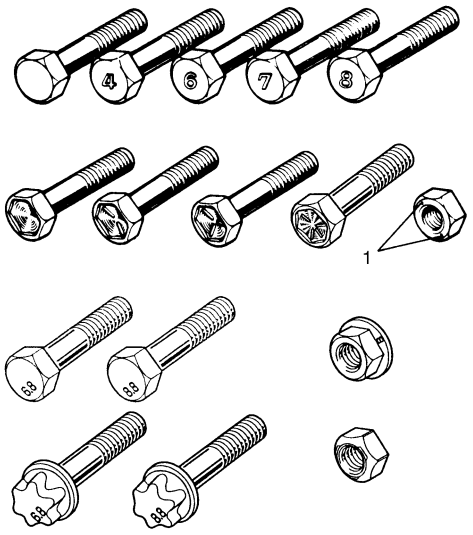
Fastener Strength Identification

Most commonly used metric fastener strength property classes are 4T, 6.8, 7T, 8.8 and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch, 6 or 8 mark strength identification on the nut face. Figure shows the different strength markings.
When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct diameter and thread pitch. Correct replacement bolts and nuts are available through the parts division.
Metric bolts: Identification class numbers or marks correspond to bolt strength (increasing numbers represent increasing strength).



I5RH01010001-01

1. Nut strength identification

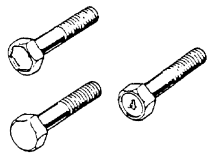
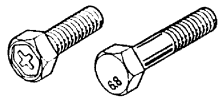
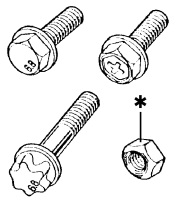
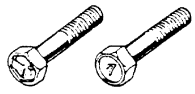
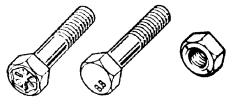
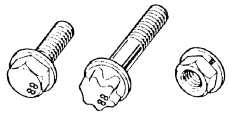
Standard Tightening Torque

Each fastener should be tightened to the torque specified in each section of this manual. If no description or specification is provided, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, however, use the torque specified for the original fastener.

NOTE

- **For the flanged bolt, flanged nut and self-lock nut of 4T and 7T strength, add 10% to the tightening torque given in the following chart.**
- **The following chart is applicable only where the fastened parts are made of steel light alloy.**

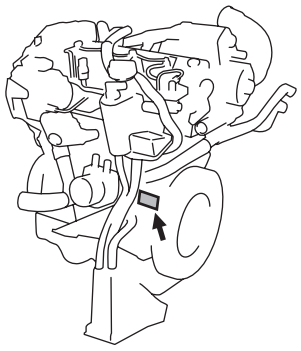
Tightening torque chart

Strength	Unit	Thread Diameter (Nominal Diameter) (mm)								
		4	5	6	8	10	12	14	16	18
A equivalent of 4T strength fastener	N·m	1.5	3.0	5.5	13	29	45	65	105	160
	kgf-m	0.15	0.30	0.55	1.3	2.9	4.5	6.5	10.5	16.0
 I1SQ01010004-01	lb-ft	1.0	2.5	4.0	9.5	21.0	32.5	47.0	76.0	116.0
A equivalent of 6.8 strength fastener without flange	N·m	2.4	4.7	8.4	20	42	80	125	193	280
	kgf-m	0.24	0.47	0.84	2.0	4.2	8.0	12.5	19.3	28.0
 I1SQ01010005-01	lb-ft	2.0	3.5	6.0	14.5	30.5	58.0	90.5	139.5	202.5
A equivalent of 6.8 strength fastener with flange *: Self-lock nut (6 strength)	N·m	2.4	4.9	8.8	21	44	84	133	203	298
	kgf-m	0.24	0.49	0.88	2.1	4.4	8.4	13.3	20.3	29.8
 I1SQ01010006-01	lb-ft	2.0	3.5	6.5	15.5	32.0	61.0	96.5	147.0	215.5
A equivalent of 7T strength fastener	N·m	2.3	4.5	10	23	50	85	135	210	240
	kgf-m	0.23	0.45	1.0	2.3	5.0	8.5	13.5	21	24
 I1SQ01010007-01	lb-ft	2.0	3.5	7.5	17.0	36.5	61.5	98.0	152.0	174.0
A equivalent of 8.8 strength bolt (8 strength nut) without flange	N·m	3.1	6.3	11	27	56	105	168	258	373
	kgf-m	0.31	0.63	1.1	2.7	5.6	10.5	16.8	25.8	37.3
 I1SQ01010008-01	lb-ft	2.5	4.5	8.0	19.5	40.5	76.0	121.5	187.0	270.0
A equivalent of 8.8 strength bolt (8 strength nut) with flange	N·m	3.2	6.5	12	29	59	113	175	270	395
	kgf-m	0.32	0.65	1.2	2.9	5.9	11.3	17.5	27	39.5
 I1SQ01010009-01	lb-ft	2.5	5.0	9.0	21.0	43.0	82.0	126.5	195.5	286.0

Engine Identification Number

S5JB0B0101009

The number is punched on the cylinder block.



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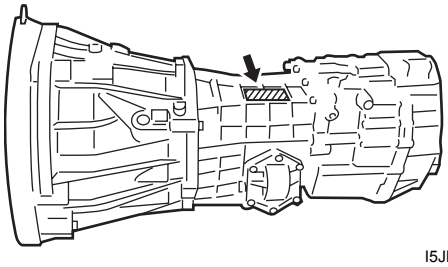
Transmission Identification Number

S5JB0B0101010

The number is located on the transmission case.



I5JB0B010002-01

Component Location

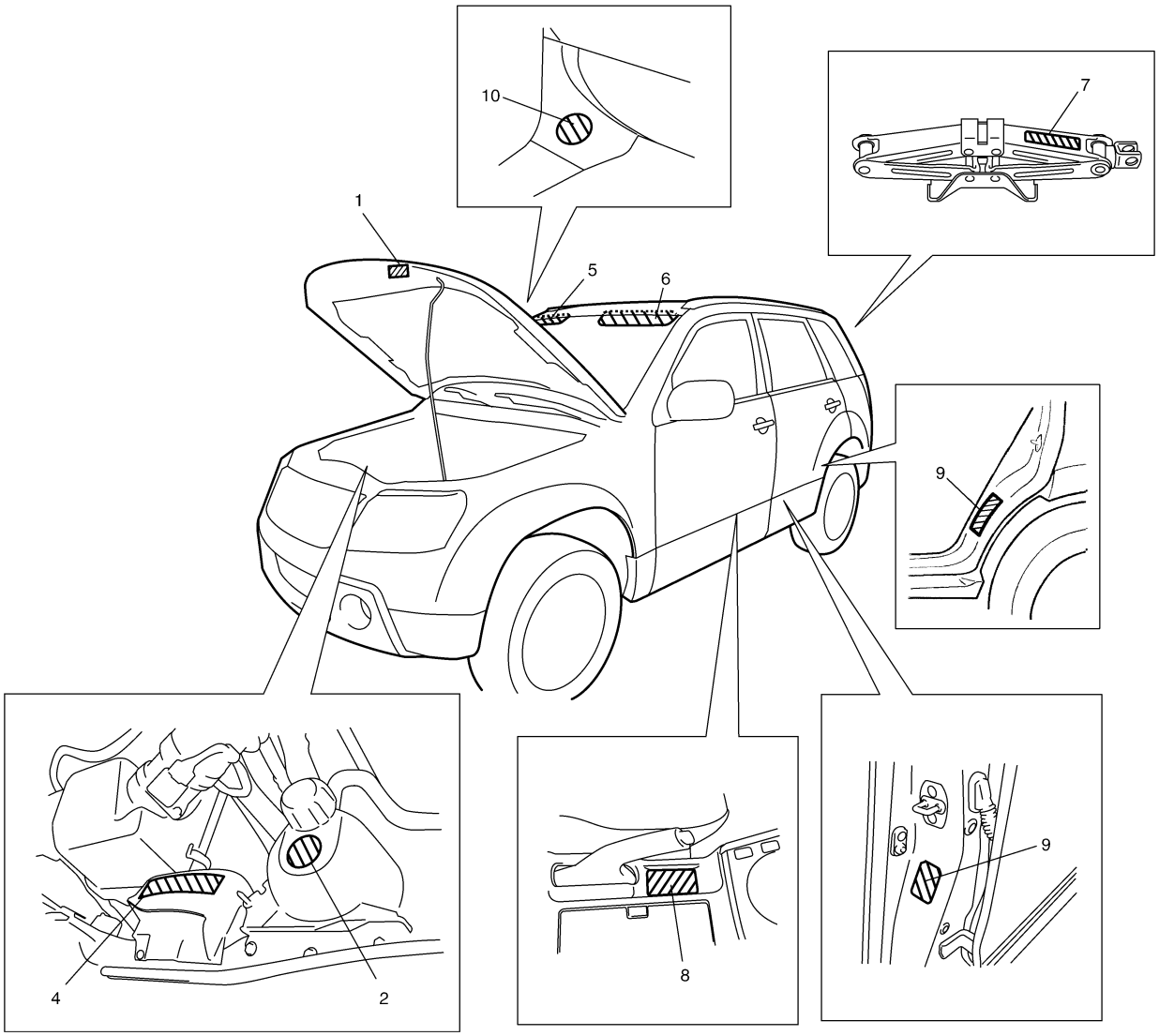
Warning, Caution and Information Label Location

S5JB0B0103001

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.

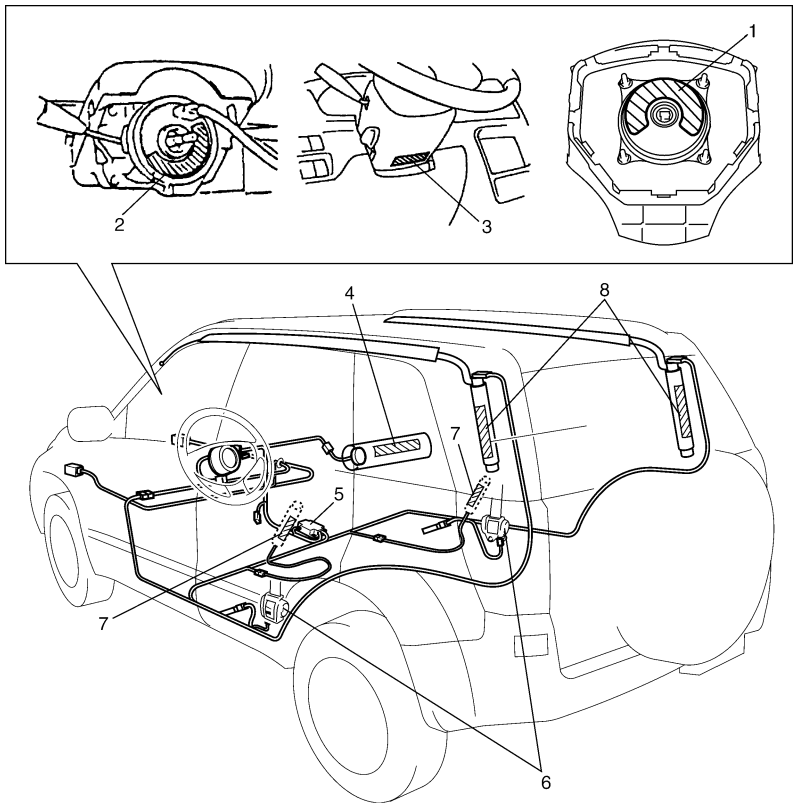
NOTE

Air bag labels are attached on the vehicle equipped with air bag system only.



I5JB0B010003-02

1. Smoke level label	5. Air bag label on sun visor	9. Side air bag label (Both RH and LH)
2. Degassing tank cap label	6. Air bag label and utility vehicle label on sun visor	10. Child seat label on instrument panel (if equipped)
3. Blank	7. Jacking label	
4. Engine cooling fan label	8. Parking (Transfer) label (if equipped)	



I5JB0B010004-03

1. Air bag label on driver air bag (inflator) module	4. Air bag label on passenger air bag (inflator) module	7. Air bag label on side air bag module
2. Air bag label on contact coil assembly	5. Air bag label on SDM	8. Air bag label on curtain air bag module
3. Air bag label on steering column cover	6. Pretensioner label on seat belt pretensioner	

Maintenance and Lubrication

Scheduled Maintenance

MIZOGUCHI Maintenance Schedule under Normal Driving Conditions

S5JB0B0205001

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, tensioner and idlers (R: ☞)			—	—	—	—	R	—
Camshaft timing belt and tensioner (R: ☞)			—	—	—	—	R	—
Engine oil and oil filter (R: ☞)			R	R	R	R	R	R
Engine coolant (R: ☞)			—	R	—	R	—	R
Exhaust system (I: ☞)			—	I	—	I	—	I
Fuel system								
Air cleaner filter (I: ☞), (R: ☞)	Paved-road		I	I	R	I	I	R
	Dusty condition		Refer to “Maintenance Recommended under Severe Driving Conditions: ”.					
Fuel lines and connections (I: ☞)			—	I	—	I	—	I
Fuel filter (R: ☞)			—	—	—	R	—	—
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 / Propeller shafts (I: ☞)			—	—	I	—	—	I
Manual transmission oil (leakage, level) (I: ☞ 1st 15,000 km only) (R: ☞)			I	—	R	—	—	R
Transfer oil (leakage, level) (I: ☞)			I	—	I	—	I	—
Differential oil (leakage, level) (R: ☞ 1st 15,000 km only) (I: ☞)			R or I	—	I	—	I	—
Power steering (if equipped) (I: ☞)			I	I	I	I	I	I
All latches, hinges and locks (I: ☞)			—	I	—	I	—	I
HVAC air filter (if equipped) (I: ☞) (R: ☞)			—	I	R	—	I	R

NOTE

- **“I”: Inspect and correct, replace or lubricate if necessary.**
- **“R”: Replace or change.**
- **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

S5JB0B0205002

If the vehicle is usually used under the conditions corresponding to any severe condition code, 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: Low quality fuel use (Diesel engine only)
H: Towing a trailer (if admitted)

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
– B C D – – – –	Engine accessory drive belt, tensioner and idlers	☞ R	Every 30,000 km (18,000 miles) or 24 months
A – C D E – – –	Camshaft timing belt and tensioner	☞R	Every 45,000 km (27,000 miles) or 36 months
A – C D E F – H	Engine oil and oil filter	☞ R	Every 7,500 km (4,500 miles) or 6 months
– B – – – – – –	Exhaust pipe mountings	☞ I	Every 15,000 km (9,000 miles) or 12 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
– – – – – – G –	Fuel filter	☞ R	Every 5,000 km (3,000 miles) or each time water is detected.
– B – – – – – –	Suspension bolts and nuts	☞ T	Every 15,000 km (9,000 miles) or 12 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 and propeller shafts	☞ I	Every 15,000 km (9,000 miles) or 12 months
– B – – E – – H	Manual transmission oil / Transfer oil / Differential oil	☞/☞ R	First time only: 15,000 km (9,000 miles) or 12 months
			Second time and after: Every 30,000 km (18,000 miles) or 24 months reckoning from 0 km (0 mile) or 0 month
– – C D – – – –	HVAC air 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.**
- **"T": Tighten to specified torque.**
- ***1: Inspect more frequently if the vehicle is used under dusty conditions.**
- ***2: Clean more frequently if the air flow from air conditioning decreases.**

Repair Instructions

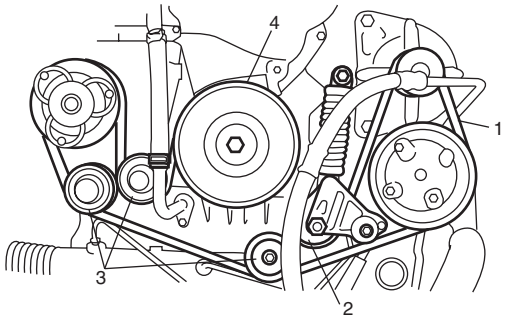
Engine Accessory Drive Belt, Tensioner and Idler Replacement

S5JB0B0206002

⚠ WARNING

Replacement must be performed with battery negative cable disconnected to avoid a personal injury.

Replace belt (1), tensioner (2) and idlers (3) with new ones referring to “Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J”.
Check crankshaft pulley (4) for wear and damage, and replace it as necessary.

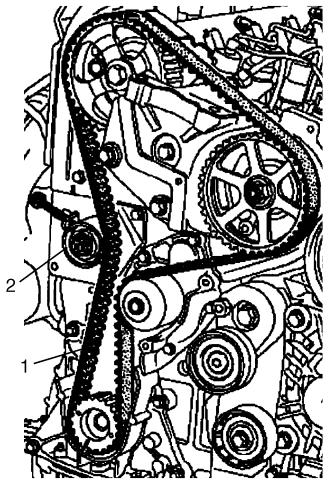


I5JB0B020001-02

Camshaft Timing Belt and Tensioner Replacement

S5JB0B0206042

Replace camshaft timing belt (1) and tensioner (2) with new ones referring to “Timing Belt and Belt Tensioner Removal and Installation: in Section 1D”.



I5JB0B020002-01

Engine Oil and Filter Change

S5JB0B0206004

⚠ WARNING

- **New and used engine oil can be hazardous.**
  Be sure to read “General Precautions: in Section 00” and observe what in written there.
- **Steps 1) – 7) must be performed with ENGINE NOT RUNNING. For Step 8), be sure to have adequate ventilation while engine is running.**

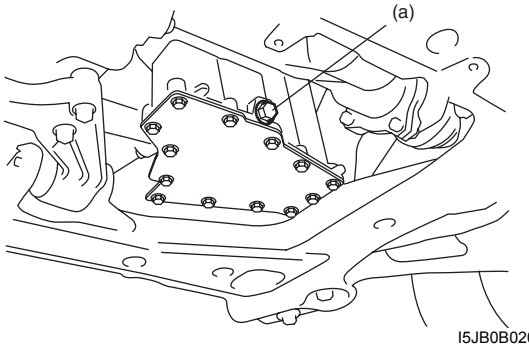
⚠ CAUTION

Do not top up oil over FULL level mark on dipstick. Too much oil could destroy engine.

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) Drain engine oil by removing drain plug.
2) After draining oil, wipe drain plug clean. Reinstall drain plug.

Tightening torque
Engine oil drain plug (a): 35 N·m (3.5 kgf-m, 25.5 lb-ft)



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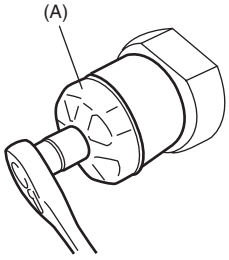
3) Loosen oil filter by using oil filter wrench (special tool) accessing from between engine mounting and radiator outlet hose and from below vehicle.

Special tool
(A): 09915–46510



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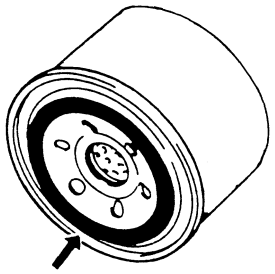
4) Apply engine oil to new oil filter gasket.



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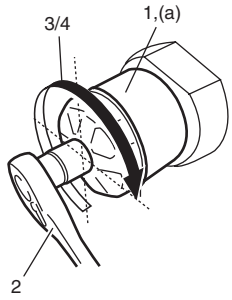
5) Screw new filter on oil filter stand by hand until the filter gasket contacts the mounting surface.

⚠ CAUTION

To tighten oil filter properly, it is important to accurately identify the position at which filter gasket first contacts the mounting surface.

6) Tighten oil filter (1) 3 / 4 turn from the point of contact with the mounting surface using an oil filter wrench (2).



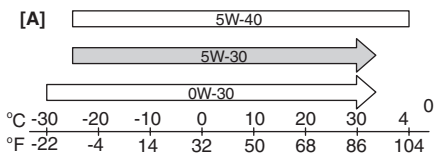
I5JB0B020006-01

7) Replenish oil until oil level is brought to FULL level mark on dipstick (about 5.1 liters (9.0 Imp pt.)). The filler inlet is at the top of the cylinder head cover. Use only engine oil of ACEA standard C3 grade. Select the appropriate oil viscosity according to the chart [A].
It is highly recommended to use SAE 5W-30 oil.

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.)

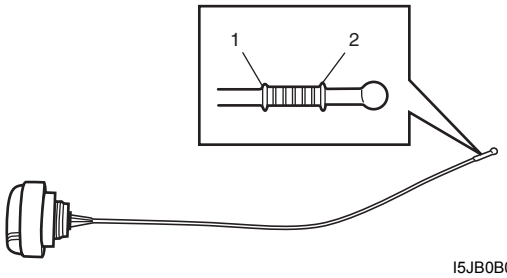
Proper engine oil viscosity chart



I5JB0B020014-02

8) Check oil filter and drain plug for oil leakage.

9) Start engine and run it for 3 minutes. Stop it and wait 10 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark (1) on dipstick.



I5JB0B020008-01

2. Low level mark

Engine Coolant Change

S5JB0B0206005

⚠ 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.

Change engine coolant referring to “Cooling System Refilling: in Section 1F”.

Exhaust system Inspection

S5JB0B0206006

⚠ WARNING

To avoid danger of being burned, do not touch exhaust system when it is still hot. Any service on exhaust system should be performed when it is cool.

Check exhaust system for loose, damage, leakage, etc. referring to “Exhaust System Check: in Section 1K”.

Air Cleaner Filter Inspection

S5JB0B0206008

Check that filter is not excessively dirty, damaged or oily and clean filter with compressed air from air outlet side of filter.
Refer to “Air Cleaner Filter Inspection and Cleaning: in Section 1D”.

Air Cleaner Filter Replacement

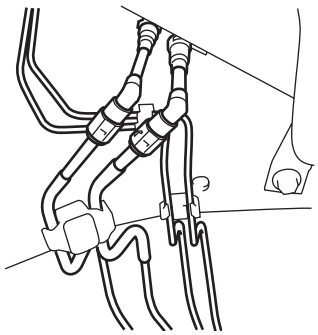
S5JB0B0206009

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

Fuel Lines and Connections Inspection

S5JB0B0206010

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.



I5JB0B020009-01

Fuel Filter Replacement

S5JB0B0206011

⚠ WARNING

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

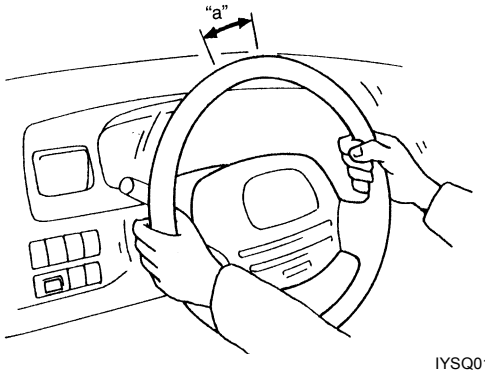
Replace fuel filter with new one, referring to “Fuel Filter and Fuel Heater Removal and Installation: in Section 1G”.

Steering System Inspection

S5JB0B0206026

1) Check steering wheel for play and rattle, holding vehicle in straight forward condition on the ground.

   Steering wheel play
   “a”: 0 – 30 mm (0 – 1.2 in.)



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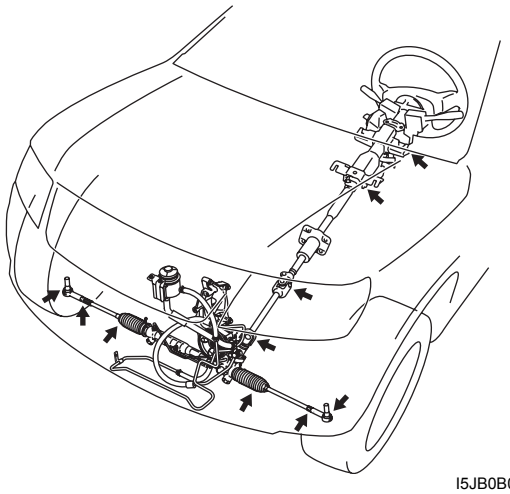
2) Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.
3) Check steering linkage for looseness and damage. Repair or replace defective part, if any.
4) Check bolts and nuts for tightness and retighten them as necessary.
   Repair or replace defective parts, if any.
5) Check boots of steering linkage for damage (leaks, detachment, tear, dent, etc.). If damage is found, replace it with new one.
   If any dent is found on steering rack boots, correct it to original shape by turning steering wheel to the right or left as far as it stops and holding it for a few seconds.



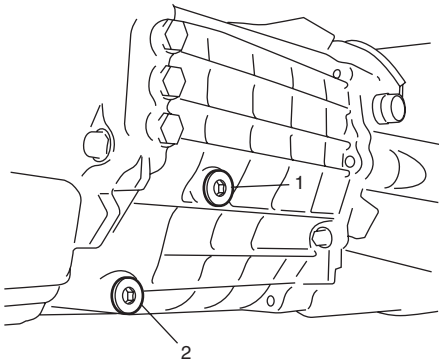
I5JB0B020010-01

6) Check wheel alignment referring to “Front Wheel Alignment Inspection and Adjustment: in Section 2B in related manual”.

Manual Transmission Oil Inspection

S5JB0B0206028

1) Inspect transmission case for evidence of oil leakage. Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove level / filler plug (1) of transmission.
4) Check oil level.
   Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level / filler plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified amount of specified oil.



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2. Drain plug

5) Tighten level / filler plug to specified torque referring to “Manual Transmission Oil Change: in Section 5B”.

Manual Transmission Oil Change

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Change transmission oil with new specified oil referring to “Manual Transmission Oil Change: in Section 5B”.

Transfer Oil Inspection (If Equipped)

S5JB0B0206033

1) Check transfer case for evidence of oil leakage. Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Check oil level referring to “Transfer Oil Level Check: in Section 3C in related manual”.

Transfer (If Equipped) and Differential Oil Change

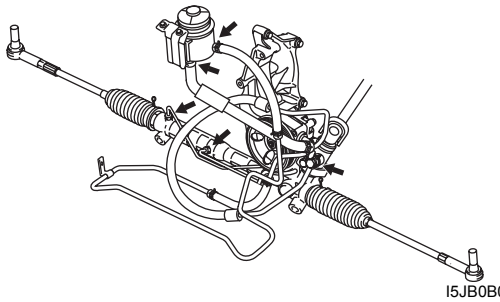
S5JB0B0206035

Change transfer oil and differential oil (front and rear) with new specified oil respectively.
For transfer, refer to “Transfer Oil Change: in Section 3C in related manual”.
For front differential, refer to “Front Differential Oil Change: Front in Section 3B in related manual”.
For rear differential, refer to “Rear Differential Oil Change: Rear in Section 3B in related manual”.

Power Steering (P/S) System Inspection

S5JB0B0206036

1) Visually check power steering system for fluid leakage and hose for damage and deterioration. Repair or replace defective parts, if any.



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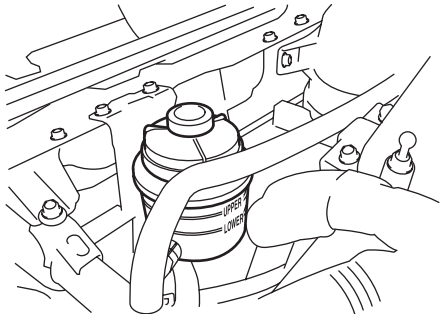
2) Check fluid level with engine stopped. If it is lower than LOWER level line, fill fluid up to UPPER level line.

NOTE

Fluid level should be checked when fluid is cool.



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Specifications

Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Engine oil drain plug	35	3.5	25.5	☞

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

Special Tools and Equipment

Recommended Fluids and Lubricants

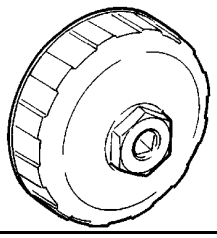
S5JB0B0208001

Fluids / Lubricants List

Engine oil	Refer to “Engine Oil and Filter Change: ”.
Engine coolant (Ethylene glycol base coolant)	“Antifreeze / Anticorrosion coolant”
Brake fluid	Refer to reservoir cap of brake master cylinder.
Manual transmission oil	Refer to “Manual Transmission Oil Change: in Section 5B”.
Transfer oil	Refer to “Transfer Oil Change: in Section 3C in related manual”.
Differential oil (front & rear)	Refer to “Front Differential Oil Change: Front in Section 3B in related manual”, or “Rear Differential Oil Change: Rear in Section 3B in related manual”.
Power steering fluid	An equivalent of DEXRON®-II
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	
Key lock cylinder	Spray lubricant

Special Tool

S5JB0B0208002

09915–46510 Oil filter wrench ☞		

Section 1

Engine

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Precautions

Precautions

Precautions for Engine

S5JB0B1000001

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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”.

Statement on Cleanliness and Care
Refer to “Statement on Cleanliness and Care: in Section 1A”.

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

Engine Cooling System Warning
Refer to “Coolant Description: in Section 1F”.

Exhaust System Caution
Refer to “Exhaust System Check: in Section 1K”.

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

Precautions for Catalytic Converter and Diesel Particulate Filter
Refer to “Precautions for Catalytic Converter and Diesel Particulate Filter: in Section 00”.

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

Precaution in Replacing ECM
Refer to “Precaution in Replacing ECM: in Section 1C”.

Engine General Information and Diagnosis

Precautions

Precautions on Engine Service

S5JB0B1100001

⚠ 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

S5JB0B1100002

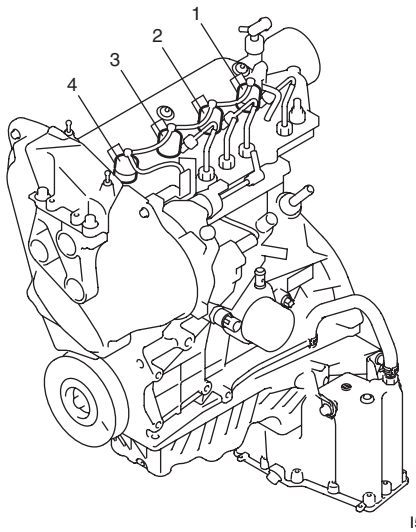
- Don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse before confirming diagnostic information (DTC) stored in ECM memory.
- Diagnostic information stored in ECM memory can be cleared as well as checked by using SUZUKI scan tool or OBD generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00 in related manual" before inspection and observe what is written there.
- Replacement of the ECM
  Before replacement of the ECM, save the data of vehicle specification (injector calibration code, EGR / Inlet throttle valve data register and Diesel PF data register) into SUZUKI scan tool from ECM according to procedure described in "ECM Registration: in Section 1C".
- ECM registration:
  If ECM is replaced, register vehicle specification (fuel injector calibration code, key verification code for immobilizer system) into ECM referring to "ECM Registration: in Section 1C".
- Communication of ECM, BCM, combination meter, ABS or ESP® control module, immobilizer control module and 4WD control module, is established by CAN (Controller Area Network). (For more detail of CAN communication for ECM, refer to "CAN Communication System Description: ").
  Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System: in Section 00 in related manual".
- Immobilizer transponder code registration after replacing ECM
  When ECM is replaced with new one or with another one, make sure to register immobilizer transponder code to ECM correctly according to "Procedure after ECM Replacement: in Section 10C".

Statement on Cleanliness and Care

S5JB0B1100003

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



I5JB0B110001-01

General Description

Engine Diagnosis General Description

S5JB0B1101002

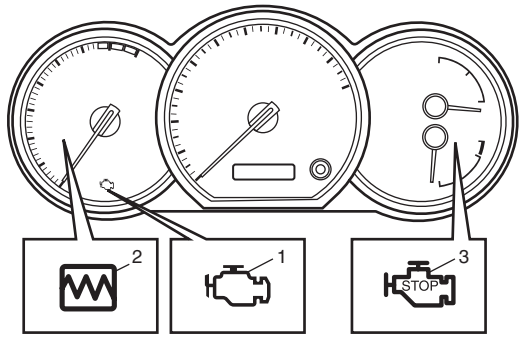
The engine and emission control system in this vehicle are controlled by ECM. ECM has an On-Board Diagnostic system which detects a malfunction in this system and abnormality of those parts that influence the engine exhaust emission. When diagnosing engine troubles, be sure to have full understanding of the outline of “On-Board Diagnostic System Description: ” and each item in “Precautions in Diagnosing Trouble: ” and execute diagnosis according to “Engine and Emission Control System Check: ”.
There is a close relationship between the engine mechanical, engine cooling system, exhaust system, etc. and the engine and emission control system in their structure and operation. In case of an engine trouble, even when the warning light (MIL, injection warning light, and/or red stop warning light) doesn’t turn ON, it should be diagnosed according to this flow table.

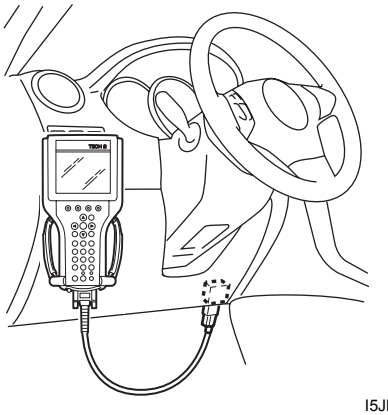
On-Board Diagnostic System Description

S5JB0B1101003

ECM in this vehicle has the following functions.

- When the ignition switch is turned ON with the engine at a stop, MIL (1), turns ON to check the warning light and its circuit.





I5JB0B110002-01

- When ECM detects a malfunction, it makes injection warning light (gravity 1 fault) (2) and/or red stop warning light (gravity 2 fault) in the meter cluster of the instrument panel turn ON and stores the malfunction area in its memory.
- When ECM detects a malfunction which gives an adverse effect to vehicle emission while the engine is running, it makes the malfunction indicator lamp in the meter cluster of the instrument panel turn ON and stores the malfunction area in its memory.
- When a malfunction is detected, a malfunction in some areas in the system and driving cycles then are stored in ECM memory (For the details, refer to description on “Indicator lamp operation table: ”.

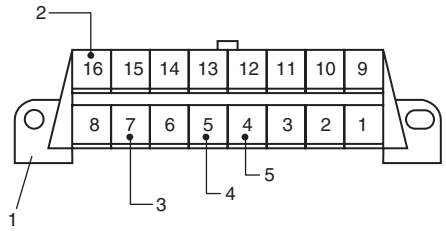
Warm-Up Cycle
A “warm-up cycle” means sufficient vehicle operation such that the coolant temperature has risen by at least 22 °C (40 °F) from engine starting and reaches a minimum temperature of 70 °C (160 °F).

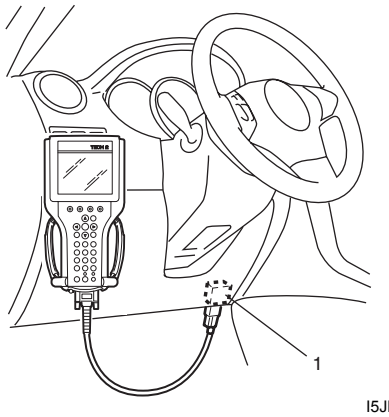
Driving Cycle
A “driving cycle” consists of two parts, engine startup and engine shutoff.

3 Driving Cycle Detection Logic
The malfunction detected in the first driving cycle is stored in ECM memory (in the form of pending DTC) but the malfunction indicator lamp does not light at this time. It does not light up at the second detection of same malfunction also in the next driving cycle. It lights up at the third detection of same malfunction also in the third driving cycle.

Pending Diagnostic Trouble Code (DTC)
Pending DTC means a DTC detected and stored temporarily at first or second driving cycle of the DTC which is detected in the 3 driving cycle detection logic.

Data Link Connector (DLC)
DLC (1) is in compliance with SAE J1962 in its installation position, the shape of connector and pin assignment.
K line (3) of ISO 9141 is used for SUZUKI scan tool or OBD generic scan tool to communicate with ECM, Air bag SDM, immobilizer control module, BCM (Body electrical Control Module), 4WD control module and ABS or ESP® control module.





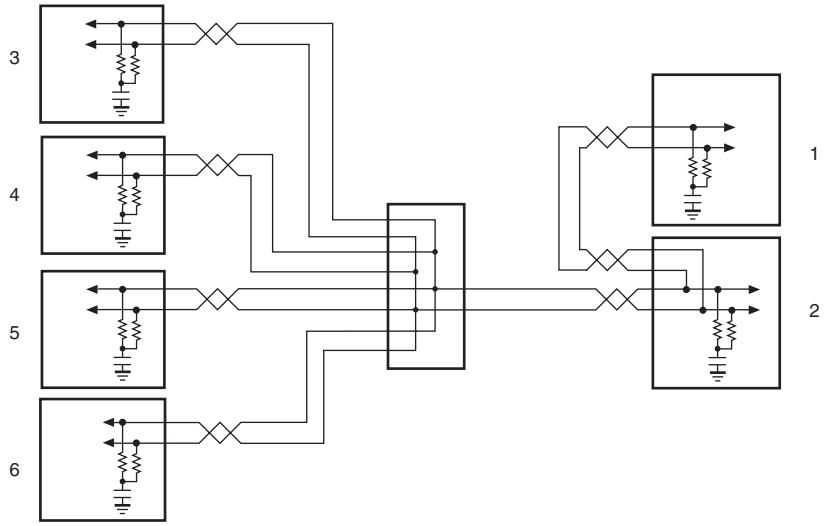
I5JB0A110004-01

1. B+	2. ECM ground	3. Body ground

CAN Communication System Description

S5JB0B1101005

ECM (1), ABS or ESP® control module (2), BCM (3), 4WD control module (4), combination meter (5) and immobilizer control module (6) of this vehicle communicate control data between each control module.
Communication of each control module is established by CAN (Controller Area Network) communication system.



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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 function to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. ECM communicates control data with each control module as follows.

ECM Transmission Data

Transmits data of ECM	ABS control module (if equipped)	BCM	Combination Meter	4WD control module (if equipped)	ESP® control module (if equipped)
Engine torque signal					○
Accelerator pedal position					○
Engine speed		○	○	○	○
Throttle position					○
Engine emissions related malfunction			○		
Injection warning light (Gravity 1 Fault)			○		
Red Stop Warning Light (Gravity 2 Fault)			○		
Glow indicator light			○		
Diesel particulate filter warning light			○		
Fuel filter warning light			○		
Engine coolant temperature		○	○		
Cruise control signal (if equipped)					○
Cruise control system indication (if equipped)			○		
Vehicle speed		○	○	○	
Brake pedal switch active	○	○		○	○
Air conditioning compressor clutch engaged (if equipped with A/C)		○			
A/C refrigerant pressure (if equipped with A/C)		○			
Distance kilometers per liter of fuel		○			
Additional heater relay signal		○			
Radiator cooling fan relay signal		○			

I5JB0B110004-10

NOTE

In communication between ECM and combination meter, between ECM and 4WD control module, data is transmitted only from ECM to combination meter and 4WD control module. (combination meter and 4WD control module does not transmit data to ECM.)

ECM Reception Data

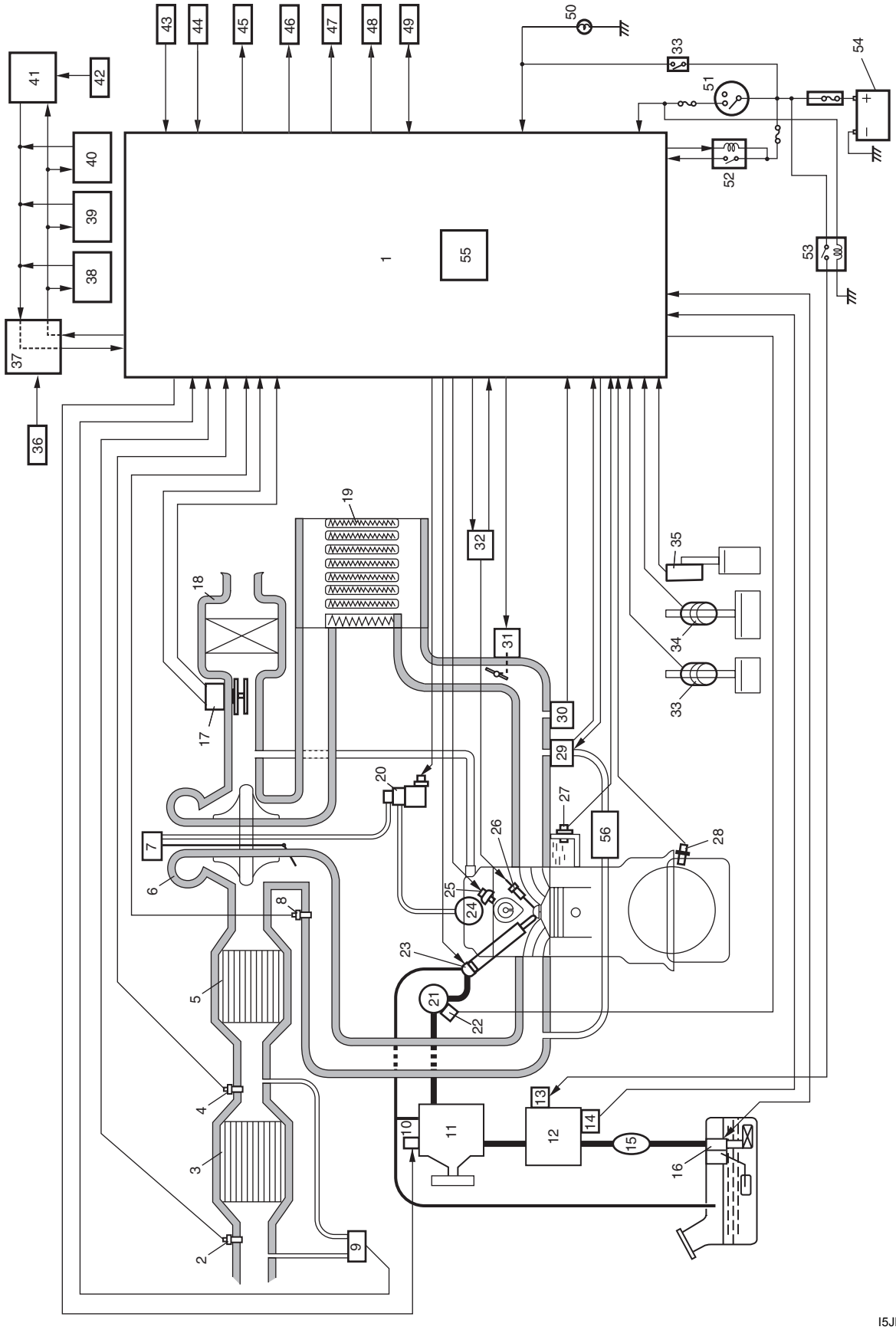
Transmits data of ECM	ABS control module (if equipped)	BCM	ESP® control module (if equipped)
Air conditioning switch ON (if equipped with A/C)		○	
Torque up request	○		○
Wheel speed pulse (rear right)	○		○
Wheel speed pulse (rear left)	○		○
Antilock brake system active	○		○
Electronic stability program system active		○	○

I5JB0B110005-08

Electronic Control System Description

S5JB0B1101004

System Diagram

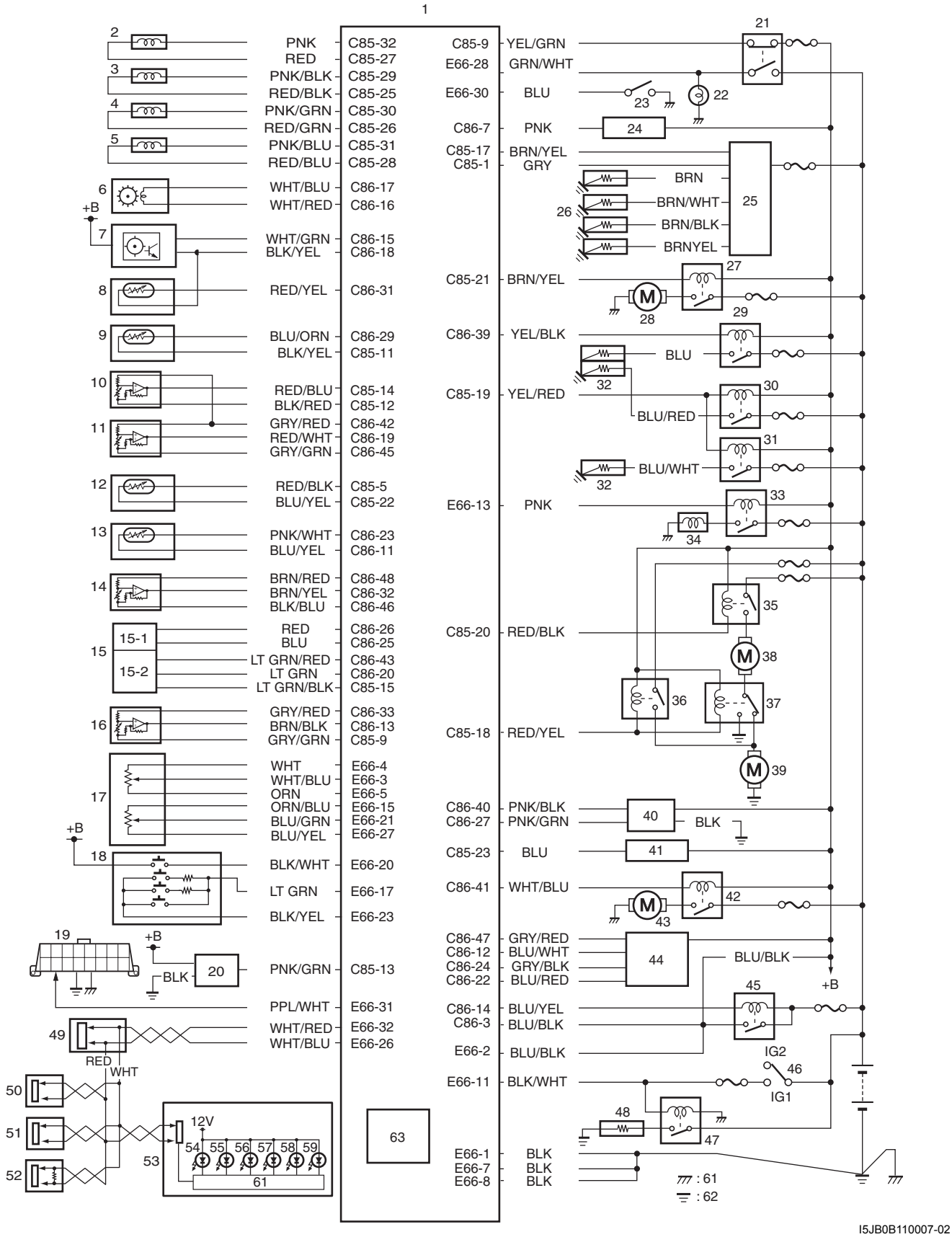


I5JB0B110006-04

1. ECM	20. Boost pressure control solenoid valve	39. 4WD control module

2. Exhaust gas temperature sensor 3	21. Common rail (High pressure fuel injection rail)	40. Immobilizer control module
3. Diesel particulate filter	22. Fuel pressure sensor	41. BCM
4. Exhaust gas temperature sensor 2	23. Fuel injector	42. Electric load
5. Oxidation catalytic converter	24. Vacuum pump	43. A/C refrigerant pressure sensor (if equipped with A/C)
6. Turbocharger	25. CMP sensor	44. Cruise control switch (if equipped with cruise control system)
7. Boost pressure control valve actuator	26. Glow plug	45. Radiator fan motor relay
8. Exhaust gas temperature sensor 1	27. ECT sensor	46. Additional heater
9. Differential pressure sensor	28. CKP sensor	47. Turbocharger electric water pump
10. Fuel flow actuator	29. EGR valve	48. A/C compressor magnet clutch
11. Injection pump	30. Boost pressure sensor	49. Data link connector
12. Fuel filter	31. Inlet throttle valve	50. Brake lamp
13. Fuel heater	32. Glow plug control module	51. Ignition switch
14. Fuel filter water detection sensor	33. Clutch pedal position (CPP) switch	52. Main relay
15. Priming pump	34. Brake lamp switch	53. Fuel heater relay
16. Fuel pump	35. Accelerator pedal position (APP) sensor	54. Battery
17. MAF sensor assembly with IAT sensor	36. Wheel speed sensor (VSS signal)	55. Barometric pressure sensor
18. Air cleaner	37. ABS or ESP® control module	56. EGR cooler
19. Intercooler	38. Combination meter	

System Wiring Circuit Diagram

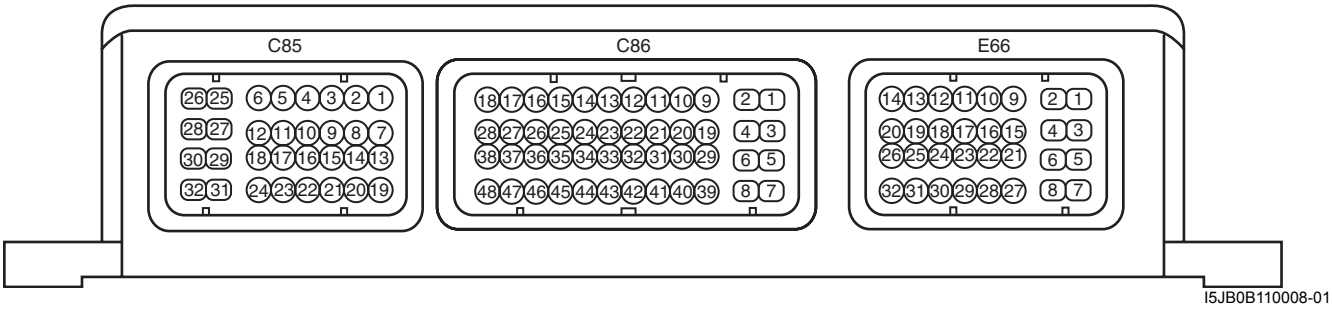


I5JB0B110007-02

1. ECM	21. Brake lamp switch	43. Turbocharger electric water pump
2. Fuel injector No.1	22. Brake lamp	44. MAF sensor assembly with IAT sensor
3. Fuel injector No.2	23. CPP switch	45. Main relay

4. Fuel injector No.3	24. Fuel flow actuator	46. Ignition switch
5. Fuel injector No.4	25. Glow plug control module	47. Fuel heater relay
6. CKP sensor	26. Glow plug	48. Fuel heater
7. CMP sensor	27. Fuel pump relay	49. ABS or ESP® control module
8. Exhaust gas temperature sensor 2	28. Fuel pump	50. 4WD control module
9. Exhaust gas temperature sensor 3	29. Additional heater relay No.1	51. BCM
10. Differential pressure sensor	30. Additional heater relay No.2	52. Immobilizer control module
11. Boost pressure sensor	31. Additional heater relay No.3	53. Combination meter
12. Exhaust gas temperature sensor 1	32. Additional heater plug	54. Malfunction indicator light (MIL)
13. ECT sensor	33. A/C compressor relay (if equipped with A/C)	55. Injection warning light (gravity 1 warning light)
14. Fuel pressure sensor	34. A/C compressor (if equipped with A/C)	56. Red stop warning light (gravity 2 warning light)
15. EGR valve	35. Radiator fan relay No.1 (LOW)	57. Diesel particulate filter warning light
15-1. EGR motor	36. Radiator fan relay No.2 (HIGH)	58. Glow plug indicator light
15-2. EGR stroke sensor	37. Radiator fan relay No.3 (HIGH)	59. Fuel filter warning light
16. A/C refrigerant pressure sensor (if equipped with A/C)	38. Radiator fan motor No.1	60. Meter driver
17. Accelerator pedal position (APP) sensor assembly	39. Radiator fan motor No.2	61. Body ground
18. Cruise control switch (if equipped with cruise control system)	40. Inlet throttle valve	62. Engine ground
19. Data link connector (DLC)	41. Boost pressure control solenoid valve	63. Barometric pressure sensor
20. Fuel filter water detection sensor	42. Turbocharger electric water pump relay	

Terminal Arrangement of ECM Coupler (Viewed from Harness Side)



Connector: C85

Terminal	Circuit	Terminal	Circuit
1	Glow plug control module diagnosis input	17	Glow plug control module output
2	—	18	Radiator fan relay No.2 and 3 output
3	—	19	Additional heater relay No.2 and 3 output
4	—	20	Radiator fan relay No.1 output
5	Exhaust gas temperature sensor 1 signal	21	Fuel pump relay output
6	—	22	Ground for exhaust gas temperature sensor 1
7	—	23	Boost pressure control solenoid valve
8	Brake lamp switch signal	24	—
9	Ground for A/C pressure sensor	25	Fuel injector No.2 (low side)
10	—	26	Fuel injector No.3 (low side)
11	Ground for exhaust gas temperature sensor 3	27	Fuel injector No.1 (low side)
12	Ground for diesel particulate filter differential pressure	28	Fuel injector No.4 (low side)
13	Water detection signal in fuel filter	29	Fuel injector No.2 (high side)
14	Diesel particulate filter differential pressure sensor signal	30	Fuel injector No.3 (high side)
15	Ground for EGR position sensor	31	Fuel injector No.4 (high side)
16	—	32	Fuel injector No.1 (high side)

Connector: C86

Terminal	Circuit	Terminal	Circuit
1	—	25	EGR valve output
2	—	26	EGR valve output
3	Main power supply	27	Inlet throttle valve feedback
4	—	28	—
5	—	29	Exhaust gas temperature sensor 3 signal
6	—	30	—
7	Fuel flow actuator	31	Exhaust gas temperature sensor 2 signal
8	—	32	Fuel pressure sensor signal
9	—	33	Power source for A/C pressure sensor
10	—	34	—
11	Ground for ECT sensor	35	—
12	MAF sensor signal	36	—
13	A/C pressure sensor signal	37	—
14	Main relay output	38	—
15	CMP sensor signal	39	Additional heater relay No.1
16	CKP sensor (low side)	40	Inlet throttle valve drive
17	CKP sensor (high side)	41	Turbocharger electric water pump relay
18	Ground for CMP sensor and exhaust gas temperature sensor 2	42	Power source for boost pressure sensor and differential pressure sensor
19	Boost pressure sensor signal	43	Power source for EGR position sensor
20	EGR position sensor signal	44	—
21	—	45	Ground for boost pressure sensor
22	IAT sensor signal	46	Ground for fuel pressure sensor
23	ECT sensor signal	47	Power source for MAF sensor
24	Ground for MAF sensor	48	Power source for fuel pressure sensor

Connector: C48

Terminal	Circuit	Terminal	Circuit
1	Ground for ECM	17	Cruise control switch signal
2	Main power supply	18	—
3	APP sensor 1 signal	19	—
4	Power source for APP sensor 1	20	Cruise control main switch signal
5	Ground for APP sensor 1	21	APP sensor 2 signal
6	—	22	—
7	Ground for ECM	23	Ground for cruise control switch
8	Ground for ECM	24	—
9	—	25	—
10	—	26	CAN (low) communication line (active low signal)
11	Ignition switch signal	27	Ground for APP sensor 2
12	—	28	Brake lamp switch signal
13	A/C compressor relay output	29	—
14	—	30	CPP switch signal
15	Power source for APP sensor 2	31	12 V serial communication line of data link connector
16	—	32	CAN (high) communication line (active high signal)

Diesel Particulate Filter Regeneration Description

S5JB0B1101006

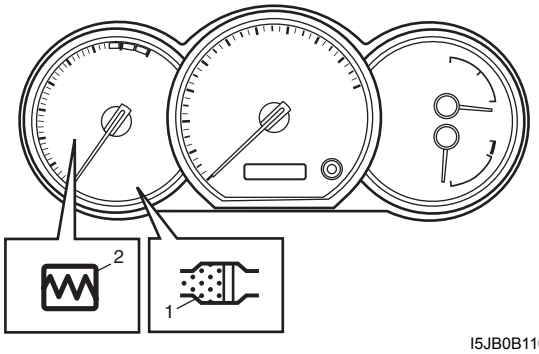
As Diesel Particulate Filter is a device to trap the diesel particulate (PM), it is necessary that the accumulated PM is burned and diesel particulate filter regenerated.
There are three ways to regenerate diesel particulate filter.

- "Natural regeneration" by catalysis and exhaust gas temperature
- "Forced regeneration" by post-injection
- "After-sales regeneration" by using SUZUKI scan tool

And, here is the mechanism to regenerate diesel particulate filter.

1. Diesel particulate filter, trapping PM, carries out "Natural regeneration" according to the driving condition. The driver will not find it.
2. ECM consistently monitors the exhaust gas temperature, injection quantity, driving time, vehicle speed, PM mass etc. In case of the long-time idling and traffic jam at low speed that cause lowering the exhaust gas temperature, PM is accumulated gradually.
   When "Natural regeneration" becomes insufficient (PM mass exceeds 25 g), ECM will perform "Forced regeneration" by the post-injection at the point of appropriate driving condition. The post-injection will heat the exhaust gas temperature to enable "Forced regeneration". In this situation, any warning indicator will not come on. Therefore, the driver will not recognize that "Forced regeneration" is performed.
3. If "Forced regeneration" is interrupted by the engine stop, long-time idling and traffic jam at low speed that do not keep the specified exhaust gas temperature, ECM will memorize it as "Regeneration failure". When the "regeneration failure" number (5 times) or PM mass reach at the specified conditions (PM mass exceeds 42 g), ECM will find it as "impossible to regenerate by diesel particulate filter itself and incapable of continuing the driving" and ask the driver for a help. This is "Speed request" announced to the driver by diesel particulate filter warning light (1) in combination meter. Then, the driver will be asked to increase the vehicle speed more than 75 km/h (47 MPH) on the average for heating the exhaust gas temperature. If the regeneration is completed by "natural regeneration" or "Forced regeneration" when accumulating "regeneration failure", the accumulation of "regeneration failure" will be reset.
4. After the driver fulfills "speed request" for the regeneration and PM mass falls to the specified amount (5 ~ 8 g), the regeneration will complete and diesel particulate filter warning light be turned OFF. It will take about 20 minutes to complete the regeneration if the regeneration driving is performed properly. During the regeneration driving, "Forced regeneration" will go simultaneously to hasten the increase of exhaust gas temperature and shorten the time of regeneration. When the engine stops before diesel particulate filter warning light is turned OFF, PM mass that should be decreased will be calculated at starting the engine next time. At that time, if PM mass does not fall to the specified amount, diesel particulate filter warning light will come on again and the vehicle continue to ask the driver for regeneration driving.
5. If the regeneration driving is not achieved and diesel particulate filter becomes almost clogged while "Speed request" is on, injection warning light (Gravity 1 Fault) (2) in combination meter will come on. Also, to prevent diesel particulate filter from melting and cracking, ECM will take following actions;
   1) EGR (Exhaust Gas Recirculation) will be cut off to avoid generating the extra PM.
   2) "Forced regeneration" function will stop.
   3) Driving performance will be limited by lowering the engine torque to avoid "Natural regeneration".

Therefore, the driver will recognize the malfunction of diesel particulate filter.
In this situation, "After-sales regeneration" using SUZUKI scan tool will be necessary or diesel particulate filter has to be replaced in the worst case.



I5JB0B110016-01

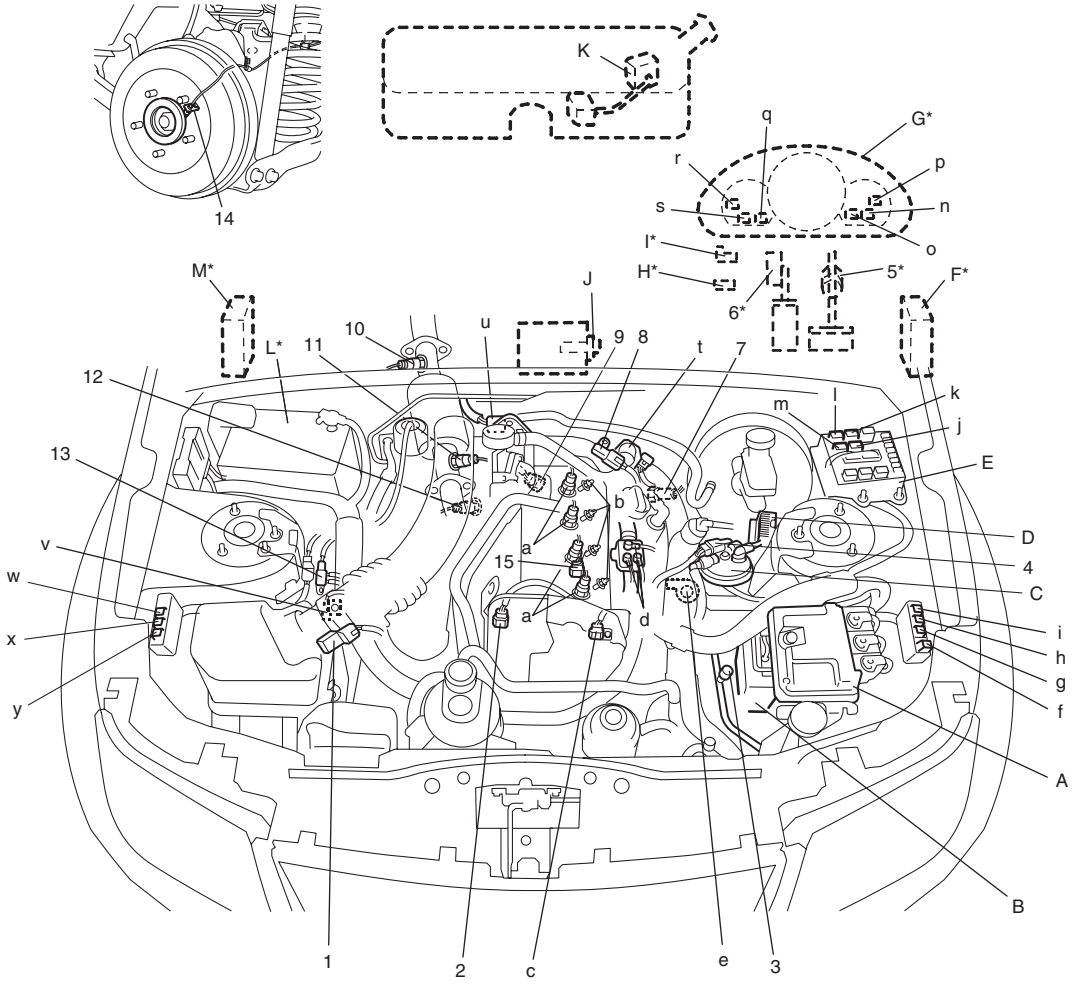
Component Location

Electronic Control System Components Location

S5JB0B1103001

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



I5JB0B110010-03

Information sensors	Control devices	Others
1. MAF sensor assembly with IAT sensor	a: Fuel injector	A: ECM
2. CMP sensor	b: Glow plug	B: ABS or ESP® control module
3. A/C refrigerant pressure sensor (if equipped with A/C)	c: Fuel flow actuator	C: Fuel filter including fuel heater
4. Fuel filter water detection sensor	d: Additional heater plug	D: Glow plug control module
5. Brake lamp switch	e: Turbocharger electric water pump	E: Fuse box No.2
6. Accelerator pedal position (APP) sensor	f: Radiator fan relay No.3 (HIGH)	F: BCM
7. CKP sensor	g: Radiator fan relay No.2 (HIGH)	G: Combination meter
8. Boost pressure sensor	h: Radiator fan relay No.1 (LOW)	H: Immobilizer control module
9. ECT sensor	i: Fuel pump relay	I: Data link connector
10. Exhaust gas temperature sensor 3	j: Turbocharger electric water pump relay	J: A/C evaporator outlet temp. sensor (if equipped with A/C)
11. Exhaust gas temperature sensor 2	k: Main relay	K: Fuel pump
12. Exhaust gas temperature sensor 1	l: A/C compressor relay (if equipped with A/C)	L: Battery
13. Differential pressure sensor	m: Fuel heater relay	M: 4WD control module
14. Rear wheel speed sensor (RH, LH) (VSS)	n: MIL	
15. Fuel pressure sensor	o: Fuel filter warning light	
	p: Injection warning light (gravity 1 warning light)	
	q: Glow plug indicator light	
	r: Red stop warning light (gravity 2 warning light)	
	s: Diesel particulate filter warning light	

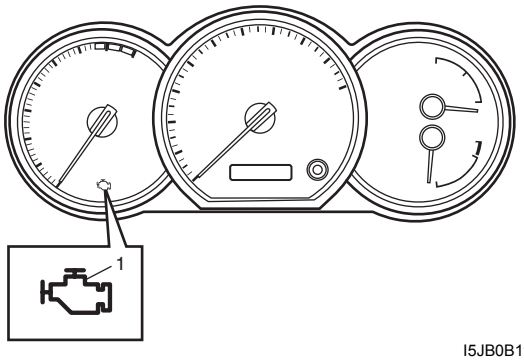
Information sensors	Control devices	Others
	t: Inlet throttle valve	
	u: EGR valve	
	v: Boost pressure control solenoid valve	
	w: Additional heater relay No.1	
	x: Additional heater relay No.2	
	y: Additional heater relay No.3	

Diagnostic Information and Procedures

Malfunction Indicator Lamp (MIL) Check

S5JB0B1104001

Malfunction indicator lamp (1) signals an antipollution system failure.
Check that it lights up for 3 seconds after the ignition switch is turned ON, and then it goes OFF (automatic test procedure).
If light remains ON after an automatic test procedure, go to “DTC Check: ”.
After the ignition switch is turned ON, if light does not light up or remains ON, check that malfunction indicator lamp circuit.

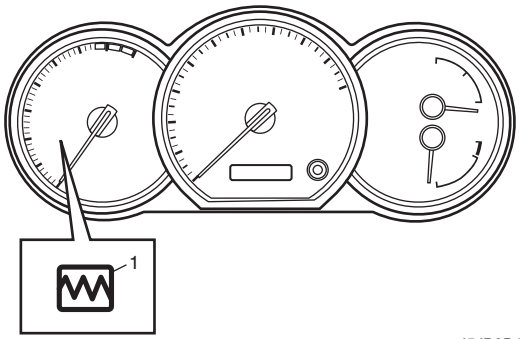


I5JB0B110011-02

Injection Warning Light (Gravity 1 Fault) Check

S5JB0B1104002

Injection warning light (1) serves to indicate proper functioning and to signal system failures.
After the ignition switch is turned ON, if lights remains ON, go to “DTC Check: ”.
If injection warning light flashes ON and OFF, there is some trouble in the immobilizer control system referring to “On-Board Diagnostic System Description (Self-diagnosis Function): in Section 10C”.

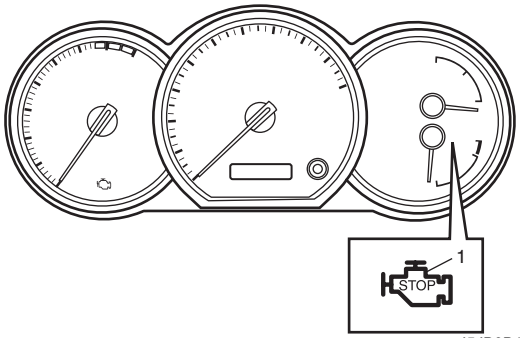


I5JB0B110012-02

Red Stop Warning Light (Gravity 2 Fault) Check

S5JB0B1104003

Red stop warning light (1) serves to indicate proper functioning and to signal system failures.
After the ignition switch is turned ON. if light remains ON, go to “DTC Check: ”.



I5JB0B110013-02

Engine and Emission Control System Check

S5JB0B1104004

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis referring to “Step 1: Customer Complaint Analysis: ”. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **Visual inspection** 1) Perform visual inspection referring to “Step 2: Visual Inspection: ”. *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 3.	Go to Step 3.
3	☞ **DTC check, record and clearance** 1) Check for DTC referring to “Step 3: DTC Check, Record and Clearance: ”. *Is there any DTC(s)?*	Record and clear DTC referring to “DTC Clearance: ” and go to Step 5.	Go to Step 4.
4	☞ **Engine basic inspection and fault finding – customer complaints** 1) Check and repair according to “Step 4: Engine Basic Inspection and Fault Finding-Customer Complaints: ”. *Is there any faulty condition?*	Repair or replace malfunction part and then go to Step 8.	Go to Step 8.
5	☞ **Recheck DTC** 1) Recheck DTC referring to “Step 5: Recheck DTC: ”. *Is there any DTC(s)?*	Go to Step 6.	Go to Step 7.
6	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC diag. flow referring to “Step 6: Troubleshooting for DTC (See each DTC Diag. Flow): ”. *Is there any faulty condition?*	Repair or replace malfunction part and then go to Step 8.	Go to Step 7.
7	☞ **Intermittent problems check** 1) Check for intermittent problems referring to “Step 7: Intermittent Problems Check: ”. *Is there any faulty condition?*	Repair or replace malfunction part(s), and go to Step 8.	Go to Step 8.
8	☞ **Final confirmation test** 1) Clear DTC if any. 2) Perform final confirmation test referring to “Step 8: Final Confirmation Test: ”. *Is there any problem symptom, DTC or abnormal condition?*	Go to Step 5.	End.

Step 1: Customer Complaint Analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

PROBLEM SYMPTOMS	
☐ **Difficult Starting** ☐ No cranking ☐ No initial combustion ☐ No combustion ☐ Poor starting at (☐cold ☐warm ☐always) ☐ Other_____	☐ **Poor Driveability** ☐ Hesitation on acceleration ☐ Back fire/☐After fire ☐ Lack of power ☐ Surging ☐ abnormal knocking ☐ Other_____
☐ **Poor Idling** ☐ Poor fast idle ☐ Abnormal idling speed (☐High ☐Low) (r/min.) ☐ Unstable ☐ Hunting (r/min. to r/min.) ☐ Other_____	☐ **Engine Stall when** ☐ Immediately after start ☐ Accel. pedal is depressed ☐ Accel. pedal is released ☐ Load is applied ☐ A/C ☐Electric load ☐P/S ☐ Other_____ ☐ Other_____
☐ OTHERS:	

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Road	☐Fair ☐Cloudy ☐Rain ☐Snow ☐Always ☐Other_____ ☐Hot ☐Warm ☐Cool ☐Cold (°F/ °C) ☐Always ☐Always ☐Sometimes (times/ day, month) ☐Only once ☐Under certain condition ☐Urban ☐Suburb ☐Highway ☐Mountainous (☐Uphill ☐Downhill) ☐Tarmacadam ☐Gravel ☐Other_____
Vehicle Condition	
Engine condition	☐Cold ☐Warming up phase ☐Warmed up ☐Always ☐Other at starting ☐Immediately after start ☐Racing without load ☐Engine speed (r/min)
Vehicle condition	During driving: ☐Constant speed ☐Accelerating ☐Decelerating ☐Right hand corner ☐Left hand corner ☐When shifting (Lever position) ☐At stop ☐Vehicle speed when problem occurs (km/h, Mile/h) ☐Other

Malfunction indicator lamp condition	☐Always ON ☐Sometimes ON ☐Always OFF ☐Good condition
Diagnostic trouble code	First check: ☐No code ☐Malfunction code ( )
	Second check: ☐No code ☐Malfunction code ( )

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NOTE

The form is a standard sample. It should be modified according to conditions characteristic of each market.

Step 2: Visual Inspection
As a preliminary step, be sure to perform visual check of the items that support proper function of the engine referring to “Visual Inspection: ”.

Step 3: DTC Check, Record and Clearance
First, check DTC, referring to “DTC Check: ”. If DTC is indicated, record and clear DTC by referring to “DTC Clearance: ”.
Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

Step 4: Engine Basic Inspection and Fault Finding-Customer Complaints
Perform basic engine check according to “Engine Basic Inspection: ” first. When the end of the flow table has been reached, check the parts of the system suspected as a possible cause referring to “Fault Finding-Customer Complaints: ” and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or basic engine check) and repair or replace faulty parts, if any.

Step 5: Recheck DTC
Refer to “DTC Check: ” for checking procedure.

Step 6: Troubleshooting for DTC (See each DTC Diag. Flow)
Based on the DTC indicated in Step 5 and referring to the applicable DTC diag. flow, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ECM or other part and repair or replace faulty parts.

Step 7: Intermittent Problems Check
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual” and related circuit of DTC recorded in Step 2.

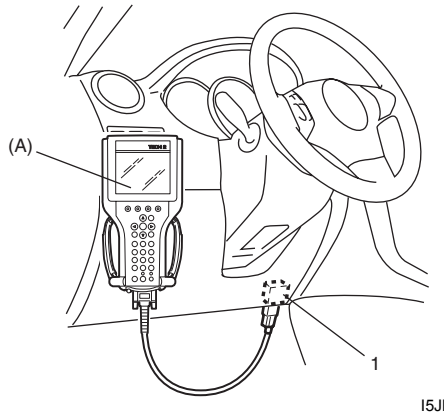
Step 8: Final Confirmation Test
Confirm that the problem symptom has gone and the engine is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once and then recheck DTC and confirm that no DTC is indicated.

DTC Check

S5JB0B1104005

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

Special tool
(A): SUZUKI scan tool



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3) Turn ignition switch ON.
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, check if scan tool is communicable by connecting it to ECM in another vehicle.
If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch OFF and disconnect scan tool from data link connector.

DTC Clearance

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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 according to instructions displayed on scan tool. Refer to scan tool operator’s manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.

DTC Table

S5JB0B1104007

DTC No. (SUZUKI scan tool)	Detecting Item	Detecting Condition (DTC will set when detecting:)
☞ P0016	Crankshaft Position – Camshaft Position Correlation	CKP sensor signal frequency above a given threshold.
☞ P0033	Turbo Charger Bypass Valve Control Circuit	• Boost pressure control solenoid valve circuit shorted to ground circuit • Boost pressure control solenoid valve circuit open or shorted to power circuit
☞ P0089	Fuel Pressure Regulator 1 Performance	Fuel pressure regulator control signal low or high input
☞ P0100	Mass or Volume Air Flow Circuit	• MAF sensor circuit shorted to ground circuit • MAF sensor circuit open or shorted to power circuit • Poor performance of MAF sensor
☞ P0105	Manifold Absolute Pressure/Barometric Pressure Circuit	Barometric pressure is lower or higher than specification
☞ P0110	Intake Air Temperature Sensor 1 Circuit	Intake air temperature sensor 1 signal low or high input
☞ P0115	Engine Coolant Temperature Circuit	Engine coolant temperature sensor signal low or high input
☞ P0190	Fuel Rail Pressure Sensor Circuit	• Fuel pressure sensor signal low or high input • Poor performance of fuel pressure sensor
☞ P0201	Injector circuit / open – Cylinder 1	Fuel injector No.1 control signal circuit open or short
☞ P0202	Injector circuit / open – Cylinder 2	Fuel injector No.2 control signal circuit open or short
☞ P0203	Injector circuit / open – Cylinder 3	Fuel injector No.3 control signal circuit open or short
☞ P0204	Injector circuit / open – Cylinder 4	Fuel injector No.4 control signal circuit open or short
☞ P0225	Throttle/Pedal Position Sensor/Switch “C” Circuit	• Accelerator pedal position (APP) sensor (truck 1) circuit shorted to ground circuit • Accelerator pedal position (APP) sensor (truck 1) circuit open or shorted to power circuit • Poor performance of Accelerator pedal position (APP) sensor (truck 1)
☞ P0235	Turbo/Super Charger Boost Sensor “A” Circuit	Turbo pressure sensor signal low or high input
☞ P0243	Turbo/Super Charger Wastegate Solenoid “A”	Turbo pressure out of specification
☞ P0297	Vehicle Overspeed Condition	The vehicle was running while the after-sales regeneration was in progress.
☞ P0301	Cylinder 1 Misfire Detected	Detection of engine speed fluctuation (problem on cylinder No.1)
☞ P0302	Cylinder 2 Misfire Detected	Detection of engine speed fluctuation (problem on cylinder No.2)
☞ P0303	Cylinder 3 Misfire Detected	Detection of engine speed fluctuation (problem on cylinder No.3)
☞ P0304	Cylinder 4 Misfire Detected	Detection of engine speed fluctuation (problem on cylinder No.4)
☞ P0335	Crankshaft Position Sensor “A” Circuit	Crankshaft position sensor signal not inputted or incorrect signal inputted
☞ P0340	Crankshaft Position Sensor “A” Circuit	Camshaft position sensor signal not inputted or inconsistent signal inputted
☞ P0380	Glow Plug / Heater Circuit “A”	Pre-heating control signal low or high input

DTC No. (SUZUKI scan tool)	Detecting Item	Detecting Condition (DTC will set when detecting:)
☞ P0403	Exhaust Gas Recirculation Control Circuit	• EGR valve actuator circuit shorted to ground circuit • EGR valve actuator circuit open or shorted to power circuit
☞ P0409	Exhaust Gas Recirculation Sensor “A” Circuit	• Excessive or insufficient EGR flow • Poor performance of EGR valve
☞ P0470	Exhaust Pressure Sensor	• Differential pressure sensor circuit shorted to ground circuit • Differential pressure sensor circuit open or shorted to power circuit • Poor performance of differential pressure sensor
☞ P0480	Fan 1 Control Circuit	Radiator cooling fan relay No.1 control circuit low or high input
☞ P0481	Fan 2 Control Circuit	Radiator cooling fan relay No.2 and No.3 control circuit low or high input
☞ P0486	Exhaust Gas Recirculation Sensor “B” Circuit	Exhaust gas temperature sensor 1 signal low or high input
☞ P0500	Vehicle Speed Sensor “A”	• Vehicle speed signal not inputted or incorrect signal inputted • Receiving error on CAN communication from other control module
☞ P0530	A/C Refrigerant Pressure Sensor “A” Circuit	A/C pressure sensor signal circuit low or high input
☞ P0544	Exhaust Gas Temperature Sensor Circuit	• Exhaust gas temperature sensor 3 circuit shorted to ground circuit • Exhaust gas temperature sensor 3 circuit open or shorted to power circuit
☞ P0560	System Voltage	Power supply low or high input
☞ P0571	Brake Switch “A” Circuit	Brake pedal switch signal (Brake switch 2) is inconsistent with stop lamp switch signal (Brake switch 1).
☞ P0575	Cruise Control Input Circuit	inconsistent signal inputted
☞ P0606	ECM/PCM Processor	Engine control module internal faulty (system error)
☞ P0611	Fuel Injector Control Module Performance	• Poor performance of ECM • IMA coeds is not entered or erroneous
☞ P0615	Starter Relay Circuit	Power supply low or high input
☞ P0627	Fuel Pump “A” Control Circuit /Open	Fuel pump relay control circuit low or high input
☞ P0638	Throttle Actuator Control Range/ Performance	• Inlet throttle valve actuator circuit shorted to ground circuit • Inlet throttle valve actuator circuit open or shorted to power circuit • Inlet throttle valve position signal low or high input
☞ P0641	Sensor Reference Voltage “A” circuit / open	Sensor power source voltage is too high or too low from ECM (Accelerator pedal position (APP) sensor (main), Turbo pressure sensor, differential pressure sensor)
☞ P0645	A/C Clutch Relay Control Circuit	A/C compressor relay control circuit low or high input

DTC No. (SUZUKI scan tool)	Detecting Item	Detecting Condition (DTC will set when detecting:)
☞ P0651	Sensor Reference Voltage “B” circuit / open	Sensor power source voltage is too high or too low from ECM (Accelerator pedal position (APP) sensor (sub), EGR stroke sensor)
☞ P0670	Glow Plug Module Control Circuit	Detection an error of pre-heating control or glow plug failure
☞ P0685	ECM/PCM Power Relay Control Circuit / Open	Monitor signal of main relay is different from command signal.
☞ P0697	Sensor Reference Voltage “C” circuit / open	Sensor power source voltage is too high or too low from ECM (Fuel pressure sensor, MAF)
☞ P0830	Clutch Pedal Switch “A” Circuit	Poor performance of clutch switch
☞ P1431	Clogged Particulate Filter Failures	Diesel particulate filter clogged
☞ P1436	Regeneration Request failures	This DTC indicates whether a specific running request has been made in order to prompt a particulate filter regeneration.
☞ P1480	Defective Particulate Filter Inlet Pick-Off Failures	Clog diesel particulate filter upstream side pipe of diesel particulate filter differential pressure sensor
☞ P1641	Additional heater relay No.1 control circuit	Additional heater relay No.1 control circuit low or high input
☞ P1642	Additional heater relay No.2, 3 control circuit	Additional heater relay No.2 and 3 control circuit low or high input
☞ P2002	Particulate Trap Efficiency Below Threshold	• Differential pressure sensor signal out of specification
☞ P2031	Exhaust Gas Temperature Sensor Circuit	• Exhaust gas temperature sensor 2 circuit shorted to ground circuit • Exhaust gas temperature sensor 2 circuit open or shorted to power circuit
☞ P2120	Throttle/Pedal Position Sensor/Switch “D” Circuit	• Accelerator pedal position (APP) sensor (truck 2) circuit shorted to ground circuit • Accelerator pedal position (APP) sensor (truck 2) circuit open or shorted to power circuit • Poor performance of Accelerator pedal position (APP) sensor (truck 2)
☞ P2141	Exhaust Gas Recirculation Throttle Control Circuit Low	EGR valve out of tolerance or inoperative
☞ P2142	Exhaust Gas Recirculation Throttle Control Circuit High	EGR valve out of tolerance or inoperative
☞ P2264	Water in Fuel Sensor Circuit	• Fuel filter water detection sensor circuit open or short • Fuel filter water detection sensor detects water in fuel filter
☞ P2413	Exhaust Gas Recirculation System Performance	• Excessive EGR flow • Poor performance of EGR valve
☞ P242A	Turbine Inlet Temperature Sensor and Wake-up Sensor Failure	• Exhaust gas temperature sensor 1 circuit shorted to ground circuit • Exhaust gas temperature sensor 1 circuit open or shorted to power circuit
☞ P242B	Turbine Inlet Temperature Sensor Regulation Failure	Exhaust gas temperature sensor 1 signal too high input
☞ P2600	Coolant Pump Control circuit / open	Turbocharger electric water pump relay control circuit low or high input
☞ P3031	Temperature Threshold Overshoot Failures During After-sales Regeneration	The exhaust gas temperature sensor 2 detects over 700 °C, 1292 °F while the after-sales regeneration was in progress.

Indicator lamp operation table

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DTC No. (SUZUKI scan tool)	Detecting Item	Malfunction Indicator Lamp (MIL)	Injection Warning Light (Gravity 1 Fault)	Red Stop Warning Light (Gravity 2 Fault)
☞ P0016	Crankshaft Position – Camshaft Position Correlation	—	—	—
☞ P0033	Turbo Charger Bypass Valve Control Circuit	*3 driving cycles	*1 driving cycle	—
☞ P0089	Fuel Pressure Regulator 1 Performance	—	*1 driving cycle	*1 driving cycle
☞ P0100	Mass or Volume Air Flow Circuit	—	1 driving cycle	—
☞ P0105	Manifold Absolute Pressure/Barometric Pressure Circuit	—	1 driving cycle	—
☞ P0110	Intake Air Temperature Sensor 1 Circuit	—	1 driving cycle	—
☞ P0115	Engine Coolant Temperature Circuit	—	1 driving cycle	—
☞ P0190	Fuel Rail Pressure Sensor Circuit	—	—	1 driving cycle
☞ P0201	Injector Circuit / Open – Cylinder 1	*3 driving cycles	*1 driving cycle	*1 driving cycle
☞ P0202	Injector Circuit / Open – Cylinder 2	*3 driving cycles	*1 driving cycle	*1 driving cycle
☞ P0203	Injector Circuit / Open – Cylinder 3	*3 driving cycles	*1 driving cycle	*1 driving cycle
☞ P0204	Injector Circuit / Open – Cylinder 4	*3 driving cycles	*1 driving cycle	*1 driving cycle
☞ P0225	Throttle/Pedal Position Sensor/ Switch “C” Circuit	—	1 driving cycle	—
☞ P0235	Turbo/Super Charger Boost Sensor “A” Circuit	—	1 driving cycle	—
☞ P0243	Turbo/Super Charger Wastegate Solenoid “A”	—	1 driving cycle	—
☞ P0297	Vehicle Overspeed Condition	—	—	—
☞ P0301	Cylinder 1 Misfire Detected	—	—	—
☞ P0302	Cylinder 2 Misfire Detected	—	—	—
☞ P0303	Cylinder 3 Misfire Detected	—	—	—
☞ P0304	Cylinder 4 Misfire Detected	—	—	—
☞ P0335	Crankshaft Position Sensor “A” Circuit	—	—	1 driving cycle
☞ P0340	Camshaft Position Sensor “A” Circuit	—	1 driving cycle	—
☞ P0380	Glow Plug/Heater Circuit “A”	—	1 driving cycle	—
☞ P0403	Exhaust Gas Recirculation Control Circuit	—	*1 driving cycle	—
☞ P0409	Exhaust Gas Recirculation Sensor “A” Circuit	—	*1 driving cycle	—
☞ P0470	Exhaust Pressure Sensor	*1 driving cycle	1 driving cycle	—
☞ P0480	Fan 1 Control Circuit	—	—	—

DTC No. (SUZUKI scan tool)	Detecting Item	Malfunction Indicator Lamp (MIL)	Injection Warning Light (Gravity 1 Fault)	Red Stop Warning Light (Gravity 2 Fault)
☞ P0481	Fan 2 Control Circuit	—	—	—
☞ P0486	Exhaust Gas Recirculation Sensor “B” Circuit	1 driving cycle	—	—
☞ P0500	Vehicle Speed Sensor “A”	—	—	—
☞ P0530	A/C Refrigerant Pressure Sensor “A” Circuit	—	—	—
☞ P0544	Exhaust Gas Temperature Sensor Circuit	—	—	—
☞ P0560	System Voltage	—	—	—
☞ P0571	Brake Switch “A” Circuit	—	—	—
☞ P0575	Cruise Control Input Circuit	—	—	—
☞ P0606	ECM / PCM Processor	*3 driving cycles	*1 driving cycle	*1 driving cycle
☞ P0611	Fuel Injector Control Module Performance	—	1 driving cycle	—
☞ P0615	Starter Relay Circuit	—	—	—
☞ P0627	Fuel Pump “A” Control Circuit /Open	—	—	—
☞ P0638	Throttle Actuator Control Range/ Performance	—	1 driving cycle	—
☞ P0641	Sensor Reference Voltage “A” Circuit / Open	—	1 driving cycle	—
☞ P0645	A/C Clutch Relay Control Circuit	—	—	—
☞ P0651	Sensor Reference Voltage “B” Circuit / Open	*3 driving cycles	*1 driving cycle	—
☞ P0670	Glow Plug Module Control Circuit	—	1 driving cycle	—
☞ P0685	ECM/PCM Power Relay Control Circuit / Open	—	1 driving cycle	—
☞ P0697	Sensor Reference Voltage “C” Circuit / Open	—	—	1 driving cycle
☞ P0830	Clutch Pedal Switch “A” Circuit	—	—	—
☞ P1431	Clogged Particulate Filter Failures	—	1 driving cycle	—
☞ P1436	Regeneration Request failures	—	—	—
☞ P1480	Defective Particulate Filter Inlet Pick-Off Failures	—	1 driving cycle	—
☞ P1641	Additional heater relay No.1 control circuit	—	—	—
☞ P1642	Additional heater relay No.2, 3 control circuit	—	—	—
☞ P2002	Particulate Trap Efficiency Below Threshold	1 driving cycle	1 driving cycle	—
☞ P2031	Exhaust Gas Temperature Sensor Circuit	—	1 driving cycle	—
☞ P2120	Throttle/Pedal Position Sensor/Switch “D” Circuit	—	1 driving cycle	—

DTC No. (SUZUKI scan tool)	Detecting Item	Malfunction Indicator Lamp (MIL)	Injection Warning Light (Gravity 1 Fault)	Red Stop Warning Light (Gravity 2 Fault)
☞ P2141	Exhaust Gas Recirculation Throttle Control Circuit Low	—	1 driving cycle	—
☞ P2142	Exhaust Gas Recirculation Throttle Control Circuit High	—	1 driving cycle	—
☞ P2264	Water in Fuel Sensor Circuit	—	—	—
☞ P2413	Exhaust Gas Recirculation System Performance	*3 driving cycles		
☞ P242A	Turbine Inlet Temperature Sensor and Wake-up Sensor Failure	1 driving cycle	1 driving cycle	—
☞ P242B	Turbine Inlet Temperature Sensor Regulation Failure	—	1 driving cycle	—
☞ P2600	Coolant Pump Control circuit / open	—	1 driving cycle	—
☞ P3031	Temperature Threshold Overshoot Failures During After-sales Regeneration	—	—	—

NOTE

- **For indicator / warning light operation of items with *, refer to corresponding Faulty Finding – Fault Interpretation in this section.**
- **"–" marked in above table indicates that indicator / warning light does not light.**

Scan Tool Data

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As the data values below are standard values estimated on the basis of values obtained from the normally operating vehicles by using a SUZUKI 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 SUZUKI 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 SUZUKI scan tool.

NOTE

When checking the data with the engine running at idle or racing, be sure to shift M/T gear to the neutral position and pull the parking brake fully. Also, if nothing or "no load" is indicated, turn OFF A/C, all electric loads and all the other necessary switches.

Scan tool data	Vehicle condition		Normal condition / reference values
Engine Speed	At specified idle speed without engine load after warming up to normal operating temperature (ECT: 80 °C, 176 °F – 85 °C, 185 °F)		750 – 850 RPM
Vehicle Speed	At stop		0 km/h
Coolant Temp	At specified idle speed without engine load after warming up to normal operating temperature		50 °C – 100 °C
Intake Air Temp	At specified idle speed without engine load after warming up to normal operating temperature (Environmental temperature: about 20 °C, 68 °F)		–5 °C + environmental temp. to 35 °C + environmental temp.
Barometric Pres	—		Barometric pressure is displayed
Turbo Pressure	At specified idle speed without engine load after warming up to normal operating temperature		900 hPa – 1100 hPa
Battery Voltage	Ignition switch ON / engine at stop		9 V – 16 V
Pedal position	Ignition switch ON		0 – 100%
EGR position sensor	At specified idle speed without engine load after warming up to normal operating temperature		10% – 40%
MAF	At specified idle speed without engine load after warming up to normal operating temperature (EGR position: 0 – 40%)		260 mg/str – 520 mg/str
Fuel pressure	At specified idle speed without engine load after warming up to normal operating temperature		22000 kPa – 32000 kPa
Metering unit duty	At specified idle speed without engine load after warming up to normal operating temperature		35% – 45%
Differential pres	At specified idle speed without engine load after warming up to normal operating temperature		5 hPa – 300 hPa
Diesel PF in Temp	At specified idle speed without engine load after warming up to normal operating temperature		150 °C – 200 °C
Diesel PF out Temp	At specified idle speed without engine load after warming up to normal operating temperature		~ 200 °C
Diesel PF soot mass	At specified idle speed without engine load after warming up to normal operating temperature		~ 50 g
Distance from regeneration	At specified idle speed without engine load after warming up to normal operating temperature		Value taken since the last dynamic regeneration (when driving)
A/C Config	At specified idle speed without engine load after warming up to normal operating temperature		Available
Water sensor Config	At specified idle speed without engine load after warming up to normal operating temperature		Available
Brake Switch	Ignition switch ON	Brake pedal is released	OFF
		Brake pedal is depressed	ON
Clutch SW	Ignition switch ON	Clutch pedal is released	Engage
		Clutch pedal is depressed	Disengage

Scan tool data	Vehicle condition	Normal condition / reference values
Cyl 1 FF Correction	At specified idle speed without engine load after warming up to normal operating temperature	–1.0 mg/str – 1.0 mg/str
Cyl 2 FF Correction		
Cyl 3 FF Correction		
Cyl 4 FF Correction		
Turbo upstream Temp.	At specified idle speed without engine load after warming up to normal operating temperature	100 °C – 200 °C

Scan Tool Data Definitions

Engine Speed (RPM): It is computed by reference pulses from the crankshaft position sensor.

Vehicle Speed (km/h): It is computed based on pulse signals from rear wheel speed sensor (RH, LH).

Coolant Temp (engine coolant temperature, °C): It is detected by engine coolant temperature sensor.

Intake Air Temp (intake air temperature, °C): It is detected by intake air temperature sensor.

Barometric Pres (barometric pressure, hPa): It is detected by barometric pressure sensor included into ECM.

Turbo Pressure (hPa): This parameter indicates intake manifold pressure measured by boost pressure sensor.

Battery Voltage (V): This parameter indicates battery positive voltage inputted to ECM.

Pedal position (accelerator pedal position, %): When throttle position sensor is fully closed position, throttle opening is indicated as 0% and 100% full open position.

EGR position sensor (EGR solenoid valve Pulse Width Modulation, %): This parameter indicates valve ON (valve open) time rate within a certain set cycle of EGR solenoid valve which controls the amount of EGR flow. 0% means that the EGR valve is completely closed while 100% is fully open valve.

MAF (mass air flow rate, mg/str (mg/stroke)): It represents mass of air entering by one stroke to a cylinder which is measured by mass air flow sensor.

Fuel pressure (kPa): This parameter indicates fuel pressure in high pressure fuel circuit which is measured by fuel pressure sensor.

Metering unit duty (fuel flow actuator Pulse Width Modulation, %): This parameter indicates fuel flow actuator opening rate which controls the amount of fuel flow.

Differential pres (Diesel Particulate Filter differential pressure, hPa): This parameter indicates the differential pressure on the diesel particulate filter upstream side and the downstream side. ECM judges the accumulative amount of soot, ash and etc. in diesel particulate filter by measuring the blocked condition of diesel particulate filter.

Diesel PF inlet Temp (Diesel Particulate Filter upstream temperature (Exhaust gas temperature sensor 2) signal, °C): It is detected by exhaust gas temperature sensor 2 located on upstream of diesel particulate filter.

Diesel PF outlet Temp (Diesel Particulate Filter outlet temperature (Exhaust gas temperature sensor 3) signal, °C): It is detected by exhaust gas temperature sensor 3 located on downstream of diesel particulate filter.

Diesel PF soot mass (Weight of soot in Diesel Particulate Filter, g): This parameter indicates weight of soot, ash and etc. in diesel particulate filter depending on differential pressure sensor signal.

Distance from regeneration (km): It represents how much distance (km) driven since last regeneration.

A/C Config (A/C configuration, (Unavailable, Available)): Every vehicle indicates Available with or without equipment of A/C system.

Water sensor Config (Fuel filter water detection sensor configuration, (Unavailable, Available)): Every vehicle indicates Available.

Brake Switch (Brake light switch, (ON,OFF)): This parameter indicates the state of the brake switch.

Clutch SW (Clutch pedal position switch, (Disengage, engage)): This parameter indicates the state of the clutch pedal position switch.

Cyl # FF Correction (Cylinder # fuel flow correction, mm3/str (mm3/stroke)): This parameter indicates the amount of the correction from the reference value of the fuel oil consumption in each injector.

Turbo upstream Temp (Turbocharger upstream temperature (Exhaust gas temperature sensor 1) signal, °C): It is detected by exhaust gas temperature sensor 1 located on exhaust manifold.

Visual Inspection

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Visually check the following parts and systems.

Inspection item	Referring section
• Engine oil-level, leakage	"Engine Oil and Filter Change: in Section 0B"
• Engine coolant-level, leakage	"Coolant Level Check: in Section 1F"
• Fuel-level, leakage	"Fuel Lines and Connections Inspection: in Section 0B"
• Air cleaner element-dirt, clogging	"Air Cleaner Filter Inspection: in Section 0B"
• Battery-fluid level, corrosion of terminal	"Battery Description: in Section 1J"
• Water pump belt-tension damage	"Accessory Drive Belt Inspection: in Section 1J"
• Vacuum hoses of air intake system-disconnection, looseness, deterioration, bend	"Air intake Pipe Removal and Installation: in Section 1D" and "Vacuum Pump Removal and Installation: in Section 1D"
• Connectors of electric wire harness-disconnection, friction	
• Fuses-burning	
• Parts-installation, bolt-looseness	
• Parts-deformation	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible	
• Malfunction indicator lamp-Operation	"Malfunction Indicator Lamp (MIL) Check: "
• Charge warning lamp-Operation	"Generator Symptom Diagnosis: in Section 1J"
• Engine oil pressure warning lamp-Operation	"Oil Pressure Switch Inspection: in Section 9C"
• Engine coolant temp. meter-Operation	
• Fuel level meter-Operation	"Fuel Level Sensor Inspection: in Section 9C"
• Tachometer-Operation	
• Abnormal air being inhaled from air intake system	
• Exhaust system-leakage of exhaust gas, noise	
• Other parts that can be checked visually	

Engine Basic Inspection

S5JB0B1104010

This check is very important for troubleshooting when ECM has detected no DTC and no abnormality has been found in "Visual Inspection: ".
Follow the flow carefully.

Step	Action	Yes	No
1	Check battery voltage *Is it 11 V or more?*	Go to Step 2.	Charge or replace battery.
2	*Is engine cranked?*	Go to Step 3	Go to "Cranking System Symptom Diagnosis: in Section 1I".
3	*Does engine start?*	Go to Step 4.	Go to Step 5.
4	*Was the trouble symptom able to be confirmed?*	Go to "Fault Finding-Customer Complaints: ".	Go to Step 7 of "Engine and Emission Control System Check: ".
5	Check immobilizer system Refer to "Immobilizer Control System Check: in Section 10C". *Is it in good condition?*	Go to "Fault Finding-Customer Complaints: ".	Repair malfunction part.

DTC P0016: Crankshaft Position-Camshaft Position Correlation Malfunction

S5JB0B1104089

NOTE

- **Conditions for applying fault finding procedures to stored faults: The fault becomes present after an attempt to start.**
- **If the fault is stored, erase the fault from the ECM memory. Turn OFF ignition switch, start the engine and check that the fault does not reappear.**
- **Use service wire for any operation on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Inconsistency of signal

Troubleshooting

Check the CKP sensor and CMP sensor connections. Check the ECM connections. Repair if necessary.
Check the continuity and the absence of interference resistance with the connector disconnected from the following connections: • Between “C08-1” wire of CMP sensor connector and “C86-18” terminal of ECM connector • Between “C08-2” wire of CMP sensor connector and “C86-15” terminal of ECM connector • Between “C20-1” wire of CKP sensor connector and “C86-17” terminal of ECM connector • Between “C20-2” wire of CKP sensor connector and “C86-16” terminal of ECM connector Repair if necessary.
With ignition switch ON and the CMP sensor connected: Use a voltmeter to measure the voltage across “C08-1” and “C08-3” wire of the CMP sensor connector: The voltage displayed should be equal to the battery voltage –0.08 to 0.08 V. • If the voltage is outside permitted tolerance values, take the measurement again on the connector, with the CMP sensor disconnected, • If the voltage is still outside permitted tolerance values with the sensor disconnected. Check the following connection for continuity and for the absence of interference resistance: • Between “C08-3” wire of the CMP sensor connector and “E33-6” wire of main relay mounting connector • If the measured voltage is correct with the sensor disconnected.
• Measure the resistance of the CMP sensor between “C20-2” and “C20-3” terminals. Replace the CMP sensor if the resistance is not 9750 – 10750 Ω at 20 °C, 68 °F • Check that the CKP sensor is correctly mounted and that the flywheel target is not damaged. • Check that the gap between the CKP sensor and the engine flywheel is 0.5 – 1.8 mm (0.020 – 0.017 in). • Check the resistance of the CKP sensor between “C20-1” and “C20-2” terminals. Replace the CKP sensor if its resistance is not 720 – 880 Ω at 20 °C, 68 °F.

DTC P0033: Turbo Charger Bypass Valve Control Circuit Malfunction

S5JB0B1104090

⚠ CAUTION

This fault can result in a rapid and significant fouling of the diesel particulate filter.

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after:
  - **Engine start.**
  - **A road test.**
  - **Output test "Boost pressure valve" on SUZUKI scan tool.**
- **If the fault is present:**
  - **Turbocharging is no longer authorized.**
  - **The EGR function is inhibited.**
  - **The vehicle performance is reduced.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
  - **If CC.0 is present, the Malfunction indicator light (MIL) will come on after three consecutive driving cycles (starting +5 seconds + turn OFF ignition switch and wait 40 seconds.).**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CC.0	Short circuit to vehicle body ground
CO	Open circuit
1.DEF	Internal electronic fault

Troubleshooting for CC.1: Short circuit to +12 V

Check the boost pressure control solenoid valve connections. Check the ECM connections. Repair if necessary.
Measure the resistance of the boost pressure control solenoid valve between its "C90-1" and "C90-2" terminals: If the resistance displayed is not 14.7 – 16.1 Ω at 20 °C, 68 °F, replace the boost pressure control solenoid valve.
Check the continuity and insulation from the +12 V feed of the following connection: • Between "C90-1" wire of boost pressure control solenoid valve connector and "C85-23" terminal of ECM connector Repair if necessary.
If the fault is still present, replace the boost pressure control solenoid valve.

Troubleshooting for CC.0: Short circuit to vehicle body ground and CO: Open circuit

Check the boost pressure control solenoid valve connections. Check the ECM connections. Repair if necessary.
Measure the resistance of the boost pressure control solenoid valve between its "C90-1" and "C90-2" terminals: If the resistance displayed is not 14.7 – 16.1 Ω at 20 °C, 68 °F, replace the boost pressure control solenoid valve.
Check the continuity and insulation from vehicle body ground of the following connections: • Between "C90-1" wire of boost pressure control solenoid valve connector and "C85-23" terminal of ECM connector • Between "C90-2" wire of boost pressure control solenoid valve connector and "E33-6" wire of main relay mounting connector Repair if necessary.
If the fault is still present, replace the boost pressure control solenoid valve.

Troubleshooting for 1.DEF: Internal electronic fault

Check the boost pressure control solenoid valve connections. Check the ECM connections. Repair if necessary.
Measure the resistance of the boost pressure control solenoid valve between its “C90-1” and “C90-2” terminals: If the resistance displayed is not 14.7 – 16.1 Ω at 20 °C, 68 °F, replace the boost pressure control solenoid valve.
Check the continuity and insulation from vehicle body ground of the following connections: • Between “C90-1” wire of boost pressure control solenoid valve connector and “C85-23” terminal of ECM connector • Between “C90-2” wire of boost pressure control solenoid valve connector and “E33-6” wire of main relay mounting connector
If the fault is still present, check that the ECM output stage is working correctly.With the boost pressure control solenoid valve connected: • Or using a voltmeter: – Connect the negative terminal of the voltmeter to “C90-1” wire of the solenoid valve connector and the positive terminal to “C90-2” wire. – Clear any solenoid valve faults and perform output test “Boost pressure valve” on SUZUKI scan tool. The voltmeter should display five cycles of two successive voltages: ~ 2.5 V (opening cyclic ratio of 20%) then ~ 8.75 V (opening cyclic ratio of 70%). • Or using an oscilloscope (at 5 V range/division and 1 ms/div time base): – Connect the negative terminal of the oscilloscope to “C90-1” wire of the solenoid valve connector and the positive terminal to “C90-2” wire of the solenoid valve connector. – Clear any solenoid valve faults and perform output test “Boost pressure valve” on SUZUKI scan tool. The oscilloscope should display a square wave signal with an amplitude of 12.5 V (equal to the battery voltage) at a frequency of 140 Hz (with an opening cyclic ratio increasing successively from ~ 20 to ~ 70%). – If the measurement is correct, replace the solenoid valve. – If the measurement does not show any control or continuous voltage, substitute a known-good ECM and recheck.

DTC P0089: Fuel Pressure Regulator 1 Performance Malfunction

S5JB0B1104091

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after:
  - **Engine start.**
  - **A road test.**
  - **Output test “IMV/Flow actuator” on SUZUKI scan tool.**
- **If the fault is present:**
  - **It is not possible to start the engine.**
  - **Engine stops if already started,**
  - **If 3.DEF is present, the Injection warning light (gravity 1 warning light) is lit.**
  - **If one of the other faults is present, the Red stop warning light (gravity 2 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CC.0	Short circuit to vehicle body ground
CO	Open circuit
1.DEF	Internal electronic fault
2.DEF	Measured pressure too low
3.DEF	Measured pressure too high
4.DEF	Insufficient pressure
5.DEF	Pressure < minimum
6.DEF	Pressure > maximum
7.DEF	Extensive pump command

Troubleshooting for CC.1: Short circuit to +12 V

Check the fuel flow actuator connector. Check the ECM connections. Check the low pressure circuit and that the correct fuel is being used using fault finding • Tests Test 2 referring to “Test 2: Low pressure circuit check: ”. Repair if necessary.
Measure the resistance of the fuel flow actuator between “C83-1” and “C83-2” terminals. If the resistance is not 2.9 – 3.1 Ω at 20 °C, 68 °F, replace the fuel flow actuator.
Check the continuity and insulation from the +12 V feed of the following connection: • Between “C83-2” wire of the fuel flow actuator connector and “C86-7” terminal of ECM connector
Check the fuel pressure sensor using the interpretation of “DTC P0190: Fuel Rail Pressure Sensor Circuit Malfunction: ”. If the fault is still present replace the fuel flow actuator.

Troubleshooting for CC.0: Short circuit to vehicle body ground and CO: Open circuit

Check the fuel flow actuator connector. Check the ECM connections. Check the low pressure circuit and that the correct fuel is being used using fault finding • Tests Test 2 referring to “Test 2: Low pressure circuit check: ”. Repair if necessary.
Measure the resistance of the fuel flow actuator between “C83-1” and “C83-2” terminals. If the resistance is not 2.9 – 3.1 Ω at 20 °C, 68 °F, replace the fuel flow actuator. Check the continuity, and insulation from vehicle body ground of the following connection: • Between “C83-2” wire of fuel flow actuator connector and “C86-7” terminal of ECM connector With ignition switch ON, check for +12 V on “C83-1” of the fuel flow actuator.If there is not +12 V on “C83-1”, check the continuity and absence of interference resistance of the following connection: • Between “C83-1” wire of fuel flow actuator connector and “E33-6” wire of main relay mounting connector Repair if necessary.
Check the fuel pressure sensor using the interpretation of “DTC P0190: Fuel Rail Pressure Sensor Circuit Malfunction: ”. If the fault is still present replace the fuel flow actuator.

Troubleshooting for 1.DEF: Internal electronic fault

Check the fuel flow actuator connector. Check the ECM connections. Check the low pressure circuit and that the correct fuel is being used using fault finding • Tests Test 2 referring to “Test 2: Low pressure circuit check: ”. Repair if necessary.
Measure the resistance of the fuel flow actuator between “C83-1” and “C83-2” terminals. If the resistance is not 2.9 – 3.1 Ω at 20 °C, 68 °F, replace the fuel flow actuator. Check the continuity and for the absence of interference resistance on the following connections: • Between “C83-2” wire of fuel flow actuator connector and “C86-7” terminal of ECM connector • Between “C83-1” wire of fuel flow actuator connector and “E33-6” wire of main relay mounting connector Repair if necessary. Check the fuel pressure sensor using the interpretation of “DTC P0190: Fuel Rail Pressure Sensor Circuit Malfunction: ”. Repair if necessary.
If the fault is still present, check that the ECM output stage is working correctly. • Either using an ammeter: With the regulator connected, connect the amperometric clamp to the connection to the fuel flow actuator “C83-1” terminal connection, observing the current direction.Clear any fuel pressure sensor faults and perform output test “IMV/Flow actuator” on SUZUKI scan tool. The ammeter should display five cycles of two successive strengths: ~ 0.6 A then ~ 2 A • Or using a voltmeter: With the fuel flow actuator connected, connect the negative terminal of the voltmeter to “C83-2” wire of the fuel flow actuator connector and the positive terminal to “C83-1” wire. Clear any fuel flow actuator faults, then perform “IMV/Flow actuator” on SUZUKI scan tool: The voltmeter should display two successive voltage readings: ~ 3.15 volts for an opening cyclic ratio of 25% then ~ 9.45 V for an opening cyclic ratio of 75% (five cycles) • Or using an oscilloscope (at 5 V range/division and 1 ms/div time base): With the fuel flow actuator connected, connect the negative terminal of the oscilloscope to the ground terminal at battery and the positive terminal to “C83-2” wire of the fuel flow actuator connector, clear any fuel flow actuator faults, then perform “IMV/Flow actuator” on SUZUKI scan tool: The oscilloscope should display a square-wave signal of an amplitude of 12.5 V at a frequency of 185 Hz (with an opening cyclic ratio alternating from 25 to 75%). If the measurement does not show any control or continuous voltage, substitute a known-good ECM and recheck.

Troubleshooting for 2.DEF: Measured pressure too low, 3.DEF: Measured pressure too high, 4.DEF: Insufficient pressure, 5.DEF: Pressure < minimum, 6.DEF: Pressure > maximum and 7.DEF: Extensive pump command

Check the fuel flow actuator connector. Check the ECM connections. Check the low pressure circuit and that the correct fuel is being used using fault finding • Tests Test 2 referring to “Test 2: Low pressure circuit check: ”. Repair if necessary.
Measure the fuel flow actuator resistance between “C83-2” wire and “C83-1” wire. If the resistance is not 2.9 – 3.1 Ω at 20 °C, 68 °F, replace the fuel flow actuator.
Check the continuity and for the absence of interference resistance on the following connections: • Between “C83-2” wire of fuel flow actuator connector and “C86-7” terminal of ECM connector • Between “C83-1” wire of fuel flow actuator connector and “E33-6” wire of main relay mounting connector Repair if necessary.
• In the event of rail overpressure: Check the operation of the injectors referring to “Test 8: Injector malfunction: ”. Check that the fuel pressure sensor is operating correctly using command “IMV/Flow actuator” on SUZUKI scan tool. Display the parameter “Fuel pressure” on Data List of SUZUKI scan tool, and refer to “SUZUKI Scan Tool Data” to check the operating values. If these checks do not reveal any faults, and if the fault is still present, replace the fuel pressure sensor. • In the event of rail underpressure: Check that the fuel pressure sensor is operating correctly using command “IMV/Flow actuator” on SUZUKI scan tool. Display the parameter “Fuel pressure” on Data List of SUZUKI scan tool, and refer to “SUZUKI Scan Tool Data” to check the operating values. Check the priming of the low pressure fuel circuit. Check the conformity of the fuel filter connections. Check the condition of the fuel filter (clogging and water saturation). Check that there are no air bubbles between the fuel filter and the high pressure pump. Check the low and high pressure fuel circuit sealing (visual checks, odour, etc.): pump casing, pressure relief valve, pipes, rail and fuel injector unions, fuel injector wells, etc. Check the conformity of the seal fitting on the fuel flow actuator. Check the operation of the injectors referring to “Test 8: Injector malfunction: ”. Carry out the necessary operations. If the fault is still present replace the fuel flow actuator.

DTC P0100: Mass or Volume Air Flow Circuit Malfunction

S5JB0B1104092

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after a road test.
- **If the fault is present, the Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**
- **Priorities when dealing with a number of faults:**
  As a priority, deal with fault "DTC P0697: Sensor Reference Voltage "C" Circuit / Open Malfunction: " if the fault is present or stored.

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CO.0	Open circuit or short circuit to vehicle body ground
1.DEF	Offset at maximum threshold
2.DEF	Offset at minimum threshold

Troubleshooting for CC.1: Short circuit to +12 V

Check the MAF sensor assembly with IAT sensor connections. Check the ECM connections. Repair if necessary.
Check the continuity and the insulation against +12 V of the following connections: • Between "C13-2" wire of MAF sensor assembly with IAT sensor connector and "C86-24" terminal of ECM connector • Between "C13-6" wire of MAF sensor assembly with IAT sensor connector and "C86-12" terminal of ECM connector • Between "C13-5" wire of MAF sensor assembly with IAT sensor connector and "C86-47" terminal of ECM connector
If the fault is still present, replace the MAF sensor assembly with IAT sensor.

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check there is a +5 V supply on "C13-5" wire of the MAF sensor assembly with IAT sensor connector. Repair if necessary. Check the MAF sensor assembly with IAT sensor connections. Check the ECM connections. Repair if necessary.
Check the continuity and insulation from vehicle body ground between: • Between "C13-2" wire of MAF sensor assembly with IAT sensor connector and "C86-24" terminal of ECM connector • Between "C13-5" wire of MAF sensor assembly with IAT sensor connector and "C86-47" terminal of ECM connector • Between "C13-6" wire of MAF sensor assembly with IAT sensor connector and "C86-12" terminal of ECM connector • Between "C13-4" wire of MAF sensor assembly with IAT sensor connector and "E33-6" terminal of main mounting connector Repair if necessary.
If the fault is still present and remains present, replace the MAF sensor assembly with IAT sensor.

Troubleshooting for 1.DEF: Offset at maximum threshold and 2.DEF: Offset at minimum threshold

NOTE

Conditions for applying fault finding procedures to stored faults: The fault is declared present after ignition switch has been turned OFF for 40 seconds.

Check the MAF sensor assembly with IAT sensor connections. Check the ECM connections. Repair if necessary
Check the following connections for continuity and make sure there is no interference resistance: • Between “C13-5” wire of MAF sensor assembly with IAT sensor connector and “C86-47” terminal of ECM connector • Between “C13-6” wire of MAF sensor assembly with IAT sensor connector and “C86-12” terminal of ECM connector • Between “C13-2” wire of MAF sensor assembly with IAT sensor connector and “C86-24” terminal of ECM connector • Between “C13-4” wire of MAF sensor assembly with IAT sensor connector and “E33-6” terminal of main relay mounting connector Repair if necessary.
If the fault is still present, apply fault finding-Tests Test 3 referring to “Test 3: Checking the turbocharged air inlet circuit: ” and Test 4 referring to “Test 4: MAF sensor: ”. • Check that the inlet throttle valve is open • With the MAF sensor assembly with IAT sensor connected, turn ON ignition switch and engine stopped: • Check the voltage between “C13-2” and “C13-6” wires of the MAF sensor assembly with IAT sensor connector: If the value is not 0.5 – 0.7 V, replace the MAF sensor assembly with IAT sensor.
Check the EGR valve is not jammed open: • Deal with any faults. • Apply fault finding-Tests Test 7 referring to “Test 7: Exhaust gas recirculation valve: ”. If these checks show that the valve is jammed or irrevocably seized, replace the EGR valve. If no faults are revealed, but the fault is still present, replace the MAF sensor assembly with IAT sensor

DTC P0105: Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction

S5JB0B1104093

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present:
  - **When an attempt is made to start the engine**
  - **With the engine running**
- **The barometric pressure sensor is built into the ECM, and cannot be separated.**
  If the fault is present:
  - **There is light smoke at the exhaust.**
  - **The atmospheric pressure value changes to safe mode, "Barometric Pres" on Data List of SUZUKI scan tool = 1000 hPa.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the controller connectors.**

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Signal outside upper limit
2.DEF	Signal outside lower limit
3.DEF	Inconsistent signal

Troubleshooting

Disconnect the ECM and check the condition of its contacts and connector. Repair if necessary. Display the value of parameter "Turbo Pressure" on Data List of SUZUKI scan tool. If this value is stuck at 1000 hPa, refer to interpretation of fault "DTC P0235: Turbo / Super Charger Boost Sensor "A" Circuit Malfunction: ". If the fault is still present, substitute a known-good ECM and recheck.

DTC P0110: Intake Air Temperature Sensor 1 Circuit Malfunction

S5JB0B1104094

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after an attempted start, or with the engine running.
- **If the fault is present:**
  - **The air temperature value changes to safe mode, "Intake Air Temp" on Data List of SUZUKI scan tool = 45.1 °C, 113.2 °F.**
  - **The EGR function is inhibited.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.0	Short circuit to vehicle body ground
CO.1	Open circuit or short circuit to +12 V

Troubleshooting for CO.1: Open circuit or short circuit to +12 V

Check the MAF sensor assembly with IAT sensor connections. Check the ECM connections. Repair if necessary.
Check the continuity of the following connection: • Between “C13-4” wire of sensor assembly with IAT sensor connector and “E33-6” terminal of Main relay mounting connector Repair if necessary.
Check the continuity and insulation against +12 V of the following connections: • Between “C13-1” wire of MAF sensor assembly with IAT sensor connector and “C86-22” terminal of ECM connector • Between “C13-2” wire of MAF sensor assembly with IAT sensor connector and “C86-24” terminal of ECM connector • Between “C13-5” wire of MAF sensor assembly with IAT sensor connector and “C86-47” terminal of ECM connector • Between “C13-6” wire of MAF sensor assembly with IAT sensor connector and “C86-12” terminal of ECM connector Repair if necessary.
Measure the air temperature sensor resistance between “C13-1” and “C13-2” terminals of the MAF sensor assembly with IAT sensor connector. **Replace the MAF sensor assembly with IAT sensor if the resistance displayed is not:** **3553 – 3875 Ω at –10 °C, –14 °F** **2352 – 2544 Ω at 20 °C, 68 °F** **1612 – 1730 Ω at 30 °C, 86 °F**

Troubleshooting for CC.0: Short circuit to vehicle body ground

Check the connections of the MAF sensor assembly with IAT sensor.Check the ECM connections. Repair if necessary.
Check the continuity and insulation against vehicle body ground of the connection between: • Between “C13-1” wire of MAF sensor assembly with IAT sensor connector and “C86-22” terminal of ECM connector • Between “C13-2” wire of MAF sensor assembly with IAT sensor connector and “C86-24” terminal of ECM connector • Between “C13-5” wire of MAF sensor assembly with IAT sensor connector and “C86-47” terminal of ECM connector • Between “C13-4” wire of MAF sensor assembly with IAT sensor connector and “E33-6” terminal of main relay mounting connector Repair if necessary.
Measure the air temperature sensor resistance between “C13-1” and “C13-2” terminals of the MAF sensor assembly with IAT sensor connector. **Replace the MAF sensor assembly with IAT sensor if the resistance displayed is not:** **3553 – 3875 Ω at –10 °C, –14 °F** **2352 – 2544 Ω at 20 °C, 68 °F** **1612 – 1730 Ω at 30 °C, 86 °F**

DTC P0115: Engine Coolant Temperature Circuit Malfunction

S5JB0B1104095

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  - **When an attempt is made to start the engine**
  - **With the engine running**
- **If the fault is present:**
  - **The coolant temperature: "Coolant Temp" on Data List of SUZUKI scan tool is fixed at 118.1 °C, 244.6 °F with engine running, 0.1 °C, 32 °F with engine stopping**
  - **The preheating phase is greater than 10 seconds,**
  - **The radiator fan is continuously operated,**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors**

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.0	Short circuit to vehicle body ground
CO.1	Open circuit or short circuit to +12 V

Troubleshooting

Check the connections of the "C09-4" terminal of ECT sensor connector. Check the ECM connections. Repair if necessary. Measure the resistance of the ECT sensor between "C09-1" and "C09-4" terminals of its connector. **Replace the sensor if its resistance is not approximately:** **68780 – 82780 Ω at –40 °C, –40 °F** **12338 – 12582 Ω at –10 °C, –14 °F** **2140 – 2364 Ω at 25 °C, 77 °F** **772 – 850 Ω at 50 °C, 122 °F** **275 – 291 Ω at 80 °C, 176 °F** **112 – 118 Ω at 110 °C, 230 °F** **85 – 89 Ω at 120 °C, 248 °F** Check for the insulation, continuity and the absence of interference resistance on the connections: • Between "C09-1" wire of ECT sensor connector and "C86-23" terminal of ECM connector • Between "C09-2" wire of ECT sensor connector and "C86-11" terminal of ECM connector Repair if necessary.
If the fault is still present, replace the ECT sensor.

DTC P0190: Fuel Rail Pressure Sensor Circuit Malfunction

S5JB0B1104096

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after repeated engine starts or with the engine running.
- **Use service wire for all operations on the controller connectors.**
- **If the fault is present:**
  - **The engine will stop immediately.**
  - **It is impossible to restart.**
  - **The Red stop warning light (gravity 2 warning light) is lit.**
- **Priorities when dealing with a number of faults:**
  As a priority, deal with fault "DTC P0697: Sensor Reference Voltage "C" Circuit / Open Malfunction: " if the fault is present or stored.

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.0	Short circuit to vehicle body ground
CO.1	Open circuit or short circuit to +12 V
1.DEF	Offset at minimum threshold

Troubleshooting for CC.0: Short circuit to vehicle body ground

Check the fuel pressure sensor connectors. Check the ECM connections. Repair if necessary.
Check the continuity and insulation from vehicle body ground of the following connections: • Between "C84-2" wire of fuel pressure sensor connector and "C86-32" terminal of ECM connector • Between "C84-3" wire of fuel pressure sensor connector and "C86-48" terminal of ECM connector Repair if necessary.
If the fault is still present, replace the fuel pressure sensor with common rail referring to "Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G".

Troubleshooting for CO.1: Open circuit or short circuit to +12 V

Check the fuel pressure sensor connectors. Check the ECM connections. Repair if necessary.
Check for continuity and insulation from the +12 V feed on the following connections: • Between "C84-2" wire of fuel pressure sensor connector and "C86-32" terminal of ECM connector • Between "C84-1" wire of fuel pressure sensor connector and "C86-46" terminal of ECM connector • Between "C84-3" wire of fuel pressure sensor connector and "C86-48" terminal of ECM connector Repair if necessary.
If the fault is still present, replace the fuel pressure sensor with common rail referring to "Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G".

Troubleshooting for 1.DEF: Offset at minimum threshold

Check the fuel pressure sensor connectors. Check the ECM connections. Repair if necessary.
Check the following connections for continuity and make sure there is no interference resistance: • Between “C84-2” wire of fuel pressure sensor connector and “C86-32” terminal of ECM connector • Between “C84-3” wire of fuel pressure sensor connector and “C86-48” terminal of ECM connector • Between “C84-1” wire of fuel pressure sensor connector and “C86-46” terminal of ECM connector Repair if necessary.
With ignition switch ON and the engine stationary for more than one minute: • Check for fuel pressure sensor output voltage between “C84-2” and “C84-1” wire of fuel pressure sensor connector. – If the voltage is above 0.5V, the sensor is in order. • In this case, substitute a known-good ECM and recheck. – If the voltage is below 0.5V, replace the fuel pressure sensor with common rail referring to “Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G”.

DTC P0201: Fuel Injector Circuit / Open Malfunction-Cylinder 1

S5JB0B1104097

⚠ CAUTION

- **This fault can result in a rapid and significant fouling of the diesel particulate filter.**
- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
- **This test enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Cylinder number is counted from flywheel side.**
- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine has been started.
- **If CC.1, CC, or 1.DEF is present, the Red stop warning light (gravity 2 warning light) is lit.**
- **If CO is present the Injection warning light (gravity 1 warning light) is lit.**
- **If CO is still present, the Malfunction indicator light (MIL) will come on after three consecutive driving cycles (starting +5 seconds + turn OFF ignition switch and wait 40 seconds.).**
- **If the fault is present, the injection on cylinder 1 is disabled.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CO	Open circuit
CC	Short circuit
1.DEF	Fuel injector control

Troubleshooting

Check the connections on fuel injector No.1. Check the ECM connections. Repair if necessary.
Disconnect fuel injector No.1. Measure the resistance of fuel injector No.1 between “C04-1” and “C04-2” terminals.Replace the fuel injector if there is a short circuit (R = 0 Ω) or an open circuit (resistance = infinity). Otherwise reconnect fuel injector No.1. Check the following connections for continuity and make sure there is no interference resistance: • Between “C04-2” wire of fuel injector No.1 connector and “C85-27” terminal of ECM connector • Between “C04-1” wire of fuel injector No.1 connector and “C85-32” terminal of ECM connector
If the fault is still present: apply Test 8 of Fault Finding-Tests referring to “Test 8: Injector malfunction: ”. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0202: Fuel Injector Circuit / Open Malfunction-Cylinder 2

S5JB0B1104098

⚠ CAUTION

- **Cylinder number is counted from flywheel side.**
- **This fault can result in a rapid and significant fouling of the diesel particulate filter.**
- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
- **This test enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine has been started.
- **If CC.1, CC, or 1.DEF is present, the Red stop warning light (gravity 2 warning light) is lit.**
- **If CO is present the Injection warning light (gravity 1 warning light) is lit.**
- **If CO is still present, the Malfunction indicator light (MIL) will come on after three consecutive driving cycles (starting +5 seconds + turn OFF ignition switch and wait 40 seconds.).**
- **If the fault is present, the injection on cylinder 2 is disabled.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CO	Open circuit
CC	Short circuit
1.DEF	Fuel injector control

Troubleshooting

Check the connections on fuel injector No.2. Check the ECM connections. Repair if necessary.
Disconnect fuel injector No.2. Measure the resistance of fuel injector No.2 between “C05-1” and “C05-2” terminals. Replace the fuel injector if there is a short circuit (R = 0 Ω) or an open circuit (resistance = infinity). Otherwise reconnect fuel injector No.2. Check the following connections for continuity and make sure there is no interference resistance: • Between “C05-2” wire of fuel injector No.2 connector and “C85-25” terminal of ECM connector • Between “C05-1” wire of fuel injector No.2 connector and “C85-29” terminal of ECM connector
If the fault is still present: apply Test 8 of Fault Finding-Tests referring to “Test 8: Injector malfunction: ”. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0203: Fuel Injector Circuit / Open Malfunction-Cylinder 3

S5JB0B1104099

⚠ CAUTION

- **Cylinder number is counted from flywheel side.**
- **This fault can result in a rapid and significant fouling of the diesel particulate filter.**
- **This fault may appear if the wiring harness has been damaged.Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.**
- **This test enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine has been started.
- **If CC.1, CC, or 1.DEF is present, the Red stop warning light (gravity 2 warning light) is lit.**
- **If CO is present the Injection warning light (gravity 1 warning light) is lit.**
- **If CO is still present, the Malfunction indicator light (MIL) will come on after three consecutive driving cycles (starting +5 seconds + turn OFF ignition switch and wait 40 seconds.).**
- **If the fault is present, the injection on cylinder 3 is disabled.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CO	Open circuit
CC	Short circuit
1.DEF	Fuel injector control

Troubleshooting

Check the connections on fuel injector No.3. Check the ECM connections. Repair if necessary.
Disconnect fuel injector No.3. Measure the resistance of fuel injector No.3 between “C06-1” and “C06-2” terminals. Replace the fuel injector if there is a short circuit (R = 0 Ω) or an open circuit (resistance = infinity). Otherwise reconnect fuel injector No.3. Check the following connections for continuity and make sure there is no interference resistance: • Between “C06-2” wire of fuel injector No.3 connector and “C85-26” terminal of ECM connector • Between “C06-1” wire of fuel injector No.3 connector and “C85-30” terminal of ECM connector
If the fault is still present: apply Test 8 of Fault Finding-Tests referring to “Test 8: Injector malfunction: ”. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0204: Fuel Injector Circuit / Open Malfunction-Cylinder 4

S5JB0B1104100

⚠ CAUTION

- **Cylinder number is counted from flywheel side.**
- **This fault can result in a rapid and significant fouling of the diesel particulate filter.**
- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
- **This test enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine has been started.
- **If CC.1, CC, or 1.DEF is present, the Red stop warning light (gravity 2 warning light) is lit.**
- **If CO is present the Injection warning light (gravity 1 warning light) is lit.**
- **If CO is still present, the Malfunction indicator light (MIL) will come on after three consecutive driving cycles (starting +5 seconds + turn OFF ignition switch and wait 40 seconds.).**
- **If the fault is present, the injection on cylinder 4 is disabled.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CO	Open circuit
CC	Short circuit
1.DEF	Fuel injector control

Troubleshooting

Check the connections on fuel injector No.4. Check the ECM connections. Repair if necessary.
Disconnect fuel injector No.4. Measure the resistance of fuel injector No.4 between “C07-1” and “C07-2” terminals. Replace the fuel injector if there is a short circuit (R = 0 Ω) or an open circuit (resistance = infinity). Otherwise reconnect fuel injector No.1. Check the following connections for continuity and make sure there is no interference resistance: • Between “C07-2” wire of fuel injector No.4 connector and “C85-28” terminal of ECM connector • Between “C07-1” wire of fuel injector No.4 connector and “C85-31” terminal of ECM connector
If the fault is still present: apply Test 8 of Fault Finding-Tests referring to “Test 8: Injector malfunction: ”. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0225: Accelerator Pedal Position (APP) Sensor Assembly / Switch “C” Circuit Malfunction

S5JB0B1104101

⚠ CAUTION

- **This fault may appear if the wiring harness has been damaged.Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.**
- **This check enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  - **The fault is declared present after a series of full load/no load actions on the accelerator pedal.**
- **Turbocharging, passenger compartment heating resistor activation and cruise control/ speed limiter are not authorised.**
  If CO.0, CC.1, 1.DEF is present the Injection warning light (gravity 1 warning light) is lit.
- **The engine speed is fixed at 1400 rpm if there is a fault on main and sub of the accelerator pedal position (APP) sensor and the engine torque is limited.**
- **Use service wire for all operations on the controller connectors.**
- **Priorities when dealing with a number of faults:**
  - **Deal with fault “DTC P0641: Sensor Reference Voltage “A” Circuit / Open Malfunction: ” first if it is present or stored.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CC.1	Short circuit to +12 V
1.DEF	Inconsistency of signal
2.DEF	Accelerator pedal position (APP) sensor locked

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

NOTE

Priorities when dealing with a number of faults:

- **If fault "DTC P2120: Throttle/Pedal Position Sensor/Switch "D" Circuit Malfunction: " is present at the same time, check that the accelerator pedal position (APP) sensor assembly connector is connected correctly.**

Check the connections of the accelerator pedal position (APP) sensor. Check the ECM connections. Repair if necessary.
Check the continuity and insulation from vehicle body ground of the following connections: • Between "E68-3" wire of accelerator pedal position (APP) sensor connector and "E66-3" terminal of ECM connector • Between "E68-2" wire of accelerator pedal position (APP) sensor connector and "E66-4" terminal of ECM connector Repair if necessary.
Measure the resistance on the accelerator pedal position (APP) sensor (main) on accelerator pedal position (APP) sensor assembly between "E68-4" and "E68-2". Replace the accelerator pedal position (APP) sensor assembly if the resistance is not approximately 0.8 – 2.6 kΩ.

Troubleshooting for CC.1: Short circuit to +12 V

Check the connections of the accelerator pedal position (APP) sensor. Check the ECM connections. Repair if necessary.
Check for continuity and insulation from the +12 V feed on the following connections: • Between "E68-3" wire of accelerator pedal position (APP) sensor connector and "E66-3" terminal of ECM connector • Between "E68-2" wire of accelerator pedal position (APP) sensor connector and "E66-4" terminal of ECM connector • Between "E68-4" wire of accelerator pedal position (APP) sensor connector and "E66-5" terminal of ECM connector Repair if necessary.
Measure the resistance on the accelerator pedal position (APP) sensor (main) on accelerator pedal position (APP) sensor assembly between "E68-4" and "E68-2". Replace the accelerator pedal position (APP) sensor assembly if the resistance is not approximately 0.8 – 2.6 kΩ.

Troubleshooting for 1.DEF: Inconsistency of signal

Check the connections of the accelerator pedal position (APP) sensor. Check the ECM connections. Repair if necessary.
Check the following connections for continuity and make sure there is no interference resistance: • Between "E68-3" wire of accelerator pedal position (APP) sensor connector and "E66-3" terminal of ECM connector • Between "E68-2" wire of accelerator pedal position (APP) sensor connector and "E66-4" terminal of ECM connector • Between "E68-4" wire of accelerator pedal position (APP) sensor connector and "E66-5" terminal of ECM connector • Between "E68-6" wire of accelerator pedal position (APP) sensor connector and "E66-21" terminal of ECM connector • Between "E68-1" wire of accelerator pedal position (APP) sensor connector and "E66-15" terminal of ECM connector • Between "E68-5" wire of accelerator pedal position (APP) sensor connector and "E66-27" terminal of ECM connector
If the fault is still present, replace the accelerator pedal position (APP) sensor assembly.

Troubleshooting for 2.DEF: Accelerator pedal position (APP) sensor locked

Check the mechanical status of the accelerator pedal: • Locked in full load position. • Pedal blocked by an external component. Repair if necessary. Vary the position of the pedal and display the parameter “Pedal position” on Data List of SUZUKI scan tool. If the values displayed are inconsistent, replace the accelerator pedal position (APP) sensor assembly.

DTC P0235: Turbo / Super Charger Boost Sensor “A” Circuit Malfunction

S5JB0B1104102

⚠ CAUTION

This fault can result in a rapid and significant fouling of the diesel particulate filter.

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present:
  - **When an attempt is made to start the engine**
  - **With the engine running**
- **Use service wire for all operations on the ECM connectors.**
- **If the fault is present:**
  - **The EGR function is inhibited.**
  - **The turbocharging pressure value changes to safe mode: “Turbo Pressure” on Data List of SUZUKI scan tool = 1000 hPa.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Order of priority in the event of more than one fault:**
  Deal with fault “DTC P0641: Sensor Reference Voltage “A” Circuit / Open Malfunction: ” first if it is present or stored.

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CC.1	Short circuit to +12 V
1.DEF	Inconsistency of signal

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the boost pressure sensor connections. Check the ECM connections. Repair if necessary.
Check the continuity and insulation from vehicle body ground of the following connections: • Between “C76-3” wire of boost pressure sensor connector and “C86-42” terminal of ECM connector • Between “C76-74” wire of boost pressure sensor connector and “C86-19” terminal of ECM connector Repair if necessary.
If the fault is still present, replace the boost pressure sensor.

Troubleshooting for CC.1: Short circuit to +12 V

Check the boost pressure sensor connections. Check the ECM connections. Repair if necessary.
Check the continuity and insulation against +12 volts of the following connections: • Between “C76-3” wire of boost pressure sensor connector and “C86-42” terminal of ECM connector • Between “C76-14” wire of boost pressure sensor connector and “C86-45” terminal of ECM connector • Between “C76-4” wire of boost pressure sensor connector and “C86-19” terminal of ECM connector Repair if necessary.
If the fault is still present, replace the boost pressure sensor.

Troubleshooting for 1.DEF: Inconsistency of signal

In the event of a number of faults with “DTC P0105: Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction: ”, display parameter “Turbo Pressure” on Data List of SUZUKI scan tool. If this value is locked at 1000 hPa and “Barometric Pres” on Data List of SUZUKI scan tool is displaying a different value, replace the boost pressure sensor.
Check the boost pressure sensor connections. Check the ECM connections. Repair if necessary.
Check the following connections for continuity and make sure there is no interference resistance: • Between “C76-3” wire of boost pressure sensor connector and “C86-42” terminal of ECM connector • Between “C76-1” wire of boost pressure sensor connector and “C86-45” terminal of ECM connector • Between “C76-4” wire of boost pressure sensor connector and “C86-19” terminal of ECM connector Repair if necessary.
If the fault is still present, replace the boost pressure sensor.

DTC P0243: Turbo / Super Charger Wastegate Solenoid “A” Malfunction

S5JB0B1104103

⚠ CAUTION

This fault can result in a rapid and significant fouling of the diesel particulate filter.

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present:**
  - **Turbocharging is no longer authorised.**
  - **The EGR function is inhibited.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**
- **Order of priority in the event of more than one fault:**
  - **Firstly, deal with fault “DTC P1431: Clogged Particulate Filter Failures Malfunction: ” if it is present or stored.**

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Pressure too low
2.DEF	Pressure too high

Troubleshooting for 1.DEF: Pressure too low

Check the boost pressure sensor connections.
Check the connections of the boost pressure control solenoid valve.
Check the ECM connections.
Repair if necessary.

Check the sealing of the high pressure air circuit:

- Disconnected or pierced pipes.
- Pressure sensor disconnected or poorly fitted (seal present).
- Intercooler pierced (to check the intercooler: with the vehicle stationary, stabiles the engine speed between 3500 to 4000 rpm and check there are no leaks).

Check the conformity of the turbocharging pressure signal and perform Test 5 and 6 of Fault Finding-Tests referring to “Test 5: Variable geometry turbocharger control: ” and “Test 6: Rotating part of a turbocharger: ”.

Check that the turbocharger and its control circuit are working:

- With the engine switched OFF, make sure the control rod is in the resting position.
- Start the engine and make sure that the control rod operates to the high stop. (when the engine stops, the control rod must return to the resting position).
  If the control shaft does not move correctly, carry out the following checks:

1. Vacuum pressure command check:
   a. Disconnect the solenoid valve intake hose and connect it to a vacuum pressure gauge.
   b. Start the engine and stabilise it at idle speed.
      If the vacuum pressure does not reach 70 – 90 kPa (0.7 – 0.9 kg/cm^2, 9.9 – 12.8 psi): check the vacuum pressure circuit from the vacuum pump.
   c. Stop the engine, reconnect the inlet hoses and go to Step 2.
2. Solenoid valve control check:
   a. Disconnect the solenoid valve outlet hose.
   b. Start the engine and stabilise it at idle speed.
   c. Place your hand on the solenoid valve and block the outlet connection with your thumb.
      If there is no detectable vibration of the solenoid valve, check that the ECM output is working correctly (Refer to “DTC P0033: Turbo Charger Bypass Valve Control Circuit Malfunction: ” 1.DEF).
3. Solenoid valve functioning check:
   a. Attach the pressure gauge to the solenoid valve outlet connection.
   b. Start the engine and stabilise it at idle speed.
   c. If the vacuum pressure does not reach 70 – 90 kPa (0.7 – 0.9 kg/cm^2, 9.9 – 12.8 psi), replace the boost pressure control solenoid valve.

Troubleshooting for 2.DEF: Pressure too high

Check the boost pressure sensor connections. Check the connections of the boost pressure control solenoid valve. Check the ECM connections. Repair if necessary.
Check the conformity of the turbocharging pressure signal. (Refer to “Turbo Pressure” on Data List of SUZUKI scan tool).
Make sure the turbocharging limit solenoid valve is not blocked open: • With ignition switch OFF, disconnect the inlet and outlet hoses from the solenoid valve. • Connect a vacuum pump to the inlet union and apply a vacuum. • If the vacuum pressure is not maintained: replace the boost pressure control solenoid valve.
Check that the turbocharger control rod has not seized: • With the engine stopped, make sure the turbocharger control shaft is in the rest position. • Apply a vacuum of 70 – 90 kPa (0.7 – 0.9 kg/cm^2, 9.9 – 12.8 psi), to the hose connecting the turbocharger control diaphragm. • If the diaphragm holds the vacuum pressure, check the movement and setting of the turbocharger control rod referring to “Turbocharger Assembly Inspection: in Section 1D”. If the control rod is seized, replace the turbocharger. If the fault persists, perform Test 5 and 6 of Fault Finding-Tests referring to “Test 5: Variable geometry turbocharger control: ” and “Test 6: Rotating part of a turbocharger: ”.

DTC P0297: Vehicle Overspeed Condition Malfunction

S5JB0B1104104

⚠ CAUTION

- **The fault is present because the vehicle was running while diesel particulate filter after-sales regeneration was in progress.**
  The vehicle speed should be zero during the regeneration.
  Carry out an after sales regeneration referring to “Diesel Particulate Filter After-sales Regeneration Procedure: in Section 1C”.
  DO NOT RUN THE VEHICLE.
  If the fault is still present, substitute a known-good ECM and recheck.
- **The parameters must be reinitialised after any procedure is carried out on the diesel particulate filter.**
  Use command “Initialize Diesel PF data” on SUZUKI scan tool, and diesel particulate filter after-sales regeneration referring to “Diesel Particulate Filter After-sales Regeneration Procedure: in Section 1C” or “Diesel Particulate Filter Removal and Installation: in Section 1K”.

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault becomes present during an diesel particulate filter after-sales regeneration with the SUZUKI scan and a non negligible speed.
- **If the fault is present, the diesel particulate filter after-sales regeneration in progress fails.**

DTC P0301: Cylinder 1 Misfire Detected Malfunction

S5JB0B1104105

NOTE

- **Cylinder number is counted from flywheel side.**
- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present, engine performance is reduced and instability is possible.**
- **Priority when dealing with a number of faults:**
  Firstly, deal with fault "DTC P0201: Fuel Injector Circuit / Open Malfunction-Cylinder 1: " if it is present or stored.

Troubleshooting

Check that the fuel injector No.1 calibration code using SUZUKI scan tool is correctly entered and that it corresponds to the code inscribed on the corresponding injector. Enter the code into an fuel injector that has not been programmed or where the code has been entered incorrectly, if necessary. Refer to "Registration Procedure for the Fuel Injector Calibration Code: in Section 1C".
Check the engine compression. Repair if necessary.
Check the valve clearance and adjust if necessary.
In the event of several combustion misfire faults being present, check that the right fuel is being used.
Visually inspect the fuel injector 1 return pipes. Repair if necessary.
If the fault is still present: apply Test 8 of Fault Finding-Tests referring to "Test 8: Injector malfunction: ". If the fault is still present, substitute a known-good ECM and recheck.

DTC P0302: Cylinder 2 Misfire Detected Malfunction

S5JB0B1104106

NOTE

- **Cylinder number is counted from flywheel side.**
- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present, engine performance is reduced and instability is possible.**
- **Priority when dealing with a number of faults:**
  Firstly, deal with fault "DTC P0202: Fuel Injector Circuit / Open Malfunction-Cylinder 2: " if it is present or stored.

Troubleshooting

Check that the fuel injector No.2 calibration code using SUZUKI scan tool is correctly entered and that it corresponds to the code inscribed on the corresponding injector. Enter the code into an fuel injector that has not been programmed or where the code has been entered incorrectly, if necessary. Refer to "Registration Procedure for the Fuel Injector Calibration Code: in Section 1C".
Check the engine compression. Repair if necessary.
Check the valve clearance and adjust if necessary.
In the event of several combustion misfire faults being present, check that the right fuel is being used.
Visually inspect the fuel injector 2 return pipes. Repair if necessary.
If the fault is still present: apply Test 8 of Fault Finding-Tests referring to "Test 8: Injector malfunction: ". If the fault is still present, substitute a known-good ECM and recheck.

DTC P0303: Cylinder 3 Misfire Detected Malfunction

S5JB0B1104107

NOTE

- **Cylinder number is counted from flywheel side.**
- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present, engine performance is reduced and instability is possible.**
- **Priority when dealing with a number of faults:**
  Firstly, deal with fault "DTC P0203: Fuel Injector Circuit / Open Malfunction-Cylinder 3: " if it is present or stored.

Troubleshooting

Check that the fuel injector No.3 calibration code using SUZUKI scan tool is correctly entered and that it corresponds to the code inscribed on the corresponding injector. Enter the code into an fuel injector that has not been programmed or where the code has been entered incorrectly, if necessary. Refer to "Registration Procedure for the Fuel Injector Calibration Code: in Section 1C".
Check the engine compression. Repair if necessary.
Check the valve clearance and adjust if necessary.
In the event of several combustion misfire faults being present, check that the right fuel is being used.
Visually inspect the fuel injector 3 return pipes. Repair if necessary.
If the fault is still present: apply Test 8 of Fault Finding-Tests referring to "Test 8: Injector malfunction: ". If the fault is still present, substitute a known-good ECM and recheck.

DTC P0304: Cylinder 4 Misfire Detected Malfunction

S5JB0B1104108

NOTE

- **Cylinder number is counted from flywheel side.**
- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present, engine performance is reduced and instability is possible.**
- **Priority when dealing with a number of faults:**
  Firstly, deal with fault "DTC P0204: Fuel Injector Circuit / Open Malfunction-Cylinder 4: " if it is present or stored.

Troubleshooting

Check that the fuel injector No.4 calibration code using SUZUKI scan tool is correctly entered and that it corresponds to the code inscribed on the corresponding injector. Enter the code into an fuel injector that has not been programmed or where the code has been entered incorrectly, if necessary. Refer to "Registration Procedure for the Fuel Injector Calibration Code: in Section 1C".
Check the engine compression. Repair if necessary.
Check the valve clearance and adjust if necessary.
In the event of several combustion misfire faults being present, check that the right fuel is being used.
Visually inspect the fuel injector 4 return pipes. Repair if necessary.
If the fault is still present: apply Test 8 of Fault Finding-Tests referring to "Test 8: Injector malfunction: ". If the fault is still present, substitute a known-good ECM and recheck.

DTC P0335: Crankshaft Position Sensor “A” Circuit Malfunction

S5JB0B1104109

NOTE

- **Conditions for applying fault finding procedures to stored faults: The fault is declared present:**
  - **When an attempt is made to start the engine.**
  - **The engine must be running.**
- **Use service wire for all operations on the controller connectors.**
- **The CKP sensor is consistent with the CMP sensor.**
- **If the fault is present:**
  - **It is impossible to start the engine or the engine stops.**
  - **The Red stop warning light (gravity 2 warning light) is lit.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Signal absent
2.DEF	Inconsistency of signal

Troubleshooting

Check the CKP sensor connections. Repair if necessary. Check that the sensor is correctly mounted and that the flywheel target is not damaged. Check that the gap between the CKP sensor and the engine flywheel is 0.5 – 1.8 mm (0.020 – 0.071 in.). Measure the resistance of the CKP sensor between “C20-1” and “C20-2” terminals of CKP sensor connector. If the coil resistance is not 720 – 880 Ω at an engine temperature of 20 °C, 68 °F, replace the CKP sensor.
Check the ECM connections. Repair if necessary.
Check the following connections for continuity and the absence of interference resistance: • Between “C20-1” wire of CKP sensor connector and “C86-17” terminal of ECM connector • Between “C20-2” wire of CKP sensor connector and “C86-16” terminal of ECM connector Repair if necessary.
If the fault is still present, substitute a known-good ECM and recheck.

DTC P0340: Camshaft Position Sensor “A” Circuit Malfunction

S5JB0B1104110

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.A drop in engine speed followed by nominal behavior from the vehicle is possible.
- **If this fault is present:**
  - **It is impossible to start the vehicle.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	No signal
2.DEF	Inconsistency of signal

Troubleshooting

Check the CMP sensor connections. Check the ECM connections. Check the CMP sensor mounting and positioning. Also check its general condition, (damaged housing, heating up, etc.) Carry out the necessary repairs.
Check the following connections for continuity and make sure there is no interference resistance: • Between “C08-2” wire of CMP sensor connector and “C86-15” terminal of ECM connector • Between “C08-1” wire of CMP sensor connector and “C86-18” terminal of ECM connector
With ignition switch ON and the CMP sensor connected: • Use a voltmeter to measure the voltage across “C08-1” and “C08-3” wires of the CMP sensor connector: The voltage displayed should be equal to the battery voltage 0.08 V) – If the voltage is outside permitted tolerance values, take the measurement again on the connector, with the CMP sensor disconnected. – If the voltage is still outside permitted tolerance values with the sensor disconnected. • Check the following connection for continuity and the absence of interference resistance: – Between “C08-3” wire of the CMP sensor connector and “E33-6” wire of main relay mounting connector If the measured voltage is correct with the sensor disconnected. Measure the CMP sensor resistance between “C08-2” and “C08-3” terminals. Replace the sensor if the resistance is not 9750 – 10750 Ω at 20 °C, 68 °F. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0380: Glow Plug / Heater Circuit “A” Malfunction

S5JB0B1104111

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after output test “Pre/Post Heater Relay Control” on SUZUKI scan tool, or after an attempted engine start.
- **If the fault is present, it is difficult or even impossible to start the vehicle when cold.**
- **If the fault is present, the Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CC.0	Open circuit or short circuit to vehicle body ground
C0	Open circuit
1.DEF	Internal electronic fault

Troubleshooting for CC.1: Short circuit to +12 V

Check the glow plug control module connections and the glow plug supply cables. Check the ECM connections. Repair if necessary.
Check the condition of the 80A fuse on the battery fuse box. Check for continuity and insulation against the +12 V feed on the following connections: • Between “C74-3” wire of glow plug control module connector and “C85-1” terminal of ECM connector • Between “C74-1” wire of glow plug control module connector and “C85-17” terminal of ECM connector Repair if necessary.
If the fault is still present, replace the glow plug control module.

Troubleshooting for CC.0: Open circuit or short circuit to vehicle body ground and CO: Open circuit

NOTE

- **If the glow plug control module has a short circuit to vehicle body ground there is a risk that the glow plugs will be operated continuously.**
- **The glow plugs and the engine may be damaged.**

Check the glow plug control module connections and the glow plug supply cables. Check the ECM connections. Repair if necessary.
Check the condition of the 80A fuse on the battery fuse box. Check the continuity and insulation against vehicle body ground of the following connection: • Between “C74-3” wire of glow plug control module connector and “C85-1” terminal of ECM connector • Between “C74-1” wire of glow plug control module connector and “C85-17” terminal of ECM connector Repair if necessary.
If the fault is still present, replace the glow plug control module.

Troubleshooting for 1.DEF: Internal electronic fault

Check the glow plug control module connections and the glow plug supply cables. Check the ECM connections. Repair if necessary.
Check the condition of the 80A fuse on the battery fuse box. Check the continuity and insulation against vehicle body ground of the following connection: • Between “C74-3” wire of glow plug control module connector and “C85-1” terminal of ECM connector • Between “C74-1” wire of glow plug control module connector and “C85-17” terminal of ECM connector Repair if necessary.
If the fault is still present, replace the glow plug control module.

DTC P0403: Exhaust Gas Recirculation Control Circuit Malfunction

S5JB0B1104112

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after a road test.
- **The EGR function is deactivated if several faults with “DTC P0638: Throttle Actuator Control Range / Performance Malfunction: ” are present.**
- **If 1.DEF is present,**
  - **The Injection warning light (gravity 1 warning light) is lit.**
  - **The vehicle performances are reduced.**
  - **There is smoke at the exhaust.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Valve stuck open
1.DEF	Valve stuck closed

Troubleshooting

⚠ CAUTION

EGR valve data initialization procedure is required when the EGR valve is replaced.
The “EGR valve initial offset” and “EGR valve last offset” parameters must be reinitialised.
Refer to “EGR Valve Data Initialization: in Section 1C” to carry out this programming.

Check the EGR valve connections. Check the ECM connections. Repair if necessary.
Measure the resistance of the EGR valve motor between “C10-4” and “C10-6” terminals. If the resistance displayed is not approximately 2.66 – 3.26 Ω at 20 °C, 68 °F, replace the EGR valve.
Check the following connections for continuity and make sure there is no interference resistance: • Between “C10-4” wire of EGR valve connector and “C86-26” terminal of ECM connector • Between “C10-6” wire of EGR valve connector and “C86-25” terminal of ECM connector Check there are no leaks on the EGR circuit: pipe pierced or damaged and that clamps are properly tightened.
Check the operation of the EGR valve: Perform “Initialize EGR valve data” on SUZUKI scan tool to reinitialise the operating values of the valve and launch a programming procedure for the EGR offsets (Refer to “EGR Valve Data Initialization: in Section 1C”). If the valve is jammed or irrevocably seized, replace the EGR valve.

DTC P0409: Exhaust Gas Recirculation Sensor “A” Circuit Malfunction

S5JB0B1104113

⚠ CAUTION

This fault can result in a rapid and significant fouling of the diesel particulate filter. If the EGR needs to be replaced to deal with the fault, it must be cleared.

NOTE

- **Conditions for applying fault finding procedures to stored faults: The fault is declared present after:**
  - **– Engine start.**
  - **– A road test.**
- **If the fault is present the EGR function is deactivated.**
- **If 2.DEF is present,**
  - **– The Injection warning light (gravity 1 warning light) is lit.**
  - **– There is smoke at the exhaust.**
- **Use service wire for all operations on the ECM connectors.**
- **Priority when dealing with a number of faults:**
  Apply the procedure for dealing with fault “DTC P0403: Exhaust Gas Recirculation Control Circuit Malfunction: ” first if it is present or stored.

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Insufficient EGR valve flow
2.DEF	Excessive EGR valve flow

Troubleshooting

⚠ CAUTION

EGR valve data initialization procedure is required when the EGR valve is replaced.
The “EGR valve initial offset” and “EGR valve last offset” parameters must be reinitialised.
Refer to “EGR Valve Data Initialization: in Section 1C” to carry out this programming.

Check the EGR valve connections. Check the ECM connections. Repair if necessary.
Measure the resistance of the EGR valve motor between “C10-4” and “C10-6” terminals. If the resistance displayed is not approximately 2.66 – 3.26 Ω at 20 °C, 68 °F, replace the EGR valve.
Check the following connections for continuity and make sure there is no interference resistance: • Between “C10-4” wire of EGR valve connector and “C86-26” terminal of ECM connector • Between “C10-6” wire of EGR valve connector and “C86-25” terminal of ECM connector Check there are no leaks on the EGR circuit: pipe pierced or damaged and that clamps are properly tightened.
Check the operation of the EGR valve: Perform “Initialize EGR valve data” on SUZUKI scan tool to reinitialise the operating values of the valve and launch a programming procedure for the EGR offsets (Refer to “EGR Valve Data Initialization: in Section 1C”). If the valve is jammed or irrevocably seized, replace the EGR valve.

DTC P0470: Exhaust Pressure Sensor Malfunction

S5JB0B1104114

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present:**
  - **The Injection warning light (gravity 1 warning light) is lit.**
  - **The diagnostic of the diesel particulate filter is inhibited.**
  - **Diesel particulate filter regenerations are inhibited.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO	Open circuit
CO.0	Open circuit or short circuit to vehicle body ground
CC.1	Short circuit to +12 V
1.DEF	Inconsistency of signal
2.DEF	Signal outside lower limit

Troubleshooting for CO: Open circuit and CC.1: Short circuit to +12 V

Check the condition of the connectors on the differential pressure sensor and the ECM. Repair if necessary.
Check the following connections for insulation, continuity and make sure there is no interference resistance: • Between “C89-2” wire of differential pressure sensor connector and “C85-12” terminal of ECM connector • Between “C89-3” wire of differential pressure sensor connector and “C85-14” terminal of ECM connector • Between “C89-1” wire of differential pressure sensor connector and “C86-42” terminal of ECM connector Repair if necessary.
Check for the presence of ground on “C89-2” of the differential pressure sensor connector. Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the continuity, the absence of interference resistance and the insulation from vehicle body ground of the following connections: • Between “C89-3” wire of differential pressure sensor connector and “C85-14” terminal of ECM connector • Between “C89-1” wire of differential pressure sensor connector and “C86-42” terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for 1.DEF: Inconsistency of signal and 2.DEF: Signal outside lower limit

Check the condition of the pressure pipes on the differential pressure sensor. Verify that they are sealed and check their position. Replace if necessary. Check the condition of the connectors on the differential pressure sensor and the ECM. Repair if necessary.
Check the continuity and for the absence of interference resistance on the following connections: • Between “C89-3” wire of differential pressure sensor connector and “C85-14” terminal of ECM connector • Between “C89-1” wire of differential pressure sensor connector and “C86-42” terminal of ECM connector Repair if necessary. If the fault is still present, change the differential pressure sensor.

DTC P0480: Fan 1 Control Circuit

S5JB0B1104150

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started.
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CO.1	Short circuit to +12 V

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the condition of the radiator fan relay No.1 (Low). Check the ECM connections. Repair if necessary.
Check the radiator fan relay No.1 (Low) mounting connections. If these checks are correct, Check the continuity and insulation from vehicle body ground of the following connections: • Between “E29-5” wire of radiator fan relay No.1 (Low) mounting connector and “C85-20” terminal of ECM connector • Between “E29-3” wire of radiator fan relay No.1 (Low) mounting connector and “E33-6” wire of main relay connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for CC.1: Short circuit to +12 V

Check the condition of the radiator fan relay No.1 (Low). Check the ECM connections. Repair if necessary.
Check the radiator fan relay No.1 (Low) mounting connections. Check the continuity and insulation from +12 V of the following connection: • Between “E29-5” wire of radiator fan relay No.1 (Low) mounting connector and “C85-20” terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0481: Fan 2 Control Circuit

S5JB0B1104151

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started.
- **"Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CO.1	Short circuit to +12 V

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the condition of the radiator fan relay No.2 (High) and radiator fan relay No.3 (High). Check the ECM connections. Repair if necessary.
Check the radiator fan relay No.2 (High) and radiator fan relay No.3 (High) mounting connections. If these checks are correct, Check the continuity and insulation from vehicle body ground of the following connections: • Between "E30-5" wire of radiator fan relay No.2 (High) mounting connector and "C85-18" terminal of ECM connector • Between "E30-3" wire of radiator fan relay No.2 (High) mounting connector and "E33-6" wire of main relay connector • Between "E31-5" wire of radiator fan relay No.3 (High) mounting connector and "C85-18" terminal of ECM connector • Between "E31-3" wire of radiator fan relay No.3 (High) mounting connector and "E33-6" wire of main relay connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for CC.1: Short circuit to +12 V

Check the condition of the radiator fan relay No.2 (High) and radiator fan relay No.3 (High). Check the ECM connections. Repair if necessary.
Check the radiator fan relay No.2 (High) and radiator fan relay No.3 (High) mounting connections. Check the continuity and insulation from +12 V of the following connection: • Between "E30-5" wire of radiator fan relay No.2 (High) mounting connector and "C85-18" terminal of ECM connector • Between "E31-5" wire of radiator fan relay No.3 (High) mounting connector and "C85-18" terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0486: Exhaust Gas Recirculation Sensor “B” Circuit Malfunction

S5JB0B1104115

⚠ CAUTION

- **This fault can result in a rapid and significant fouling of the diesel particulate filter. If the EGR needs to be replaced to deal with the fault, it must be cleared.**
- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
- **This check enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present:**
  - **There is smoke at the exhaust.**
  - **The EGR offset fault finding function is deactivated.**
  - **The Malfunction indicator light (MIL) will come on after three consecutive driving cycles (starting +5 seconds + turn OFF ignition switch and wait 40 seconds.).**
- **Use service wire for all operations on the ECM connectors.**
- **Priorities when dealing with a number of faults:**
  Apply the procedure for dealing with fault “DTC P0651: Sensor Reference Voltage “B” Circuit / Open Malfunction: ” first if it is present or stored.

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CC.1	Short circuit to +12 V
1.DEF	Micro-breaks

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

⚠ CAUTION

EGR valve data initialization procedure is required when the EGR valve is replaced.
The “EGR valve initial offset” and “EGR valve last offset” parameters must be reinitialised.
Refer to “EGR Valve Data Initialization: in Section 1C” to carry out this programming.

Check the EGR valve connections. Check the ECM connections. Repair if necessary.
Measure the resistance of the EGR valve position feedback potentiometer between “C10-1” and “C10-2” terminals. If the resistance displayed is not approximately 5.9 – 7.1 Ω at 20 °C, 68 °F, replace the EGR valve. Check the continuity and insulation from vehicle body ground of the following connections: • Between “C10-3” wire of EGR valve connector and “C86-20” terminal of ECM connector • Between “C10-1” wire of EGR valve connector and “C86-43” terminal of ECM connector Repair if necessary.
Check the operation of the EGR valve: Perform “Initialize EGR valve data” on SUZUKI scan tool to reinitialise the operating values of the valve and launch a programming procedure for the EGR offsets (Refer to “EGR Valve Data Initialization: in Section 1C”). If the valve is jammed or irrevocably seized, replace the EGR valve.

Troubleshooting for CC.1: Short circuit to +12 V and 1.DEF: Micro-breaks

⚠ CAUTION

EGR valve data initialization procedure is required when the EGR valve is replaced.
The "EGR valve initial offset" and "EGR valve last offset" parameters must be reinitialised.
Refer to "EGR Valve Data Initialization: in Section 1C" to carry out this programming.

Check the EGR valve connections. Check the ECM connections. Repair if necessary.
Measure the resistance of the EGR valve position feedback potentiometer between "C10-1"and "C10-2" terminals. If the resistance displayed is not approximately 5.9 – 7.1 kΩ at 20 °C, 68 °F, replace the EGR valve. Check for continuity and insulation from +12 V on the following connections: • Between "C10-3" wire of EGR valve connector and "C86-20" terminal of ECM connector • Between "C10-2" wire of EGR valve connector and "C85-15" terminal of ECM connector • Between "C10-1" wire of EGR valve connector and "C86-43" terminal of ECM connector Repair if necessary.
Ensure the presence of +5 V on "C10-1"terminal of the EGR valve. Check the operation of the EGR valve: Perform "Initialize EGR valve data" on SUZUKI scan tool to reinitialise the operating values of the valve and launch a programming procedure for the EGR offsets (Refer to "EGR Valve Data Initialization: in Section 1C"). If the valve is jammed or irrevocably seized, replace the EGR valve.

DTC P0500: Vehicle Speed Sensor "A" Malfunction

S5JB0B1104116

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present during a road test.
- **Use service wire for all operations on the ECM connectors.**

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Inconsistency of signal
2.DEF	Signal outside upper limit
3.DEF	Configuration absent or incorrect
4.DEF	CAN connection fault

Troubleshooting

Check the ABS or ESP® control module connections. Check the ECM connections. Repair if necessary. Check ABS control module assembly or ESP® control module assembly for DTC referring to "DTC Check: in Section 4E" or "DTC Check: in Section 4F". Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0530: A/C Refrigerant Pressure Sensor “A” Circuit Malfunction

S5JB0B1104117

NOTE

- **For vehicle not equipped with A/C system, it is not abnormal even if the DTC is detected.**
- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present following a road test, or if the air conditioning is switched ON.
- **If the fault is present, air conditioning is not authorized.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CO.0	Open circuit or short circuit to vehicle body ground

Troubleshooting for CC.1: Short circuit to +12 V

Check the A/C refrigerant pressure sensor connectors. Check the ECM connections. Repair if necessary.
Connect an air conditioning filling station (equipped with a high pressure gauge) to the vehicle. Display parameter “REFRIGERANT PRESSURE” on HVAC control module with SUZUKI scan tool and compare the value displayed by the filling station. If the values match, carry out a fault finding procedure as described in the fault finding note for that vehicle. If the values do not match, check the continuity and insulation against +12 V of the following connections: • Between “E04- 3" wire of A/C refrigerant pressure sensor connector and “C86-13” terminal of ECM connector • Between “E04-1” wire of A/C refrigerant pressure sensor connector and “C86-33” terminal of ECM connector • Between “E04-2” wire of A/C refrigerant pressure sensor connector and “C85-9” terminal of ECM connector Repair if necessary.
If the fault is still present, replace the A/C refrigerant pressure sensor

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the A/C refrigerant pressure sensor connector. Check the ECM connections. Repair if necessary.
Connect an air conditioning filling station (equipped with a high pressure gauge) to the vehicle. Display parameter “REFRIGERANT PRESSURE” on HVAC control module with SUZUKI scan tool and compare the value displayed by the filling station. If the values match, carry out a fault finding procedure as described in the fault finding note for that vehicle. If the values do not match, check the continuity and insulation against vehicle body ground of the following connections: • Between “E04-3” wire of A/C refrigerant pressure sensor connector and “C86-13” terminal of ECM connector • Between “E04-1” wire of A/C refrigerant pressure sensor connector and “C86-33” terminal of ECM connector Repair if necessary.
If the fault is still present, replace the A/C refrigerant pressure sensor.

DTC P0544: Exhaust Gas Temperature Sensor Circuit Malfunction

S5JB0B1104118

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present, diesel particulate filter regenerations are not possible.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.1	Open circuit or short circuit to +12 V
CC.0	Short circuit to vehicle body ground

Troubleshooting

Check for the continuity, absence of interference resistance and insulation from +12 V for the following connections: • Between “C88-1” wire of exhaust gas temperature sensor 3 connector and “C86-29” terminal of ECM connector • Between “C88-2” wire of exhaust gas temperature sensor 3 connector and “C85-11” terminal of ECM connector Repair if necessary.
Check the continuity, absence of interference resistance and insulation from vehicle body ground of the following connection: • Between “C88-1” wire of exhaust gas temperature sensor 3 connector and “C86-29” terminal of ECM connector Repair if necessary.
Check for the presence of ground on “C88-2” wire of the exhaust gas temperature sensor 3 connector. Check the sensor resistance between “C88-1” and “C88-2” terminals of the exhaust gas temperature sensor 3 connector according to parameter “Diesel PF out Temp” on Data list of SUZUKI scan tool. **Exhaust gas temperature sensor resistance:** **132500 Ω at 250 °C, 482 °F** **52560 Ω at 300 °C, 572 °F** **3529 Ω at 500 °C, 932 °F** **1378 Ω at 600 °C, 1112 °F** If the recorded values do not correspond to the above values, replace the exhaust gas temperature sensor 3. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0560: System Voltage Malfunction

S5JB0B1104119

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present following a road test or after attempting to start the engine several times.
- **ECM operating voltage: 9 V < operating voltage < 16 V.**
- **Battery voltage that is too low can cause the level 1 fault warning light to come on thereby causing other faults to appear.**
- **It is then not possible to start the engine.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Overvoltage
2.DEF	Undervoltage

Troubleshooting for 1.DEF: Overvoltage

Check the charge circuits:
Condition of the battery.
Condition of the alternator (full fault finding).
Carry out the necessary repairs.

Troubleshooting for 2.DEF: Undervoltage

With ignition switch OFF, measure the voltage across the battery terminals.
If the voltage is less than 11.5 V, test the battery.
If the battery is faulty, replace the battery then test the charge circuit.
With ignition switch ON and the with the starter motor turning, measure the voltage across the battery terminals.
If the voltage drops below 9.6 V, check the tightness and condition of the battery terminals.
Repair if necessary.
If the terminals are in good condition, test the battery.
If they are faulty, replace the battery.
If the starter is cranking the engine correctly, but the fault is still present,
Check the continuity and for the absence of interference resistance on the following connections:

- Between “E33-6” wire of main relay mounting connector and “C86-3” terminal of ECM connector
- Between “E33-6” wire of main relay mounting connector and “E66-2” terminal of ECM connector
- Between “E66-1”, “E66-7” and “E66-8” terminals of ECM connector and ground terminal at battery
  Repair if necessary.

DTC P0571: Brake Switch “A” Circuit Malfunction

S5JB0B1104120

⚠ CAUTION

- **This fault may appear if the wiring harness has been damaged. Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.**
- **This check enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying fault finding procedures to stored faults: The fault is declared present after the brake pedal is depressed, or during a road test.**
- **If the fault is present, the cruise control/speed limiter is deactivated.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1. DEF	Open circuit or short circuit
2. DEF	Inconsistency of signal

Troubleshooting for 1.DEF: Open circuit or short circuit

Check the connections of the brake lamp switch. Check the condition and adjustment of the brake lamp switch. Repair if necessary.
Check the conformity of the brake lamp switch: • Brake pedal released: – Continuity between “E67-1” and “E67-2” terminals of brake lamp switch. – Infinite resistance across “E67-3” and “E67-4” terminals of brake lamp switch. • Brake pedal depressed: – Infinite resistance across “E67-1” and “E67-2” terminals of brake lamp switch. – Continuity between “E67-3” and “E67-4” terminals of brake lamp switch. Replace the switch if necessary.
Check the condition of “STOP” fuse on the junction block assembly. Replace the fuse if necessary. Check the feeds to the switch: • Between “E67-2” wire of the brake lamp switch connector and “E82-20” terminal of BCM connector • Between “E67-4” wire of the brake lamp switch connector and “E33-6” wire of main relay mounting connector Replace the switch if necessary. Check the continuity and insulation of the following connections: • Between “E67-1” wire of brake lamp switch connector and “E66-28” terminal of ECM connector Repair if necessary.

Troubleshooting for 2.DEF: Inconsistency of signal

Check the connections of the brake lamp switch. Check the condition and adjustment of the brake lamp switch. Repair if necessary.
Check the continuity and make sure there is no interference resistance on the following connection: • Between “E67-1” wire of brake lamp switch connector and “E66-28” terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0575: Cruise Control Input Circuit Malfunction

S5JB0B1104121

⚠ CAUTION

- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in "Electrical Circuit Inspection Procedure: in Section 00 in related manual".
- **This check enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **The cruise control/speed limiter function is inhibited.**
- **Use service wire for all operations on the ECM connectors.**

Detecting Condition

- 1.DEF: Inconsistency of signal
- 2.DEF: Inconsistent vehicle speed
- 3.DEF: Steering wheel controls

Troubleshooting

If the fault is declared present, refer to "Cruise Control System Symptom Diagnosis: in Section 10A".
Check that by pressing the buttons the statuses change and that with ignition switched on, all the values are correct.
If the fault is still present, substitute a known-good ECM and recheck.

DTC P0606: ECM / PCM Processor Malfunction

S5JB0B1104122

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after an attempted start, or with the engine running.
- **If 6.DEF, 8.DEF, 12.DEF is present, the Injection warning light (gravity 1 warning light) is lit.**
- **If one of the other faults is present, the Red stop warning light (gravity 2 warning light) is lit.**
- **If 6.DEF is still present, the Malfunction indicator light (MIL) will come on after three consecutive driving cycles (starting +5 seconds + turn OFF ignition switch and wait 40 seconds.).**
- **Use service wire for all operations on the ECM connectors.**
- **Priority when dealing with a number of faults:**
  Deal with fault "DTC P0560: System Voltage Malfunction: " first if it is present or stored.

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Permanent high level
2.DEF	Permanent low signal
3.DEF	Configuration absent or incorrect
4.DEF	Analogue/digital converter fault
5.DEF	Communication disrupted
6.DEF	EEPROM fault
7.DEF	Watchdog Activation
8.DEF	Signal outside upper limit
10.DEF	Fuel injector control
11.DEF	Fuel injector control condenser fault
12.DEF	Injection fault under deceleration
13.DEF	Initialisation error
14.DEF	Open circuit or internal electronic fault

Troubleshooting for 1.DEF: Permanent high level, 8.DEF: Signal outside upper limit, 10.DEF: Fuel injector control, 12.DEF: Injection fault under deceleration and 13.DEF: Initialisation error

NOTE

- **Check the ECM connections and the continuity of all its supplies. Repair if necessary.**
- **Clear the faults.**
- **Turn OFF ignition switch, wait 10 seconds and turn ON ignition switch again. If the fault is still present, substitute a known-good ECM and recheck.**

Troubleshooting for 11.DEF: Fuel injector control condenser fault

NOTE

If there are a number of faults, deal with the other system faults first.

Step	Action	Yes	No
1	*Is there DTC P0606: ECM / PCM Processor Malfunction of 10.DEF: Fuel injector control?*	Go to Step 2.	Substitute a known-good ECM and recheck.
2	Check the battery voltage using “Battery Voltage” on Data list of SUZUKI scan tool. *Is battery voltage more than 10V?*	Go to Step 3.	Check the charge circuit and carry out the necessary repairs: Check the condition of the battery terminals. Carry out fault finding on the alternator. Recharge or replace the battery.
3	Check the condition of the wiring harness between the computer and the battery, carry out the necessary repairs. • Start the vehicle. • Clear the stored faults. • Check the faults. *Is there DTC P0606: ECM / PCM Processor Malfunction?*	Substitute a known-good ECM and recheck.	End of fault finding.

DTC P0611: Fuel injector Control Module Performance Malfunction

S5JB0B1104123

NOTE

- **Condition for applying fault finding ONLY to a present fault:**
  The fault is declared present after:
  - **Reprogramming the ECM.**
  - **Replacing and programming the ECM.**
- **If the fault is present:**
  - **Engine speed is limited.**
  - **The Injection warning light (gravity 1 warning light) is lit.**

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Internal electronic fault when writing
2.DEF	No code in memory

Troubleshooting for 1.DEF: Internal electronic fault when writing

- Program the fuel injector codes referring to “Registration Procedure for the Fuel Injector Calibration Code: in Section 1C”.
- If the fault is still present after turning ignition switch OFF and waiting 40 seconds, then a new dialogue. Program the fuel injector codes again.
  If the fault is still present, substitute a known-good ECM and recheck.
- Otherwise clear the fault memory using DTC clearance on SUZUKI Scan tool referring to “DTC Clearance: ”.

Troubleshooting for 2.DEF: No code in memory

NOTE

This fault appears on any blank computer (new or recently reprogrammed).

- Program the fuel injector codes referring to “Registration Procedure for the Fuel Injector Calibration Code: in Section 1C”.
- If the fault is still present after turning ignition switch OFF and waiting 40 seconds, then a new dialogue. Program the fuel injector codes again.
  If the fault is still present, substitute a known-good ECM and recheck.
- Otherwise clear the fault memory using DTC clearance on SUZUKI Scan tool referring to “DTC Clearance: ”.

DTC P0615: Starter Relay Circuit Malfunction

S5JB0B1104124

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after several starting attempts, or with the engine running.
- **Computer operating voltage: 9 V < operating voltage < 16 V.**
- **Battery voltage that is too low can cause the Injection warning light (gravity 1 warning light) to come on thereby causing other faults to appear.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Voltage outside permitted range of values

Troubleshooting

Check continuity and make sure there is no interference resistance on the following connection: • Between “E82-23” wire of junction block connector and “E66-11” terminal of ECM connector Repair if necessary.
• Check the condition of “IG COIL” fuse located on the junction block assembly. Check the condition of the “FI” fuse located on a fuse box No.2. Repair if necessary. • If the fault does not reappear, start the engine and wait 1 min. Carry out a road test and check the system faults. If there are no faults, fault finding is complete. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0627: Fuel Pump “A” Control Circuit / Open

S5JB0B1104148

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started.
- **Use service wire for all operations on the ECM connectors.**
- **This fuel pump is just for balancing the fuel level between the two chambers left side and right side of the fuel tank.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
COC.1	Short circuit to +12 V

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the condition of the fuel pump relay. Check the ECM connections. Repair if necessary.
Check the fuel pump relay mounting connections. If these checks are correct, Check the continuity and insulation from vehicle body ground of the following connections: • Between “E28-4” wire of fuel pump relay mounting connector and “C85-21” terminal of ECM connector • Between “E28-3” wire of fuel pump relay mounting connector and “E33-6” wire of main relay connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for CC.1: Short circuit to +12 V

Check the condition of the fuel pump relay. Check the ECM connections. Repair if necessary.
Check the fuel pump relay mounting connections. Check the continuity and insulation from +12 V of the following connection: • Between “E28-4” wire of fuel pump relay mounting connector and “C85-21” terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0638: Throttle Actuator Control Range / Performance Malfunction

S5JB0B1104125

⚠ CAUTION

This fault can result in a rapid and significant fouling of the diesel particulate filter.

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after:
  - **The engine is started.**
  - **A road test.**
  - **Output test "Electronic Throttle valve" on SUZUKI scan tool.**
  - **Turning OFF ignition switch and waiting 40 seconds.**
- **If the fault is present:**
  - **It is difficult or even impossible to start the vehicle.**
  - **The engine stops noisily.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.1	Short circuit to +12 V
CC.0	Short circuit to vehicle body ground
C0	Open circuit
CC	Short circuit
1.DEF	Internal electronic fault
2.DEF	External diagnostics
3.DEF	Values out of range

Troubleshooting for CC.1: Short circuit to +12 V

NOTE

After any inlet throttle valve procedures, it is necessary to perform "Initialize inlet throttle valve data" on SUZUKI scan tool. Then turn OFF ignition switch and wait 40 seconds.

Check the connections of the inlet throttle valve. Check the ECM connections. Repair if necessary.
Check the continuity and insulation from +12 V of the following connection: • Between "C75-1" wire of inlet throttle valve connector and vehicle body ground • Between "C75-3" wire of inlet throttle valve connector and "C86-40" terminal of ECM connector • Between "C75-4" wire of inlet throttle valve connector and "C86-27" terminal of ECM connector Repair if necessary.
If the fault persists, replace the inlet throttle valve.

Troubleshooting for CC.0: Short circuit to vehicle body ground and CO: Open circuit

NOTE

After any inlet throttle valve procedures, it is necessary to perform "Initialize inlet throttle valve data" on SUZUKI scan tool.
Inlet throttle valve fault adaptives. Then turn OFF ignition switch and wait 40 seconds.

Check the connections of the inlet throttle valve. Check the ECM connections. Repair if necessary.
Check the continuity and insulation from vehicle body ground of the following connections: • Between "C75-3" wire of inlet throttle valve connector and "C86-40" terminal of ECM connector • Between "C75-2" wire of inlet throttle valve connector and "E33-6" wire of main relay mounting connector • Between "C75-4" wire of inlet throttle valve connector and "C86-27" terminal of ECM connector Repair if necessary. If the fault persists, replace the inlet throttle valve.

Troubleshooting for CC: Short circuit

NOTE

After any inlet throttle valve procedures, it is necessary to perform "Initialize inlet throttle valve data" on SUZUKI scan tool.
Inlet throttle valve fault adaptives. Then turn OFF ignition switch and wait 40 seconds.

Check the connections of the inlet throttle valve. Check the ECM connections. Repair if necessary.
Check the continuity, absence of interference resistance and insulation on the following connection: • Between "C75-1" wire of inlet throttle valve connector and vehicle body ground • Between "C75-2" wire of inlet throttle valve connector and "E33-6" wire of main relay mounting connector • Between "C75-3" wire of inlet throttle valve connector and "C86-40" terminal of ECM connector • Between "C75-4" wire of inlet throttle valve connector and "C86-27" terminal of ECM connector Repair if necessary. If the fault persists, replace the inlet throttle valve.

Troubleshooting for 1.DEF: Internal electronic fault, 2.DEF: External diagnostics and 3.DEF: Values out of range

NOTE

After any inlet throttle valve procedures, it is necessary to perform “Initialize inlet throttle valve data” on SUZUKI scan tool.
Inlet throttle valve fault adaptives. Then turn OFF ignition switch and wait 40 seconds.

Check the connections of the inlet throttle valve. Check the ECM connections. Repair if necessary.
Check the continuity, absence of interference resistance and insulation on the following connection: • Between “C75-1” wire of inlet throttle valve connector and vehicle body ground • Between “C75-2” wire of inlet throttle valve connector and “E33-6” wire of main relay mounting connector • Between “C75-3” wire of inlet throttle valve connector and “C86-40” terminal of ECM connector • Between “C75-4” wire of inlet throttle valve connector and “C86-27” terminal of ECM connector Repair if necessary.
• Perform “Initialize inlet throttle valve data” on SUZUKI scan tool. • If the fault is still present, check that the ECM output stage is working correctly. • Connected inlet throttle valve: – Connect the negative terminal of the voltmeter to “C75-3” wire of the inlet throttle valve – Connect the positive terminal of the voltmeter to “C75-2” wire of the inlet throttle valve – Perform output test “Electronic Throttle Control” on SUZUKI scan tool: The voltmeter should display five cycles of two successive voltages: ~ 3.15 V (Opening Cyclic Ratio of 25%) then ~ 9.45V (Opening Cyclic Ratio of 75%). If the voltmeter indicates above voltage, but inlet throttle valve does not operate, replace inlet throttle valve. If the voltmeter does not indicate any control while the command is running (five cycles), substitute a known-good ECM and recheck.

DTC P0641: Sensor Reference Voltage “A” Circuit / Open Malfunction

S5JB0B1104126

⚠ CAUTION

- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
- **This check enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present following a road test or after attempting to start the engine several times.
- **If the fault is present:**
  - **The cruise control / speed limiter function is deactivated.**
  - **Turbocharging is disabled.**
  - **Engine speed is restricted.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Sensor reference voltage too low
2.DEF	Sensor reference voltage too high

Troubleshooting

NOTE

Priorities when dealing with a number of faults:
If fault "DTC P0225: Accelerator Pedal Position (APP) Sensor Assembly / Switch "C" Circuit Malfunction: " is present at the same time, check that the sensor is connected correctly.
In the event of the simultaneous presence of fault "DTC P0235: Turbo / Super Charger Boost Sensor "A" Circuit Malfunction: " or "DTC P0470: Exhaust Pressure Sensor Malfunction: ", check that the boost pressure sensor circuit connector is connected correctly.

The sensors connected to supply No.1 are:

- Differential pressure sensor.
- Boost pressure sensor.
- Accelerator pedal position (APP) sensor (main).

To locate any faulty sensor and/or connection, disconnect one of these sensors then check whether the fault becomes stored.
If the fault is still present, start the operation again with the other sensor.
(Wait a few seconds between each disconnection to allow the ECM to make the measurement).
If the fault is stored after a disconnection, change the faulty sensor or repair its connection.
Clear the faults created by the multiple disconnections.

If the fault is still present when both these sensors have been disconnected:

1. Check the insulation against vehicle body ground of the following connections:
   – Between "C76-3" wire of boost pressure sensor connector and "C86-42" terminal of ECM connector
   – Between "C76-4" wire of boost pressure sensor connector and "C86-19" terminal of ECM connector
   – Between "E68-2" wire of accelerator pedal position (APP) sensor connector and "E66-4" terminal of ECM connector
   – Between "E68-3" wire of accelerator pedal position (APP) sensor connector and "E66-3" terminal of ECM connector
   – Between "C89-1" wire of differential pressure sensor connector and "C86-42" terminal of ECM connector
   – Between "C89-3" wire of differential pressure sensor connector and "C85-14" terminal of ECM connector
   Repair if necessary.
2. Check the insulation against +12 V of the following connections:
   – Between "C76-4" wire of boost pressure sensor connector and "C86-19" terminal of ECM connector
   – Between "C76-1" wire of boost pressure sensor connector and "C86-45" terminal of ECM connector
   – Between "C76-3" wire of boost pressure sensor connector and "C86-42" terminal of ECM connector
   – Between "E68-4" wire of accelerator pedal position (APP) sensor connector and "E66-5" terminal of ECM connector
   – Between "E68-3" wire of accelerator pedal position (APP) sensor connector and "E66-3" terminal of ECM connector
   – Between "E68-2" wire of accelerator pedal position (APP) sensor connector and "E66-4" terminal of ECM connector
   – Between "C89-1" wire of differential pressure sensor connector and "C86-42" terminal of ECM connector
   – Between "C89-3" wire of differential pressure sensor connector and "C85-14" terminal of ECM connector
   – Between "C89-2" wire of differential pressure sensor connector and "C85-12" terminal of ECM connector
   Repair if necessary.
3. Check the insulation between the following connections after disconnecting the sensors and ECM:
   – "E68-1" and "E68-4" wires of the accelerator pedal position (APP) sensor connector.
   – "C76-1" and "C76-3" wires of the boost pressure sensor connector.
   – "C89-2" and "C89-1" wires of differential pressure sensor connector.

If these checks do not produce the correct results, replace the faulty sensor(s).
If the fault is still present, substitute a known-good ECM and recheck.

DTC P0645: A/C Clutch Relay Control Circuit

S5JB0B1104149

NOTE

- **For vehicle not equipped with A/C system, it is not abnormal even if the DTC is detected.**
- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started.
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CO.1	Short circuit to +12 V

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the condition of the A/C compressor relay. Check the ECM connections. Repair if necessary.
Check the A/C compressor relay mounting connections. If these checks are correct, Check the continuity and insulation from vehicle body ground of the following connections: • Between “E33-12” wire of A/C compressor relay mounting connector and “E66-13” terminal of ECM connector • Between “E33-11” wire of A/C compressor relay mounting connector and “E33-6” wire of main relay connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for CC.1: Short circuit to +12 V

Check the condition of the A/C compressor relay. Check the ECM connections. Repair if necessary.
Check the A/C compressor relay mounting connections. Check the continuity and insulation from +12 V of the following connection: • Between “E33-12” wire of A/C compressor relay mounting connector and “E66-13” terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0651: Sensor Reference Voltage “B” Circuit / Open Malfunction

S5JB0B1104127

⚠ CAUTION

- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
- **This check enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present following a road test or after attempting to start the engine several times.
- **If the fault is present:**
  - **The EGR functions is inhibited.**
  - **The cruise control function is deactivated.**
  - **Engine speed is limited.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
  - **The Malfunction indicator light (MIL) will light up after three consecutive cycles (starting +5 seconds + turn OFF ignition switch and wait 40 second).**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Sensor reference voltage too low
2.DEF	Sensor reference voltage too high

Troubleshooting

The sensors connected to supply No.2 are:

- EGR valve position sensor.
- Sensor for accelerator pedal position (APP) sensor (sub).

To locate any faulty sensor and/or connection, disconnect one of the sensors then check whether the fault becomes stored.
If the fault is still present, repeat the operation with the other sensors.
(Wait a few seconds between each disconnection to allow the ECM to make the measurement).
If the fault is stored after a disconnection, change the faulty sensor or repair its connection.
Clear the faults created by the multiple disconnections.

If the fault is still present when both these sensors have been disconnected:

1. Check the insulation against vehicle body ground of the following connections:
   – Between “C10-1” wire of EGR valve connector and “C86-43” terminal of ECM connector
   – Between “C10-3” wire of EGR valve connector and “C86-20” terminal of ECM connector
   – Between “E68-1” wire of accelerator pedal position (APP) sensor connector and “E66-15” terminal of ECM connector
   – Between “E68-6” wire of accelerator pedal position (APP) sensor connector and “E66-21” terminal of ECM connector
   Repair if necessary.
2. Check the insulation against +12 V of the following connections:
   – Between “C10-1” wire of EGR valve connector and “C86-43” terminal of ECM connector
   – Between “C10-3” wire of EGR valve connector and “C86-20” terminal of ECM connector
   – Between “C10-2” wire of EGR valve connector and “C85-15” terminal of ECM connector
   – Between “E68-1” wire of accelerator pedal position (APP) sensor connector and “E66-15” terminal of ECM connector
   – Between “E68-6” wire of accelerator pedal position (APP) sensor connector and “E66-21” terminal of ECM connector
   – Between “E68-5” wire of accelerator pedal position (APP) sensor connector and “E66-27” terminal of ECM connector
   Repair if necessary.
3. Check the insulation between the following connections after disconnecting the sensors and ECM:
   – “E68-1” and “E68-5” wires of accelerator pedal position (APP) sensor connector.
   – “C10-1” and “C10-2” wires of the EGR valve position sensor connector.

If these checks do not produce the correct results, replace the faulty sensor(s).
If the fault is still present, substitute a known-good ECM and recheck.

DTC P0670: Glow Plug Module Control Circuit Malfunction

S5JB0B1104128

NOTE

- **Cylinder number is counted from flywheel side.**
- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after several attempts to start the engine, or perform output test "Pre/post Heater Relay Control" on SUZUKI scan tool.
- **It is difficult or even impossible to start the engine when cold.**
- **If the fault is present, the Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Troubleshooting

Check the glow plug control module connections. Check the connections on all the glow plugs. Repair if necessary.
Check the condition of the 80A fuse on the battery fuse box. Check the resistance of the glow plugs: Replace any plug whose resistance is not less than 2 Ω at 20 °C, 68 °F.
Check the following connections for continuity and make sure there is no interference resistance: • Between cylinder 3 glow plug terminal and "C74-5" wire of the glow plug control module connector • Between cylinder 1 glow plug terminal and "C74-8" wire of the glow plug control module connector • Between cylinder 4 glow plug terminal and "C74-4" wire of the glow plug control module connector • Between cylinder 2 glow plug terminal and "C74-6" wire of the glow plug control module connector
Check for the presence of +12 V on "C74-7" wire of the glow plug control module (by 80A fuse on battery fuse box).
If the fault is still present. Check the ECM connections.
Check continuity and make sure there is no interference resistance on the following connection: • Between "C74-3" wire of glow plug control module connector and "C85-1" terminal of ECM connector • Between "C74-1" wire of glow plug control module connector and "C85-17" terminal of ECM connector
If the fault is still present, replace the glow plug control module.

DTC P0685: ECM / PCM Power Relay Control Circuit / Open Malfunction

S5JB0B1104129

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  Only deal with this fault if this fault is stored.
- **The main relay located on fuse box No.2.**
- **If the fault is present, the Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Relay cut out too soon
2.DEF	Relay cut out too late

Troubleshooting

• Check the ECM connections. Repair if necessary. • Check the condition of the battery terminals making sure they are correctly tightened. Check the condition of the main relay and its mounting. Repair if necessary.
Check the following connection for continuity and for the absence of interference resistance: • Between “E33-8” wire of main relay mounting connector and “C86-14” terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P0697: Sensor Reference Voltage “C” Circuit / Open Malfunction

S5JB0B1104130

⚠ CAUTION

This fault may appear if the wiring harness has been damaged.
Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
This check enables the condition and the conformity of the engine wiring harness to be checked.

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present following a road test or after attempting to start the engine several times.
- **If the fault is present:**
  - **The EGR function is inhibited.**
  - **Engine stops.**
  - **The Red stop warning light (gravity 2 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Sensor reference voltage too low
2.DEF	Sensor reference voltage too high

Troubleshooting

The sensors connected to supply No.3 are:

- Fuel pressure sensor.
- MAF sensor assembly with IAT sensor.

To locate any faulty sensor and/or connection, disconnect one of the sensors then check whether the fault becomes stored.
If the fault is still present, repeat the operation with the other sensors.
(Wait a few seconds between each disconnection to allow the computer to make the measurement).

If the fault is stored after a disconnection, change the faulty sensor or repair its connection.
Clear the faults created by the multiple disconnections.
If the fault is still present when both these sensors have been disconnected:

1. Check the insulation against vehicle body ground of the following connections:
   – Between “C84-2” wire of fuel pressure sensor connector and “C86-32” terminal of ECM connector
   – Between “C84-3” wire of fuel pressure sensor connector and “C86-48” terminal of ECM connector
   – Between “C13-6” wire of MAF sensor assembly with IAT sensor connector and “C86-12” terminal of ECM connector
   – Between “C13-5” wire of MAF sensor assembly with IAT sensor connector and “C86-47” terminal of ECM connector
   – Between “C13-2” wire of MAF sensor assembly with IAT sensor connector and “C86-24” terminal of ECM connector
   Repair if necessary.
2. Check the insulation against +12 V of the following connections:
   – Between “C84-2” wire of fuel pressure sensor connector and “C86-32” terminal of ECM connector
   – Between “C84-3” wire of fuel pressure sensor connector and “C86-48” terminal of ECM connector
   – Between “C84-1” wire of fuel pressure sensor connector and “C86-46” terminal of ECM connector
   – Between “C13-6” wire of MAF sensor assembly with IAT sensor connector and “C86-12” terminal of ECM connector
   – Between “C13-5” wire of MAF sensor assembly with IAT sensor connector and “C86-47” terminal of ECM connector
   – Between “C13-2” wire of MAF sensor assembly with IAT sensor connector and “C86-24” terminal of ECM connector
3. Check the insulation between the following connections after disconnecting the sensors and ECM:
   – Between “C84-1” and “C84-3” wires of fuel pressure sensor connector and “C13-2” and “C13-5” wires of MAF sensor assembly with IAT sensor connector

If these checks do not produce the correct results, replace the faulty sensor(s).
If the fault is still present, substitute a known-good ECM and recheck.

DTC P0830: Clutch Pedal Switch “A” Circuit Malfunction

S5JB0B1104131

⚠ CAUTION

- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
- **This check enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after the clutch pedal is depressed, or during a road test.
- **If this fault is present, the cruise control / speed limiter function will be inhibited.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Signal absent
2.DEF	Inconsistency of signal

Troubleshooting

Check the condition and adjustment of the clutch pedal position (CPP) switch. Repair if necessary.
If these checks are correct: • Check the connections of the clutch pedal switch. • Check the ECM connections. Repair if necessary.
Check continuity and make sure there is no interference resistance on the following connection: • Between “E71-2” wire of clutch pedal switch connector and “E66-30” terminal of ECM connector. Repair if necessary.
Check for the presence of ground on “E71-1” wire of the clutch pedal switch. Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P1431: Clogged Particulate Filter Failures Malfunction

S5JB0B1104132

⚠ CAUTION

The parameters must be reinitialised after any procedure is carried out on the diesel particulate filter. Use command “Initialize Diesel PF data” on SUZUKI scan tool, and diesel particulate filter after-sales regeneration referring to “Diesel Particulate Filter After-sales Regeneration Procedure: in Section 1C” or “Diesel Particulate Filter Removal and Installation: in Section 1K”.

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present:**
  - **Diesel particulate filter regenerations are inhibited.**
  - **The EGR function is inhibited.**
  - **The vehicle performances are reduced.**
  - **The Injection warning light (gravity 1 warning light) is lit.**

Troubleshooting

Check the condition of the following pressure pipes: • Differential pressure sensor downstream side pipe if necessary.
The fault appears if the weight of soot contained in the filter is greater than 50 g. Carry out diesel particulate filter after-sales regeneration referring to “Diesel Particulate Filter After-sales Regeneration Procedure: in Section 1C”. If the fault is still present, substitute a known-good ECM and recheck.

DTC P1436: Regeneration Request Failures Malfunction

S5JB0B1104133

⚠ CAUTION

- **The parameters must be reinitialised after any procedure is carried out on the diesel particulate filter.**
  Use command “Initialize Diesel PF data” on SUZUKI scan tool, and diesel particulate filter after-sales regeneration referring to “Diesel Particulate Filter After-sales Regeneration Procedure: in Section 1C” or “Diesel Particulate Filter Removal and Installation: in Section 1K”.
- **In order to enable the diesel particulate filter to self-clean automatically, we recommend that you drive as soon as possible for up to about 20 minutes after diesel particulate filter warning light turning ON, at an average speed of 75 km/h (46 mph) compatible with:**
  - **The road conditions.**
  - **Respect for authorised speed limits.**

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present:**
  - **Diesel particulate filter warning light is lit.**
  - **Specific driving requirement to regenerate the diesel particulate filter when driving.**
- **Order of priority in the event of more than one fault:**
  - **Firstly, deal with fault “DTC P1431: Clogged Particulate Filter Failures Malfunction: ” if it is present or stored.**

Troubleshooting

• Fault appears following several failed regeneration attempts when driving, or if the weight of soot in the filter is above 50 g. • Do not start diesel particulate filter after-sales regeneration with SUZUKI scan tool. Regeneration must absolutely be carried out when driving insofar as possible. The diesel particulate filter warning light is displayed on the combination meter to show a risk of the filter becoming saturated.

DTC P1480: Defective Particulate Filter Inlet Pick-Off Failures Malfunction

S5JB0B1104134

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present:**
  - **The Injection warning light (gravity 1 warning light) is lit.**
  - **The diagnostic of the diesel particulate filter is inhibited.**
  - **Diesel particulate filter regenerations are inhibited.**

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Inconsistency of signal

Troubleshooting

Check the condition of the following pressure pipes: • Differential pressure sensor upstream side pipe
Check that the pipe is not crushed, blocked or pierced. Check the correct position and connection on the differential pressure sensor. Replace the differential pressure sensor upstream side pipe if necessary.

DTC P1641: Additional Heater Relay No.1 Control Circuit

S5JB0B1104146

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started.
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CO.1	Short circuit to +12 V

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the condition of the additional heater relay No.1. Check the ECM connections. Repair if necessary.
Check the additional heater relay No.1 mounting connections. If these checks are correct, Check the continuity and insulation from vehicle body ground of the following connections: • Between “C93-5” wire of additional heater relay No.1 mounting connector and “C86-39” terminal of ECM connector • Between “C93-1” wire of additional heater relay No.1 mounting connector and “E33-6” wire of main relay connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for CC.1: Short circuit to +12 V

Check the condition of the additional heater relay No.1. Check the ECM connections. Repair if necessary.
Check the turbocharger electric water pump relay mounting connections. Check the continuity and insulation from +12 V of the following connection: • Between “C93-5” wire of additional heater relay No.1 mounting connector and “C86-39” terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P1642: Additional Heater Relay No.2 and 3 Control Circuit

S5JB0B1104147

NOTE

- **Conditions for applying fault finding procedures to stored faults: The fault is declared present after the engine is started.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CC.1	Short circuit to +12 V

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the condition of the additional heater relay No.2 and No.3. Check the ECM connections. Repair if necessary.
Check the additional heater relay No.2 and No.3. mounting connections. If these checks are correct, Check the continuity and insulation from vehicle body ground of the following connections: • Between “C93-5” wire of additional heater relay No.2 mounting connector and “C85-19” terminal of ECM connector • Between “C94-3” wire of additional heater relay No.2 mounting connector and “E33-6” wire of main relay connector • Between “C95-5” wire of additional heater relay No.3 mounting connector and “C85-19” terminal of ECM connector • Between “C95-3” wire of additional heater relay No.3 mounting connector and “E33-6” wire of main relay connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for CC.1: Short circuit to +12 V

Check the condition of the additional heater relay No.2 and No.3. Check the ECM connections. Repair if necessary.
Check the additional heater relay No.2 and No.3 mounting connections. Check the continuity and insulation from +12 V of the following connection: • Between “C93-5” wire of additional heater relay No.2 mounting connector and “C85-19” terminal of ECM connector • Between “C95-5” wire of additional heater relay No.3 mounting connector and “C85-19” terminal of ECM connector Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P2002: Particulate Trap Efficiency Below Threshold Malfunction

S5JB0B1104135

⚠ CAUTION

The parameters must be reinitialised after any procedure is carried out on the diesel particulate filter. Use command “Initialize Diesel PF data” on SUZUKI scan tool, and diesel particulate filter after-sales regeneration referring to “Diesel Particulate Filter After-sales Regeneration Procedure: in Section 1C” or “Diesel Particulate Filter Removal and Installation: in Section 1K”.

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present:**
  - **Diesel particulate filter regenerations are inhibited.**
  - **Blue and white fumes and black particles can be seen at the exhaust.**

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	ABSENT

Troubleshooting

Check the diesel particulate filter is present.
If it is already present,
Visually inspect the diesel particulate filter by placing the vehicle on a lift:

- Not damaged (no abnormal welds, if necessary compare it with another fitted vehicle),
- If After Sales sleeves are present, following a previous procedure, check that the diesel particulate filter has not had its contents removed when it was removed.

If the diesel particulate filter is not in good working order or is absent, replace diesel particulate filter.

DTC P2031: Exhaust Gas Temperature Sensor Circuit Malfunction

S5JB0B1104136

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault is declared present after the engine is started or following a road test.
- **If the fault is present:**
  - **Diesel particulate filter regenerations are inhibited.**
  - **The Injection warning light (gravity 1 warning light) is lit.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CC.0	Short circuit to vehicle body ground
CO.1	Open circuit or short circuit to +12 V

Troubleshooting

Check for the continuity, absence of interference resistance and insulation from +12 V for the following connections: • Between “C87-1” wire of exhaust gas temperature sensor 2 connector and “C86-31” terminal of ECM connector • Between “C87-2” wire of exhaust gas temperature sensor 2 connector and “C86-18” terminal of ECM connector Repair if necessary.
Check the continuity, absence of interference resistance and insulation from vehicle body ground of the following connection: • Between “C87-1” wire of exhaust gas temperature sensor 2 connector and “C86-31” terminal of ECM connector Repair if necessary.
Check for the presence of ground on “C87-1” wire of the exhaust gas temperature sensor 2 connector. Check the exhaust gas temperature sensor 2 resistance between “C87-1” and “C87-2” terminals of the connector according to parameter “Diesel PF in Temp” on Data List of SUZUKI scan tool. **Diesel particulate filter upstream temperature:** **106000 Ω at 50°C, 122 °F** **33500 Ω at 100 °C, 212 °F** **13900 Ω at 150 °C, 302 °F** **6896 Ω at 150 °C, 392 °F** **2575 Ω at 300 °C, 572 °F** **1202 Ω at 400 °C, 752 °F** **673 Ω at 500 °C, 932 °F** **424 Ω at 600 °C, 1112 °F** If the recorded values do not correspond to the above values, replace the exhaust gas temperature sensor 2 of the diesel particulate filter. If the fault is still present, substitute a known-good ECM and recheck.

DTC P2120: Throttle/Pedal Position Sensor/Switch “D” Circuit Malfunction

S5JB0B1104137

⚠ CAUTION

- **This fault may appear if the wiring harness has been damaged.**
  Follow the procedure described in “Electrical Circuit Inspection Procedure: in Section 00 in related manual”.
- **This check enables the condition and the conformity of the engine wiring harness to be checked.**

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after a series of full load/no load actions on the accelerator pedal.
- **Turbocharging, passenger compartment heating resistor activation and cruise control/ speed limiter are not authorised.**
- **If the fault is present, the Injection warning light (gravity 1 warning light) is lit.**
- **The engine speed is fixed at 1400 rpm if there is a fault on “main” and “sub” wire of the accelerator pedal position (APP) sensor and the engine torque is limited.**
- **Use service wire for all operations on the controller connectors.**
- **Priorities when dealing with a number of faults:**
  Apply the procedure for dealing with fault “DTC P0651: Sensor Reference Voltage “B” Circuit / Open Malfunction: ” first if it is present or stored.

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CC.1	Short circuit to +12 V
1.DEF	Inconsistency of signal

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

NOTE

Priorities when dealing with a number of faults:
If fault “DTC P0225: Accelerator Pedal Position (APP) Sensor Assembly / Switch “C” Circuit Malfunction: ” is present at the same time, check that the sensor is connected correctly.

Check the connections of the accelerator pedal position (APP) sensor. Check the ECM connections. Repair if necessary.
Check the continuity and insulation from vehicle body ground of the following connections: • Between “E68-6” wire of accelerator pedal position (APP) sensor connector and “E66-21” terminal of ECM connector • Between “E68-1” wire of accelerator pedal position (APP) sensor connector and “E66-15” terminal of ECM connector Repair if necessary.
Measure the resistance on the accelerator pedal position (APP) sensor (sub) on accelerator pedal position (APP) sensor assembly between “E68-1” and “E68-5” terminals. Replace the accelerator pedal position (APP) sensor assembly if the resistance is not 0.8 – 4.9 kΩ.

Troubleshooting for CC.1: Short circuit to +12 V

NOTE

Priorities when dealing with a number of faults:
If fault "DTC P0225: Accelerator Pedal Position (APP) Sensor Assembly / Switch "C" Circuit Malfunction: " is present at the same time, check that the sensor is connected correctly.

Check the connections of the accelerator pedal position (APP) sensor. Check the ECM connections. Repair if necessary.
Check the continuity and insulation in relation to +12 V of the following connections: • Between "E68-6" wire of accelerator pedal position (APP) sensor connector and "E66-21" terminal of ECM connector • Between "E68-1" wire of accelerator pedal position (APP) sensor connector and "E66-15" terminal of ECM connector • Between "E68-5" wire of accelerator pedal position (APP) sensor connector and "E66-27" terminal of ECM connector Repair if necessary.
Measure the resistance on the accelerator pedal position (APP) sensor (sub) on accelerator pedal position (APP) sensor assembly between "E68-1" and "E68-5" terminals. Replace the accelerator pedal position (APP) sensor assembly if its resistance is not approximately: 0.8 – 4.9 kΩ.

Troubleshooting for 1.DEF: Inconsistency of signal

Check the fuel pressure sensor connectors. Check the ECM connections. Repair if necessary.
Check the following connections for continuity and make sure there is no interference resistance: • Between "E68-6" wire of accelerator pedal position (APP) sensor connector and "E66-21" terminal of ECM connector • Between "E68-1" wire of accelerator pedal position (APP) sensor connector and "E66-15" terminal of ECM connector • Between "E68-5" wire of accelerator pedal position (APP) sensor connector and "E66-27" terminal of ECM connector • Between "E68-3" wire of accelerator pedal position (APP) sensor connector and "E66-3" terminal of ECM connector • Between "E68-2" wire of accelerator pedal position (APP) sensor connector and "E66-4" terminal of ECM connector • Between "E68-4" wire of accelerator pedal position (APP) sensor connector and "E66-5" terminal of ECM connector Repair if necessary.
If the fault is still present, replace the accelerator pedal position (APP) sensor assembly.

DTC P2141: Exhaust Gas Recirculation Throttle Control Circuit Low Malfunction

S5JB0B1104138

⚠ CAUTION

- **EGR valve data initialization procedure is required when the EGR valve is replaced. The "EGR valve initial offset" and "EGR valve last offset" parameters must be reinitialised. Refer to "EGR Valve Data Initialization: in Section 1C" to carry out this programming.**
- **This fault can result in a rapid and significant fouling of the diesel particulate filter. If the EGR valve needs to be replaced to deal with the fault, it must be cleared.**

NOTE

- **Conditions for applying fault finding procedures to stored faults: The fault is declared present after a road test.**
- **If the fault is present:**
  - **The EGR function is inhibited.**
  - **Diesel particulate filter regenerations are inhibited.**
  - **Turbocharging is disabled,**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for any operation on the ECM connectors.**

Troubleshooting

Check the connections of the EGR valve Check the ECM connections. Repair if necessary.
• Check the operation of the EGR valve: Perform Test 7 referring to "Test 7: Exhaust gas recirculation valve: ". • If the fault if still present, perform "Initialization EGR valve data" on SUZUKI scan tool to reintialise the operating values of the valve and launch a programming procedure for the EGR offsets (Refer to "EGR Valve Data Initialization: in Section 1C"). If the valve is jammed or irrevocably seized, replace the EGR valve.

DTC P2142: Exhaust Gas Recirculation Throttle Control Circuit High Malfunction

S5JB0B1104139

⚠ CAUTION

- **EGR valve data initialization procedure is required when the EGR valve is replaced. The "EGR valve initial offset" and "EGR valve last offset" parameters must be reinitialised. Refer to "EGR Valve Data Initialization: in Section 1C" to carry out this programming.**
- **This fault can result in a rapid and significant fouling of the diesel particulate filter. If the EGR valve needs to be replaced to deal with the fault, it must be cleared.**

NOTE

- **Conditions for applying fault finding procedures to stored faults: The fault is declared present after a road test.**
- **If the fault is present:**
  - **The EGR and turbocharging functions are inhibited.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for any operation on the ECM connectors.**

Troubleshooting

Check the connections of the EGR valve Check the ECM connections. Repair if necessary.
• Check the operation of the EGR valve: Perform Test 7 referring to "Test 7: Exhaust gas recirculation valve: ". • If the fault if still present, perform "Initialization EGR valve data" on SUZUKI scan tool to reinitialize the operating values of the valve and launch a programming procedure for the EGR offsets (Refer to "EGR Valve Data Initialization: in Section 1C"). If the valve is jammed or irrevocably seized, replace the EGR valve.

DTC P2264: Water in Fuel Sensor Circuit Malfunction

S5JB0B1104140

NOTE

Conditions for applying fault finding procedures to stored faults:
The fault is declared present after the engine is started or following a road test.

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Troubleshooting

NOTE

If the level of water in the fuel filter unit is lower than the electrodes on the sensor, certain driving conditions (on a bend, leaning) may cause the injection fault warning light to light up erratically.

1. Check the conformity and quality of the fuel.
2. Check the sealing of the reservoir and the low pressure circuit by applying fault finding-Tests Test 2 referring to “Test 2: Low pressure circuit check: ”.
   a. Make sure the water in fuel filter water detection sensor is properly connected.
      – If not, clear the fault.
      – Carry out a road test (speed > 20 km/h (12 mph) and engine speed > 1200 rpm) for more than 30 seconds.
      – If the fault does not recur, end the fault finding procedure.
      – If the fault does recur, go to next step.
   b. If the sensor is properly connected:
      – Drain the fuel filter unit.
      – Clear the fault.
      – Carry out a road test (speed > 20 km/h (12 mph) and engine speed > 1200 rpm) for more than 30 seconds.
      – If the fault does not reappear, finish the fault finding procedure.
   c. If the fault recurs:
      Check for continuity and the absence of interference resistance on the connection between:
      – Between “C82-1” wire of water detection sensor connector and “C85-13” terminal of ECM connector
3. Check the power supply to the water detection sensor:
   – Between “C82-3” wire of water detection sensor connector and “E33-6” wire of main relay mounting connector
   – Between “C82-2” wire of water detection sensor connector and vehicle body ground

Carry out the necessary repairs.
If all these checks reveal no irregularities:

- Replace the water detection sensor including fuel filter case.
- Clear the fault.
- Carry out a road test (speed > 20 km/h (12 mph) and engine speed > of 1200 rpm) for more than 30 seconds, to confirm the repair.

DTC P2413: Exhaust Gas Recirculation System Performance Malfunction

S5JB0B1104141

⚠ CAUTION

- **EGR valve data initialization procedure is required when the EGR valve is replaced. The "EGR valve initial offset" and "EGR valve last offset" parameters must be reinitialised. Refer to "EGR Valve Data Initialization: in Section 1C" to carry out this programming.**
- **This fault can result in a rapid and significant fouling of the diesel particulate filter. If the EGR valve needs to be replaced to deal with the fault, it must be cleared.**

NOTE

- **Conditions for applying fault finding procedures to stored faults: The fault is declared present after a road test.**
- **If the fault is present:**
  - **There is heavy smoke at the exhaust.**
  - **The Malfunction indicator light (MIL) will come on after three consecutive driving cycles (starting +5 seconds + turn OFF ignition switch and wait 40 seconds.).**
- **Use service wire for any operation on the ECM connectors.**

Troubleshooting

Check the connections of the EGR valve. Check the ECM connections. Repair if necessary.
• Check the operation of the EGR valve: Perform Test 7 referring to "Test 7: Exhaust gas recirculation valve: ". • If the fault if still present, perform "Initialization EGR valve data" on SUZUKI scan tool to reinitialize the operating values of the valve and launch a programming procedure for the EGR offsets (Refer to "EGR Valve Data Initialization: in Section 1C"). If the valve is jammed or irrevocably seized, replace the EGR valve.

DTC P242A: Turbine Inlet Temperature Sensor and Wake-up Sensor Failure Malfunction

S5JB0B1104142

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault becomes present if:
  - **The engine is started with a speed greater than 1750 rpm and a fuel flow greater than 30 mg/str.**
  - **Or following a road test.**
- **If the fault is present:**
  - **The EGR function is inhibited.**
  - **Diesel particulate filter regenerations are inhibited.**
  - **The vehicle performances are reduced.**
  - **The Injection warning light (gravity 1 warning light) is lit.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO	Open circuit
CC.1	Short circuit to +12 V
1.DEF	Signal outside upper limit

Troubleshooting

Check the continuity, absence of interference resistance and insulation from +12 V of the following connection: • Between “C73-1” wire of exhaust gas temperature sensor 1 connector and “C85-5” terminal of ECM connector • Between “C73-2” wire of turbocharger upstream temperature sensor connector and “C85-22” terminal of ECM connector Repair if necessary.
Check the continuity, the absence of interference resistance and the insulation from vehicle body ground of the following connection: • Between “C73-1” wire of exhaust gas temperature sensor 1 connector and “C85-5” terminal of ECM connector Repair if necessary.
Check for the presence of ground on “C73-2” wire of the turbocharger upstream temperature sensor yellow connector. Check the exhaust gas temperature sensor 1 resistance between “C73-1” and “C73-2” terminals of the yellow connector according to parameter “Turbo upst temp.” on Data List of SUZUKI scan tool. **exhaust gas temperature sensor 1 resistance:** **1572 – 1972 Ω at 400 °C, 752 °F** **675 – 775 Ω at 500 °C, 932 °F** **343 – 383 Ω at 600 °C, 1112 °F** **197 – 217 Ω at 700 °C, 1292 °F** **126 – 136 Ω at 800 °C, 1472 °F** **84 – 94 Ω at 900 °C, 1652 °F** If the recorded values do not correspond to the above values, replace the exhaust gas temperature sensor 1. If the fault is still present, substitute a known-good ECM and recheck.

DTC P242B: Turbine Inlet Temperature Sensor Regulation Failure Malfunction

S5JB0B1104143

⚠ CAUTION

This fault can result in a rapid and significant fouling of the diesel particulate filter.

NOTE

- **Conditions for applying fault finding procedures to stored faults:**
  The fault becomes present if:
  - **The engine is started with a speed greater than 1750 rpm and a fuel flow greater than 30 mg/str.**
  - **Or following a road test.**
- **If the fault is present:**
  - **Diesel particulate filter regenerations are inhibited.**
  - **The vehicle performances are reduced.**
  - **The Injection warning light (gravity 1 warning light) is lit.**

Wiring Diagram

For wiring circuit and connector number, refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A”.

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
1.DEF	Parameter at maximum limit
2.DEF	Temperature measured too high

Troubleshooting

Check the continuity, absence of interference resistance and insulation from +12 V of the following connection: • Between “C73-1” wire of exhaust gas temperature sensor 1 connector and “C85-5” terminal of ECM connector • Between “C73-2” wire of exhaust gas temperature sensor 1 connector and “C85-22” terminal of ECM connector Repair if necessary.
Check the continuity, the absence of interference resistance and the insulation from vehicle body ground of the following connection: • Between “C73-1” wire of exhaust gas temperature sensor 1 connector and “C85-5” terminal of ECM connector Repair if necessary.
Check for the presence of ground on “C73-2” wire of the exhaust gas temperature sensor 1 connector. Check the sensor resistance between “C73-1” and “C73-2” terminals of the connector according to parameter “Turbo upst temp.” on Data List of SUZUKI scan tool. **exhaust gas temperature sensor 1 resistance:** **1572 – 1972 Ω at 400 °C, 752 °F** **675 – 775 Ω at 500 °C, 932 °F** **343 – 383 Ω at 600 °C, 1112 °F** **197 – 217 Ω at 700 °C, 1292 °F** **126 – 136 Ω at 800 °C, 1472 °F** **84 – 94 Ω at 900 °C, 1652 °F** If the recorded values do not correspond to the above values, replace the exhaust gas temperature sensor 1. If the fault is still present, substitute a known-good ECM and recheck.

DTC P2600: Coolant Pump Control Circuit / Open Malfunction

S5JB0B1104144

NOTE

- **Conditions for applying the fault finding procedure to stored faults:**
  The fault is declared present after ignition switch has been turned OFF and after an interval of 40 seconds, or after output test "Turbo charger cooling pump" on SUZUKI scan tool.
- **If the fault is present:**
  - **The EGR function is inhibited.**
  - **The Injection warning light (gravity 1 warning light) is lit.**
- **Use service wire for all operations on the ECM connectors.**

Wiring Diagram

For wiring circuit and connector number, refer to "A-5 Engine and A/C Control System Circuit Diagram (DSL): in Section 9A".

Detecting Condition

Displaying on SUZUKI scan tool	Detecting condition
CO.0	Open circuit or short circuit to vehicle body ground
CC.1	Short circuit to +12 V

Troubleshooting for CO.0: Open circuit or short circuit to vehicle body ground

Check the condition of the "T/C P" fuse on the fuse box No.2. Check the condition of the turbocharger electric water pump relay. Check the ECM connections. Repair if necessary.
Check the turbocharger electric water pump relay mounting connections. If these checks are correct, Check the continuity and insulation from vehicle body ground of the following connections: • Between "E34-10" wire of turbocharger electric water pump relay mounting connector and "C86-41" terminal of ECM connector • Between "E34-8" wire of turbocharger electric water pump relay mounting connector and "E33-6" wire of main relay connector • Between "E34-6" wire of turbocharger electric water pump relay mounting connector and "E38-1" wire of fuse box No.2 mounting connector • Between "E34-7" wire of turbocharger electric water pump relay mounting connector and "C70-2" wire of turbocharger electric water pump connector
Check for the ground on "C70-1" wire of the turbocharger electric water pump connector.Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

Troubleshooting for CC.1: Short circuit to +12 V

Check the condition of the turbocharger electric water pump relay. Check the ECM connections. Repair if necessary.
Check the turbocharger electric water pump relay mounting connections. Check the continuity and insulation from +12 V of the following connection: • Between "E34-10" wire of turbocharger electric water pump relay mounting connector and "C86-41" terminal of ECM connector • Between "C70-1" wire of turbocharger electric water pump connector and vehicle body ground Repair if necessary. If the fault is still present, substitute a known-good ECM and recheck.

DTC P3031: Temperature Threshold Overshoot Failures During After-sales Regeneration

S5JB0B1104152

⚠ CAUTION

- **The fault is present because the exhaust gas temperature sensor 2 detects over 700 °C, 1292 °F while the diesel particulate filter after-sales regeneration was in progress.**
  Carry out an after sales regeneration referring to "Diesel Particulate Filter After-sales Regeneration Procedure: in Section 1C".
  If the fault is still present, substitute a known-good ECM and recheck.
- **The parameters must be reinitialised after any procedure is carried out on the diesel particulate filter.**
  Use command "Initialize Diesel PF data" on SUZUKI scan tool, and diesel particulate filter after-sales regeneration referring to "Diesel Particulate Filter After-sales Regeneration Procedure: in Section 1C" or "Diesel Particulate Filter Removal and Installation: in Section 1K".

NOTE

If the fault is present, the diesel particulate filter after-sales regeneration in progress fails.

Fault Finding-Customer Complaints

S5JB0B1104153

NOTE

Before carrying out the procedures associated with customer complaints, check for the absence of faults and the conformity (or otherwise) of the parameters and statuses, using SUZUKI scan tool. If the customer complaint is not eliminated, then proceed according to the corresponding fault finding chart.

Table 1: No dialogue with the ECM
Table 2: The Engine Does Not Start
Table 3: The Engine Starts with Difficulty
Table 4: Injection Noise
Table 5: Poor Performance with Smoke
Table 6: Poor Performance without Smoke
Table 7: Irregular Engine Operation
Table 8: Fuel System Leaks
Table 9: Rough idle
Table 10: Oil leaks from the turbocharger

Table 1: No dialogue with the ECM

S5JB0B1104154

Troubleshooting

Try the scan tool on another vehicle.
Check the ECM earth point.
Check: • Check the connection between the scan tool and the data link connector • Check the main and circuit fuses
Check the voltage (12 volts) between the following terminals (ignition switch turned ON): • Between “G20-16” wire and “G20-4” wire of data link connector • Between “G20-16” wire and “G20-5” wire of data link connector Repair if necessary.
Check the insulation, continuity and absence of interference resistance of the connections: • Between “C86-41” terminal of ECM connector and “E33-8” wire of main relay mounting connector (relay control) • Between “C86-3” terminal of ECM connector and “E33-6” wire of main relay mounting connector • Between “E66-2” terminal of ECM connector and “E33-6” wire of main relay mounting connector • Between “E66-11” terminal of ECM connector and “E82-23” wire of BCM connector • Between “E66-1” terminal of ECM connector and vehicle body ground • Between “E66-7” terminal of ECM connector and vehicle body ground • Between “E66-8” terminal of ECM connector and vehicle body ground • Between “E66-31” terminal of ECM connector and “G20-7” wire of data link connector (K-line) Repair if necessary.

Table 2: The Engine Does Not Start

S5JB0B1104155

Troubleshooting

Step	Action	Yes	No
1	Check that the fuel tank is correctly filled and that the fuel type is suitable. *Is the fuel type suitable and the tank correctly filled?*	Go to Step 2.	Refill the fuel tank correctly. Bleed the low and high pressure diesel circuit.
2	*Is the starter motor working properly?*	Go to Step 3.	Carry out the required repairs.
3	*Is the immobilizer system working properly?*	Go to Table 3 referring to “Table 3: The Engine Starts with Difficulty: ”.	Carry out the required repairs.

Table 3: The Engine Starts with Difficulty

S5JB0B1104156

Troubleshooting

Step	Action	Yes	No
1	Check that the fuel tank is correctly filled and that the fuel type is suitable. *Is the fuel type suitable and the tank correctly filled?*	Go to Step 2.	Refill the fuel tank correctly. Bleed the low and high pressure diesel circuit.
2	Check the engine earths. Check that engine speed reaches 250 rpm under the starter motor, as displayed on SUZUKI scan tool. *Is the starter motor working properly?*	Go to Step 3.	Carry out the required repairs.
3	Check ECM for DTC(s). *Is there DTC P0335?*	Go to “DTC P0335: Crankshaft Position Sensor “A” Circuit Malfunction: ”.	Go to Step 4.
4	Check ECM for DTC(s). *Is there DTC P0016?*	Go to “DTC P0016: Crankshaft Position-Camshaft Position Correlation Malfunction: ”.	Go to Step 5.
5	Check that the engine earthing is in order (oxidation, tightness, etc.). Check the mounting, the air gap and the condition of the sensor (overheating). *Is there in good condition?*	Go to Step 6.	Repair or replace the defective part.
6	Check that the fuel circuit is leak-tight. If the fault is still present, refer to “DTC P0089: Fuel Pressure Regulator 1 Performance Malfunction: ” of troubleshooting for 2.DEF: Measured pressure too low. *Is there in good condition?*	Go to Step 7.	Repair or replace the defective part.
7	Check the following: • Check that the heater plugs are actuated using “Pre/post Heater Relay Control” on SUZUKI scan tool. • Check that the fuel flow actuator are actuated using “IMV/Flow actuator” on SUZUKI scan tool. • Check the exhaust system referring to “Test 1: Exhaust system check: ”. • Check the low pressure circuit referring to “Test 2: Low pressure circuit check: ”. • Check for leaks in the high pressure circuit referring to “Test 8: Injector malfunction: ”. • Check the turbocharged air inlet circuit referring to “Test 3: Checking the turbocharged air inlet circuit: ”. • Check the MAF sensor referring to “Test 4: MAF sensor: ”. • Check the consistency of the signal from the engine coolant temperature sensor. • Check that the injectors are working properly (return leakage too high, clogging, sticking) referring to “Test 8: Injector malfunction: ”. • Check the engine timing (and the position of the high pressure pump sprocket). *Is there in good condition?*	Go to Step 8.	Repair or replace the defective part.
8	*Are the compressions correct?*	End of fault finding.	Carry out the required repairs.

Table 4: Injection Noise

S5JB0B1104157

Troubleshooting

Step	Action	Yes	No
1	If injection noise occurs after starting from cold: Check the priming of the low pressure fuel circuit. Check the fuel heater supply. Check the operation of the preheating system. Check that fuel and engine temperatures are consistent. *Is there in good condition?*	Go to Step 2.	Carry out the required repairs.
2	If the injection noises occur at idling speed: Check the condition of the injector connector and pressure regulator terminals. Check the conformity of the air flow signal “MAF” on Data List of SUZUKI scan tool or perform test 3 referring to “Test 3: Checking the turbocharged air inlet circuit: ”. *Is there in good condition?*	Go to Step 3.	Carry out the required repairs.
3	If the injection noise occur at all engine speeds: Perform fault finding on the injectors referring to “Test 8: Injector malfunction: ”. Check the condition of the injector connector and pressure regulator terminals. Ensure that the correct fuel is being used: Smell and compare the fuel with unpolluted diesel fuel: To detect petrol, solvent, thinner, sulphuric acid (fuel with a white colour), water or fuel oil. If the diesel fuel is not correct: • Replace the diesel fuel. • Change the fuel filter. • Bleed the low and high pressure diesel circuit. Check the conformity of the air flow signal “MAF” on Data List of SUZUKI scan tool. *Is there in good condition?*	End of fault finding.	Carry out the required repairs.

Table 5: Poor Performance with Smoke

S5JB0B1104158

NOTE

In the case of engine overheating to more than 119 °C, 246°F the computer deliberately limits the fuel flow (overheating warning light illuminates from 115 °C, 239 °F).

Troubleshooting

Step	Action	Yes	No
1	*Is the poor performance accompanied by smoke?*	Go to Step 2.	Go to Table 6 referring to “Table 6: Poor Performance without Smoke: ”.
2	Check the following: Ensure that the correct fuel is being used: Smell and compare the fuel with unpolluted diesel fuel: To detect petrol, solvent, thinner, sulphuric acid (fuel with a white colour), water or fuel oil. If the diesel fuel is not correct: • Replace the diesel fuel. • Change the diesel filter. Bleed the low and high pressure diesel circuit. *Is there in good condition?*	Go to Step 3.	Carry out the required repairs.
3	The conformity of the assembly of the injectors (presence and conformity of the sealing washer). Checking procedure: • Take a straightedge approximately 40 cm (15.7 in.) long and place it on the 4 injectors. The straightedge should rest on the 4 injectors. • If 1 injector protrudes, remove the injector and check that the sealing washer is correct. • If one injector does not touch the straightedge (clearance of more than 1 mm (0.040 in.)), remove the injector and check that there is a sealing washer. • Clean the injector wells and the injector, refit the injector with the correct sealing washer. *Is there in good condition?*	Go to Step 4.	Carry out the required repairs.
4	Check the following: The sealing and condition of the inlet circuit referring to “Test 3: Checking the turbocharged air inlet circuit: ”. The condition of the MAF sensor referring to “Test 4: MAF sensor: ”. The turbocharger referring to “Test 5: Variable geometry turbocharger control: ” and “Test 6: Rotating part of a turbocharger: ”. Check that the boost pressure follows the rise in the engine speed and that the loop difference with the boost pressure is low. *Is there in good condition?*	Go to Test 7 referring to “Test 7: Exhaust gas recirculation valve: ”.	Replace turbocharger.

Table 6: Poor Performance without Smoke

S5JB0B1104159

NOTE

In the case of engine overheating to more than 119 °C, 246 °F the computer deliberately limits the fuel flow (overheating warning light illuminates from 115 °C, 239 °F).

Troubleshooting

Step	Action	Yes	No
1	*Is the engine running on all cylinders?*	Go to Step 2.	Check the injector operation referring to “Test 8: Injector malfunction: ”.
2	Check the conformity of the accelerator pedal position sensor, the brake lamp switch, the boost pressure sensor, the EGR valve and the inlet throttle valve. *Is there in good condition?*	Go to Step 3.	Carry out the required repairs.
3	Check the consistency of the signal: of the MAF sensor, of the ECT sensor and of the engine speed. Check the connections, the continuity and absence of interference resistance of the MAF sensor (refer to “DTC P0100: Mass or Volume Air Flow Circuit Malfunction: ” of troubleshooting for 2.DEF: Offset at minimum threshold.), of the ECT sensor (refer to “DTC P0115: Engine Coolant Temperature Circuit Malfunction: ”), and the engine speed (refer to “DTC P0016: Crankshaft Position-Camshaft Position Correlation Malfunction: ”). *Is there in good condition?*	Go to Step 4.	Carry out the required repairs.
4	Check the following: • Diesel filter not clogged (for the test, refer to “DTC P0089: Fuel Pressure Regulator 1 Performance Malfunction: ” of troubleshooting for 2.DEF: Measured pressure too low.). • There are no leaks on the low and high pressure air circuits referring to “Test 3: Checking the turbocharged air inlet circuit: ”. • The oil vapour rebreathing system is connected. • The fuel flow actuator (blocked/seized, perform output test “IMV/Flow actuator” on SUZUKI scan tool.). • The engine timing (and the position of the high pressure pump sprocket). *Is there in good condition?*	Go to Step 5.	Carry out the required repairs.
5	*Are the compressions correct?*	End of fault finding.	Carry out the required repairs.

Table 7: Irregular Engine Operation

S5JB0B1104160

Troubleshooting

Step	Action	Yes	No
1	If the engine races during gear changes, check, if there is a floor carpet, that this is not blocking the accelerator pedal, the brake pedal and the clutch pedal, then check the conformity of the clutch switch and the conformity of the accelerator pedal sensor when the pedal is released. *Is there in good condition?*	Go to Step 2.	Carry out the required repairs.
2	Check the following: • CKP sensor and its circuit (refer to “DTC P0335: Crankshaft Position Sensor “A” Circuit Malfunction: ”.). • Check that the engine earthing is in order (oxidation, tightness, etc.). • Check the mounting, the air gap and the condition of the sensor (overheating). *Is there in good condition?*	Go to Step 3.	Carry out the required repairs.
3	Low pressure circuit check. Check the fuel flow actuator by applying Step 12 of the “Table 9: Rough idle: ” finding table. The sealing and condition of the inlet circuit referring to “Test 3: Checking the turbocharged air inlet circuit: ”. The condition of the air flow sensor referring to “Test 4: MAF sensor: ”. The turbocharger referring to “Test 5: Variable geometry turbocharger control: ” and “Test 6: Rotating part of a turbocharger: ”. *Is there in good condition?*	Go to Step 4.	Carry out the required repairs.
4	*Are the compressions correct?*	End of fault finding.	Carry out the required repairs.

Table 8: Fuel System Leaks

S5JB0B1104161

⚠ WARNING

When servicing fuel system, be sure to observe WARNING in "Precautions on Fuel System Service: in Section 1G" to reduce the risk of fire and personal injury.

Procedure for checking for an external leak on the fuel circuit:
Clean away traces of grease with clean thinner and wipe the part or the parts concerned with cleaning cloths. Start the engine and raise the engine coolant temperature until the diesel fuel reaches 80 °C, 176 °F. Stop the engine and check for traces of grease on the part or parts concerned. If there are such signs, replace the part or parts concerned. Bleed the fuel circuit and continue the checks.

Troubleshooting

Step	Action	Yes	No
1	*Are there greasy marks on the priming pump? (Visual inspection and touch check)*	Check the assembly of the elements and the condition of the seal at the union of the two components, if the leak is at the seal. Replace the part or the parts concerned. Bleed the fuel circuit and continue the checks.	Go to Step 2.
2	*Does the diesel filter offer up traces of grease? (Visual and tactile inspections)*	Check the assembly of the elements and the condition of the seal at the union of the two components, if the leak is at the seal. Replace the part or the parts concerned. Bleed the fuel circuit and continue the checks.	Go to Step 3.
3	*Are there greasy marks on the return pipes?*	Check the assembly of the elements and the condition of the seal at the union of the two components, if the leak is at the seal. Replace the part or the parts concerned. Bleed the fuel circuit and continue the checks.	Go to Step 4.
4	*Does the high pressure pump show traces of grease? (Visual and tactile inspections)*	Go to Step 7.	Go to Step 5.
5	*Do the high pressure pipes and the injector rail show traces of grease? (Visual and tactile inspections)*	Go to Step 7.	Go to Step 6.
6	*Do the injectors show traces of grease? (Visual and tactile inspections)*	Go to Step 7.	End of fault finding.

Step	Action	Yes	No
7	*Does the leak appear on the union / joint?*	If the leak is on the component, replace this and the high pressure pipe(s) removed at the same time as the component.	If the leak is on the join of a high pressure pipe and the component, remove the high pressure pipe and perform a visual inspection of the unions: if you find damaged unions, change the defective component and the high pressure pipe(s) removed at the same time as the component.

Table 9: Rough idle

S5JB0B1104162

Troubleshooting

Step	Action	Yes	No
1	Check the sealing and the condition of the inlet circuit referring to “Test 3: Checking the turbocharged air inlet circuit: ” and “Test 7: Exhaust gas recirculation valve: ”. *Is there in good condition?*	Go to Step 2.	Carry out the required repairs.
2	Check the low-pressure circuit referring to “Test 2: Low pressure circuit check: ”. *Is there in good condition?*	Go to Step 3.	Carry out the required repairs.
3	Check the charging system referring to “Generator Test (Undercharged Battery Check): in Section 1J” or “Generator Test (Overcharged Battery Check): in Section 1J”. *Is there in good condition?*	Go to Step 4.	Carry out the required repairs.
4	Check that the engine speed signal is correct using an oscilloscope: no interference, broken tooth, etc. If not correct, check the wiring, the position of the flywheel and the condition of the flywheel teeth, the position and tightness of the engine speed sensor. *Is there in good condition?*	Go to Step 5.	Carry out the required repairs.
5	Check the conformity of the fuel injector calibration codes using SUZUKI scan tool. *Is it correct codes?*	Go to Step 6.	Register the fuel injector calibration code into ECM referring to “Registration Procedure for the Fuel Injector Calibration Code: in Section 1C”.
6	Check the correction of the fuel flow referring to “Test 8: Injector malfunction: ”. *Is there in good condition?*	Go to Step 7.	Carry out the required repairs.
7	Check the connections and wiring of the injectors and ECM. *Is there in good condition?*	Go to Step 8.	Carry out the required repairs.
8	Check the high pressure circuit (external leaks) referring to “Table 8: Fuel System Leaks: ”. *Is there in good condition?*	Go to Step 9.	Carry out the required repairs.

Step	Action	Yes	No
9	Check the engine timing (and the position of the high pressure pump sprocket). *Is there in good condition?*	Go to Step 10.	Carry out the required repairs.
10	*Check the engine mount condition referring to "Engine Mounting Components: in Section 1D".*	Go to Step 11.	Repair if necessary.
11	*Are the compressions correct?*	Go to Step 12.	Carry out the required repairs.
12	Start the engine, engine at idling speed. Record "Fuel pressure", "Engine speed" and "Metering unit duty" on Data List of SUZUKI scan tool for 30 seconds. *Does the fuel pressure difference between min. and max. less than 50 bar?*	End of fault finding.	Substitute a known-good ECM and recheck.

Table 10: Oil leaks from the turbocharger

S5JB0B1104163

⚠ CAUTION

In case of replacing turbocharger, risk of destroying the new turbocharger and the engine if the air circuit is not cleaned and the oil and its filter are not replaced.

Troubleshooting

Step	Action	Yes	No
1	At idling speed, check if the turbocharger is leaking from the turbocharger oil supply inlet or outlet, from the turbocharger inlet or outlet or from the compressor and the rear plate of the compressor sump. *Is there in good condition?*	Go to Step 2.	Replace the seal of the leaky pipe or channel.
2	If the leak is at the inlet or outlet of the turbocharger or of the compressor. Check manually if the axial play is normal or excessive referring to "Test 6: Rotating part of a turbocharger: ". **NOTE** **It is normal to find traces of oil at the turbocharger inlet and outlet, as the air passing through the compressor is loaded with oil from the engine rebreathing circuit.** *Is the axial play normal?*	If the leak is on the exhaust side plate (turbine side). Replace the turbocharger.	Replace the turbocharger and check that the turbocharger oil supply circuit is not blocked.

Fault Finding-Tests

S5JB0B1104164

Some specific checks are grouped together into tests and are performed as required in the various fault finding tables or when interpreting faults.
Test 1: Exhaust system check
Test 2: Low pressure circuit check
Test 3: Checking the turbocharged air inlet circuit
Test 4: MAF sensor
Test 5: Variable geometry turbocharger control
Test 6: Rotating part of a turbocharger
Test 7: EGR valve
Test 8: Injector malfunction

Test 1: Exhaust system check

S5JB0B1104166

⚠ 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.

Step	Action	Yes	No
1	Engine stopped: Check that the muffler tail end is not blocked. Repair or replace the muffler, if necessary. Check the tightness of the exhaust manifold on the contact surface between the turbocharger and the exhaust manifold. *Is the tightness in order?*	Go to Step 2.	Repair or replace the defective part.
2	Loosen the clamp of catalytic converter on the turbocharger side. Place a wedge of wood between the two parts. Start the vehicle and check if the engine is working better. *Is the engine running normally?*	Go to Step 3.	The exhaust pipe is not the cause of the fault, repeat the engine fault finding procedure in the “Engine and Emission Control System Check”.
3	Retighten the clamp of catalytic converter. Loosen the flange bolt of diesel particulate filter on the catalytic converter side. Place a wedge of wood between the two parts. Start the vehicle and check if the engine is working better. *Is the engine running normally?*	Go to Step 4.	Replace the catalytic converter.
4	Retighten the flange bolt of diesel particulate filter. Loosen the flange bolt of exhaust pipe No.1 on the diesel particulate filter side. Place a wedge of wood between the two parts. Start the vehicle and check if the engine is working better. *Is the engine running normally?*	Go to Step 5.	Replace the diesel particulate filter.
5	Retighten the flange bolt of exhaust pipe No.1. Loosen the flange bolt of exhaust pipe No.2 on the exhaust pipe No.1 side. Place a wedge of wood between the two parts. Start the vehicle and check if the engine is working better. *Is the engine running normally?*	Go to Step 6.	Replace the exhaust pipe No.1.
6	Retighten the flange bolt of exhaust pipe No.2. Loosen the flange bolt of muffler on the exhaust pipe No.2 side. Place a wedge of wood between the two parts. Start the vehicle and check if the engine is working better. *Is the engine running normally?*	Replace the muffler.	Replace the exhaust pipe No.2.

Test 2: Low pressure circuit check

S5JB0B1104167

Step	Action	Yes	No
1	Check the fuel filter: • Conformity of the fuel filter. • Positioning and degree of contamination of the filter cartridge. • Positioning and condition of the seals. • If there is metal swarf in the filter: Replace the fuel filter, bleed the circuit and continue the fault finding procedure. *Is there in good condition?*	Go to Step 2.	Repair or replace the defective part.
2	Supplying the injection system with fuel from an additional tank. This operation aims to detect possible faults in the low pressure supply system of a vehicle by replacing it entirely with an additional tank. Mode: • Disconnect the diesel fuel supply pipe at the fuel filter inlet and seal it with a plug. • Connect a pipe to the fuel filter inlet and insert the other end in a clean container of approximately 5 liters. • Disconnect the diesel fuel return pipe at the pump return and injector leak-off junction and seal it with a plug. • Fill the container with clean diesel fuel. • Start the engine and let the system drain itself of its air (there must not be any air bubbles in the return pipe). *Does the customer complaint persist?*	If the low pressure circuit is in order, reconnect the different pipes of the low pressure circuit and repeat the fault finding of the fault finding chart or of the fault that referred you to this test.	Go to Step 3.
3	*Are the low pressure circuit connections in order and in good condition?*	Go to Step 4.	Carry out the necessary repairs.
4	Check the condition of the priming pump, and that it is working properly. Perform repairs if necessary and continue the test. *Is there in good condition?*	Go to Step 5.	Repair or replace the defective part.
5	If the fault is still present with a low fuel level, check the consistency of the actual fuel level and that indicated on the combination meter. • The fuel pump is supplied via a venturi pipe located underneath it. Check that the opening of the venturi (6 to 8 mm (0.24 to 0.31 in.) in diameter) is not blocked by dirt contained in the fuel tank. Check the priming of the low pressure diesel fuel circuit. *Is there in good condition?*	Go to Step 6.	Repair or replace the defective part.
6	Ensure that the correct fuel is being used: • Smell and compare the fuel with unpolluted diesel fuel: to detect petrol, solvent, thinner, sulphuric acid (fuel with a white colour), water or fuel oil. If the diesel fuel is not correct: • Replace the diesel fuel. • Change the diesel filter. • Bleed the low and high pressure diesel circuit. *Is there in good condition?*	Low-pressure circuit correct.	Repair or replace the defective part.

Test 3: Checking the turbocharged air inlet circuit

S5JB0B1104168

Step	Action	Yes	No
1	Engine stopped: Check the low and high pressure air circuits for leaks (air leaks in or out, before and after the turbocharger). Look for parts of the system that are abnormally greasy, indicating leakage. Check: • The condition and fitting of the ducts (foreign bodies, clogged, disconnected, pinched, broken, holed, cut, tightness of the mounting bolts, etc.). • The presence, condition and fitting of the seals. • The presence and tightening of the clamps. • The fitting of the boost pressure sensor. *Is there in good condition?*	Go to Step 2.	Carry out the necessary repairs.
2	Checking the air filter. Check: • The air filter unit inlet and outlet are not blocked. • The condition and the assembly of the air filter unit (disconnected, broken, with holes, etc.). • The cleanliness, conformity and the non-distortion of the filter element. • The MAF sensor: apply test 4. *Is there in good condition?*	Go to Step 3.	Carry out the necessary repairs.
3	Checking the inlet throttle valve. Check: • The condition of the inlet throttle valve. • The tightness of the mounting bolts. • Cracks in the damper valve. *Is there in good condition?*	Go to Step 4.	Carry out the necessary repairs.
4	Check that there is no leak on the exhaust manifold, in particular at the exhaust manifold/turbocharger interface. Check the exhaust system: apply test 1 referring to “Test 1: Exhaust system check: ”. *Is there in good condition?*	Go to Step 5.	Carry out the necessary repairs.
5	Check the condition of the intercooler: • Clogging, • Leaks (vehicle stationary, stabilise the engine speed between 3500 rpm and 4000 rpm and check that there are no leaks).	Air inlet circuit correct.	Replace the intercooler.

Test 4: MAF sensor

S5JB0B1104169

Step	Action	Yes	No
1	BREAKAGE OF ELECTRICAL COMPONENTS: Visual inspection: remove the MAF sensor assembly with IAT sensor, the components must not be broken *Is there in good condition?*	Go to Step 2.	Replace the MAF sensor assembly with IAT sensor if necessary.
2	CLOGGING OF THE MAF SENSOR: Test: • Check the values for conformity: – * During the first 5 seconds after starting: – Coolant temperature: 80 °C, 176 °F. – Engine speed: idle speed (800 ± 50 rpm). – MAF measurement: 490 mg/str ± 10%. – EGR valve: between –10% and 0%. – * After the starting phase: – Coolant temperature: 80 °C, 176 °F. – Engine speed: idle speed (800 ± 50 rpm). – MAF measurement: 310 mg/str ± 5%. – EGR valve: between 10% and 40%. • Refer to “DTC P0100: Mass or Volume Air Flow Circuit Malfunction: ” for 2.DEF, for the MAF sensor checks. *Is there in good condition?*	MAF sensor correct.	Replace the MAF sensor if necessary.

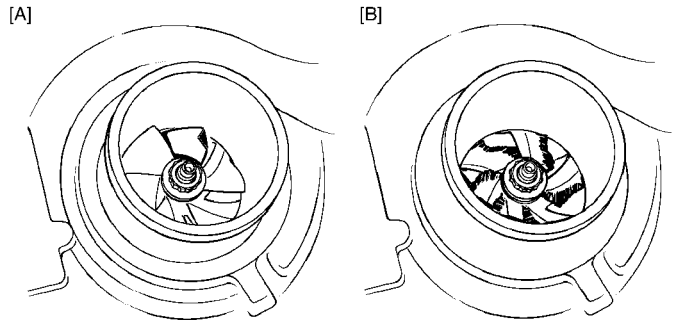
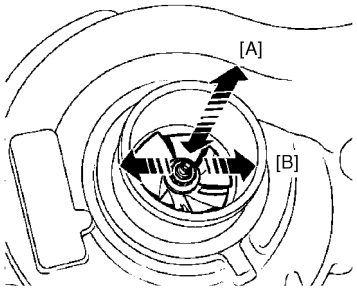
Test 5: Variable geometry turbocharger control

S5JB0B1104170

Step	Action	Yes	No
1	Engine stopped: Check manually if the variable geometry control rod is blocked. *Is the rod blocked?*	Replace the turbocharger.	Go to Step 2.
2	At idle speed, with boost pressure control solenoid valve control: between of 70% and 85% opening cyclic ratio, disconnect the electrical connector of the solenoid valve and check at the same time if the rod controlling the variable geometry blades moves. *Does the rod move from end stop to end stop?*	The turbocharging control circuit is operating normally.	Go to Step 3.
3	Check the condition of the boost pressure control solenoid valve connectors (corrosion, bent pins, etc.). Measure the resistance of the solenoid valve referring to “Boost Pressure Control Solenoid Valve Inspection: in Section 1C”. *Is the solenoid valve in order?*	Go to Step 4.	Replace the boost pressure control solenoid valve.
4	Check the electric harness of boost pressure control solenoid valve *Is there in good condition?*	Go to step 5.	Repair as necessary.
5	Reconnect the electrical connector of the boost pressure control solenoid valve. On the control diaphragm of the variable geometry blades, disconnect the pipe coming from the solenoid valve. Connect a pressure gauge in place of the diaphragm. Engine at idling speed. *Is the vacuum pressure > 750 mbar?*	Replace the turbocharger.	Go to Step 6.
6	Measure the vacuum pressure upstream of the boost pressure control solenoid valve. *Is the vacuum pressure > 750 mbar?*	Replace the boost pressure control solenoid valve.	Check the vacuum circuit and repeat the test from the vacuum pressure check.

Test 6: Rotating part of a turbocharger

S5JB0B1104171

Step	Action	Yes	No
1	With the engine cold and stopped, remove the air inlet duct from the turbocharger, check manually if the compressor and turbine shaft turns. *Does the shaft turn?*	Go to Step 2.	Replace the turbocharger. Seizing of the turbocharger could be caused by poor lubrication of the bearings. Check the lubrication circuit for any blockage and check the engine oil pressure. Perform an oil change and change the oil filter.
2	Perform a visual inspection of the condition of the compressor and turbine wheels. ([A]: Deformed, twisted blade (“soft” foreign body), [B]: Broken blades (“hard” foreign body))  I5JB0B110014-01 *Are the compressor and turbine wheels in good condition?*	Go to Step 3.	• Replace the turbocharger. • Replace the duct connected to the damaged wheel.
3	Manually check the axial play of the wheels. ([A]: Axial play, [B]: Radial play)  I5JB0B110015-01 *The significant axial play is approximately 2 mm (0.080 in.). Does the turbo have too much play in the shaft?*	Replace the turbocharger. If the rotating part is broken: change the engine oil and the oil filter. clean the intercooler and the air circuit ducts.	The rotating part is in order.

Test 7: Exhaust gas recirculation valve

S5JB0B1104172

Step	Action	Yes	No
1	VALVE POSITION FAULT FINDING: Or detection of a leak in the exhaust gas recirculation valve Clear the faults. Use “Initialize EGR valve data” on SUZUKI scan tool command to try to reinitialise the operating values of the EGR valve. Switch OFF the ignition and wait 40 seconds. Switch the ignition back on and check for faults. If the fault is still present: • Switch OFF the vehicle ignition. • Disconnect the connector of the EGR valve. • Remove the EGR valve referring to “EGR Valve Removal and Installation: in Section 1D” and reconnect it after having removed it. • Check that no particles are blocking the movement of the EGR valve flap. • Check that the EGR valve is not stuck or jammed in one position. • Switch ON the ignition again. • Check the movement of the valve with displaying “EGR position sensor” on Data List of SUZUKI scan tool (0 to 2.5 mm travel for an opening cyclic ratio of 40% and when fully open, ~ 5 mm, for an opening cyclic ratio of 95%). • Check that the EGR valve flap closes completely. *Is there in good condition?*	Go to Step 2.	Replace the EGR valve referring to “EGR Valve Removal and Installation: in Section 1D”.
2	EGR VALVE BUSHING FAULT FINDING: Remove the EGR valve referring to “EGR Valve Removal and Installation: in Section 1D” the EGR valve should not contain a cluster of soot between the base and the valve. Clean the EGR valve sleeve if necessary. *Is there in good condition?*	Go to Step 3.	Replace the EGR valve referring to “EGR Valve Removal and Installation: in Section 1D”.
3	1) Use “Initialize EGR valve data” on SUZUKI scan tool command to try to reinitialise the operating values of the EGR valve. 2) Check the air circuit referring to “Test 3: Checking the turbocharged air inlet circuit: ”. 3) Check the MAF sensor referring to “Test 4: MAF sensor: ”. *Is there in good condition?*	Go to Step 4.	Repair as necessary.
4	Confirmation of the fault finding: • Start the vehicle. • Leave the engine at idling speed for 1 min. • Accelerate very slowly up to 1500 rpm for 2 mins until the exhaust gas recirculation function becomes active. • Carry out a vehicle test at low speed, without accelerating heavily, then normally. • Check for faults using SUZUKI scan tool. *Does customer complaint or the faults recur?*	Substitute a known-good ECM and recheck.	Exhaust gas recirculation valve correct.

Test 8: Injector malfunction

S5JB0B1104173

⚠ WARNING

When servicing fuel system, be sure to observe WARNING in "Precautions on Fuel System Service: in Section 1G" to reduce the risk of fire and personal injury.

Step	Action	Yes	No
1	CHECK THE FUEL REGULATION BALANCE, INJECTOR BY INJECTOR • With the engine at idle speed, coolant temperature > 80 °C, 176 °F, display the each injector fuel flow correction values "Cyl # FF Correction" on Data List of SUZUKI scan tool. The normal value for fuel flow correction for an injector is ± 1.0 mm^3/stroke. This tolerance may increase with time, but indicates an injector/cylinder fault if it exceeds ± 5.0 mm^3/ stroke. *Do one of these values exceed ± 5.0 mm^3/stroke?*	Go to Step 2.	Go to Step 4.
2	CHECK THE FUEL REGULATION BALANCE, INJECTOR BY INJECTOR: 1) If at least one of these values is > +5.0 mm^3/stroke • Check the valve clearance. • Check the engine compression referring to "Compression Check: in Section 1D". – If the compression test reveals a cylinder fault, carry out the necessary repairs. – If the compression is in order, check the conformity of the assembly of the injector referring to "Fuel Injector Removal and Installation: in Section 1G", then check the fuel regulation again, injector by injector. If the customer complaint is still present, replace the injector 2) If at least one of these values is < –5.0 mm^3/stroke • Check the valve clearance. • Check the level and condition of the engine oil. • Remove the injector with the largest adjustment. • If there is pollution via the diesel, check the condition of the cylinder concerned (cylinder, piston, valves). • Replace the injector. **NOTE** **Before replacing an injector, check for the presence and conformity of its sealing washer (refer to "Table 5: Poor Performance with Smoke: ").** After replacing an injector, enter the code into an fuel injector that has not been programmed referring to "Registration Procedure for the Fuel Injector Calibration Code: in Section 1C". *Is there in good condition?*	Go to Step 3.	Repair as necessary.

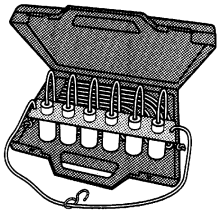
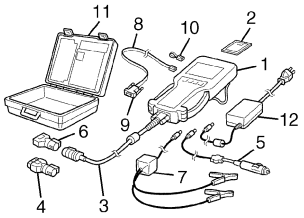
Step	Action	Yes	No
3	CONFIRMATION OF THE FAULT FINDING FOR THE CORRECTION OF THE FLOW, INJECTOR BY INJECTOR: Clear the fault(s) and carry out a test with the engine at idle speed, coolant temperature > 80 °C, 176 °F and check that no faults appear on the diagnostic tool and the fuel flow correction values do not reach ± 5.0 mm^3/stroke to confirm the repair. • If any other cylinders have injector fuel flow correction values > ± 5.0 mm^3/stroke, follow the fault finding procedure in Step 2 of this test. • If the repairs carried out have not repaired the engine, substitute a known-good ECM and recheck. *Is there in good condition?*	Go to step 4.	Repair as necessary.
4	INJECTOR RETURN FLOW BALANCE CHECK: • Allow the engine to heat up to a coolant temperature of > 80 °C, 176 °F. • Switch OFF the ignition. • Protect the upper engine edges with rags (mainly around the injectors). • Disconnect the injector return pipes. • Connect special tool (09912 – 96540) to injector. • Start the engine and let it idle. • Disconnect the fuel pressure regulator. • Start the ignition and perform a starting sequence (activate the starter motor for 5 seconds), • The flow of fuel on the return is normally very weak. Otherwise, replace the injector. • Clear the fault caused by the disconnection of the fuel flow actuator. • Refit the injector fuel return pipes after checking that the seals and pipes are in good condition. • If this is not the case, replace the injector fuel return pipes. • Confirm the repairs by means of a road test. **Special tool** **(A): 09912–96540** *Is there in good condition?*	Go to Step 5.	Repair as necessary.

Step	Action	Yes	No
5	INJECTOR NOZZLE SEALING TEST: • Check the level and condition of the engine oil: • If there is pollution via the diesel fuel, the injector nozzle which is leaking will be “greasy”. • Disconnect the preheating relay. Check that this is not caused by rising engine oil by checking the engine compression values. Check the condition of the heater plug: this must not be humid. If this is the case, change the defective injector. If the compression values are in order, locate the faulty injector by examining the condition of the cylinders and the pistons via the heater plug wells (greasy cylinder, overheating, starting to disintegrate, etc.). If the cylinder-piston examination is not conclusive, remove the injectors and change the one with the “greasy” nozzle. **NOTE** **Before replacing an injector, check for the presence and conformity of its sealing washer (refer to “Table 5: Poor Performance with Smoke: ”).** *Is there in good condition?*	Fuel injector correct.	Repair as necessary.

Special Tools and Equipment

Special Tool

S5JB0B1108001

09912–96540 Injector flow measuring kit Mot. 1711 ☞		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

EGR Valve Inspection

S5JB0B1206006

- Check EGR valve for wear or damage.

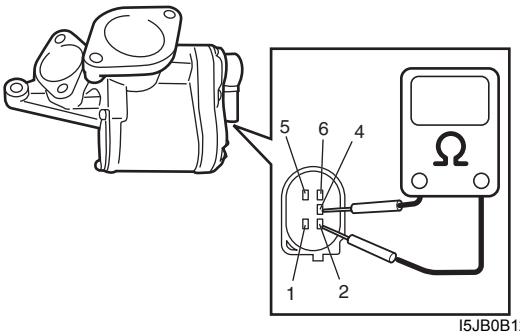
⚠ CAUTION

Do not disassembly EGR valve.

1) Check resistance between following terminals of EGR valve in each pair. If resistance is out of specification, replace EGR valve.

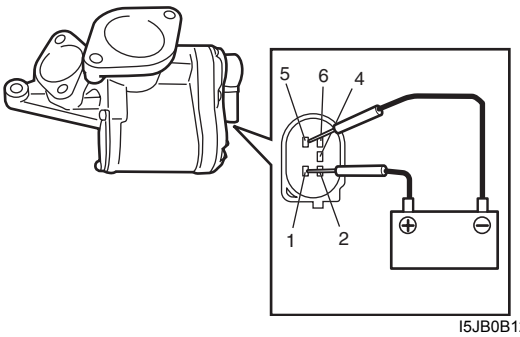
EGR valve resistance

Terminal	Resistance
Between 1 and 5 terminals	2.96 ± 0.3 Ω at 20 °C, 68 °F
Between 2 and 4 terminals	6.5 ± 0.6 kΩ at 20 °C, 68 °F



I5JB0B120009-01

2) Check EGR valve operation as following procedure. If check result is not satisfied, replace EGR valve.
   a) When connecting battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “5”, confirm EGR valve operates fully open.
   b) When disconnecting battery from EGR valve, confirm EGR valve operates fully close.



I5JB0B120010-01

⚠ CAUTION

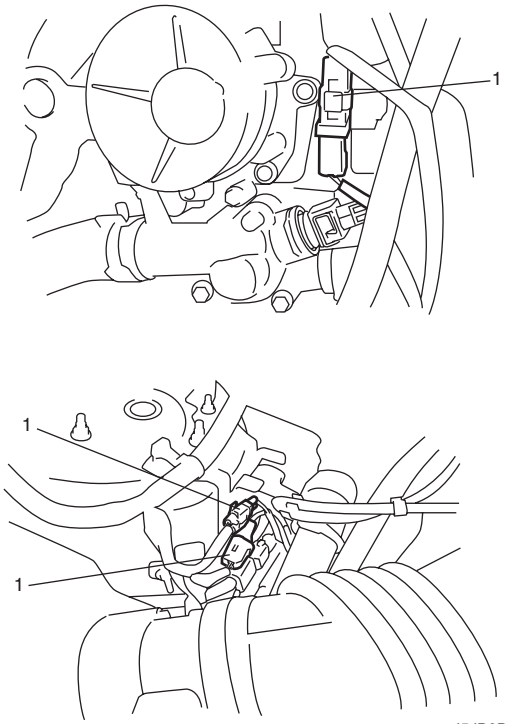
When replacing EGR valve, perform “Initialize EGR valve data” mode of SUZUKI scan tool referring to “EGR Valve Data Initialization”.

Exhaust Gas Temperature Sensor 1, 2 and 3 Removal and Installation

S5JB0B1206007

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect exhaust gas temperature sensor 1, 2 and/or 3 connectors (1).



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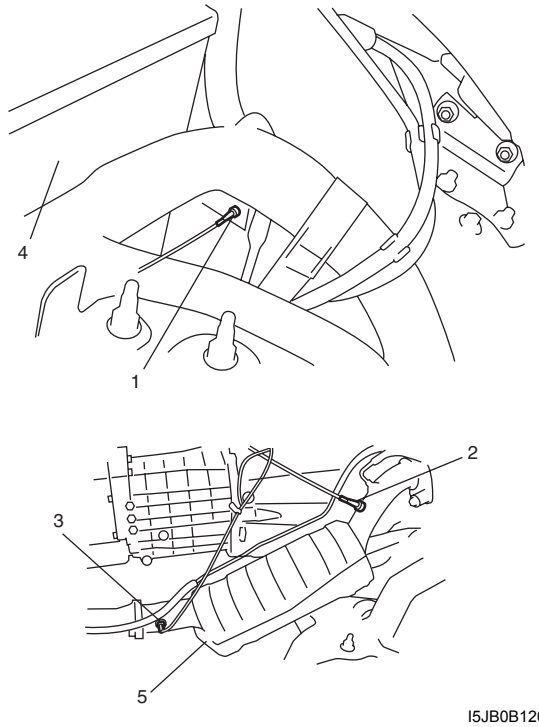
3) Remove exhaust gas temperature sensor 1 (1), 2 (2) and/or 3 (3).



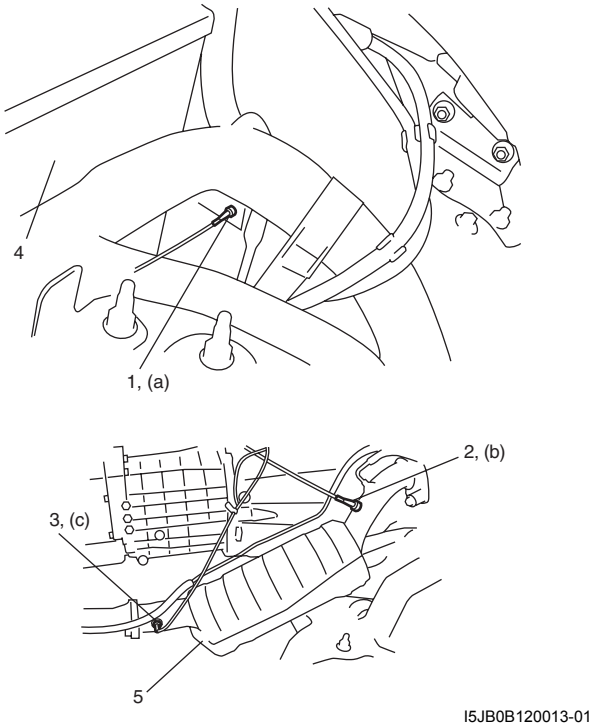
I5JB0B120012-01

4. Battery	5. Diesel particulate filter

Installation

1) Install exhaust gas temperature sensor 1, 2 and/or 3.

Tightening torque
Exhaust gas temperature sensor 1 (a): 40 N·m (4.0 kgf-m, 29.0 lb-ft)
Exhaust gas temperature sensor 2 (b): 30 N·m (3.0 kgf-m, 22.0 lb-ft)
Exhaust gas temperature sensor 3 (c): 30 N·m (3.0 kgf-m, 22.0 lb-ft)



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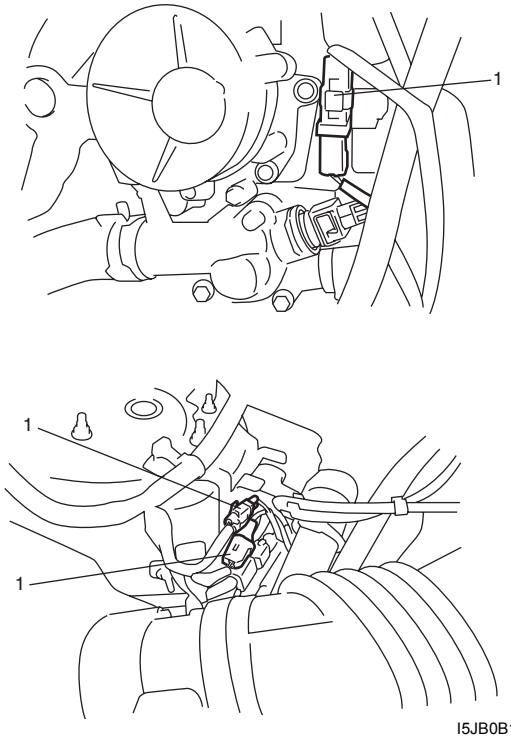
4. Battery	5. Diesel particulate filter

2) Connect exhaust gas temperature sensor 1, 2 and/or 3 connectors (1).



I5JB0B120011-01

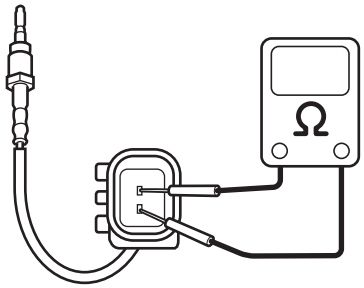
3) Connect negative (–) cable at battery.

Exhaust Gas Temperature Sensor 1, 2 and 3 Inspection

S5JB0B1206008

1) Disconnect negative (–) cable at battery.
2) Disconnect exhaust gas temperature sensor 1, 2 and/or 3 connectors.
3) Measure resistance between terminals of exhaust gas temperature sensor 1, 2 and/or 3 connectors. If resistance is out of specification, replace exhaust gas temperature sensor 1, 2 and/or 3.

Exhaust gas temperature sensor resistance
Exhaust gas temperature sensor 1
1.77 kΩ at 400 °C, 752 °F
0.7 kΩ at 500 °C, 932 °F
Exhaust gas temperature sensor 2
106 kΩ at 50 °C, 122 °F
33.5 kΩ at 100 °C, 212 °F
Exhaust gas temperature sensor 3
132 kΩ at 250 °C, 482 °F
3.5 kΩ at 500 °C, 932 °F



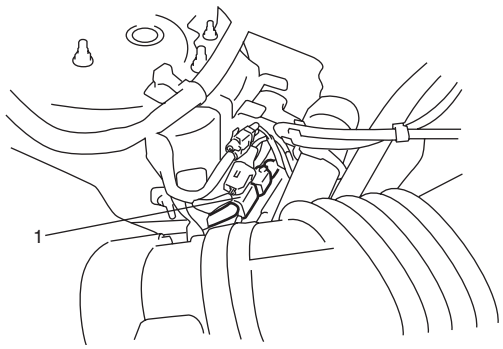
I5JB0B120014-01

Diesel Particulate Filter Differential Pressure Sensor Removal and Installation

S5JB0B1206009

Removal

1) Disconnect negative (–) cable at battery.
2) Detach diesel particulate filter differential pressure sensor (1) from its bracket.



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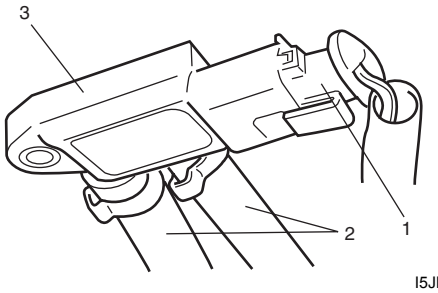
3) Disconnect diesel particulate filter differential pressure sensor connector (1) and hoses (2) from diesel particulate filter differential pressure sensor (3).



I5JB0B120016-01

Installation
Reverse removal procedure of installation.

Specifications

Tightening Torque Specifications

S5JB0B1207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Exhaust gas temperature sensor 1	40	4.0	29.0	☞
Exhaust gas temperature sensor 2	30	3.0	22.0	☞
Exhaust gas temperature sensor 3	30	3.0	22.0	☞

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

Engine Electrical Devices

Precautions

Precaution in Replacing ECM

S5JB0B1300001

- If ECM is replaced with new one or a used one, the engine cannot be started unless the key verification code stored in ECM is registered in the immobilizer control system.
  Also, ECM is registered the following vehicle information in addition of the key verification code.
  After replacing ECM, register these information to new ECM according to “Registration Procedure for the ECM: ”.
  – Fuel injector calibration codes
  – EGR/Inlet throttle valve data
  – Diesel PF (Diesel Particulate Filter) data
- If ECM is replaced with new or used one without the function of the immobilizer control system, the engine will not be started.
  In case of the above-mentioned, check if the newly installed ECM has the function of the immobilizer control system referring to its part number.

General Description

ECM Registration

S5JB0B1301001

The following vehicle information is registered in ECM.

- Fuel injector calibration codes
- EGR/Inlet throttle valve data
- Diesel PF (Diesel Particulate Filter) data
- Key verification code (for immobilizer control system)

If the following parts are replaced or ECM is reprogrammed, register the above-mentioned information in ECM as below table.

Service	Part	Registered data	Reference
Replace	ECM	• Fuel injector calibration codes • EGR/Inlet throttle valve data • Diesel PF (Diesel Particulate Filter) data • Key verification code	Go to “Registration Procedure for the ECM: ”.
	Fuel injector(s)	Fuel injector calibration code(s)	Go to “Registration Procedure for the Fuel Injector Calibration Code: ”.
	EGR valve	EGR valve data	Go to “EGR Valve Data Initialization: ”.
	Inlet throttle valve	Inlet throttle valve data	Go to “Inlet Throttle Valve Data Initialization: ”.
	Diesel Particulate Filter	Diesel PF (Diesel Particulate Filter) data	Go to “Diesel Particulate Filter Data Initialization: ”.
Reprogram	ECM	Key verification code	Go to “Registration Procedure for the ECM: ”.

Repair Instructions

Idle Speed Inspection

S5JB0B1306001

1) Shift transmission into Neutral.
2) Start engine and warm it up to normal operating temperature.
3) Turn all electrical loads OFF.
4) Using SUZUKI scan tool, verify that idle speed is within specification.

Engine speed
750 – 850 rpm

5) If not, refer to "SUZUKI Scan Tool Operator's Manual.

Engine Control Module (ECM) Removal and Installation

S5JB0B1306002

⚠ CAUTION

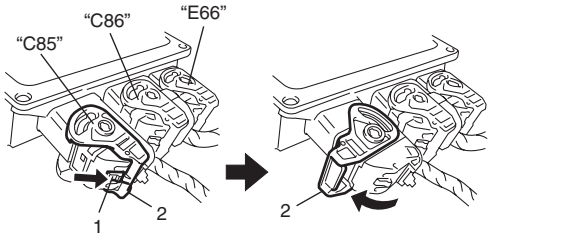
As ECM consists of precision parts, be careful not to expose it to excessive shock.

Removal

NOTE

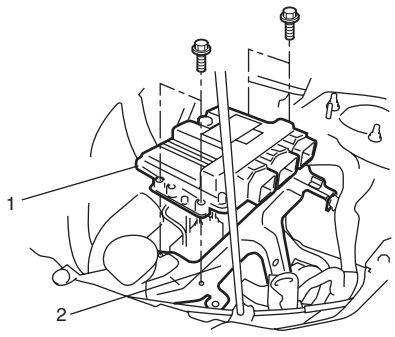
When ECM is replaced, register vehicle specification (Fuel injector calibration code register, EGR/Inlet throttle valve data register and Diesel PF (Diesel Particulate Filter) data register) into ECM referring to "ECM Registration: ".

1) Disconnect negative cable at battery.
2) Remove ECM cover.
3) Disconnect connectors from ECM in order of "E66", "C85" and "C86" as follows.
   a) Push lock (1) to release locking of lock lever (2).



I5JB0B130001-03

   b) Turn the lock lever to arrow direction until it stops.
4) Remove ECM (1) from ECM bracket (2).



I5JB0B130002-01

Installation
Reverse removal procedure for installation.

Registration Procedure for the ECM

S5JB0B1306005

For ECM Replacement
Using SUZUKI scan tool, be sure to register the following vehicle information from old ECM to new or substitute ECM as follows.

- Fuel injector calibration codes
- EGR/Inlet throttle valve data
- Diesel PF (Diesel Particulate Filter) data
- Key verification code (for immobilizer control system)

NOTE

- **For further details of SUZUKI scan tool, refer to its operator's manual.**
- **If these vehicle information cannot be read from old ECM, register/initialize them according to "Registration Procedure for the Fuel Injector Calibration Code: ", "EGR Valve Data Initialization: ", "Diesel Particulate Filter Data Initialization: " and "Procedure after ECM Replacement: in Section 10C".**

1) Register fuel injector calibration codes as follows.
   a) Connect SUZUKI scan tool to DLC with ignition switch OFF.
   b) Turn IG switch to ON position.
   c) Select “Replace ECM” of “ECM Setting” under “Miscellaneous test” (“Misc test”) mode of SUZUKI scan tool
   d) Read fuel injector calibration codes from old ECM by performing “IMA code register”.
   e) Replace old ECM with new or substitute ECM referring to “Engine Control Module (ECM) Removal and Installation: ”.
   f) Register injector calibration codes to new or substitute ECM by performing “IMA code register”.
   g) Turn ignition switch to OFF position, and wait 40 seconds or more.
2) Register the EGR/Inlet throttle valve data and Diesel PF (Diesel Particulate Filter) data respectively in the same manner as step 1) by selecting “EGR Valve Data Initialization: ” and “Diesel Particulate Filter Data Initialization: ”.
3) Register key verification code into ECM referring to “Procedure after ECM Replacement: in Section 10C”.

For ECM Reprogram

1) Perform ECM reprogramming. (Refer to “Suzuki Pass-Thru Reprogramming Tool Operator’s Manual”.)
2) Register key verification code to reprogrammed ECM referring to “Procedure after ECM Replacement: in Section 10C”.

NOTE

Once ECM reprogramming is failed, vehicle information (fuel injector calibration codes, EGR/Inlet throttle valve data and Diesel PF (Diesel Particulate Filter) data) is cleared from ECM.
In this case, after ECM reprogramming is successful, register/initialize them according to “Registration Procedure for the Fuel Injector Calibration Code: ”, “EGR Valve Data Initialization: ”, “Diesel Particulate Filter Data Initialization: ”, and “Procedure after ECM Replacement: in Section 10C”.

Registration Procedure for the Fuel Injector Calibration Code

S5JB0B1306006

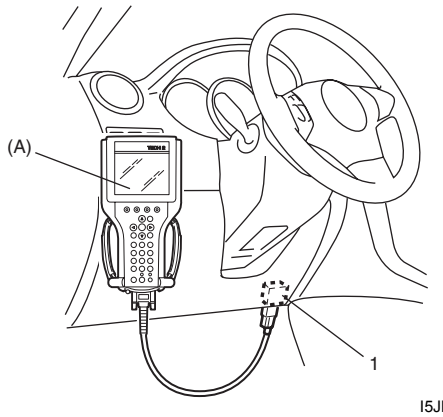
After one or more fuel injector(s) is replaced, register the fuel injector calibration code of each fuel injector manually, by reading the fuel injector calibration code on each fuel injector using SUZUKI scan tool (Refer to “SUZUKI Scan Tool Operator’s Manual”).

EGR Valve Data Initialization

S5JB0B1306025

1) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

   Special tool
   (A): SUZUKI scan tool



I5JB0A110019-01

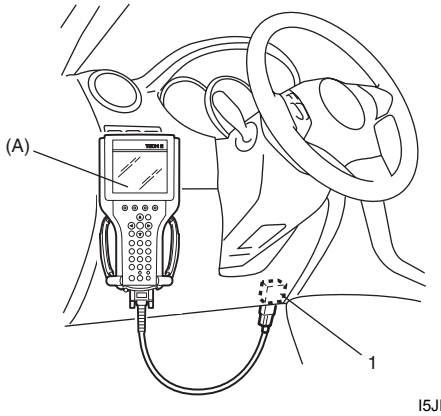
2) Turn ignition switch ON position and select “ECM setting” under “Miscellaneous test” (“MISC TEST”) mode of SUZUKI scan tool.
3) Perform “Initialize EGR valve data” on scan tool.
4) Turn ignition switch to OFF position and wait 40 seconds.
5) Turn ignition switch to ON position and then start engine for programming latest EGR valve offset.
6) Turn ignition switch to OFF position and wait 120 seconds.

Inlet Throttle Valve Data Initialization

S5JB0B1306026

1) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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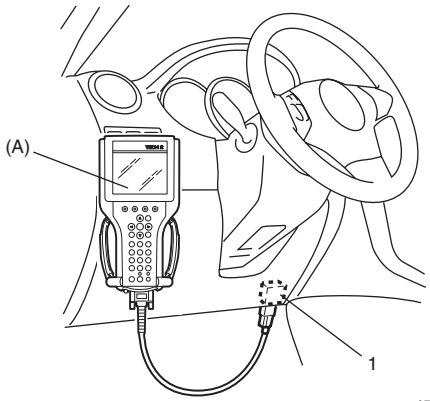
2) Turn ignition switch ON position and select “ECM setting” under “Miscellaneous test” (“MISC TEST”) mode of SUZUKI scan tool.
3) Perform “Initialize Inlet throttle valve data” on scan tool.
4) Turn ignition switch to OFF position and wait 40 seconds or more.

Diesel Particulate Filter Data Initialization

S5JB0B1306027

1) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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2) Turn ignition switch ON position and select “ECM setting” under “Miscellaneous test” (“MISC TEST”) mode of SUZUKI scan tool.
3) Perform “Initialize Diesel PF data” on scan tool.
4) Turn ignition switch to OFF position and wait 40 seconds or more.

Diesel Particulate Filter After-sales Regeneration Procedure

S5JB0B1306028

⚠ WARNING

During after-sales regeneration, exhaust gas temperature rises significantly and excessive smoke and strong swell occur.
In order to reduce risk of fire and personal injury, this work must be performed in outside of work shop or a well ventilated area with an exhaust gas extractor approved at 400 °C (750 °F) and nothing should be left in vicinity of exhaust system components.

⚠ CAUTION

- **Check the engine oil level before performing this procedure to prevent the engine damage. Engine oil level should be between the LOW and Full level marks on the gauge.**
- **It is essential to change engine oil after this procedure in order to avoid any damage to the engine.**
- **Only perform diesel particulate filter after-sales regeneration under the following conditions.**
  - **“DTC P1431: Clogged Particulate Filter Failures Malfunction: in Section 1A” is detected.**
  - **“DTC P1436: Regeneration Request Failures Malfunction: in Section 1A” is detected.**

NOTE

For further detail of SUZUKI scan tool, refer to its operator’s manual.

1) Check engine oil level referring to “Engine Oil and Filter Change: in Section 0B”.
2) Locate vehicle in outside of workshop or well ventilated area with connecting exhaust gas extractor to exhaust pipe.
3) Connect SUZUKI scan tool to data link connector (DLC) with ignition switch OFF.
4) Start engine.
5) Select “Regeneration” under “Miscellaneous test” (“MISC. TEST”) of SUZUKI scan tool, and follow instructions displayed in SUZUKI scan tool.

6) Proceed after-sales regeneration automatically as follows.
   a) Phase 1: Warming up
      The engine speed is raised to 1500 rpm for at least 3 minutes or until engine coolant temperature reaches 80 °C (176 °F)
   b) Phase 2: Regenerating
      Injection timing is shifted to post injection (a change in the engine operation sound can be heard) and start regeneration.

NOTE

This phase lasts approximately 30 minutes. This period depends on soot deposit in diesel particulate filter.

   c) Phase 3: Cooling down
      The injection is shifted to normal timing again.

⚠ CAUTION

To avoid thermal shock in the diesel particulate filter, do not stop engine at this step.

7) Confirm “Diesel PF inlet Temp” under “Data list” of SUZUKI scan tool, and wait until it decreases to 200 °C (392 °F) or less.
8) Stop engine.
9) Turn ignition switch to OFF position, and wait for 10 minutes or more.
10) Clear DTC referring to “DTC Clearance: in Section 1A”.
11) After engine is cooled, replace engine oil and oil filter referring to “Engine Oil and Filter Change: in Section 0B”.

Glow Plug Removal and Installation

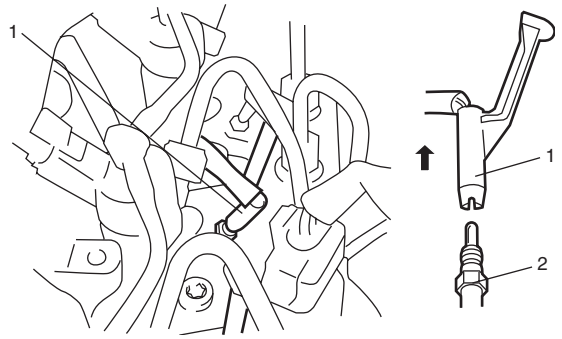
S5JB0B1306007

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 with a tool so that one or more screw threads remain engaged, then loosen and remove by hand.**

1) Disconnect negative (–) cable at battery.
2) Remove injector cover referring to “Cylinder Head Cover Removal and Installation: in Section 1D”.
3) Pull off glow plug wires (1).
4) Clean outside of glow plug to avoid any dirt entering cylinder head.
5) Remove glow plugs (2) from cylinder head.



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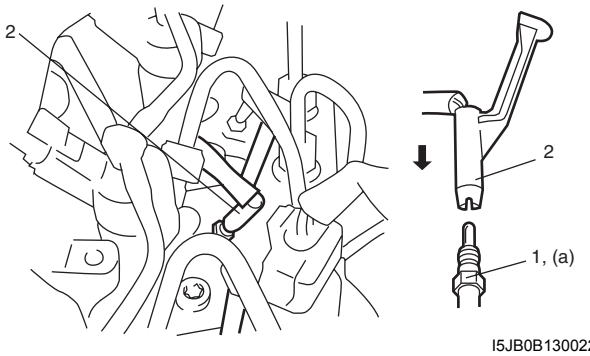
Installation

For installation, reverse removal procedure noting the following.

- Tightening glow plug (1) to specified torque.

  Tightening torque
  Glow plug (a): 15 N·m (1.5 kgf-m, 11.0 lb-ft)

- Connect glow plug wires (2) securely.



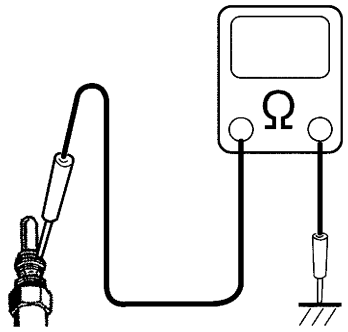
I5JB0B130022-01

Glow Plug Inspection

S5JB0B1306008

1) Disconnect negative (–) cable at battery.
2) Remove injector cover referring to “Cylinder Head Cover Removal and Installation: in Section 1D”.
3) Disconnect glow plug wires.
4) Check resistance between glow plug and engine ground.
   If resistance is out of specification, replace glow plug.

   Glow plug resistance
   Approx. 0.6 Ω



I4SN0A132006-01

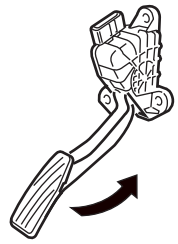
Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection

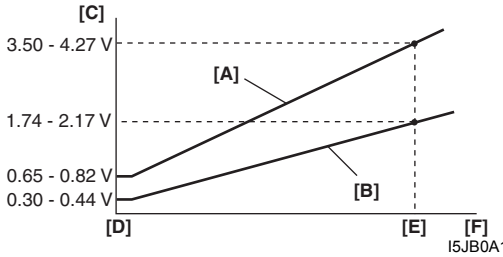
S5JB0B1306037

1) Check that accelerator pedal position (APP) sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.).
   If mounting is not properly, reinstall accelerator pedal position (APP) sensor assembly properly referring to “Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: ”.
2) Connect SUZUKI scan tool to DLC with ignition switch turned OFF.

   Special tool
   : SUZUKI scan tool

3) Turn ON ignition switch and select “Date List” mode on scan tool.
4) Check that accelerator pedal position sensor voltage varies as the following graph.
   If sensor voltage is out of specified value or does not vary linearly as the following graph, check accelerator to “Accelerator Pedal Position (APP) Sensor Assembly Inspection: ”.





I5JB0A130018-05

[A]:	Accelerator pedal position (APP) sensor (main) voltage
[B]:	Accelerator pedal position (APP) sensor (sub) voltage
[C]:	Sensor output voltage
[D]:	Idle position of accelerator pedal
[E]:	Full depressed position of accelerator pedal
[F]:	Pedal stroke

Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation

S5JB0B1306038

⚠ CAUTION

- **Do not expose accelerator pedal position (APP) sensor assembly to excessive shock like a dropping it. If accelerator pedal position (APP) sensor assembly has been exposed to excessive shock, it should be replaced.**
- **Be careful not to expose sensor section of accelerator pedal position (APP) sensor assembly to water.**

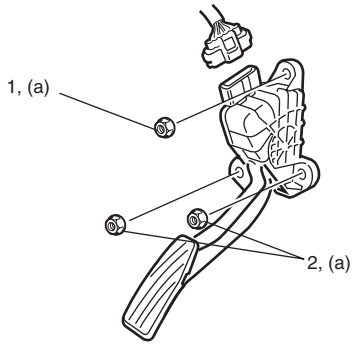
Removal

1) Disconnect negative cable at battery.
2) Disconnect connector from accelerator pedal position (APP) sensor assembly.
3) Remove accelerator pedal position (APP) sensor assembly from its bracket.

Installation
Reverse removal procedure for installation noting the following.

- Tighten accelerator pedal position (APP) sensor assembly upper nut (1) first and then lower nuts (2) to specified torque.

  Tightening torque
  Accelerator pedal position (APP) sensor assembly nut (a): 6.0 N·m (0.6 kgf-m, 4.5 lb-ft)



I5JB0A130036-01

- If APP sensor assembly bracket is removed, tighten its mounting nuts to specified torque.

  Tightening torque
  APP sensor assembly bracket nut: 6.0 N·m (0.6 kgf-m, 4.3 lb-ft)

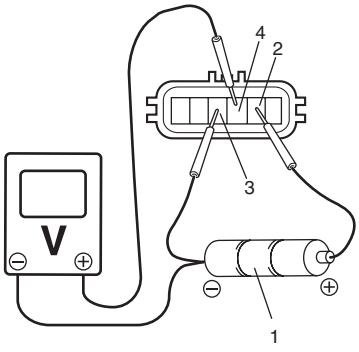
- Connect connector to accelerator pedal position (APP) sensor assembly securely.

Accelerator Pedal Position (APP) Sensor Assembly Inspection

S5JB0B1306039

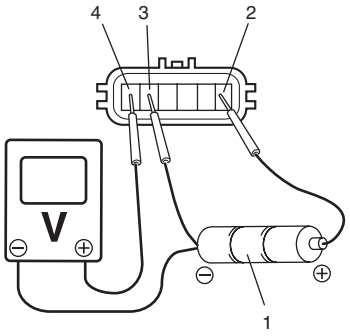
Check accelerator pedal position (APP) sensor (main and sub) output voltage as following steps.

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 “Volt 1” terminal (4) of sensor and negative terminal to battery.



I5JB0A130019-02

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 “Volt 2” terminal (4) of sensor and negative terminal to battery.

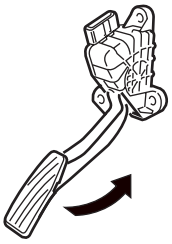


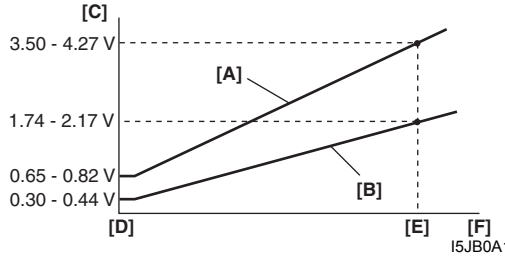
I5JB0A130020-02

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 assembly.

Accelerator pedal position (APP) sensor output voltage
Accelerator pedal position (APP) sensor (main) output voltage [A]: 0.82 – 3.50 V, varying according to depressed extent of accelerator pedal
Accelerator pedal position (APP) sensor (Sub) output voltage [B]: 0.44 – 1.74 V, varying according to depressed extent of accelerator pedal





I5JB0A130021-05

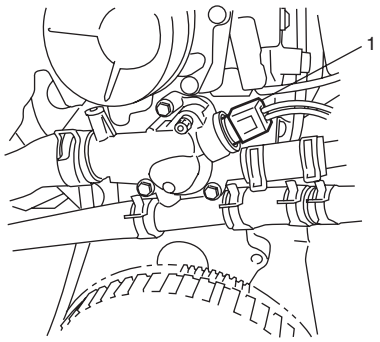
[C]:	Sensor output voltage
[D]:	Idle position of accelerator pedal
[E]:	Fully depressed position of accelerator pedal
[F]:	Pedal stroke

Engine Coolant Temperature (ECT) Sensor Removal and Installation

S5JB0B1306011

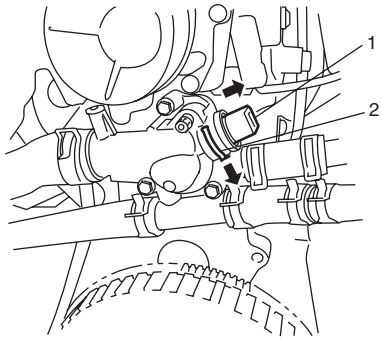
Removal

1) Disconnect negative cable at battery.
2) Drain cooling system referring to “Cooling System Description: in Section 1F”.
3) Disconnect ECT sensor connector (1).



I5JB0B130003-01

4) Remove ECT sensor (1) from thermostat assembly by removing clip (2).



I5JB0B130004-01

Installation

Reverse removal procedure for installation noting the following.

- Check ECT sensor O-ring for damage.
  If malfunction is found, replace ECT sensor.
- Refill cooling system referring to “Cooling System Refilling: in Section 1F”.
- Check cooling system leakage referring to “Engine Cooling System Inspection and Cleaning: in Section 1F”.

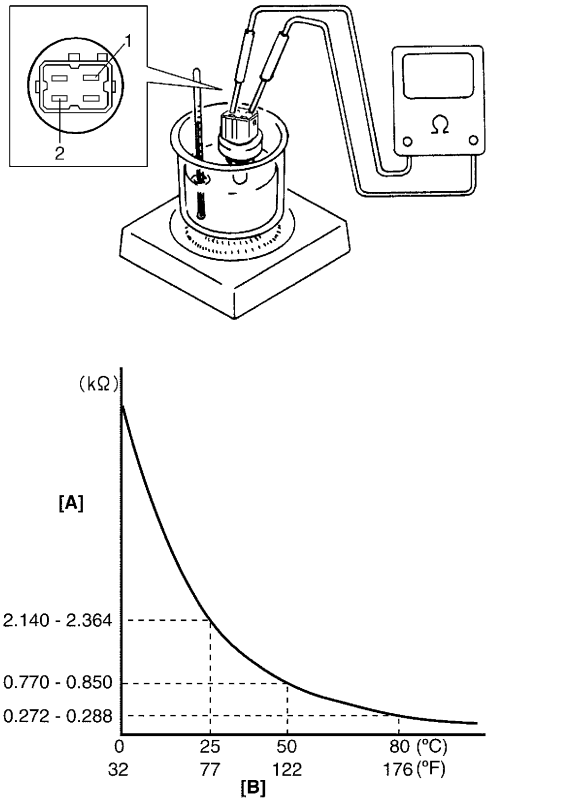
Engine Coolant Temperature (ECT) Sensor Inspection

S5JB0B1306012

1) Remove ECT sensor referring to “Engine Coolant Temperature (ECT) Sensor Removal and Installation: ”.
2) Immerse temperature sensing part of ECT sensor in water and measure resistance between sensor terminal (1) and (2) while heating water gradually. If measured resistance doesn’t show such characteristic as shown, replace ECT sensor.

ECT sensor resistance

Water temperature °C (°F)	Resistance (kΩ)
25 (77)	2.140 – 2.364
50 (122)	0.770 – 0.850
80 (176)	0.272 – 0.288



I4SN0A132012-01

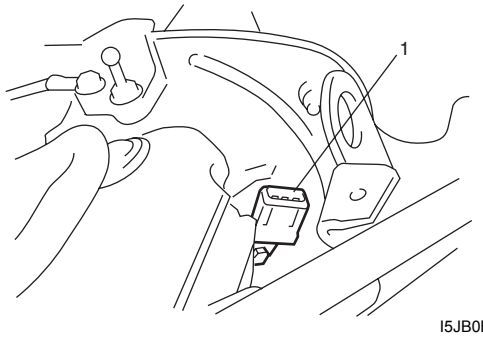
[A]:	Resistance
[B]:	Temperature

Camshaft Position (CMP) Sensor Removal and Installation

S5JB0B1306013

Removal

1) Disconnect negative cable at battery.
2) Remove injector cover referring to “Cylinder Head Cover Removal and Installation: in Section 1D”.
3) Remove CMP sensor (1) from generator upper bracket support.



I5JB0B130005-01

Installation

Reverse removal procedure for installation noting the following.

- Clean CMP sensor and protrusion of camshaft pulley before installation.
- Tighten throttle body to EGR valve pipe to specified torque.

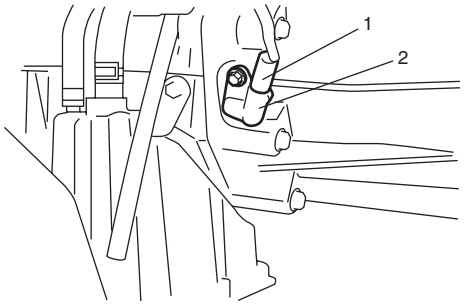
Tightening torque
Throttle body to EGR valve pipe: 21 N·m (2.1 kgf-m, 15.5 lb-ft)

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

S5JB0B1306014

Removal

1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Disconnect connector (1) from CKP sensor (2).
4) Remove CKP sensor from transmission case.



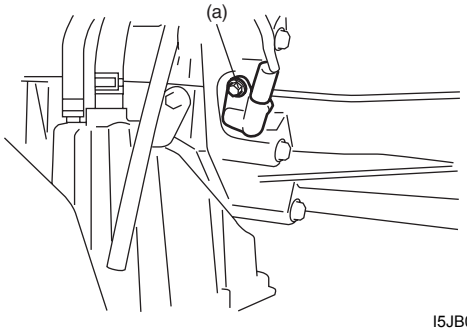
I5JB0B130007-01

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): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

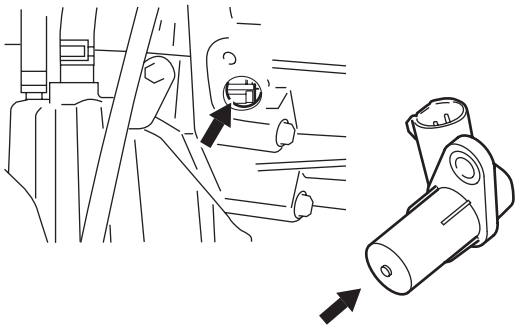


I5JB0B130008-01

Crankshaft Position (CKP) (Engine Speed Sensor) Sensor Inspection

S5JB0B1306015

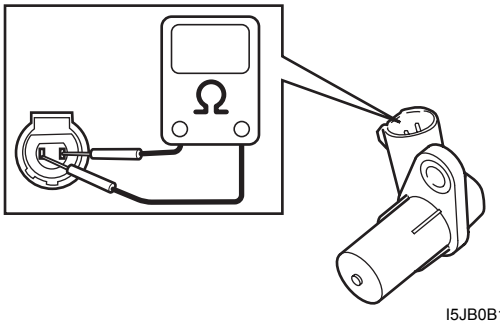
1) Remove CKP sensor referring to “Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation: ”.
2) Check that CKP sensor (1) and sensor rotor tooth (2) are free from any metal particles and damage.



I5JB0B130009-02

3) Check that resistance between terminals of CKP sensor is within specification.
   If resistance is not as specified, replace CKP sensor.

CKP sensor resistance
612 – 748 Ω at 20°C, 68°F



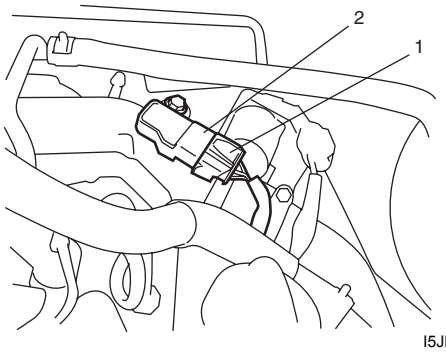
I5JB0B130010-01

Boost Pressure Sensor Removal and Installation

S5JB0B1306020

Removal

1) Disconnect negative cable at battery.
2) Disconnect connector (1) from boost pressure sensor (2).
3) Remove boost pressure sensor from throttle body to EGR valve pipe.



I5JB0B130011-01

Installation

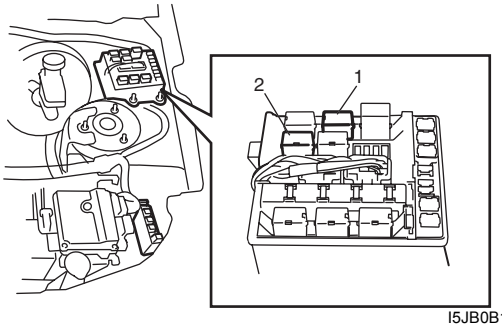
Reverse removal procedure for installation noting the following.

- Check boost pressure sensor O-ring for damage.
  If malfunction is found, replace boost pressure sensor.

Main Relay and Fuel Heater Relay Inspection

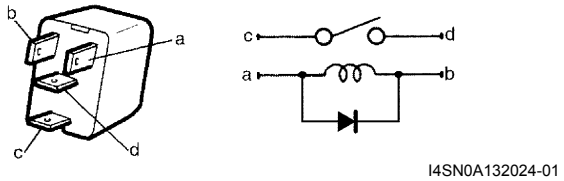
S5JB0B1306022

1) Disconnect negative cable at battery.
2) Remove main relay (1) and fuel heater relay (2) from relay connector.



I5JB0B130012-01

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.



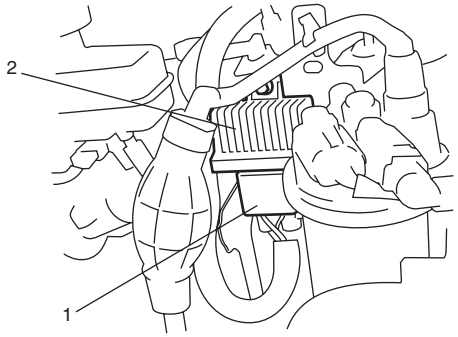
I4SN0A132024-01

Pre-Heating Unit Removal and Installation

S5JB0B1306023

Removal

1) Disconnect negative cable at battery.
2) Disconnect pre-heating unit connector (1).
3) Remove pre-heating unit (2) from bracket.



I5JB0B130013-01

Installation

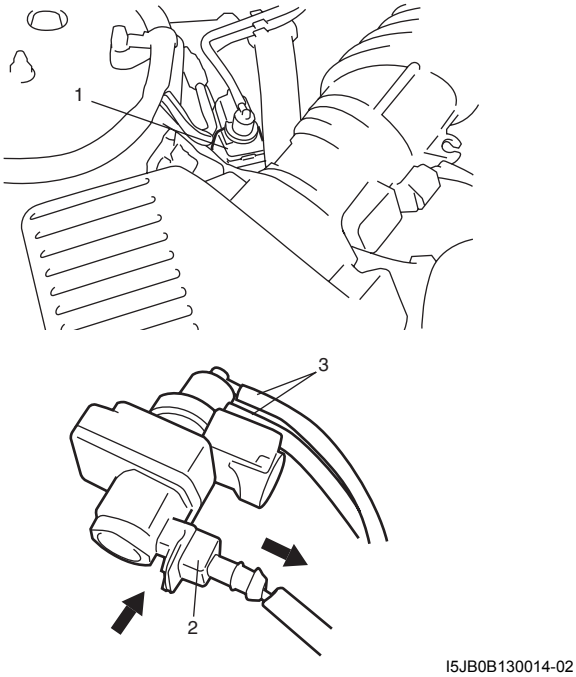
Reverse removal procedure for installation.

Boost Pressure Control Solenoid Valve Removal and Installation

S5JB0B1306029

Removal

1) Disconnect negative cable at battery.
2) Detach boost pressure control solenoid valve (1).
3) Disconnect boost pressure control solenoid valve connector (2) and hoses (3) from boost pressure control solenoid valve.



I5JB0B130014-02

Installation

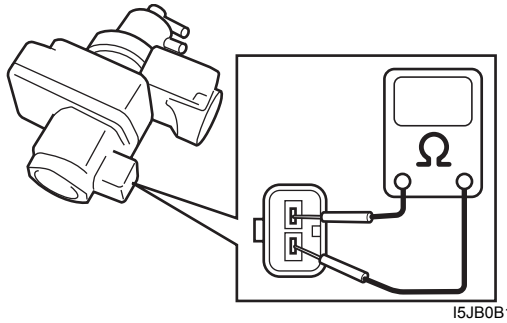
Reverse removal procedure for installation.

Boost Pressure Control Solenoid Valve Inspection

S5JB0B1306030

1) Remove boost pressure control solenoid valve referring to “Boost Pressure Control Solenoid Valve Removal and Installation: ”.
2) Check the resistance between terminals of boost pressure control solenoid valve is within specification.
   If resistance is not as specified, replace boost pressure control solenoid valve.

   Boost pressure control solenoid valve resistance
   14.7 – 16.1 Ω at 20 °C, 68 °F



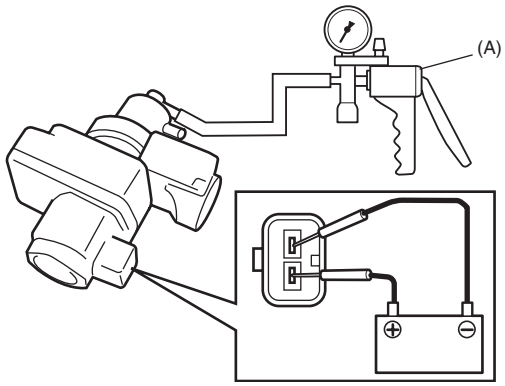
I5JB0B130015-01

3) Apply vacuum 80 kPa (0.8 kg/cm^2 11.5 psi) to boost pressure control valve using special tool.
   If vacuum can be applied, go to the next step.
   If not, replace boost pressure control valve.

   Special tool
   (A): 09917–47011

4) Connect 12 V battery to boost pressure control valve terminals. In this state, apply vacuum 80 kPa (0.8 kg/cm^2 11.5 psi) to the outlet nozzle using a special tool.
   If vacuum can not be applied, boost pressure control valve is in good condition.
   If not, replace boost pressure control valve.

   Special tool
   (A): 09917–47011



I5JB0B130016-01

Turbocharger Electric Water Pump Removal and Installation

S5JB0B1306031

Removal

1) Disconnect negative cable at battery.
2) Drain cooling system referring to “Cooling System Components: in Section 1F”.
3) Remove turbocharger electric water pump referring to “Cooling System Components: in Section 1F”.

Installation

Reverse removal procedure for installation noting the following.

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

Turbocharger Electric Water Pump Inspection

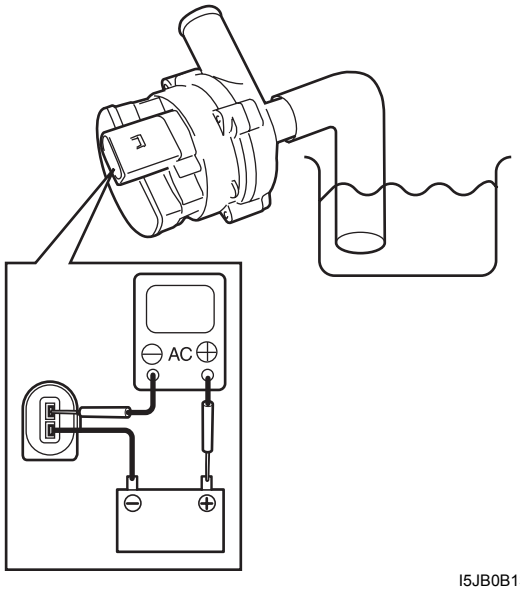
S5JB0B1306032

1) Connect 12 V battery terminals to turbocharger electric water pump terminals.
2) Check if turbocharger electric water pump operates smoothly without noise.
3) Check if ammeter indicates the specified current.
   If measured current is out of specification, replace turbocharger electric water pump.

   Turbocharger electric water pump current at 12 V
   1 – 1.3 A at 23 °C, 73 °F

4) Check pumping rate.

   Turbocharger electric water pump pumping rate:
   More than 850 L/h. (1796 US pt./h., 1496 Imp pt./h.). at 23 °C, 73 °F



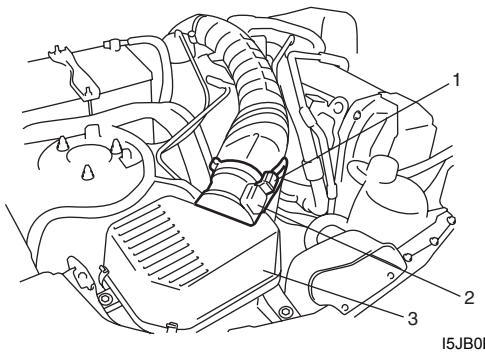
I5JB0B130017-01

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

S5JB0B1306033

Removal

1) Disconnect negative cable at battery.
2) Disconnect MAF and IAT sensor connector (1).
3) Remove MAF and IAT sensor (2) from air cleaner (3).



I5JB0B130018-01

Installation

Reverse removal procedure noting the followings.

- Tighten MAF and IAT sensor screws to specified torque.

  Tightening torque
  MAF and IAT sensor screw: 6 N·m (0.6 kgf-m, 4.5 lb-ft)

- Tighten turbocharger inlet hose clamp to specified torque.

  Tightening torque
  Inlet hose clamp: 2.5 N·m (0.25 kgf-m, 2.0 lb-ft)

- Connect MAF and IAT sensor connector securely.

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection

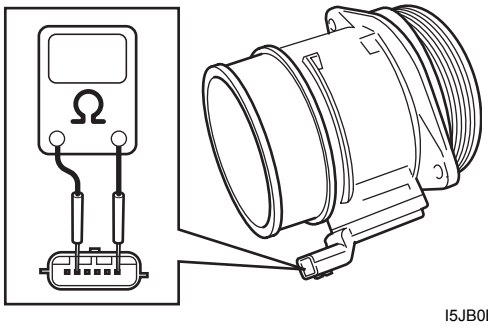
S5JB0B1306034

⚠ CAUTION

Do not heat up MAF and IAT sensor more than 100 °C (212 °F). Otherwise, MAF and IAT sensor will be damaged.

- Check sensor O-ring (1) for damage and deterioration. Replace as necessary.
- Blow hot air to temperature sensing part (2) of MAF and IAT sensor (3) using hot air drier (4) and measure resistance between sensor terminals while heating air gradually.
  If measured resistance does not show such characteristic as shown, replace MAF and IAT sensor.

Intake air temperature sensor resistance
10 °C (50 °F): 3.55 – 3.87 kΩ
20 °C (68 °F): 2.35 – 2.54 kΩ
30 °C (86 °F): 1.61 – 1.73 kΩ



I5JB0B130019-01

Inlet Throttle Valve Removal and Installation

S5JB0B1306035

Refer to “Air intake Pipe Removal and Installation: in Section 1D”.

Inlet Throttle Valve On-Vehicle Inspection

S5JB0B1306036

⚠ CAUTION

Do not disassembly inlet throttle valve.

1) Connect SUZUKI scan tool to data link connector (DLC) with ignition switch OFF.
2) Check that no abnormality is detected in ECM. Refer to “DTC Check: in Section 1A”.
3) Turn ignition switch to ON position and select menu “Electronic Throttle Control” under “Miscellaneous test” (“MISC. TEST”) mode of SUZUKI scan tool. Follow the instructions indicated on the SUZUKI scan tool.

NOTE

For further details, refer to the operator’s manual for SUZUKI scan tool.

4) Confirm the inlet throttle valve operates five times. If inlet throttle valve does nit operate, replace inlet throttle valve referring to “Inlet Throttle Valve Removal and Installation: ”.

⚠ CAUTION

When replacing inlet throttle valve, perform “Initialize inlet throttle valve date” mode of SUZUKI scan tool referring to “Inlet Throttle Valve Data Initialization: ”.

Specifications

Tightening Torque Specifications

S5JB0B1307001

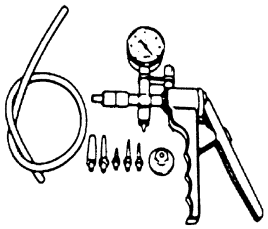
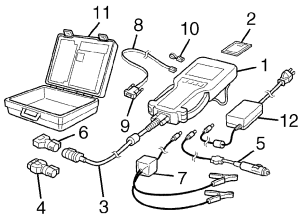
Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Glow plug	15	1.5	11.0	☞
Accelerator pedal position (APP) sensor assembly nut	6.0	0.6	4.5	☞
APP sensor assembly bracket nut	6.0	0.6	4.3	☞
Throttle body to EGR valve pipe	21	2.1	15.5	☞
CKP sensor bolt	11	1.1	8.0	☞
MAF and IAT sensor screw	6	0.6	4.5	☞
Inlet hose clamp	2.5	0.25	2.0	☞

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

Special Tools and Equipment

Special Tool

S5JB0B1308001

09917–47011 Vacuum pump gauge ☞ / ☞		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 ☞ / ☞ / ☞ / ☞	

Engine Mechanical

Diagnostic Information and Procedures

Compression Check

S5JB0B1404001

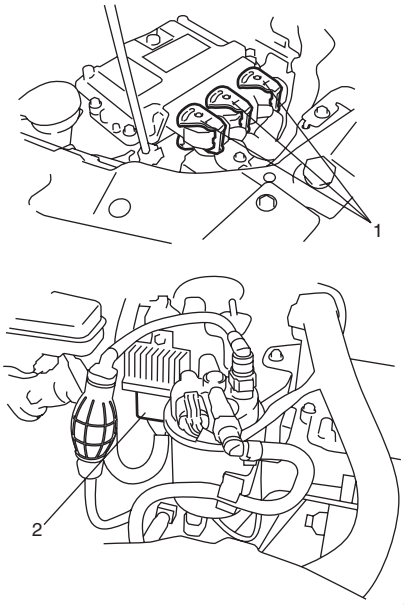
Check compression pressure on all 4 cylinders as follows:

1) Warm up engine to normal operating temperature.
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.

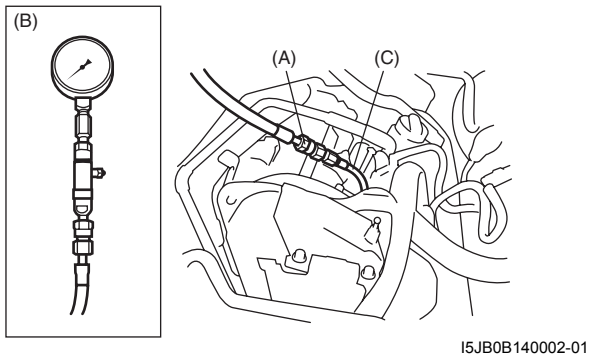
3) Disconnect negative (–) cable at battery.
4) Disconnect ECM connectors (1) and pre-heating unit connector (2).



I5JB0B140001-01

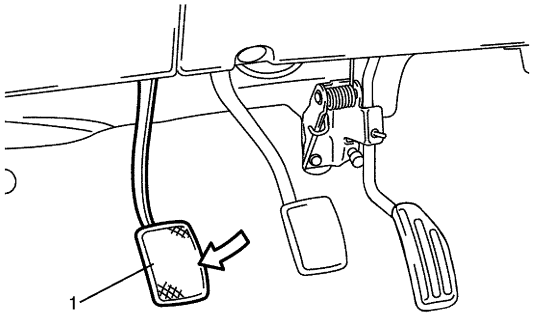
5) Remove all glow plugs referring to "Glow Plug Removal and Installation: in Section 1C".
6) Connect negative (–) cable at battery.
7) Install special tools into glow plug hole.

Special tool
(A): 09912–56540
(B): 09912–57821
(C): 09918–26510



I5JB0B140002-01

8) Disengage clutch (1) (to lighten starting load on engine) for M/T vehicle.



I4RH0A140057-01

9) Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE

- **For measuring compression pressure, crank engine at least 250 r/min. by using fully charged battery.**
- **If measured compression pressure is lower than limit value, check installation condition of special tool. If it is properly installed, possibility is compression pressure leakage from where piston ring or valve contact.**

Compression pressure
Standard:
2200 – 2600 kPa (22 – 26kgf/cm², 319 – 392psi)
Limit:
Min. 2100 kPa (21 kgf/cm², 304.5 psi)
Max. 2700 kPa (27 kgf/cm², 391.5 psi)
Max. difference between any two cylinders: 400 kPa (4 kgf/cm², 58 psi)

10) Carry out Steps 7) through 9) on each cylinder to obtain 4 readings.
11) Disconnect negative (–) cable at battery.
12) After checking, install glow plugs referring to “Glow Plug Removal and Installation: in Section 1C”.
13) Connect ECM connectors and pre-heating unit connector.
14) Connect negative (–) cable at battery.

Valve Lash (Clearance) Inspection

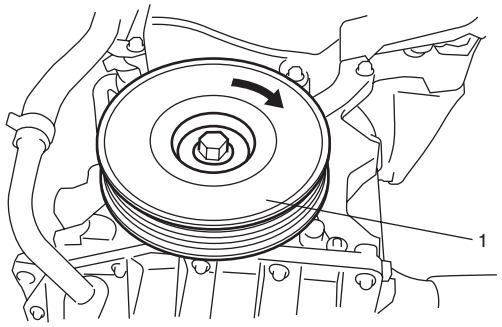
S5JB0B1404003

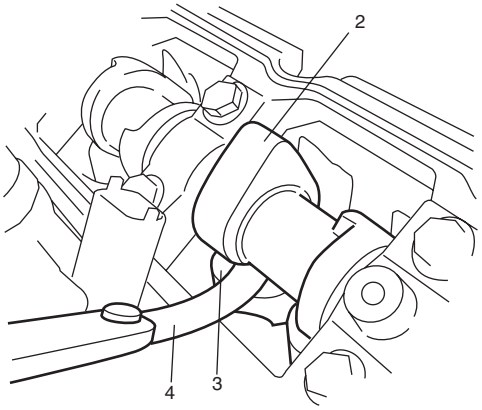
1) Remove negative cable at battery.
2) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
3) Turn crankshaft pulley (1) clockwise until cam lobe (2) becomes perpendicular to tappet face (3) at valves “1” and “6” as shown in figure.
4) Check valve lashes with thickness gauge (4) according to the following procedure.
   a) Check valve lashes at valves “1” and “6”.
   b) Turn camshaft by 90° by turning crankshaft pulley with wrench.
   c) Make sure that cam lobe is perpendicular to tappet face at valves to be checked (in this case, “5” and “8”), if not, adjust camshaft position by turning crankshaft pulley. Check valve lashes.
   d) In the same manner as b) – c), check valve lashes at valves “4” and “7”.
   e) In the same manner as b) – c) again, check valve lashes at valves “2” and “3”.

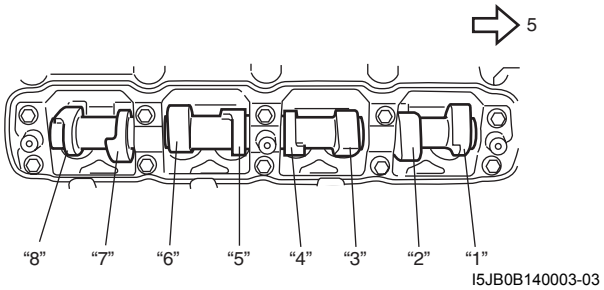
If valve lash (clearance) is out of specification, record valve lash (clearance) and adjust it to specification referring to “Valve Lash (Clearance) Adjustment: ”.

Valve lash (clearance) specification

	When cold
Intake	0.15 – 0.25 mm (0.0060 – 0.0098 in.)
Exhaust	0.35 – 0.45 mm (0.0138 – 0.0177 in.)







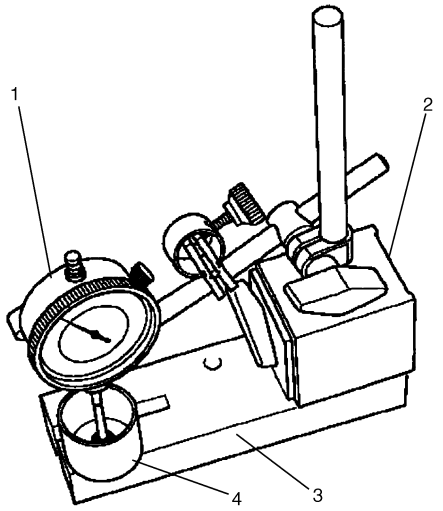
I5JB0B140003-03

5. Fly wheel side

Valve Lash (Clearance) Adjustment

S5JB0B1404004

1) Measure valve lash (clearance) referring to “Valve Lash (Clearance) Inspection: ”.
2) Remove tappet referring to “Camshaft and Tappet Removal and Installation: ”.
3) Using dial gauge (1), magnetic stand (2) and surface plate (3), measure thickness of removed tappet.



I5JB0B140004-01

4. Tappet

4) Determine replacement tappet by calculating thickness of new tappet with the following formula.
Intake side:
A = B + C – 0.200 mm (0.00787 in.)
Exhaust side:
A = B + C – 0.400 mm (0.01575 in.)
A: Thickness of new tappet
B: Thickness of removed tappet
C: Measured valve lash (clearance)
Example of intake side:
When thickness of removed tappet is 7.825 mm (0.30807 in.), and measured valve lash (clearance) is 0.275 mm (0.0108 in.):
A = 7.825 mm (0.30807 in.) + 0.275 mm (0.0108 in.) – 0.200 mm (0.007382 in.) = 7.900 mm (0.31102 in.)
Calculated thickness of new tappet = 7.900 mm (0.31102 in.)
5) Select new tappet with a thickness as close as possible to calculated value.

Available new tappet

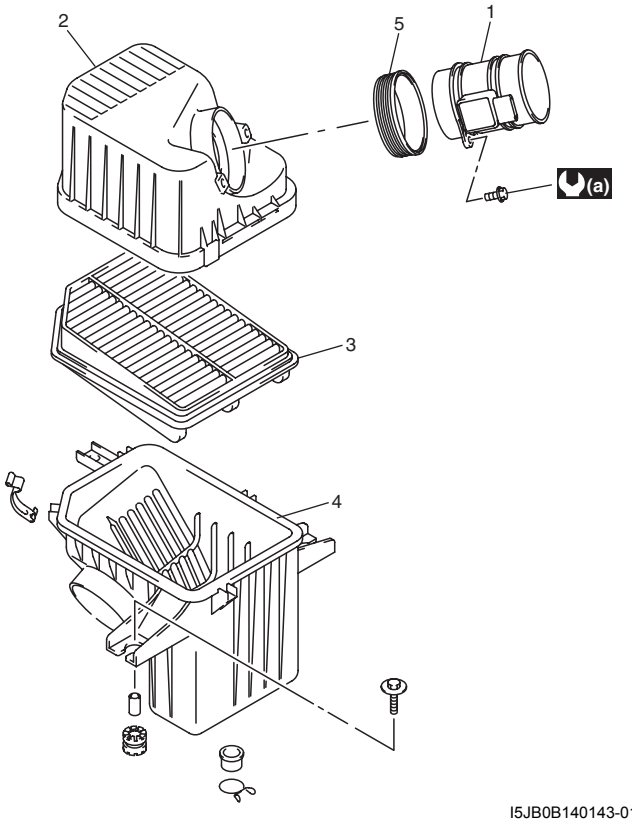
Thickness mm (in.)	
7.550 (0.29724)	7.875 (0.31004)
7.575 (0.29823)	7.900 (0.31102)
7.600 (0.29921)	7.925 (0.31201)
7.625 (0.30020)	7.950 (0.31299)
7.650 (0.30118)	7.975 (0.31398)
7.675 (0.30217)	8.000 (0.31496)
7.700 (0.30315)	8.025 (0.31595)
7.725 (0.30413)	8.050 (0.31693)
7.750 (0.30512)	8.075 (0.31791)
7.775 (0.30610)	8.100 (0.31890)
7.800 (0.30709)	8.125 (0.31988)
7.825 (0.30807)	8.150 (0.32087)
7.850 (0.30906)	

6) Install tappet and camshaft referring to “Camshaft and Tappet Removal and Installation: ”.
7) Confirm valve lash (clearance) is within specification referring to “Valve Lash (Clearance) Inspection: ”.
8) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.

Repair Instructions

Air Cleaner Components

S5JB0B1406072



I5JB0B140143-01

1. MAF sensor	3. Air cleaner filter	5. Gasket
2. Air cleaner upper case	4. Air cleaner lower case	(a) : 6 N·m (0.6 kgf-m, 4.5 lb-ft)

Air Cleaner Removal and Installation

S5JB0B1406073

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect MAF sensor connector.
3) Remove air cleaner.

Installation

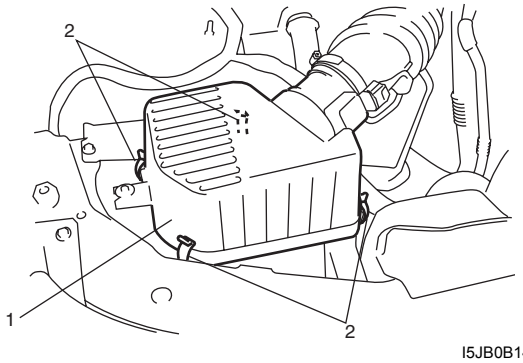
Reverse removal procedure for installation.

Air Cleaner Filter Removal and Installation

S5JB0B1406001

Removal

1) Open air cleaner case (1) by unhooking its clamps (2).
2) Remove air cleaner filter from case.



I5JB0B140005-01

Installation

Reverse removal procedure for installation.

Air Cleaner Filter Inspection and Cleaning

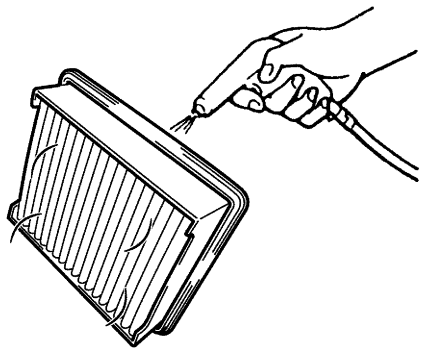
S5JB0B1406002

Inspection

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

Cleaning

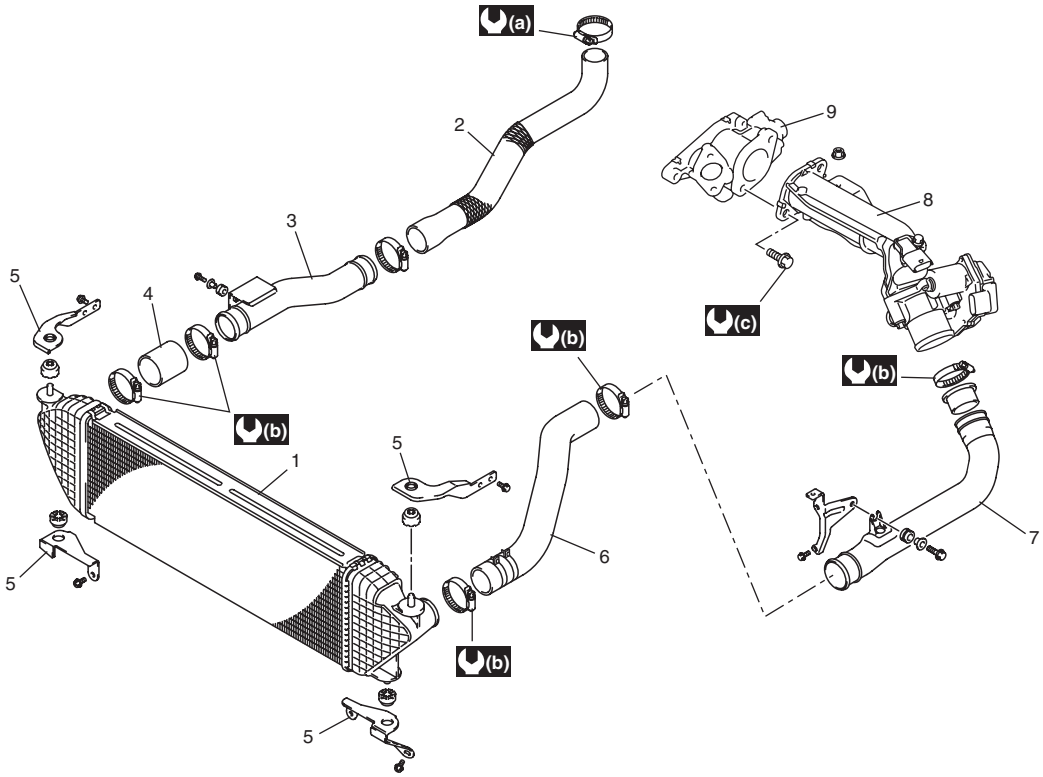
Blow off dust by compressed air from air outlet side of filter.



I2RH0B140150-01

Intercooler and Air Intake Pipe Components

S5JB0B1406045



I5JB0B140006-02

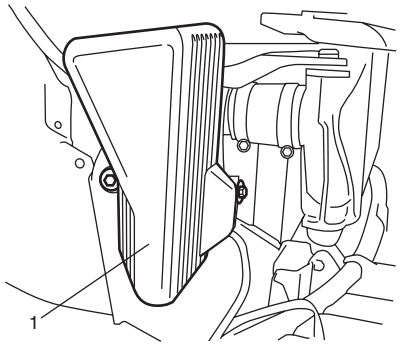
1. Intercooler	5. Intercooler blacket	9. EGR valve
2. Turbocharger outlet hose	6. Intercooler outlet hose	(a) : 5 N·m (0.5 kgf-m, 4.0 lb-ft)
3. Intercooler inlet pipe	7. Intercooler outlet pipe	(b) : 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)
4. Intercooler inlet hose	8. Air intake pipe	(c) : 21 N·m (2.1 kgf-m, 15.5 lb-ft)

Intercooler Removal and Installation

S5JB0B1406046

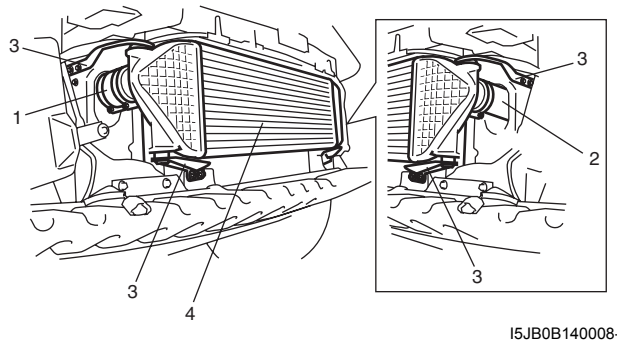
Removal

1) Remove front bumper referring to “Front Bumper Components: in Section 9K in related manual” and “Rear Bumper Components: in Section 9K in related manual”.
2) Remove resonator (1).



I5JB0B140007-01

3) Disconnect intercooler inlet hose (1) and outlet hose (2) from intercooler (4).
4) Remove intercooler brackets (3) and intercooler (4).

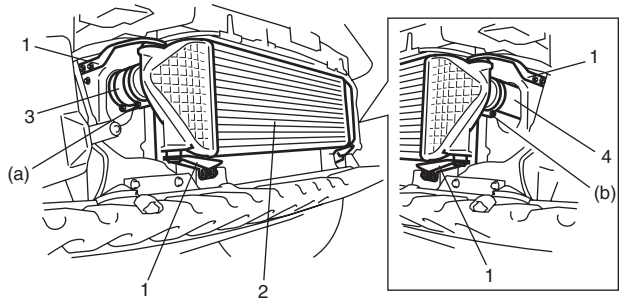


I5JB0B140008-01

Installation

1) Install intercooler brackets (1) and intercooler (2).
2) Connect intercooler inlet hose (3) and outlet hose (4).

Tightening torque
Intercooler inlet hose clamp (a): 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)
Intercooler outlet hose clamp (b): 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)



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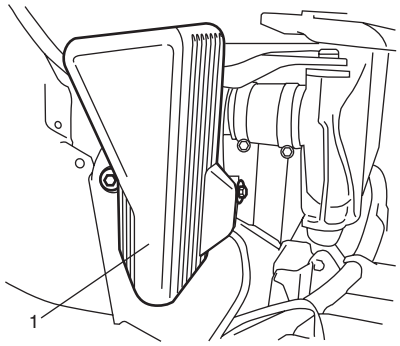
3) Install resonator (1).



I5JB0B140007-01

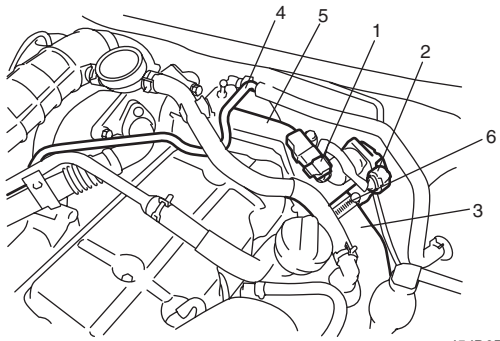
4) Install front bumper referring to “Front Bumper Components: in Section 9K in related manual” and “Rear Bumper Components: in Section 9K in related manual”.

Air intake Pipe Removal and Installation

S5JB0B1406074

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect boost presser sensor connector (1) and intake throttle valve connector (2).
3) Disconnect intercooler outlet pipe (3) from air intake pipe (5) after removing intercooler outlet pipe clamp (6).
4) Remove vacuum pipe (4) and air intake pipe.



I5JB0B140144-01

Installation

Reverse removal procedure for installation noting the following.

- Tighten air intake pipe bolt and nut to specified torque.

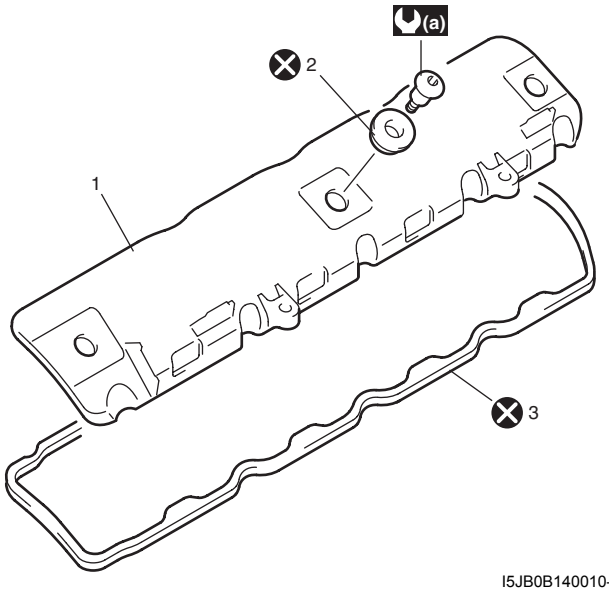
  Tightening torque
  Air intake pipe bolt and nut: 21 N·m (2.1 kgf-m, 15.5 lb-ft)

- Tighten intercooler outlet pipe clamp to specified torque.

  Tightening torque
  Intercooler outlet pipe clamp: 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)

Cylinder Head Cover Components

S5JB0B1406047



I5JB0B140010-01

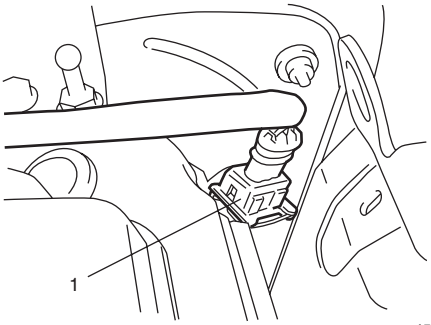
1. Cylinder head cover	3. Cylinder head cover gasket	⊗ : Do not reuse.
2. Cylinder head cover bolt gasket	(a) : Tighten 12 N·m (1.2 kgf-m, 9.0 lb-ft) by the specified procedure.	

Cylinder Head Cover Removal and Installation

S5JB0B1406048

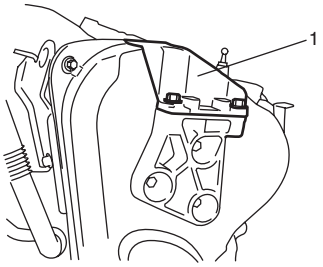
Removal

1) Disconnect CMP sensor connector (1).



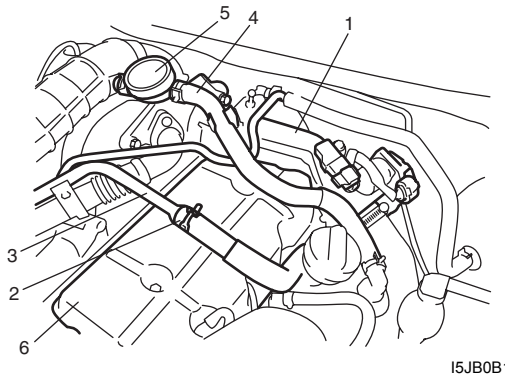
I5JB0B140011-01

2) Remove harness bracket and timing belt cover No.2 (1).



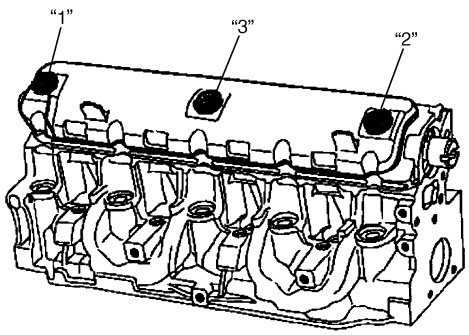
I5JB0B140012-01

3) Remove air intake pipe (1) referring to “Air intake Pipe Removal and Installation: ”.
4) Disconnect ventilation hose No.2 (2) from ventilation pipe No.2 (3).
5) Disconnect ventilation hose No.3 (4) from oil vapor recirculation valve (5).
6) Remove fuel injector cover (6).



I5JB0B140013-02

7) Remove cylinder head cover bolts evenly and gradually in numerical order (“1” through “3”) as shown in figure.



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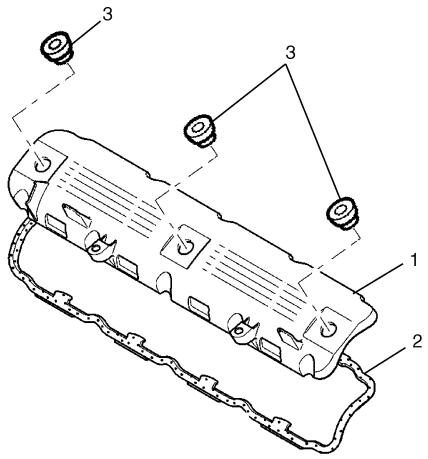
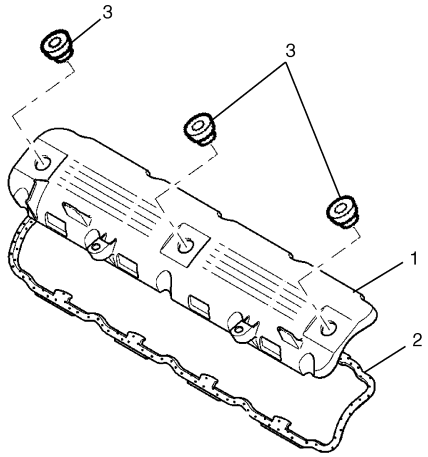
8) Remove cylinder head cover (1), cylinder head cover gasket (2) and cylinder head cover bolt gaskets (3).



I5JB0B140015-01

Installation

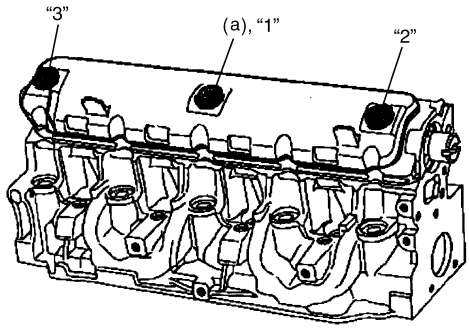
1) Remove oil and dust from sealing surfaces on cylinder head and cylinder head cover.
2) Install cylinder head cover (1), new cylinder head cover gasket (2) and new cylinder head cover bolt gaskets (3).



I5JB0B140015-01

3) Tighten cylinder head cover bolts evenly and gradually in numerical order (“1” through “3”) by repeating tightening sequence two or three times until specified torque is obtained.

Tightening torque
Cylinder head cover bolt (a): Tighten 12 N·m (1.2 kgf-m, 9.0 lb-ft) by the specified procedure



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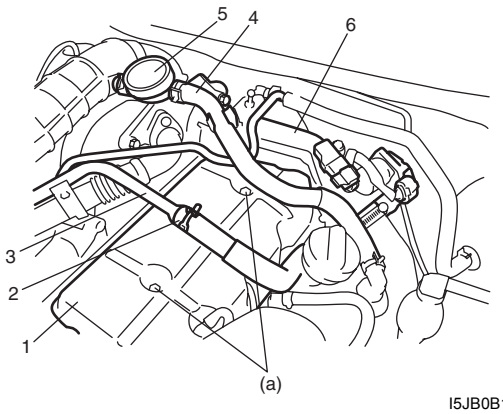
4) Install fuel injector cover (1).

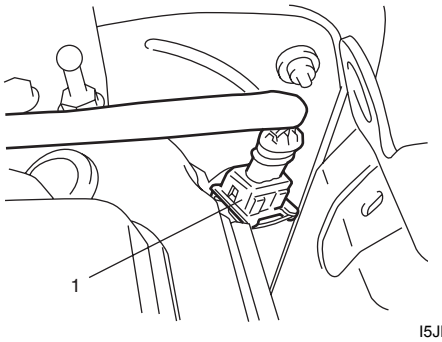
Tightening torque
Injector cover bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

5) Connect ventilation hose No.2 (2) to ventilation pipe No.2 (3).
6) Connect ventilation hose No.3 (4) to oil vapor recirculation valve (5).
7) Install air intake pipe (6) referring to “Air intake Pipe Removal and Installation: ”.



I5JB0B140017-03

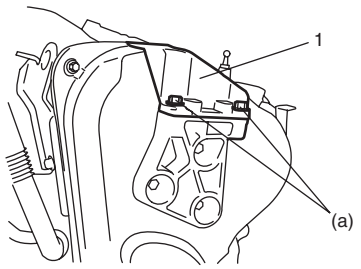
8) Connect CMP sensor connector (1).



I5JB0B140011-01

9) Install timing belt cover No.2 (1) and harness bracket.

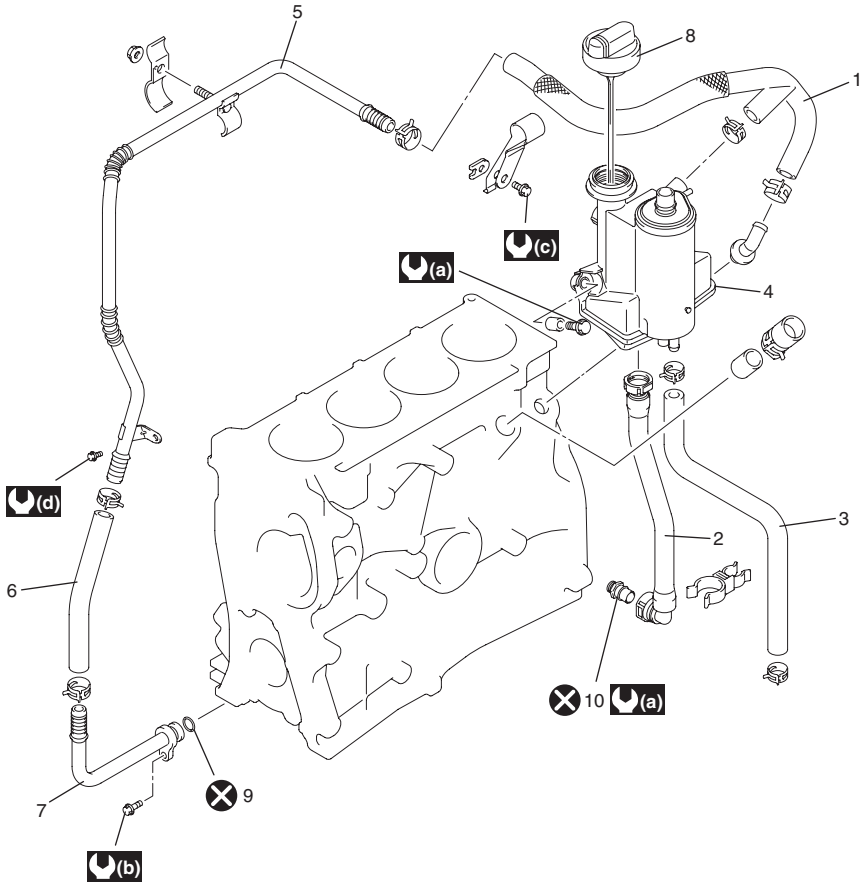
Tightening torque
Timing belt cover No.2 bolt (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)



I5JB0B140018-01

Oil Separator Components

S5JB0B1406075



I5JB0B140145-02

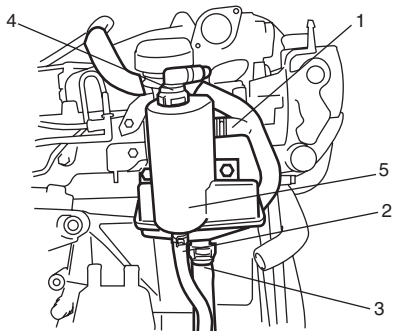
1. Ventilation hose No.2	6. Ventilation hose No.1	(a) : 25 N·m (2.5 kgf-m, 18.5 lb-ft)
2. Oil separator return hose	7. Ventilation pipe No.1	(b) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
3. Flesh air vent hose	8. Oil level gauge	(c) : 8 N·m (0.8 kgf-m, 6.0 lb-ft)
4. Oil separator	9. O-ring	(d) : 5 N·m (0.5 kgf-m, 4.0 lb-ft)
5. Ventilation pipe No.2	10. Ventilation hose No.3 union bolt	⊗ : Do not reuse.

Oil Separator Removal and Installation

S5JB0B1406049

Removal

1) Remove intercooler outlet pipe referring to “Air intake Pipe Removal and Installation: ”.
2) Disconnect ventilation hose No.2 (1), oil separator return hose (2), flesh air vent hose (3) and ventilation hose No.3 (4) from oil separator (5).
3) Remove oil separator (5) from cylinder head.



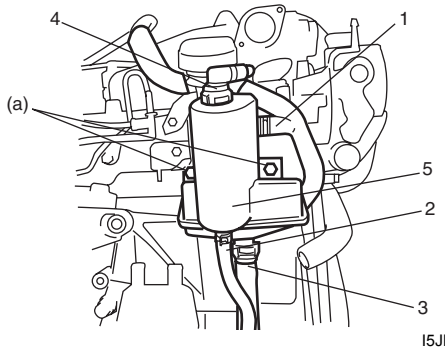
I5JB0B140019-01

Installation

1) Install oil separator (5) to cylinder head.

Tightening torque
Oil separator bolt (a): 25 N·m (2.5 kgf-m, 18.5 lb-ft)

2) Connect ventilation hose No.2 (1), oil separator return hose (2), flesh air vent hose (3) and ventilation hose No.3 (4) to oil separator.



I5JB0B140020-01

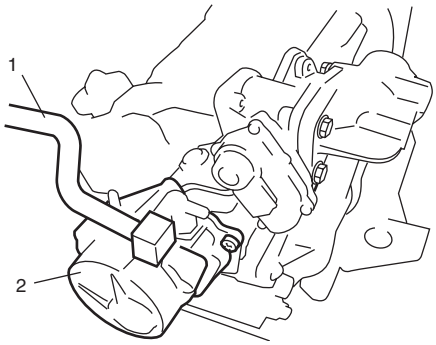
3) Install intercooler outlet pipe referring to “Intercooler and Air Intake Pipe Components: ”.

Vacuum Pump Removal and Installation

S5JB0B1406077

Removal

1) Disconnect negative (–) cable at battery.
2) Remove engine cover.
3) Remove air intake pipe referring to “Air intake Pipe Removal and Installation: ”.
4) Disconnect vacuum hose (1) from vacuum pump (2).
5) Remove vacuum pump from cylinder head.



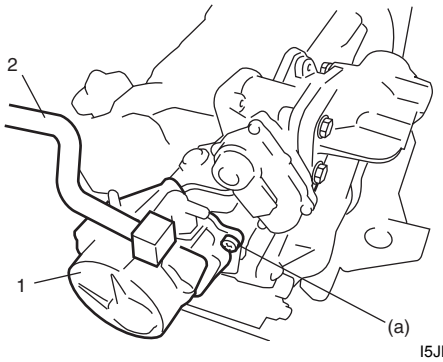
I5JB0B120002-01

Installation

1) Install vacuum pump (1) to cylinder head with new gasket.

Tightening torque
Vacuum pump bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)

2) Connect vacuum hose (2) to vacuum pump.



I5JB0B120003-01

3) Install air intake pipe referring to “Air intake Pipe Removal and Installation: ”.
4) Install engine cover.
5) Connect negative (–) cable at battery.

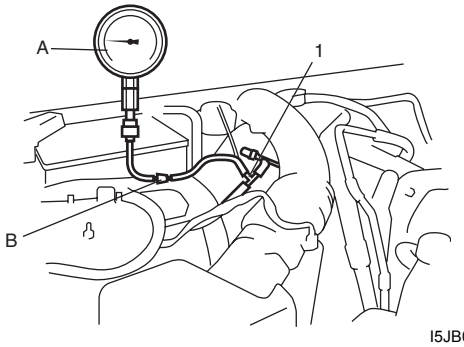
Vacuum Pump Inspection

S5JB0B1406076

Install a vacuum gauge to the vacuum circuit using 3-way joint (1) as shown in the figure and measure vacuum.
If vacuum is out of specification, check vacuum leakage, if OK than replace vacuum pump.

Vacuum pump specification
–75 kPa (–10.9 psi) or more (keep for 20 seconds at engine speed 1,500 r/min first)
–85 kPa (–12.3 psi) or more (keep for 20 seconds at engine speed 3,000 r/min first)

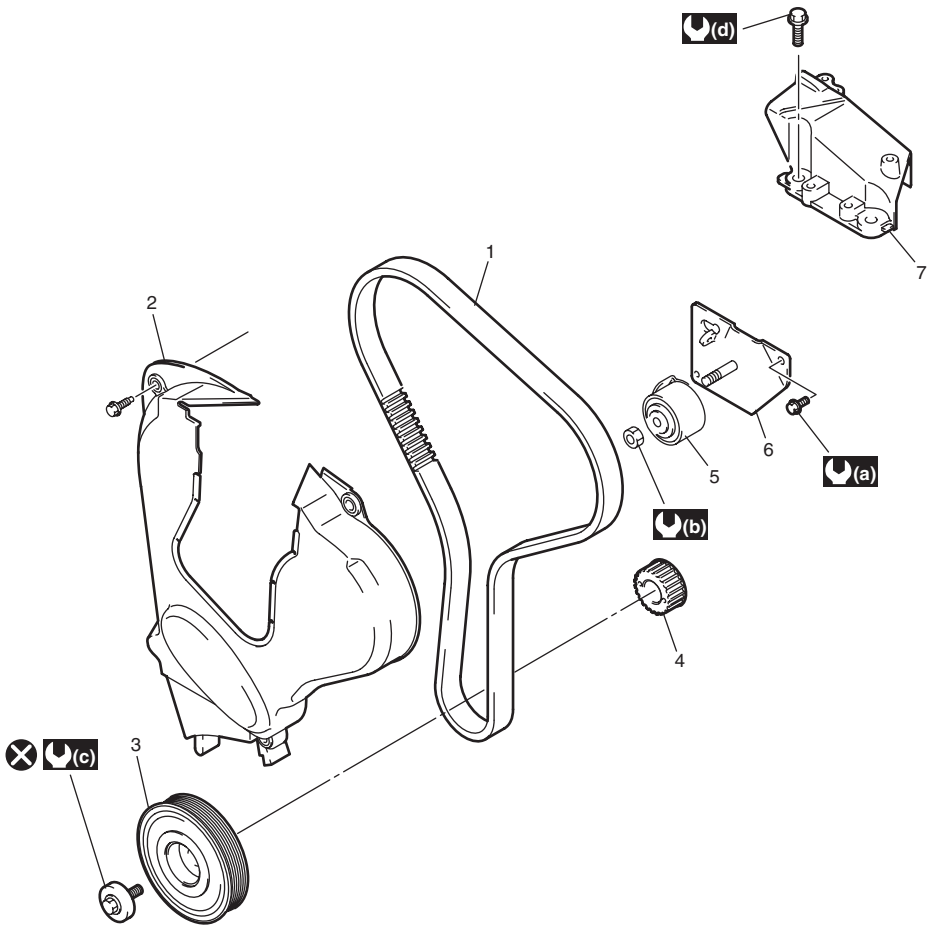
Special tool
(A): 09915–67311
(B): 09918–08210



I5JB0B120005-02

Timing Belt and Belt Tensioner Components

S5JB0B1406050



I5JB0B140021-01

1. Timing belt	(a) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
2. Timing belt cover No.1	(b) : 45 N·m (4.5 kgf-m, 32.5 lb-ft)
3. Camshaft pulley	(c) : Tighten 40 N·m (4.0 kgf-m, 29.0 lb-ft) and 110° by the specified procedure.
4. Crankshaft timing belt pulley	(d) : 55 N·m (5.5 kgf-m, 40.0 lb-ft)
5. Timing belt tensioner pulley	⊗ : Do not reuse.
6. Timing belt tensioner plate	
7. Timing belt cover No.2	

Timing Belt and Belt Tensioner Removal and Installation

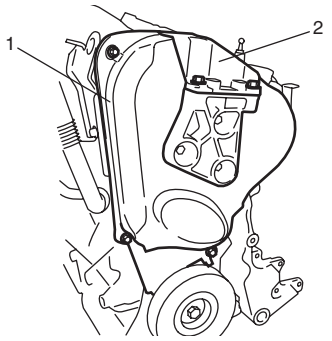
S5JB0B1406051

⚠ CAUTION

- **Never turn injection pump pulley counterclockwise. It may cause damage of injection pump.**
- **After timing belt is removed, never turn crankshaft and camshafts independently. If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.**
- **Do not bend or twist timing belt.**
- **Do not allow timing belt to come into contact with oil, water, etc. It may be adversely affect belt life.**
- **When replacing a timing belt, be sure to replace timing belt pulley and crankshaft pulley bolt.**

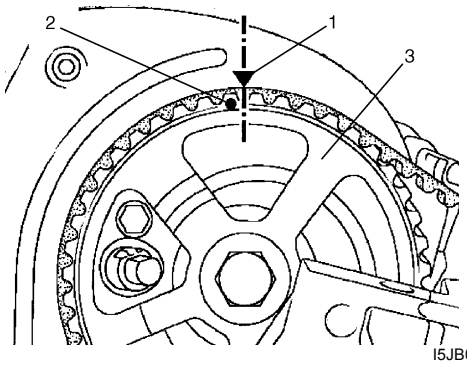
Removal

1) Remove accessory drive belt referring to “Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J”.
2) Remove timing belt cover No.1 (1) and timing belt cover No.2 (2).



I5JB0B140022-01

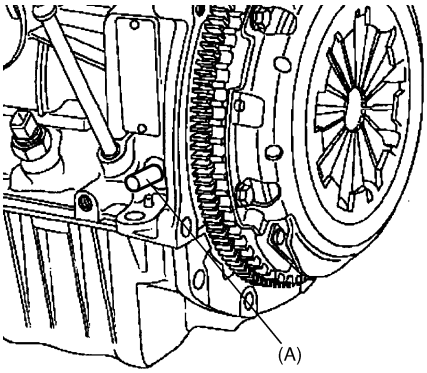
3) Turn crankshaft pulley clockwise, and stop turning crankshaft pulley immediately before mark (2) of camshaft pulley (3) matches with mark (1) of belt inner cover.



I5JB0B140023-01

4) Remove TDC pin cap, and insert special tool (A) into TDC pin hole as shown in figure.

Special tool
(A): 09912–46510



I5JB0B140024-01

5) Turn crankshaft pulley clockwise until crankshaft touches special tool (A).
6) Remove crankshaft pulley as follows.
   a) Lock ring gear (2) of flywheel by inserting flat head screw driver (1) or the like into hole of clutch housing.

⚠ CAUTION

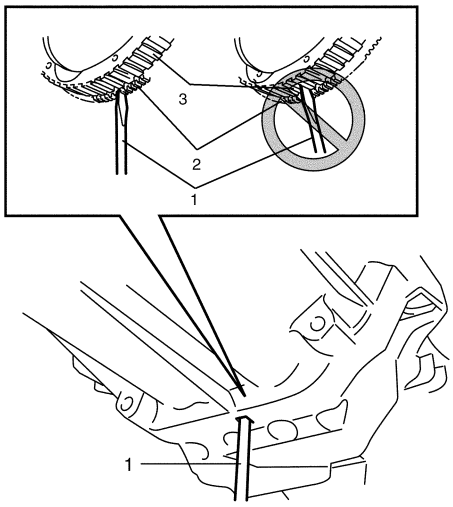
Never lock flywheel with CKP sensor ring (3). It may cause damage of sensor ring.

NOTE

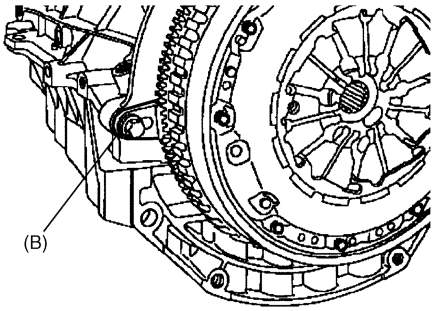
For unit disassembly service, lock ring gear of flywheel using special tool (B).

Special tool
(B): 09916–98110

[A]



[B]

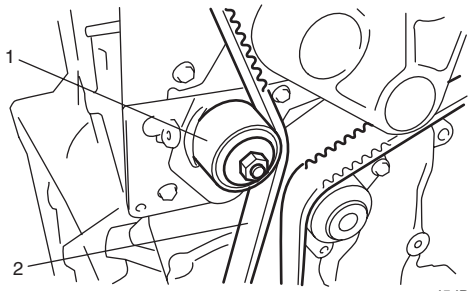


I5JB0B140025-01

[A]: For on-vehicle service	[B]: For unit disassembly service

   b) Remove special tool (A) from TDC pin hole.
   c) Loosen crankshaft pulley bolt, and remove crankshaft pulley.
   d) Insert special tool (A) into TDC pin hole.
   e) Remove special tool (B) or screw driver or the like.

7) Remove tensioner pulley (1) and timing belt (2).



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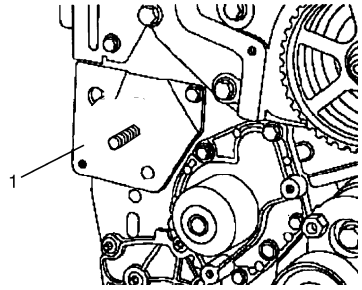
8) Remove timing belt tensioner plate (1), if necessary.



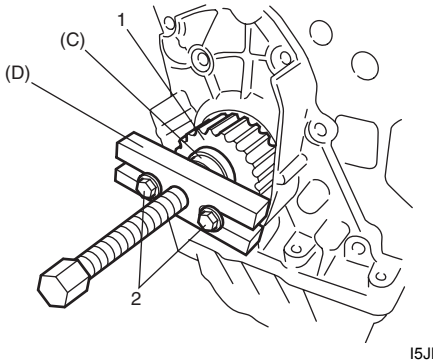
I5JB0B140027-01

9) Remove crankshaft timing belt pulley (1) using special tools as shown in finger, if necessary.

Special tool
(C): 09919–76510
(D): 09926–37610–001

NOTE

Be sure to use bolts (2) of M6 size and 1.0 mm (0.039 in.) pitch for fixing crankshaft timing belt pulley by special tools.

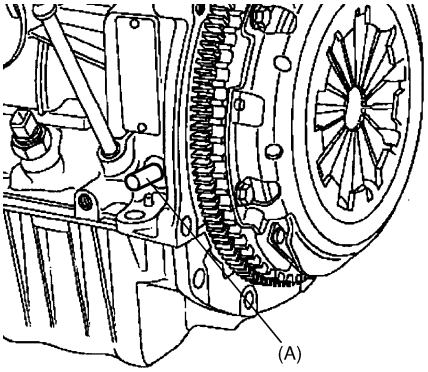


I5JB0B140028-01

Installation

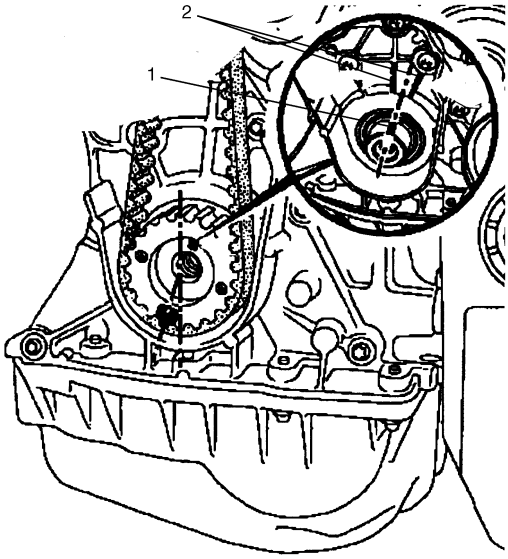
1) Confirm that special tool (A) is inserted into TDC pin hole.
   If special tool (A) is removed, insert special tool (A) referring to Step 5) of “Installation” under “Piston, Piston Ring and Connecting Rod Removal and Installation: ”.

   Special tool
   (A): 09912–46510



I5JB0B140024-01

2) Check crankshaft groove (1) is located in middle of two ribs (2) on gasket holder plate.



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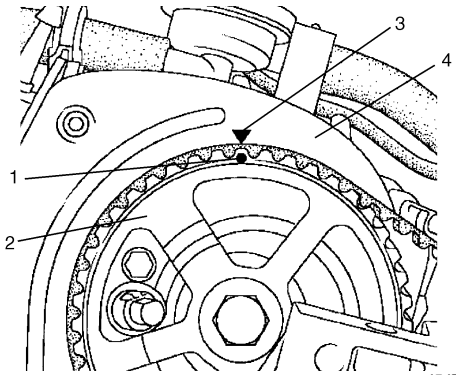
3) Check mark (1) of camshaft pulley (2) is aligned with mark (3) of timing belt inner cover (4).

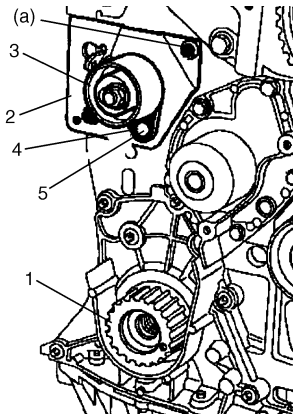


I5JB0B140031-01

4) Install crankshaft timing belt pulley (1), if removed.
5) Install timing belt tensioner plate (2), if removed.

   Tightening torque
   Timing belt tensioner plate bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

6) Install timing belt tensioner pulley (3) with positioning hole (4) to pin (5) of timing belt tensioner plate, and tighten timing belt tensioner pulley nut by hand temporarily.

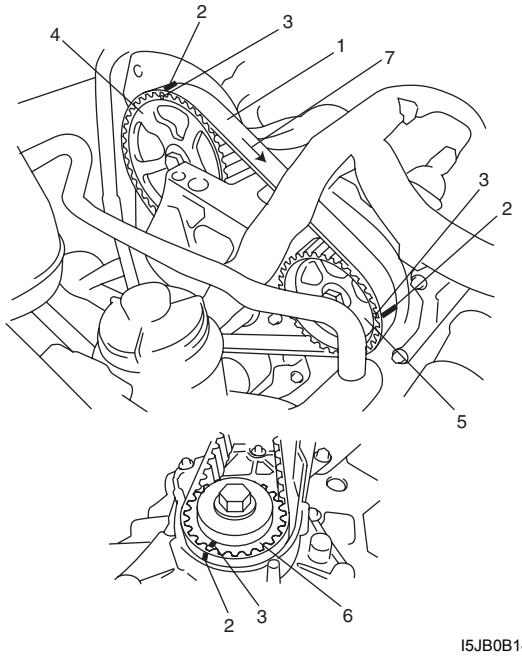


I5JB0B140032-01

7) Install timing belt (1) with aligning its matching lines (2) with matching marks (3) of camshaft pulley (4), injection pump pulley (5) and crankshaft timing belt pulley (6).

NOTE

Be sure to direct arrow mark (7) of timing belt clockwise as shown in figure.

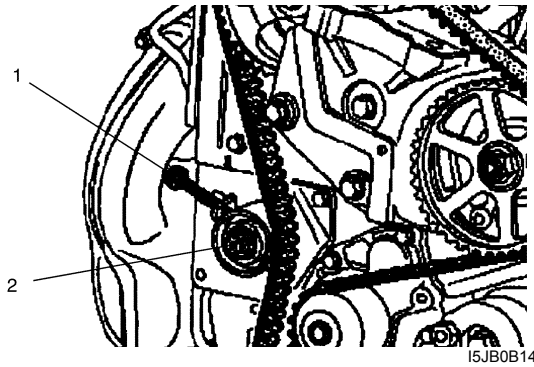


I5JB0B140029-01

8) Remove special tool (A) from TDC pin hole.
9) Adjust timing belt tension as follows.
   a) Tighten crankshaft pulley bolt to crankshaft temporarily by hand.
   b) Install adjusting bolt (1) to timing belt tensioner plate, and tighten adjusting bolt and timing belt tensioner pulley nut (2) by hand.

NOTE

Be sure to use adjusting bolt (1) of M6 size and 1.0 mm (0.039 in.) pitch.

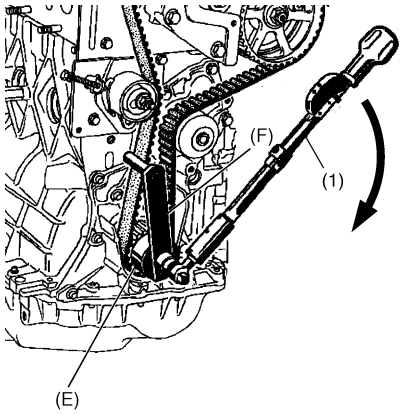


I5JB0B140034-01

   c) Pre-tense timing belt as follows.

Special tool
(E): 09919–76520
(F): 09919–76530

      i) Fit special tools with torque wrench on crankshaft belt pulley bolt.
      ii) Pre-tense timing belt by turning special tools with torque wrench (1) clockwise to 11 N·m (1.1kgf-m, 8.0 lb-ft) as shown in figure.



I5JB0B140033-02

      iii) Remove special tool (E) and (F).

   d) Measure timing belt tension using special tool as follows.

Special tool
(G): 09919–76540

      i) Place sensor (2) of special tool (G) on the center of crankshaft pulley and timing belt tensioner pulley of timing belt.

NOTE

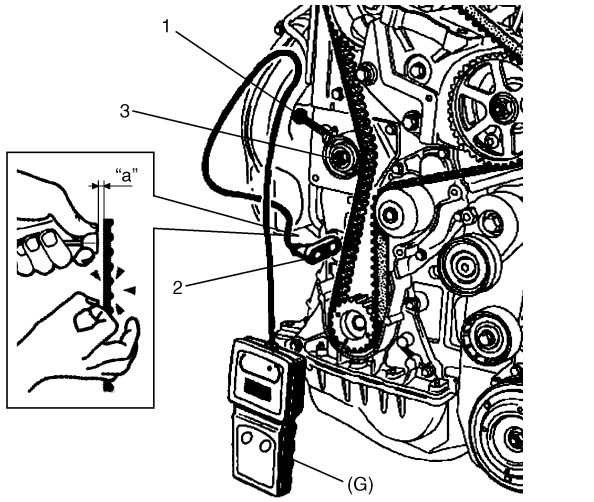
Be sure to separate sensor (2) from timing belt by specified distance "a".

Distance between timing belt and sensor "a": 2 - 10 mm (0.08 - 0.40 in.)

      ii) Measure timing belt tension flipping timing belt by finger as shown in figure.
      If timing belt tension is out of specification below, adjust timing belt tension by tightening / loosening adjusting bolt (1) and return to Step c).

Timing belt tension (Frequency displayed on special tool):
87 – 93 Hz

   e) Tighten timing belt tensioner pulley nut (3) to 10 N·m (1.0 kgf-m, 7.5 lb-ft) temporarily.



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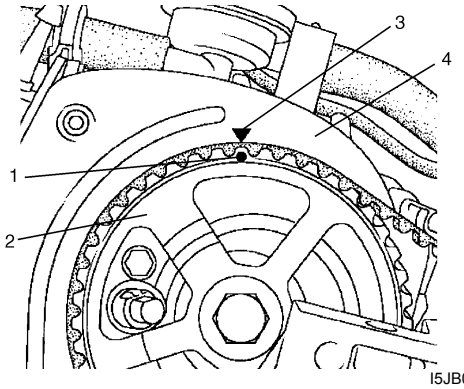
f) Turn crankshaft two revolutions clockwise until mark (1) of camshaft pulley (2) matches with mark (3) of timing belt inner cover (4).



I5JB0B140031-01

g) Check that special tool (A) can be inserted into TDC pin hole smoothly.

h) Remove special tool (A).

i) Pre-tense timing belt in the same manner as step c).

j) Measure timing belt tension in the same manner as step d).
If timing belt tension is out of specification below, remove timing belt and return to Step 1).

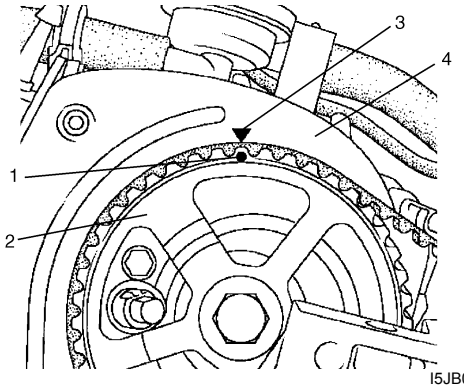
Timing belt tension (Frequency displayed on special tool):
75 – 85 Hz

k) Tighten timing belt tensioner pulley nut to specified torque.

Tightening torque
Timing belt tensioner pulley nut: 45 N·m (4.5 kgf-m, 32.5 lb-ft)

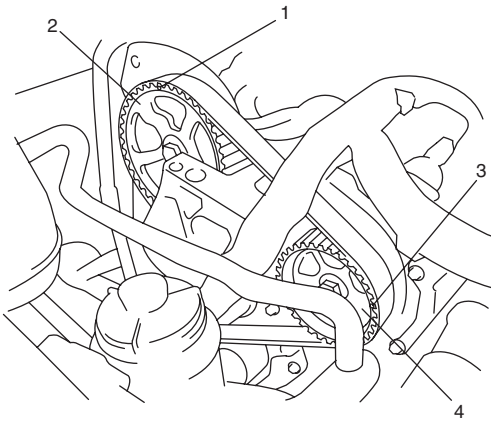
l) Remove adjusting bolt (2).

m) Turn crankshaft four revolutions clockwise until mark (1) of camshaft pulley (2) matches with mark (3) of timing belt inner cover (4).



I5JB0B140031-01

n) Confirm number of timing belt teeth between mark (1) of camshaft pulley (2) and mark (3) of injection pump pulley (4) is 29.
If not, remove timing belt and return to Step 1).



I5JB0B140036-01

10) Install crankshaft pulley as follows.

a) Lock ring gear in the same manner as Step 6) - a) of “Removal”.

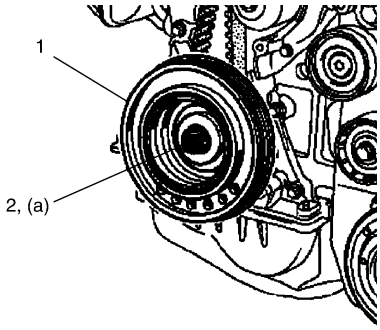
b) Fit crankshaft pulley (1) to crankshaft.

c) Tighten new crankshaft pulley bolt (2) as follows.

i) Tighten crankshaft pulley bolt to 40 N·m (4.0 kgf-m, 29.0 lb-ft).

ii) Retighten crankshaft pulley bolt by turning through 110°.

Tightening torque
Crankshaft pulley bolt (a): Tighten 40 N·m (4.0 kgf-m, 29.0 lb-ft) and 110° by the specified procedure



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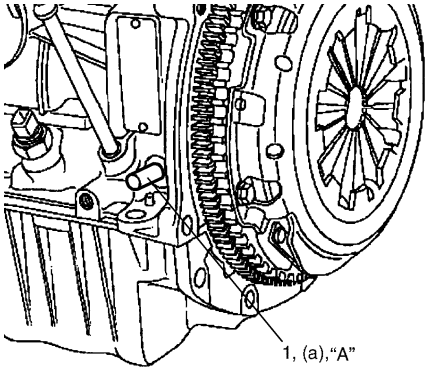
iii) Remove special tool (B) or screw driver or the like.

11) Apply sealant “A” to thread of TDC pin cap (1), and tighten TDC pin cap as specified torque.

Tightening torque
TDC pin cap (a): 20 N·m (2.0 kgf-m, 14.5 lb-ft)

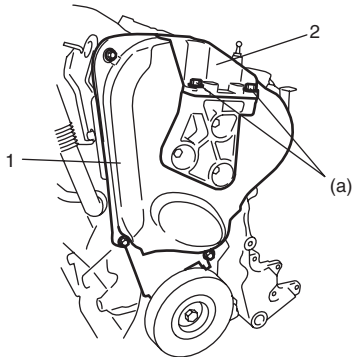
“A”: Loctite rhodorseal 5661® (Loctite rhodorseal 5661®)



I5JB0B140142-01

12) Install timing belt cover No.1 (1) and timing belt cover No.2 (2).

Tightening torque
Timing belt cover No.2 bolt (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)



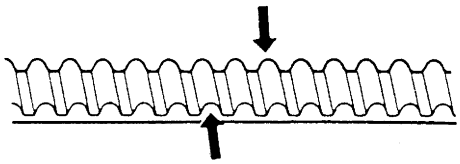
I5JB0B140038-01

13) Install accessory drive belt referring to “Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J”.

Timing Belt and Belt Tensioner Inspection

S5JB0B1406052

Timing belt
Inspect timing belt for wear or crack.Replace it as necessary.



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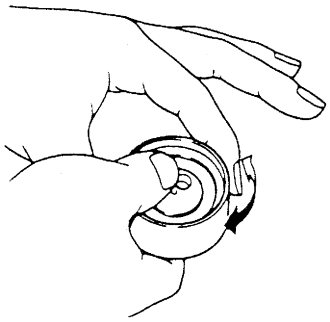
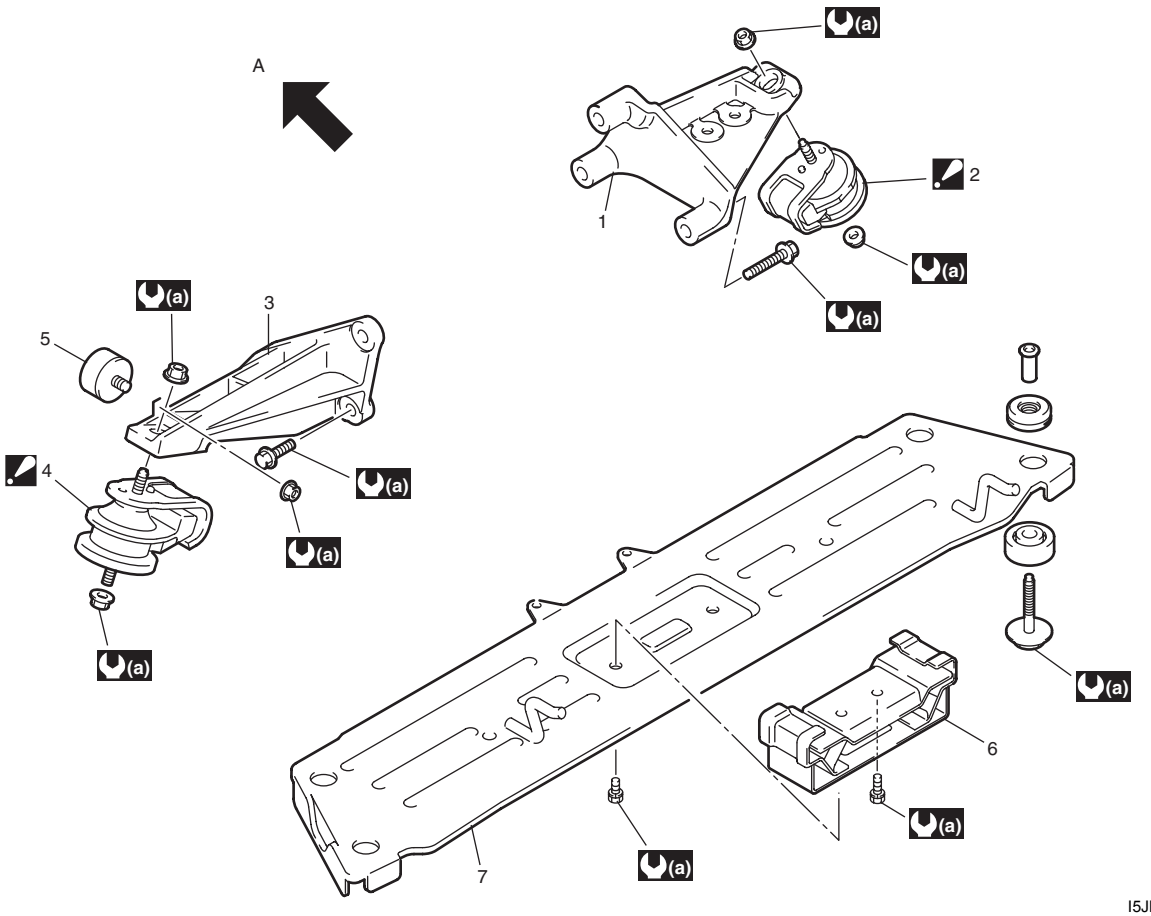
Timing belt tensioner
Inspect timing belt tensioner pulley for smooth rotation. Replace it as necessary.



I4RH0A140044-01

Engine Mounting Components

S5JB0B1406011



I5JB0B140039-01

A: Forward	5. Engine left mounting bracket damper
1. Engine right mounting bracket	6. Engine rear mounting
2. Engine right mounting : Be sure to align dowel pin with dowel hole of engine right mounting bracket.	7. Engine rear mounting bracket
3. Engine left mounting bracket	(a) : 55 N·m (5.5 kgf-m, 40.0 lb-ft)
4. Engine left mounting : Be sure to align dowel pin with dowel hole of engine left mounting bracket.	

Engine Assembly Removal and Installation

S5JB0B1406053

⚠ WARNING

Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: in Section 1G".

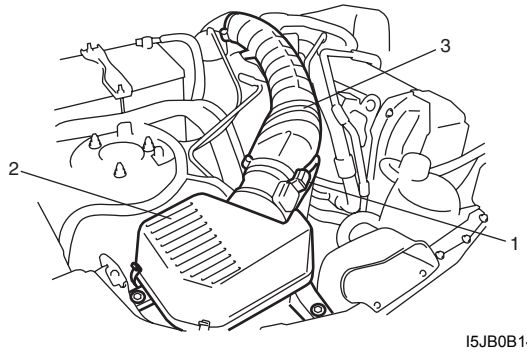
Removal

1) Relief fuel pressure referring to "Fuel Pressure Relief Procedure: in Section 1G".
2) Remove battery.
3) Drain engine oil referring to "Engine Oil and Filter Change: in Section 0B".
4) Drain coolant referring to "Cooling System Draining: in Section 1F".
5) Remove accessory drive belt referring to "Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J".
6) Remove shift control lever referring to "Transmission Shift Control Lever Removal and Installation: in Section 5B".
7) Remove exhaust No.1 pipe referring to "Exhaust System Components: in Section 1K".
8) Remove front and rear propeller shafts referring to "Propeller Shaft Removal and Installation: in Section 3D".
9) Disconnect clutch operating cylinder referring to "Clutch Fluid Pipe and Hose Removal and Installation: in Section 5C in related manual".
10) With hose connected, detach A/C compressor from its bracket referring to "Compressor Assembly Removal and Installation: in Section 7B", if equipped.

⚠ CAUTION

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

11) Disconnect P/S suction hose and low pressure return hose from P/S fluid reservoir referring to "P/S Hose / Pipe Components: in Section 6C".
12) Disconnect MAF sensor connector (1), and remove air cleaner case (2) and turbocharger inlet hose (3).



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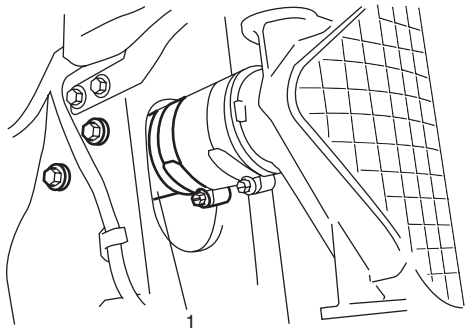
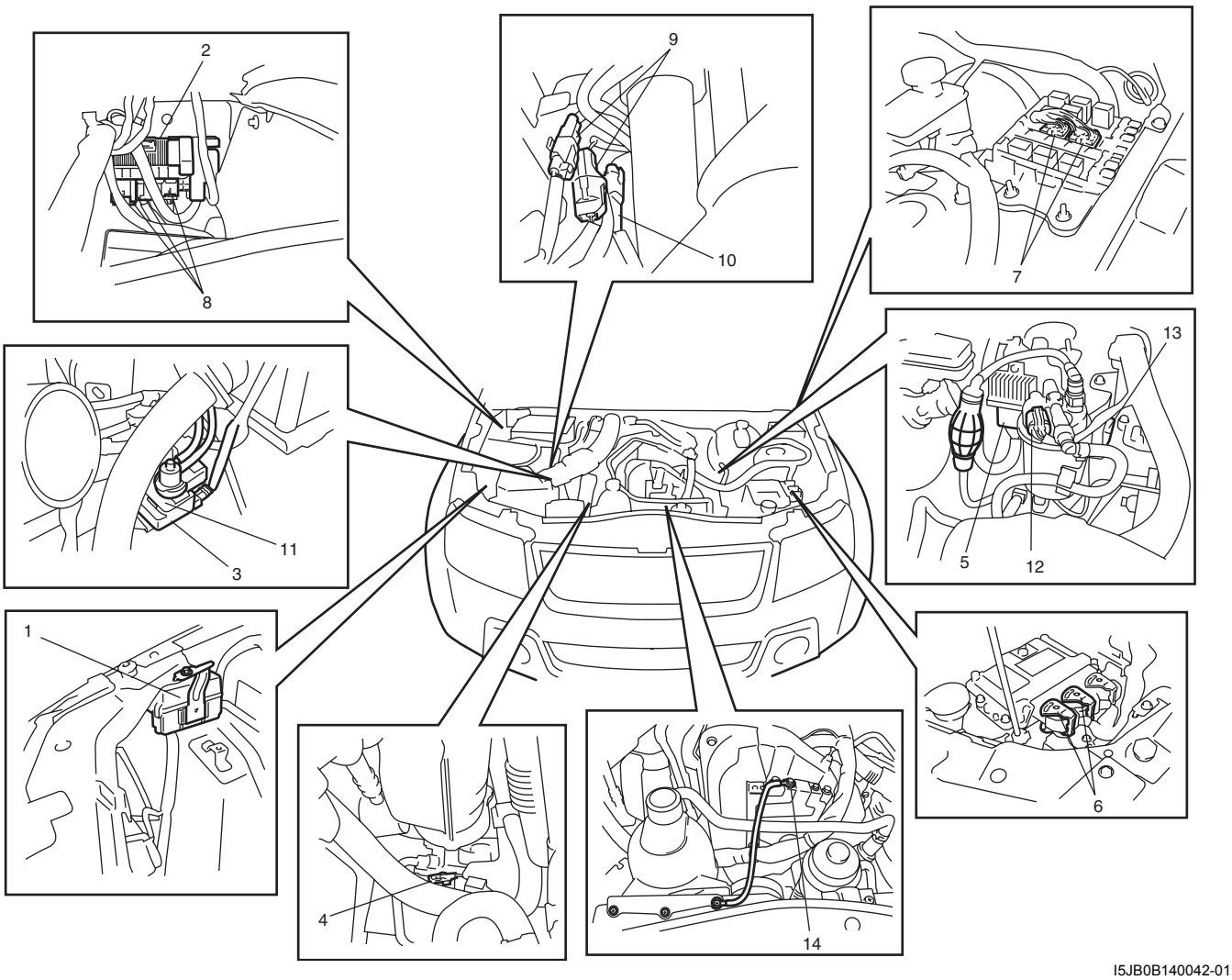
13) Remove intercooler inlet pipe (1).



I5JB0B140041-02

14) Disconnect the following connectors and wire harness.
    - A/C compressor (4)
    - Pre / post heating control unit (5)
    - ECM (6)
    - Main fuse (7)
    - Fuse box No.1 (8)
    - Exhaust gas temperature sensor -2 & -3 sensors (9)
    - Diesel particulate filter differential pressure sensor (10)
    - Boost pressure control solenoid valve (11)
    - Fuel heater (12)
    - Fuel filter water detection sensor (13)
    - Noise suppressor wire (14) from timing belt cover No.2

15) Remove relay box (1), fuse box No.1 (2) and boost pressure control solenoid valve (3) from vehicle body.

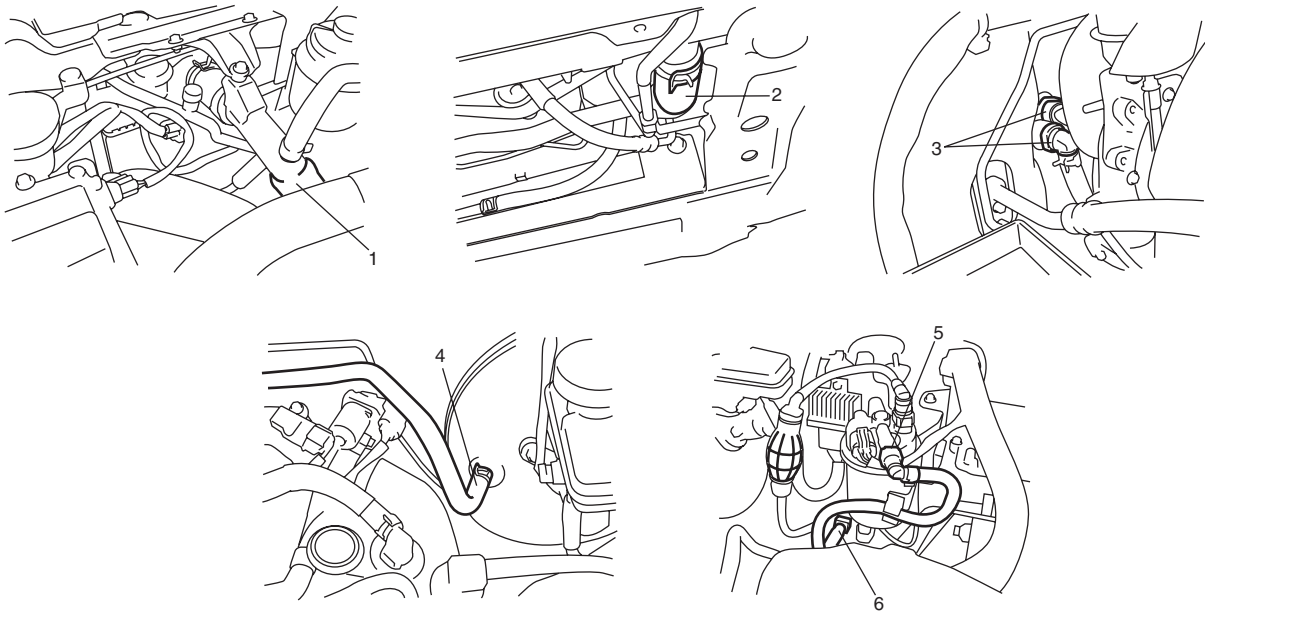


16) Disconnect the following hoses.

⚠ CAUTION

After disconnecting, plug fuel line with plug cap immediately referring to "Precautions on Fuel System Service: in Section 1G".

- Radiator inlet hose No.1 (1) from radiator inlet pipe
- Radiator outlet hoses No.1 (2) from radiator
- Heater hoses (3) from heater core
- Vacuum hose (4) from brake booster
- Fuel feed hose (5) from fuel filter
- Fuel return hose (6) from fuel return pipe

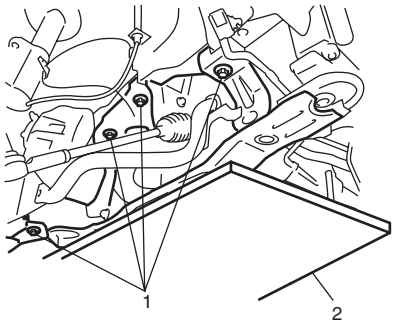


I5JB0B140043-01

17) Support front suspension frame and engine rear mounting member using engine jack (2).

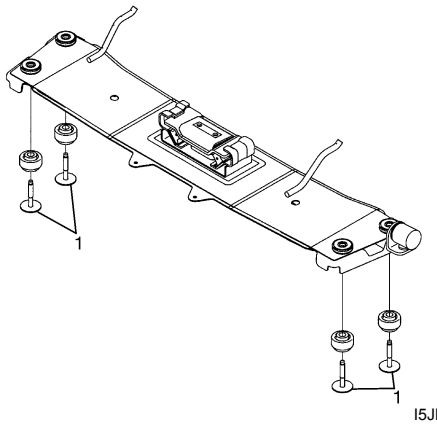
18) Carry out Step 1) through 12) of "Removal" under "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B in related manual" in order to lower engine with front suspension frame.

19) Remove front suspension frame mounting bolts (1).



I5JB0A141017-02

20) Remove engine rear mounting member bolts (1).



I5JB0A141018-02

21) Before lowering engine with transmission and front suspension frame from engine compartment, recheck to make sure all hoses, electric wires and cables are disconnected.
22) Lower engine with transmission and front suspension frame from engine compartment.

⚠ CAUTION

Before lowering engine, in order to avoid damage to A/C compressor, make clearance by rising them.

23) Disconnect transmission from engine referring to "Manual Transmission Assembly Dismounting and Remounting: in Section 5B", if necessary.

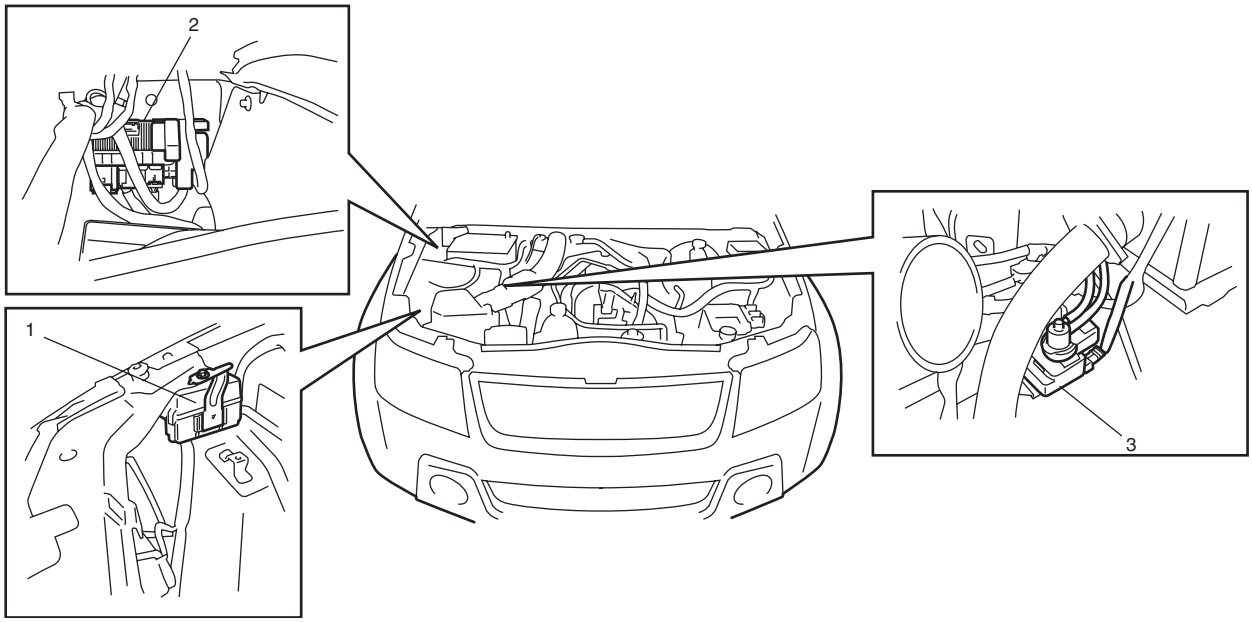
Installation

1) Connect transmission to engine referring to "Manual Transmission Assembly Dismounting and Remounting: in Section 5B", if removed.
2) Lift engine with transmission and front suspension frame to engine compartment using engine jack.

⚠ CAUTION

Before lifting engine, in order to avoid damage to A/C compressor, make clearance by rising them.

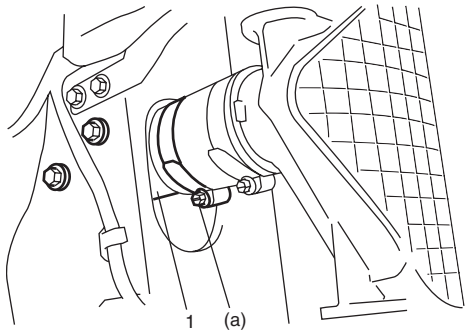
3) Tighten engine rear mounting member bolt referring to "Engine Mounting Components: ".
4) Carry out Step 5) through 19) of "Installation" under "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B in related manual" in order to install engine with front suspension frame.
5) Remove engine jack.
6) Install relay box (1), fuse box No.1 (2) and boost pressure control solenoid valve (3) to vehicle body.



I5JB0B140044-01

7) Connect connectors and wire harness disconnected in removal procedure.
8) Connect hoses disconnected in removal procedure.
9) Install intercooler inlet pipe (1).

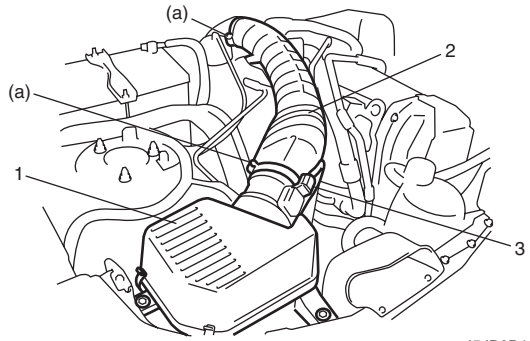
Tightening torque
Intercooler inlet hose clamp (a): 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)



I5JB0B140045-02

10) Install air cleaner case (1) and turbocharger inlet hose (2), and connect MAF sensor connector (3).

Tightening torque
Inlet hose clamp (a): 2.5 N·m (0.25 kgf-m, 2.0 lb-ft)



I5JB0B140046-02

11) Connect P/S suction hose and low pressure return hose referring to “P/S Hose / Pipe Components: in Section 6C”.
12) Install A/C compressor to its bracket referring to “Compressor Assembly Removal and Installation: in Section 7B”, if removed.
13) Install front and rear propeller shafts referring to “Propeller Shaft Removal and Installation: in Section 3D”.
14) Install exhaust No.1 pipe referring to “Exhaust System Components: in Section 1K”.
15) Install shift control lever referring to “Transmission Shift Control Lever Removal and Installation: in Section 5B”.
16) Install accessory drive belt referring to “Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J”.
17) Check all removed parts are back in place.
18) Refill coolant referring to “Cooling System Refilling: in Section 1F”.
19) Refill engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
20) After installation, bleed air from clutch system referring to “Air Bleeding of Brake System: in Section 4A in related manual” for air bleeding procedure.
21) Install battery, and connect positive (+) and negative (–) cable at battery.
22) Bleed air in fuel system referring to “Air Bleeding of Fuel System: in Section 1G”.
23) Start engine, and check coolant, oil and exhaust gas leakage at each connection.
24) Check fuel leakage referring to “Fuel Leakage Check Procedure: in Section 1G”.
25) Check DTC referring to “DTC Check: in Section 1A”.

EGR Valve Components

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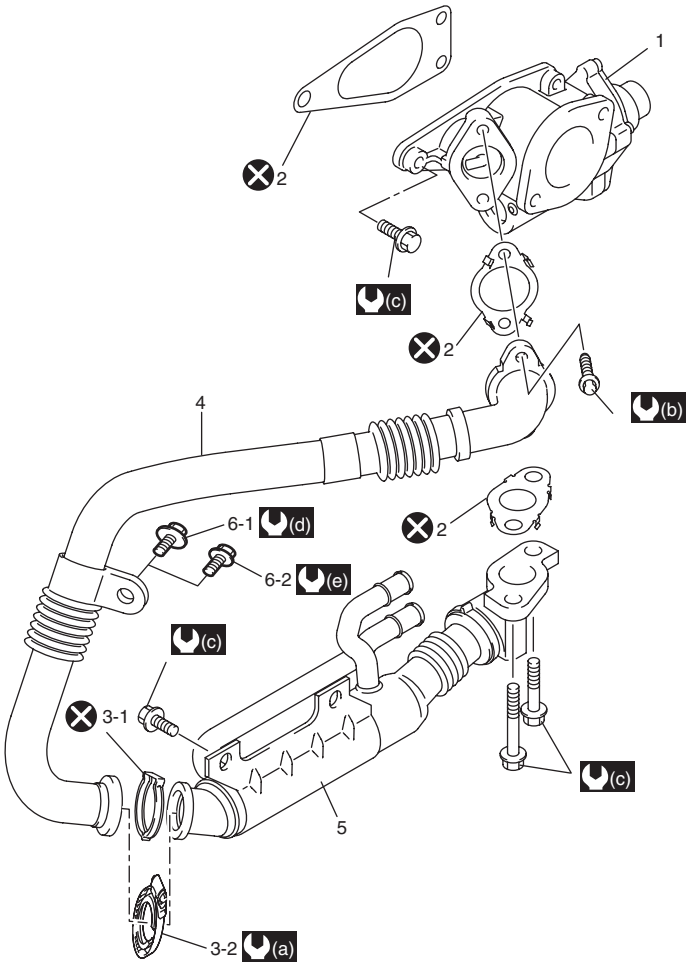


I5JB0B140047-06

1. EGR valve	5. EGR cooler	(c) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
2. Gasket	6-1. EGR pipe stiffener bolt (with washer)	(d) : 11 N·m (1.1 kgf-m, 8.0 lb-ft)
3-1. Clamp (type A)	6-2. EGR pipe stiffener bolt (without washer)	(e) : 9 N·m (0.9 kgf-m, 7.0 lb-ft)
3-2. Clamp (type B)	(a) : 5 N·m (0.5 kgf-m, 4.0 lb-ft)	: Do not reuse.
4. EGR pipe	(b) : 18 N·m (1.8 kgf-m, 13.0 lb-ft)	

EGR Valve Removal and Installation

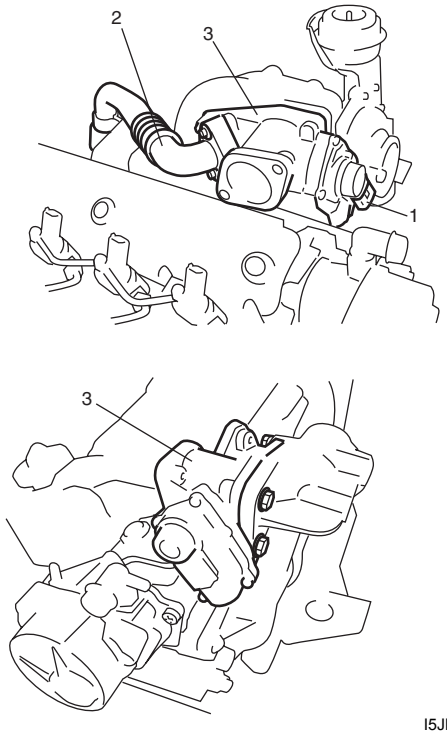
S5JB0B1406071

⚠ CAUTION

When replacing EGR valve, perform "Initialize EGR valve data" mode of SUZUKI scan tool referring to "EGR Valve Data Initialization".

Removal

1) Disconnect negative (–) cable at battery.
2) Remove engine cover.
3) Remove air intake pipe referring to "Air intake Pipe Removal and Installation: ".
4) Disconnect EGR valve connector (1) and EGR pipe (2) from EGR valve (3).
5) Remove EGR valve from intake manifold.



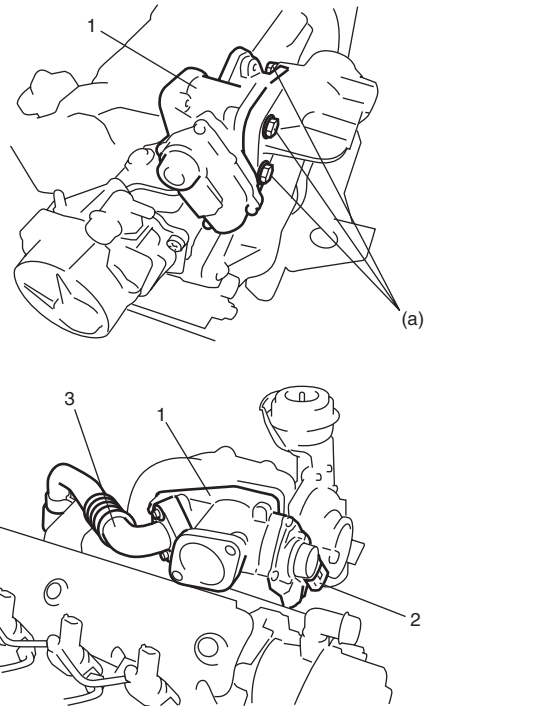
I5JB0B120007-01

Installation

1) Install EGR valve (1) to intake manifold.

Tightening torque
EGR valve bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

2) Connect EGR valve connector (2) and EGR pipe (3) to EGR valve.



I5JB0B120008-01

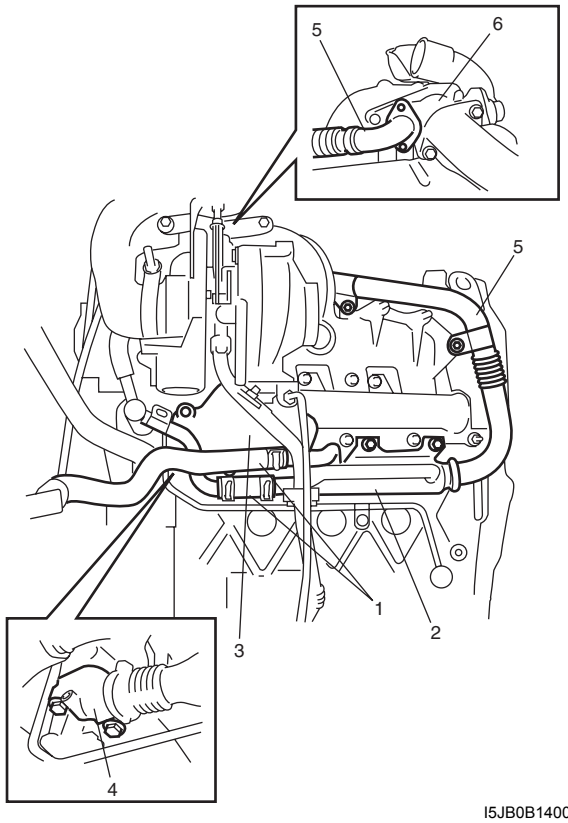
3) Install air intake pipe referring to "Air intake Pipe Removal and Installation: ".
4) Install engine cover.
5) Connect negative (–) cable at battery.

EGR Pipe and EGR Cooler Removal and Installation

S5JB0B1406055

Removal

1) Remove engine assembly referring to “Engine Assembly Removal and Installation: ”.
2) Remove catalytic converter referring to “Exhaust System Components: in Section 1K”.
3) Remove thermostat assembly referring to “Thermostat Assembly Removal and Installation: in Section 1F”.
4) Disconnect water hoses (1) from EGR cooler (2).
5) Remove exhaust manifold heat shield (3) from exhaust manifold.
6) Disconnect EGR joint (4) from exhaust manifold.
7) Disconnect EGR pipe (5) from EGR valve (6).
8) Remove EGR cooler (2) with EGR pipe (5) and EGR joint (4) from cylinder block.

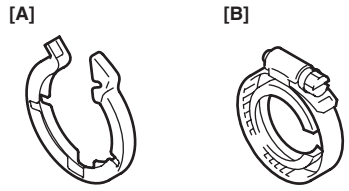


I5JB0B140048-01

9) Remove EGR pipe as follows, if necessary.

⚠ CAUTION

EGR pipe clamp has two types as shown in figure. And, Type A is disposable one and it has not already been supplied.
Be sure to use Type B EGR pipe clamp after removing Type A EGR pipe clamp.

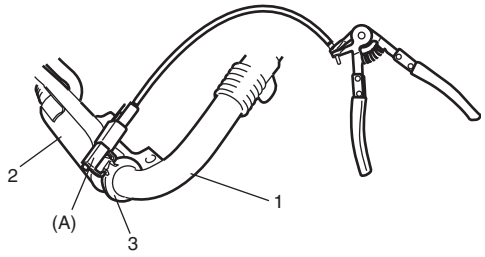


I5JB0B140146-01

[A]: Type A	[B]: Type B

- For Type A
  Remove EGR pipe (1) from EGR cooler (2) after removing EGR pipe clamp (3) with special tool.

  Special tool
  (A): 09910–68110



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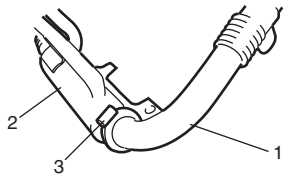
- For Type B
  Remove EGR pipe (1) from EGR cooler (2) after loosening EGR pipe clamp bolt (3).

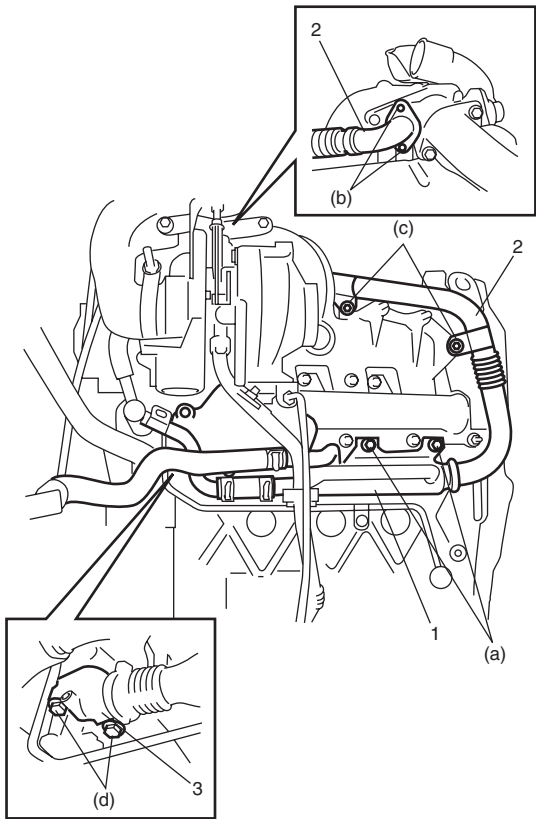


I5JB0B140148-01

Installation

1) Install EGR cooler (1), EGR pipe (2) and EGR joint (3) with new gaskets.

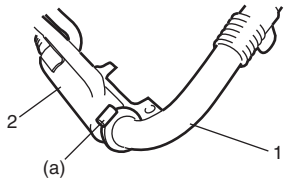
Tightening torque
EGR cooler bolt (a): 25 N·m (2.5 kgf-m, 18.5 lb-ft)
EGR pipe bolt (b): 18 N·m (1.8 kgf-m, 13.0 lb-ft)
EGR pipe stiffener bolt (with washer) (c): 11 N·m (1.1 kgf-m, 8.0 lb-ft)
EGR pipe stiffener bolt (without washer) (c): 9 N·m (0.9 kgf-m, 7.0 lb-ft)
EGR joint bolt (d): 25 N·m (2.5 kgf-m, 18.5 lb-ft)



I5JB0B140050-02

2) Install EGR pipe as follows, if necessary.
- For Type A
  Type A EGR pipe clamp is disposable one, install new Type B EGR pipe clamp as below-mentioned.
- For Type B
  Install EGR pipe (1) to EGR cooler (2) by tightening EGR pipe clamp bolt as specified torque.

Tightening torque
Clamp bolt (a): 5 N·m (0.5 kgf-m, 4.0 lb-ft)

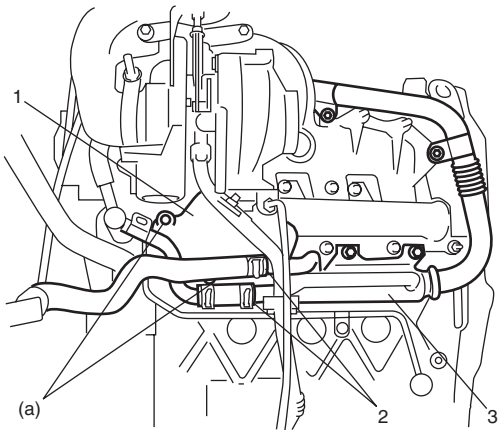


I5JB0B140147-01

3) Install exhaust manifold heat shield (1) to exhaust manifold.

Tightening torque
Exhaust manifold heat shield bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

4) Connect water hoses (2) to EGR cooler (3).

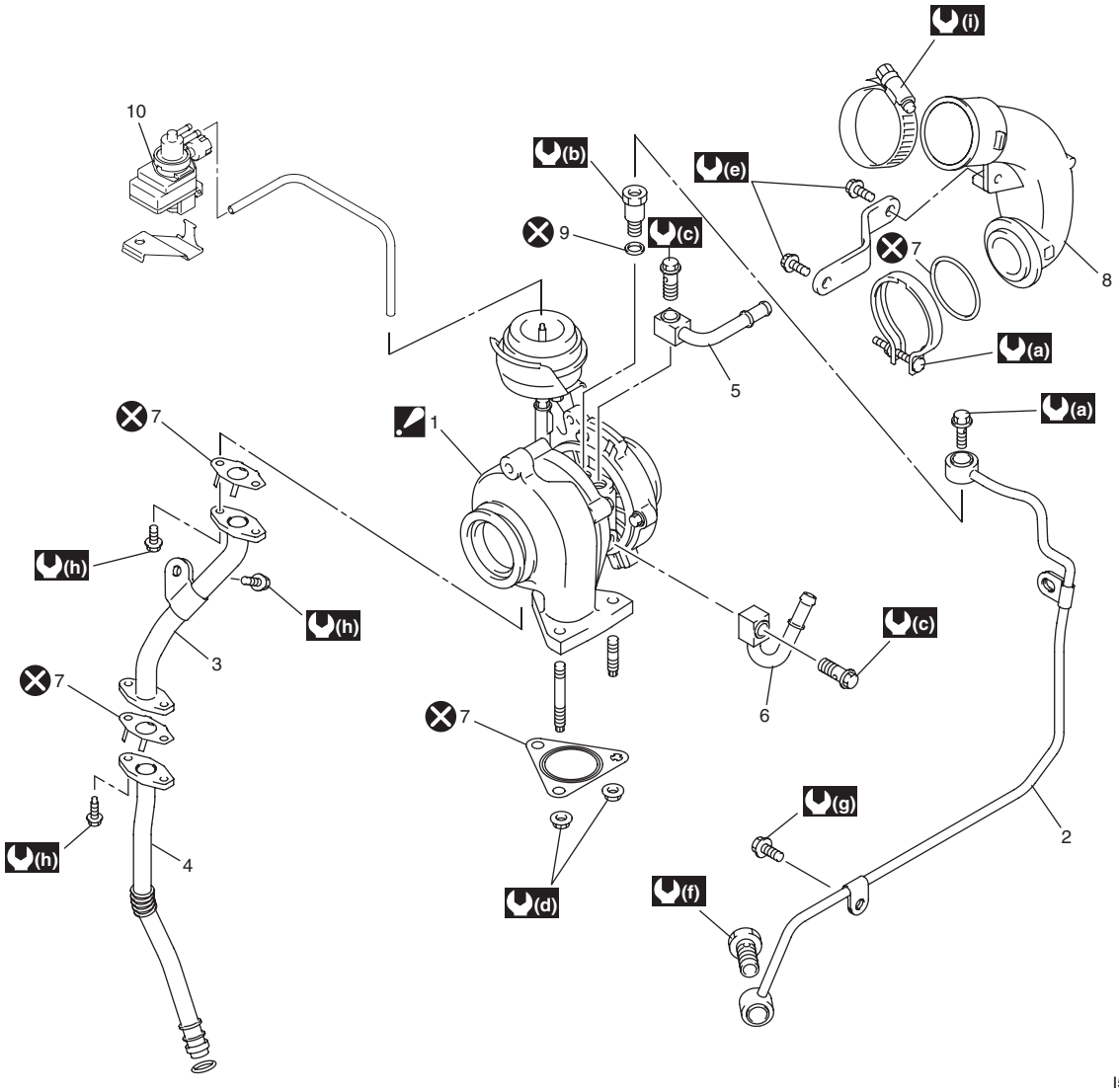


I5JB0B140051-01

5) Install thermostat assembly referring to “Thermostat Assembly Removal and Installation: in Section 1F”.
6) Install catalytic converter referring to “Exhaust System Components: in Section 1K”.
7) Install engine assembly referring to “Engine Assembly Removal and Installation: ”.

Turbocharger Components

S5JB0B1406056



I5JB0B140052-05

1. Turbocharger assembly : Do not disassemble.	8. Turbocharger inlet pipe	(e) : 21 N·m (2.1 kgf-m, 15.5 lb-ft)
2. Turbocharger lubrication pipe	9. Copper ring	(f) : 44 N·m (4.4 kgf-m, 32.0 lb-ft)
3. Oil return pipe No.1	10. Boost presser control solenoid valve	(g) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
4. Oil return pipe No.2	(a) : 16 N·m (1.6 kgf-m, 12.0 lb-ft)	(h) : 12 N·m (1.2 kgf-m, 9.0 lb-ft)
5. Turbocharger water inlet pipe	(b) : 36 N·m (3.6 kgf-m, 26.5 lb-ft)	(i) : 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)
6. Turbocharger water outlet pipe	(c) : 29 N·m (2.9 kgf-m, 21.0 lb-ft)	⊗ : Do not reuse.
7. Gasket	(d) : 37 N·m (3.7 kgf-m, 27.0 lb-ft)	

Turbocharger Assembly Removal and Installation

S5JB0B1406057

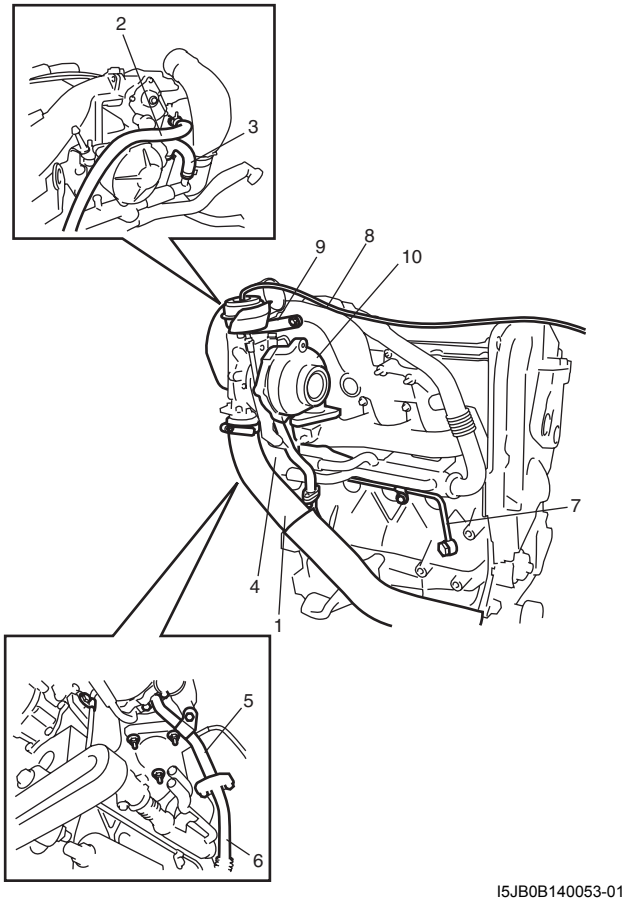
⚠ CAUTION

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

Removal

1) Remove engine assembly referring to “Engine Assembly Removal and Installation: ”.
2) Remove thermostat assembly referring to “Thermostat Assembly Removal and Installation: in Section 1F”.
3) Remove catalytic converter referring to “Exhaust System Components: in Section 1K”.
4) Disconnect turbocharger outlet hose (1) from turbochanger (10).
5) Disconnect turbocharger water inlet hose (2) and outlet hose (3).

6) Remove exhaust manifold heat shield (4) from exhaust manifold.
7) Remove oil return pipe No.1 (5) and No.2 (6).
8) Disconnect turbocharger lubrication pipe (7) and lubrication pipe stiffeners from cylinder block.
9) Disconnect boost pressure control actuator hose (8) from boost pressure control actuator.
10) Remove turbocharger stiffener (9).
11) Remove turbocharger (10) from exhaust manifold.



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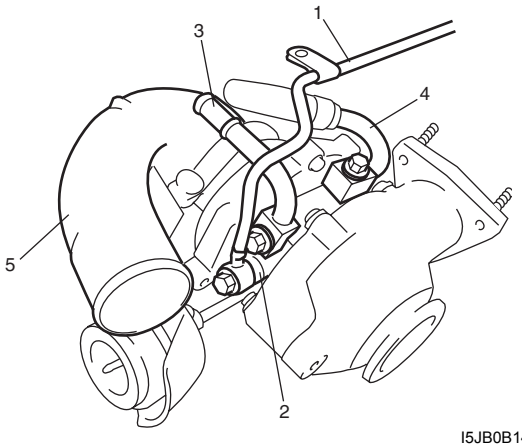
12) Remove turbocharger inlet pipe (5) from turbocharger.
13) Remove turbocharger lubrication pipe (1), turbocharger lubrication pipe union nut (2), turbocharger water inlet pipe (3) and turbochanger water outlet pipe (4) from turbocharger, if necessary.

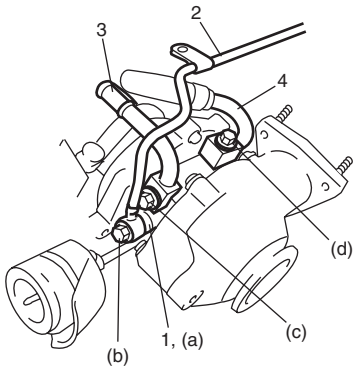


I5JB0B140054-01

Installation

1) Install turbocharger lubrication pipe union nut (1) with new copper ring, turbocharger lubrication pipe (2), turbocharger water inlet pipe (3) and turbochanger water outlet pipe (4) to turbocharger with new gasket and new clamp, if removed.

Tightening torque
Turbocharger lubrication pipe union nut (a): 36 N·m (3.6 kgf-m, 26.5 lb-ft)
Turbocharger lubrication pipe union bolt (turbocharger side) (b): 16 N·m (1.6 kgf-m, 12.0 lb-ft)
Turbocharger water inlet pipe union bolt (c): 29 N·m (2.9 kgf-m, 21.0 lb-ft)
Turbocharger water outlet pipe union bolt (d): 29 N·m (2.9 kgf-m, 21.0 lb-ft)



I5JB0B140055-04

2) Install turbocharger (1) to exhaust manifold with new gasket.

Tightening torque
Turbocharger nut (a): 37 N·m (3.7 kgf-m, 27.0 lb-ft)

3) Fit turbocharger inlet pipe (11) to turbocharger and install turbocharger stiffener (2). Tighten turbocharger stiffener bolt by hand temporarily.

4) Tighten turbocharger inlet pipe clamp by specified torque.

Tightening torque
Turbocharger inlet pipe clamp (i): 16 N·m (1.6 kgf-m, 12.0 lb-ft)

5) Tighten turbocharger stiffener bolt by specified torque.

Tightening torque
Turbocharger stiffener bolt (b): 21 N·m (2.1 kgf-m, 15.5 lb-ft)

6) Install exhaust manifold heat shield (3) to exhaust manifold.

Tightening torque
Exhaust manifold heat shield bolt (c): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

7) Connect turbocharger lubrication pipe (4) and lubrication pipe stiffeners to cylinder block.

Tightening torque
Turbocharger lubrication pipe union bolt (cylinder block side) (d): 44 N·m (4.4 kgf-m, 32.0 lb-ft)
Turbocharger lubrication pipe stiffener bolt (e): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

8) Install oil return pipe No.1 (5) and No.2 (6) with new gasket and O-ring.

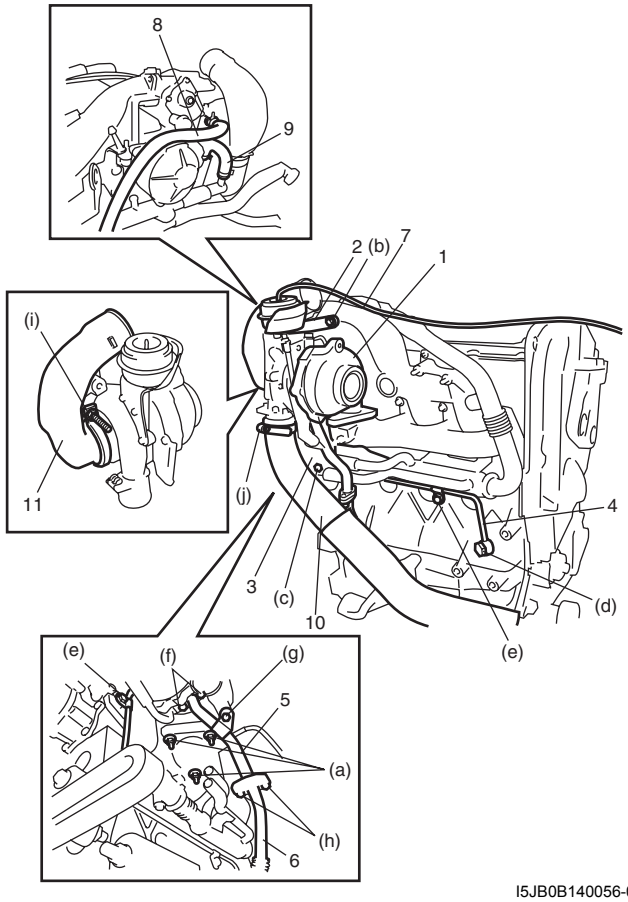
Tightening torque
Oil return pipe No.1 bolt (f): 12 N·m (1.2 kgf-m, 9.0 lb-ft)
Oil return pipe No.1 stiffener bolt (g): 12 N·m (1.2 kgf-m, 9.0 lb-ft)
Oil return pipe No.2 bolt (h): 12 N·m (1.2 kgf-m, 9.0 lb-ft)

9) Connect boost pressure control actuator hose (7) to boost pressure control actuator.

10) Connect turbocharger water inlet hose (8) and outlet hose (9).

11) Connect turbocharger outlet hose (10) to turbocharger (1).

Tightening torque
Turbocharger outlet hose clamp (turbocharger side) (j): 5 N·m (0.5 kgf-m, 4.0 lb-ft)



I5JB0B140056-04

12) Install catalytic converter referring to “Exhaust System Components: in Section 1K”.

13) Install thermostat assembly referring to “Thermostat Assembly Removal and Installation: in Section 1F”.

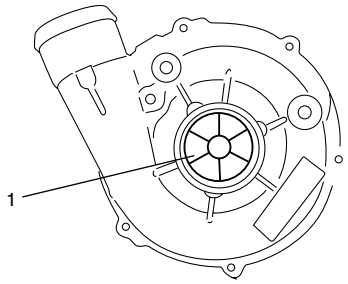
14) Install engine assembly referring to “Engine Assembly Removal and Installation: ”.

Turbocharger Assembly Inspection

S5JB0B1406069

Turbocharger

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 turbocharger.



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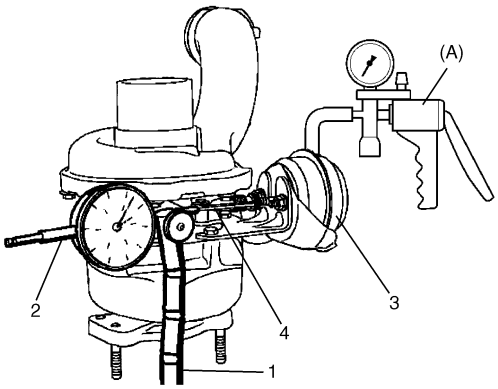
Boost Presser Control Valve

1) Remove turbocharger referring to “Turbocharger Assembly Removal and Installation: ”.
2) Set magnetic base (1) with dial gauge (2) as shown in figure.
3) Connect special tool to boost presser control valve (3).

   Special tool
   (A): 09917–47011

4) Measure stroke of boost presser control valve rod (4) when applying specified pressure.
   If measure stroke is out of specification, adjust rod stroke referring to “Turbocharger Assembly Adjustment: ” or replace turbocharger.

   Boost presser control valve rod stroke
   1.3 – 3.3 mm (0.052 – 0.129 in.) at 20 kPa (–0.2 kg/cm^2, 2.84 psi)
   9.5 – 11.5 mm (0.374 – 0.452 in.) at 55 kPa (–0.55kg/cm^2, 7.81 psi)
   Stop at 60 kPa (–0.6kg/cm^2, 8.52 psi) or more

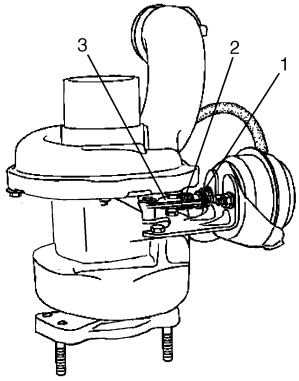


I5JB0B140139-01

Turbocharger Assembly Adjustment

S5JB0B1406070

1) Loosen lock nut (1).
2) Tighten or loose adjusting wheel (2) so as to adjust stroke of boost presser control valve rod with applying specified pressure.
   For correct stroke and specified pressure, refer to “Boost Presser Control Valve” under “Turbocharger Assembly Inspection: ”.
3) Tighten lock nut after adjusting.



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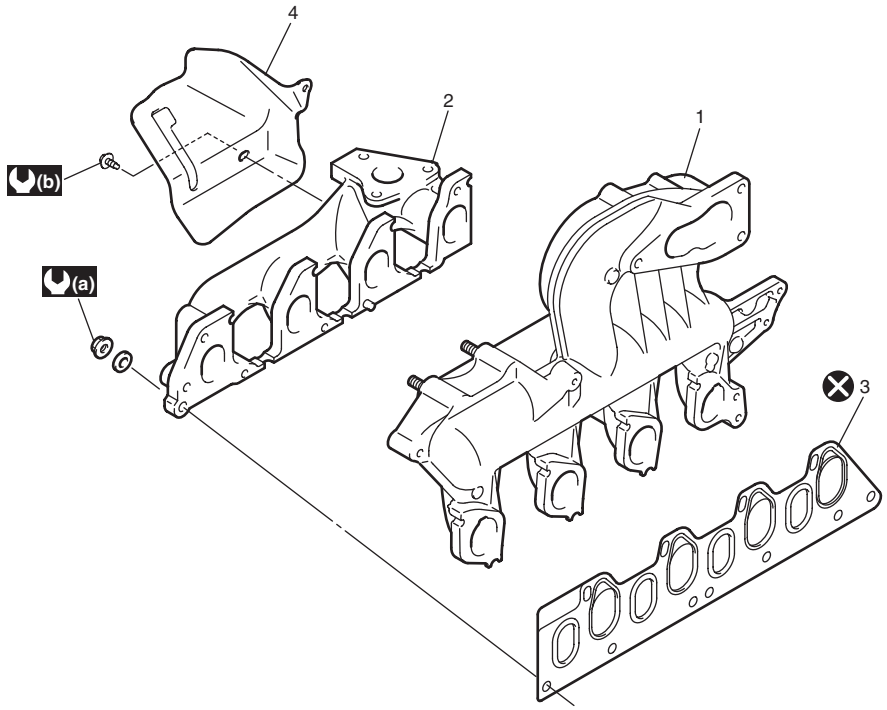
Intake Manifold and Exhaust Manifold Components

S5JB0B1406058



I5JB0B140057-01

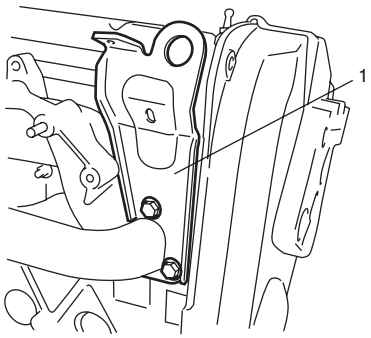
1. Intake manifold	3. Intake and exhaust manifold gasket	(b) : 11 N·m (1.1 kgf-m, 8.0 lb-ft)
2. Exhaust manifold	4. Exhaust manifold heat shield	⊗ : Do not reuse.
3. Intake and exhaust manifold gasket	(a) : Tighten 28 N·m (0.8 kgf-m, 6.0 lb-ft) by the specified procedure.	

Intake Manifold and Exhaust Manifold Removal and Installation

S5JB0B1406059

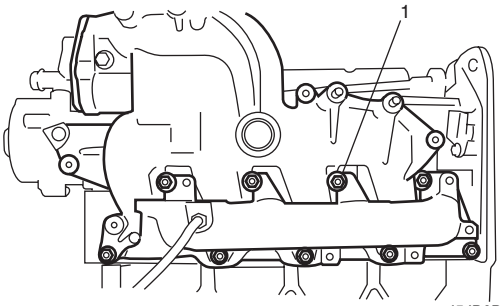
Removal

1) Remove turbocharger assembly referring to “Turbocharger Assembly Removal and Installation: ”.
2) Remove EGR pipe and cooler referring to “EGR Pipe and EGR Cooler Removal and Installation: ”.
3) Remove EGR valve referring to “EGR Valve Removal and Installation: ”.
4) Remove engine hanger (1).



I5JB0B140059-02

5) Loosen intake and exhaust manifold nuts (1) from outside to center in symmetry and evenly.



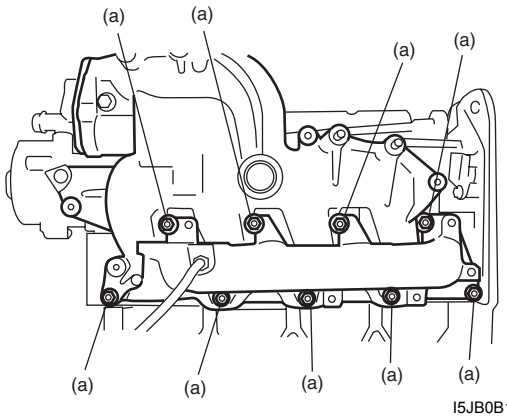
I5JB0B140058-01

6) Remove intake and exhaust manifolds.
7) Remove exhaust gas temperature sensor-1 from exhaust manifold referring to “Exhaust Gas Temperature Sensor 1, 2 and 3 Removal and Installation: in Section 1B”, if necessary.

Installation

1) Install exhaust gas temperature sensor-1 to exhaust manifold “Exhaust Gas Temperature Sensor 1, 2 and 3 Removal and Installation: in Section 1B”, if removed.
2) Install intake and exhaust manifolds as follows.
   a) Fit intake and exhaust manifolds to cylinder head with new gasket.
   b) Tighten new intake and exhaust manifold nuts from center to outside in symmetry and evenly until specified torque is obtained.

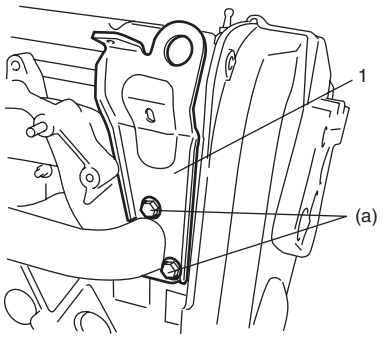
   Tightening torque
   Intake and exhaust manifolds nut (a): Tighten 28 N·m (0.8 kgf-m, 6.0 lb-ft) by the specified procedure



I5JB0B140060-01

3) Install engine hanger (1).

   Tightening torque
   Engine hanger bolt (a): 25 N·m (2.5 kgf-m, 18.5 lb-ft)

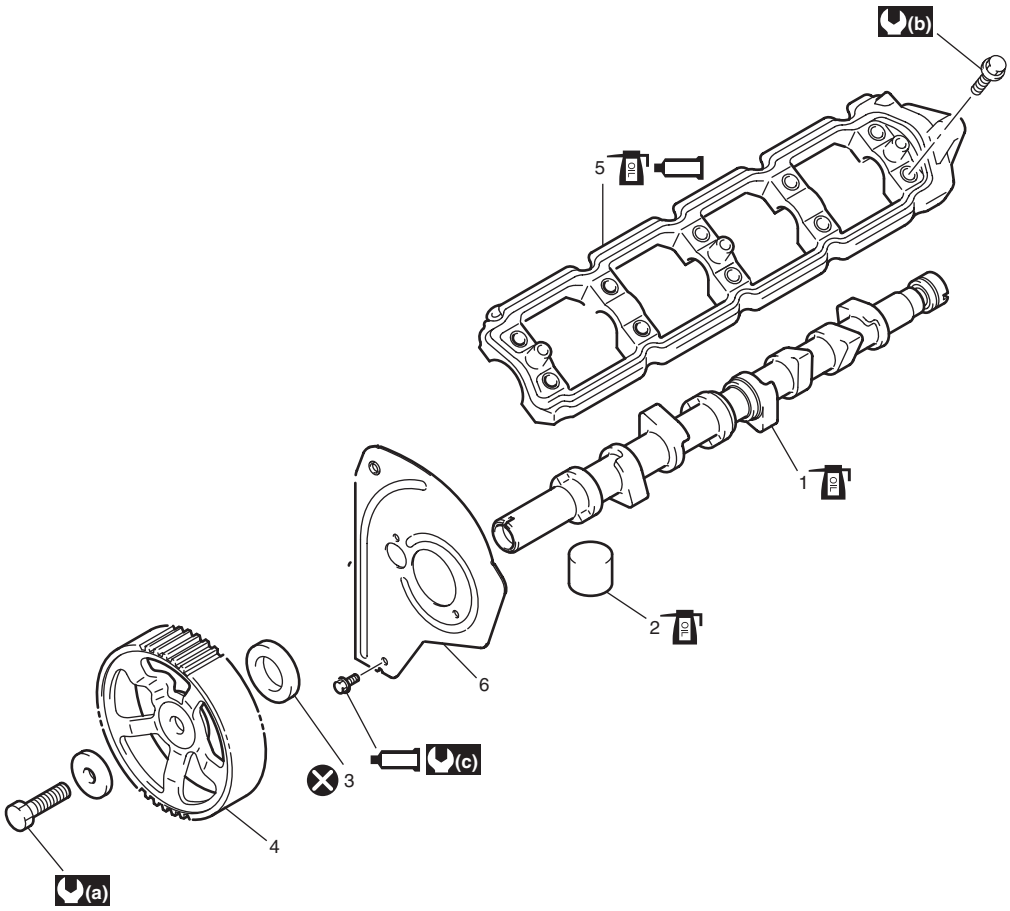


I5JB0B140061-01

4) Install EGR pipe and cooler referring to “EGR Pipe and EGR Cooler Removal and Installation: ”.
5) Install EGR valve referring to “EGR Valve Removal and Installation: ”.
6) Install turbocharger referring to “Turbocharger Assembly Removal and Installation: ”.

Camshaft and Tappet Components

S5JB0B1406060



I5JB0B140062-02

1. Camshaft : Apply engine oil to sliding surface.	(a) : 60 N·m (6.0 kgf-m, 43.5 lb-ft)
2. Tappet : Apply engine oil to sliding surface.	(b) : Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) by the specified procedure.
3. Camshaft oil seal	(c) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
4. Camshaft pulley	: Do not reuse.
5. Camshaft housing : Apply engine oil to sliding surface. : Apply sealant Loctite FRENETANCH® to the maing surface of camshaft housing and cylinder head.	: Apply sealant Loctite FRENETANCH® to the bolt thread.
6. Timing belt inner cover	

Camshaft and Tappet Removal and Installation

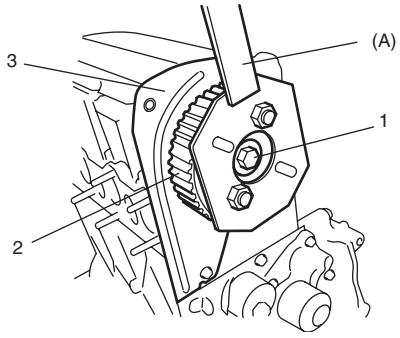
S5JB0B1406061

Removal

1) Remove engine assembly referring to “Engine Assembly Removal and Installation: ”.
2) Remove timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: ”.
3) Remove injection pump and front bracket referring to “Injection Pump Removal and Installation: in Section 1G”.
4) Remove vacuum pump referring to “Vacuum Pump Removal and Installation: ”.
5) Remove CMP sensor referring to “Camshaft Position (CMP) Sensor Removal and Installation: in Section 1C”.
6) Remove camshaft pulley as follows.
   a) Fix camshaft pulley using special tool.

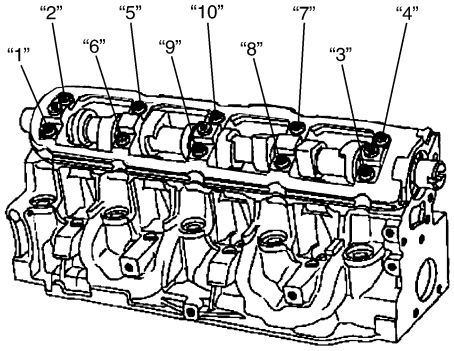
      Special tool
      (A): 09917–68221

   b) Loosen camshaft pulley bolt (1), and remove camshaft pulley (2).
   c) Remove timing belt inner cover (3).



I5JB0B140063-01

7) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
8) Loosen camshaft housing bolts evenly and gradually in numerical order “1” through “10” as shown in figure, and remove them.

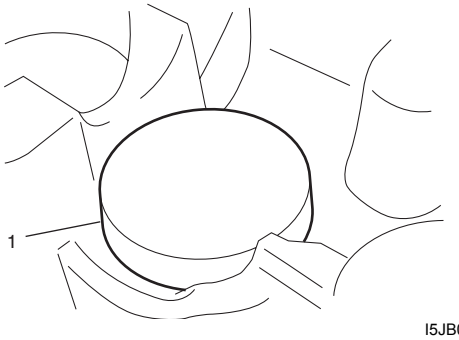


I5JB0B140066-01

9) Remove camshaft housing and camshaft from cylinder head.
10) Remove camshaft oil seal from camshaft.
11) Remove tappet (1) from cylinder head.

⚠ CAUTION

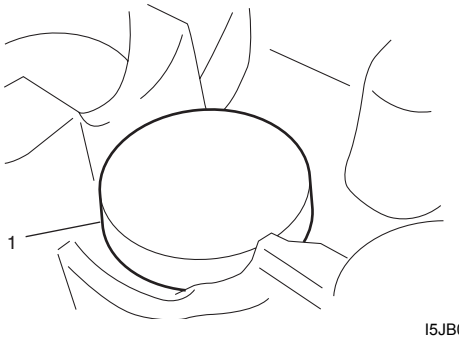
Note original position in which each tappet was installed when valve lash (clearance) adjustment is not necessary.
If each tappet is not installed to original position, engine will spoil its original performance.



I5JB0B140065-01

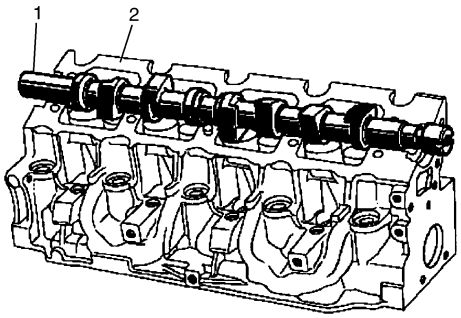
Installation

1) Apply engine oil around tappet (1), and then install it to cylinder head.



I5JB0B140065-01

2) Install camshaft to cylinder head as follows.
   a) Apply engine oil to sliding surface of each camshaft and camshaft journal.
   b) Fit camshaft (1) to cylinder head (2).

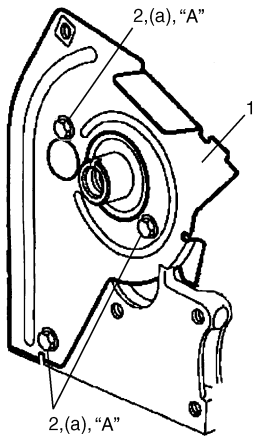


I5JB0B140064-02

   c) Fit timing belt inner cover (1), and tighten timing belt inner cover bolts (2) after applying “A” to bolt thread.

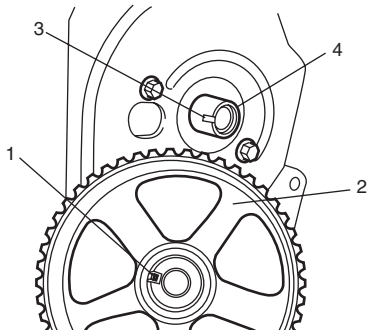
“A”: Loctite FRENETANCH® (Loctite FRENETANCH®)

Tightening torque
Timing belt inner cover bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)



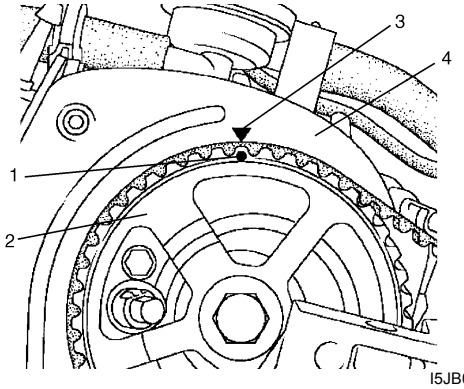
I5JB0B140067-01

   d) Install camshaft pulley (2) to camshaft (4) aligning key (1) to groove (3).



I5JB0B140068-01

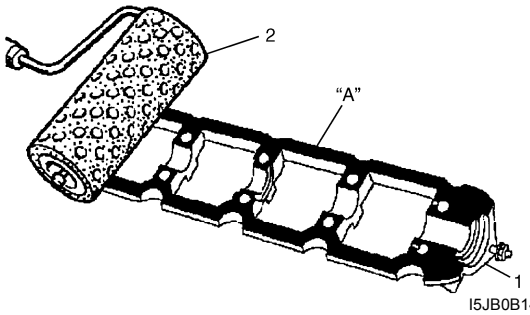
   e) Tighten camshaft pulley bolt temporarily by hand.
   f) Turn camshaft pulley clockwise, and stop turning crankshaft immediately before mark (1) of camshaft pulley (2) with mark (3) of timing belt inner cover (4).



I5JB0B140031-01

   g) Install camshaft housing to cylinder head as follows.
      i) Remove oil, old sealant and dust from sealing surfaces of camshaft housing (1) and cylinder head cover.
      ii) Apply sealant “A” to sealing surface area of camshaft housing (1) using stipple roller (2) as shown in figure.

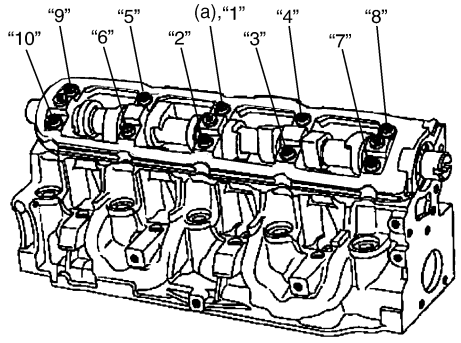
“A”: Loctite 518® (Loctite 518®)



I5JB0B140069-01

iii) Fit camshaft holder to cylinder head.
iv) Apply “A” to camshaft housing bolt thread.
v) Tighten camshaft housing bolts evenly and gradually in numerical order (“1” through “10”) by repeating tightening sequence two or three times until specified torque is obtained.

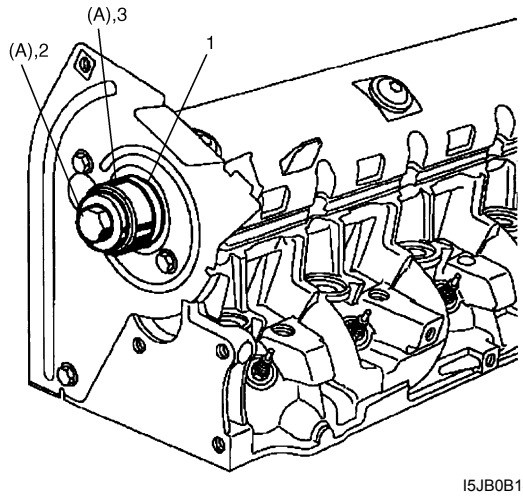
Tightening torque
Camshaft housing bolt (a): Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) by the specified procedure



I5JB0B140070-01

3) Remove camshaft pulley.
4) Install camshaft oil seal as follows.
a) Fit oil seal (1) to camshaft.
b) Install oil seal to camshaft by tightening bolt (2) of special tool until installer (3) of special tool comes contact with cylinder head.

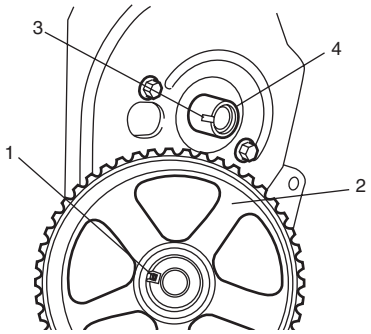
Special tool
(A): 09913–56520



I5JB0B140071-01

c) Remove special tool.

5) Install camshaft pulley (2) to camshaft (4) aligning key (1) to groove (3).

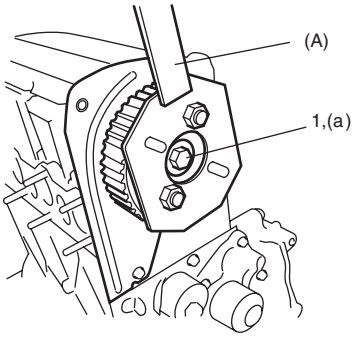


I5JB0B140068-01

6) Tighten camshaft pulley bolt (1) to specified torque using special tool.

Special tool
(A): 09917–68221

Tightening torque
Camshaft pulley bolt (a): 60 N·m (6.0 kgf-m, 43.5 lb-ft)



I5JB0B140072-02

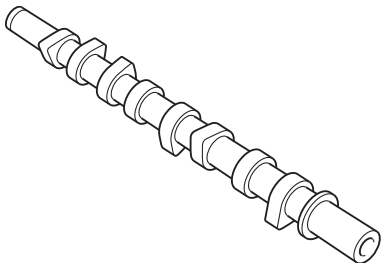
7) Install CMP sensor referring to “Camshaft Position (CMP) Sensor Removal and Installation: in Section 1C”.
8) Install vacuum pump referring to “Vacuum Pump Removal and Installation: ”.
9) Install injection pump and front bracket referring to “Injection Pump Removal and Installation: in Section 1G”.
10) Install timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: ”.
11) Check valve lash (clearance) referring to “Valve Lash (Clearance) Inspection: ”.
12) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”
13) Install engine assembly referring to “Engine Assembly Removal and Installation: ”.

Camshaft and Tappet Inspection

S5JB0B1406023

Camshaft

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

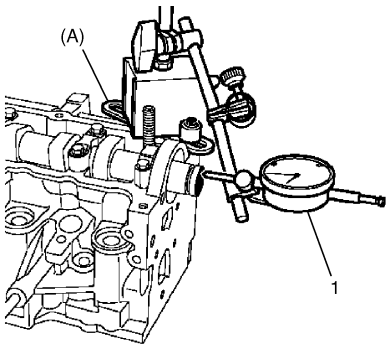


I5JB0B140073-01

Camshaft thrust play

1) Remove all tappets from cylinder head.
2) Install camshaft to cylinder head.
3) Install camshaft housing referring to “Installation” under “Camshaft and Tappet Removal and Installation: ”.
4) Measure camshaft thrust play using special tool and dial gauge (1) as shown in figure.If measured thrust play is out of specification, replace camshaft and/or cylinder head.

Camshaft thrust play
0.045 – 0.135 mm (0.00178 – 0.00531 in.)



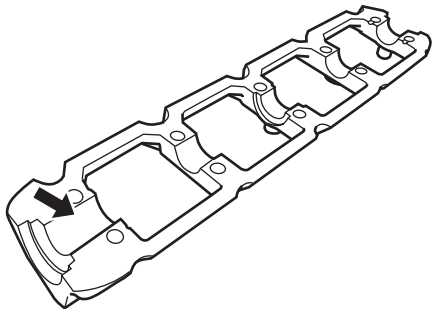
I5JB0B140074-01

Cam Wear

Using a micrometer, measure cam height “a”. If measured height underruns its limit, replace camshaft.

Camshaft Journal Wear

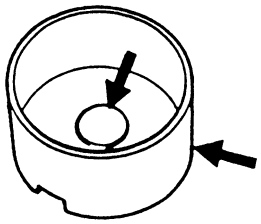
Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.
If any malcondition is found, replace camshaft or cylinder head with housing. Never replace cylinder head without replacing housings.



I5JB0B140075-01

Wear of Tappet

Check tappet for pitting, scratches, or damage.
If any malcondition is found, replace.



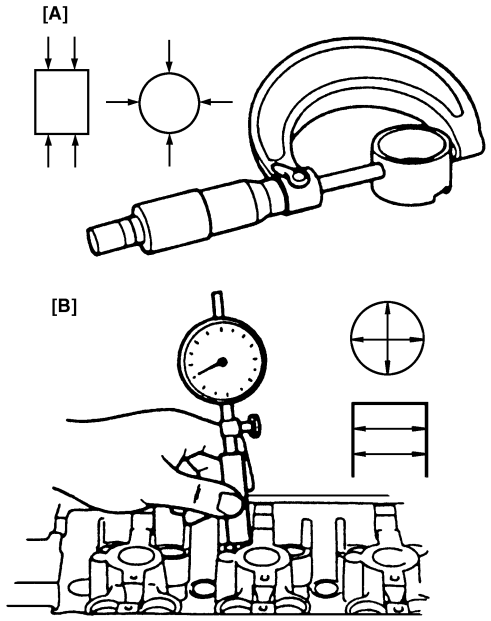
I5JB0B140133-01

Measure cylinder head bore and tappet outside diameter to determine cylinder head-to-tappet clearance. If measured clearance is out of specification, replace tappet and/or cylinder head.

Cylinder head to tappet clearance
0.015 – 0.074 mm (0.00059 – 0.00291 in.)

Tappet outside diameter [A]
34.965 – 34.985 mm (1.37658 – 1.37736 in.)

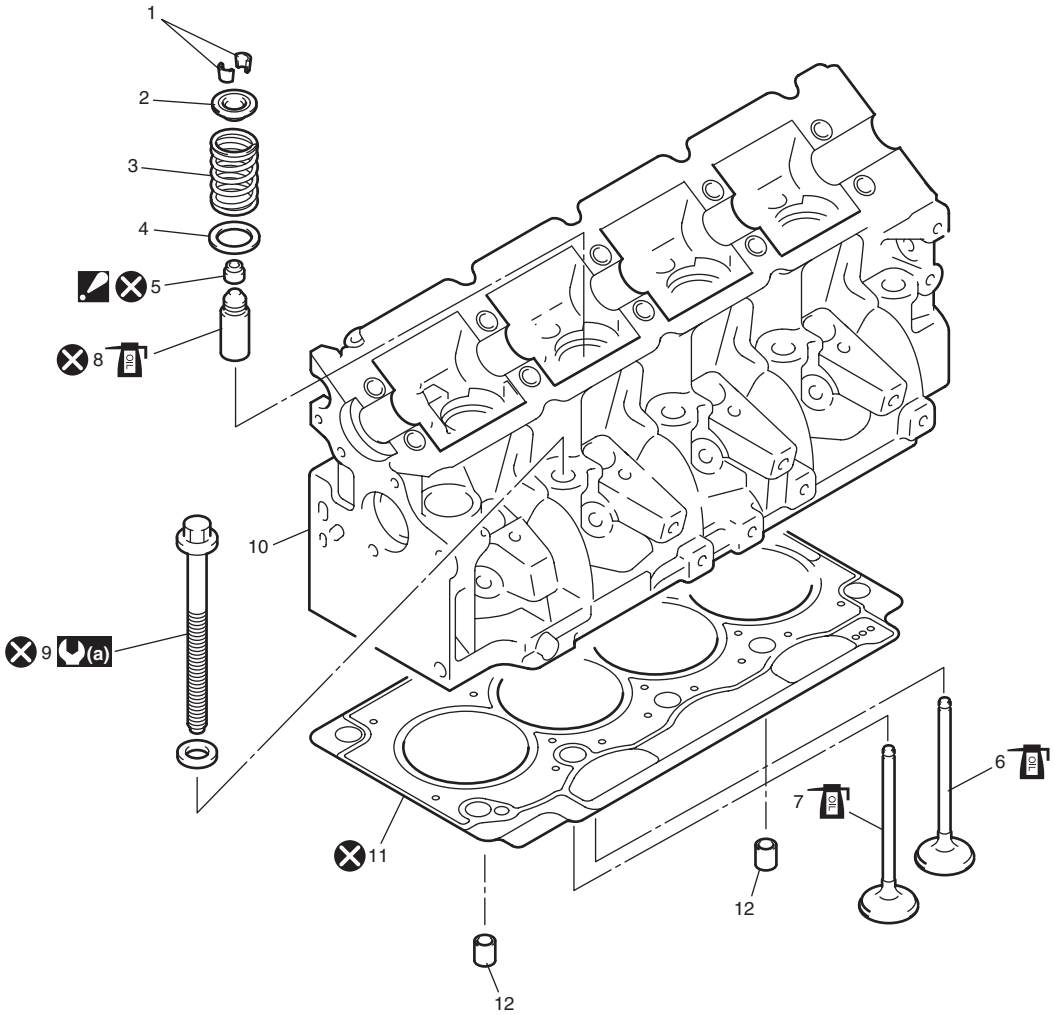
Cylinder head tappet bore [B]
35.000 – 35.039 mm (1.37796 – 1.37948 in.)



I2RH0B140086-01

Valve and Cylinder Head Assembly Components

S5JB0B1406024



I5JB0B140076-01

1. Valve cotter	6. Intake valve	11. Cylinder head gasket
2. Valve spring retainer	7. Exhaust valve	12. Dowel pin

3. Valve spring	8. Valve guide	(a) : Tighten 30 N·m (3.0 kgf-m, 22.0 lb-ft), 100°, 0 N·m (0.0 kgf-m, 0.0 lb-ft), 25 N·m (2.5 kgf-m, 18.0 lb-ft) and 213° by the specified procedure.
4. Valve stem seat	9. Cylinder head bolt	: Do not reuse.
5. Valve stem seal : Do not lubricate valve stem seal before fitting.	10. Cylinder head	: Apply engine oil to sliding surface of each part.

Valve and Cylinder Head Assembly Removal and Installation

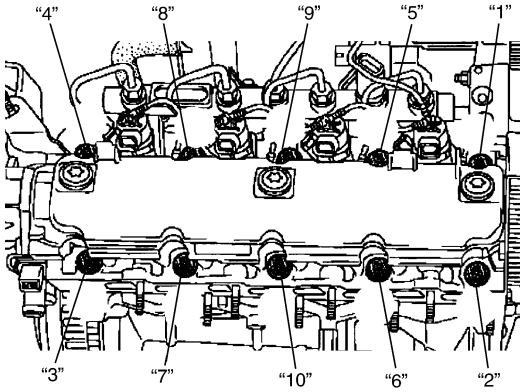
S5JB0B1406062

Removal

1) Remove engine assembly referring to “Engine Assembly Removal and Installation: ”.
2) Remove timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: ”.
3) Remove turbocharger referring to “Turbocharger Assembly Removal and Installation: ”.
4) Remove EGR cooler referring to “EGR Pipe and EGR Cooler Removal and Installation: ”.
5) Remove oil separator referring to “Oil Separator Removal and Installation: ”.
6) Remove EGR valve referring to “EGR Valve Removal and Installation: ”.
7) Remove ventilation pipe No.2 referring to “Oil Separator Components: ”.
8) Remove injection pump rear bracket referring to “Injection Pump Removal and Installation: in Section 1G”, if necessary.
9) Loosen cylinder head bolts in numerical order (“1” through “10”) as shown in figure, and remove them.

⚠ CAUTION

Never reuse cylinder head bolts once removed it due to plastic deformation tightening. Be sure to use new cylinder head bolts when installing.

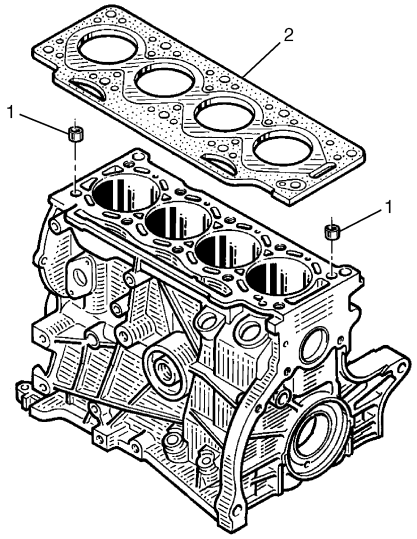


I5JB0B140077-02

10) Check all around cylinder head for any other parts required to be removed or disconnected, and remove or disconnect whatever necessary.
11) Remove cylinder head and cylinder head gasket from cylinder block.
12) Remove dowel pins, if necessary.
13) Remove vacuum pump referring to “Vacuum Pump Removal and Installation: ”, if necessary.
14) Remove thermostat assembly referring to “Thermostat Assembly Removal and Installation: in Section 1F”, if necessary.
15) Remove intake and exhaust manifolds referring to “Intake Manifold and Exhaust Manifold Removal and Installation: ”, if necessary.
16) Remove camshaft and tappets referring to “Camshaft and Tappet Removal and Installation: ”, if necessary.
17) Remove fuel injector referring to “Fuel Injector Removal and Installation: in Section 1G”, if necessary.
18) Remove injection pump referring to “Injection Pump Removal and Installation: in Section 1G”, if necessary.
19) Remove common rail (high pressure fuel injection rail) referring to “Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G”, if necessary.

Installation

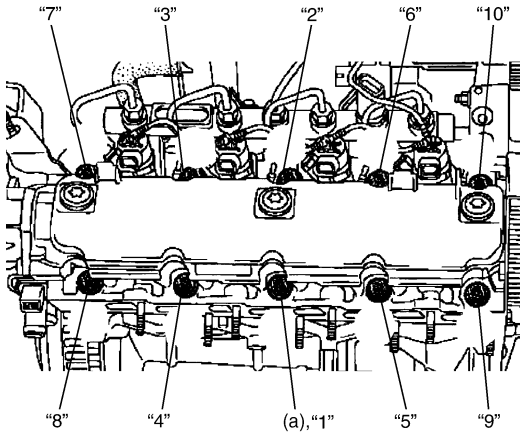
1) Remove oil, old sealant and dust from bolt holes and mating surface of cylinder head and cylinder block.
2) Install camshaft and tappets referring to “Camshaft and Tappet Removal and Installation: ”, if removed.
3) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”, if removed.
4) Install injection pump referring to “Injection Pump Removal and Installation: in Section 1G”, if removed.
5) Install common rail (high pressure fuel injection rail) referring to “Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G”, if removed.
6) Install fuel injector referring to “Fuel Injector Removal and Installation: in Section 1G”, if removed.
7) Install high pressure pipes referring to “High Pressure Pipe Removal and Installation: in Section 1G”, if removed.
8) Install intake and exhaust manifolds referring to “Intake Manifold and Exhaust Manifold Removal and Installation: ”, if removed.
9) Install vacuum pump referring to “Vacuum Pump Removal and Installation: ”, if removed.
10) Install thermostat assembly referring to “Thermostat Assembly Removal and Installation: in Section 1F”, if removed.
11) Install dowel pins (1) to cylinder block, if removed.
12) Install new cylinder head gasket (2) to cylinder block.



I5JB0B140078-01

13) Install cylinder head to cylinder block, and tighten new cylinder head bolts as follows.
    a) Tighten cylinder head bolts to 30 N·m (3.0 kgf-m, 22.0 lb-ft) according to numerical order (“1” through “10”) as shown in figure.
    b) Retighten them by turning through 100° in same manner as Step a).
    c) Wait 3 minutes for setting time.
    d) Loosen cylinder head bolts (“1” and “2”) until they are completely free, and tighten them to 25 N·m (2.5 kgf-m, 18.0 lb-ft), then retighten then by turning through 213°.
    e) Loosen and tighten bolts (“3” and “4”), bolts (“5” and “6”), bolts (“7” and “8”) then bolt (“9” and “10”) in the same manner as Step d).

    Tightening torque
    Cylinder head bolt (a): Tighten 30 N·m (3.0 kgf-m, 22.0 lb-ft), 100°, 0 N·m (0.0 kgf-m, 0.0 lb-ft), 25 N·m (2.5 kgf-m, 18.0 lb-ft) and 213° by the specified procedure



I5JB0B140079-01

14) Install injection pump rear bracket referring to “Injection Pump Removal and Installation: in Section 1G”, if necessary.
15) Install EGR valve referring to “EGR Valve Removal and Installation: ”.
16) Install oil separator referring to “Oil Separator Removal and Installation: ”.
17) Install EGR cooler referring to “EGR Pipe and EGR Cooler Removal and Installation: ”.
18) Install turbocharger referring to “Turbocharger Assembly Removal and Installation: ”.
19) Install ventilation pipe No.2 referring to “Oil Separator Components: ”.
20) Install timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: ”.
21) Install engine assembly referring to “Engine Assembly Removal and Installation: ”.

Valve and Cylinder Head Assembly Inspection

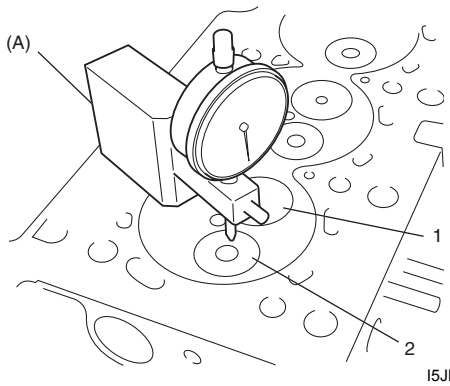
S5JB0B1406063

Cylinder Head Assembly Specifications (for Reference)

Valve and cylinder head specification

Item		Specification
Valve protrusion (valve closed)		– 0.03 to 0.21 mm (– 0.0011 to 0.0082 in.)
Max. valve lift	Intake valve	8.866 mm (0.34895 in.)
	Exhaust valve	10.344 mm (0.40724 in.)

Special tool
(A): 09910–26510



I5JB0B140080-01

1. Intake valve	2. Exhaust valve

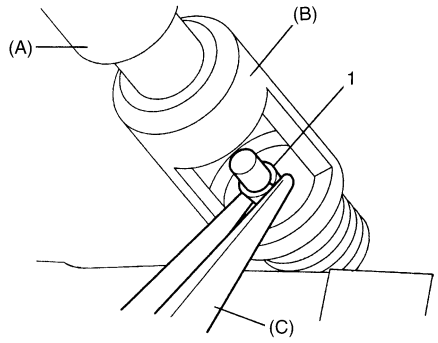
Valve and Cylinder Head Disassembly and Reassembly

S5JB0B1406064

Disassembly

1) Using special tool (A) and (B), compress valve spring, and remove valve cotters (1) also by using special tool (C).

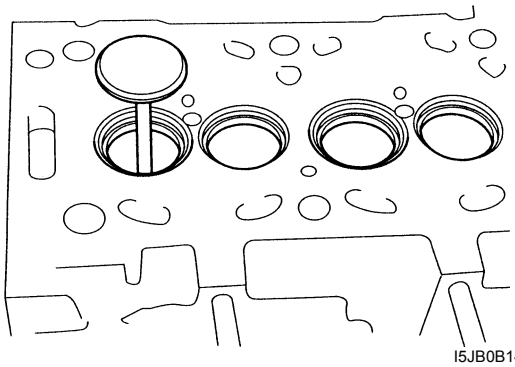
Special tool
(A): 09916–19030
(B): 09916–14521
(C): 09916–84511



I5JB0B140081-01

2) Release special tool and remove spring retainer, valve spring and spring seat from cylinder head.

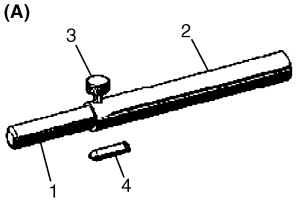
3) Remove valve from combustion chamber side.



I5JB0B140082-01

4) Measure stem seal height as follows in order to install stem seal in specified position.

Special tool
(A): 09917–96530

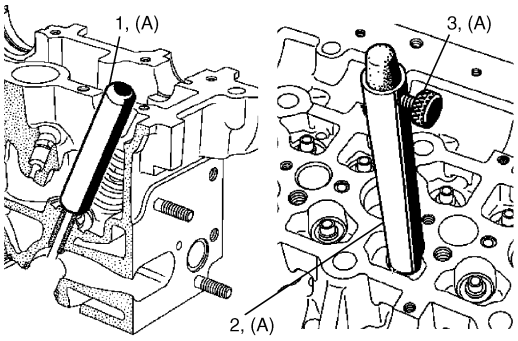


I5JB0B140083-02

1. Pushrod	3. Screw
2. Tube	4. Fitting

a) Fit pushrod (1) of special tool on valve stem seal.

b) Fit guide tube (2) of special tool over pushrod (1) until guide tube comes into contact with cylinder head, and lock pushrod with screw (3).

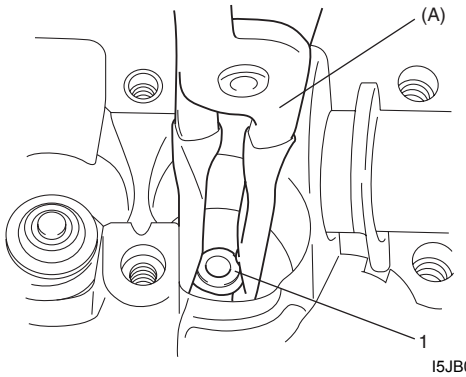


I5JB0B140084-01

c) Remove special tool.

5) Remove stem seal (1) from valve guide using special tool.

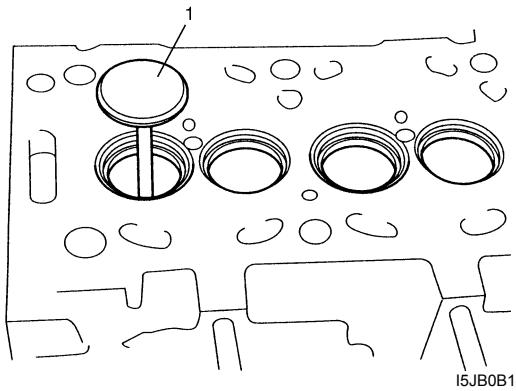
Special tool
(A): 09916–48110



I5JB0B140085-01

Reassembly

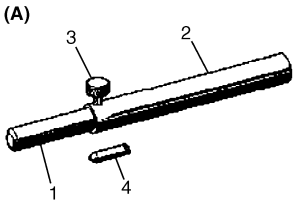
1) Apply engine oil to valve guide bore and valve stem, and install valve (1) to valve guide.



I5JB0B140086-01

2) Install valve stem seal using special tool (A) as follows.

Special tool
(A): 09917–96530



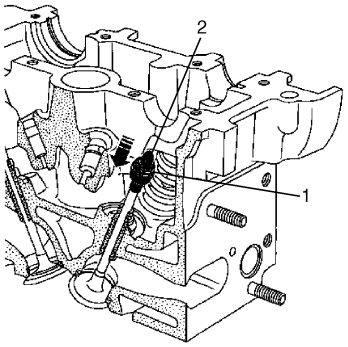
I5JB0B140083-02

1. Pushrod	3. Screw
2. Tube	4. Fitting

a) Install fitting (2) to valve stem in order to prevent stem seal from damage, and install stem seal (1) to valve stem.

NOTE

- **Be sure to remove special tool after installing stem seal.**
- **Do not lubricate the valve stem seal before fitting.**



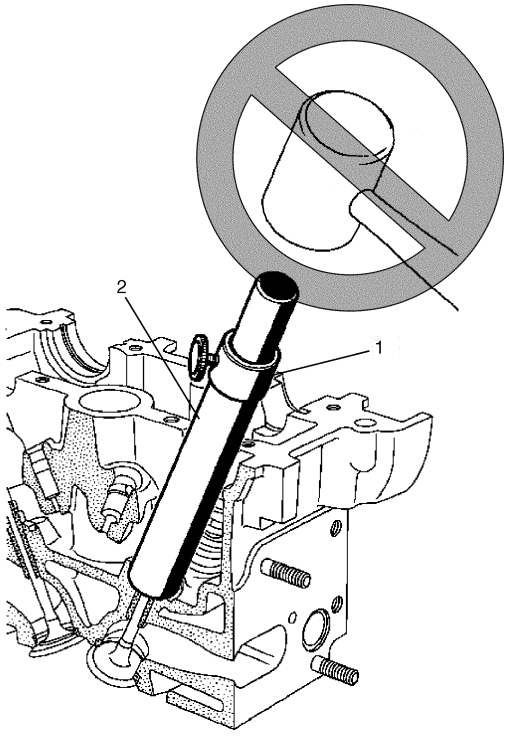
I5JB0B140134-01

b) Place pushrod (1) which is measured stem seal height in removal.

c) Press into stem seal tapping top of pushrod (1) by hand until tube (2) touches cylinder head.

⚠ CAUTION

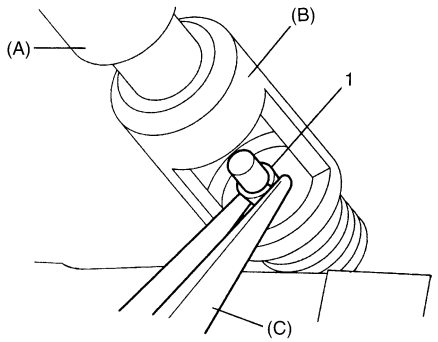
Do not tap pushrod (1) by hammer.It may result in misinstalling of stem seal and damage of special tool.



I5JB0B140087-01

3) Install spring seat, valve spring and spring retainer.
4) Using special tool (A) and (B), compress valve spring. And, fit two valve cotters (1) into groove of valve stem using special tool (C) as shown in figure.

Special tool
(A): 09916–19030
(B): 09916–14521
(C): 09916–84511



I5JB0B140081-01

Valves and Valve Guides Inspection

S5JB0B1406027

Valve Guide

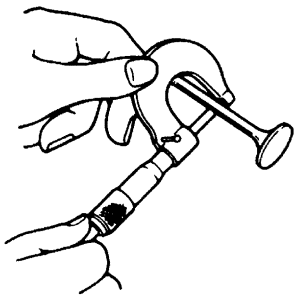
Valve stem-to-guide clearance
Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance.
Be sure to take reading at more than one place along the length of each stem and guide.
If clearance is out specification, replace valve and valve guide.

Valve stem diameter [A]
In: 6.974 – 6.996 mm (0.27457 – 0.27543 in.)
Ex: 6.960 – 6.982 mm (0.27402 – 0.27488 in.)

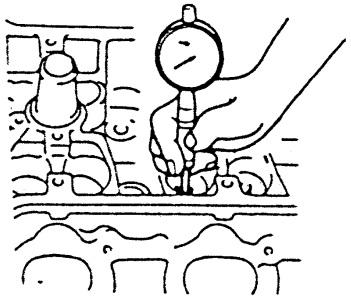
Valve guide bore [B]
In: 7.000 – 7.022 mm (0.27560 – 0.27645 in.)
Ex: 7.000 – 7.022 mm (0.27560 – 0.27645 in.)

Stem-to-guide clearance
In: 0.004 – 0.048 mm (0.00016 – 0.00188 in.)
Ex: 0.018 – 0.062 mm (0.00071 – 0.00244 in.)

[A]



[B]



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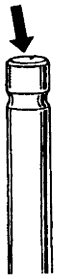
Valve

Visual inspection

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem end, as necessary, replace it.
- Inspect valve stem end face for pitting and wear. If pitting or wear is found there, valve stem end may be resurfaced, but not too much to grind off its chamber. When it is worn out too much that its chamber is gone, replace valve.

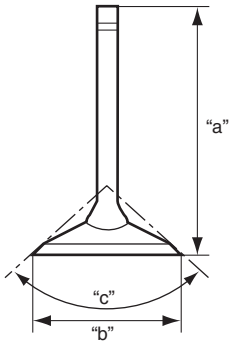


I2RH01140135-01

Valve and Related Parts Specifications (for Reference)

Valve

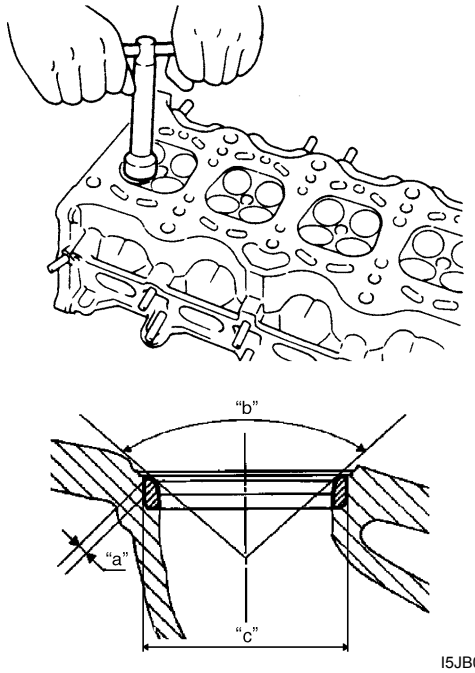
Item		Specification
Valve length “a”	Intake valve	110.79 – 111.19 mm (4.3619 – 4.3775 in.)
	Exhaust valve	110.59 – 110.99 mm (4.3540 – 4.3696 in.)
Valve head diameter “b”	Intake valve	35.20 – 35.45 mm (1.3859 – 1.3956 in.)
	Exhaust valve	32.50 – 32.75 mm (1.2796 – 1.2893 in.)
Valve face angle “c”		90°



I5JB0B140088-02

Valve seat

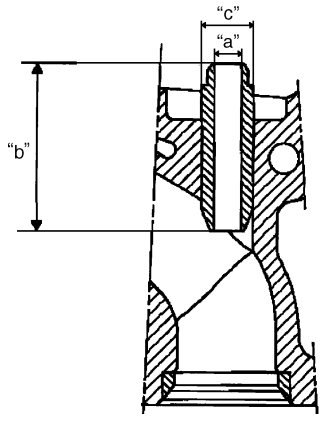
Item		Specification
Valve seat width “a”		1.8 mm (0.071 in.)
Valve seat angle “b”		89.5°
Valve seat outside diameter “c”	Intake valve	36.967 – 36.983 mm (1.45540 – 1.45602 in.)
	Exhaust valve	33.589 – 33.605 mm (1.32240 – 1.32303 in.)



I5JB0B140089-02

Valve guide

Item	Specification
Valve guide bore “a” (supply parts)	6.30 – 6.42 mm (0.2481 – 0.2527 in.)
Valve guide length “b”	38.10 – 38.40 mm (1.5000 – 1.5118 in.)
Valve guide outside diameter “c”	12.050 – 12.068 mm (0.47441 – 0.47511 in.)



I5JB0B140090-01

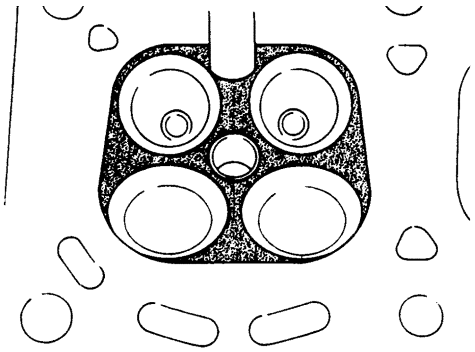
Cylinder Head Inspection

S5JB0B1406028

- Remove all carbon deposits from combustion chambers.

NOTE

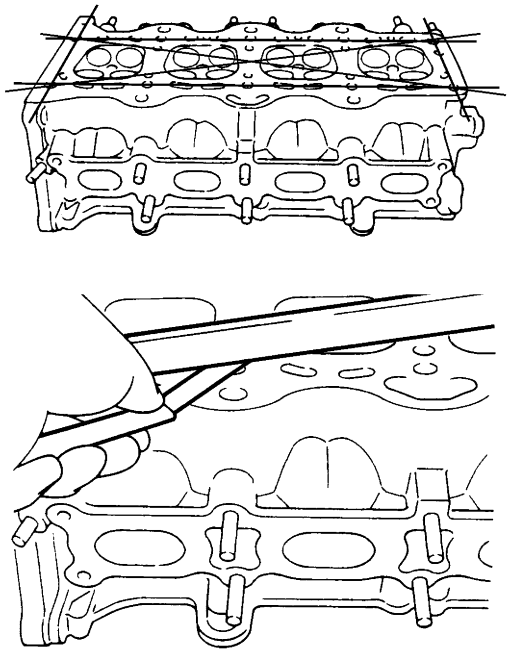
Do not use any sharp-edged tool to scrape off carbon deposits. Be careful not to scuff or nick metal surfaces when decarbonizing. The same applies to valves and valve seats, too.



I2RH0B140105-01

- 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 6 locations. If distortion limit is exceeded, replace cylinder head.
  Leakage of combustion gases from this gasketed joint is often due to warped gasketed surface: such leakage results in reduced power output.

Distortion for cylinder head surface on piston side
Limit: 0.05 mm (0.0020 in.)

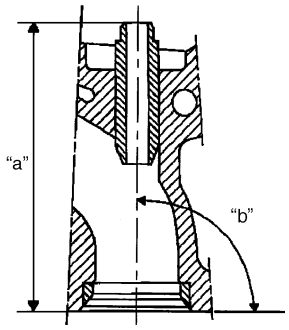


I2RH0B140106-01

Cylinder Head and Related Parts Specification (for Reference)

Cylinder head with valve guide

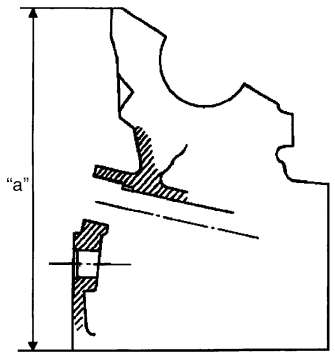
Item	Specification
Valve guide position “a”	80.65 – 81.45 mm (3.1752 – 3.2066 in.)
Valve guide angle “b”	90°



I5JB0B140091-01

Cylinder head

Item		Specification
Cylinder head height “a”		161.00 – 164.50 mm (6.3386 – 6.4763 in.)
Valve seat housing inside diameter “b”	Intake valve	36.877 – 36.907 mm (1.45185 – 1.45303 in.)
	Exhaust valve	33.500 – 33.529 mm (1.31890 – 1.32003 in.)
Valve guide housing inside diameter “c”		11.95 – 11.98 mm (0.4705 – 0.4716 in.)



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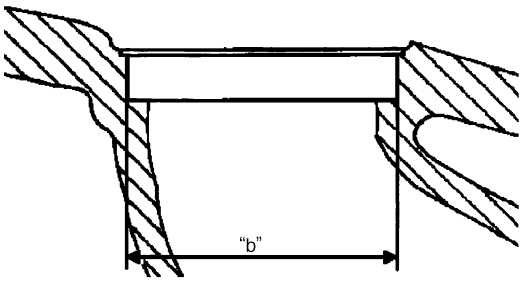

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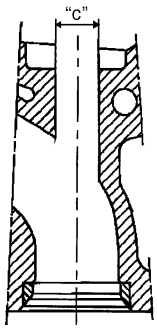

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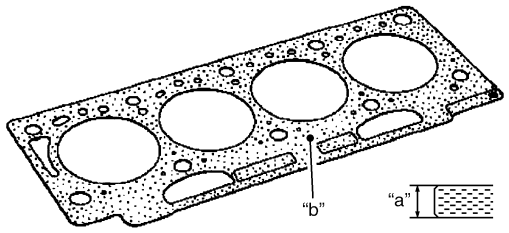
Cylinder head gasket

Item	Specification
Cylinder head gasket thickness “a”	1.27 – 1.37 mm (0.0500 – 0.0539 in.)



I5JB0B140095-01

“b”: Measured point

Valve Spring Inspection

S5JB0B1406029

Valve Spring Free Length and Preload

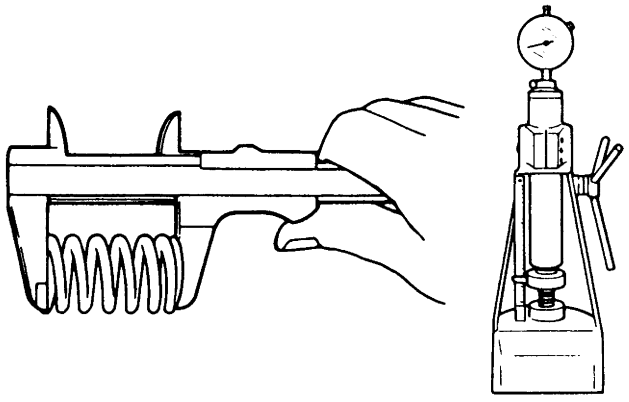
Referring to data, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Valve spring free length

44 – 48 mm (1.74 – 1.88 in.)

Valve spring preload

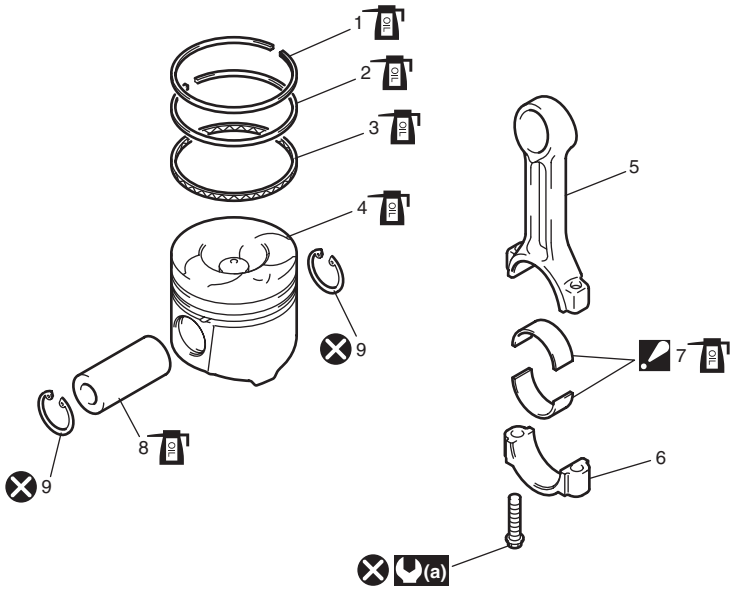
27 N (2.7 kg, 6.0 lb) for 37.5 mm (1.476 in.)
61.4 N (6.14 kg, 13.5 lb) for 27.5 mm (1.083 in.)



I2RH01140143-01

Piston, Piston Ring, Connecting Rod and Cylinder Components

S5JB0B1406030



I5JB0B140096-01

1. Top ring	8. Piston pin
2. 2nd ring	9. Piston pin circlip
3. Oil ring	(a) : Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 40° by the specified procedure.
4. Piston	: Apply engine oil to sliding surface of each part.
5. Connecting rod	: Do not reuse.
6. Connecting rod bearing cap : See “A”	“A”: Point arrow mark on cap to fly wheel side.
7. Connecting rod bearing : See “B”	“B”: Do not apply oil between connecting rod and bearing and between bearing cap and bearing.

Piston, Piston Ring and Connecting Rod Removal and Installation

S5JB0B1406065

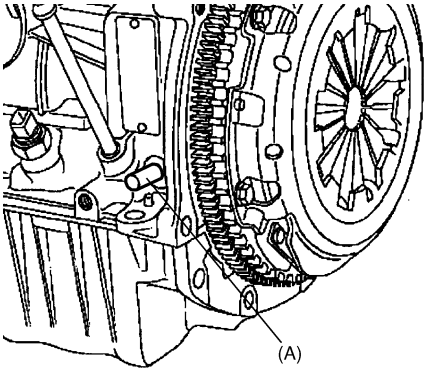
NOTE

- **All parts to be installed must be perfectly clean.**
- **Connecting rods, connecting rod bearings, connecting rod bearing caps, pistons and piston rings are in combination sets. Do not disturb such combination and make sure that each part goes back to where it came from, when installing.**

Removal

1) Remove engine assembly referring to “Engine Assembly Removal and Installation: ”.
2) Remove cylinder head referring to “Valve and Cylinder Head Assembly Removal and Installation: ”.
3) Remove oil pump referring to “Oil Pump, Oil Pump Chain and Gasket Holder Plate Removal and Installation: in Section 1E”.
4) Remove special tool.

Special tool
(A): 09912–46510



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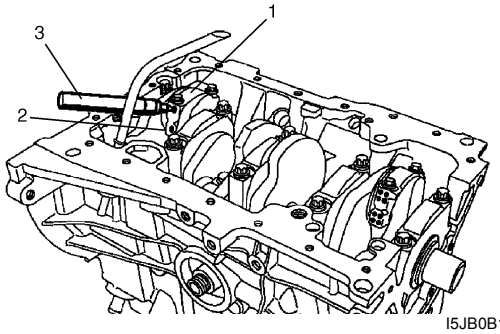
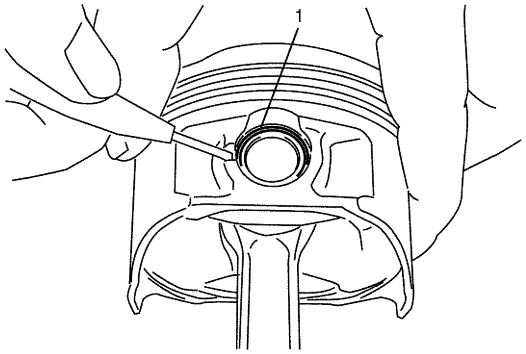
5) Mark cylinder number on all pistons, connecting rods (1) and connecting rod bearing caps (2) using silver pencil or quick drying paint (3) for installation.



I5JB0B140097-01

6) Remove connecting rod bearing caps.
7) Decarbon top of cylinder bore before removing piston from cylinder.
8) Push piston and connecting rod assembly out through the top of cylinder bore.
9) Remove piston pin from connecting rod as follows.
   a) Ease out piston pin circlips (1) as shown in figure.



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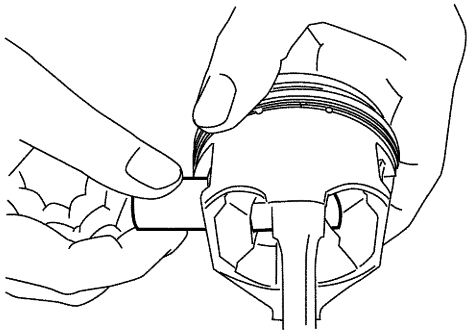
   b) Force piston pin out.

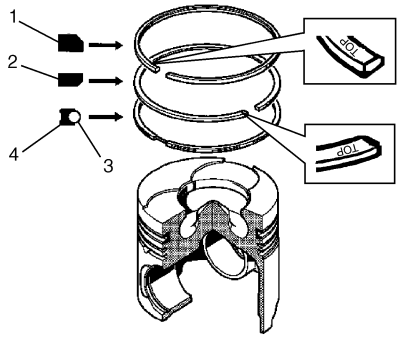


I2RH0B140114-01

10) Remove connecting rod bearings
11) Using piston ring expander, remove two compression rings (1st and 2nd) and oil ring from piston, if necessary.

Installation

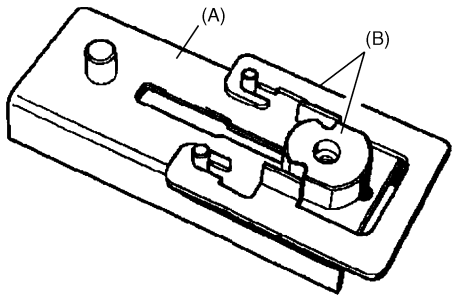
1) Decarbonize piston head and ring grooves using a suitable tool.
2) Install piston ring to piston noting the following, if removed.
   - As indicated in figure. 1st and 2nd rings have “TOP” mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
   - 1st ring (1) differs from 2nd ring (2) in thickness, shape and color of surface contacting cylinder wall.
     Distinguish 1st ring from 2nd ring by as shown in figure.
   - When installing oil ring, install spring ring (3) first and then rail (4).



I5JB0B140098-01

3) Assemble connecting rod bearing to connecting rod / bearing cap as follows.
   a) Install special tool (B) to special tool (A).

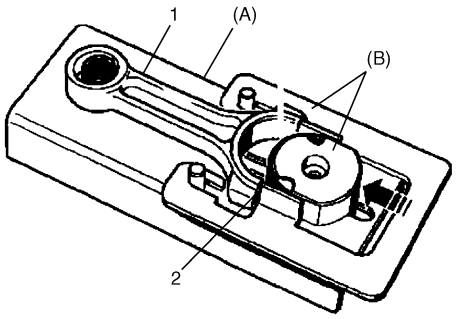
Special tool
(A): 09913–98110
(B): 09913–86520



I5JB0B140099-01

b) Set connecting rod (1) and bearing (2) to special tool (A) and (B) as shown in figure.

c) Install connecting rod bearing to connecting rod by pushing special tool (B) as shown in figure.



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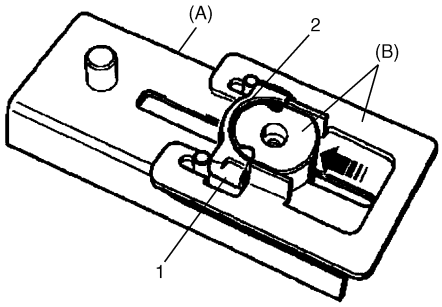
d) Set bearing cap (1) and connecting rod bearing (2) to special tool (A) and (B) as shown in figure.

e) Install bearing to bearing cap by pushing special tool (B) as shown in figure.



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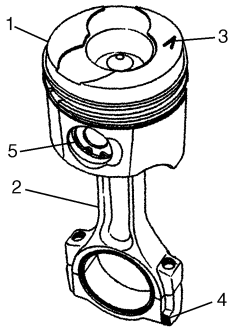
4) Assemble piston and connecting rod with piston pin as follows.

a) Apply engine oil to piston pin and piston pin hole of piston (1) and connecting rod (2).

b) Fit connecting rod to piston so that flat part (4) of connecting rod and arrow mark (3) of piston come on opposite side as shown in figure.

c) Insert piston pin to piston and connecting rod.

d) Install piston pin circlips (5) as shown in figure.



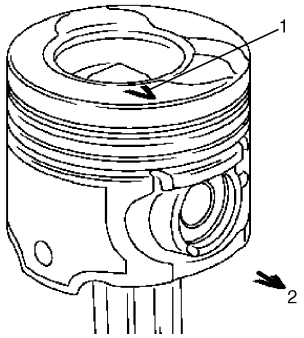
I5JB0B140102-01

5) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crank pins.

NOTE

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

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



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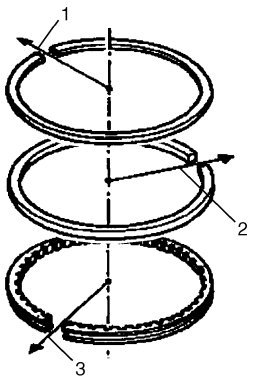
7) Distribute end gaps of three piston rings (1st, 2nd and oil rings) as shown in figure.

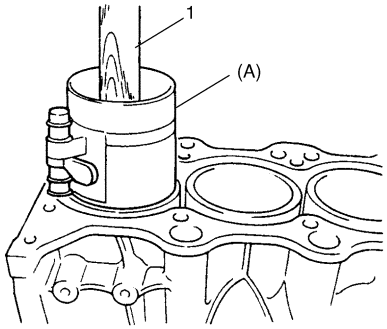


I5JB0B140104-01

1. 1st ring end gap	3. Oil ring end gap
2. 2nd ring end gap	

8) Install piston and connecting rod assembly into cylinder bore with matching cylinder number marked in removal. Use special tool to compress rings. Guide connecting rod into place on crankshaft. Using a hammer handle (1), 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



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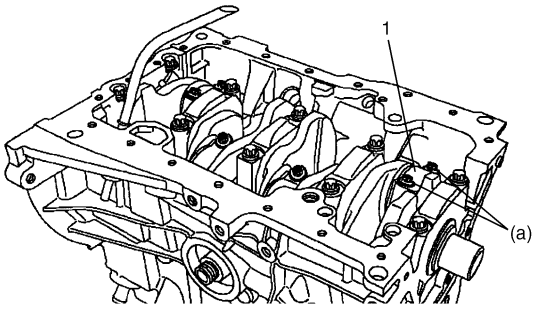
9) Install bearing cap (1) to applicable cylinder with matching cylinder number marked in removal, and tighten new connecting rod bearing cap bolts as follows.
   a) Tighten all new cap bolts to 20 N·m (2.0 kgf-m, 14.5 lb-ft).
   b) Retighten them by turning through 40°.

NOTE

After tightening bearing cap bolts, check to be sure that crankshaft rotates smoothly.

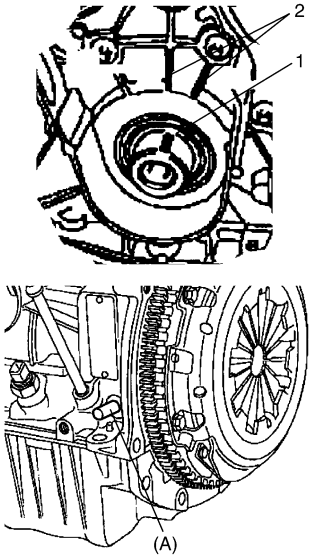
Tightening torque
Connecting rod bearing cap bolt (a): Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 40° by the specified procedure



I5JB0B140105-01

10) Turn crankshaft clockwise until key groove (1) comes in middle of two ribs (2) and install special tool (A) to TDC pin hole.

Special tool
(A): 09912–46510



I5JB0B140138-01

11) Install oil pump referring to “Oil Pump, Oil Pump Chain and Gasket Holder Plate Removal and Installation: in Section 1E”.
12) Install oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E”.
13) Install cylinder head referring to “Valve and Cylinder Head Assembly Removal and Installation: ”.
14) Install timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: ”.
15) Install engine assembly referring to “Engine Assembly Removal and Installation: ”.

Cylinders, Pistons and Piston Rings Inspection

S5JB0B1406033

Cylinder

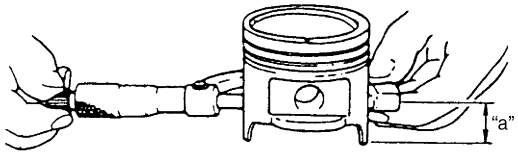
Visual inspection
Inspect cylinder walls for scratches, roughness or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, replace cylinder block.

Piston

Visual inspection
Inspect piston for faults, cracks or other damages. Damaged or faulty piston should be replaced.

Piston diameter
As indicated in the figure, piston diameter should be measured at a position “a” from piston skirt end in the direction perpendicular to piston pin.

Piston diameter specification
79.8585 – 79.8735 mm (3.144036 – 3.144625 in.)



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“a”: 39.0 mm (1.535 in.)

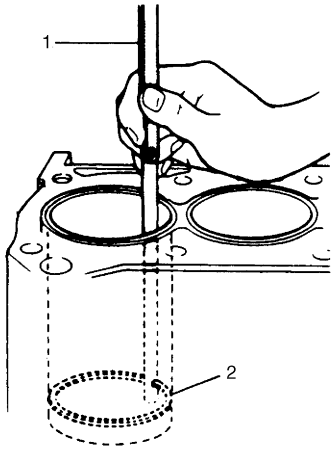
Piston Ring

Piston ring end gap
To measure end gap, insert piston ring (2) into cylinder bore and then measure the gap by using thickness gauge (1).
If measured gap 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 – 0.35 mm (0.0079 – 0.0137 in.)
2nd ring: 0.70 – 0.90 mm (0.0276 – 0.0354 in.)
Oil ring: 0.25 – 0.50 mm (0.0099 – 0.0196 in.)



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Piston and Related Parts Specifications (for Reference)

Piston ring

Item		Specification
Piston ring thickness	1st ring	2.47 – 2.49 mm (0.0973 – 0.0980 in.)
	2nd ring	1.97 – 1.99 mm (0.0776 – 0.0783 in.)
	Oil ring	2.97 – 2.99 mm (0.1170 – 0.1177 in.)

Piston Pins and Connecting Rods Inspection

S5JB0B1406034

Piston Pin

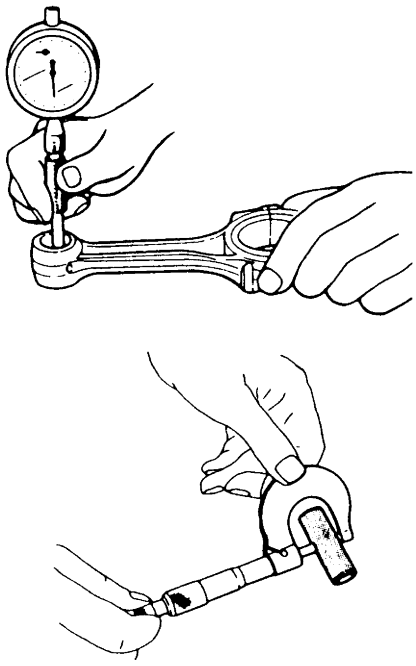
Visual inspection
Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod and/or piston.

Piston pin clearance
Check piston pin clearance in small end and piston. Replace connecting rod and/or piston if its small end is badly worn or damaged or if measured clearance exceeds limit.

Piston pin clearance in connecting rod small end
0.013 – 0.030 mm (0.00052 – 0.00118 in.)

Small-end bore
28.013 – 28.025 mm (1.10288 – 1.10334 in.)

Piston pin dia.
27.995 – 28.000 mm (1.10217 – 1.10236 in.)



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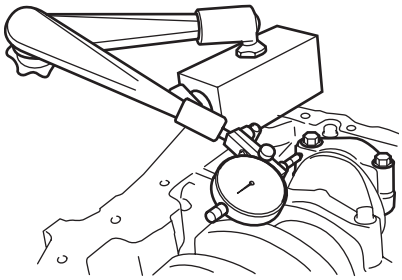
Connecting Rod

Connecting rod thrust play
Check big-end of connecting rod for thrust play, with rod fitted and connected to its crank pin in the normal manner. If measured thrust play is out of specification, replace connecting rod.

Connecting rod big end play
0.220 – 0.482 mm (0.00867 – 0.01897 in.)



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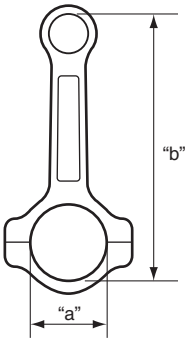
Connecting Rod and Related Parts Specifications (for Reference)

Connecting Rod

Item	Specification
Connecting rod big end bore “a”	51.587 – 51.606 mm (2.03099 – 2.03173 in.)
Connecting rod length “b”	178.80 – 178.91 mm (7.0394 – 7.0397 in.)



I5JB0B140108-02

Piston Pin

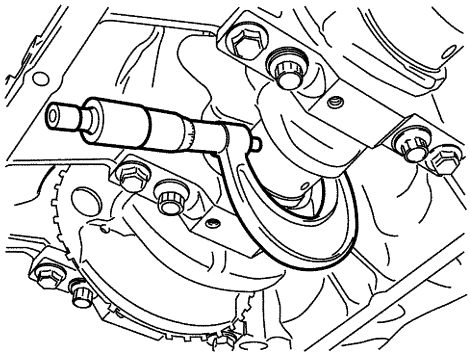
Item	Specification
Piston pin inside diameter	12.8 – 13.1 mm (0.504 – 0.515 in.)
Piston pin length	59.5 – 60.0 mm (2.343 – 2.362 in.)

Crank Pin and Connecting Rod Bearings Inspection

S5JB0B1406035

Crank Pin Diameter
Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged or out-of round or taper is out of specification, replace crankshaft.

Crank pin diameter
48.000 – 48.020 mm (1.88977 – 1.89055 in.)



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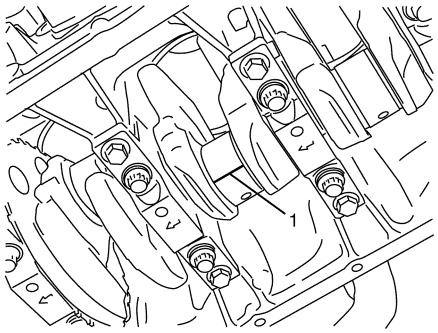
Connecting Rod Bearing Visual Inspection
Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Connecting Rod Bearing Clearance

1) Before checking bearing clearance, clean bearing and crank pin.
2) Install connecting rod bearings referring to Step 3) of “Installation” under “Piston, Piston Ring and Connecting Rod Removal and Installation: ”.
3) Place a piece of gauging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.

NOTE

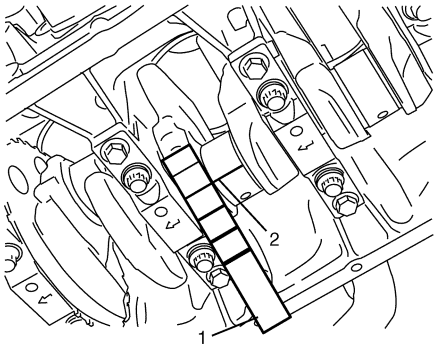
Do not rotate crankshaft while gauging plastic is installed.



I2RH0B140121-01

4) Install bearing cap referring to connecting rod and bearing cap referring to Step 9) of “Installation” under “Piston, Piston Ring and Connecting Rod Removal and Installation: ”.
5) Remove cap, and using a scale (1) on gauging plastic envelope (2), measure gauging plastic (2) width at the widest point (clearance).
If measured clearance is out of specification, use a new connecting rod bearing.
After install new bearing, recheck clearance.

Connecting rod bearing clearance
0.027 – 0.086 mm (0.00107 – 0.00338 in.)



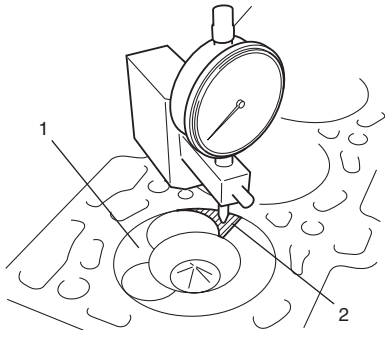
I2RH0B140123-01

6) If clearance can not be brought to its specification even by using a new connecting rod bearing and/or replace crankshaft.

Piston Protrusion

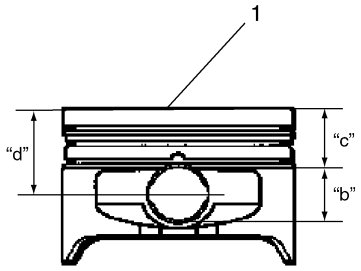
1) Install piston and connecting rod assembly to cylinder block referring to Step 1) through 9) of “Install” under “Piston, Piston Ring and Connecting Rod Removal and Installation: ”.
2) Using special tool and dial gauge, measure piston protrusion at specified position (2) as shown in figure when piston (1) reaches top dead center. Repeat this procedure with each piston.If measured protrusion is out of specification, proceed to next step.

Piston protrusion
“a”: 0.50 – 0.62 mm (0.0197 – 0.0244 in.)



I5JB0B140109-01

3) Check connecting rod length referring to “Connecting Rod and Related Parts Specification (for Reference)” under “Cylinders, Pistons and Piston Rings Inspection: ”.If connecting rod is normal, proceed to next step.
4) Replace piston (1) as follows in order to adjust piston protrusion to specified value.
   a) Remove piston, and measure the following specification.
      - Piston pin hole diameter “b”
      - Distance “c” between top of piston and top of piston pin hole
   b) Obtain distance “d” between top of piston and center of piston pin hole by formula below.
   “d” = “b” / 2 + “c”
   c) Using piston protrusion “a” measured at Step 2), obtain adjusting distance “e” by formula below.
   “e” = “d” + 0.56 mm (0.0220 in.) – “a”
   Example:
   When distance “d” of removed piston is 47.026 mm (1.85142 in.), and measured piston protrusion “a” is 0.45 mm (0.0177 in.)
   Calculated adjusting distance “e” = 47.026 mm (1.85142 in.) + 0.56 mm (0.0220 in.) – 0.45 mm (0.0177 in.) = 47.136 mm (1.85575 in.)



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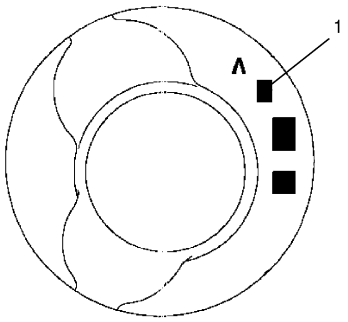
d) Select new piston so that distance “e” is within range of distance “d” of new piston.

NOTE

Piston class (1) is marked on piston top as shown in figure.

Available new piston class

Piston class (1)	Distance “d”
S	47.026 – 47.066 mm (1.85142 – 1.85299 in.)
T	47.068 – 47.108 mm (1.85307 – 1.85464 in.)
U	47.110 – 47.150 mm (1.85473 – 1.85629 in.)



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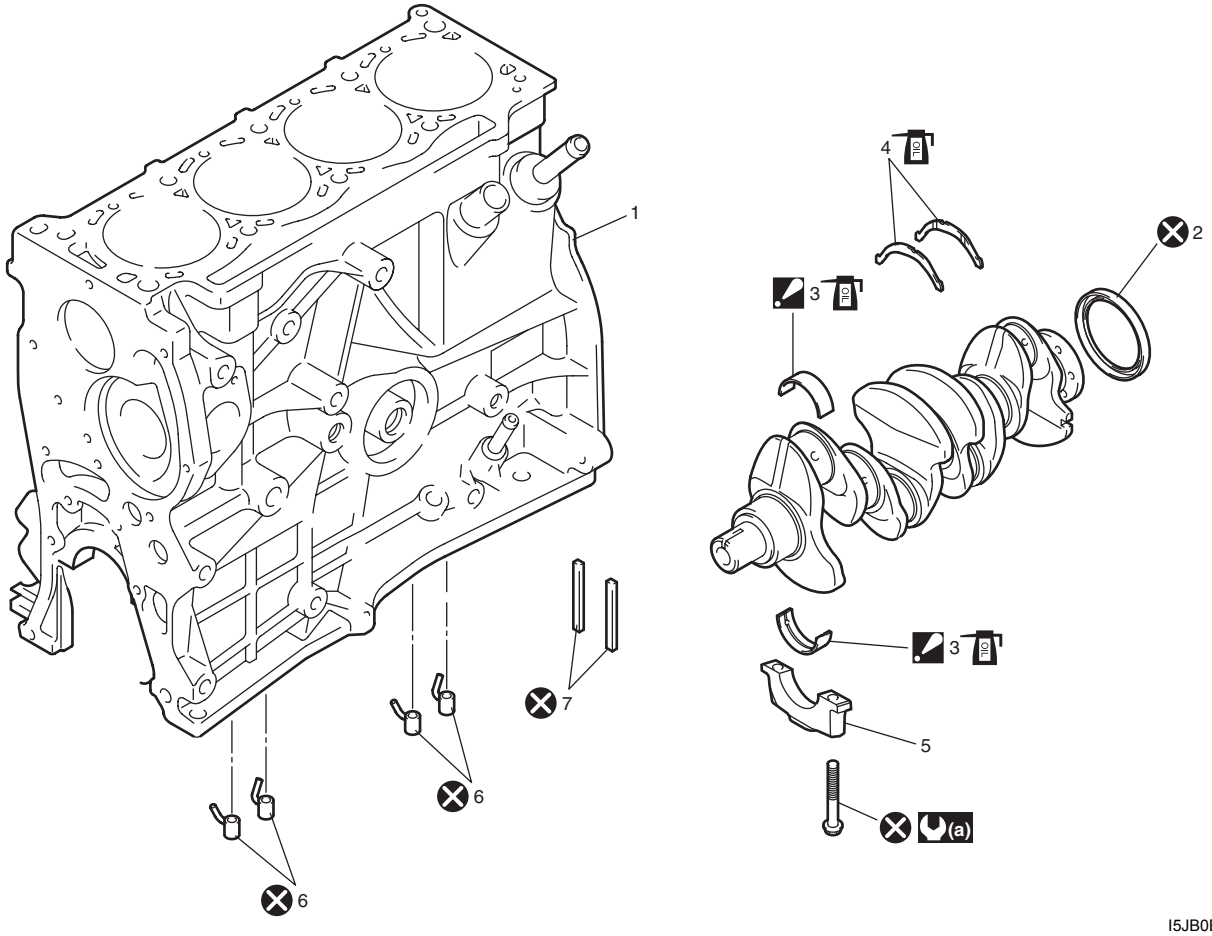
e) Replace piston with selected piston.
f) Check piston protrusion, again.

Main Bearing, Crankshaft and Cylinder Block Component

S5JB0B1406068



I5JB0B140111-01

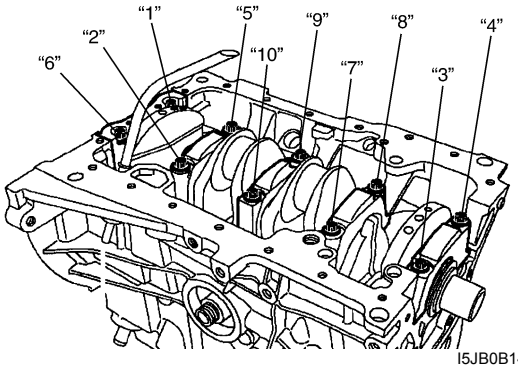
1. Cylinder block	6. Oil jet
2. Flywheel side crankshaft oil seal	7. Bearing cap seal
3. Main bearing : Do not apply oil between cylinder block and bearing and between, main bearing cap and bearing.	(a) : Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 62° by the specified procedure.
4. Thrust bearing	: Do not reuse.
5. Main bearing cap	: Apply engine oil to inside / sliding surface.

Main Bearing, Crankshaft and Cylinder Block Removal and Installation

S5JB0B1406066

Removal

1) Remove piston and connecting rod referring to “Piston, Piston Ring and Connecting Rod Removal and Installation: ”.
2) Remove heat exchanger referring to “Heat Exchanger Removal and Installation: in Section 1E”, if necessary.
3) Loosen main bearing cap bolts in numerical order as indicated in figure, and remove them.

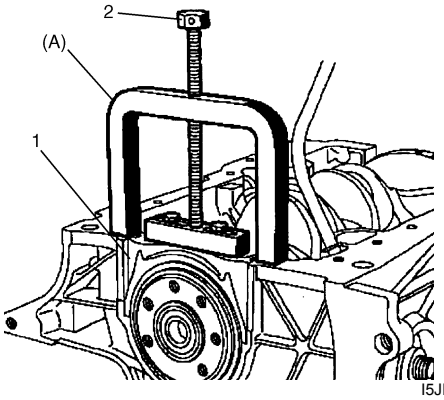


I5JB0B140112-01

4) Remove main bearing cap No.1 using special tool as follows.

Special tool
(A): 09917–56510

a) Install special tool to main bearing cap No.1 (1).
b) Pull out main bearing cap No.1 from cylinder block by tightening bolt (2) of special tool.



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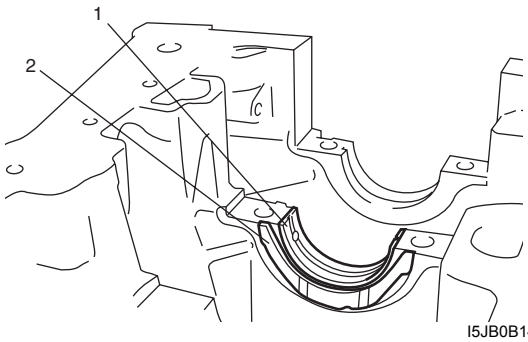
c) Remove main bearing cap from special tool.
5) Remove main bearing caps (No.2 through No.5) and crankshaft from cylinder block.
6) Remove main bearings (1) and thrust bearings (2).



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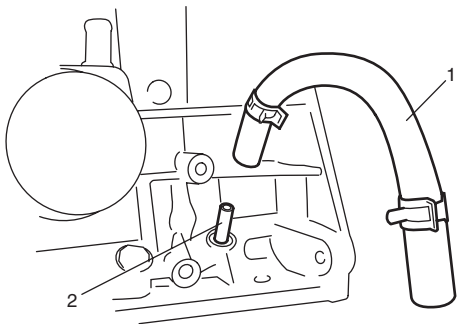
7) Disconnect fresh air vent hose (1), and remove oil fresh air vent pipe (2) from cylinder block, if necessary.

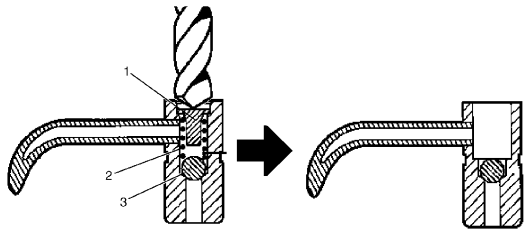


I5JB0B140115-01

8) Remove oil jet as follows, if necessary.
   a) Pack rag into cylinder in order to prevent swart from entering.
   b) Remove spring stop (1) and spring (2) using 7 mm (0.28 in.) diameter drill (4).

⚠ CAUTION

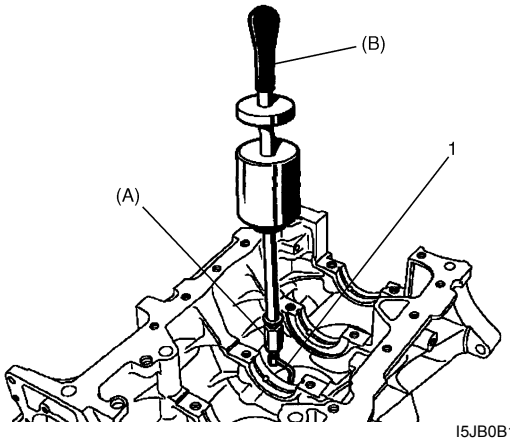
Do not remove ball (3) to prevent swarf from entering lubrication circuit.



I5JB0B140118-01

   c) Desorb swarf from cylinder and oil jet.
   d) Install special tool (A) to drilled hole of oil jet (1).
   e) Remove oil jets from cylinder using special tool (A) and (B).

Special tool
(A): 09916–48120
(B): 09916–58120



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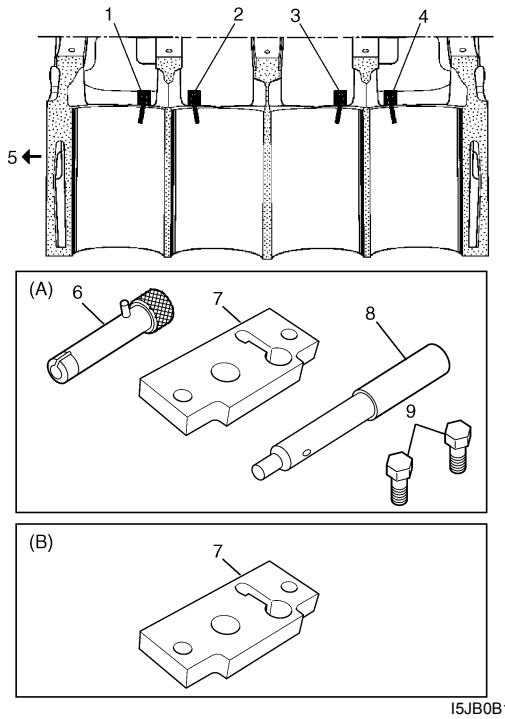
Installation

NOTE

- **Use new bearing cap bolts. They are deformed after tightening once because they are plastic deformation tightening bolts.**
- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, main bearings and thrust bearings.**
- **Main bearings and bearing caps are in combination sets.**
  Do not disturb such combination and make sure that each part goes back to where it came from, when installing.

1) Remove oil, old sealant and dust from mating surface of cylinder block, bearing caps and crankshaft.
2) Using special tool, install oil jets as follows, if removed.

Special tool
(A): 09912–86510
(B): 09912–86520



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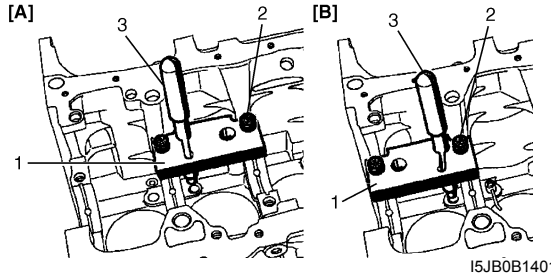
1. Oil jet No.1	4. Oil jet No.4	7. Plate
2. Oil jet No.2	5. Flywheel side	8. Guide rod
3. Oil jet No.3	6. Pushrod	9. Plate bolt

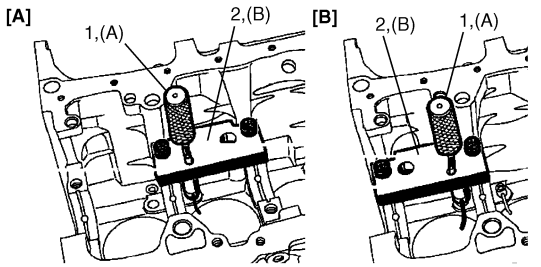
a) Install plate (1) to cylinder block by head tightening plate bolts (2).
b) Install guide rod (3) to plate aligning guide rod end with oil jet hole.
c) Tighten plate bolts, and remove guide rod.



I5JB0B140119-01

[A]: Oil jet No.2 and No.4	[B]: Oil jet No.1 and No.3

d) Insert oil jet into pushrod (1), and install pushrod to plate (2) facing oil jet with center of cylinder.
e) Using hammer, tap pushrod until pushrod (1) comes into contact with plate (2).



I5JB0B140120-01

[A]: Oil jet No.2 and No.4	[B]: Oil jet No.1 and No.3

f) Remove special tools.

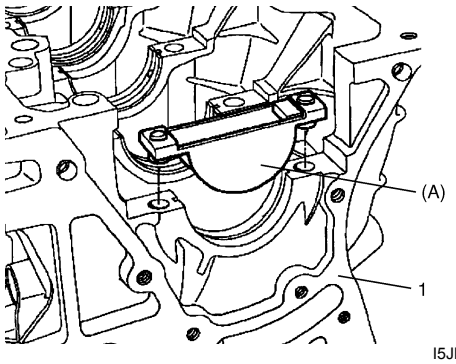
3) Using special tool, install main bearing to cylinder block and bearing cap as follows.

NOTE

One of two halves of main bearing has oil groove. Install main bearing with oil groove to cylinder block, and the other one without oil groove to bearing cap.

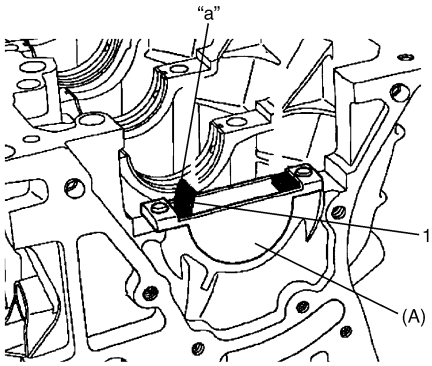
Special tool
(A): 09913–86510

a) Install special tool (A) to cylinder block (1).



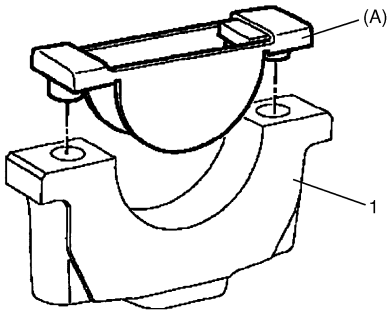
I5JB0B140121-01

b) Fit main bearing (1) in special tool (A) as shown in figure, and then press bearing end “a” until it becomes flush with cylinder block.



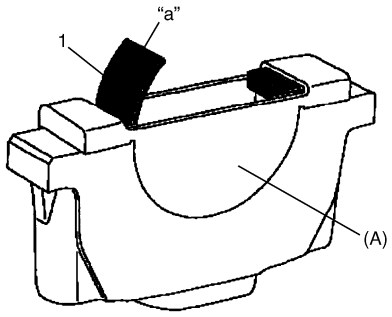
I5JB0B140122-01

c) Install special tool (A) to bearing cap (1).



I5JB0B140123-01

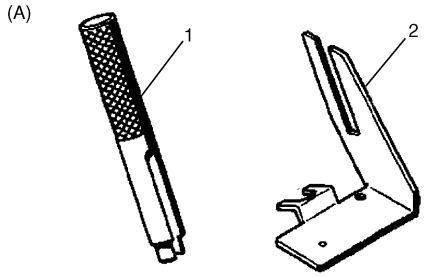
d) Fit main bearing (1) in special tool (A) as shown in figure, and then press bearing end “a” until becomes flush with main bearing cap.



I5JB0B140124-01

4) Install oil fresh air vent pipe using special tool as follows, if removed.

Special tool
(A): 09914–86510



I5JB0B140125-02

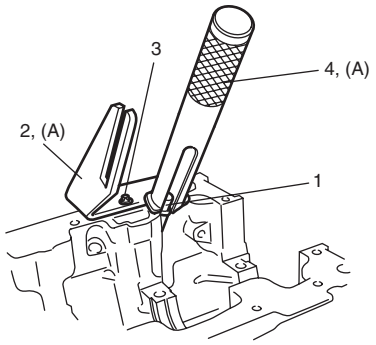
1. Pushrod	2. Jig

a) Install jig (2) to cylinder block, and tighten bolt (3).

NOTE

Be sure to use bolt (1) of M6 size and 1.0 mm (0.039 in.) pitch.

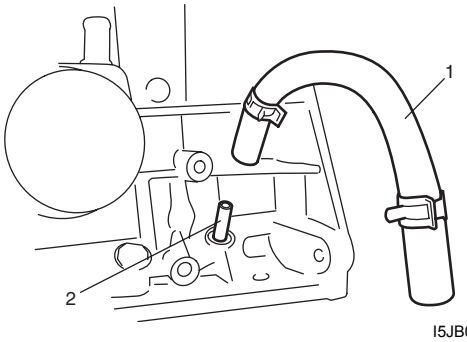
b) Install oil return pipe (1) into pushrod (4).
c) Using hammer, tap pushrod comes into contact jig.



I5JB0B140126-01

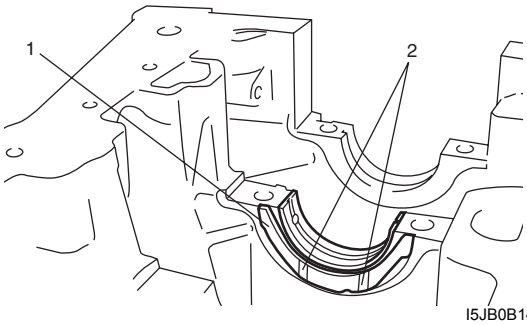
d) Remove special tools.

5) Connect fresh air vent hose (1) to fresh air vent pipe (2), if removed.



I5JB0B140115-01

6) Install thrust bearings (1) to crankshaft journal No.2 facing its oil groove (2) to outside.



I5JB0B140127-01

7) Apply engine oil to bearings and crankshaft.

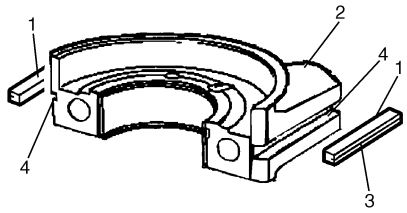
NOTE

Do not apply oil between cylinder block and bearing and between main bearing cap and bearing.

8) Install crankshaft to cylinder block.
9) Install bearing cap seal (1) to main bearing cap No.1 (2) so that groove (3) of bearing cap seal faces outwards.

NOTE

Grooves (4) of bearing cap are different with depth, and two kinds of bearing cap seal with different thickness are supplied. Install thick seal in deep groove, and install thin seal in shallow groove securely.



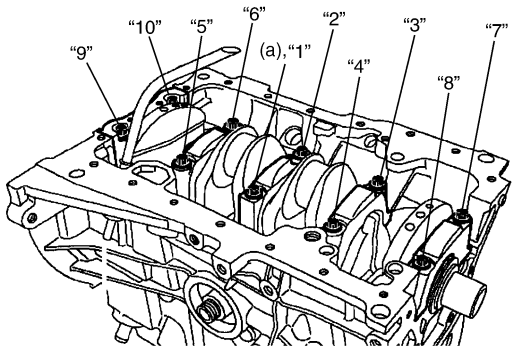
I5JB0B140141-01

10) Install main bearing caps in proper position mating cylinder number marked in removal.
11) Tighten new main bearing cap bolts as follows.
    a) Tighten main bearing cap bolts to 20 N·m (2.0 kgf-m, 14.5 lb-ft) according to numerical order (“1” through “10”) as shown in figure.
    b) Retighten them by turning through 62° in the same manner as step a).

NOTE

After tightening bearing cap bolts, check to be sure that crankshaft rotates smoothly.

Tightening torque
Crankshaft main bearing cap bolt (a): Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 62° by the specified procedure

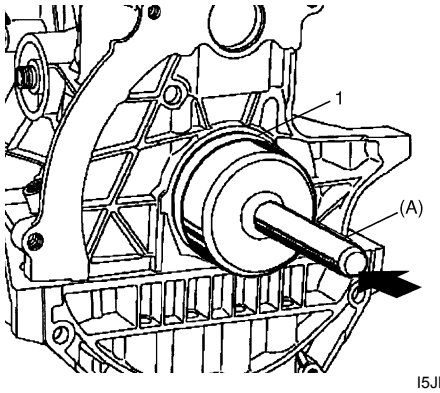


I5JB0B140129-01

12) Cut excess bearing cap seal that protrudes from main bearing cap No.1.
13) Using special tool, install flywheel side crankshaft oil seal as follows.

Special tool
(A): 09911–96530

    a) Fit new oil seal (1) to special tool.
    b) Install oil seal tapping special tool with a plastic hammer.



I5JB0B140130-01

14) Install piston and connecting rod referring to “Piston, Piston Ring and Connecting Rod Removal and Installation: ”.
15) Install cylinder head referring to “Valve and Cylinder Head Assembly Removal and Installation: ”.
16) Install heat exchanger with new gasket referring to “Heat Exchanger Removal and Installation: in Section 1E”, if removed.
17) Install oil pump, oil pump drive sprocket, oil pump chain and gasket holder plate referring to “Oil Pump, Oil Pump Chain and Gasket Holder Plate Removal and Installation: in Section 1E”.
18) Install oil pan and oil pump strainer referring to “Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E”.
19) Install timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: ”.
20) Install engine assembly to vehicle referring to “Engine Assembly Removal and Installation: ”.

Crankshaft Inspection

S5JB0B1406038

Thrust Bearing General Information

Service thrust bearing has 4 kinds of bearings differing in tolerance.

Crankshaft Thrust Play

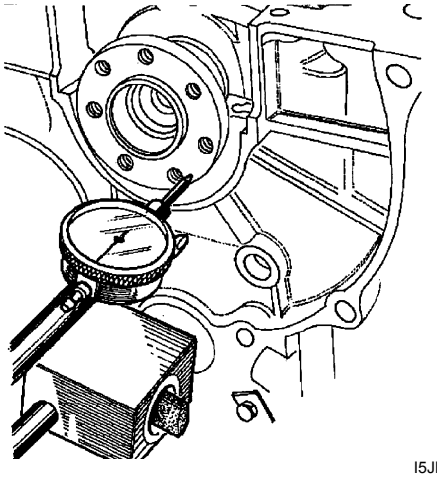
1) Install main bearings, thrust bearings, crankshaft and bearing caps, and tighten main bearing cap bolts referring to “Main Bearing, Crankshaft and Cylinder Block Removal and Installation: ”.

Thickness of crankshaft thrust bearing

- **2.30 mm (0.0906 in.)**
- **2.35 mm (0.0925 in.)**
- **2.40 mm (0.0945 in.)**
- **2.45 mm (0.0965 in.)**

2) Use a dial gauge, to read displacement in axial (thrust) direction of crankshaft.
If it is out of specification, replace new thrust bearing and recheck.

Crankshaft thrust play
0.067 – 0.233 mm (0.00264 – 0.00917 in.)



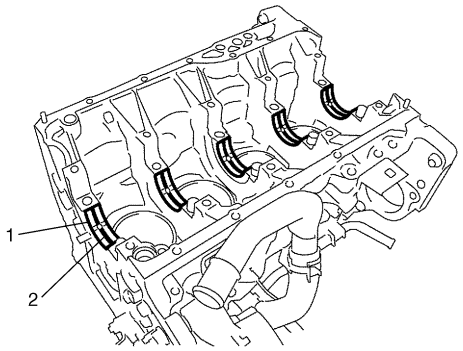
I5JB0B140131-01

Main Bearings Inspection

S5JB0B1406039

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 an oil groove.



I2RH0B140139-01

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.

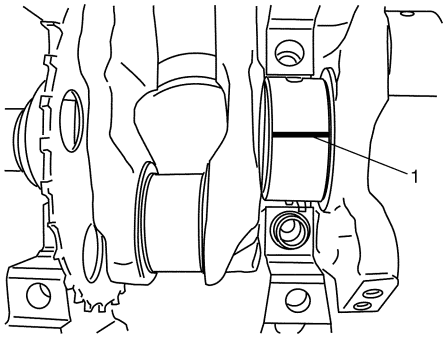
Main Bearing Clearance

NOTE

Do not rotate crankshaft while gauging plastic is installed.

Check clearance by using gauging plastic according to the following procedure.

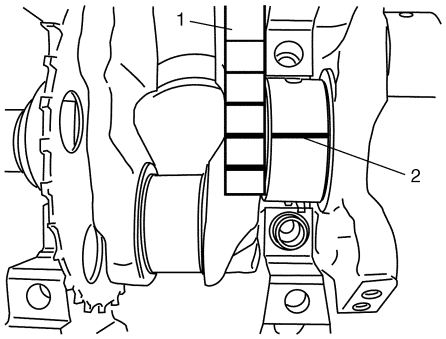
1) Remove bearing caps.
2) Clean bearings and main journals.
3) Place a piece of gauging plastic (1) the full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.



I2RH0B140140-01

4) Install main bearing caps referring to “Main Bearing, Crankshaft and Cylinder Block Removal and Installation: ”.
5) Remove bearing caps and using scale (1) on gauging plastic envelop (2), measure gauging plastic width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
   A new main bearing may produce proper clearance. If not, replace crankshaft and/or cylinder block.

   Main bearing clearance
   0.027 – 0.086 mm (0.00107 – 0.00338 in.)



I2RH0B140141-01

Specifications

Tightening Torque Specifications

S5JB0B1407001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Intercooler inlet hose clamp	4.5	0.45	3.5	☞ / ☞
Intercooler outlet hose clamp	4.5	0.45	3.5	☞
Air intake pipe bolt and nut	21	2.1	15.5	☞
Intercooler outlet pipe clamp	4.5	0.45	3.5	☞
Cylinder head cover bolt	Tighten 12 N·m (1.2 kgf-m, 9.0 lb-ft) by the specified procedure			☞
Injector cover bolt	8	0.8	6.0	☞
Timing belt cover No.2 bolt	55	5.5	40.0	☞ / ☞
Oil separator bolt	25	2.5	18.5	☞
Vacuum pump bolt	23	2.3	17.0	☞
Timing belt tensioner plate bolt	10	1.0	7.5	☞
Timing belt tensioner pulley nut	45	4.5	32.5	☞
Crankshaft pulley bolt	Tighten 40 N·m (4.0 kgf-m, 29.0 lb-ft) and 110° by the specified procedure			☞
TDC pin cap	20	2.0	14.5	☞
Inlet hose clamp	2.5	0.25	2.0	☞
EGR valve bolt	25	2.5	18.0	☞
EGR cooler bolt	25	2.5	18.5	☞
EGR pipe bolt	18	1.8	13.0	☞
EGR pipe stiffener bolt (with washer)	11	1.1	8.0	☞
EGR pipe stiffener bolt (without washer)	9	0.9	7.0	☞
EGR joint bolt	25	2.5	18.5	☞
Clamp bolt	5	0.5	4.0	☞
Exhaust manifold heat shield bolt	11	1.1	8.0	☞ / ☞
Turbocharger lubrication pipe union nut	36	3.6	26.5	☞
Turbocharger lubrication pipe union bolt (turbocharger side)	16	1.6	12.0	☞
Turbocharger water inlet pipe union bolt	29	2.9	21.0	☞
Turbocharger water outlet pipe union bolt	29	2.9	21.0	☞
Turbocharger nut	37	3.7	27.0	☞
Turbocharger inlet pipe clamp	16	1.6	12.0	☞
Turbocharger stiffener bolt	21	2.1	15.5	☞
Turbocharger lubrication pipe union bolt (cylinder block side)	44	4.4	32.0	☞
Turbocharger lubrication pipe stiffener bolt	25	2.5	18.0	☞
Oil return pipe No.1 bolt	12	1.2	9.0	☞
Oil return pipe No.1 stiffener bolt	12	1.2	9.0	☞
Oil return pipe No.2 bolt	12	1.2	9.0	☞

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Turbocharger outlet hose clamp (turbocharger side)	5	0.5	4.0	☞
Intake and exhaust manifolds nut	Tighten 28 N·m (0.8 kgf-m, 6.0 lb-ft) by the specified procedure			☞
Engine hanger bolt	25	2.5	18.5	☞
Timing belt inner cover bolt	10	1.0	7.5	☞
Camshaft housing bolt	Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) by the specified procedure			☞
Camshaft pulley bolt	60	6.0	43.5	☞
Cylinder head bolt	Tighten 30 N·m (3.0 kgf-m, 22.0 lb-ft), 100°, 0 N·m (0.0 kgf-m, 0.0 lb-ft), 25 N·m (2.5 kgf-m, 18.0 lb-ft) and 213° by the specified procedure			☞
Connecting rod bearing cap bolt	Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 40° by the specified procedure			☞
Crankshaft main bearing cap bolt	Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 62° by the specified procedure			☞

NOTE

The specified tightening torque is also described in the following.
“Air Cleaner Components: ”
“Intercooler and Air Intake Pipe Components: ”
“Cylinder Head Cover Components: ”
“Oil Separator Components: ”
“Timing Belt and Belt Tensioner Components: ”
“Engine Mounting Components: ”
“EGR Valve Components: ”
“Turbocharger Components: ”
“Intake Manifold and Exhaust Manifold Components: ”
“Camshaft and Tappet Components: ”
“Valve and Cylinder Head Assembly Components: ”
“Piston, Piston Ring, Connecting Rod and Cylinder Components: ”
“Main Bearing, Crankshaft and Cylinder Block Component: ”

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

Special Tools and Equipment

Recommended Service Material

S5JB0B1408001

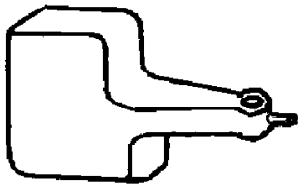
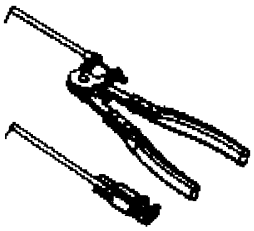
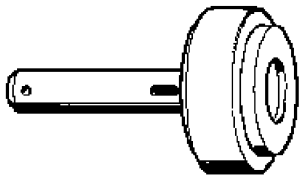
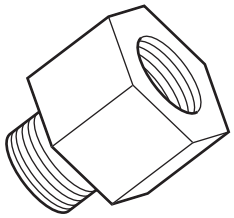
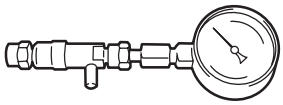
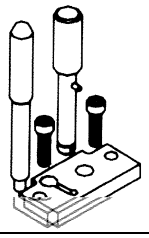
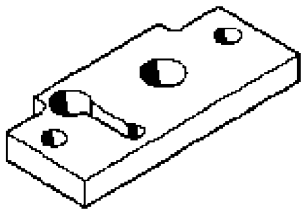
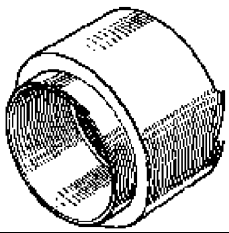
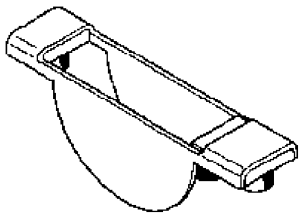
Material	SUZUKI recommended product or Specification		Note
Loctite 518®	Loctite 518®	—	☞
Loctite FRENETANCH®	Loctite FRENETANCH®	—	☞
Loctite rhodorseal 5661®	Loctite rhodorseal 5661®	—	☞

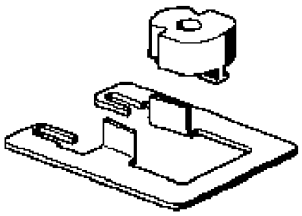
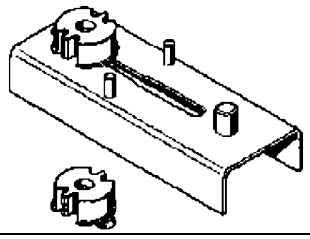
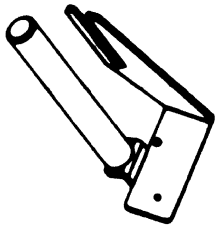
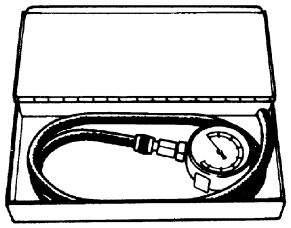
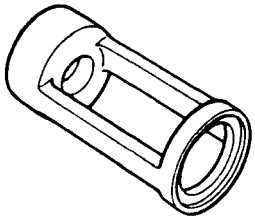
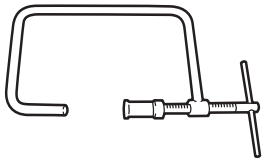
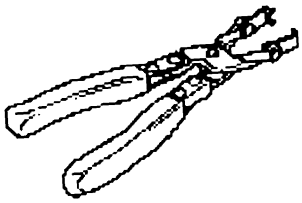
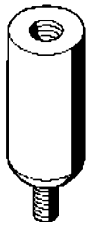
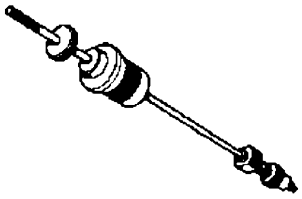
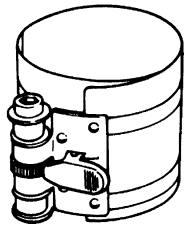
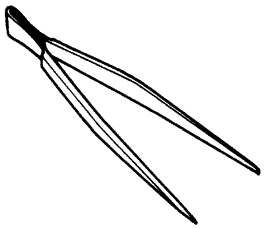
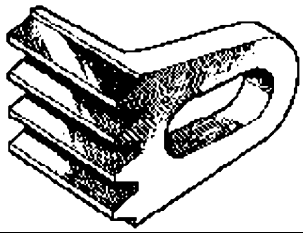
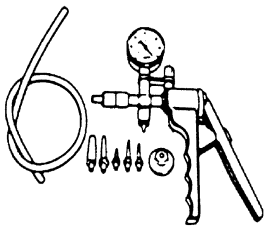
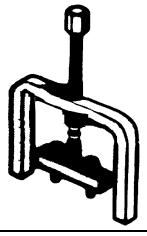
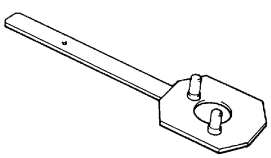
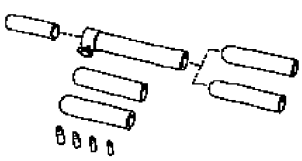
NOTE

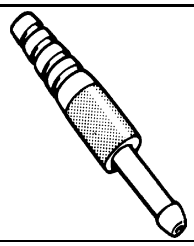
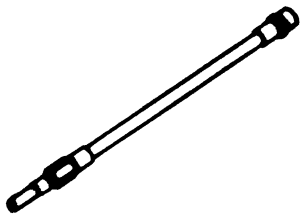
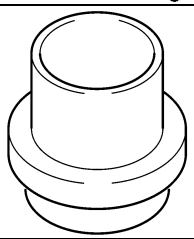
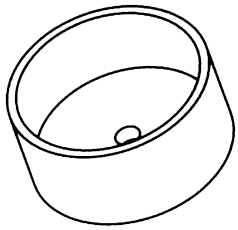
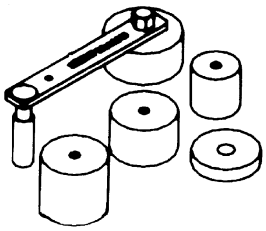
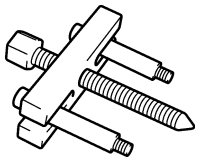
Required service material is also described in the following.
“Camshaft and Tappet Components: ”
“Valve and Cylinder Head Assembly Components: ”
“Piston, Piston Ring, Connecting Rod and Cylinder Components: ”
“Main Bearing, Crankshaft and Cylinder Block Component: ”

Special Tool

S5JB0B1408002

09910–26510 Dial gauge support OUT 0000005 ☞		09910–68110 EGR pipe clamp pliers ☞	
09911–96530 Crankshaft oil seal fitting Mot. 991-01 ☞		09912–46510 TDC setting rod Mot. 1054 ☞ / ☞ / ☞ / ☞	
09912–56540 Compression gauge adapter ☞		09912–57821 Compression gauge ☞	
09912–86510 Oil jet installer Mot. 1516 ☞		09912–86520 Oil jet installer plate Mot. 1516-02 ☞	
09913–56520 Camshaft oil seal fitting Mot. 988-02 ☞		09913–86510 Main bearing fitting Mot. 1493 ☞	

09913–86520 Bearing fitting adapter Mot. 1492-01 ☞ 	09913–98110 Connecting rod bearing fitting (Mot. 1492) ☞ 
09914–86510 Oil return pipe installer Mot. 1551 ☞ 	09915–67311 Vacuum gauge ☞ 
09916–14521 Valve spring compressor attachment ☞ / ☞ 	09916–19030 Valve lifter ☞ / ☞ 
09916–48110 Valve stem seal pliers (Mot. 1335) ☞ 	09916–48120 Oil jet remover (Mot. 1485-01) ☞ 
09916–58120 Inertia extractor (Emb. 880) ☞ 	09916–77310 Piston ring compressor (50-125 mm) ☞ 
09916–84511 Forceps ☞ / ☞ 	09916–98110 Flywheel locking tool (Mot. 582-01) ☞ 
09917–47011 Vacuum pump gauge ☞ 	09917–56510 Bearing cap remover Mot. 1423 ☞ 
09917–68221 Camshaft pulley holder ☞ / ☞ 	09917–96530 Valve stem seal fitting Mot. 1511 ☞ / ☞ 

09918–08210 Vacuum gauge hose joint ☞ 	09918–26510 Dummy heater plug (F9Q) Mot. 1592 ☞ 
09919–76510 Timing pulley adapter Rou. 15-01 ☞ 	09919–76520 Pre-tensioner adapter Mot. 1705 ☞ 
09919–76530 Timing belt pre-tensioner Mot. 1543 ☞ 	09919–76540 Belt tension device Mot. 1505 ☞
09926–37610–001 Bearing puller ☞ 	

Engine Lubrication System

General Description

Engine Lubrication Description

S5JB0B1501001

The oil pump is of a gear type, and mounted downward in the cylinder block. Oil is drawn up through the oil pump strainer and passed through the pump to the heat exchanger, then the oil filter, and the filtered oil flow to each engine part.

Diagnostic Information and Procedures

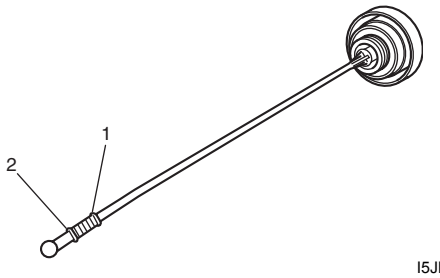
Oil Pressure Check

S5JB0B1504001

NOTE

Prior to checking oil pressure, check the following.

- **Oil level in oil pan**
  If oil level is low, add oil up to Full level mark (1) on oil level gauge referring to "Engine Oil and Filter Change: in Section 0B".

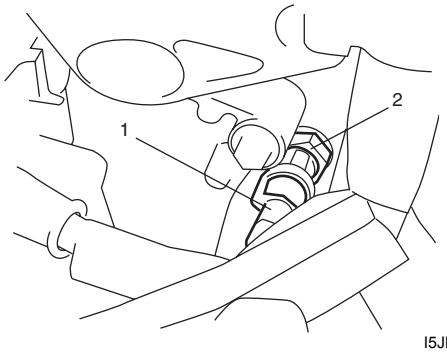


I5JB0B150001-01

2. Low level mark

- **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.

1) Disconnect oil pressure switch coupler (1).
2) Remove oil pressure switch (2) from cylinder block.



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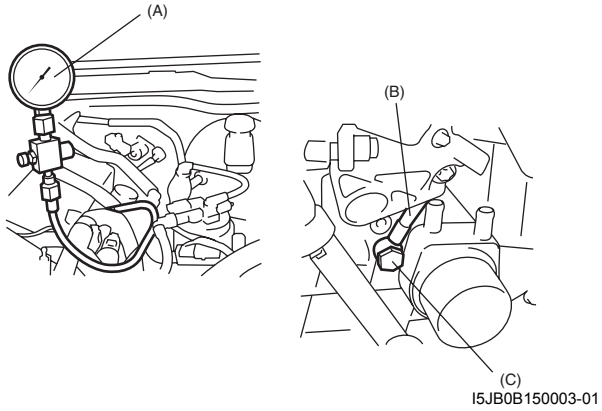
3) Install special tools to vacated threaded hole of oil pressure switch.

Special tool
(A): 09915–77311
(B): 09915–77420
(C): 09915–77430



I5JB0B150003-01

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

NOTE

Be sure to shift transmission gear shift lever in "Neutral" (shift select lever in "P" range for A/T vehicle), set parking brake and block drive wheels.

5) After warming up, measure oil pressure.

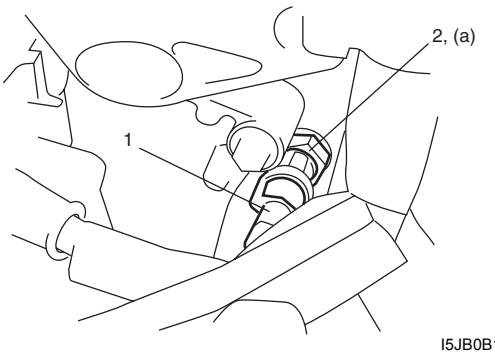
Oil pressure specification
Standard:
Approx. 120 kPa (1.2 kgf/cm^2, 17.4 psi) at 1,000 r/min
Approx. 350 kPa (3.5 kgf/cm^2, 50.8 psi) at 3,000 r/min
Limit:
Min. 70 kPa (0.7 kgf/cm^2, 10.2 psi) at 1,000 r/min
Max. 400 kPa (4.0 kgf/cm^2, 58.0 psi) at 3,000 r/min

6) After checking oil pressure, stop engine and remove special tool.

7) Tighten oil pressure switch (2) to specified torque.

Tightening torque
Oil pressure switch (a): 38 N·m (3.8 kgf-m, 27.5 lb-ft)

8) Start engine and check oil pressure switch for oil leakage. If oil leakage is found, repair it.
9) Connect oil pressure switch coupler (1).

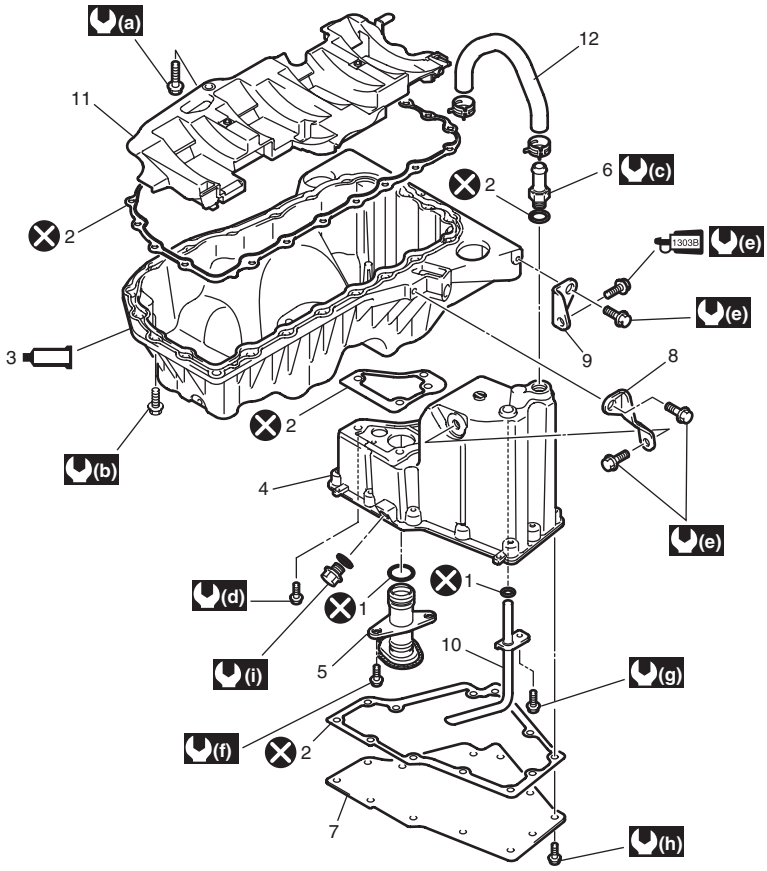


I5JB0B150004-01

Repair Instructions

Oil Pan and Oil Pump Strainer Components

S5JB0B1506001



I5JB0B150045-02

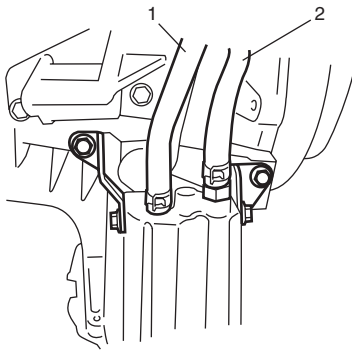
1. O-ring	8. Lower oil pan stiffener No.1	(d) : Tighten 22 N·m (2.2 kgf-m, 16.0 lb-ft) by the specified procedure.
2. Gasket	9. Lower oil pan stiffener No.2	(e) : Tighten 32 N·m (3.2 kgf-m, 23.5 lb-ft) by the specified procedure.
3. Upper oil pan	10. Oil separator return pipe	(f) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
: Apply sealant Loctite® rhodorseal 5661 (Loctite® rhodorseal 5661) to the maing surface of upper oil pan, gasket holder plate and main bearing cap No.1.	11. Oil pan baffle plate	(g) : 12 N·m (1.2 kgf-m, 9.0 lb-ft)
4. Lower oil pan	12. Fresh air vent hose	(h) : Tighten 8 N·m (0.8 kgf-m, 6.0 lb-ft) by the specified procedure.
5. Oil pump strainer No.1	(a) : 24 N·m (2.4 kgf-m, 7.5 lb-ft)	(i) : 35 N·m (3.5 kgf-m, 25.5 lb-ft)
6. Fresh air vent union bolt	(b) : Tighten 15 N·m (1.5 kgf-m, 11.0 lb-ft) by the specified procedure.	1303B : Apply sealant locktite Thread lock cement 99000-32030 (Thread Lock Cement Super 1303B) to bolt thread.
7. Closure plate	(c) : 30 N·m (3.0 kgf-m, 22.0 lb-ft)	: Do not reuse.

Oil Pan and Oil Pump Strainer Removal and Installation

S5JB0B1506002

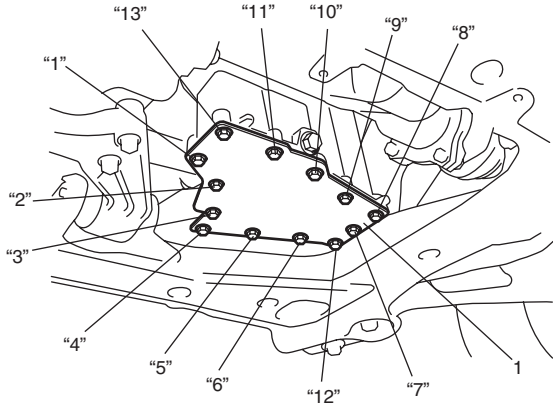
Removal

1) Drain engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
2) Disconnect oil separator return hose (1) from oil separator return pipe.
3) Disconnect fresh air vent hose (2) from fresh air vent union bolt.



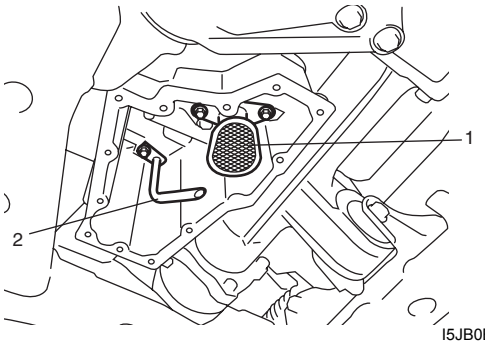
I5JB0B150005-01

4) Loosen closure plate bolts in numerical order (“1” through “12”) evenly and gradually as shown in figure, and remove them.
5) Remove closure plate (1) from lower oil pan.



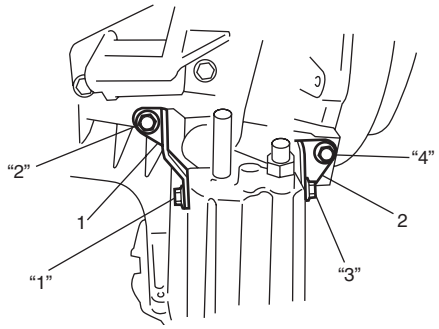
I5JB0B150006-01

6) Remove oil pump strainer No.1 (1) and oil separator return pipe (2).



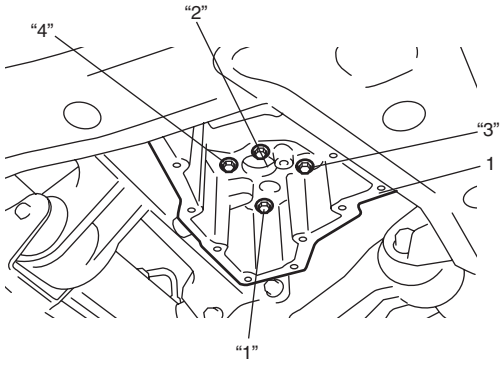
I5JB0B150007-01

7) Loosen lower oil pan stiffener bolts in numerical order (“1” through “4”) as shown in figure, and remove them.
8) Remove lower oil pan stiffener No.1 (1) and No.2 (2).



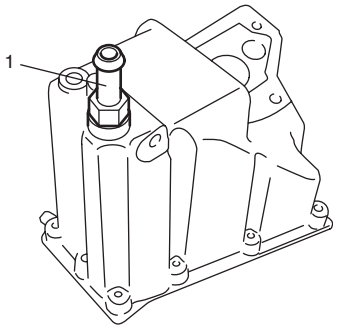
I5JB0B150008-01

9) Loosen lower oil pan bolts in numerical order (“1” through “4”) evenly and gradually as shown in figure, and remove them.
10) Remove lower oil pan (1) from upper oil pan.



I5JB0B150009-01

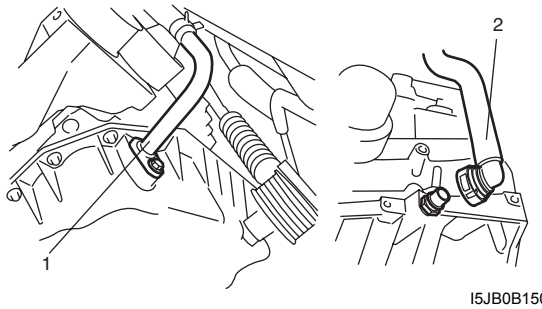
11) Remove fresh air vent union bolt (1) from lower oil pan, if necessary.



I5JB0B150010-01

12) Lower suspension member referring to “Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B in related manual”.

13) Disconnect ventilation pipe No.1 (1) and ventilation hose No.3 (2) from upper oil pan.



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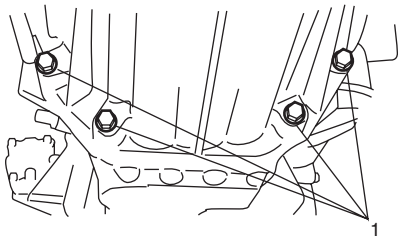
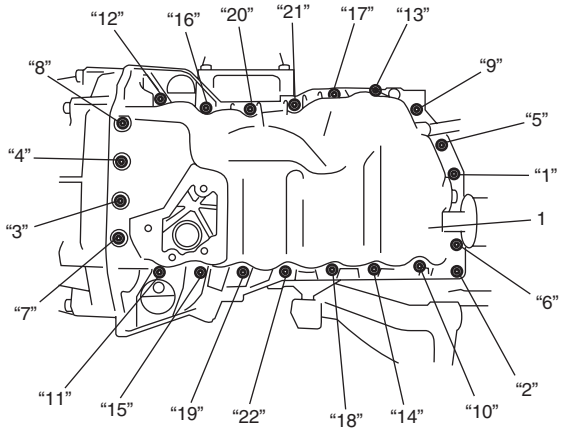
14) Remove transmission to engine bolts (1).



I5JB0B150012-01

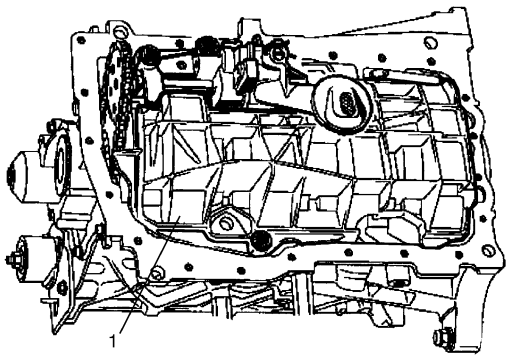
15) Loosen upper oil pan bolts evenly and gradually in numerical order (“1” through “22”) as shown in figure, and remove them.

16) Remove upper oil pan (1) from cylinder block.



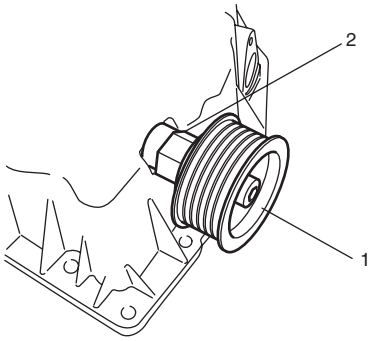
I5JB0B150013-01

17) Remove oil pan baffle plate (1), if necessary.



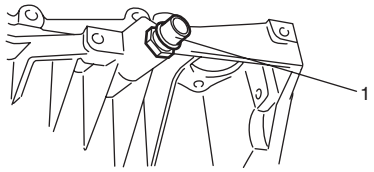
I5JB0B150015-01

18) Remove accessory belt idler (1) with base (2) from upper oil pan, if necessary.



I5JB0B150016-01

19) Remove ventilation hose No.3 union bolt (1) from upper oil pan, if necessary.

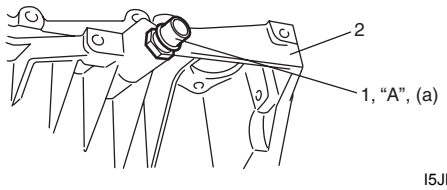


I5JB0B150017-01

Installation

1) Remove oil, old sealant and dust from mating surface of upper oil pan, cylinder block and lower oil pan.
2) Install new ventilation hose No.3 union bolt (1) to upper oil pan (2), if necessary.

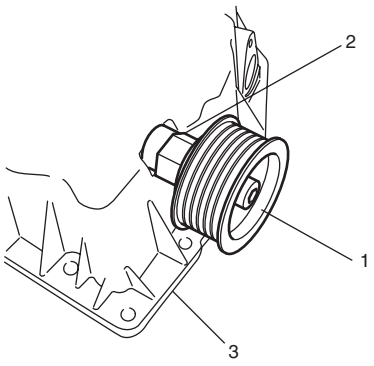
Tightening torque
Ventilation hose No.3 union bolt (a): 25 N·m (2.5 kgf-m, 18.5 lb-ft)



I5JB0B150018-03

3) Install accessory belt idler (1) with base (2) to upper oil pan (3), if removed.

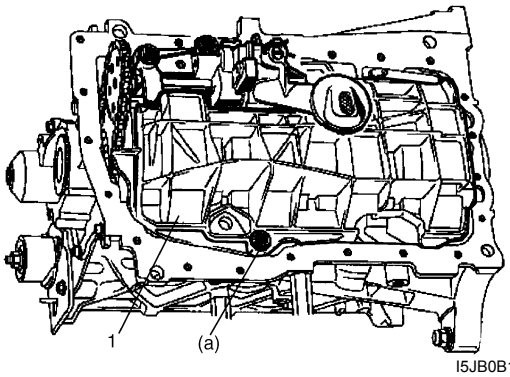
Tightening torque
Idler base (a): 50 N·m (5.0 kgf-m, 36.5 lb-ft)



I5JB0B150019-01

4) Install oil pan baffle plate (1), if removed.

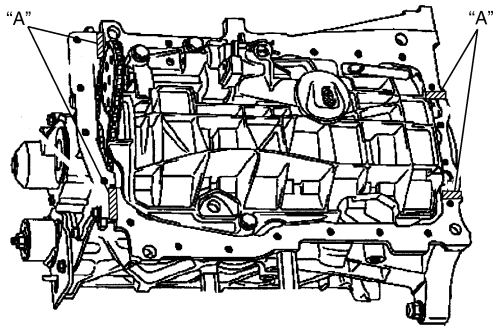
Tightening torque
Oil pan baffle plate bolt (a): 24 N·m (2.4 kgf-m, 17.5 lb-ft)



I5JB0B150020-01

5) Apply sealant to hatched part of cylinder block, gasket holder plate and main bearing cap No.1 as shown in figure.

“A”: Loctite rhodorseal 5661® (Loctite rhodorseal 5661®)



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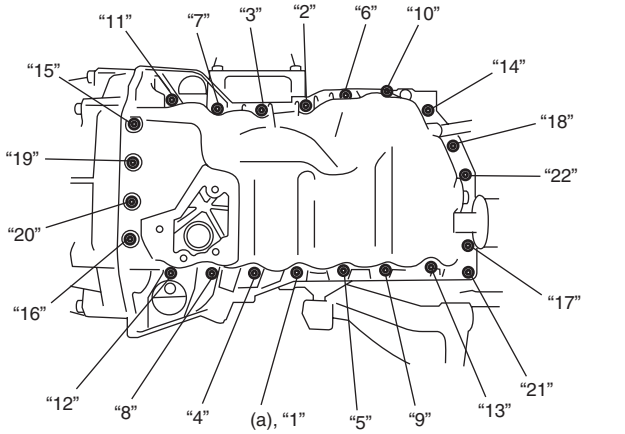
6) Install upper oil pan (1) to cylinder block with new gasket, and tighten upper oil pan bolts evenly and gradually in numerical order (“1” through “22”) by repeating tightening sequence two or three times until specified torque is obtained.

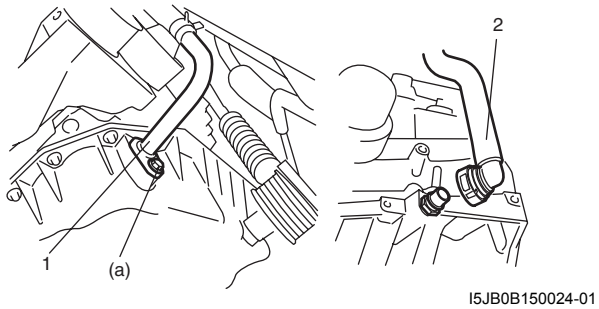
Tightening torque
Upper oil pan bolt (a): Tighten 15 N·m (1.5 kgf-m, 11.0 lb-ft) by the specified procedure



I5JB0B150023-01

7) Tighten transmission to engine bolts referring to “Manual Transmission Assembly Dismounting and Remounting: in Section 5B”.
8) Connect ventilation pipe No.1 (1) and ventilation hose No.3 (2) to upper oil pan with new O-ring.

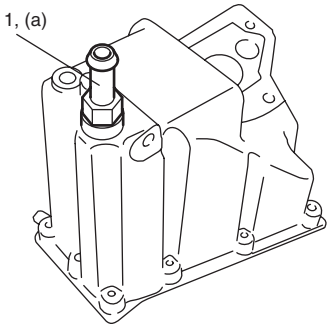
Tightening torque
Ventilation pipe No.1 bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)



I5JB0B150024-01

9) Install suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B in related manual”.
10) Install fresh air vent union bolt (1) to lower oil pan with new gasket, if removed.

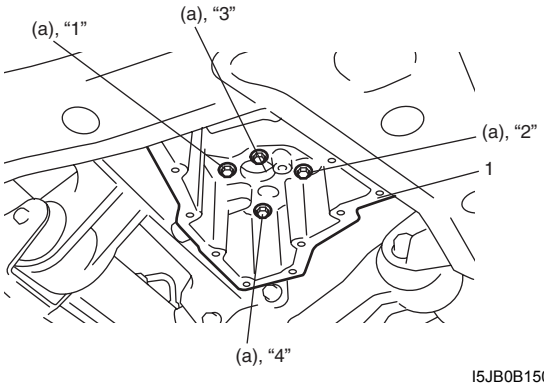
Tightening torque
Fresh air vent union bolt (a): 30 N·m (3.0 kgf-m, 22.0 lb-ft)



I5JB0B150025-01

11) Install lower oil pan (1) to upper oil pan with new gasket, and tighten lower oil pan bolts evenly and gradually in numerical order (“1” through “4”) by repeating tightening sequence two or three times until specified torque is obtained.

Tightening torque
Lower oil pan bolt (a): Tighten 22 N·m (2.2 kgf-m, 16.0 lb-ft) by the specified procedure

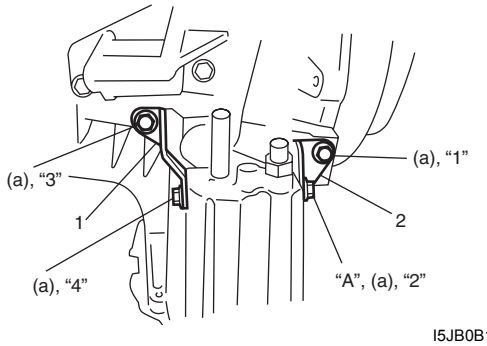


I5JB0B150026-01

12) Install lower oil pan stiffener No.1 (1) and No.2 (2), and tighten lower oil pan stiffener No.1 and No.2 bolts according to numerical order (“1” though “4”) as shown in figure.
Apply thread lock “A” to lower oil pan stiffener bolt marked “2”.

“A”: Thread lock cement 99000–32030 (Thread Lock Cement Super 1303B)

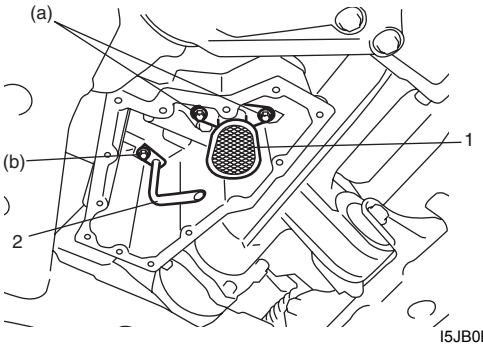
Tightening torque
Lower oil pan stiffener bolt (a): Tighten 32 N·m (3.2 kgf-m, 23.5 lb-ft) by the specified procedure



I5JB0B150027-01

13) Install oil pump strainer No.1 (1) and oil separator return pipe (2) with new O-rings.

Tightening torque
Oil pump strainer No.1 bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)
Oil separator oil return pipe (b): 12 N·m (1.2 kgf-m, 9.0 lb-ft)



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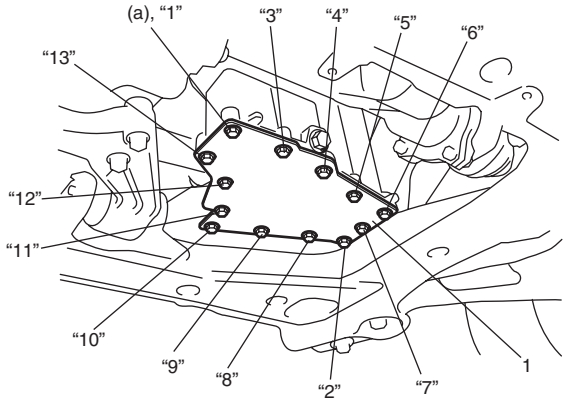
14) Install closure plate (1) with new gasket, and tighten closure plate bolts evenly and gradually in numerical order (“1” though “13”) by repeating tightening sequence two or three times until specified torque is obtained.

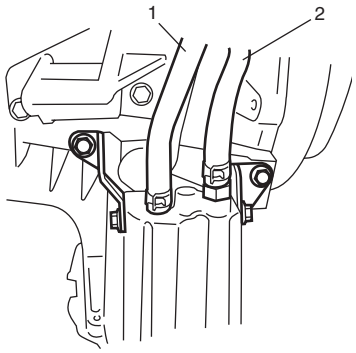
Tightening torque
Closure plate bolt (a): Tighten 8 N·m (0.8 kgf-m, 6.0 lb-ft) by the specified procedure



I5JB0B150029-01

15) Connect lower oil pan hose (1) to oil separator return pipe.

16) Connect oil separator return hose (2) to oil separator return pipe.



I5JB0B150005-01

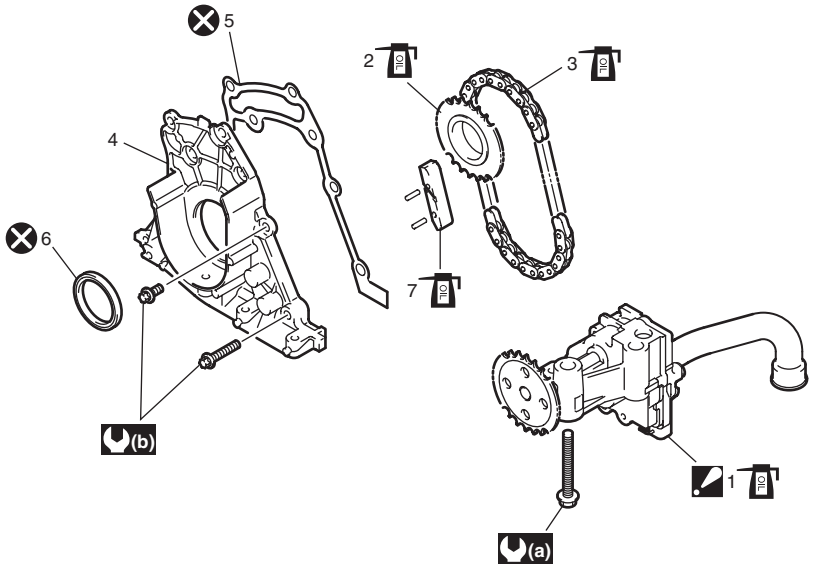
17) Refill engine oil referring to “Engine Oil and Filter Change: in Section 0B”.

Oil Pump, Oil Pump Chain and Gasket Holder Plate Component

S5JB0B1506003

⚠ CAUTION

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



I5JB0B150043-01

1. Oil pump : Do not disassemble.	4. Gasket holder plate	7. Oil pump chain tensioner	: Do not reuse.
2. Oil pump drive sprocket	5. Gasket holder plate gasket	(a) : 24 N·m (2.4 kgf-m, 17.5 lb-ft)	: Apply engine oil to sliding surface of each part.
3. Oil pump chain	6. Crankshaft oil seal	(b) : 14 N·m (1.4 kgf-m, 10.5 lb-ft)	

Oil Pump, Oil Pump Chain and Gasket Holder Plate Removal and Installation

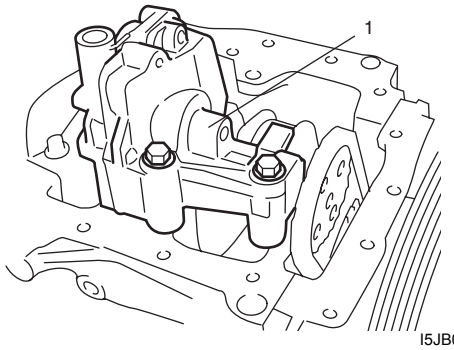
S5JB0B1506004

⚠ CAUTION

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

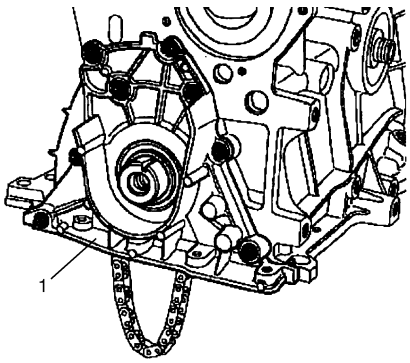
Removal

1) Remove oil pan and oil pump strainer referring to “Oil Pan and Oil Pump Strainer Removal and Installation: ”.
2) Remove oil pump (1) from cylinder block.



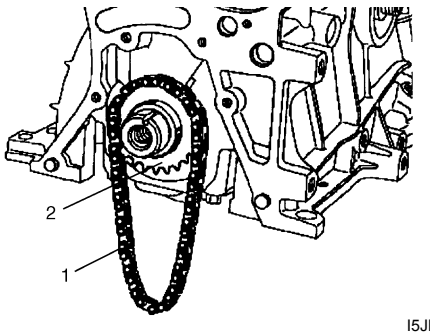
I5JB0B150030-01

3) Remove timing belt and crankshaft timing pulley referring to “Timing Belt and Belt Tensioner Removal and Installation: in Section 1D”.
4) Remove gasket holder plate (1) from cylinder block.



I5JB0B150031-01

5) Remove oil pump chain (1) and oil pump drive sprocket (2).



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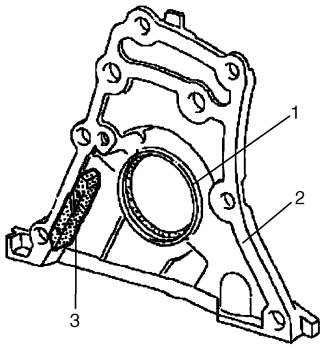
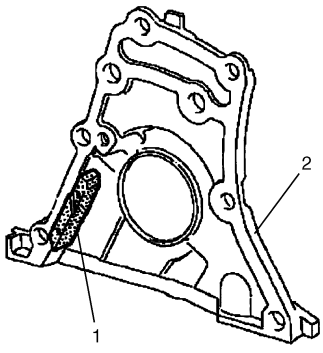
6) Remove crankshaft oil seal (1) from gasket holder plate (2).
7) Remove oil pump chain tensioner (3) from gasket holder plate, if necessary.



I5JB0B150033-01

Installation

1) Remove oil and dust from mating surfaces of oil pump drive sprocket, crankshaft gasket holder plate and cylinder block.
2) Install oil pump chain tensioner (1) to gasket holder plate (2), if removed.



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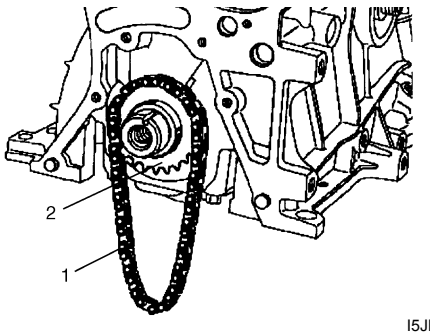
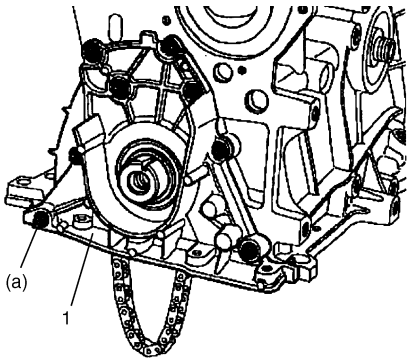
3) Install oil pump drive sprocket (1) with oil pump chain (2).



I5JB0B150032-01

4) Install gasket holder plate (1) with new gasket to cylinder block.

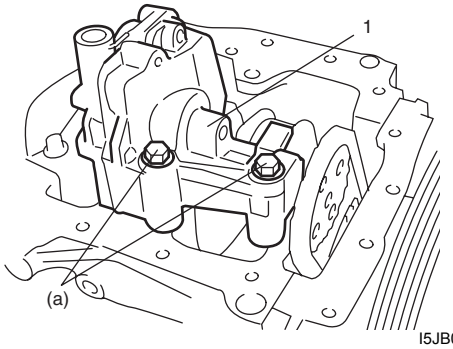
Tightening torque
Gasket holder plate bolt (a): 14 N·m (1.4 kgf-m, 10.5 lb-ft)



I5JB0B150035-01

5) Install oil pump (1) and tighten oil pump bolts to specified torque.

Tightening torque
Oil pump bolt (a): 24 N·m (2.4 kgf-m, 17.5 lb-ft)

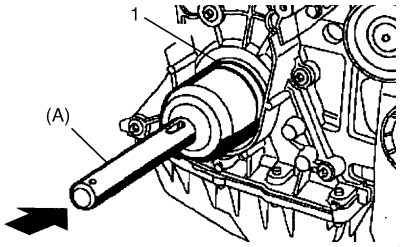


I5JB0B150036-01

6) Install oil pan and oil pump strainer referring to “Oil Pan and Oil Pump Strainer Removal and Installation: ”.
7) Install new crankshaft oil seal to gasket holder plate using special tool as follows.

Special tool
(A): 09911–96520

a) Fit new oil seal (1) to special tool.
b) Install oil seal tapping special tool with a plastic hammer.



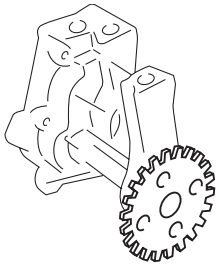
I5JB0B150037-01

8) Install timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: in Section 1D”.

Oil Pump, Oil Pump Chain and Gasket Holder Plate Inspection

S5JB0B1506005

Oil Pump
Check teeth of oil pump sprocket for wear or damage.
If any malcondition is found, replace oil pump assembly.



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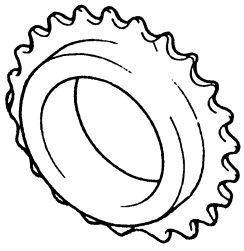
Oil Pump Drive Sprocket
Check teeth of oil pump drive sprocket for wear or damage.
If any malcondition is found, replace oil pump drive sprocket.



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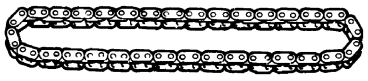
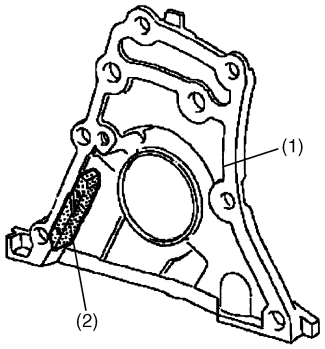
Oil Pump Chain
Check oil pump chain for wear or damage.
If any malcondition is found, replace oil pump chain.



I5JB0B150040-01

Gasket Holder Plate
Check gasket holder plate (1) and oil pump chain guide (2) for wear or damage.
If any malcondition is found, replace gasket holder and/or oil pump chain guide.



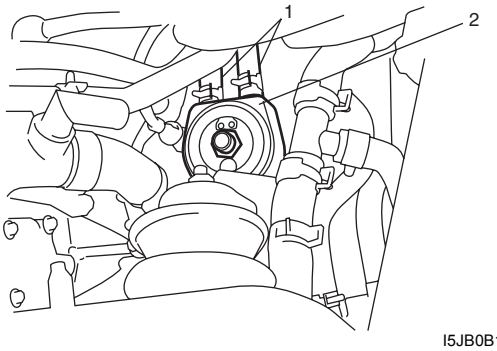
I5JB0B150044-01

Heat Exchanger Removal and Installation

S5JB0B1506006

Removal

1) Remove oil filter referring to “Engine Oil and Filter Change: in Section 0B”.
2) Disconnect water hoses (1) from heat exchanger (2).
3) Remove heat exchanger (2).



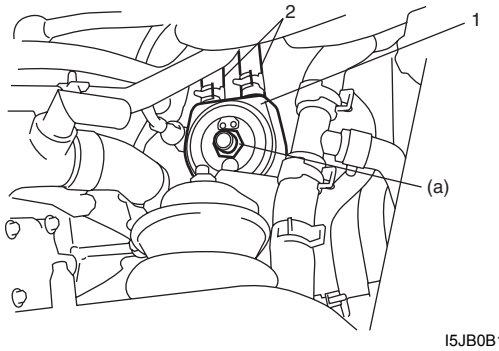
I5JB0B150041-01

Installation

1) Install heat exchanger (1) with new gasket.

   Tightening torque
   Oil filter stand bolt (a): 15 N·m (1.5 kgf-m, 11.0 lb-ft)

2) Connect water hoses (2) to heat exchanger.
3) Install oil filter referring to “Engine Oil and Filter Change: in Section 0B”.



I5JB0B150042-01

Specifications

Tightening Torque Specifications

S5JB0B1507001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Oil pressure switch	38	3.8	27.5	☞
Ventilation hose No.3 union bolt	25	2.5	18.5	☞
Idler base	50	5.0	36.5	☞
Oil pan baffle plate bolt	24	2.4	17.5	☞
Upper oil pan bolt	Tighten 15 N·m (1.5 kgf-m, 11.0 lb-ft) by the specified procedure			☞
Ventilation pipe No.1 bolt	10	1.0	7.5	☞
Fresh air vent union bolt	30	3.0	22.0	☞
Lower oil pan bolt	Tighten 22 N·m (2.2 kgf-m, 16.0 lb-ft) by the specified procedure			☞
Lower oil pan stiffener bolt	Tighten 32 N·m (3.2 kgf-m, 23.5 lb-ft) by the specified procedure			☞
Oil pump strainer No.1 bolt	10	1.0	7.5	☞
Oil separator oil return pipe	12	1.2	9.0	☞
Closure plate bolt	Tighten 8 N·m (0.8 kgf-m, 6.0 lb-ft) by the specified procedure			☞
Gasket holder plate bolt	14	1.4	10.5	☞
Oil pump bolt	24	2.4	17.5	☞
Oil filter stand bolt	15	1.5	11.0	☞

NOTE

The specified tightening torque is also described in the following.
“Oil Pan and Oil Pump Strainer Components: ”
“Oil Pump, Oil Pump Chain and Gasket Holder Plate Component: ”

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

Special Tools and Equipment

Recommended Service Material

S5JB0B1508001

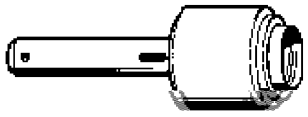
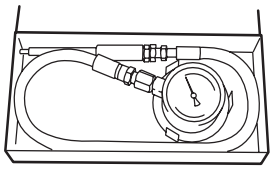
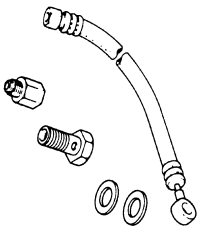
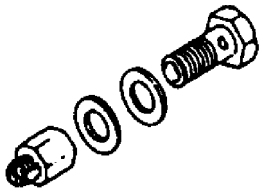
Material	SUZUKI recommended product or Specification		Note
Loctite rhodorseal 5661®	Loctite rhodorseal 5661®	—	☞
Thread lock cement	Thread Lock Cement Super 1303B	P/No.: 99000–32030	☞

NOTE

Required service material is also described in the following.
“Oil Pan and Oil Pump Strainer Components: ”
“Oil Pump, Oil Pump Chain and Gasket Holder Plate Component: ”

Special Tool

S5JB0B1508002

09911–96520 Crankshaft oil seal fitting Mot. 990-03 ☞ 	09915–77311 Oil pressure gauge ☞ 
09915–77420 Oil pressure gauge attachment and hose set ☞ 	09915–77430 Oil pressure gauge attachment ☞ 

Engine Cooling System

General Description

Cooling System Description

S5JB0B1601001

The cooling system consists of a degassing tank, a radiator, radiator cooling fan, hoses, pipes, a water pump, an additional heater, a turbocharger electric water pump and a thermostat assembly.

Coolant Description

S5JB0B1601002

⚠ WARNING

- **Do not remove degassing tank cap to check engine coolant level; check coolant visually at the see-through degassing tank. Coolant should be added only to degassing tank as necessary.**
- **As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator and degassing tank without causing the solution to boil. Removal of the degassing tank cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.**
- **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.**

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the coolant is overflowed to the reservoir.
When the system cools down, the coolant is drawn back into the radiator.
The cooling system has been filled 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 deminelized water or distilled water.**

Anti-freeze proportioning table

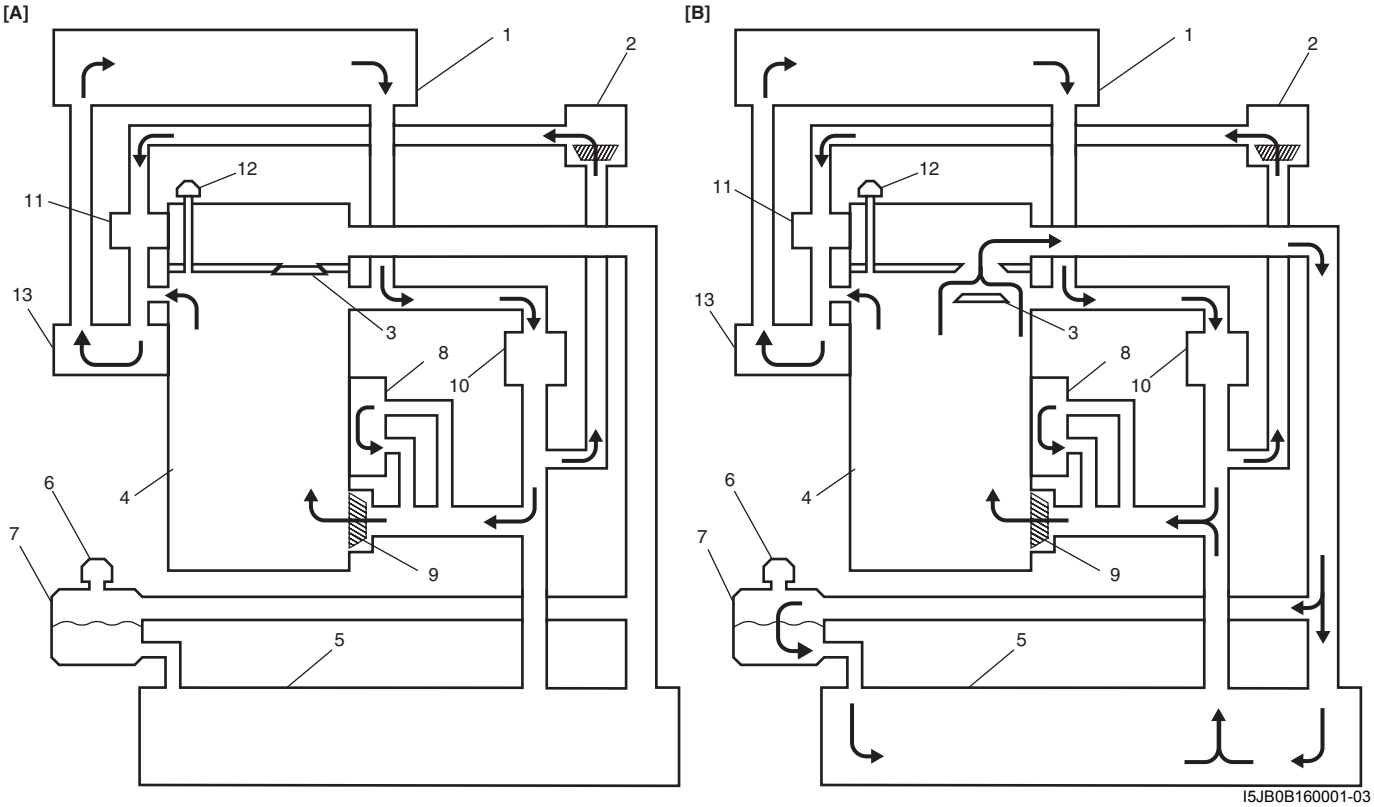
Freezing temperature	**°C**	**–36**
	°F	**–33**
Anti-freeze / Anti-corrosion coolant concentration	**%**	**50**
Ratio of compound to cooling water	**ltr.**	**3.75/3.75**
	US pt.	**7.92/7.92**
	Imp pt.	**6.60/6.60**

Coolant capacity
7.5 liters (15.85/13.2 US/Imp pt.)

Schematic and Routing Diagram

Coolant Circulation

S5JB0B1602001



I5JB0B160001-03

[A]: When thermostat is close	4. Cylinder block and cylinder head	9. Water pump
[B]: When thermostat is open	5. Radiator	10. Turbo charger electric water pump
1. Heater core	6. Degassing tank cap	11. Turbo charger
2. Additional heater	7. Degassing tank	12. Ventilation plug
3. Thermostat	8. Heat exchanger	13. EGR cooler

Diagnostic Information and Procedures

Engine Cooling Symptom Diagnosis

S5JB0B1604001

Condition	Possible cause	Correction / Reference Item
Engine overheats (Radiator fan operates)	Loose or timing belt	*Adjust.*
	Not enough coolant	*Check coolant level and add as necessary.*
	Faulty thermostat	*Replace.*
	Faulty water pump	*Replace.*
	Dirty or bent radiator fins	*Clean or remedy.*
	Coolant leakage on cooling system	*Repair.*
	Clogged radiator	*Check and replace radiator as necessary.*
	Faulty degassing tank cap	*Replace.*
	Dragging brakes	*Adjust brake.*
	Slipping clutch	*Adjust or replace.*
	Poor charge battery	*Check and replace as necessary.*
	Poor generation generator	*Check and repair.*
	ECT sensor faulty	*Check and replace as necessary.*
	Radiator cooling fan relay No.2 and/or No.3 faulty	*Check and replace as necessary.*
	Radiator fan motor faulty	*Check and replace as necessary.*
	ECM faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	Equipped with too much electric load part(s)	*Dismount.*
Engine overheats (Radiator fan does not operate)	Fuse blown	*Check 30 A fuse of relay/fuse box and check for short circuit to ground.*
	Radiator cooling fan relay No.1 faulty	*Check and replace as necessary.*
	ECT sensor faulty	*Check and replace as necessary.*
	Radiator cooling fan motor faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM faulty	*Check and replace as necessary.*

Repair Instructions

Cooling System Components

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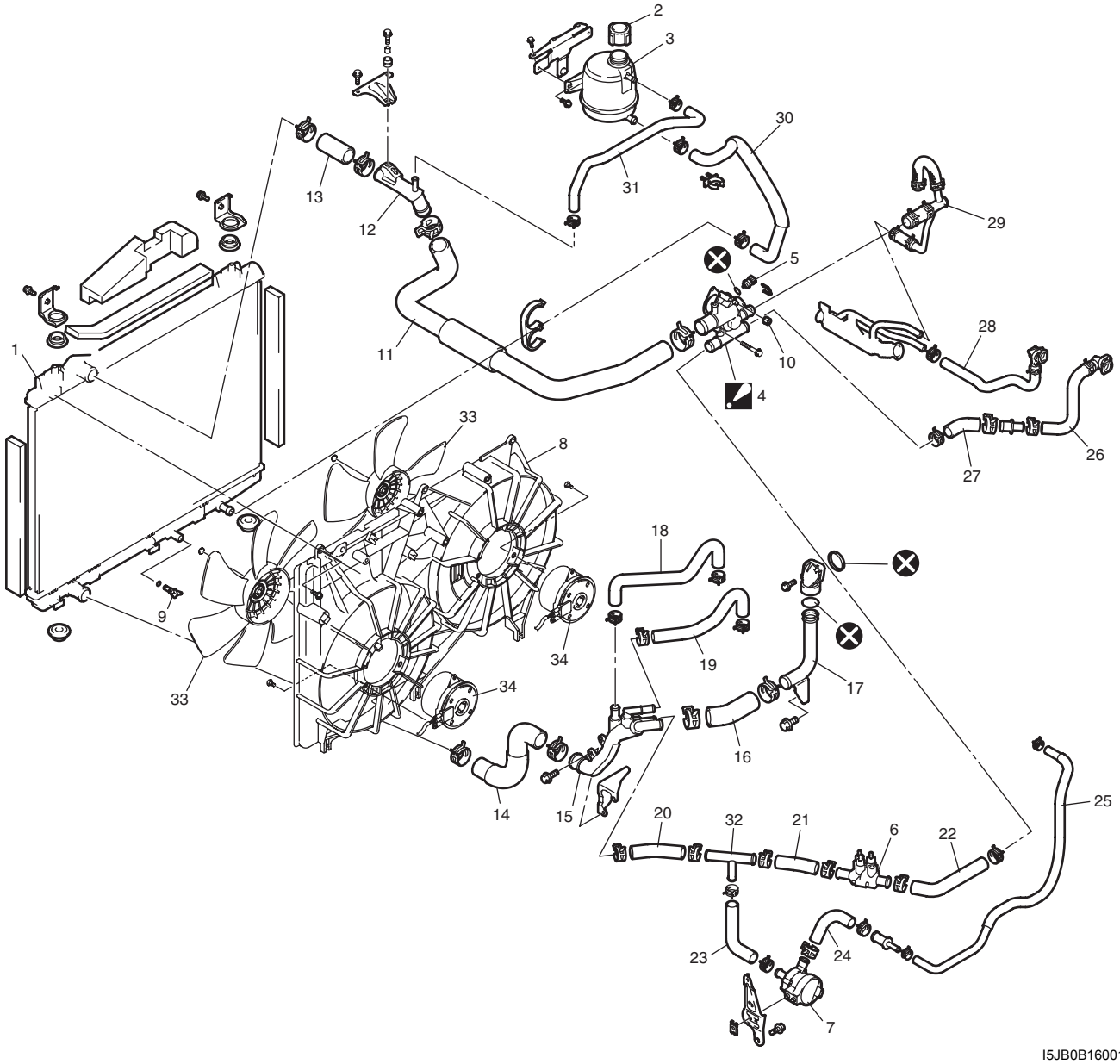


I5JB0B160013-01

1. Radiator	13. Radiator inlet hose No.2	25. Turbocharger inlet hose
2. Degassing tank cap	14. Radiator outlet hose No.1	26. Heater outlet hose No.1
3. Degassing tank	15. Radiator outlet pipe No.1	27. Heater outlet hose No.2
4. Thermostat assembly : Do not disassemble.	16. Radiator outlet hose No.2	28. Heater inlet hose
5. ECT sensor	17. Radiator outlet pipe No.2	29. Thermostat outlet hose and pipe
6. Additional heater	18. Heat exchanger inlet hose	30. Ventilation hose (radiator to degassing tank)
7. Turbocharger electric water pump	19. Heat exchanger outlet hose	31. Ventilation hose (radiator inlet pipe to degassing tank)
8. Fan shroud guide	20. Additional heater inlet hose No.1	32. 3-way joint
9. Drain plug	21. Additional heater inlet hose No.2	33. Radiator cooling fan
10. Air ventilation plug	22. Additional heater outlet hose	34. Radiator cooling fan motor
11. Radiator inlet hose No.1	23. Turbocharger electric water pump inlet hose	
12. Radiator inlet pipe	24. Turbocharger electric water pump outlet hose	

Coolant Level Check

S5JB0B1606002

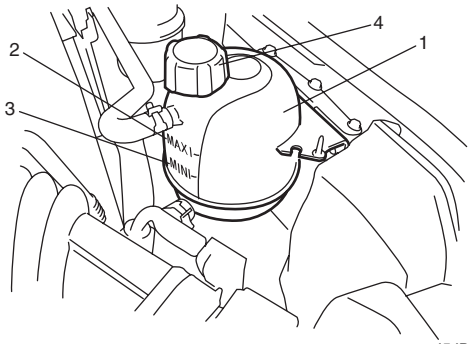
⚠ WARNING

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 degassing tank cap is taken off too soon.

To check level, lift hood and look at “see-through” degassing tank.
It is not necessary to remove degassing tank cap to check coolant level.
When engine is cool, check coolant level in degassing tank (1).
A normal coolant level should be between “MAXI” mark (2) and “MINI” mark (3) on degassing tank (1).
If coolant level is below “MINI” mark (3), remove degassing tank cap (4) and add proper coolant to degassing tank to bring coolant level up to “MAXI” mark (2).

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.



I5JB0B160002-01

Engine Cooling System Inspection and Cleaning

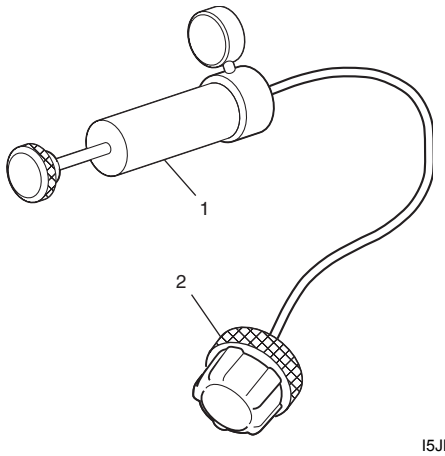
S5JB0B1606003

⚠ 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) 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)
   Approx. 140 kPa (1.4 kg/cm², 19.9 psi)



I5JB0B160003-02

5) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
6) Clean frontal area of radiator core.

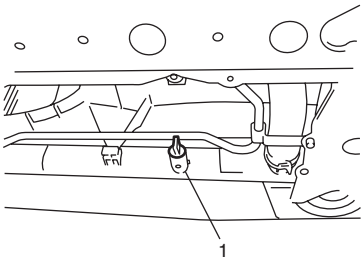
Cooling System Draining

S5JB0B1606004

⚠ 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.
2) Drain coolant from radiator drain plug (1).
3) After draining coolant, be sure to tighten drain plug (1) securely.



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Cooling System Refilling

S5JB0B1606005

⚠ 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.

NOTE

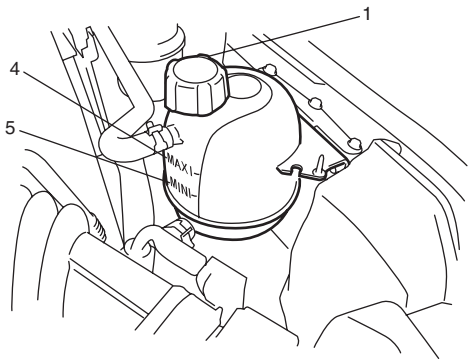
For detail of coolant specification, refer to "Coolant Description: ".

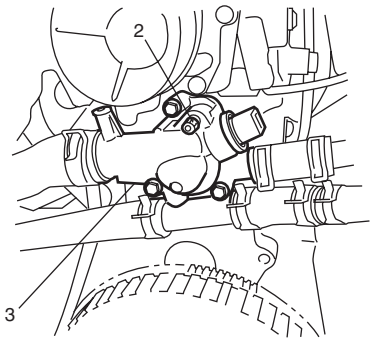
1) Close radiator drain plug.
2) Remove air ventilation plug (2) from thermostat assembly (3).
3) Fill degassing tank with coolant until coolant flow out from air ventilation plug, and then tighten air ventilation plug.
4) Fill degassing tank with coolant up to "MAXI" level mark (4).
5) Install degassing tank cap (1).
6) Run engine as follows in order to bleed air remained in engine and radiator.
   a) Run engine at 1500 r/min until upper radiator hose is hot.
   b) Race engine at 3500 r/min 4 times.
   c) Run engine at 2000 r/min for 20 minutes.
   d) Race engine at 3500 r/min 4 times.

NOTE

If coolant level comes lower than "MINI" level mark (5) during this step, perform the following procedures.

1. **Stop engine and wait until engine is cooled.**
2. **Fill degassing tank with coolant up to "MAXI" level mark.**
3. **Repeat Step 6) again.**





I5JB0B160004-02

7) Stop engine and wait until engine is cooled.
8) Fill degassing tank with coolant up to "MAXI" level mark.

Cooling System Flushing

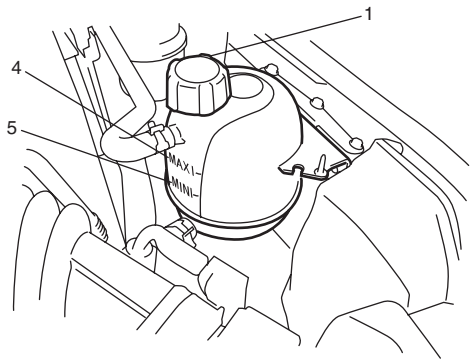
S5JB0B1606018

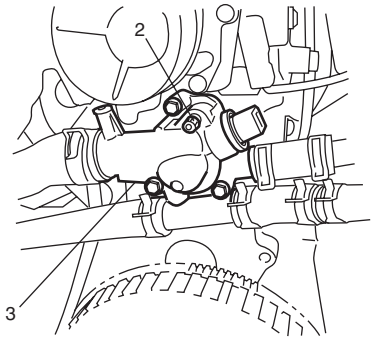
⚠ WARNING

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) Drain coolant referring to "Cooling System Draining: ".
2) Close radiator drain plug.
3) Remove air ventilation plug (2) from thermostat assembly (3).
4) Fill degassing tank with water until water flow out from air ventilation plug, and then tighten air ventilation plug.
5) Fill degassing tank with coolant up to "MAXI" level mark (4).

6) Install degassing tank cap (1).





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5. “MINI” level mark

7) Run engine until upper radiator hose is hot.
8) Stop engine.
9) Wait until engine is cooled, and drain water from cooling system.
10) Repeat Step 2) to 9) several times until drained liquid is nearly colorless.
11) Fill cooling system with coolant referring to “Cooling System Refilling: ”.

Cooling Water Pipe or Hose Removal and Installation

S5JB0B1606006

Removal

1) Drain coolant referring to “Cooling System Draining: ”.
2) To remove these pipes or hoses, loosen clamp on each hose and pull hose end off.

Installation

Install removed parts in reverse order of removal procedure, noting the following.

- Tighten each clamp securely referring to “Cooling System Components: ”.
- Refill cooling system referring to “Cooling System Refilling: ”.

Thermostat Assembly Removal and Installation

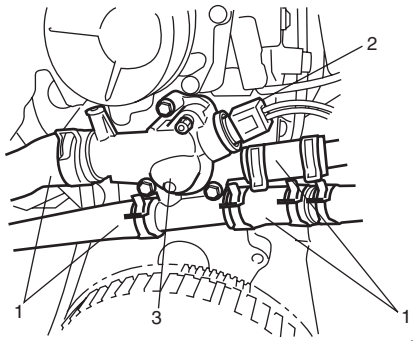
S5JB0B1606019

⚠ CAUTION

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

Removal

1) Remove engine assembly referring to “Engine Assembly Removal and Installation: in Section 1D”.
2) Disconnect water hoses (1) from thermostat assembly (3).
3) Disconnect ECT sensor connector (2).
4) Remove thermostat assembly from cylinder head.



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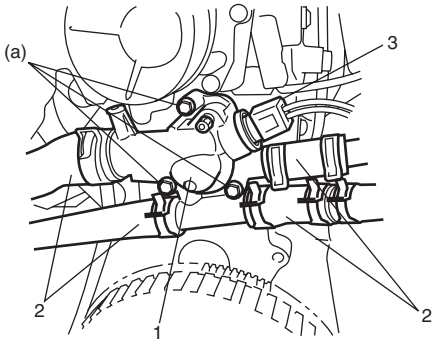
5) Remove ECT sensor referring to “Engine Coolant Temperature (ECT) Sensor Removal and Installation: in Section 1C”, if necessary.

Installation

1) Install ECT sensor referring to “Engine Coolant Temperature (ECT) Sensor Removal and Installation: in Section 1C”, if removed.
2) Install thermostat assembly (1) to cylinder head with new gasket.

Tightening torque
Thermostat bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

3) Connect ECT sensor connector (3).
4) Connect water hoses (2) to thermostat assembly.



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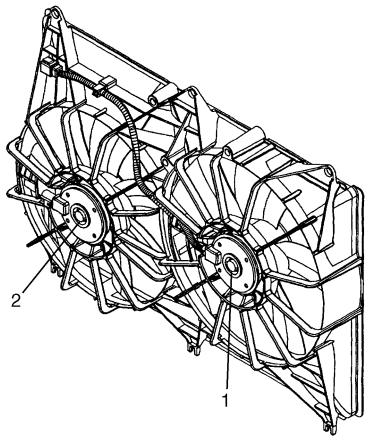
5) Install engine assembly referring to “Engine Assembly Removal and Installation: in Section 1D”.

Radiator Cooling Fan Motor On-Vehicle Inspection

S5JB0B1606009

1) Check main and/or sub fan operation of radiator cooling fans as follows.
   a) Connect battery to main fan motor coupler (coupler color: black) or sub fan motor coupler (coupler color: gray) as shown in figure.
   b) Check that radiator cooling fan rotates smoothly. If any abnormality is found, replace fan motor.

   Reference: Fan motor specified current at 12 V
   Main fan operation: 10.9 – 14.4 A
   Sub fan operation: 10.9 – 14.4 A



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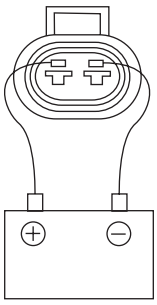


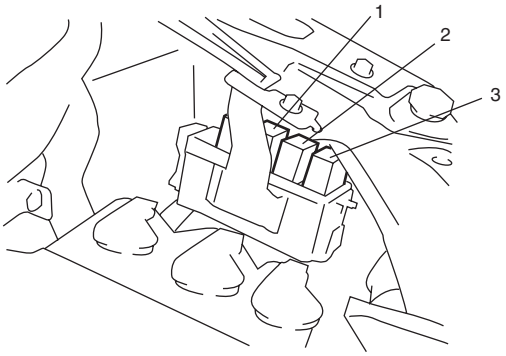
I5JB0A161011-01

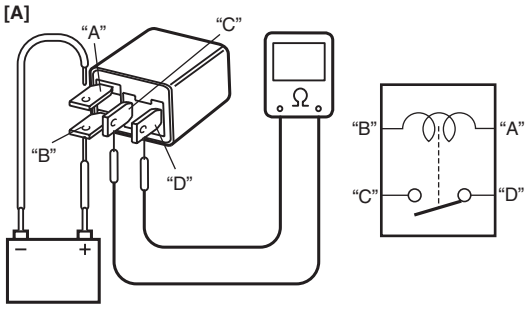
1. Main fan motor	3. Battery
2. Sub fan motor	4. Fan motor coupler

Radiator Cooling Fan Relay Inspection

S5JB0B1606010

1) Disconnect negative (–) cable at battery.
2) Remove radiator cooling fan relay No.1 (1), No.3 (2) and/or No.2 (3) from relay box.
3) Check radiator cooling fan relay No.1 (1) and No.3 (2) as follows.
   a) Check that there is no continuity between terminals “C” and “D”. If there is continuity, replace relay.
   b) Connect battery positive (+) terminal to terminal “B” of relay.
   c) Connect battery negative (–) terminal to terminal “A” of relay.
   d) Check continuity between terminals “C” and “D”. If there is no continuity, replace relay.
4) Check radiator cooling fan relay No.2 (3) as follows.
   a) Check that there is no continuity between terminals “G” and “H” and between terminals “G” and “F”. If there is continuity, replace relay.
   b) Check continuity between terminals “I” and “H”. If there is continuity, replace relay.
   c) Connect battery positive (+) terminal to terminal “F” of relay.
   d) Connect battery negative (–) terminal to terminal “E” of relay.
   e) Check continuity between terminals “G” and “H”. If there is continuity, replace relay.





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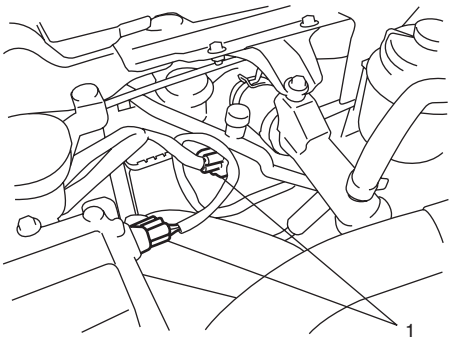
[A]: For radiator cooling fan relay No.1 and No.3
[B]: For radiator cooling fan relay No.2

Radiator Cooling Fan Assembly Removal and Installation

S5JB0B1606011

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect connectors (1) of cooling fan motors.



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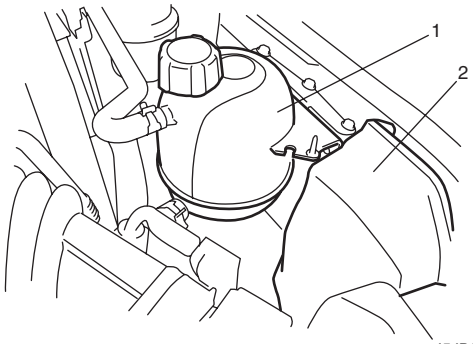
3) With hose connected, detach P/S fluid reservoir with reservoir bracket.
4) Remove air cleaner case and air cleaner suction pipe (2).
5) Remove degassing tank (1) from radiator.



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6) Remove cooling fan assembly.

⚠ CAUTION

Be sure not to damage condenser inlet pipe.

Installation

Reverse removal procedure for installation noting the following.

- Refill cooling system referring to “Cooling System Refilling: ”.
- After installation, verify there is no coolant leakage at each connection.

Radiator On-Vehicle Inspection and Cleaning

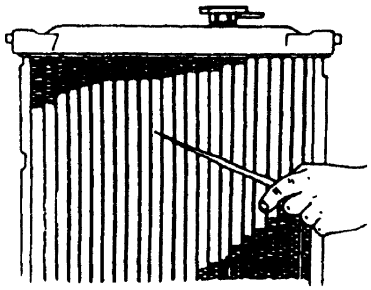
S5JB0B1606012

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

S5JB0B1606013

Removal

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

Installation

Reverse removal procedures, noting the following.

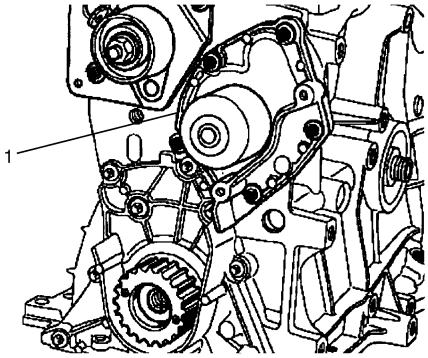
- Refill cooling system referring to “Cooling System Refilling: ”.
- After installation, verify there is no coolant leakage each connection.

Water Pump Removal and Installation

S5JB0B1606020

Removal

1) Drain coolant referring to “Cooling System Draining: ”.
2) Remove timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: in Section 1D”.
3) Remove water pump assembly (1).



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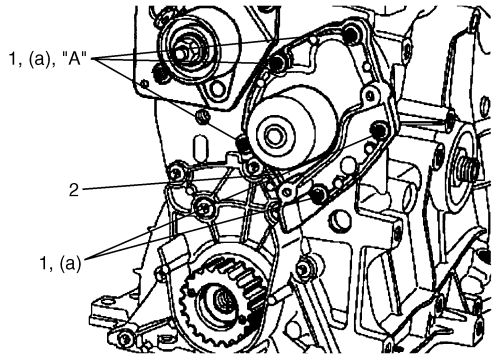
Installation

1) Remove oil and dust from sealing surface of cylinder block and water pump.
2) Apply sealant to three bolts (1).

   "A": Thread lock cement (LOCTITE® FRENETANCH)

3) Install water pump assembly (2) with new gasket.

   Tightening torque
   Water pump assembly bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)



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4) Install timing belt referring to "Timing Belt and Belt Tensioner Removal and Installation: in Section 1D".
5) Refill coolant referring to "Cooling System Refilling: ".

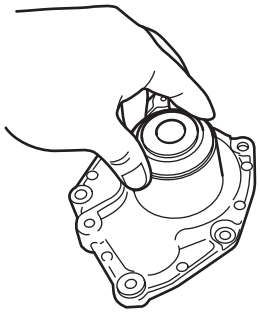
Water Pump Inspection

S5JB0B1606017

⚠ 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.



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Specifications

Tightening Torque Specifications

S5JB0B1607001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Thermostat bolt	8	0.8	6.0	☞
Water pump assembly bolt	10	1.0	7.5	☞

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

Special Tools and Equipment

Recommended Service Material

S5JB0B1608001

Material	SUZUKI recommended product or Specification		Note
Thread lock cement	LOCTITE® FRENETANCH	—	☞

Fuel System

Precautions

Precautions on Fuel System Service

S5JB0B1700001

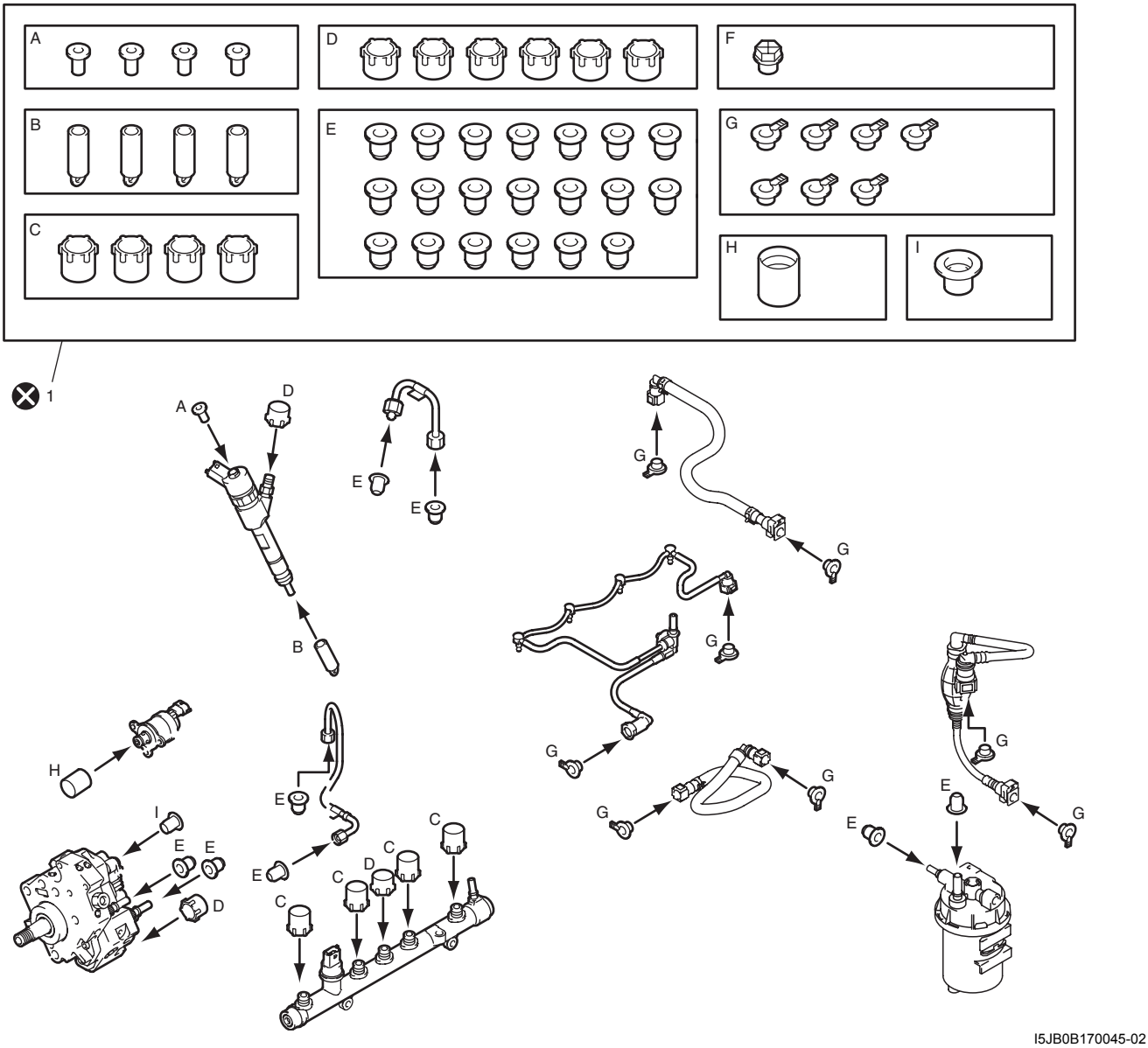
⚠ WARNING

- **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 CO_2 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.**
  - **– As fuel feed line is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel high presser line, make sure to relieve fuel pressure referring to "Fuel Pressure Relief Procedure: ".**
  - **– 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 lint-free cloth. Be sure to put that cloth in an approved container when disconnection is completed.**
  - **– When connecting fuel pipe flare nut, first tighten flare nut by hand and then tighten it to specified torque.**
  - **– The system can inject the diesel fuel into the engine at a pressure up to 160,000 kPa (1,600 kg/cm^2, 22,760 psi). Before carrying out any work, check that the injector rail is not under pressure and that the fuel temperature is not too high.**
  - **– Do not place your hand near to a leak on the high pressure fuel circuit.**
  - **– Do not run engine with disconnecting fuel pipe and/or removing fuel system components.**
  - **– Do not expose removed fuel system parts to dust. Keep 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.**
  - **– 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, mark sure that it has no twist or kink.
- **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.**

- The fuel system must be checked for leaks after service work referring 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.
- 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 (1) 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.

NOTE

- **Plug cap set is available as a spare part.**
- **Plug unions as soon as possible when removing / disconnecting fuel system component in order to prevent dust from invading.**
  Similarly, do not remove plug cap immediately before when installing / connecting fuel system component.



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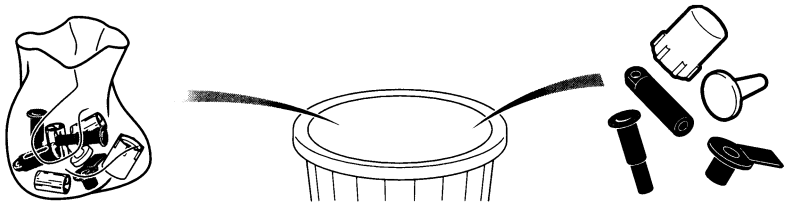
1. Plug cap	⊗ : Do not reuse.

- 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.



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- Make sure that lint-free towelettes. The use of a normal cloth or paper for cleaning purposes is forbidden.
  These are not lint-free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.
- Carry out any servicing as much as possible with the plug cap installed in order to prevent impurities from entering the system.
- Instructions to be followed before opening the fuel circuit.
  - For each operation, use new thinner (used thinner contains impurities). Pour it into a clean receptacle.
  - For each operation, use a clean brush which is in good condition (the brush must not shed its bristles).
  - Use a brush and thinners to clean the connections to be opened.
  - Blow compressed air over the cleaned parts (tools, cleaned the same way as the parts, connections and injection system zone). Check that no bristles remain adhered.
  - Wash your hands before and during the operation if necessary.
  - When wearing leather protective gloves, cover these with latex gloves.
- Instructions to be followed during the operation.
  - As soon as the circuit is open, all openings must be plugged to prevent impurities from entering the system by using the plug cap. They must not, under any circumstances, be reused.
  - Close the hermetically sealed bag, even if it has to be reopened shortly afterwards.
    Ambient air carries contamination.
  - All components of the injection system that are removed must be stored in a hermetically sealed plastic bag once the plugs have been inserted.
  - The use of a brush, thinner, bellows, sponge or normal cloth is strictly forbidden once the circuit has been opened.
    These items are likely to allow impurities to enter the system.
  - A new component replacing an old one must not be removed from its packaging until it is to be fitted to the vehicle.

Fuel System Description

S5JB0B1700003

⚠ CAUTION

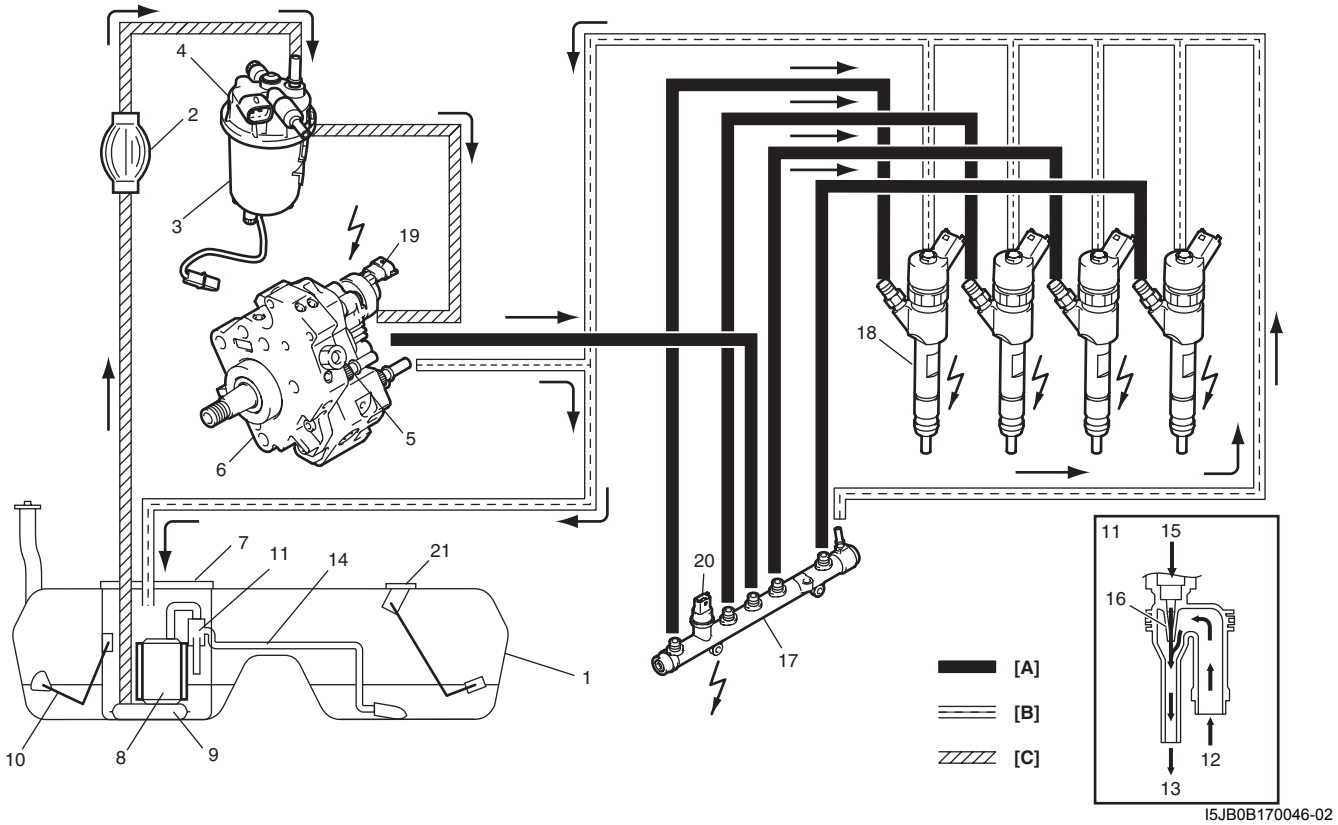
This engine requires the unleaded fuel only. The leaded and/or low lead fuel can result in engine damage and reduce the effectiveness of the emission control system.

Low-pressure fuel supply circuit [A]

The fuel in the fuel tank (1) is pumped up to the high pressure fuel supply circuit [B] through the priming pump (2), the fuel filter (3) and the fuel heater (4) by the low pressure fuel pump (5) built in the injection pump (6).
The fuel pump assembly (7) is composed of a fuel pump (8) a fuel suction filter (9), a main fuel level gauge (10) and a jet pump (11). The fuel pump is an in-tank type electric pump, and the fuel pump is equipped only for the jet pump. The jet pump sucks up the fuel from the sub fuel level gauge side (12) to the main fuel level gauge side (13) through the fuel suction pipe/hose (14) by using the negative pressure produced when the pressured fuel (15) with the fuel pump passes the venturi (16).

High-pressure fuel supply circuit [B]

The injection pump (6) driven by engine rotation creates high-pressure fuel from the low pressure fuel. The high-pressure fuel is supplied to the common rail (17) through the high-pressure fuel pipe. And, the injectors (18) atomize the fuel in the cylinders.
The fuel flow actuator (19) located on the injection pump regulates the quantity of fuel to the injection pump by ECM signal in order to control the fuel pressure in the common rail.



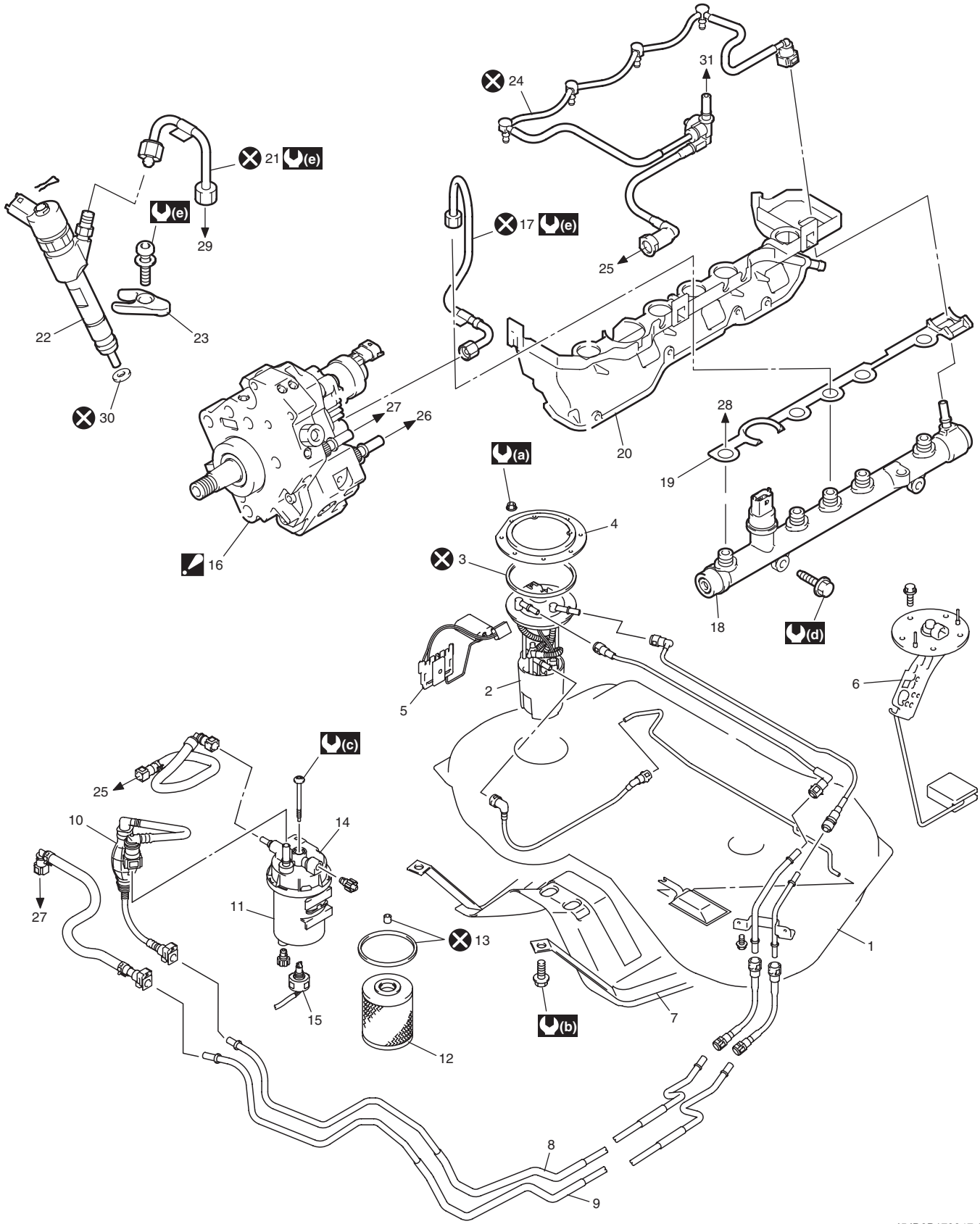
I5JB0B170046-02

[C]: Return fuel circuit	20. Fuel pressure sensor	21. Sub fuel level gauge

Repair Instructions

Fuel System Components

S5JB0B1706001



I5JB0B170047-01

1. Fuel tank	13. O-ring	25. To injection pump
2. Fuel pump assembly	14. Fuel heater	26. To fuel filter

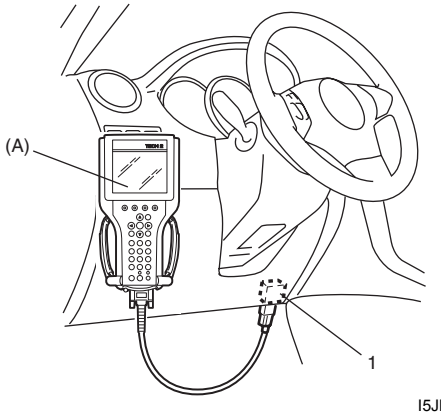
3. Gasket	15. Fuel filter water detection sensor	27. To fuel injector return hose
4. Fuel pump assembly plate	16. Injection pump : For detail of component, refer to “Injection Pump Components: ”.	28. To high pressure pipe between common rail and injection pump
5. Main fuel level gauge	17. High pressure pipe between injection pump and common	29. To common rail
6. Sub fuel level gauge	18. Common rail	30. Sealing washer
7. Fuel tank belt	19. Common rail cover	31. To fuel return line
8. Fuel feed line	20. Common rail cushion	(a) : 11 N·m (1.1 kgf-m, 8.0 lb-ft)
9. Fuel return line	21. High pressure pipe between common rail and fuel injector	(b) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)
10. Priming pump	22. Fuel injector	(c) : 5 N·m (0.5 kgf-m, 4.0 lb-ft)
11. Fuel filter case	23. Fuel injector bracket	(d) : 22 N·m (2.2 kgf-m, 16.0 lb-ft)
12. Fuel filter	24. Fuel injector return hose	(e) : 25 N·m (2.5 kgf-m, 18.5 lb-ft)

Fuel Pressure Relief Procedure

S5JB0B1706002

1) Check that engine is cold.
2) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool



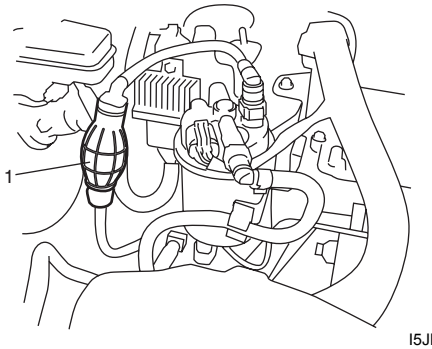
I5JB0A110019-01

3) Turn ON ignition switch.
4) Confirm that fuel high pressure line is not under pressure by using “Fuel Rail Pressure” under “Data List” of SUZUKI scan tool.

Fuel Leakage Check Procedure

S5JB0B1706003

1) Prime fuel line using priming pump (1).



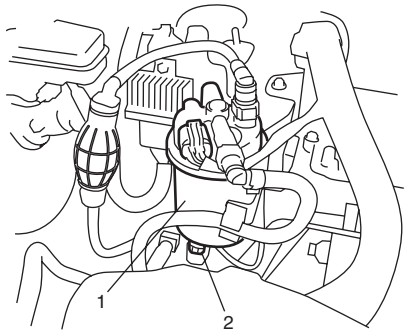
I5JB0B170002-01

2) Check low pressure fuel supply circuit for fuel leakage.
3) Start engine and run it at idle speed for about 10 seconds.
4) Stop engine and then check for fuel leakage in each part, which was serviced.
5) Start engine and run it at 4,000 r/min. for about 10 seconds.
6) Stop engine and then check for fuel leakage in each part, which was serviced.

Water Draining of Fuel Filter

S5JB0B1706023

1) Disconnect negative (–) cable at battery.
2) Place container under fuel filter (1).
3) Loosen bleed screw (2), and drain water until fuel flow out from fuel filter.
4) Tighten bleed screw (2).



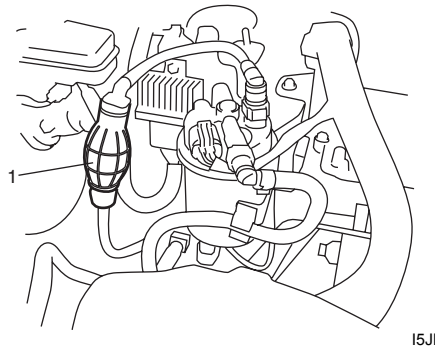
I5JB0B170003-01

5) Connect negative (–) cable at battery.
6) Check fuel leakage referring to “Fuel Leakage Check Procedure: ”.

Air Bleeding of Fuel System

S5JB0B1706024

Air bleeding must be carried out when fuel system has been disassembled or when vehicle ran out of fuel. Pump priming pump (1) 20 times or more, and then check engine starts.



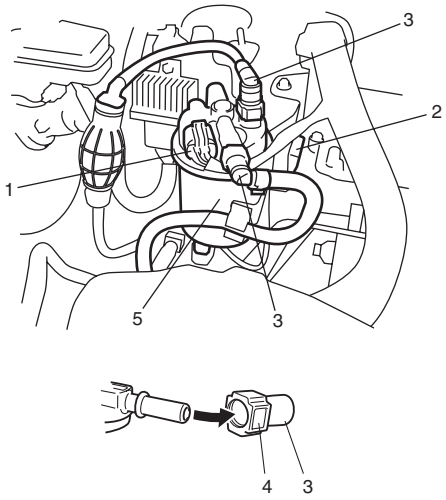
I5JB0B170002-01

Fuel Filter and Fuel Heater Removal and Installation

S5JB0B1706025

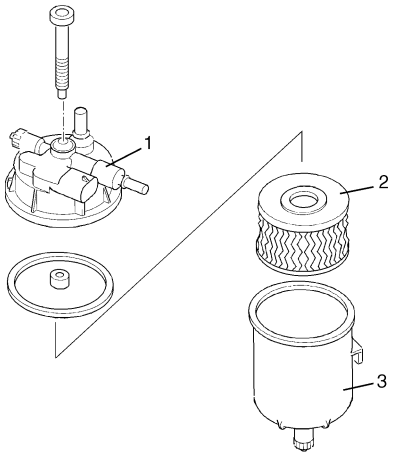
Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect fuel heater connector (1) and fuel filter water detection sensor connector (2).
3) Clean filter and its surrounding area.
4) Pull out fuel hoses (3) with pushing lock button (4).
5) Plug fuel hoses, fuel filter (5) and fuel heater with plug cap according to “Precautions on Fuel System Service: ” for parts number and handling.
6) Remove fuel filter (5) from its bracket (6).



I5JB0B170004-01

7) Remove fuel heater (1) and fuel filter (2) from fuel filter case (3).

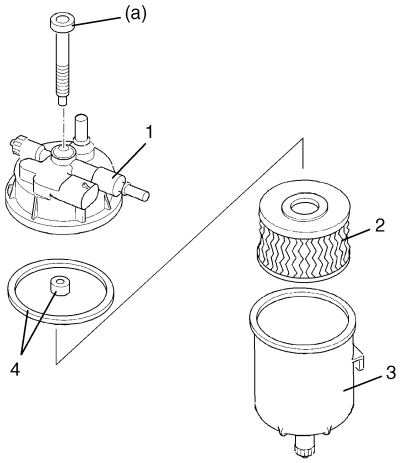


I5JB0B170005-01

Installation

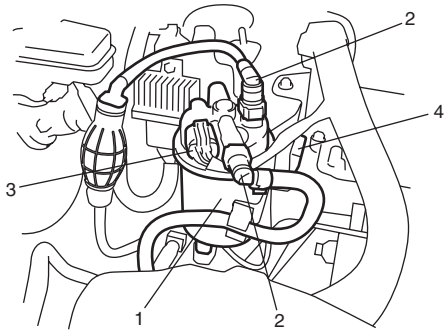
1) Clean fuel heater and fuel filter case.
2) Install fuel heater (1) and fuel filter (2) to fuel filter case (3) after applying diesel fuel to its new O-rings (4).

   Tightening torque
   Fuel filter case bolt (a): 5 N·m (0.5 kgf-m, 4.0 lb-ft)



I5JB0B170006-01

3) Install fuel filter (1) to its bracket.
4) Remove plug cup from fuel hoses (2) and fuel filter.
5) Connect fuel hoses to fuel filter.
6) Connect fuel heater connector (3) and fuel filter water detection sensor (4).



I5JB0B170007-01

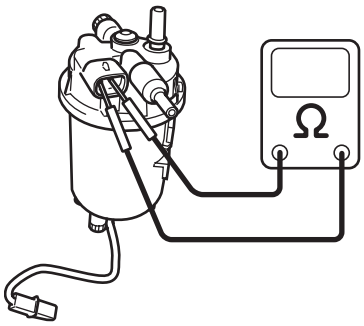
7) Connect negative (–) cable at battery.
8) Bleed air in fuel system referring to “Air Bleeding of Fuel System: ”.
9) Check fuel leakage referring to “Fuel Leakage Check Procedure: ”.

Fuel Heater Inspection

S5JB0B1706026

- Check for terminals of fuel heater for damage. If damage is found, replace fuel heater.
- Check resistance between terminals of fuel heater connector.If resistance is out of specification, replace fuel heater.

Fuel Heater Resistance
Approx. 0.6 Ω



I5JB0B170008-01

Fuel Hose Disconnecting and Reconnecting

S5JB0B1706038

⚠ WARNING

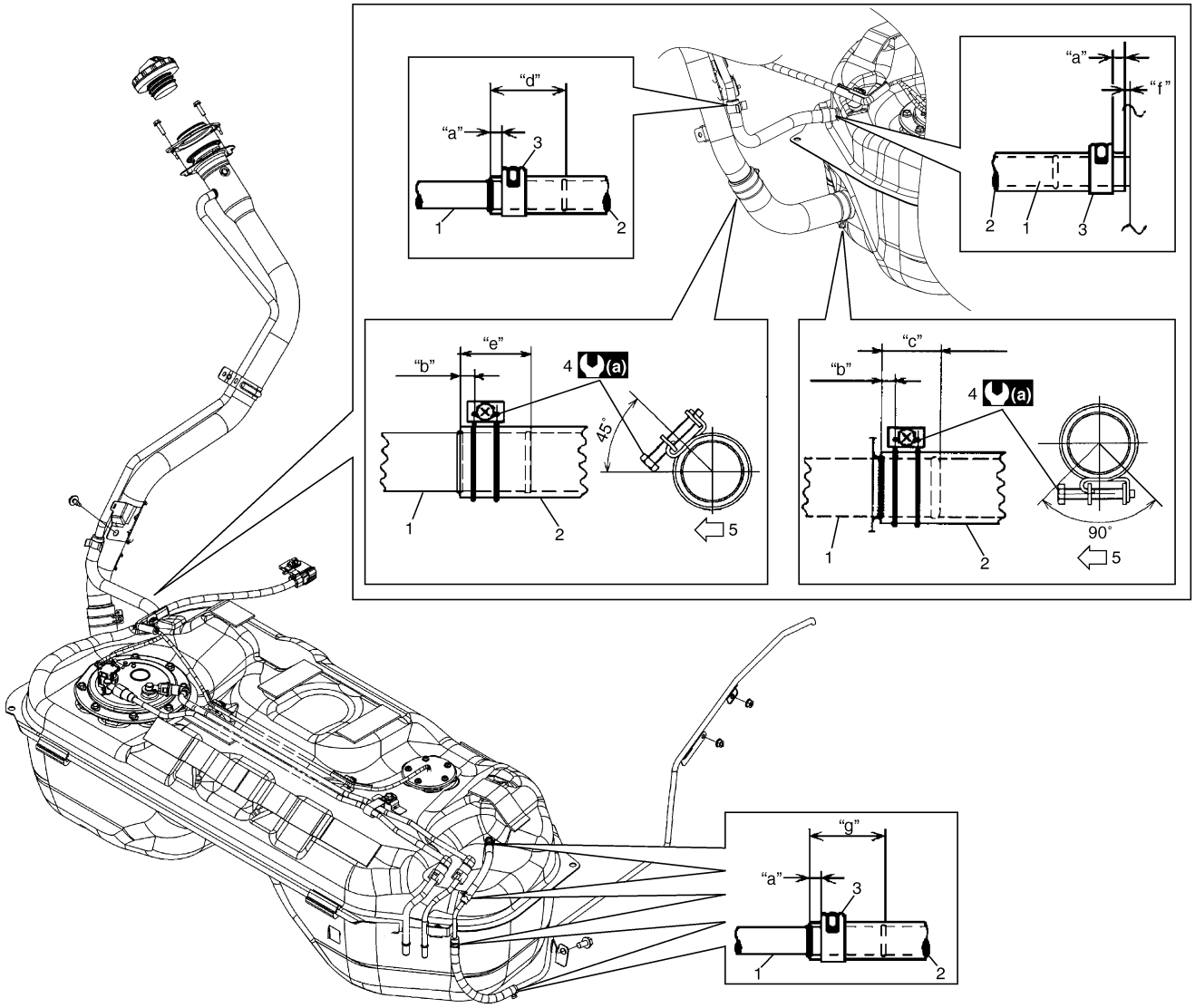
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk or fire and personal injury.

For Connection Other Than Quick Joint

- Clamp around fuel tank

NOTE

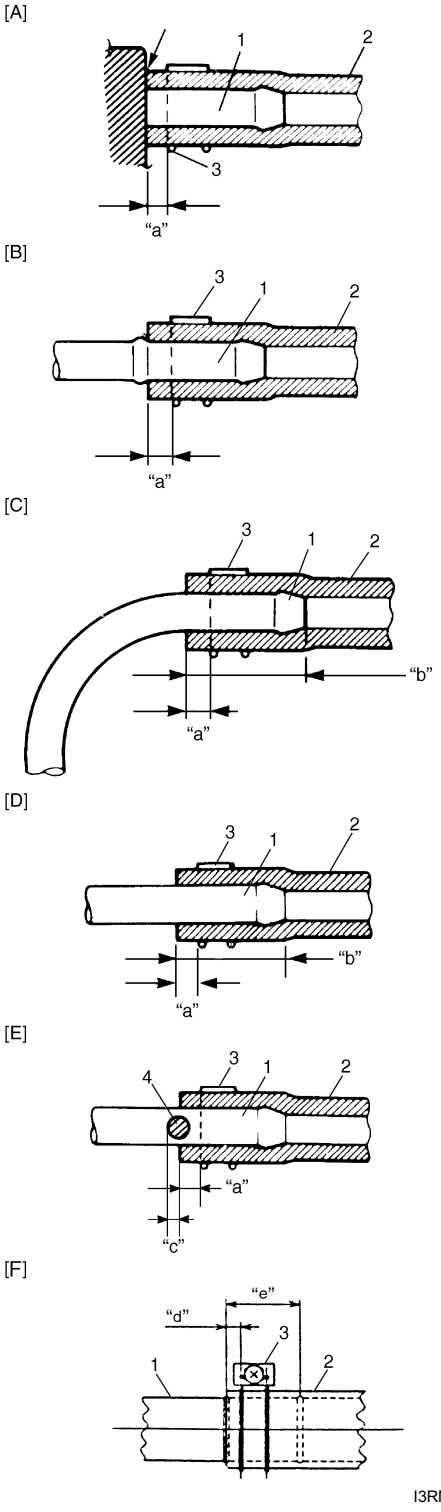
Be sure to install hose to spool of pipe surely.



I5JB0B170009-02

1. Pipe	"a": 3 – 7 mm (0.12 – 0.28 in.)	"f": 0 – 2 mm (0.00 – 0.08 in.)
2. Hose	"b": 5 – 12 mm (0.20 – 0.48 in.)	"g": 25 – 30 mm (0.99 – 1.18 in.)
3. Clamp	"c": 33 mm (1.30 in.)	(a) : 2 N·m (0.2 kgf-m, 1.5 lb-ft)
4. Fuel filler hose clamp screw	"d": 30 mm (1.18 in.)	
5. Vehicle leftward	"e": 38 mm (1.50 in.)	

- Other than clamp around fuel tank



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

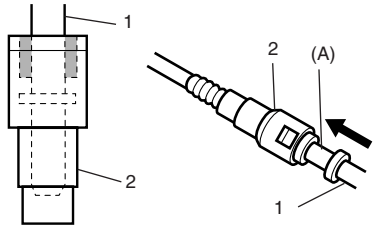
For Quick Joint

Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (2) by blowing compressed air.
2) Unlock joint lock by inserting special tool between pipe and quick joint.

   Special tool
   (A): 09919–47020

3) Disconnect quick joint from pipe.



I4RS0A170019-01

Reconnecting

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

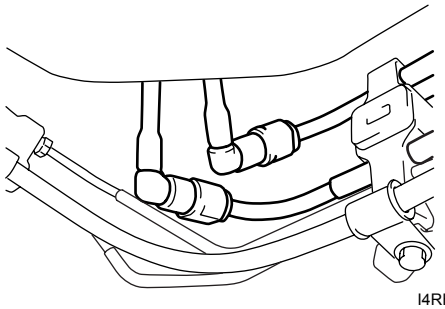
Fuel Lines Inspection

S5JB0B1706004

⚠ CAUTION

Due to the fact that fuel feed line 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.



I4RH0A170005-01

Fuel Pipe Removal and Installation

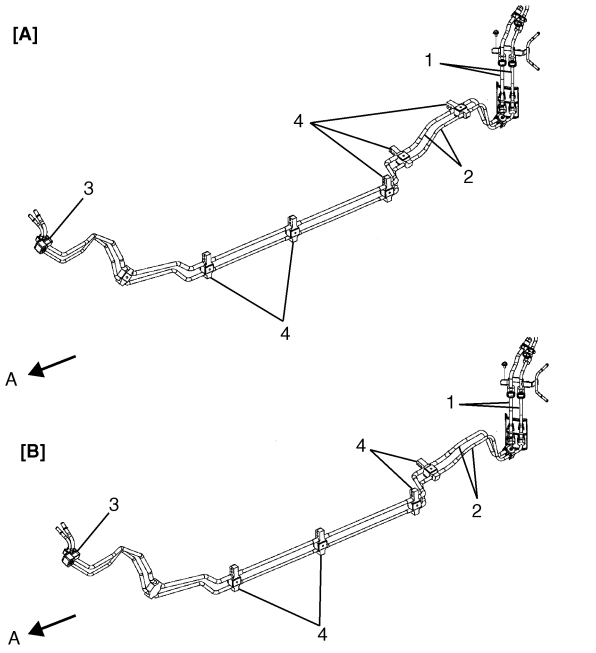
S5JB0B1706005

⚠ WARNING

Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: ".

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect fuel pipe joint and fuel hose (1) from fuel pipe (2) at the front and rear of each fuel pipe referring to "Fuel Hose Disconnecting and Reconnecting: ".
3) Mark the location of clamps (3) and (4) on fuel pipes (2), so that the clamps can be reinstalled to where they were.
4) Remove pipes (2) with clamp (3) and (4) from vehicle.
5) Remove clamp (3) and (4) from pipes (2).



I5JB0B170010-03

[A]: 5 door model	[B]: 3 door model	A: Vehicle forward

Installation

1) Install clamps to painted white location pipes. If clamp is deformed, 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 referring to "Fuel Hose Disconnecting and Reconnecting: ".
4) Connect negative (–) cable at battery.
5) Check fuel leakage referring to "Fuel Leakage Check Procedure: ".

High Pressure Pipe Removal and Installation

S5JB0B1706027

⚠ WARNING

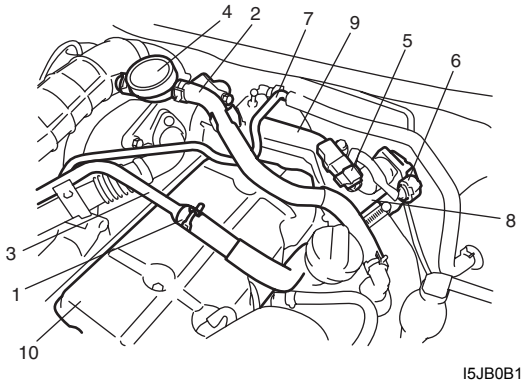
Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: ".

Removal

⚠ CAUTION

A small amount of fuel may come out during removal of high pressure pipes, cover high pressure pipes with lint-free cloth.

1) Relief fuel pressure referring to "Fuel Pressure Relief Procedure: ".
2) Disconnect negative (–) cable at battery.
3) Remove engine cover.
4) Disconnect ventilation hose No.2 (1) from ventilation pipe No.2 (3).
5) Disconnect ventilation hose No.4 (2) from oil vapor recirculation valve (4).
6) Disconnect boost pressure sensor connector (5) and inlet throttle valve connector (6).
7) Remove vacuum pipe (7), throttle body (8) with throttle body to EGR valve pipe (9) and fuel injector cover (10).



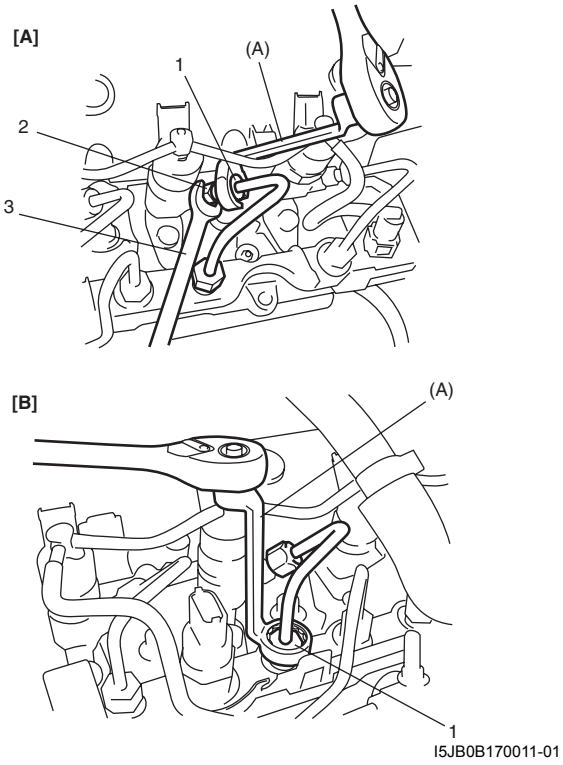
I5JB0B170041-01

8) Remove high pressure pipe as follows.
   - For high pressure pipe between fuel injector and common rail
     a. Loosen high pressure pipe union nut (1) using special tool and wrench.

⚠ CAUTION

When loosing union nut of injection side, hold union nut (2) with wrench (3) as shown in figure. Otherwise, pipe way bend or break.

Special tool
(A): 09911–75410



I5JB0B170011-01

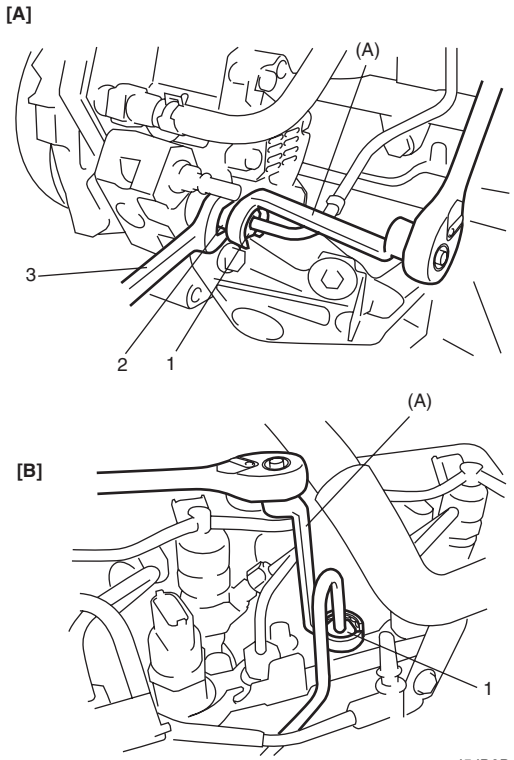
[A]: Injector side	[B]: Common rail side

- For high pressure pipe between injection pump and common rail
  a. Loosen high pressure pipe union nut (1) using special tool and wrench.

⚠ CAUTION

When loosing union nut of injection pump side, hold union nut (2) with wrench (3) as shown in figure.

Special tool
(A): 09911–75410



I5JB0B170012-01

[A]: Injection pump side	[B]: Common rail side

9) Clean and vacuum any contamination, and plug all joint part of disconnected fuel injection circuit with plug cap referring to “Precautions on Fuel System Service: ”

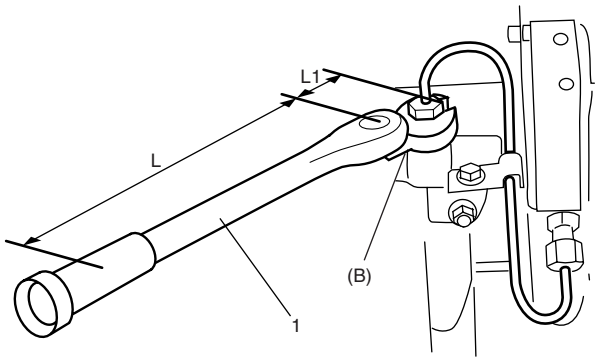
Installation

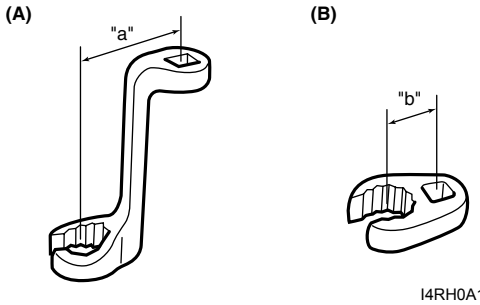
⚠ CAUTION

- **Do not touch pipes with wrench when tightening union nut to avoid a damage of high pressure pipe.**
- **In case of extension special tool combined with torque wrench, reading value of torque wrench is smaller than specified tightening torque. When using extension special tool, reading value should be calculated according to formula below.**

Tightening torque formula.
M = T x L / (L + “a”)
M: Reading value using extension special tool
T: Specified tightening torque
L: Length of torque wrench
“a”: Length of special tool

Special tool
(A): 09911–75410
(B): 09911–75420





I4RH0A170002-01

“a”: 35 mm (1.38 in.)	“b”: 23 mm (0.97 in.)

1) Loosen common rail mounting bolts fully in order not to install high pressure pipe under stress.
2) Install new high pressure pipes as follows.

⚠ CAUTION

- **Be sure not to interfere high pressure pipe with glow plug.**
- **Before installing high pressure pipe, be sure to lubricate not threads with oil included in spare part without allowing oil into high pressure pipe.**
  Do not lubricate high pressure pipe supplied without oil so that this fuel pipe is lubricated previously.

- For high pressure pipe between fuel injector and common rail
  a. Remove plug caps from fuel injector and common rail.
  b. Tighten high pressure pipe union nut as follows.
     i. Tighten fuel injector side union nuts then common rail side union nuts by hand.
     ii. Tighten common rail bolts to specified torque.

     Tightening torque
     Common rail bolt: 22 N·m (2.2 kgf-m, 16.0 lb-ft)

     iii. Tighten fuel injector side union nut then common rail side union nut to specified torque in the same manner as removal procedure.

     Tightening torque
     High pressure pipe union nut: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

- For high pressure pipe between injection pump and common rail
  a. Remove plug caps from fuel injector and common rail.
  b. Tighten high pressure pipe union nut as follows.
     i. Tighten injection pump side union nuts then common rail side union nuts by hand.
     ii. Tighten common rail mounting bolts to specified torque.

     Tightening torque
     Common rail mounting bolt: 22 N·m (2.2 kgf-m, 16.0 lb-ft)

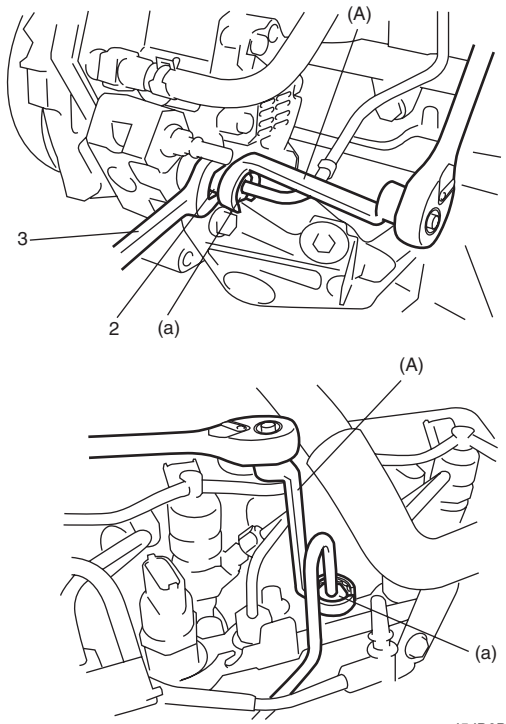
     iii. Tighten injection pump side union nut then common rail side union nut to specified torque in the same manner as removal procedure.

⚠ CAUTION

When tightening union nut of injection pump side, hold union nut (2) with wrench (3) as shown in figure.

Special tool
(A): 09911–75410

Tightening torque
High pressure pipe union nut (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



I5JB0B170013-01

3) Tighten common rail bolts.

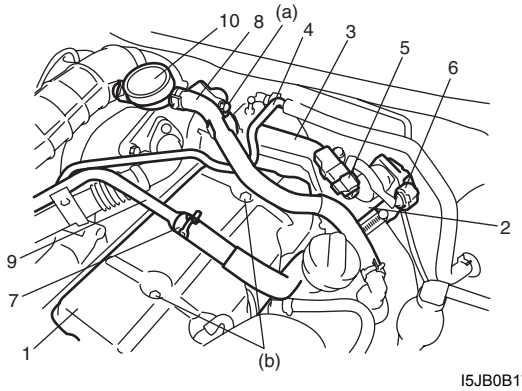
Tightening torque
Common rail bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

4) Install fuel injector cover (1), throttle body (2) with throttle body to EGR valve pipe (3) and vacuum pipe (4).

Tightening torque
Throttle body to EGR valve pipe bolt and nut (a): 21 N·m (2.1 kgf-m, 15.5 lb-ft)
Injector cover bolt (b): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

5) Connect inlet throttle valve connector (5) and boost pressure sensor connector (6).
6) Connect ventilation hose No.2 (7) to ventilation pipe No.2 (9).

7) Connect ventilation hose No.4 (8) to oil vapor recirculation valve (10).



I5JB0B170039-02

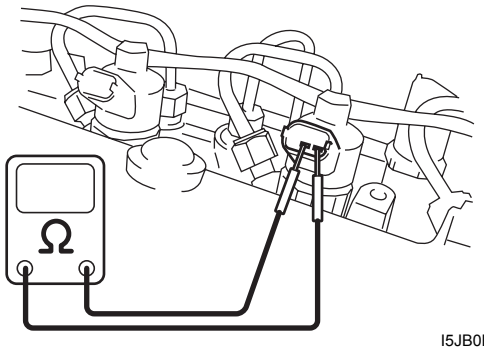
8) Install engine cover.
9) Connect negative (–) cable at battery.
10) Check fuel leakage referring to “Fuel Leakage Check Procedure: ”.
11) Check DTC referring to “DTC Check: in Section 1A”.

Fuel Injector On-Vehicle Inspection

S5JB0B1706006

1) Disconnect negative (–) cable at battery.
2) Remove engine cover.
3) Remove fuel injector cover referring to Step 4) through 7) in “Removal” of “High Pressure Pipe Removal and Installation: ”.
4) Disconnect connector from fuel injector.
5) Measure resistance between terminals of fuel injector.
   If resistance is out of specification, replace fuel injector.

   Fuel Injector Resistance
   Approx. 2 Ω or less



I5JB0B170014-01

Fuel Injector Removal and Installation

S5JB0B1706007

⚠ WARNING

Before servicing fuel system, be sure to observe “Precautions on Fuel System Service: ”.

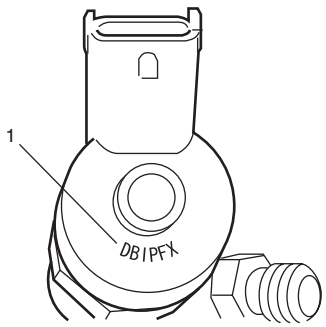
⚠ CAUTION

- **Never disassemble fuel injector. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.**
- **Never use ultrasound and wire brush.**

Removal

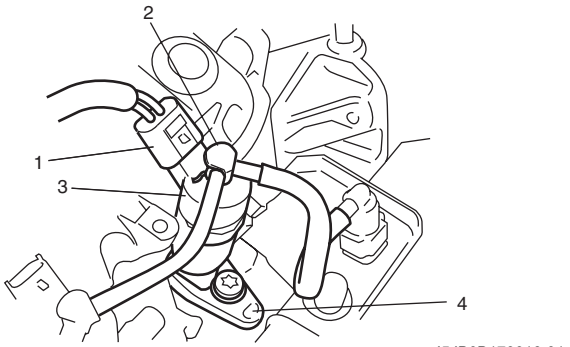
NOTE

The calibration code (1) 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”. If it is not registered correctly, DTC is stored in ECM and warning light is turned ON. Also calibration codes registration in ECM can be checked by SUZUKI scan tool.



I5JB0B170015-01

1) Remove high pressure pipe between fuel injector and common rail referring to “High Pressure Pipe Removal and Installation: ”.
2) Disconnect fuel injector connector (1) from fuel injector.
3) Remove fuel return hose (2).
4) Remove fuel injector (3) with fuel injector bracket (4).



I5JB0B170016-01

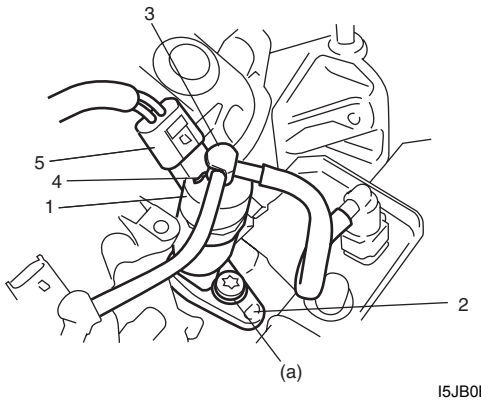
5) Remove sealing washer.
6) Plug fuel injector with plug caps referring to “Precautions on Fuel System Service: ”.

Installation

1) Soak new fuel injector body in grease remover.
2) Wipe off fuel injector using a lint-free cloth.
3) Remove plug caps from fuel injector.
4) Install new sealing washer to fuel injector hole.
5) Install fuel injector (1) with bracket (2) to cylinder head, and tighten fuel injector bracket bolt to specified torque.

Tightening torque
Fuel injector bracket bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

6) Install new fuel return hose (3) with new clip (4).
7) Connect fuel injector connector (5) to fuel injector.

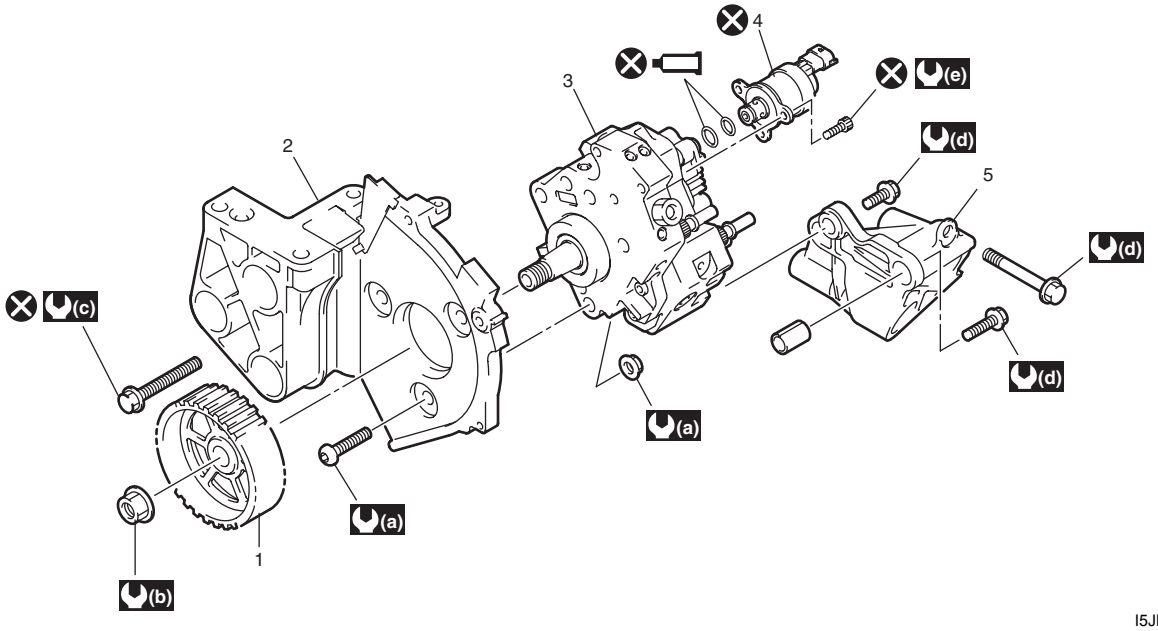


I5JB0B170017-02

8) Install new high pressure pipe referring to “High Pressure Pipe Removal and Installation: ”.

Injection Pump Components

S5JB0B1706037



I5JB0B170048-01

1. Injection pump pulley	(a) : 30 N·m (3.0 kgf-m, 22.0 lb-ft)
2. Injection pump front bracket	(b) : 70 N·m (7.0 kgf-m, 51.0 lb-ft)
3. Injection pump	(c) : Tighten 20 N·m (0.2 kgf-m, 14.5 lb-ft) and 80° by the specified procedure.
4. Fuel flow actuator	(d) : 44 N·m (4.4 kgf-m, 32.0 lb-ft)
5. O-ring : Apply clean fuel to O-ring.	(e) : Tighten 3 N·m (0.3 kgf-m, 2.5 lb-ft) and 6 N·m (0.6 kgf-m, 4.5 lb-ft) by the specified procedure.
6. Injection pump rear bracket	: Do not reuse.

Injection Pump Removal and Installation

S5JB0B1706030

⚠ WARNING

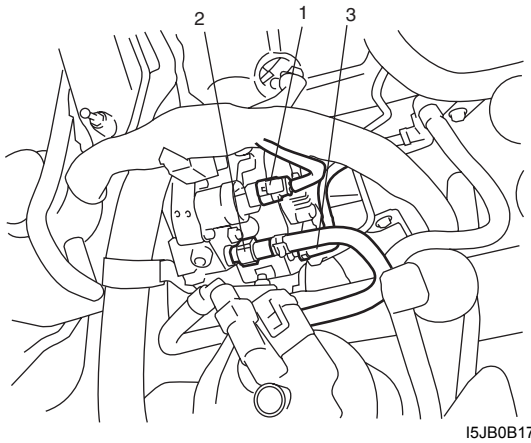
Before servicing fuel system, be sure to observe “Precautions on Fuel System Service: ”.

⚠ CAUTION

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

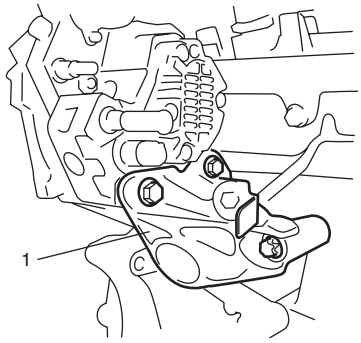
Removal

1) Check that engine is cold and fuel pressure is not under pressure referring to “Fuel Pressure Relief Procedure: ”.
2) Remove timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: in Section 1D”.
3) Clean all fuel connectors on injection pump.
4) Disconnect fuel flow actuator connector (1).
5) Disconnect fuel feed hose (2) and fuel return hose (3) from injection pump.



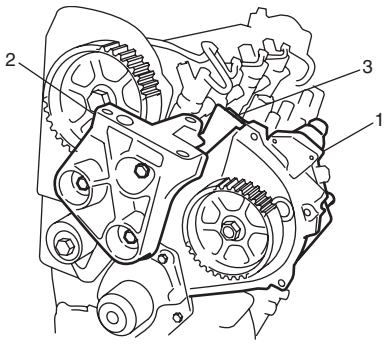
I5JB0B170018-01

6) Clean and vacuum any contamination, and plug all joint part of disconnected fuel circuit with plug cap referring to “Precautions on Fuel System Service: ”
7) Remove injection pump to common rail high pressure pipe referring to “High Pressure Pipe Removal and Installation: ”.
8) Remove timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: in Section 1D”.
9) Remove injection pump rear bracket (1).



I5JB0B170019-02

10) Remove injection pump (1) with front bracket (2) and timing belt cover plate (3) from cylinder head.

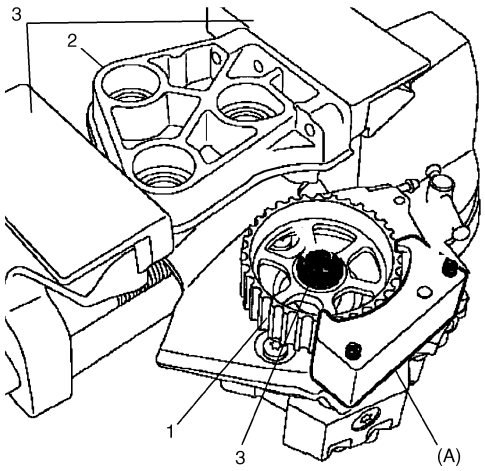


I5JB0B170020-01

11) Remove injection pump pulley (1) as follows, if necessary.
    a) Support injection pump front bracket (2) using vise (3).
    b) Install special tool (A) to injection pump front bracket in order to fix injection pump pulley.

    Special tool
    (A): 09912–96530

    c) Remove injection pump pulley nut (3).

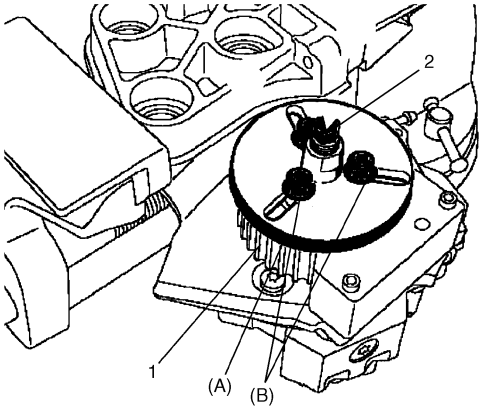


I5JB0B170021-04

d) Fit special tool (A) and (B) to injection pulley (1).

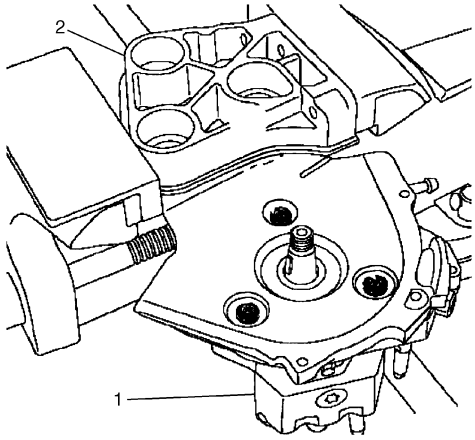
Special tool
(A): 09912–96510
(B): 09912–96520

e) Remove injection pump pulley by tightening bolt (2) of special tool (B).



I5JB0B170023-03

12) Remove injection pump (1) from injection pump front bracket (2), if necessary.

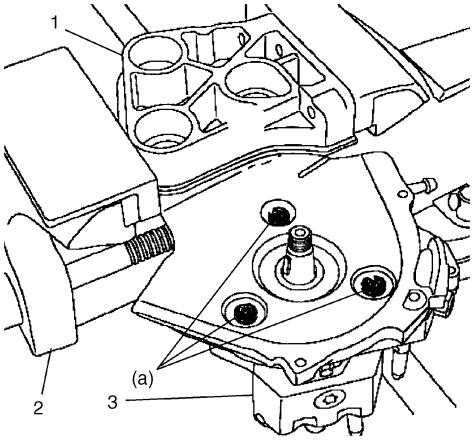


I5JB0B170022-03

Installation

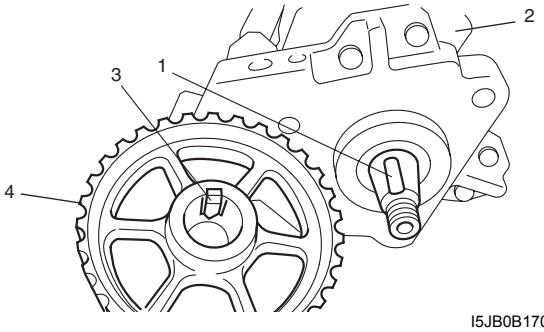
1) Support injection pump front bracket (1) using vise (2).
2) Install injection pump (3) to injection pump front bracket, if removed.

Tightening torque
Injection pump bolt (a): 30 N·m (3.0 kgf-m, 22.0 lb-ft)



I5JB0B170024-02

3) Install injection pump pulley as follows, if removed.
   a) Install injection pump pulley (4) to injection pump (2) aligning key (3) to groove (1).



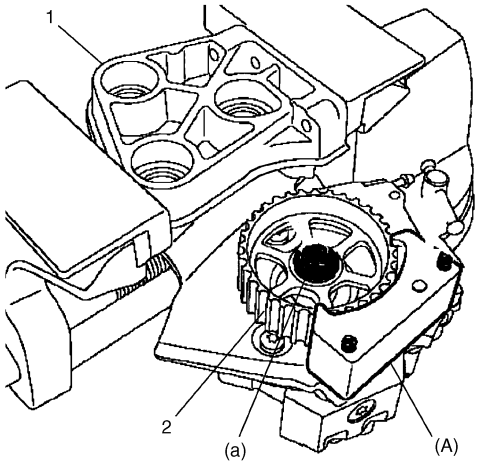
I5JB0B170025-02

b) Install special tool to injection pump front bracket (1) in order to fit injection pump pulley (2).

Special tool
(A): 09912–96530

c) Tighten injection pulley nut to specified torque.

Tightening torque
Injection pump pulley nut (a): 70 N·m (7.0 kgf-m, 51.0 lb-ft)



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d) Remove special tool (A).

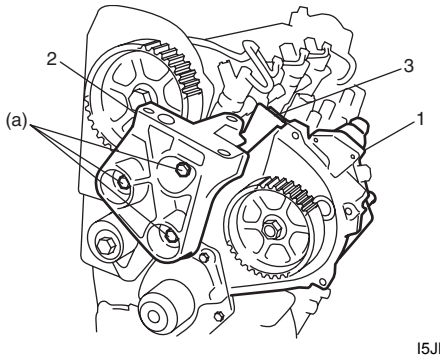
4) Install injection pump (1) with injection pump front bracket (2) and timing belt cover plate (3) to cylinder block.

5) Tighten new injection pump front bracket bolts as follows.

a) Tighten injection pump front bracket bolts to 20 N·m (2.0 kgf-m, 14.5 lb-ft).

b) Retighten them by turning through 80°.

Tightening torque
Injection pump front bracket bolt (a): Tighten 20 N·m (0.2 kgf-m, 14.5 lb-ft) and 80° by the specified procedure.



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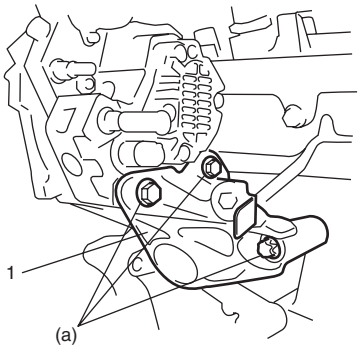
6) Install injection pump rear bracket (1).

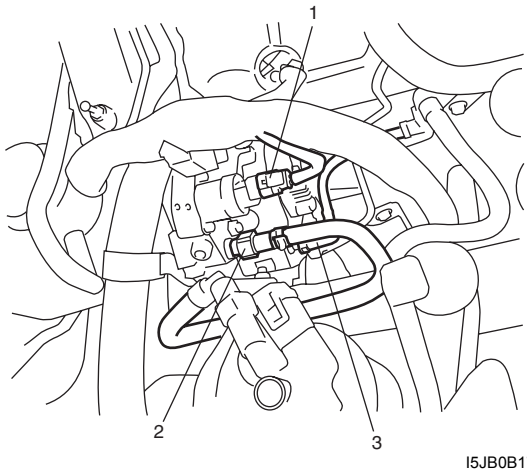
Tightening torque
Injection pump rear bracket bolt (a): 44 N·m (4.4 kgf-m, 32.0 lb-ft)



I5JB0B170028-01

7) Connect fuel flow actuator connector (1).

8) Connect fuel feed hose (2) and fuel return hose (3) to injection pump.



I5JB0B170040-01

9) Install new high pressure pipe referring to “High Pressure Pipe Removal and Installation: ”.

10) Install timing belt referring to “Timing Belt and Belt Tensioner Removal and Installation: in Section 1D”.

11) Check fuel leakage referring to “Fuel Leakage Check Procedure: ”.

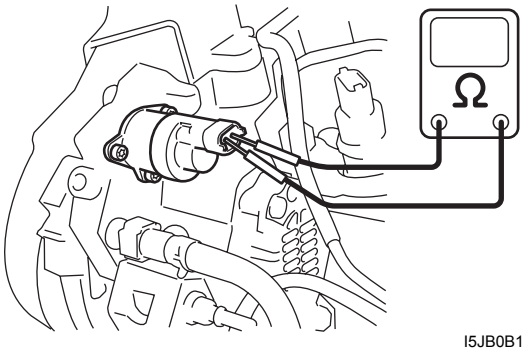
12) Check DTC referring to “DTC Check: in Section 1A”.

Fuel Flow Actuator Inspection

S5JB0B1706033

Check resistance between terminals of fuel flow actuator.
If resistance is out of specification, replace fuel flow actuator referring to “Fuel Flow Actuator Removal and Installation: ”.

Fuel flow actuator resistance
2.9 – 3.1 Ω at 20 °C (68 °F)



I5JB0B170029-01

Fuel Flow Actuator Removal and Installation

S5JB0B1706032

⚠ WARNING

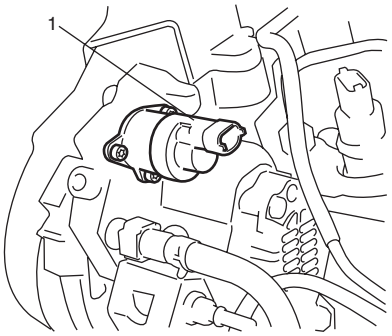
Before servicing fuel system, be sure to observe “Precautions on Fuel System Service: ”.

⚠ CAUTION

- **Do not reuse fuel flow actuator and fuel flow actuator bolt because it has the possibility that fuel leaks.**
- **Never leave fuel flow actuator orifice open. Replace new fuel flow actuator at once in order to prevent fuel circuit from contamination.**

Removal

1) Relief fuel pressure referring to “Fuel Pressure Relief Procedure: ”.
2) Disconnect negative (–) cable at battery.
3) Clean fuel flow actuator and its surrounding area.
4) Disconnect fuel flow actuator connector.
5) Remove fuel flow actuator (1) from injection pump by pulling and twisting it gradually.

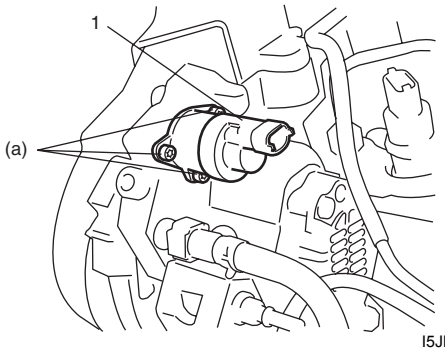


I5JB0B170030-01

Installation

1) Apply clean fuel to O-rings.
2) Fit new fuel flow actuator (1) to injection pump.
3) Tighten new fuel flow actuator bolts (2) as follows.
   a) Tighten fuel flow actuator bolts to 3 N·m (0.3 kgf-m, 2.5 lb-ft).
   b) Retighten fuel flow actuator bolts to 6 N·m (0.6 kgf-m, 4.5 lb-ft).

   Tightening torque
   Fuel flow actuator bolt (a): Tighten 3 N·m (0.3 kgf-m, 2.5 lb-ft) and 6 N·m (0.6 kgf-m, 4.5 lb-ft) by the specified procedure.



I5JB0B170031-01

4) Connect fuel flow actuator connector.
5) Connect negative (–) cable at battery.
6) Check fuel leakage referring to “Fuel Leakage Check Procedure: ”.
7) Check DTC referring to “DTC Check: in Section 1A”.

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

S5JB0B1706034

⚠ WARNING

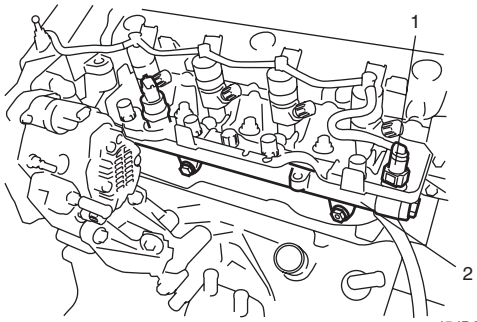
Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: ".

⚠ CAUTION

Never remove fuel rail pressure sensor from common rail because this may cause fuel circuit contamination problems.
If fuel rail pressure sensor fails, common rail and all high pressure pipes must be replaced.

Removal

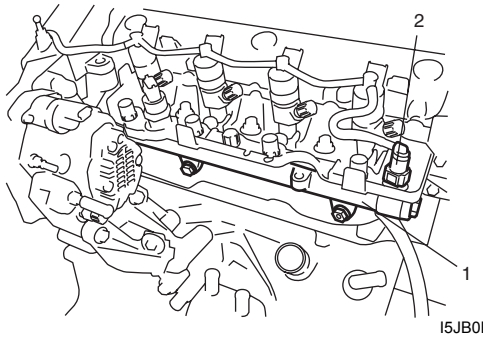
1) Remove all high pressure pipes referring to "High Pressure Pipe Removal and Installation: ".
2) Remove oil separator referring to "Oil Separator Removal and Installation: in Section 1D".
3) Disconnect fuel return hose (1).
4) Remove common rail (2) from cylinder head.



I5JB0B170032-02

Installation

1) Install common rail (1) to cylinder head, and tighten common rail bolt by hand.
2) Install new high pressure pipes referring to "High Pressure Pipe Removal and Installation: ".
3) Connect fuel return hose.



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4) Install oil separator referring to "Oil Separator Removal and Installation:".
5) Install fuel injector cover, throttle body and engine cover referring to Step 3) through 6) of "Installation" under "High Pressure Pipe Removal and Installation: ".
6) Connect negative (–) cable to battery.
7) Check fuel leakage referring to "Fuel Leakage Check Procedure: ".
8) Check DTC referring to "DTC Check: in Section 1A".

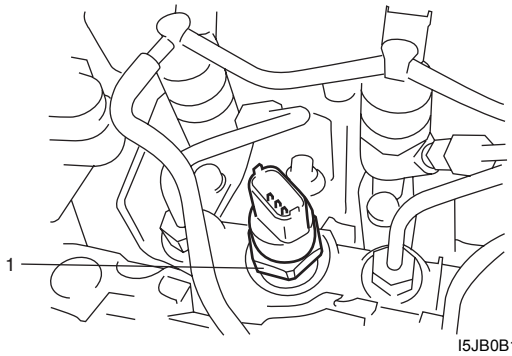
Fuel Rail Presser Sensor Inspection

S5JB0B1706035

⚠ CAUTION

Never remove fuel rail pressure sensor from common rail because this may cause fuel circuit contamination problems.
If fuel rail pressure sensor fails, common rail and all high pressure pipes must be replaced.

1) Disconnect negative (–) cable at battery.
2) Remove fuel injector cover referring to Step 2) through 6) of "Removal" under "High Pressure Pipe Removal and Installation: ".
3) Check for fuel rail pressure sensor (1) and its terminal for damage.
   If damage is found, replace common rail referring to "Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: ".



I5JB0B170034-01

Fuel Filler Cap Inspection

S5JB0B1706011

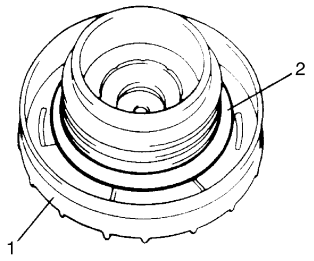
⚠ WARNING

Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: ".

⚠ CAUTION

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in critical malfunction of system.

Remove cap (1), and check gasket for even filler neck imprint, and deterioration or any damage. If gasket (2) is in malcondition, replace cap.



I2RH01170008-01

Fuel Tank Removal and Installation

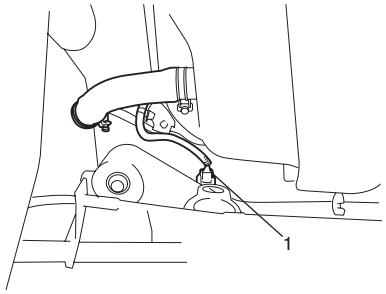
S5JB0B1706012

⚠ WARNING

Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: ".

Removal

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle.
3) Remove exhaust center pipe.
4) Remove rear propeller shaft referring to "Propeller Shaft Removal and Installation: in Section 3D".
5) With cable connected, detach parking brake cable clamp from fuel tank cover referring to "Parking Brake Cable Location: in Section 4D in related manual"
6) Disconnect fuel filler hose and breather hose from filler neck referring to "Fuel Tank Inlet Valve Removal and Installation: ".
7) For 5 door model, disconnect fuel pump connector (1).



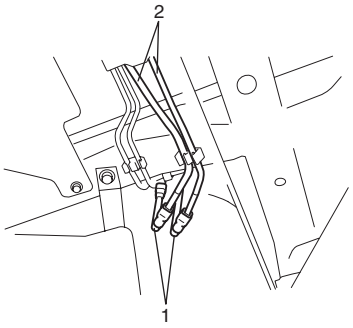
I5JB0A171015-01

8) Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler. Use hand operated pump device to drain fuel tank.

⚠ CAUTION

- **Do not force pump hose into fuel tank, or pump hose may damage fuel tank inlet valve.**
- **Never store fuel in an open container due to possibility of fire or explosion.**

9) Disconnect fuel pipe joint and fuel hoses (1) from fuel pipes (2) referring to "Fuel Hose Disconnecting and Reconnecting: ".



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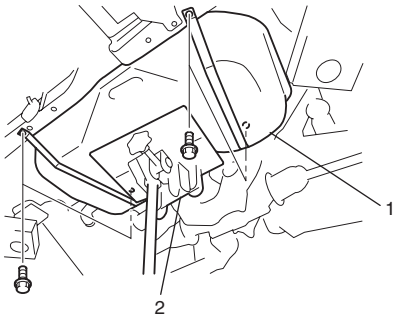
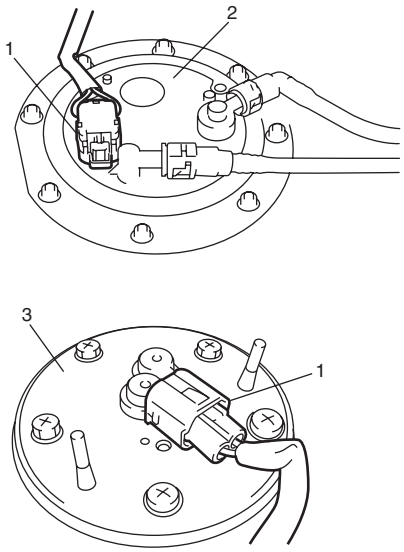
10) Support fuel tank (1) with jack (2) and remove its mounting bolts.



I5JB0A171018-01

11) For 3 door model, lower fuel tank a little so as to disconnect connectors (1) of fuel pump (2) and sub fuel level gauge (3), then remove fuel tank.



I5JB0A171019-01

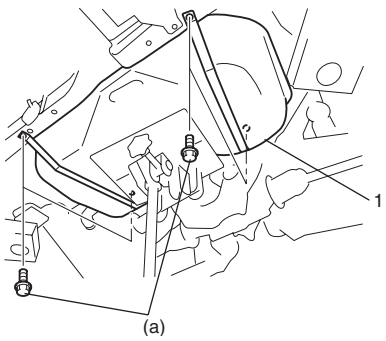
Installation

⚠ 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) Raise fuel tank (1) with jack, and connect connectors of fuel pump and sub fuel level gauge and clamp wire harness.
3) Install fuel tank to vehicle.

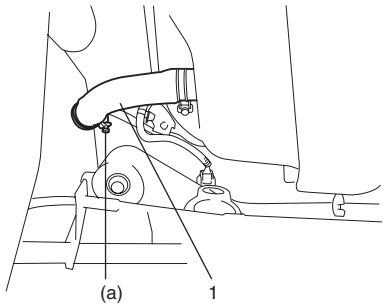
Tightening torque
Fuel tank bolt (a): 50 N·m (5.0 kgf-m, 36.5 lb-ft)



I5JB0A171020-01

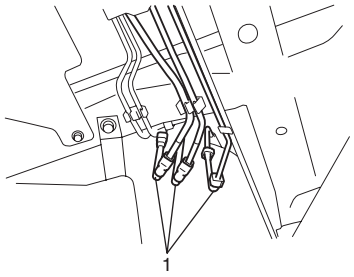
4) Connect fuel filler hose (1) and breather hose to filler neck as shown in figure, and clamp them securely.

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



I5JB0A171021-01

5) Connect fuel feed hoses (1) to each pipe as shown in figure, and clamp them securely referring to “Fuel Hose Disconnecting and Reconnecting: ”.



I5JB0A171022-01

6) Install parking brake cable clamp to fuel tank cover referring to “Parking Brake Cable Location: in Section 4D in related manual”.
7) Install rear propeller shaft referring to “Propeller Shaft Removal and Installation: in Section 3D”
8) Install exhaust No.1 pipe referring to “Exhaust System Components: in Section 1K”.
9) Connect negative (–) cable at battery.
10) Check fuel leakage referring to “Fuel Leakage Check Procedure: ”.

Fuel Tank Inspection

S5JB0B1706013

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel level gauge assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

Fuel Tank Purging Procedure

S5JB0B1706014

⚠ WARNING

This purging procedure will not remove all fuel vapor.
Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.

1) After removing fuel tank, remove all hoses, pipes and fuel level gauge assembly from fuel tank.
2) Drain all remaining fuel from tank.
3) Move 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.

⚠ CAUTION

Never remain water in fuel tank after washing, or fuel tank inside will get corrosion.

Fuel Tank Inlet Valve Removal and Installation

S5JB0B1706015

⚠ WARNING

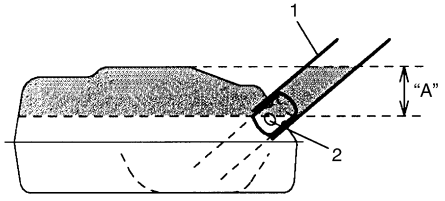
Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: ".

Removal

1) Remove fuel filler cap.
2) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space "A" as shown in figure.

⚠ CAUTION

Do not force pump hose into fuel tank, or pump hose may damage to fuel tank inlet valve (2).



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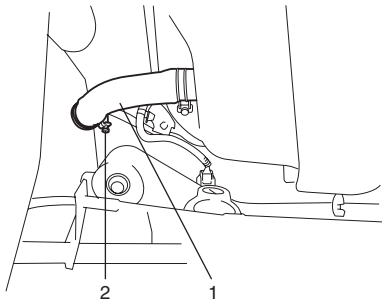
3) Hoist vehicle, and remove clamp (2) and fuel filler hose (1) from fuel filler neck.

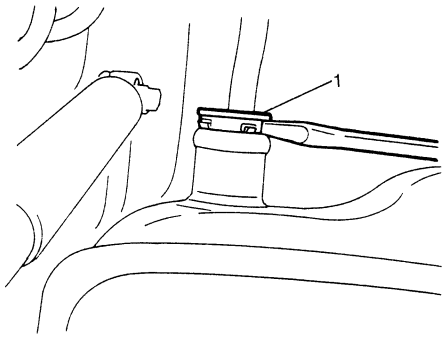


I5JB0A171014-01

4) Remove fuel tank inlet valve (1) using flat head rod (2) or the like.

⚠ CAUTION

Be careful not to damage fuel tank inlet valve (1) with flat head rod (2) or the like.



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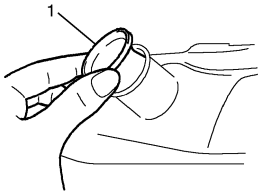
Installation

1) Install fuel tank inlet valve (1) to fuel tank.



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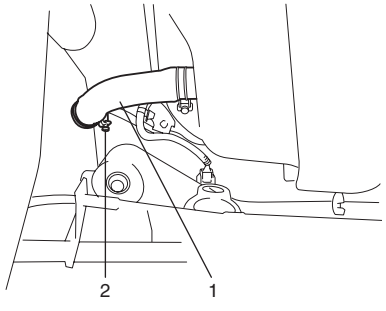
2) Install fuel filler hose (1) to fuel tank and secure it with clamp (2).
For proper installation, refer to "Fuel Hose Disconnecting and Reconnecting: ".



I5JB0A171014-01

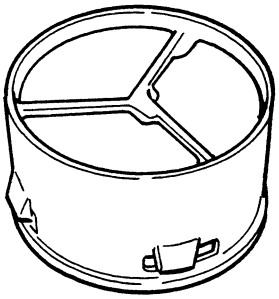
3) Lower vehicle and install fuel filler cap.

Fuel Tank Inlet Valve Inspection

S5JB0B1706016

Check fuel tank inlet valve for the following.
If any damage or malfunction is found, replace.

- Damage
- Smooth opening and closing



I2RH0B170019-01

Fuel Pump Assembly Removal and Installation

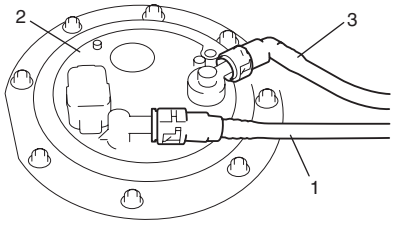
S5JB0B1706019

⚠ WARNING

Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: ".

Removal

1) Remove fuel tank from vehicle. Refer to "Fuel Tank Removal and Installation: ".
2) Disconnect fuel feed pipe (1) and fuel return pipe (3) from fuel pump assembly (2) referring to "Fuel Hose Disconnecting and Reconnecting: ".



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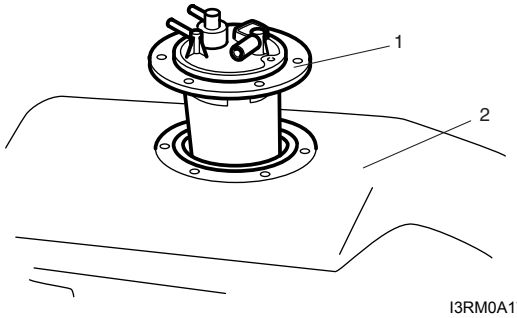
3) Remove fuel pump assembly (1) from fuel tank (2) and disconnect suction hose.



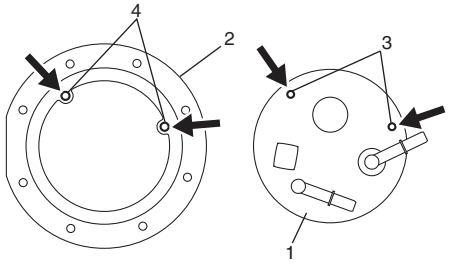
I3RM0A170021-01

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.

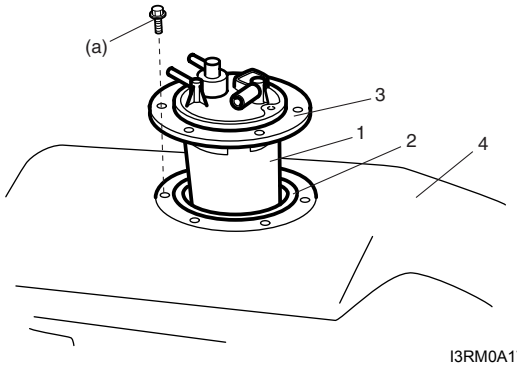
1) Clean mating surfaces of fuel pump assembly (1) and fuel tank.
2) Put plate (2) on fuel pump assembly (1) by matching the protrusion of fuel pump assembly (3) to plate hole (4) as shown.



I5JB0A171025-01

3) Connect suction hose to fuel pump assembly (1), and install new gasket (2) and fuel pump assembly with plate (3) to fuel tank (4).

Tightening torque
Fuel pump assembly bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



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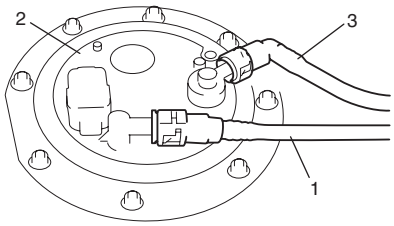
4) Connect fuel feed pipe (1) (pipe joint) and fuel return pipe (3) (pipe joint) to fuel pump assembly (2).



I5JB0A171024-01

5) Install fuel tank to vehicle. Refer to "Fuel Tank Removal and Installation: ".

Fuel Pump Inspection

S5JB0B1706043

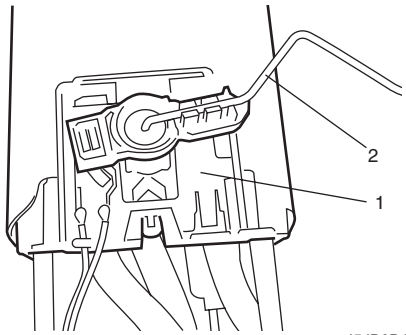
- Check fuel pump assembly for damage.
- Check fuel suction filter for evidence of dirt and contamination.
  If present, replace or clean and check for presence of dirt in fuel tank.
- For electrical circuit.

Main Fuel Level Gauge Removal and Installation

S5JB0B1706039

⚠ CAUTION

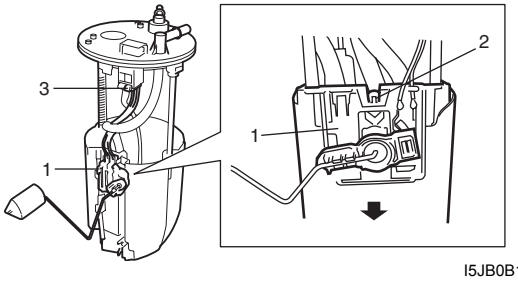
- **Do not touch resister plate (1) and deform arm (2). It may cause main fuel level gauge to fail.**
- **Be very careful not to cause damage to fuel tube installed section (sealed section in bore). If it be damaged, replace it with new one, or fuel will leak from the part.**



I5JB0B170036-01

Removal

1) Remove fuel pump assembly from fuel tank referring to “Fuel Pump Assembly Removal and Installation: ”.
2) Disconnect main fuel level gauge connector (3).
3) With pressing snap-fit part (2), remove main fuel level gauge (1) by sliding it in the arrow direction as shown in figure.



I5JB0B170037-01

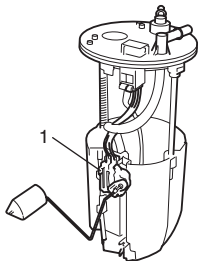
Installation

Reverse removal procedure for installation.

Main Fuel Level Gauge Inspection

S5JB0B1706041

- Check main fuel level gauge for damage.
- For inspection of main fuel level gauge (1), refer to “Fuel Level Sensor Inspection: in Section 9C”.



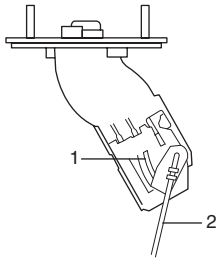
I5JB0A171027-01

Sub Fuel Level Gauge Removal and Installation

S5JB0B1706040

⚠ CAUTION

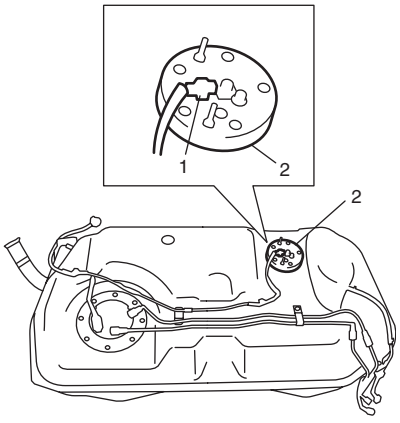
Do not touch resister plate (1) and deform arm (2). It may cause sub fuel level gauge to fail.



I5JB0A171028-01

Removal

1) Remove fuel tank from vehicle Referring to “Fuel Tank Removal and Installation: ”
2) Disconnect sub fuel level gauge connector (1) referring to “Fuel Hose Disconnecting and Reconnecting: ”.
3) Remove sub fuel level gauge (2).



I5JB0A171029-01

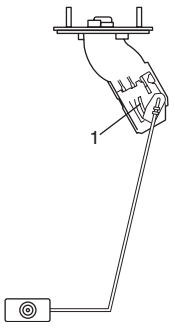
Installation
Reverse removal procedure for installation noting the following.

- Replace O-ring with new one using care not to damage it.
- Apply thin coat of fuel to O-ring, and then install sub fuel level sensor.

Sub Fuel Level Gauge Inspection

S5JB0B1706042

- Check sub fuel level gauge for damage.
- For inspection of sub fuel level gauge (1), refer to “Fuel Level Sensor Inspection: in Section 9C”.



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Specifications

Tightening Torque Specifications

S5JB0B1707001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Fuel filter case bolt	5	0.5	4.0	☞
Common rail bolt	22	2.2	16.0	☞
High pressure pipe union nut	25	2.5	18.0	☞ / ☞
Common rail mounting bolt	22	2.2	16.0	☞
Common rail bolt	25	2.5	18.0	☞
Throttle body to EGR valve pipe bolt and nut	21	2.1	15.5	☞
Injector cover bolt	8	0.8	6.0	☞
Fuel injector bracket bolt	25	2.5	18.0	☞
Injection pump bolt	30	3.0	22.0	☞
Injection pump pulley nut	70	7.0	51.0	☞
Injection pump front bracket bolt	Tighten 20 N·m (0.2 kgf-m, 14.5 lb-ft) and 80° by the specified procedure.			☞
Injection pump rear bracket bolt	44	4.4	32.0	☞
Fuel flow actuator bolt	Tighten 3 N·m (0.3 kgf-m, 2.5 lb-ft) and 6 N·m (0.6 kgf-m, 4.5 lb-ft) by the specified procedure.			☞
Fuel tank bolt	50	5.0	36.5	☞
Fuel filler hose clamp	2	0.2	1.5	☞
Fuel pump assembly bolt	11	1.1	8.0	☞

NOTE

The specified tightening torque is also described in the following.
“Fuel System Components: ”
“Fuel Hose Disconnecting and Reconnecting: ”
“Injection Pump Components: ”

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

Special Tools and Equipment

Recommended Service Material

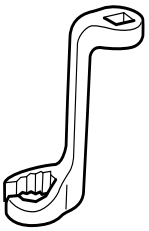
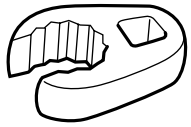
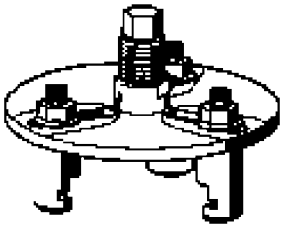
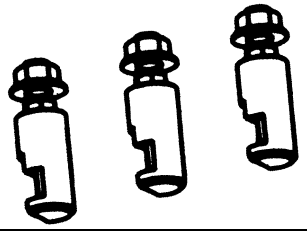
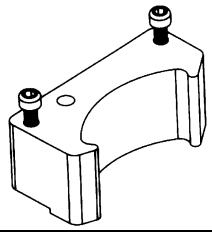
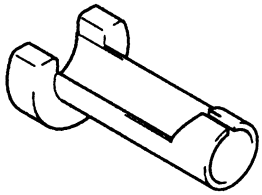
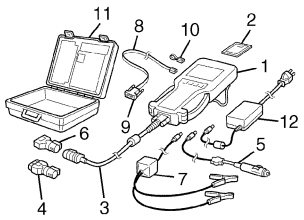
S5JB0B1708001

NOTE

Required service material is also described in the following.
"Injection Pump Components: "

Special Tool

S5JB0B1708002

09911–75410 Diesel injection-line wrench DM.19A ☞ / ☞ / ☞ / ☞ 	09911–75420 Crow foot flare-nut wrench 18.17 ☞ 
09912–96510 Injection pump pulley remover Mot. 1525 ☞ 	09912–96520 Adaptation crow Mot. 1525-03 ☞ 
09912–96530 Injection pump pulley locking Mot. 1668 ☞ / ☞ 	09919–47020 Quick joint remover ☞ 
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 ☞ 	

Starting System

General Description

Cranking Circuit Introduction

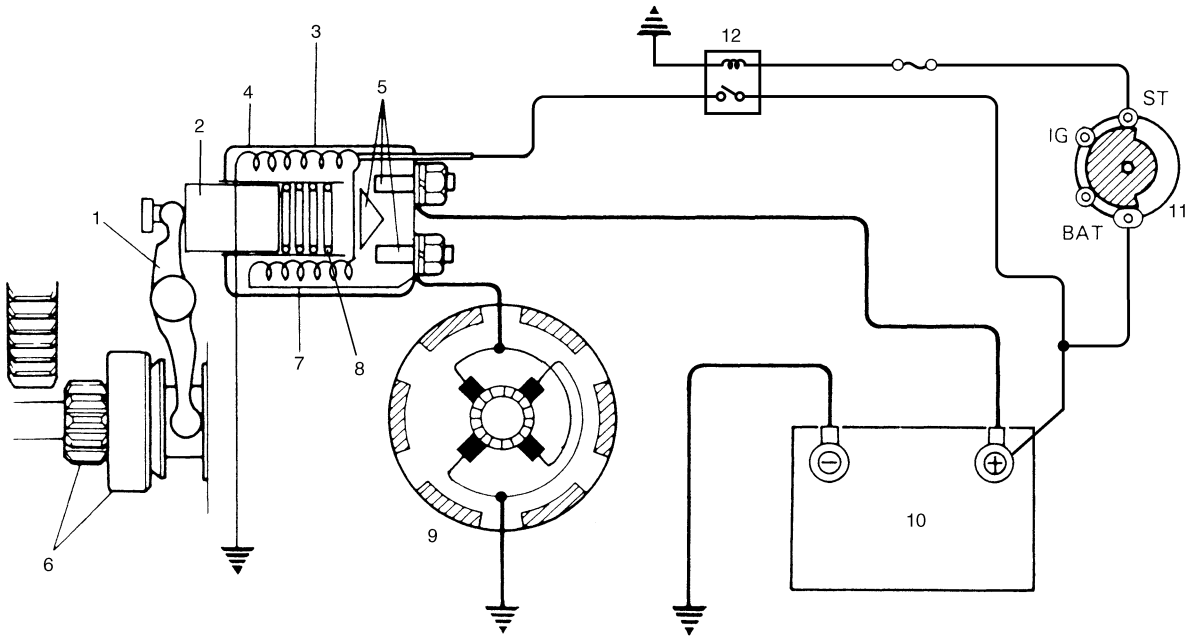
S5JB0B1901001

The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically.

Starting Motor Circuit Description

S5JB0B1901002

- 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.



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1. Pinion drive lever	5. Magnetic switch contacts	9. Starting motor
2. Plunger	6. Pinion and over-running clutch	10. Battery
3. Hold-in coil	7. Pull-in coil	11. Ignition and starting motor switch
4. Magnetic switch	8. Return spring	

Diagnostic Information and Procedures

Cranking System Symptom Diagnosis

S5JB0B1904001

Possible symptoms due to starting system trouble would be as follows:

- Starting motor does not run (or runs slowly)
- Starting motor runs but fails to crank engine
- Abnormal noise is heard

Proper diagnosis must be made to determine exactly where the cause of each trouble lies.....in battery, wiring harness, (including starting motor switch), starting motor or engine.
Do not remove motor just because starting motor does not run. Check 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	Shift lever switch is not in P or N, or not adjusted (A/T)	*Shift in P or N, or adjust switch.*
	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Poor contact in battery terminal connection	*Retighten or replace.*
	Loose grounding cable connection	*Retighten.*
	Fuse set loose or blown off	*Tighten or replace.*
	Poor contacting action of ignition switch and magnetic switch	*Replace.*
	Lead wire coupler loose in place	*Retighten.*
	Open-circuit between ignition switch and magnetic switch	*Repair.*
	Open-circuit in pull-in coil	*Replace magnetic switch.*
	Brushes are seating poorly or worn down	*Repair or replace.*
	Poor sliding or plunger and/or pinion	*Repair.*
Motor not running – Operating sound of magnetic switch heard	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Loose battery cable connections	*Retighten.*
	Burnt main contact point, or poor contacting action of magnetic switch	*Replace magnetic switch.*
	Brushes are seating poorly or worn down	*Repair or replace.*
	Weakened brush spring	*Replace starting motor.*
	Burnt commutator	*Replace starting motor.*
	Layer short-circuit of armature	*Replace starting motor.*
	Crankshaft rotation obstructed	*Repair.*
Starting motor running, but too slow (small torque) – Battery and wiring are satisfactory	Insufficient contact of magnetic switch main contacts	*Replace magnetic switch.*
	Layer short-circuit of armature	*Replace starting motor.*
	Disconnected, burnt or worn commutator	*Replace starting motor.*
	Worn brushes	*Replace starting motor.*
	Weakened brush springs	*Replace starting motor.*
	Burnt or abnormally worn end bush	*Replace starting motor.*

Condition	Possible cause	Correction / Reference Item
Starting motor running, but not cranking engine	Worn pinion tip	*Replace over-running clutch.*
	Poor sliding of over-running clutch	*Repair.*
	Over-running clutch slipping	*Replace over-running clutch.*
	Worn teeth of ring gear	*Replace flywheel (M/T) or drive plate (A/T).*
Noise	Abnormally worn bearing	*Replace front housing.*
	Worn pinion or worn teeth of ring gear	*Replace over-running clutch, flywheel (M/T) or drive plate (A/T).*
	Poor sliding of pinion (failure in return movement)	*Repair or replace.*
	Worn internal or planetary gear teeth	*Replace.*
	Lack of oil in each part	*Lubricate.*
Starting motor does not stop running	Fused contact points of magnetic switch	*Replace magnetic switch.*
	Short-circuit between turns of magnetic switch coil (layer short-circuit)	*Replace magnetic switch.*
	Failure of returning action in ignition switch	*Replace.*

Starting Motor Performance Test

S5JB0B1904002

⚠ CAUTION

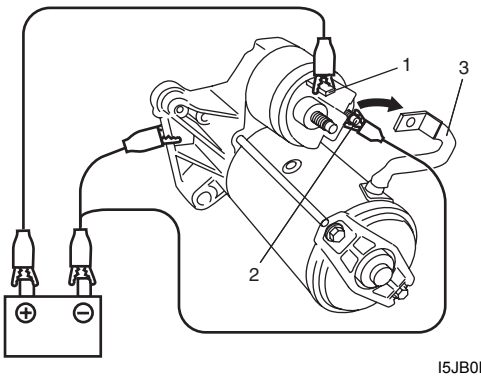
Each test must be performed within 3 – 5 seconds to avoid coil from burning.

Pull-In Test

1) Connect battery to magnetic switch as shown.
2) Check that plunger and pinion move outward. If plunger and pinion don't move, replace magnetic switch.

NOTE

Before testing, disconnect lead wire from terminal "M".



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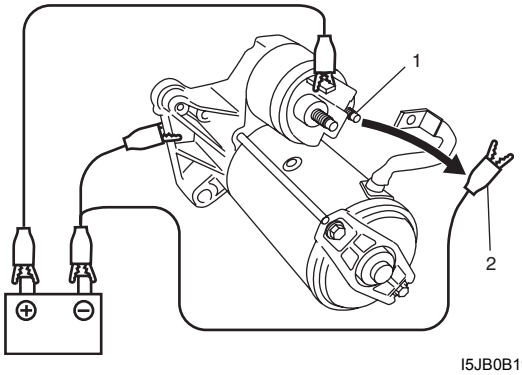
1.	Terminal "S"
2.	Terminal "M"
3.	Lead wire (switch to motor)

Hold-In Test

1) While connected as above with plunger out, disconnect negative lead (2) from terminal "M" (1).
2) Check that plunger and pinion remain out. If plunger and pinion return inward, replace magnetic switch.



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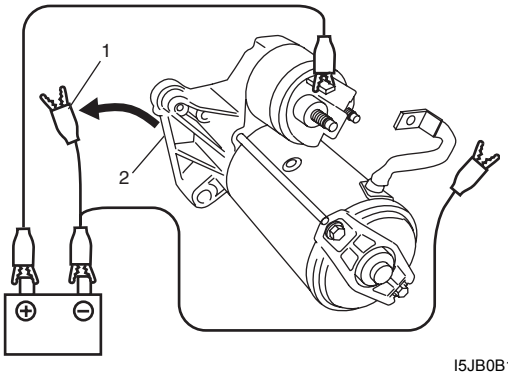
Plunger and Pinion Return Test

1) Disconnect negative lead (1) from switch body (2).
2) Check that plunger and pinion return inward. If plunger and pinion don't return, disassemble and inspect starting motor.



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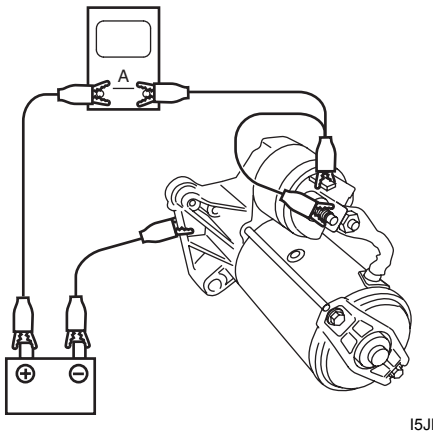
No-Load Performance Test

1) Connect battery and ammeter to starter as shown.
2) Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter indicates specified current.

Specified current (no-load performance test)
90A MAX. at 11V

NOTE

Use wires as thick as possible and tighten each terminal fully.



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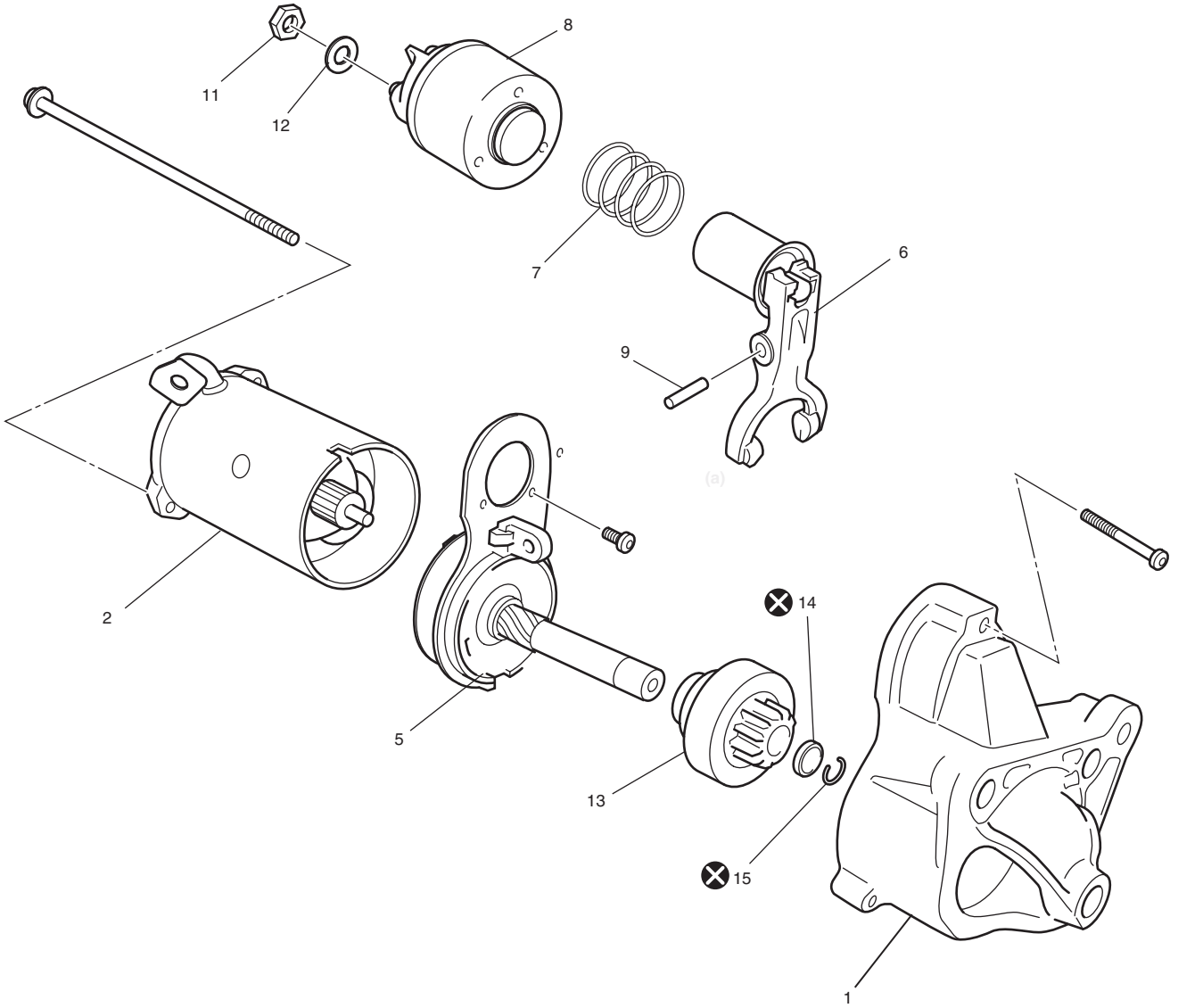
Repair Instructions

Starting Motor Components

S5JB0B1906005



I5JB0B190006-02

1. Front housing	5. Planetary carrier shaft assembly	9. Pin	13. Over-running clutch
2. Yoke	6. Plunger / lever assembly	10. Magnetic switch inner bolt	14. Pinion stop ring

3. Magnetic switch bolt	7. Spring	11. Nut	15. Snap ring
4. Through bolt	8. Magnetic switch	12. Washer	⊗ : Do not reuse.

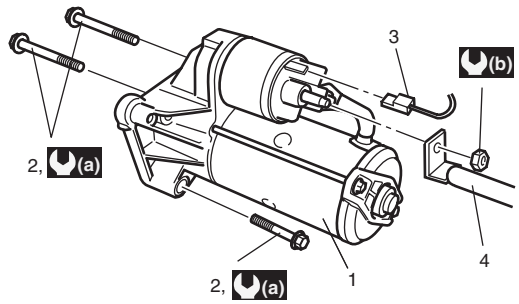
Starting Motor Dismounting and Remounting

S5JB0B1906001

⚠ WARNING

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

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner outlet hose.
3) Remove catalytic converter referring to “Exhaust System Components: in Section 1K”.
4) Disconnect magnetic switch lead wire (3) and battery cable (4) from starting motor terminals.
5) Remove 3 starting motor mount bolts (2).
6) Remove starting motor (1).
7) To install, reverse the above procedure.



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(a)	: 55 N·m (5.5 kg-m, 40.0 lb-ft)
(b)	: 8 N·m (8.0 kg-m, 6.0lb-ft)

Starting Motor Disassembly and Assembly

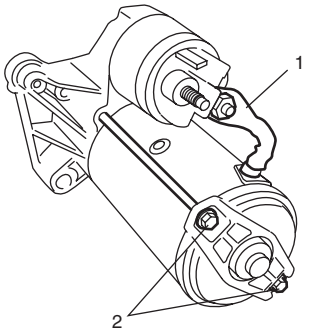
S5JB0B1906002

Disassembly

NOTE

Do not clamp yoke in a vise or strike it with a hammer during repair operations.

1) Disconnect lead wire from terminal “M” (1).
2) Loosen through bolts (2).



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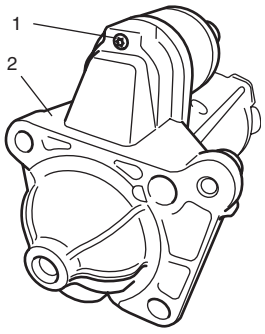
3) Loosen magnetic switch screw (1) and then remove front housing (2).



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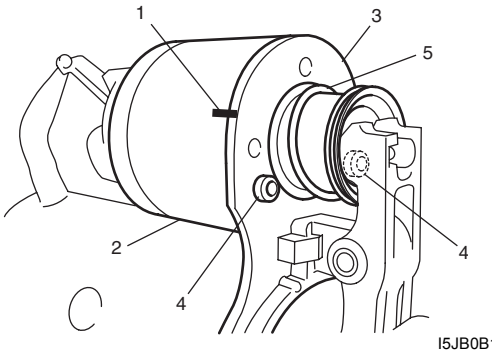
4) Put match marks (1) on magnetic switch (2) and planetary carrier shaft assembly (3) to install the magnetic switch correctly in position.
5) Loosen magnetic switch inner screw (4) and then remove magnetic switch (2) and spring (5).

⚠ CAUTION

Don’t disassemble this switch. If defective, replace as a complete assembly.



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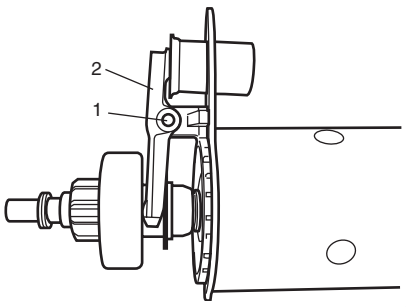
6) Remove pin (1) and then remove from lever (2) and then plunger / lever assembly.



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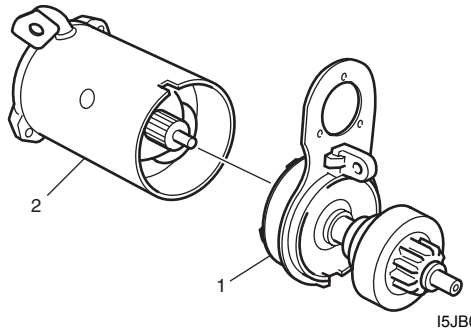
7) Remove planetary carrier shaft assembly (1) from yoke (2).

⚠ CAUTION

Don't disassemble motor. If defective, replace as a complete assembly.



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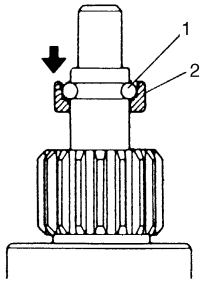
8) Loosen pinion stop ring (2) fixed by snap ring (1).



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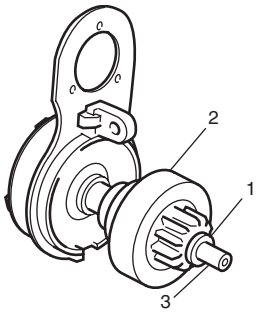
9) Remove snap ring and then pull out pinion stop ring (1) and over-running clutch (2) from planetary carrier shaft (3).



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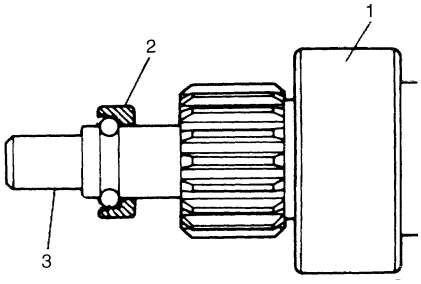
Assembly

1) Install over-running clutch (1) to planetary carrier shaft (3), using care for installing direction of pinion stop ring (2).



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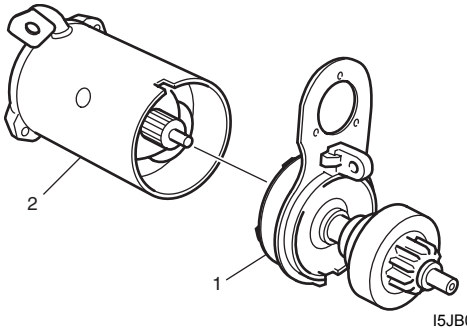
2) Install planetary carrier shaft assembly (1) to yoke (2).



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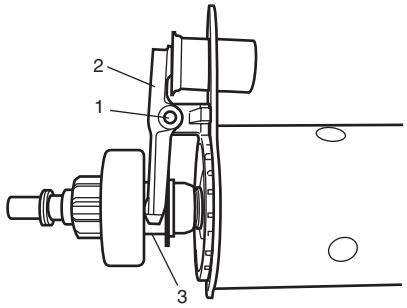
3) Install lever (2) to planetary carrier shaft assembly (3) and then insert pin (1).

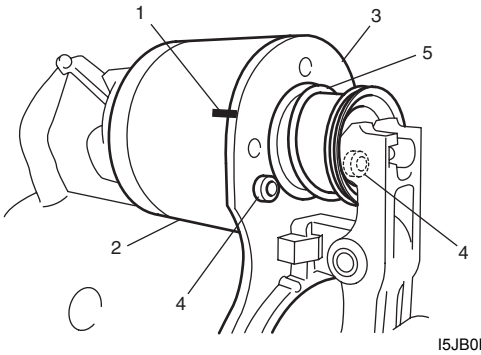


I5JB0B190016-01

4) Install spring (5) and magnetic switch (2) to plunger and then tighten magnetic switch inner screw (4).

⚠ CAUTION

With marks (1) on magnetic switch (2) and planetary carrier shaft assembly (3) marked before remove aligned to each other.



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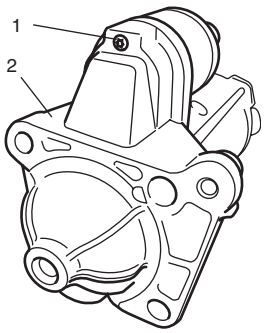
5) Install front housing (2) and then tighten magnetic switch screw (1).



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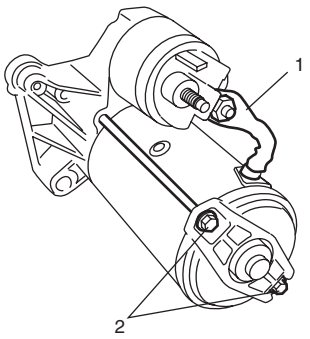
6) Install through bolts (2) and then tighten through bolts.

7) Connect lead wire to terminal “M” (1).



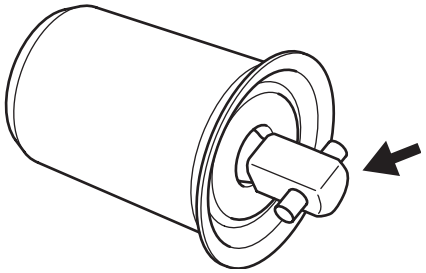
I5JB0B190017-02

Starting Motor Inspection

S5JB0B1906004

Plunger

Inspect plunger for wear. Replace if necessary.



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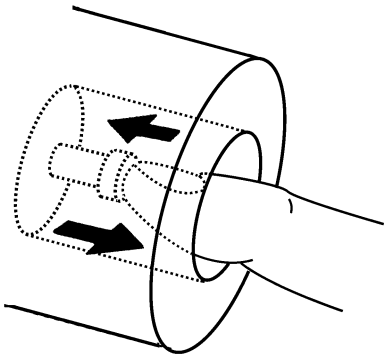
Magnetic Switch

Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.



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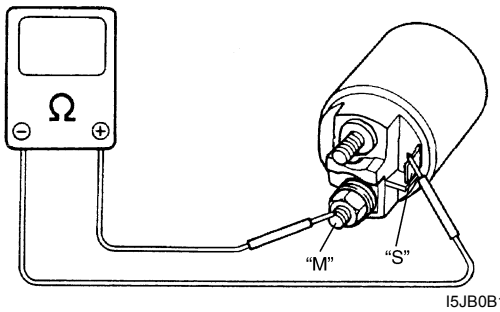
Pull-in coil open circuit test

Check for continuity across magnetic switch “S” terminal and “M” terminal. If no continuity exists, coil is open and should be replaced.



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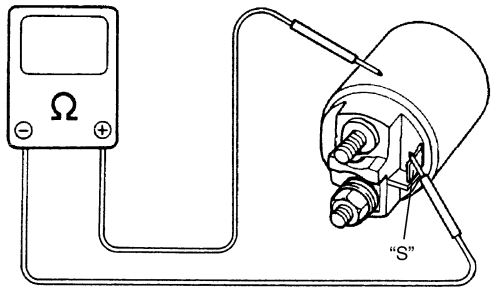
Hold-in coil open circuit test
Check for continuity across magnetic switch “S” terminal and coil case. If no continuity exists, coil is open and should be replaced.



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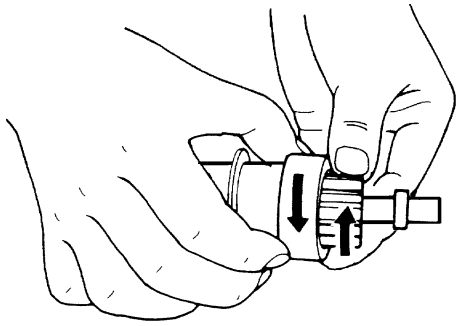
Pinion and Over-Running Clutch

- Inspect pinion for wear, damage or other abnormal conditions. Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction. Replace if necessary.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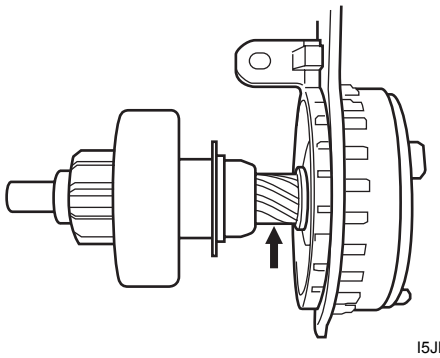
- Inspect spline teeth for wear or damage. Replace if necessary. Inspect pinion for smooth movement.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Specifications

Starting Motor Specifications

S5JB0B1907001

Voltage			12 volts
Output			2.2kW
Rating			30 seconds
Direction of rotation			Clockwise as viewed from pinion side
Number of pinion teeth			11
Performance		Condition	Guarantee
Around at 20 °C (68 °F)	No load characteristic	11.0 V	90 A maximum 2400 rpm minimum
	Load characteristic	7.5 V 300 A	10.8 N·m (1.1 kg-m, 7.8 lb-ft) minimum 870 rpm minimum
	Locked characteristic	3.0 V	840 A maximum 19.8 N·m (2.0 kg-m, 14.3 lb-ft) minimum
	Magnetic switch operating voltage		8 volts maximum

Tightening Torque Specifications

S5JB0B1907002

NOTE

The specified tightening torque is also described in the following.
“Starting Motor Dismounting and Remounting: ”

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

Charging System

General Description

Battery Description

S5JB0B1A01001

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking the engine.
- It acts as a voltage stabilizer for the electrical system.
- It can, for a limited time, provide energy when the electrical load exceeds the output of the generator.

Carrier and Hold-Down

The battery carrier should be in good condition so that it will support the battery securely and keep it level.
Before installing the battery, the battery carrier and hold-down clamp should be clean and free from corrosion and make certain there are no parts in carrier.
To prevent the battery from shaking in its carrier, the hold-down bolts should be tight enough but not over-tightened.

Electrolyte Freezing

The freezing point of electrolyte depends on its specific gravity. Since freezing may ruin a battery, it should be protected against freezing by keeping it in a fully charged condition. If a battery is frozen accidentally, it should not be charged until it is warmed.

Sulfation

If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. “Sulfation” means the result as well as the process of that reaction.
Such a battery can be revived by very slow charging and may be restored to usable condition but its capacity is lower than before.

Care of battery

⚠ WARNING

- **Never expose battery to open flame or electric spark because of battery generate gas which is flammable and explosive.**
- **Do not allow battery fluid to contact eyes, skin, fabrics, or painted surfaces as fluid is a corrosive acid. Flush any contacted area with water immediately and thoroughly.**
- **Batteries should always be kept out of reach of children.**

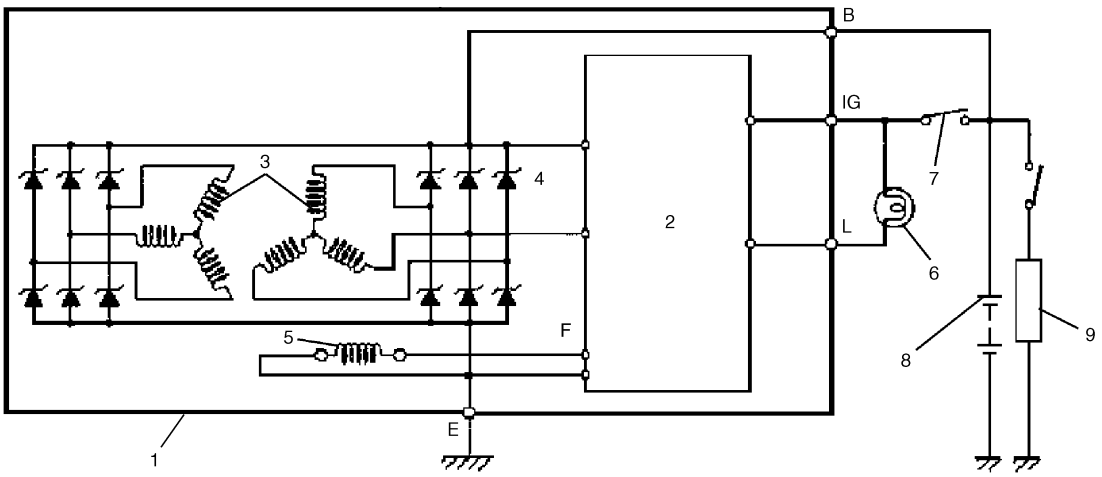
1) The battery is a very reliable component, but needs periodical attentions.
   - Keep the battery carrier clean.
   - Prevent rust formation on the terminal posts.
   - Keep the electrolyte up to the upper level uniformly in all cells.
   - When keeping battery on vehicle over a long period of time, follow instructions given below.
     – Weekly, start the engine and run it until it reaches normal operating temperature with engine speed of 2000 to 3000 rpm. Make sure all electric switches are off before storing the vehicle.
     – Recharge the battery twice a month to prevent it from discharging excessively. This is especially important when ambient temperature is low.
     The battery discharges even when it is not used, while vehicles are being stored. Battery electrolyte can freeze and battery case can crack at cold ambient condition if battery is not properly charged.
2) Keep the battery cable connections clean.
   The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current.
   Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.
3) Be always in the know as to the state of charge of the battery. The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an instrument for measuring the specific gravity (S.G.) of the battery electrolyte. The S.G. of the electrolyte is indicative of the state of charge. Refer to “Hydrometer Test” in “Battery Inspection: ”.

Generator Description

S5JB0B1A01002

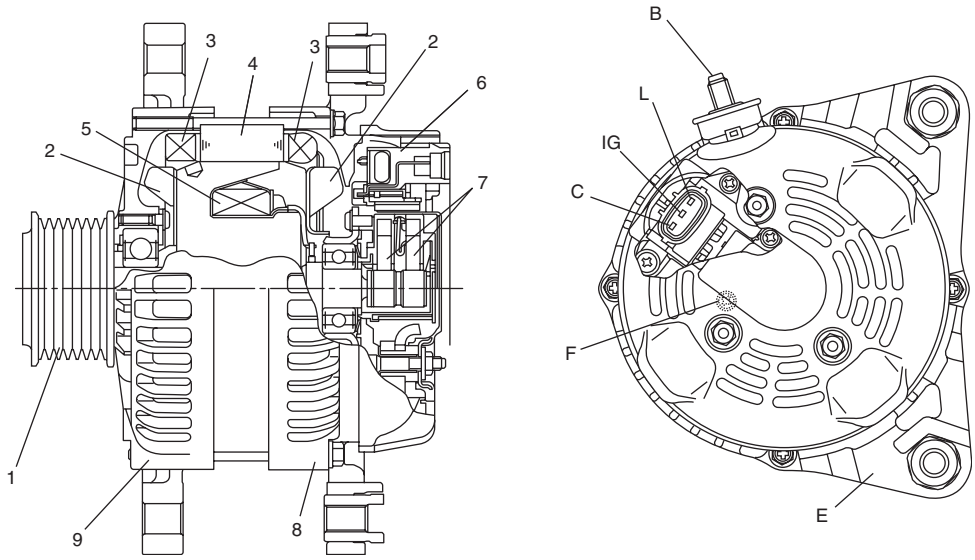
The generator is a small and high performance type with an IC regulator incorporated. The internal components are connected electrically as shown in the following figure.
The generator features are as follows:

- Solid state regulator is mounted inside the generator.
- All regulator components are enclosed into a solid mold.
- This unit along with the brush holder assembly is attached to the rear housing.
- The IC regulator uses integrated circuits and controls the voltage produced by the generator, and the voltage setting cannot be adjusted.
- The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service.
- The stator windings are assembled on the inside of a laminated core that forms part of the generator frame.



I5JB0B1A0001-05

1. Generator with regulator assembly	3. Stator coil	5. Field coil (rotor coil)	7. Main switch	9. Load
2. I.C. regulator	4. Diode	6. Charge indicator light	8. Battery	



I5JB0B1A0002-03

1. Pulley	5. Field coil	9. Drive end frame	L: Lamp terminal
2. Rotor fan	6. Regulator	B: Generator output (Battery terminal)	IG: Ignition terminal
3. Stator coil	7. Brush	E: Ground	C: Dummy
4. Stator core	8. Rear end frame	F: Field coil terminal	

Diagnostic Information and Procedures

Battery Inspection

S5JB0B1A04001

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 leave 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.

Battery Test

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

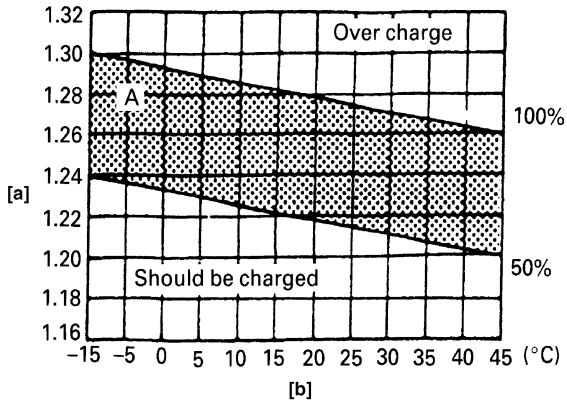
The direct method of checking the battery for state of charge is to carry out a high rate discharge test, which involves a special precise voltmeter and an expensive instrument used in the service shops, but not recommendable to the user of the vehicle.
At 20 °C of battery temperature (electrolyte temperature):

- 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.



I5JB0B1A0003-01

[a]:	Gravity
[b]:	Temperature

Generator Symptom Diagnosis

S5JB0B1A04002

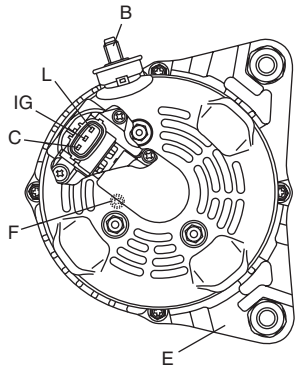
⚠ CAUTION

- **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.
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.



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B: Generator output (Battery terminal)	L: Lamp terminal
E: Ground	IG: Ignition terminal
F: Field coil terminal	C: Dummy

Charging Indicator Lamp Operation

Condition	Possible cause	Correction / Reference Item
Charge light does not light with ignition ON and engine off	Fuse blown	*Replace fuse and check for short circuit.*
	Indicator lamp (LED) faulty	*Replace combination meter.*
	Wiring connection loose	*Tighten loose connection.*
	IC regulator or field coil faulty	*Check generator.*
	Poor contact between brush and slip ring	*Repair or replace.*
Charge light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	*Replace drive belt.*
	IC regulator or generator faulty	*Check charging system.*
	Wiring faulty	*Repair wiring.*

Generator Test (Undercharged Battery Check)

S5JB0B1A04003

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 cars with voltmeter and ammeter.

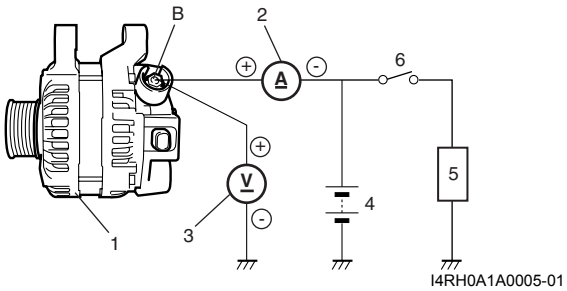
- Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
- Check drive belt for proper tension.
- If battery defect is suspected, refer to "Battery Description: ".
- Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor and ignition ground cable.

No-Load Check

1) Connect voltmeter and ammeter as shown in figure.

NOTE

Use fully charged battery.



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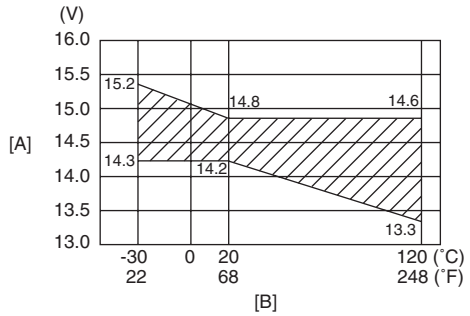
1. Generator	
2. Ammeter (between generator "B" terminal and battery (+) terminal)	
3. Voltmeter (between generator "B" terminal and ground)	
4. Battery	
5. Load	
6. Switch	

2) Run engine from idling up to 2,000 rpm with all accessories turned off and read meters.
If voltage is higher than standard value, check ground of brushes.
If brushes are not grounded, replace coil assembly.
If voltage is lower than standard value, proceed to the following check.

Specification for undercharged battery (No-load check)
Current: 10 A
Voltage: 14.2 – 14.8 V (at 25 °C, 77 °F)

NOTE

Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in figure.



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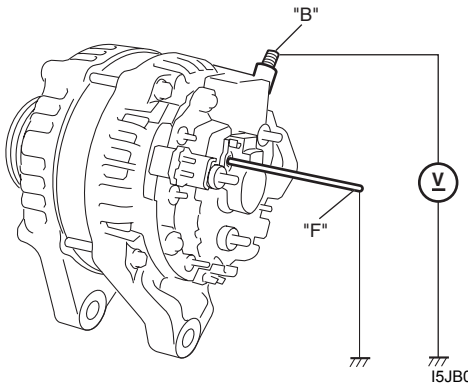
[A]:	Regulated voltage (V)
[B]:	Heatsink temperature

3) Remove generator rear end cover.
4) Ground “F” terminal and start engine, then measure voltage at “B” terminal as shown in figure.
   - Voltage is higher than standard value. It is considered that generator itself is good but IC regulator has been damaged, replace coil assembly.
   - Voltage is lower than standard value. It is considered that generator itself has problem, check the generator.

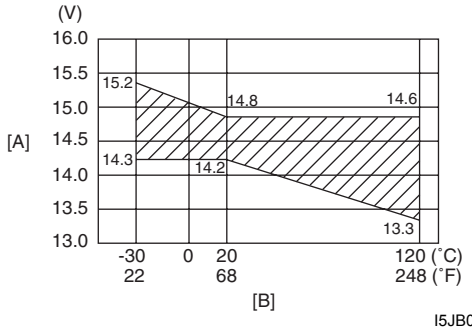


I5JB0B1A0005-01

Generator Test (Overcharged Battery Check)

S5JB0B1A04004

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 2000 rpm.
3) If measured voltage is higher than upper limit value, disassemble generator.
4) Check ground of brushes. If brushes are not grounded, replace coil assembly. Then check field coil for grounds and shorts.



I5JB0A1A0006-02

[A]:	Regulated voltage (V)
[B]:	Heatsink temperature

Repair Instructions

Jump Starting in Case of Emergency

S5JB0B1A06001

With Auxiliary (Booster) Battery

⚠ CAUTION

If vehicle is manual transmission model and has a catalytic converter, do not push or tow vehicle to start. Damage to emission system and/or other parts of vehicle may result.

Both booster and discharged battery should be treated carefully when using jumper cables. Follow procedure outlined below, being careful not to cause sparks.

⚠ WARNING

- **Departure from these conditions or procedure described below could result in:**
  a. **Serious personal injury (particularly to eyes) or property damage from such causes as battery explosion, battery acid, or electrical burns.**
  b. **Damage to electronic components of either vehicle.**
- **Never expose battery to open flame or electric spark. Batteries generate gas which is flammable and explosive.**
- **Remove rings, watches, and other jewelry. Wear approved eye protection.**
- **Do not allow battery fluid to contact eyes, skin, fabrics, or painted surface as fluid is a corrosive acid. Flush any contacted area with water immediately and thoroughly.**
- **Be careful so that metal tools or jumper cables do not contact positive battery terminal (or metal in contact with it) and any other metal on vehicle, because a short circuit could occur.**
- **Batteries should always be kept out of reach of children.**

1) Set parking brake and place automatic transmission in PARK (NEUTRAL on manual transmission).
2) Turn OFF ignition switch, turn OFF lights and all other electrical loads.
3) Check electrolyte level. If it is below low level line, add distilled water.
4) Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. (Use 12-volt battery only to jump start engine).
5) Attach one end of the remaining negative cable to negative terminal of booster battery, and the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.

⚠ WARNING

Do not connect negative cable directly to negative terminal of dead battery.

6) Start engine of vehicle that is providing jump start and turn off electrical accessories. Then Start engine of the vehicle with discharged battery.
7) Reverse connecting procedure exactly when disconnecting jumper cable. Negative cable must be disconnected from engine that was jump started first.

With Charging Equipment

⚠ CAUTION

When jump starting engine with charging equipment, be sure equipment used is 12-volt and negative ground. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.

Battery Dismounting and Remounting

S5JB0B1A06002

⚠ WARNING

When handling battery, following safety precautions should be followed:

- **Hydrogen gas is produced by battery. A flame or spark near battery may cause the gas to ignite.**
- **Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled electrolyte should be flushed with large quantity of water and cleaned immediately.**

Dismounting

1) Disconnect negative cable (1).
2) Disconnect positive cable (2).
3) Remove retainer (3).
4) Remove battery (4).

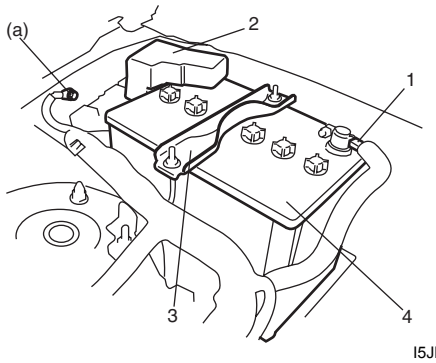
Remounting

1) Reverse removal procedure.
2) Torque battery cables to specification.

NOTE

Check to be sure that ground cable has enough clearance to hood panel by terminal.

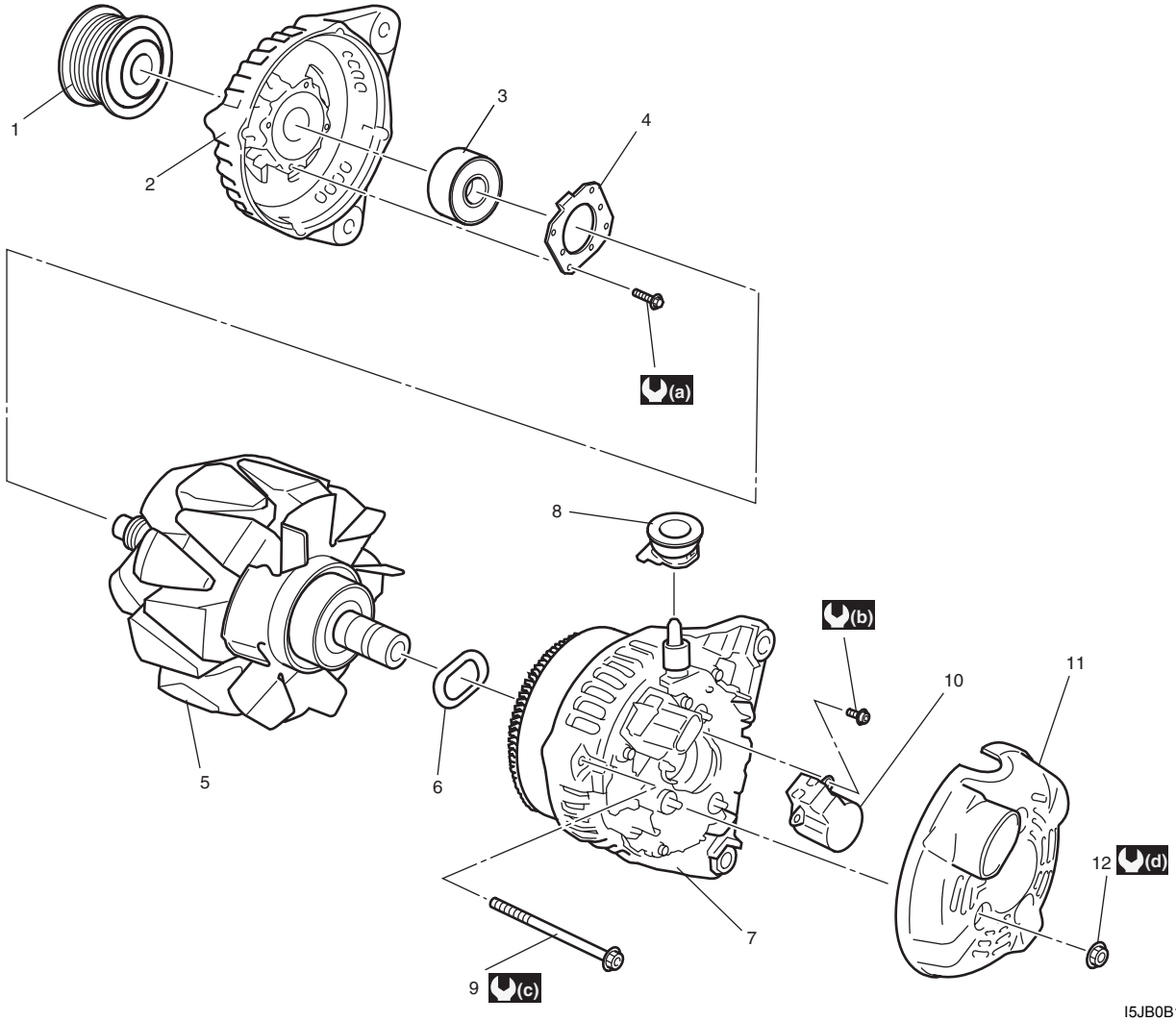
Tightening torque
Battery ground bolt (a): 12 N·m (1.2 kgf-m, 9.0 lb-ft)



I5JB0B1A0006-01

Generator Components

S5JB0B1A06004



I5JB0B1A0007-01

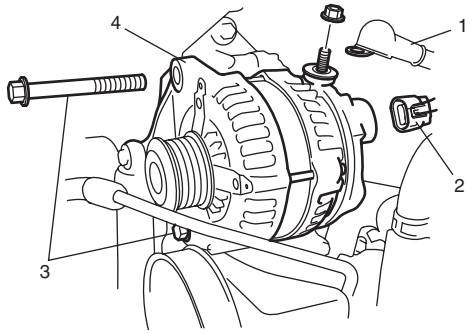
1. Pulley	4. Bearing retainer	7. Coil assembly	10. Brush holder assembly
2. Drive end frame	5. Rotor assembly	8. Insulator	11. Rear end cover
3. Drive end bearing	6. Wave washer	9. Through bolt	12. Rear end cover nut

Generator Dismounting and Remounting

S5JB0B1A06003

Dismounting

1) Disconnect negative (–) cable at battery.
2) Remove accessory drive belt. Refer to “Accessory Drive Belt and Idler Pulley Removal and Installation: ”.
3) Remove Intercooler outlet hose and pipe, if necessary.
4) Disconnect generator lead wire (“B” terminal wire) (1) and coupler (2) from generator.
5) Remove generator mounting bolts (3).
6) Remove generator (4).



I5JB0B1A0008-01

Remounting

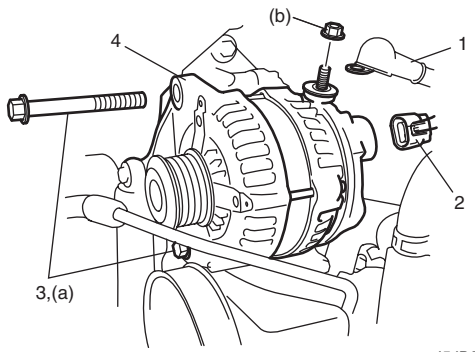
1) Mount generator (4) on the generator bracket.
2) Tighten generator mounting bolts (3) to specified torque.

   Tightening torque
   Generator mounting bolt (a): 44 N·m (4.4 kgf-m, 32.0 lb-ft)

3) Connect “B” terminal wire (1) to generator and then tighten “B” terminal nut to specified torque.

   Tightening torque
   “B” terminal nut (b): 12 N·m (1.2 kgf-m, 9.0 lb-ft)

4) Connect coupler (2) to generator.
5) Install Intercooler outlet hose and pipe, if removed.
6) Install accessory drive belt. Refer to “Accessory Drive Belt and Idler Pulley Removal and Installation: ”.



I5JB0B1A0009-01

7) Connect negative (–) cable at battery.

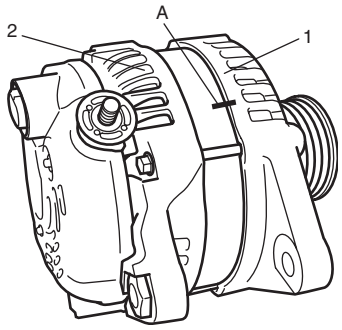
Generator Disassembly and Assembly

S5JB0B1A06009

Disassembly

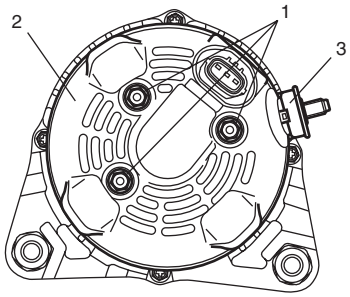
NOTE

Before disassembling generator, be sure to put match marks at 1 locations (A (drive end frame (1) and coil assembly (2)) as shown in figure so that any possible mistake can be avoided.



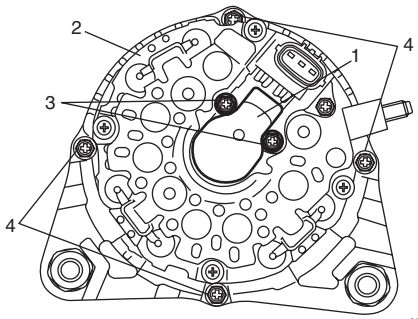
I5JB0B1A0010-01

1) Loosen rear end cover nut (1) and then remove rear end cover (2) from coil assembly.
2) Remove insulator (3).



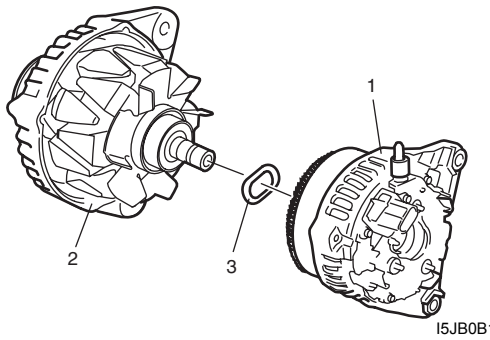
I5JB0B1A0011-01

3) Loosen screw (3) and then remove brush holder assembly (1) from coil assembly (2).
4) Loosen through bolt (4).



I5JB0B1A0012-01

5) Remove coil assembly (1) from rotor (2) and then remove wave washer (3).

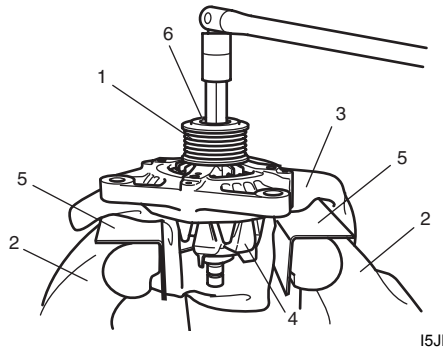


I5JB0B1A0013-01

6) Hold rotor by using vise (2) and loosen pulley nut (6) and then remove pulley (1).

⚠ CAUTION

When using vise, put clean cloth (3) and aluminium plate (5) between rotor (4) and vise (2) so as not to cause damage to rotor.



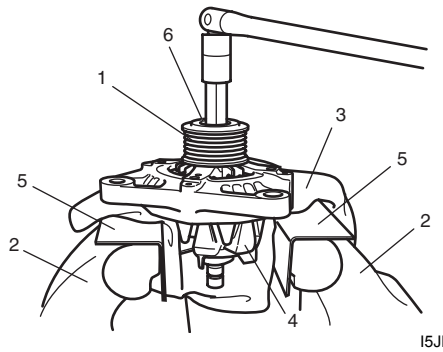
I5JB0B1A0014-01

Assembly

1) Insert rotor assembly to drive end frame and then install pulley (1).
2) Install pulley nut (6) and then tighten pulley nut.

⚠ CAUTION

When using vise, put clean cloth (3) and aluminium plate (5) between rotor (4) and vise (2) so as not to cause damage to rotor.

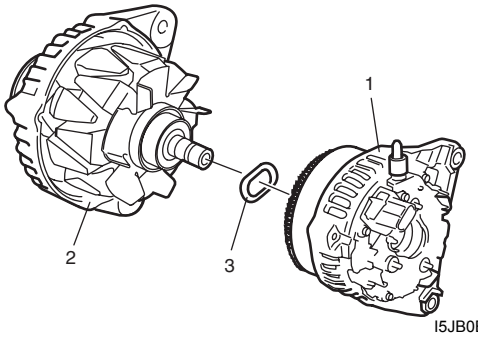


I5JB0B1A0014-01

3) Install wave washer (3) and coil assembly (2) to rotor (1).

NOTE

With marks on drive end frame and coil assembly marked before remove aligned to each other.



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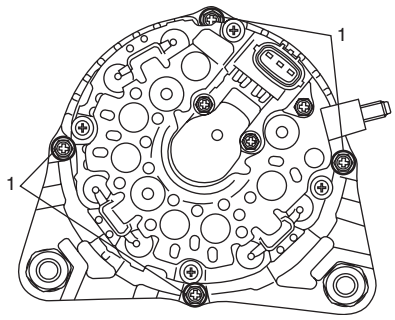
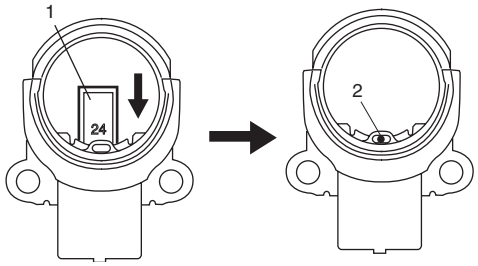
4) Install through bolt and then tighten through bolt (1).



I5JB0B1A0016-02

5) Install brush holder assembly to coil assembly as follows.
   a) Depress brush (1) and then while holding it depressed, and insert pin (2).



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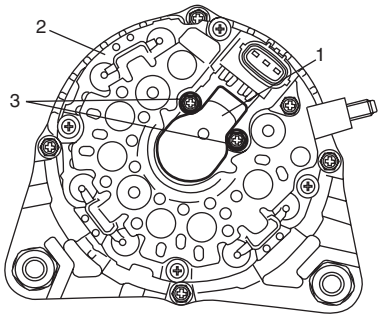
   b) Install brush holder assembly (1) to coil assembly (2) and then tighten screw (3).

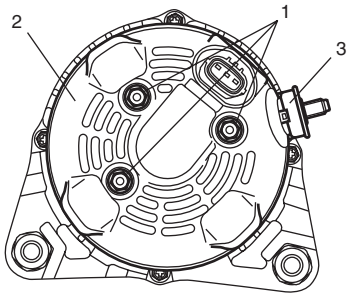


I5JB0B1A0030-01

c) Remove pin from brush holder.

6) Install insulator (3).

7) Install rear end cover (2) to coil assembly and tighten rear end cover nut (1) to specified torque.



I5JB0B1A0011-01

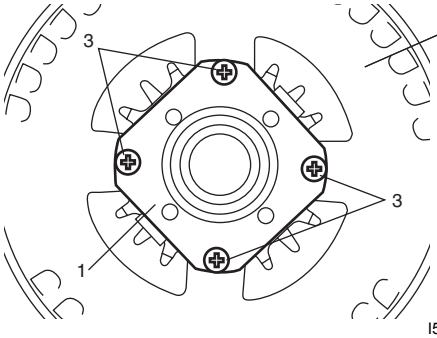
8) Make sure that rotor turns smoothly.

Drive End Frame / Bearing Disassembly and Assembly

S5JB0B1A06010

Disassembly

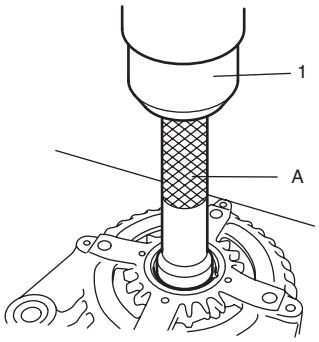
1) Loosen screw (3) and then remove bearing retainer (1) from drive end frame (2).



I5JB0B1A0019-01

2) Push out drive end bearing by using hydraulic press (1) and special tools.

Special tool
(A): 09913–75821



I5JB0B1A0020-01

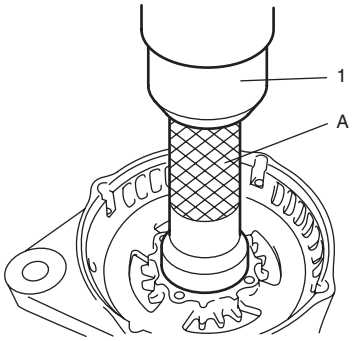
Assembly

1) Press-fit drive end bearing by using special tools and press (1).

Special tool
(A): 09913–76010

⚠ CAUTION

Be sure to use new bearing.



I5JB0B1A0021-01

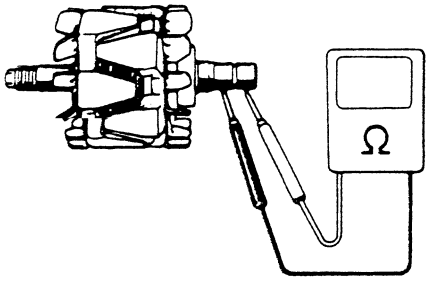
2) Install bearing retainer to drive end frame and tighten screw.

Generator Inspection

S5JB0B1A06005

Rotor

1) Using an ohmmeter, check for continuity between slip rings of rotor. If there is no continuity, replace the rotor assembly.



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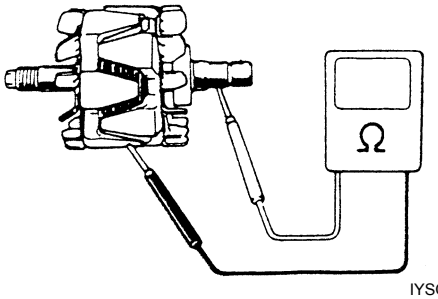
2) Using an ohmmeter, check that there is no continuity between slip ring and rotor. If there is continuity, replace the rotor assembly.



IYSQ011A0043-01

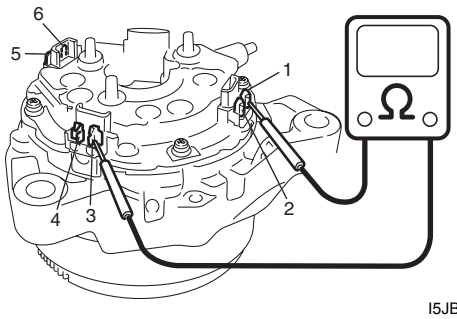
3) Check slip rings for roughness or scoring. If rough or scored, replace the rotor assembly.

Stator

1) Check resistance between the following leads of stator. If there is no continuity, replace coil assembly.

Stator lead resistance

Stator lead	Resistance
1 - 2	continuity
1 - 3	
4 - 5	
4 - 6	



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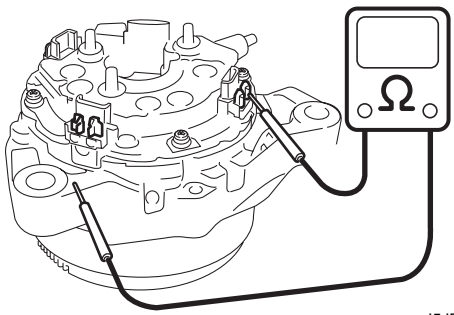
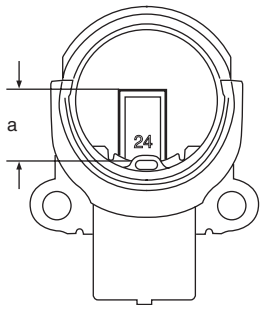
2) Using an ohmmeter, check that there is no continuity between coil leads and stator core. If there is continuity, replace coil assembly.



I5JB0B1A0023-01

Brush and Brush Holder

Check each brush for wear by measuring its length (a) as shown. If the brush is found worn down, replace the brush.



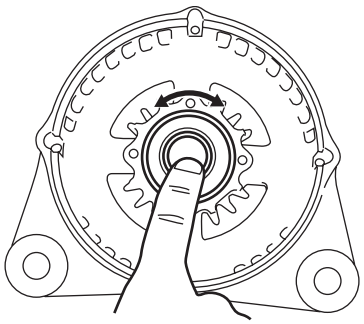
I5JB0B1A0024-02

Rectifier

1) Check continuity of rectifier by using an ohm meter.
2) Reverse the polarity of the tester probes and repeat Step 1).
3) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace coil assembly.

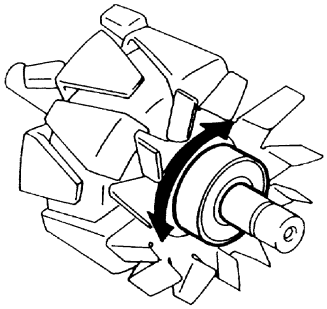
Bearing

- Check that drive and bearing is not rough or worn.



I5JB0B1A0026-01

- Check that end housing bearing is not rough or worn.



IYSQ011A0051-01

Accessory Drive Belt and Idler Pulley Removal and Installation

S5JB0B1A06006

Removal

⚠ WARNING

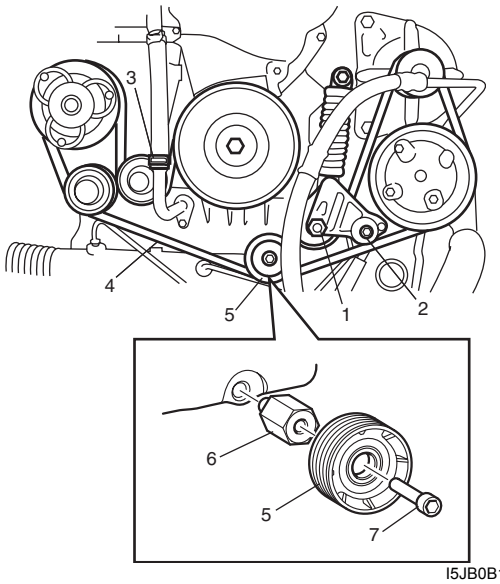
Disconnect negative (–) cable at battery before removing and installing generator belt.

1) Remove engine under cover.
2) Loosen tensioner by turning the tensioner (1) clockwise.
3) While holding the tensioner and belt loose.
4) Loosen tensioner bolt No.1 (2) and remove breather front No.1 hose clip (3).
5) Remove accessory drive belt (4).

⚠ CAUTION

Do not apply any oil or grease to the accessory drive belt.

6) Loosen idler pulley bolt (7) and then remove idler pulley (5) and adapter (6).



I5JB0B1A0027-01

Installation

1) Install adapter (6) and then tighten adapter.
2) Install idler pulley (5) and then tighten idler pulley bolt (7) to specified torque.

Tightening torque
Idler pulley bolt (b): 50 N·m (5.0 kgf-m, 36.5 lb-ft)

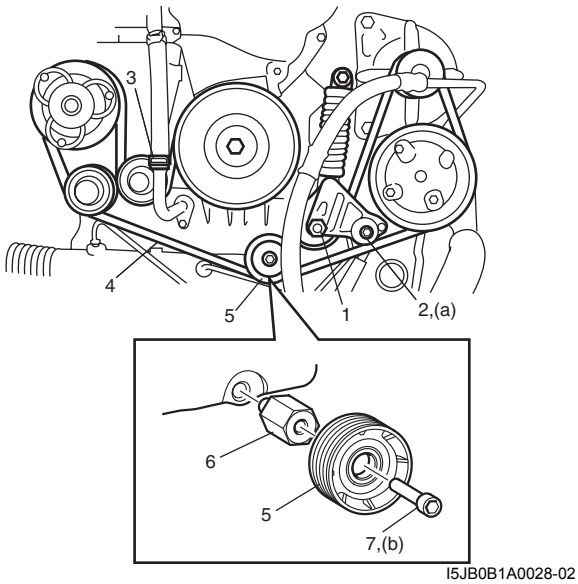
3) Install accessory drive belt (4).
4) Tighten tensioner bolt No.1 (2) and install breather front No.1 hose clip (3).

Tightening torque
Accessory drive belt and belt tensioner bolt No.1 (a): 50 N·m (5.0 kgf-m, 36.5 lb-ft)

5) Loosen tensioner by turning the tensioner (1) clockwise.
6) While holding the tensioner, install accessory drive belt (4).

NOTE

Make sure that the belt fits each pulley's groove properly.



I5JB0B1A0028-02

7) Install engine under cover.

Accessory Drive Belt Inspection

S5JB0B1A06007

Check accessory drive belt for cracks, cuts, deformation, wear and cleanliness, and replace as required.

Accessory Drive Belt Tensioner Removal and Installation

S5JB0B1A06008

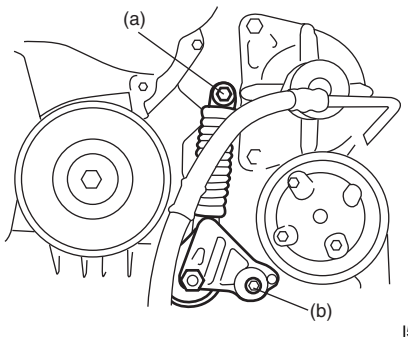
Removal

1) Remove accessory drive belt referring to “Accessory Drive Belt and Idler Pulley Removal and Installation: ”.
2) Remove accessory drive belt tensioner.

Installation

1) Install accessory drive belt tensioner.
2) Tighten accessory drive belt tensioner bolt No.1 and No.2 to specified torque.

Tightening torque
Accessory drive belt tensioner bolt No.2 (a): 22 N·m (2.2 kgf-m, 16.0 lb-ft)
Accessory drive belt tensioner bolt No.1 (b): 50 N·m (5.5 kgf-m, 36.5 lb-ft)



I5JB0B1A0029-01

3) Install accessory drive belt referring to “Accessory Drive Belt and Idler Pulley Removal and Installation: ”.

Specifications

Charging System Specifications

S5JB0B1A07001

Battery

Battery type		95D26L
Rated capacity	AH/5HR, 12 Volts	63
Electrolyte	L (US / Imp pt.)	4.0 (8.45 / 7.04)
Electrolyte S.G.		1.28 when fully charged at 20 °C (68 °F)

Generator

Type	150 A type
Rated voltage	12 V
Nominal output	150 A
Permissible max. speed	18,000 r/min.
No-load speed	1500 r/min. (rpm)
Regulated voltage	14.2 – 14.8 V
Exposed brush length	Standard: 10.5 mm (0.41 in.) Limit: 4.5 mm (0.18 in.)
Permissible ambient temperature	–30 – 90 °C (–22 to 194 °F)
Polarity	Negative ground
Rotation	Clockwise viewed from pulley side

Tightening Torque Specifications

S5JB0B1A07002

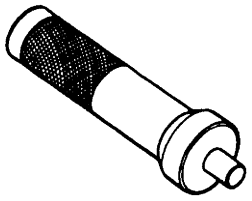
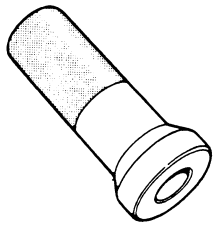
Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Battery ground bolt	12	1.2	9.0	☞
Generator mounting bolt	44	4.4	32.0	☞
“B” terminal nut	12	1.2	9.0	☞
Idler pulley bolt	50	5.0	36.5	☞
Accessory drive belt and belt tensioner bolt No.1	50	5.0	36.5	☞
Accessory drive belt tensioner bolt No.2	22	2.2	16.0	☞
Accessory drive belt tensioner bolt No.1	50	5.5	36.5	☞

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

Special Tools and Equipment

Special Tool

S5JB0B1A08001

09913–75821 Bearing installer attachment ☞	
09913–76010 Bearing installer ☞	

Exhaust System

General Description

Exhaust System Description

S5JB0B1B01001

The exhaust system consists of an exhaust manifold, a turbo charger, a catalytic converter in a catalyst case, a diesel particurate filter, an exhaust pipes, a muffler and seals, gasket and etc.
The catalytic converter is an emission control device added to the exhaust system to reduce the levels of Hydrocarbon (HC) and Carbon Monoxide (CO) in the exhaust gas.

Diesel Particurate Filter

S5JB0B1B01002

The diesel particurate filter is emission control device added to the exhaust system after catalytic converter, and it accumulates the diesel particular in the exhaust gas.
The diesel particurate filter is made up of a special ceramic monolith filled with a precious metal.

Diagnostic Information and Procedures

Exhaust System Check

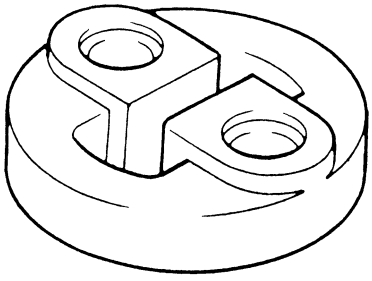
S5JB0B1B04001

⚠ 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.

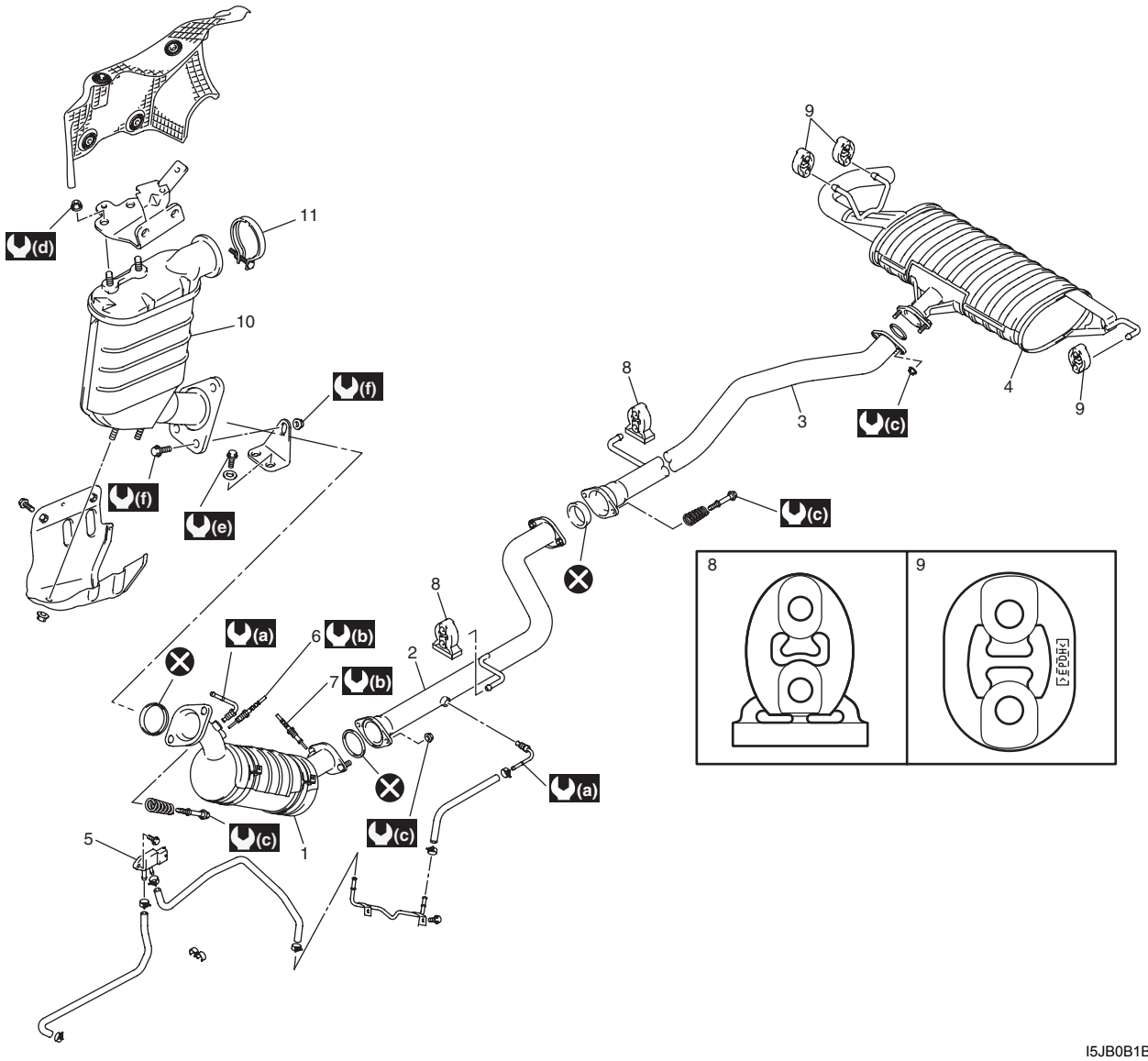
Repair Instructions

Exhaust System Components

S5JB0B1B06001

⚠ 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.



I5JB0B1B0001-02

1. Diesel particulate filter	7. Exhaust gas temperature sensor 3	(b) : 30 N·m (3.0 kgf-m, 22.0 lb-ft)
2. Exhaust pipe No.1	8. Mounting No.1	(c) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)
3. Exhaust pipe No.2	9. Mounting No.2	(d) : 35 N·m (3.5 kgf-m, 25.5 lb-ft)
4. Muffler	10. Catalytic converter	(e) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
5. Diesel particulate filter differential pressure sensor	11. Clamp	(f) : 44 N·m (4.4 kgf-m, 32.0 lb-ft)
6. Exhaust gas temperature sensor 2	(a) : 21 N·m (2.1 kgf-m, 15.5 lb-ft)	⊗ : Do not reuse.

Exhaust Manifold Removal and Installation

S5JB0B1B06002

For removal and installation, refer to “Intake Manifold and Exhaust Manifold Removal and Installation: in Section 1D”.

Diesel Particulate Filter Removal and Installation

S5JB0B1B06003

⚠ 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.

⚠ CAUTION

When replacing diesel particulate filter, perform “Initialize diesel PF data” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator's Manual”.

Removal

1) Disconnect negative (–) cable at battery.
2) Remove exhaust gas temperature sensor 2 and 3 from diesel particulate filter.
3) Remove diesel particulate filter differential pressure sensor union nut.
4) Remove diesel particulate filter differential pressure sensor pipe from diesel particulate filter.
5) Remove diesel particulate filter.

Installation

Reverse removal procedure noting the following.

- Tighten bolts and nuts to specified torque referring to “Exhaust System Components: ”.
- When replacing diesel particulate filter, perform “Initialize diesel PF data” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator's Manual”.

Specifications

Tightening Torque Specifications

S5JB0B1B07001

NOTE

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

Reference:

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

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 manual.

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Precautions

Precautions

Precautions for Driveline / Axle

S5JB0B3000001

Differential Gear Oil Note
Refer to “Differential Gear Oil Note: in Section 00 in related manual”.

Fastener Caution
Refer to “Fastener Caution: in Section 00 in related manual”.

Precautions for Transfer
Refer to “Precautions in Diagnosing Trouble: in Section 3C in related manual”.

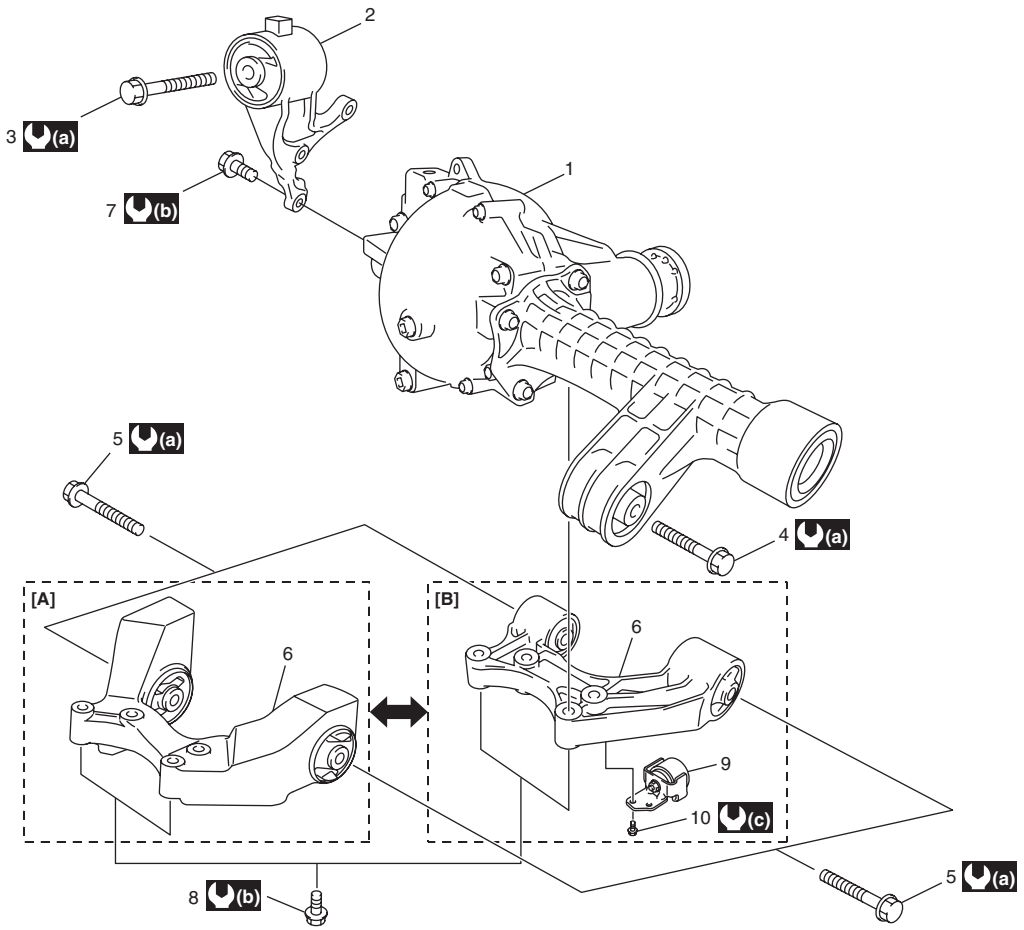
Differential

Front

Repair Instructions

Front Differential Unit Components

S5JB0B3216002



I5JB0B321001-02

[A]: Damper without rear mounting bracket	4. Differential mounting bolt	9. Damper
[B]: Damper with rear mounting bracket	5. Rear mounting bolt	10. Damper bolt
1. Front differential	6. Rear mounting bracket	(a) : 85 N·m (8.5 kgf-m, 61.5 lb-ft)
2. Right mounting bracket	7. Right mounting bracket bolt	(b) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)
3. Right mounting bolt	8. Rear mounting bracket bolt	(c) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)

Specifications

Tightening Torque Specifications

S5JB0B3217001

NOTE

The specified tightening torque is also described in the following.
“Front Differential Unit Components: Front”

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

Rear

Repair Instructions

Rear Differential Dismounting and Remounting

S5JB0B3226003

Dismounting

1) Lift up vehicle and drain oil from rear differential.
2) Remove rear propeller shaft referring to “Propeller Shaft Removal and Installation: in Section 3D”.
3) Remove exhaust center pipe referring to “Exhaust System Components: in Section 1K”.
4) Remove rear drive shafts referring to “Rear Drive Shaft Assembly Removal and Installation: Rear in Section 3A in related manual”.
5) Support rear differential with transmission jack.
6) Remove front and rear mounting bolts, and then lower rear differential.

Remounting

Reverse dismounting procedure for remounting noting the following.

- Tighten rear differential mounting front and rear bolts to specified torque.

  Tightening torque
  Rear differential front mounting bolt: 120 N·m (12.0 kgf-m, 87.0 lb-ft)
  Rear differential rear mounting bolt: 120 N·m (12.0 kgf-m, 87.0 lb-ft)

- Fill rear differential oil referring to “Rear Differential Oil Change: Rear in related manual”.

Specifications

Tightening Torque Specifications

S5JB0B3227001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Rear differential front mounting bolt	120	12.0	87.0	☞
Rear differential rear mounting bolt	120	12.0	87.0	☞

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

Transfer

Precautions

Transfer Warning

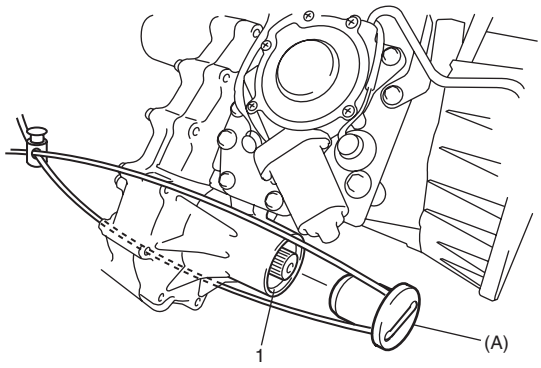
S5JB0B3300001

⚠ WARNING

This transfer has a center differential.
When testing with 2-wheel chassis dynamometer, speedometer tester or brake tester, be sure to make the vehicle as rear wheel drive temporarily as follows.
Otherwise, front wheels drive rear wheels or vise-versa and personal injury may result.

1) Remove front propeller shaft referring to “Propeller Shaft Removal and Installation: in Section 3D”.
2) Install special tool (cap) to flange yoke cover hole of transfer (1) and fix it to transfer with string to prevent oil leakage from transfer, if necessary.

Special tool
(A): 09928–36510



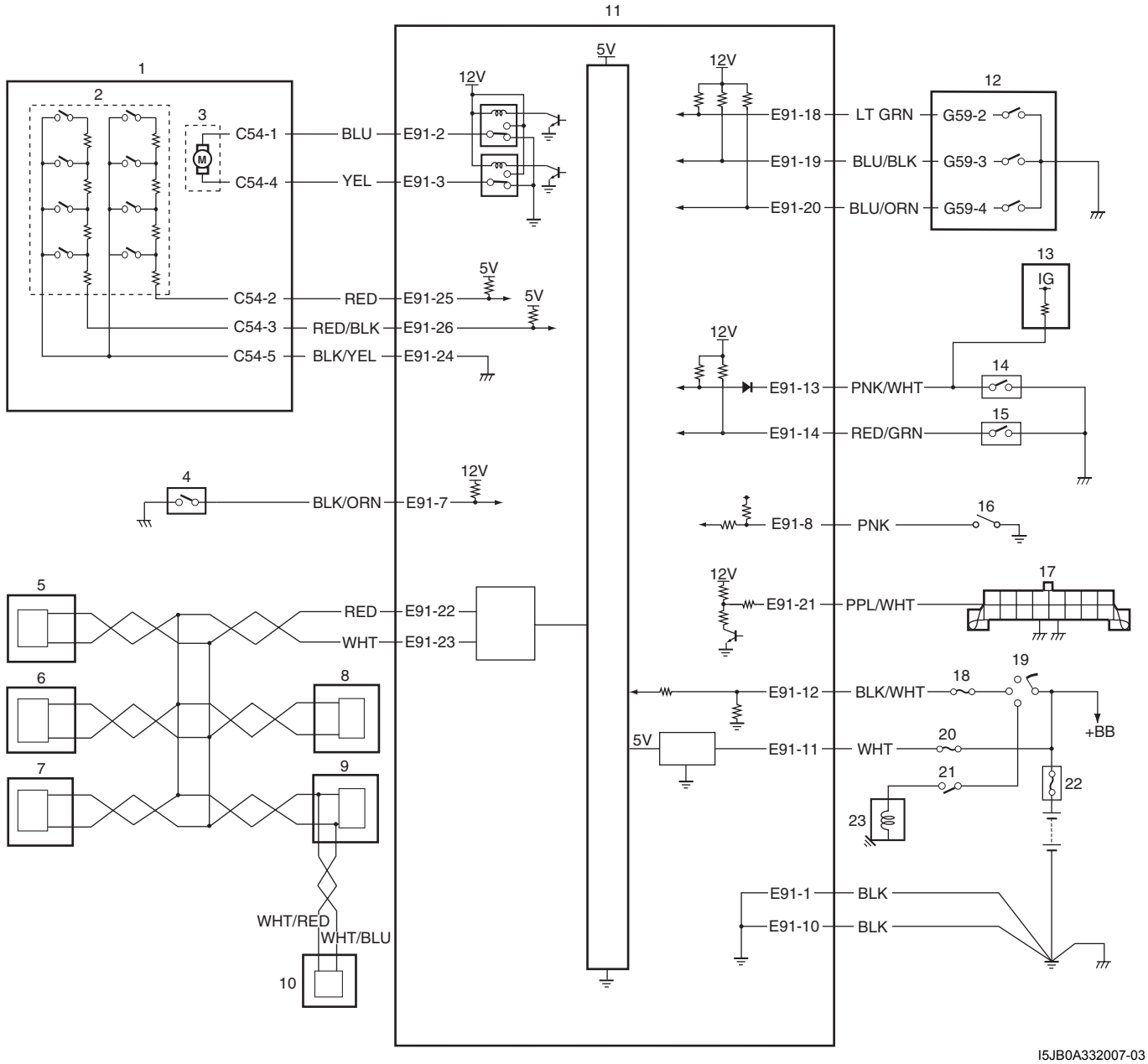
I5JB0A331107-03

3) Pour specified oil into transfer up to lever plug hole, if drain transfer oil.
4) Shift transfer to 4H-lock position by turning transfer switch.

General Description

4WD Control System Wiring Circuit Diagram

S5JB0B3301006



I5JB0A332007-03

1. Transfer actuator	9. ABS / ESP® hydraulic unit/control module	17. DLC
2. Transfer actuator position switch	10. ECM	18. “IG COIL” fuse
3. Transfer actuator motor	11. 4WD control module	19. Ignition switch
4. CPP switch (for M/T model)	12. Transfer switch	20. “4WD” fuse
5. BCM	13. TCM (for A/T model)	21. Shift switch (for A/T model) or CPP switch (for M/T model)
6. TCM (for A/T model)	14. 4L/N switch	22. Main fuse box
7. Combination meter	15. Center differential lock switch	23. Starting motor
8. Keyless start control module (if equipped)	16. Diagnosis connector (if equipped)	

Input / Output Signal Table of 4WD Control Module

S5JB0B3301008

4WD control module outputs the following signals to actuators, indicators, warning buzzer, according to the transfer switch operation.

		Output signal (to each component parts)				
		Transfer shift actuator	Differential lock indicator	4L indicator	N indicator	Warning buzzer
Input signal	Transfer switch	○	○	○	○	○
	CPP switch	○		○	○	○
	TCM	○		○	○	○
	ABS / ESP® hydraulic unit / control module	○	○	○	○	○
	4L/N switch			○	○	○
	Center differential lock switch		○	○		

CAN Communication System Description

S5JB0B3301010

Refer to “CAN Communication System Description: in Section 1A”.

4WD Control Module Transmission Data

				BCM	Combination Meter
4WD control module	Transmit	DATA	Buzzer on reques	○	
			Lock indication status		○
			Low indication status		○
			Neutral Indication Status		○
			4WD diagnostic trouble codes		○

I5JB0A332010-01

4WD Control Module Reception Data

				ECM	TCM	ABS hydraulic unit / control module (if equipped)	ESP® hydraulic unit / control module (if equipped)
4WD control module	Receive	DATA	Engine speed	○			
			Vehicle speed	○			
			Brake pedal switch active	○			
			Transmission gear selector position		○		
			Wheel speed pulse (front right)			○	○
			Wheel speed pulse (front left)			○	○
			Wheel speed pulse (rear right)			○	○
			Wheel speed pulse (rear left)			○	○
			Antilock brake system active			○	○
			Electronic stability program system active				○

I6JB01331001-01

Diagnostic Information and Procedures

Visual Inspection

S5JB0B3304004

Check the following parts and systems visually.

Inspection Item	Referring
• Front differential oil ---- level, leakage	"Front Differential Oil Change: Front in Section 3B in related manual"
• Rear differential oil ---- level, leakage	"Rear Differential Oil Change: Rear in Section 3B in related manual"
• Transfer gear oil ---- level, leakage	"Transfer Oil Change: in related manual"
• Manual transmission oil ---- level, leakage	"Manual Transmission Oil Change: in Section 5B"
• Transfer mounting(s) ---- wear and looseness	
• Fuses ---- burning	
• Battery ---- fluid level, corrosion of terminal	"Battery Inspection: in Section 1J"
• Connectors of electric wire harness ---- disconnection, friction	"Intermittent and Poor Connection Inspection: in Section 00 in related manual"
• Other parts that can be checked visually	

DTC Table

S5JB0B3304007

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Transfer position indicators
☞ C1213	Transfer switch circuit open	Different switch combination from specification is detected.	—
☞ C1214	Transfer switch circuit short	Different switch combination from specification is detected.	—
☞ C1223	Transfer shift actuator motor position switch 1 circuit open	Actuator position switch signal voltage 4.2 V or more.	—
☞ C1224	Transfer shift actuator motor position switch 1 circuit short	Actuator position switch signal voltage 0.6 V or less.	—
☞ C1227	4L/N switch circuit open	Though actuator position switch is "4L-lock" position, the ON signal is not input from the 4L/N switch.	○
☞ C1228	4L/N switch circuit short	Though actuator position switch is "4L-lock" position, the OFF signal is not input from the 4L/N switch.	○
☞ C1230	Transfer actuator circuit malfunction	Transfer switch is changed of position, and then actuator position switch is not changed for more than 3 seconds.	—
☞ C1235	Transfer shift actuator motor position switch 2 circuit open	Actuator position switch signal voltage 4.2 V or more.	—
☞ C1236	Transfer shift actuator motor position switch 2 circuit short	Actuator position switch signal voltage 0.6 V or less.	—
☞ C1237	Center differential lock switch circuit open	Though actuator position switch is "4H" position, the ON signal is not input from the center differential lock switch.	○
☞ C1238	Center differential lock switch circuit short	Though actuator position switch is "4L-lock" position, the OFF signal is not input from the center differential lock switch.	○
☞ C1240	4WD control module power supply circuit malfunction	Battery voltage is lower than lower limit voltage for 4WD control module diagnosis.	—
☞ C1243	Internal circuit malfunction of 4WD control module	EEPROM error	—
☞ C1246	Clutch pedal position (CPP) switch circuit short	CPP switch signal is input when vehicle speed is 30 km/h (19 mph).	—
☞ U1073	Control module communication bus off	Transmitting and receiving error of 4WD control module for specified time continuously.	○

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Transfer position indicators
☞ U1100	Lost communication with ECM	Receiving error of 4WD control module from ECM for specified time continuously.	○
☞ U1121	Lost communication with ABS / ESP® control module	Receiving error of 4WD control module from ABS / ESP® control module for specified time continuously.	○

NOTE

"O" in transfer position indicator column of the above table means indicator lights up when DTC is detected.

Scan Tool Data

S5JB0B3304009

Scan Tool Data	Vehicle Condition	Normal Condition / Reference Value
Vehicle speed	At vehicle stop	0 km/h, 0 mph
Engine speed	At engine idle speed	Engine idle speed is display
Actuator Pos Sen	Transfer shifted to 4H position	4H
	Transfer being shifted between 4H-lock and 4H position	4H-lock – 4H
	Transfer shifted to 4H-lock position	4H-lock
	Transfer being shifted between 4H and N position	4H – N
	Transfer shifted to 4L-lock position	4L-lock
	Transfer being shifted between N and 4L-lock position	N – 4L-lock
	Transfer shifted to N position	N
Actuator motor Pos	Transfer shifted to 4H position	4H
	Transfer shifted to 4H-lock position	4H-lock
	Transfer shifted to 4L-lock position	4L-lock
	Transfer shifted to N position	N
Battery voltage	Ignition switch ON and engine stop	10 – 14 V
4L/N switch	Transfer shifted to 4L-lock or N position	ON
	Transfer shifted to 4H or 4H-lock position	OFF
Center diff lock SW	Transfer shifted to 4H or N position	ON
	Transfer shifted to 4H-lock or 4L-lock position	OFF
N range signal (AT)	A/T shifted to "N" range	ON
	A/T shifted to other than "N" range	OFF
CPP switch (MT)	Clutch pedal depressed	OFF
	Clutch pedal released	ON
Mode switch 1	Transfer switch selected to N position	ON
	Transfer switch selected to 4H, 4H-lock or 4L-lock position	OFF
Mode switch 2	Transfer switch selected to 4H, 4H-lock or N position	ON
	Transfer switch selected to 4L-lock position	OFF
Mode switch 3	Transfer switch selected to 4H-lock or 4L-lock position	ON
	Transfer switch selected to 4H or N position	OFF
Warning buzzer	Buzzer not being sound	OFF
	Transfer shifted to N Position	N Pos
	Transfer shifted to disagreement of transfer switch and transfer position	Error
ABS active	ABS operating	ON
	ABS not operating	OFF
ESP® active	ESP® operating	ON
	ESP® not operating	OFF

Scan Tool Data Definitions

S5JB0B3304010

Vehicle Speed (KM/H, MPH):
This parameter indicates vehicle speed calculated by 4WD control module.

Engine Speed (RPM):
This parameter indicates engine revolution calculated by 4WD control module.

Actuator Pos Sen (Transfer shift actuator motor position switch) (4H / 4H-lock / 4L-lock / N / 4H-lock-4H / 4H-N / N-4L-lock):
This parameter indicates transfer shift actuator motor position switch status detected by 4WD control module.

Actuator motor Pos (Transfer shift actuator motor position) (4H / 4H-lock / 4L-lock / N):
This parameter indicates transfer shift actuator motor position detected by 4WD control module using transfer shift actuator motor position.

Battery voltage (V):
This parameter indicates battery voltage detected by 4WD control module.

4L / N switch (ON / OFF):
This parameter indicates 4L / N switch status detected by 4WD control module.

Center diff lock Sw (ON / OFF):
This parameter indicates center differential lock switch status detected by 4WD control module.

N range signal (AT) (ON / OFF):
This parameter indicates A/T shift position (“N” range or not) detected by 4WD control module.

CPP switch (Clutch pedal position switch) (MT) (ON / OFF):
This parameter indicates clutch pedal position switch status detected by 4WD control module using CPP switch.

Mode switch 1 (Transfer switch) (ON / OFF):
ON: Transfer switch to N position.
OFF: Transfer switch to other than N position.

Mode switch 2 (Transfer switch) (ON / OFF):
ON: Transfer switch to other than 4L-lock position.
OFF: Transfer switch to 4L-lock position.

Mode switch 3 (Transfer switch) (ON / OFF):
ON: Transfer switch to 4H-lock or 4L-lock position.
OFF: Transfer switch to 4H or N position.

Warning buzzer (OFF / N Pos / Error):
This parameter indicates if buzzer is being commanded by 4WD control module.

ABS active (ON / OFF):
This parameter indicates ABS status detected by 4WD control module.

ESP® active (ON / OFF):
This parameter indicates ESP® status detected by 4WD control module.

4WD Control Symptom Diagnosis

S5JB0B3304011

Diagnose transfer assembly after performing the following inspections.

1) Perform 4WD control system check referring to “4WD Control System Check: in related manual”.

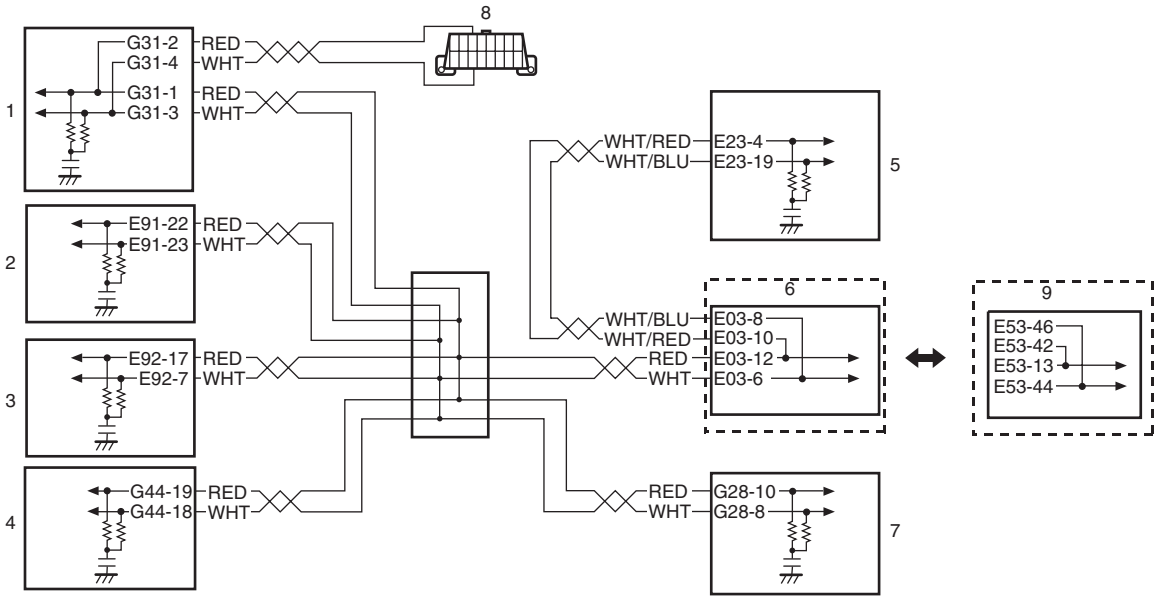
2) Confirm 4WD control system operation referring to “4WD Control System Operation: in related manual”

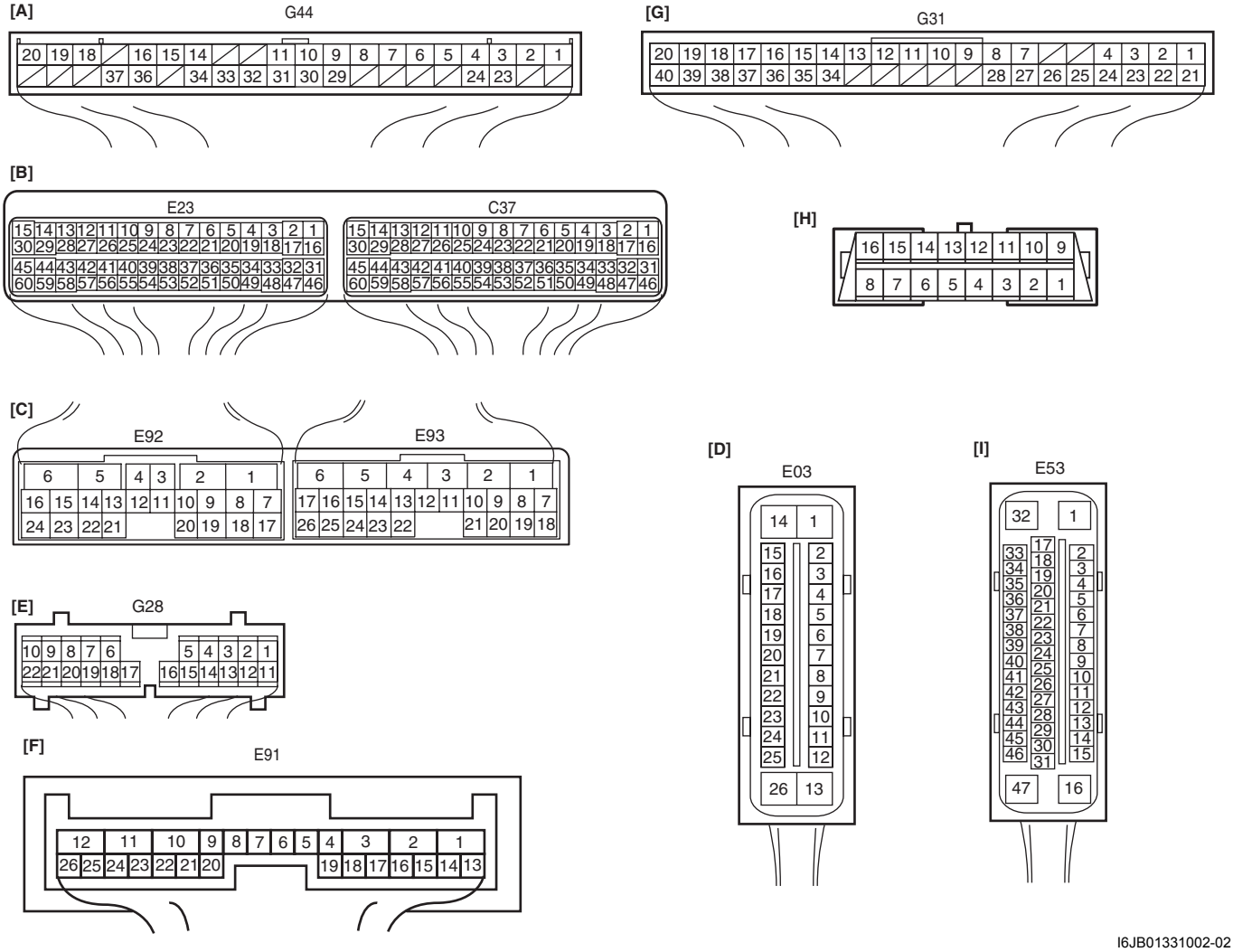
Condition	Possible cause	Correction / Reference Item
Transfer does not operate (Transfer position indicator does not operate)	Transfer switch faulty	*Check switch referring to “Transfer Switch Inspection: in related manual”.*
	Transfer shift actuator faulty	*Check transfer shift actuator referring to “Transfer Assembly Inspection: in related manual”.*
	4L/N switch and/or switch center differential lock switch faulty	*Check switch referring to “Transfer Assembly Inspection: in related manual”.*
	CPP switch faulty (for M/T model)	*Check CPP switch referring to “Clutch Pedal Position (CPP) Switch Inspection and Adjustment: in Section 5C in related manual”.*
	Wiring or grounding faulty	*Repair as necessary.*
	4WD control module faulty	*Check 4WD control module referring to “Inspection of 4WD Control Module and Its Circuits: in related manual”.*
Transfer refuses to operate (Transfer position indicator flashes, and then transfer does not shift)	Transfer shift actuator faulty	*Check transfer shift actuator referring to “Transfer Assembly Inspection: in related manual”.*
	4L/N switch and/or center differential lock switch faulty	*Check switch referring to “Transfer Assembly Inspection: in related manual”.*
	Distorted control cover shift shaft or shift fork	*Check shift fork referring to “Transfer Assembly Inspection: in related manual”.*
	Weakened control cover shift shaft spring	*Check spring referring to “Transfer Assembly Inspection: in related manual”.*
	Distorted or dispositioned control cover shift shaft snap ring and washer	*Check snap ring and washer referring to “Transfer Assembly Inspection: in related manual”.*
	Worn chamfered tooth on sleeve or gear	*Check chamfered tooth and gear referring to “Transfer Assembly Inspection: in related manual”.*
	Wiring or grounding faulty	*Repair as necessary.*
	4WD control module faulty	*Check 4WD control module referring to “Inspection of 4WD Control Module and Its Circuits: in related manual”.*
Gear slipping out of mesh	Worn control cover shift shaft	*Check control cover shift shaft referring to “Transfer Assembly Inspection: in related manual”.*
	Worn shift fork or sleeve	*Check shift fork or sleeve referring to “Transfer Assembly Inspection: in related manual”.*
	Weak or damaged control cover shift shaft spring	*Check spring referring to “Transfer Assembly Inspection: in related manual”.*
	Worn bearings on input gear or counter gear	*Check bearing referring to “Transfer Assembly Inspection: in related manual”.*
	Worn chamfered tooth on sleeve or gear	*Check sleeve and gear referring to “Transfer Assembly Inspection: in related manual”.*
	Missing or disengagement of circlip(s)	*Check circlip(s) referring to “Transfer Assembly Inspection: in related manual”.*
Noise	Damaged or worn bearing(s)	*Refer to “Transfer Assembly Inspection: in related manual”.*
	Damaged or worn gear(s)	*Refer to “Transfer Assembly Inspection: in related manual”.*
	Damaged or worn chamfered tooth on sleeve or gear	*Refer to “Transfer Assembly Inspection: in related manual”.*

DTC U1073: Control Module Communication Buss Off

S5JB0B3304026

Wiring Diagram





I6JB01331002-02

[A]: Keyless start control module connector (if equipped) (viewed from harness side)	1. BCM
[B]: ECM connector (viewed from harness side)	2. 4WD control module
[C]: TCM connector (for A/T model) (viewed from harness side)	3. TCM (if equipped)

[D]: ABS hydraulic unit/control module connector (viewed from terminal side)	4. Keyless start control module (if equipped)
[E]: Combination meter connector (viewed from harness side)	5. ECM
[F]: 4WD control module connector (viewed from harness side)	6. ABS hydraulic unit / control module (if equipped)
[G]: BCM connector (viewed from harness side)	7. Combination meter
[H]: DLC (viewed from harness side)	8. DLC
[I]: ESP® hydraulic unit / control module connector (viewed from terminal side)	9. ESP® hydraulic unit / control module (if equipped)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for 4WD control module is detected more than 7 times at more than specified error counts continuously.	• CAN communication circuit • ECM • BCM • 4WD control module • TCM (if equipped) • Combination meter • Keyless start control module (if equipped) • ABS or ESP® hydraulic unit / control module

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Start engine and run it for 1 min. or more.
3) Stop vehicle and check DTC.

Troubleshooting

Step	Action	Yes	No
1	*Was "4WD control system check" performed?*	Go to Step 2.	Go to "4WD Control System Check: in related manual".
2	**Control module connector check** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck DTC in TCM. *Is DTC U1073 detected?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00 in related manual".
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. *Is each CAN communication circuit in good condition?*	Go to Step 4.	Repair circuit.
4	**Check DTC** 1) Turn ignition switch to OFF position. 2) Disconnect each connector. • ECM • ABS or ESP® hydraulic unit / control module • BCM • TCM (if equipped) • Keyless start control module (if equipped) 3) Recheck DTC in 4WD control module. *Is DTC U1073 detected?*	Check 4WD control module power and ground circuit. If circuits are OK, substitute a known-good 4WD control module and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

DTC U1100: Lost Communication with ECM

S5JB0B3304027

Wiring Diagram

Refer to “DTC U1073: Control Module Communication Buss Off: ”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for ECM is detected for longer than specified time continuously.	• CAN communication circuit • ABS or ESP® hydraulic unit / control module • ECM • 4WD control module

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Start engine and run it for 1 min. or more.
3) Stop vehicle and check DTC.

Troubleshooting

Step	Action	Yes	No
1	*Was “4WD control system check” performed?*	Go to Step 2.	Go to “4WD Control System Check: in related manual”.
2	**DTC check** 1) Check DTC in 4WD control module. *Is DTC U1100 and DTC U1073 detected together?*	Go to “DTC U1073: Control Module Communication Buss Off: ”.	Go to Step 3.
3	**DTC check** 1) Check DTC in ECM. *Is DTC P0500 detected?*	Go to “DTC P0500: Vehicle Speed Sensor “A” Malfunction: in Section 1A”.	Go to Step 4.
4	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck in 4WD control module. *Is DTC U1100 detected?*	Go to Step 5.	NO Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”.
5	**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. *Is each CAN communication circuit in good condition?*	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.	Repair circuit.

DTC U1121: Lost Communication with ABS / Electronic Stability Program Hydraulic Unit / Control Module

S5JB0B3304029

Wiring Diagram

Refer to “DTC U1073: Control Module Communication Buss Off: ”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for ABS / ESP® hydraulic unit / control module is detected for longer than specified time continuously.	• CAN communication circuit • ABS / ESP® hydraulic unit / control module • 4WD control module

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Start engine and run it for 1 min. or more.
3) Stop vehicle and check DTC.

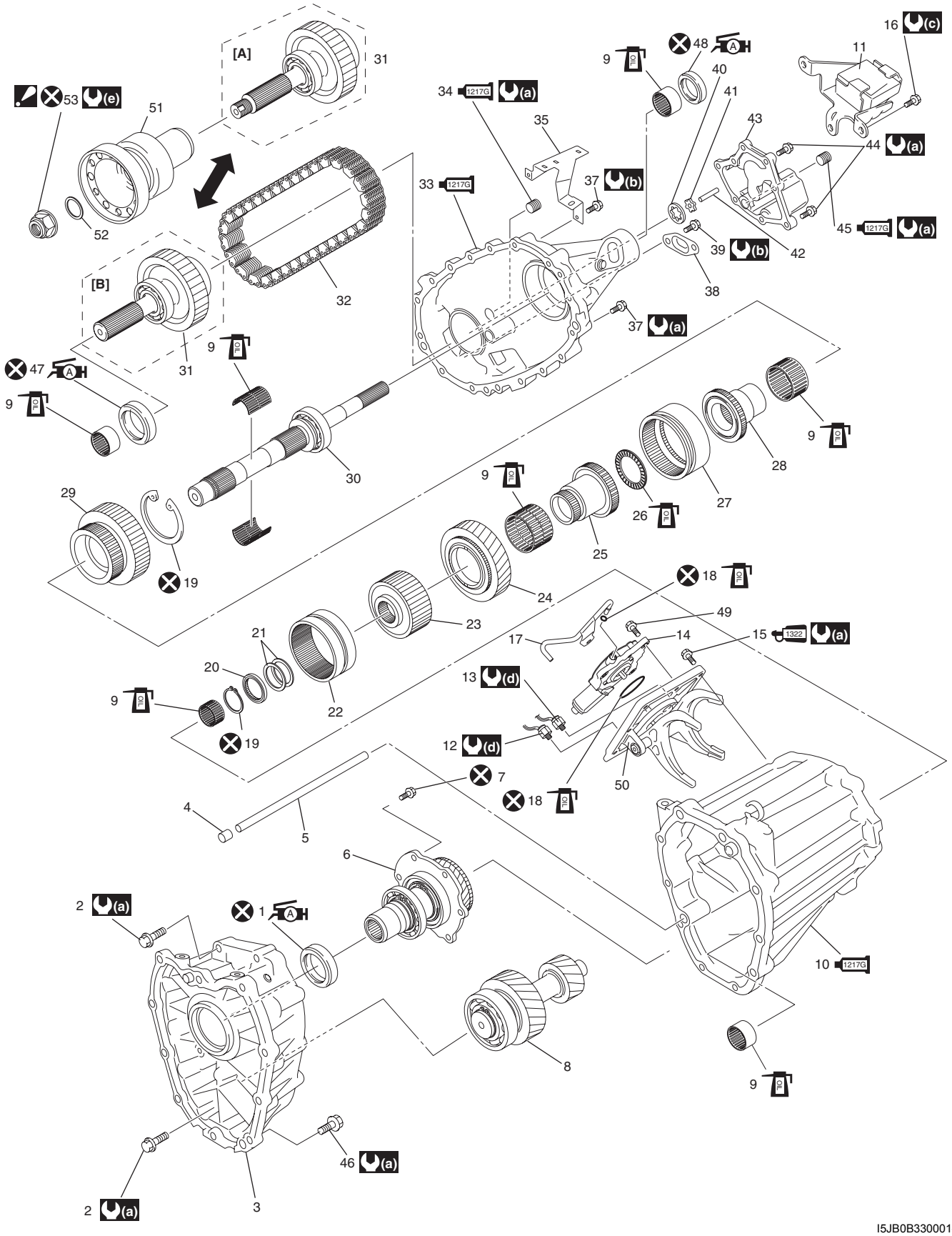
Troubleshooting

Step	Action	Yes	No
1	*Was “4WD control system check” performed?*	Go to Step 2.	Go to “4WD Control System Check: in related manual”.
2	**DTC check** 1) Check DTC in 4WD control module. *Is DTC U1100 and DTC U1073 detected together?*	Go to “DTC U1073: Control Module Communication Buss Off: ”.	Go to Step 3.
3	**DTC check** 1) Check DTC in ABS or ESP® hydraulic unit / control module. *Is DTC PU1073 detected?*	Go to “DTC U1073: Control Module Communication Bus Off: in Section 4E” or “DTC U1073: Control Module Communication Bus Off: in Section 4F”.	Go to Step 4.
4	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck in 4WD control module. *Is DTC U1100 detected?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”.
5	**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. *Is each CAN communication circuit in good condition?*	Check ABS or ESP® hydraulic unit / control module power and ground circuit. If circuit is OK, substitute a known-good ABS or ESP® hydraulic unit / control module and recheck.	Repair circuit.

Repair Instructions

Transfer Assembly Components

S5JB0B3306008



I5JB0B330001-09

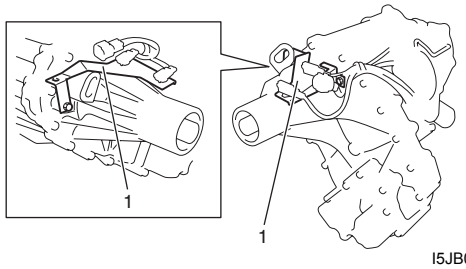
[A]: Flange is fixed type	19. Snap ring	41. Oil pump outer rotor
[B]: Flange is not fixed type	20. Washer	42. Oil pump inner rotor
1. Front oil seal No.1 : Apply grease 99000-25010 to oil seal lip.	21. Shim	43. Oil pump drive pin
2. Front case bolt	22. Reduction shift sleeve	44. Oil pump cover
3. Front case	23. Center differential assembly	1217G 45. Oil drain plug : Apply sealant 99000-31260 to plug thread.
4. Knock pin	24. Low gear	46. Transfer to transmission bolt
5. Oil pipe	25. Front drive shaft	47. Front oil seal No.2 : Apply grease 99000-25010 to oil seal lip.
6. Input gear assembly	26. Thrust needle bearing	48. Rear oil seal : Apply grease 99000-25010 to oil seal lip.
7. Input gear plate bolt	27. Differential lock clutch sleeve	49. Transfer actuator bolt
8. Counter gear assembly	28. Front drive sprocket bush	50. Control cover
9. Needle bearing	29. Front drive sprocket	51. Flange (if equipped)
1217G 10. Center case : Apply sealant 99000-31260 to mating surface of front case, transfer control cover and center case.	30. Rear output shaft assembly	52. Washer (if equipped)
11. Damper	31. Front output shaft assembly	53. Flange nut (if equipped) : After tightening nut, caulk nut securely.
12. 4L/N switch	32. Drive chain	(a) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
13. Center differential lock switch	1217G 33. Rear case : Apply sealant 99000-31260 to mating surface of rear case, oil pump cover and center case.	(b) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
14. Transfer actuator assembly	1217G 34. Oil level / filler plug : Apply sealant 99000-31260 to plug thread.	(c) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)
1322 15. Control cover bolt : Apply thread lock 99000-32110 to bolt thread.	35. Harness bracket	(d) : 20 N·m (2.0 kgf-m, 14.5 lb-ft)
16. Damper bolt	36. Harness bracket bolt	(e) : 125 N·m (12.5 kgf-m, 90.5 lb-ft)
	37. Rear case bolt	: Do not reuse.
17. Breather pipe	38. Oil strainer	: Apply transfer oil.
18. O-ring	39. Oil strainer	
19. Snap ring	40. Oil strainer bolt	

Transfer Assembly Disassembly and Reassembly

S5JB0B3306009

Disassembly

1) Remove harness bracket (1).



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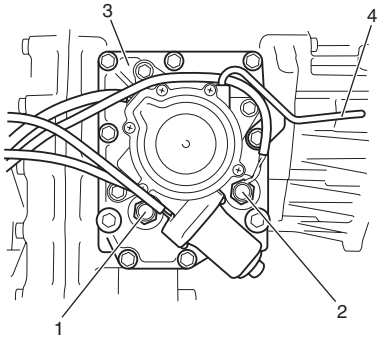
2) Remove center differential lock switch (1) and 4L/N switch (2).

3) Remove transfer actuator assembly (3) and breather pipe (4).

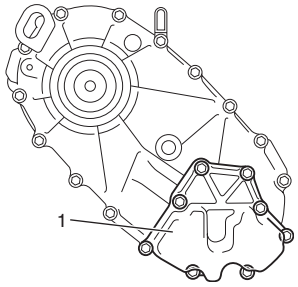


I5JB0A331011-01

4) Remove front output flange follows, if equipped.
   a) Uncaulk front output flange nut.
   b) Remove front output flange nut while holding flange by using special tool.

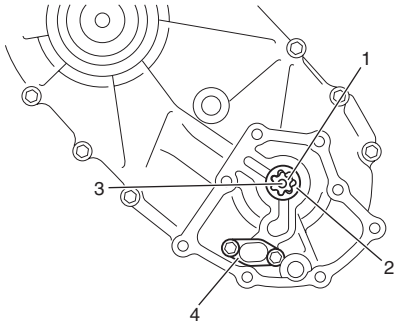
   Special tool
   : 09922–66021

5) Remove oil pump cover (1).



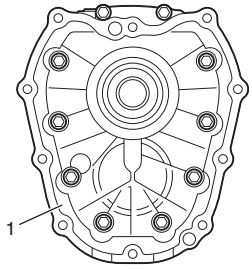
I5JB0A331012-01

6) Remove oil pump inner rotor (1), outer rotor (2), oil strainer (4) and drive pin (3).



I5JB0A331013-01

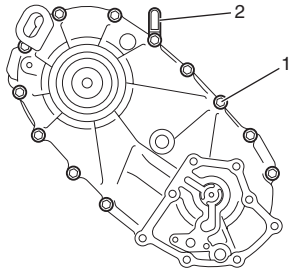
7) Remove front case (1) using plastic hammer.



I5JB0A331014-01

8) Remove rear case bolts (1) and clamp (2) and then separate center case (3) using special tool.

   Special tool
   (A): 09912–34510



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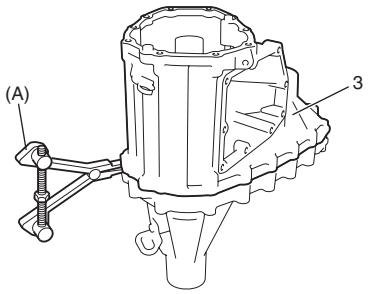
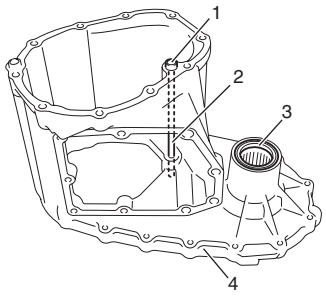


I5JB0A331106-01

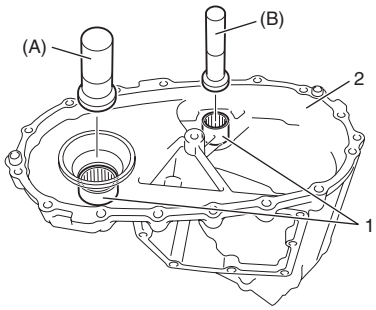
9) Remove knock pin (1) and oil pipe (2) from center case (4) and remove front oil seal No.1 (3) using flat end rod or the like, if necessary.



I5JB0A331017-01

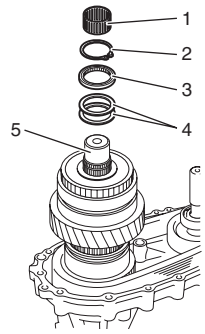
10) Remove needle bearings (1) from center case (2) using special tools, if necessary.

   Special tool
   (A): 09913–76010
   (B): 09925–98210



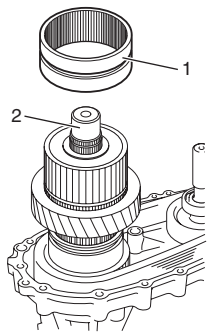
I5JB0A331018-01

11) Remove needle bearing (1), snap ring (2), washer (3) and shim(s) (4) from rear output shaft (5).



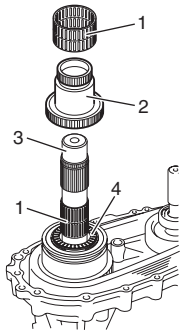
I5JB0A331019-01

12) Remove reduction shift sleeve (1), center differential and low gear from rear output shaft (2).



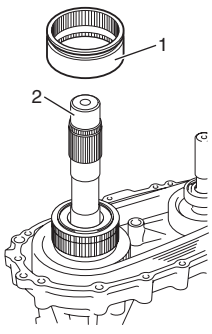
I5JB0A331020-02

13) Remove needle bearings (1), front drive shaft (2) and thrust needle bearing (4) from rear output shaft (3).



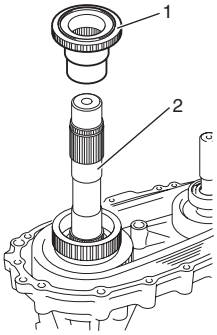
I5JB0A331021-01

14) Remove differential lock clutch sleeve (1) from rear output shaft (2).



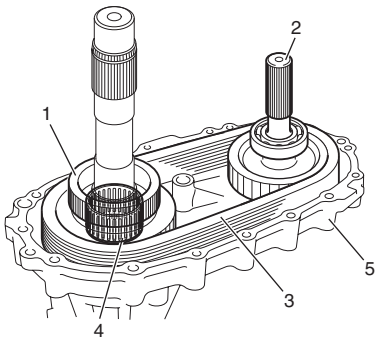
I5JB0A331022-01

15) Remove front drive sprocket bush (1) from rear output shaft (2).



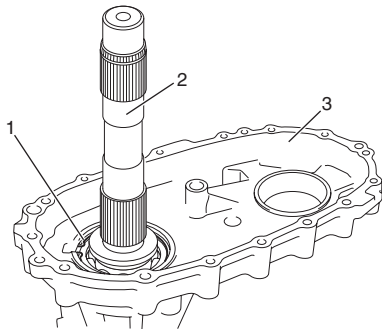
I5JB0A331023-01

16) Take out front drive sprocket (1), front output shaft assembly (2), drive chain (3) and needle bearing (4) from rear case (5) all at once.



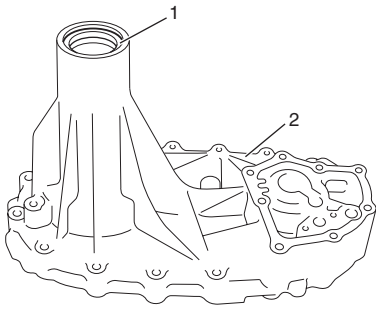
I5JB0A331024-01

17) Remove snap ring (1), and then remove rear output shaft assembly (2) from rear case (3).



I5JB0A331025-01

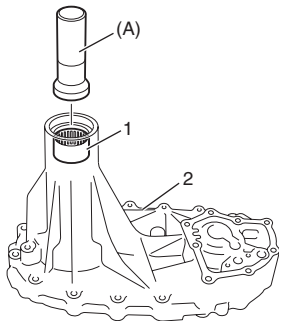
18) Remove rear oil seal (1) from rear case (2) using flat end rod or the like, if necessary.



I5JB0A331026-01

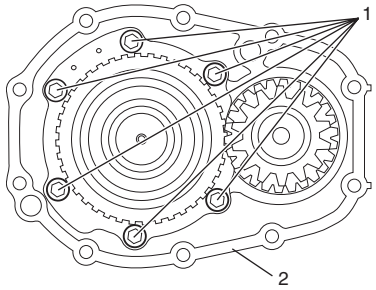
19) Remove needle bearing (1) from rear case (2) using special tool, if necessary.

Special tool
(A): 09913–76010



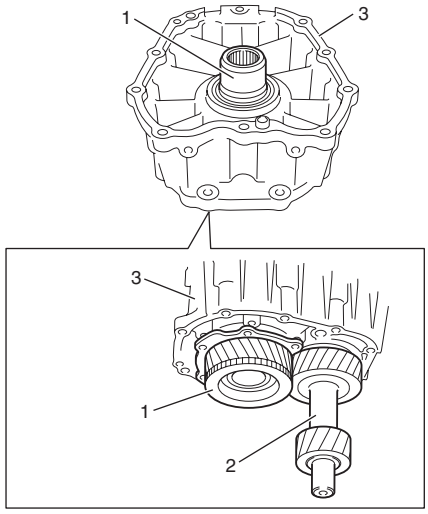
I5JB0A331027-01

20) Remove input gear plate bolts (1) from front case (2).



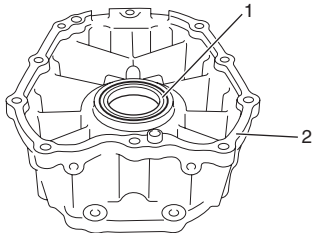
I5JB0A331028-02

21) Remove input gear assembly (1) and counter gear assembly (2) from front case (3) using plastic hammer.



I5JB0A331029-01

22) Remove front oil seal No.2 (1) from front case (2) using flat end rod or the like, if necessary.



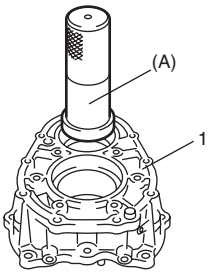
I5JB0A331030-01

Reassembly

1) Install new front oil seal No.2 to front case (1) using special tool, and then apply grease to oil seal lip.

: Grease 99000–25010 (SUZUKI Super Grease A)

Special tool
(A): 09913–85210



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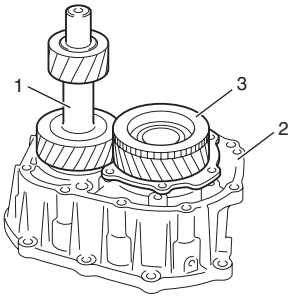
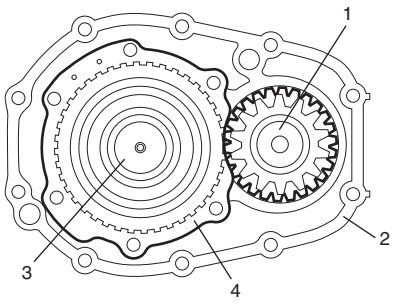
2) Install counter gear assembly (1) to front case (2), and then install input gear assembly (3).

NOTE

Install input gear plate (4) so as not to hit counter gear assembly.

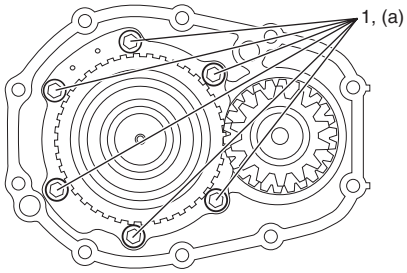




I5JB0A331034-02

3) Tighten new input gear plate bolts (1) to specified torque.

Tightening torque
Input gear plate bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)

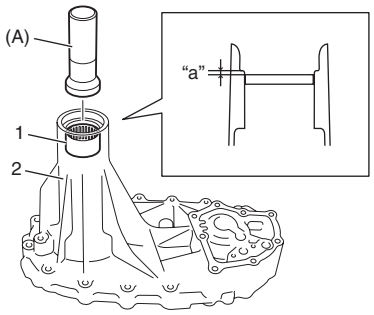


I5JB0A331035-03

4) Install needle bearing (1) to rear case (2) using special tool as shown in figure.

Distance between case and needle bearing "a"
: 0 – 0.5 mm (0 – 0.008 in.)

Special tool
(A): 09913–76010



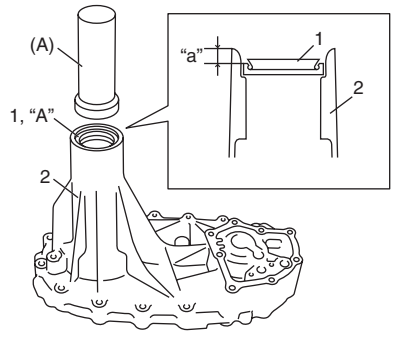
I5JB0A331036-02

5) Install new rear oil seal (1) to rear case (2) using special tool as shown in figure, and then apply grease to oil seal lip.

"A": Grease 99000–25010 (SUZUKI Super Grease A)

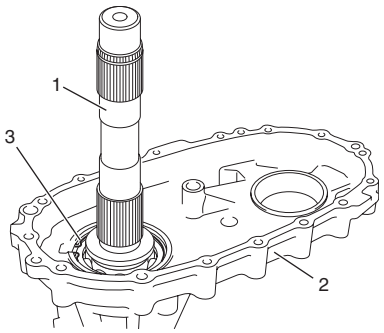
Distance between case and oil seal "a"
: 3.5 – 4.5 mm (0.138 – 0.177 in.)

Special tool
(A): 09913–70123



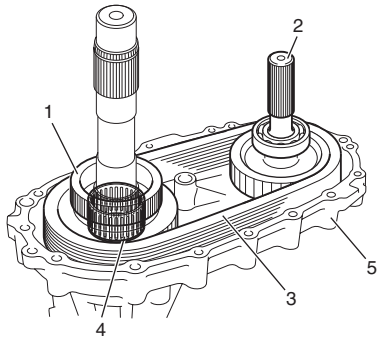
I5JB0A331037-04

6) Install rear output shaft assembly (1) to rear case (2), and then install snap ring (3).



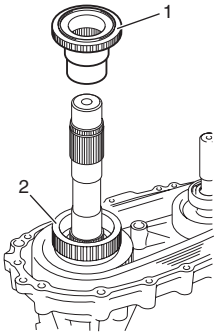
I5JB0A331038-01

7) Install front drive sprocket (1), front output shaft assembly (2), drive chain (3) and needle bearing (4) into rear case (5).



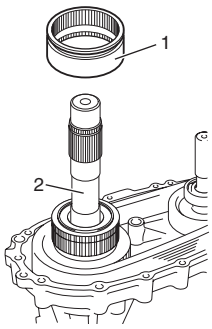
I5JB0A331024-01

8) Install front drive sprocket bush (1) into front drive sprocket (2).



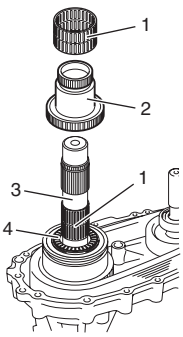
I5JB0A331039-01

9) Install differential lock clutch sleeve (1) to rear output shaft (2) as shown in figure.



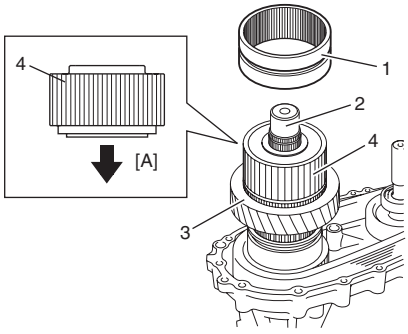
I5JB0A331040-01

10) Install thrust needle bearing (4), front drive shaft (1) and needle bearings (2) to rear output shaft (3).



I5JB0A331041-02

11) Install low gear (3), center differential (4) and reduction shift sleeve (1) to rear output shaft (2).



I5JB0A331042-02

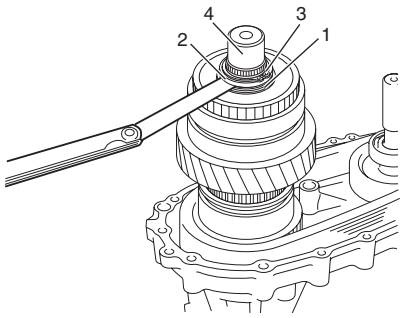
[A]: Rear case side

12) Select shim (1) as follows.
   a) Install shim, washer (2) and used snap ring (3) into rear output shaft (4).
   b) Check clearance between shim and washer.
   c) If clearance is out of specified value, select shim from the following table so that clearance become specified value.

Clearance between shim and washer
: 0.1 – 0.3 mm (0.004 – 0.012 in.)

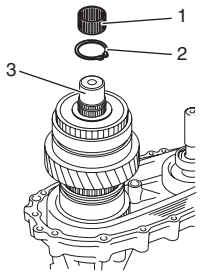
Available shim thickness

0.4 mm (0.016 in.)	**1.6 mm (0.063 in.)**
0.6 mm (0.024 in.)	**1.8 mm (0.071 in.)**
0.8 mm (0.031 in.)	**2.0 mm (0.079 in.)**
1.0 mm (0.039 in.)	**2.2 mm (0.087 in.)**
1.2 mm (0.047 in.)	**2.4 mm (0.098 in.)**
1.4 mm (0.055 in.)	



I5JB0A331043-01

13) Remove used snap ring, and then install new snap ring (2) and needle bearing (1) to rear output shaft (3).

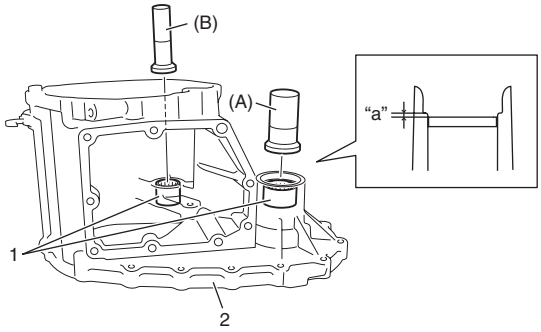


I5JB0A331044-02

14) Install needle bearings (1) to center case (2) using special tools as shown in figure.

Distance between case and needle bearing "a"
: 0 – 0.5 mm (0 – 0.008 in.)

Special tool
(A): 09913–76010
(B): 09925–98210



I5JB0A331045-02

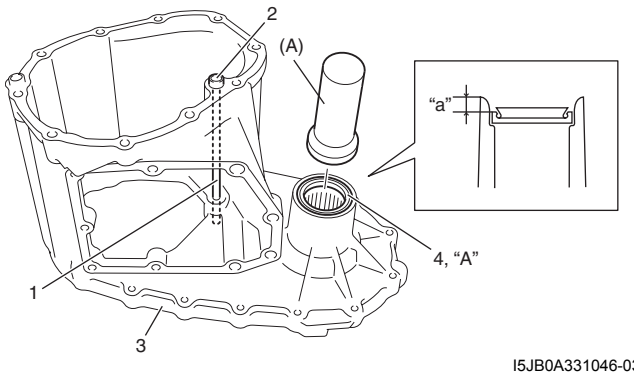
15) Install oil pipe (1) and knock pin (2) into center case (3).

16) Install new front oil seal No.1 (4) into center case using special tool as shown in figure, and then apply grease to oil seal lip.

Distance between case and oil seal "a"
: 3.5 – 4.5 mm (0.138 – 0.177 in.)

"A": Grease 99000–25010 (SUZUKI Super Grease A)

Special tool
(A): 09913–70123

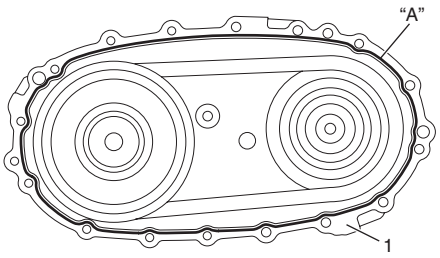


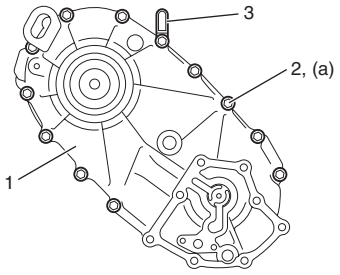
I5JB0A331046-03

17) Clean mating surface of both center case and rear case (1), apply sealant to rear case as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter, mate center case with rear case and then tighten bolts (2) to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Rear case bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)





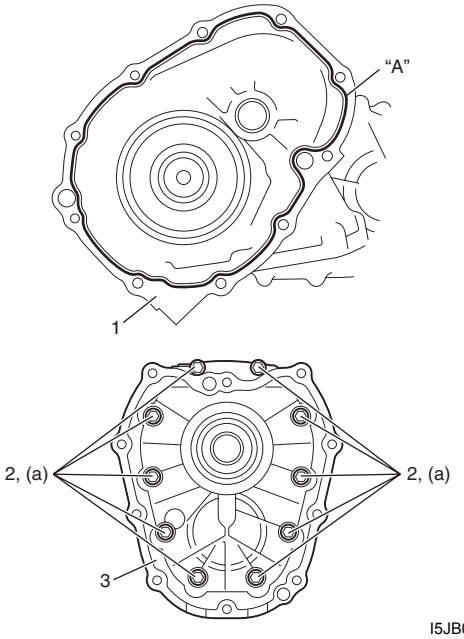
I5JB0A331047-02

3. Clamp

18) Clean mating surface of both center case (1) and front case, apply sealant to center case as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter, mate front case (3) with center case and then tighten bolts (2) to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Rear case bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)

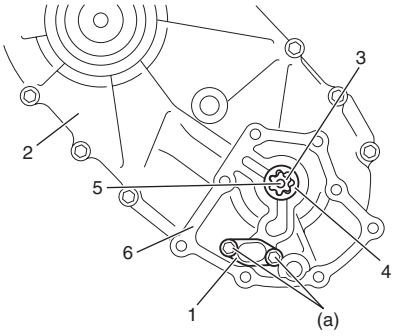


I5JB0A331048-03

19) Install oil strainer (1) to rear case (2).

Tightening torque
Strainer bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

20) Install oil pump inner rotor (3), outer rotor (4) and drive pin (5) to rear case (6).

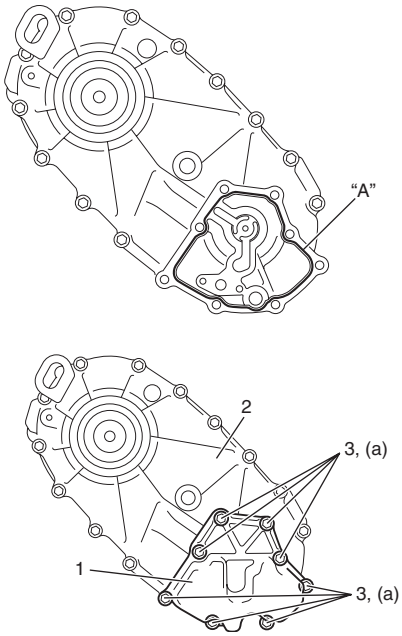


I5JB0A331050-01

21) Clean mating surface of oil pump cover (1) and rear case (2), apply sealant to rear case as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter, mate oil pump cover with rear case and then tighten bolts (3) to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Oil pump cover bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)

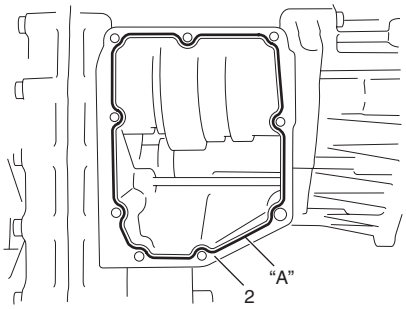


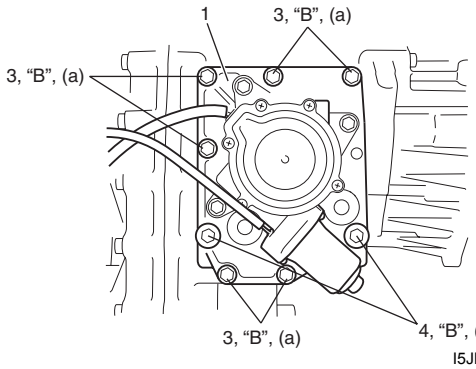
I5JB0A331049-02

22) Clean mating surface of control cover (1) and center case (2), apply sealant to center case as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter, confirm the each fork of control cover is in groove of the sleeve, mate control cover with center case and then tighten control cover bolts (3) to which thread lock cement has been applied and control cover dowel bolts (4) to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)
"B": Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Control cover bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)
Control cover dowel bolt (b): 23 N·m (2.3 kgf-m, 17.0 lb-ft)

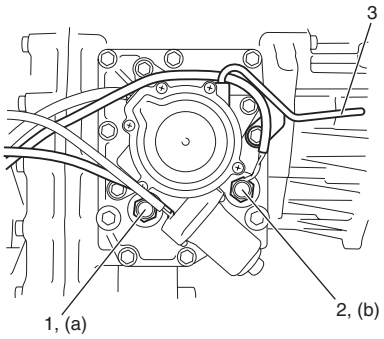




I5JB0A331051-04

23) Install center differential lock switch (1), 4L/N switch (2) and breather pipe (3).

Tightening torque
Center differential lock switch (a): 20 N·m (2.0 kgf-m, 14.5 lb-ft)
4L/N switch (b): 20 N·m (2.0 kgf-m, 14.5 lb-ft)



I5JB0A331052-02

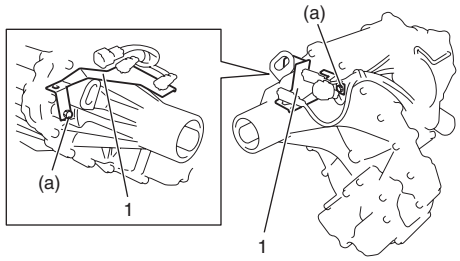
24) Install front output flange as follows, if equipped.
   a) Install front output flange nut while holding flange by using special tool.
   b) Caulk flange nut.

Special tool
: 09922–66021

Tightening torque
Flange nut: 125 N·m (12.5 kgf-m, 90.5 lb-ft)

25) Install harness bracket (1).

Tightening torque
Harness bracket bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)



I5JB0A331053-01

Specifications

Tightening Torque Specifications

S5JB0B3307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Input gear plate bolt	23	2.3	17.0	☞
Rear case bolt	23	2.3	17.0	☞ / ☞
Strainer bolt	10	1.0	7.5	☞
Oil pump cover bolt	23	2.3	17.0	☞
Control cover bolt	23	2.3	17.0	☞
Control cover dowel bolt	23	2.3	17.0	☞
Center differential lock switch	20	2.0	14.5	☞
4L/N switch	20	2.0	14.5	☞
Flange nut	125	12.5	90.5	☞
Harness bracket bolt	10	1.0	7.5	☞

NOTE

The specified tightening torque is also described in the following.
“Transfer Assembly Components: ”

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

Special Tools and Equipment

Recommended Service Material

S5JB0B3308001

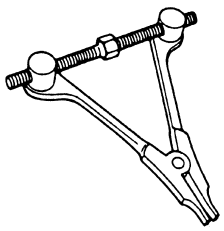
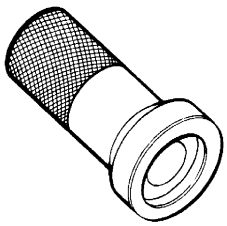
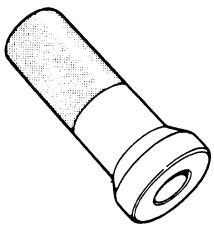
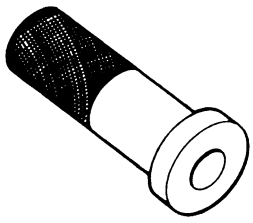
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞ / ☞ / ☞ / ☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞

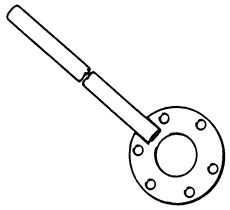
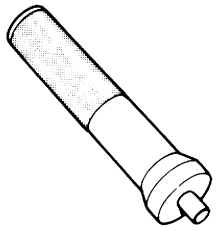
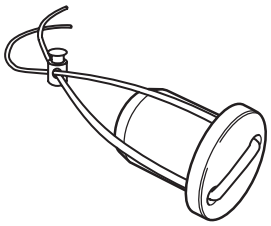
NOTE

Required service material is also described in the following.
“Transfer Assembly Components: ”

Special Tool

S5JB0B3308002

09912–34510 Case separator ☞		09913–70123 Bearing installing tool ☞ / ☞	
09913–76010 Bearing installer ☞ / ☞ / ☞ / ☞		09913–85210 Bearing installer ☞	

09922–66021 Flange holder ☞ / ☞ 	09925–98210 Input shaft bearing installer ☞ / ☞ 
09928–36510 Transfer cap ☞ 	

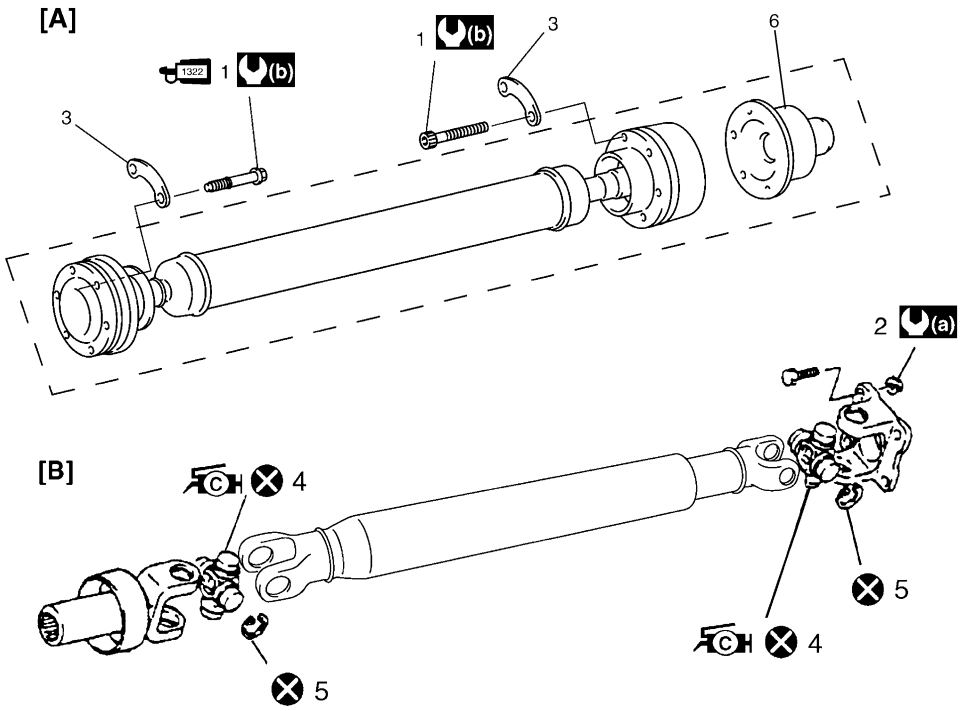
Propeller Shafts

General Description

Propeller Shaft Construction

S5JB0B3401001

Most universal joints and ball joints require no maintenance. They are lubricated for life and can not be lubricated on the vehicle. If a universal joint becomes noisy or worn, it must be replaced.
The propeller shaft is a balanced unit. Handle it carefully so that balance can be maintained.



I5JB0B340001-01

[A]: Front propeller shaft	5. Circlip
[B]: Rear propeller shaft	6. Flange (if equipped)
1322 1. Front propeller shaft flange bolt : Apply thread lock 99000-32110 to bolt thread.	(a) : 85 N·m (8.5 kgf-m, 61.5 lb-ft)
2. Rear propeller shaft flange nut	(b) : 30 N·m (3.0 kgf-m, 22.0 lb-ft)
3. Support washer	⊗ : Do not reuse.
C 4. Spider joint assembly : Apply grease (99000-25030) to spider bearing race.	

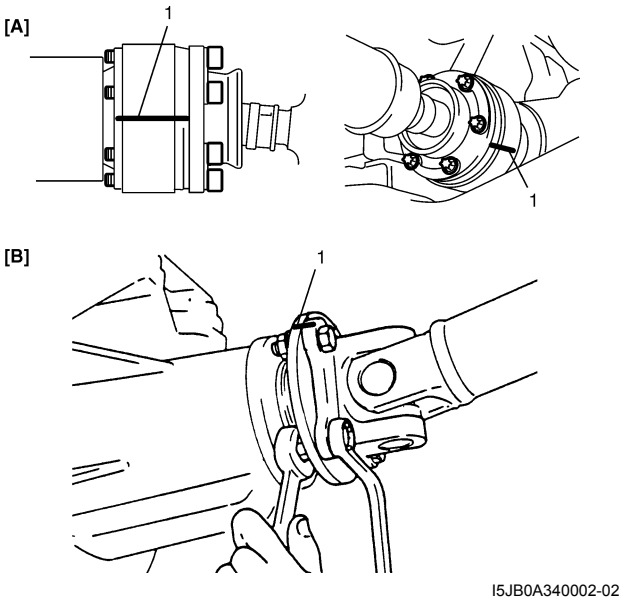
Repair Instructions

Propeller Shaft Removal and Installation

S5JB0B3406002

Removal

1) Hoist vehicle.
2) Give match marks (1) on joint flange and propeller shaft as shown in the figure.



I5JB0A340002-02

[A]: Front propeller shaft
[B]: Rear propeller shaft

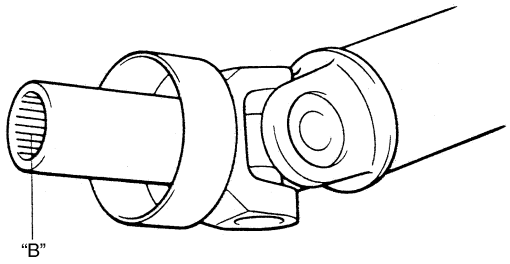
3) Remove rear propeller shaft.
4) Drain transfer oil when removed front propeller shaft from transfer, if necessary.

Installation

Reverse removal procedure to install propeller shaft noting the following points.

- Clean and inspect sliding portion of propeller shaft end (where oil seal contacts) before installation and if even small dent or scratch exists, correct end clean it again.
  Then apply grease inside splines of propeller shaft.

  "B": Grease 99000–25010 (SUZUKI Super Grease A)

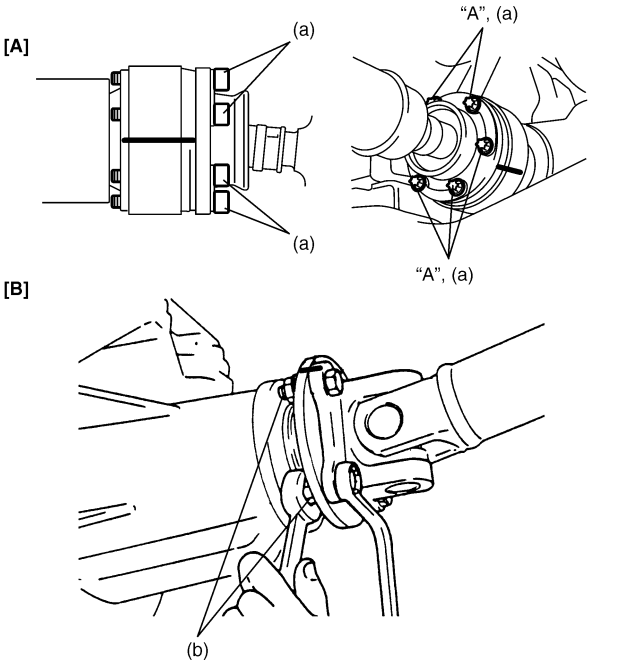


IYSQ01521009-01

- Install propeller shaft aligning match marks. Otherwise, vibration may occur during driving.
- Use the following specification to torque universal joint flange nuts and bolts. For front propeller shaft flange bolt (front differential side), apply thread lock cement to thread part of bolts if reused.
- Fill transfer oil, if removed front propeller shaft referring to "Transfer Oil Change: in Section 3C in related manual", if necessary.

  "A": Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

  Tightening torque
  Front propeller shaft flange bolt (a): 30 N·m (3.0 kgf-m, 22.0 lb-ft)
  Rear propeller shaft flange nut (b): 85 N·m (8.5 kgf-m, 61.5 lb-ft)



I5JB0A340004-01

[A]: Front propeller shaft
[B]: Rear propeller shaft

Specifications

Tightening Torque Specifications

S5JB0B3407001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Front propeller shaft flange bolt	30	3.0	22.0	☞
Rear propeller shaft flange nut	85	8.5	61.5	☞

NOTE

The specified tightening torque is also described in the following.
“Propeller Shaft Construction: ”

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

Special Tools and Equipment

Recommended Service Material

S5JB0B3408001

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.
“Propeller Shaft Construction: ”

Section 4

Brakes

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 manual.

Precautions 4-*
- **Precautions 4-***
  - Precautions for Brakes 4-*

Brake Control System and Diagnosis 4A-*
- **General Description 4A-***
  - Brakes Construction 4A-*
  - Front Brake Hose / Pipe Construction 4A-*
  - Rear Brake Hose / Pipe Construction 4A-*
  - Master Cylinder Assembly Construction 4A-*
  - Booster Assembly Construction 4A-*
- **Diagnostic Information and Procedures 4A-***
  - Brake Diagnosis Note 4A-*
  - Brakes Symptom Diagnosis 4A-*
- **Repair Instructions 4A-***
  - Excessive Pedal Travel Check 4A-*
  - Brake Pedal Play Check 4A-*
  - Brake Fluid Level Check 4A-*
  - Air Bleeding of Brake System 4A-*
  - Brake Pedal Free Height Adjustment 4A-*
  - Brake Light Switch Adjustment 4A-*
  - Brake Flexible Hose and Pipe Check 4A-*
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ABS

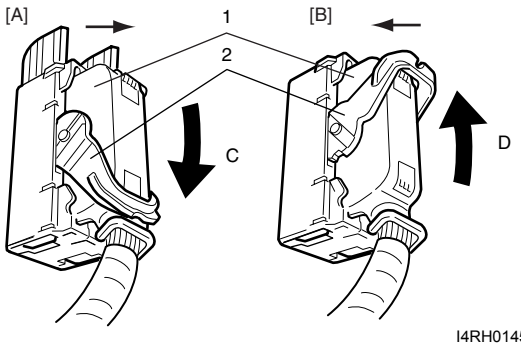
Precautions

Precautions in Diagnosing Troubles

S5JB0B4500001

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow “ABS Check: ”.

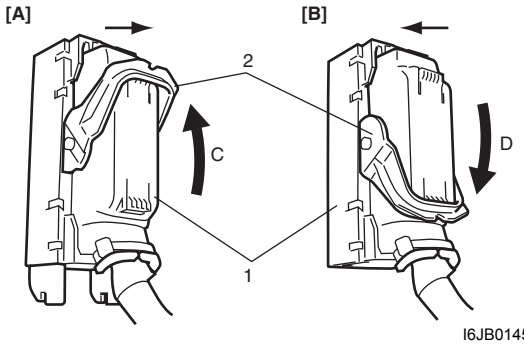
- Diagnostic information stored in ABS (ESP®) control module memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- If the vehicles was operated in any of the following ways, ABS warning lamp may light momentarily but this does not indicate anything abnormal in ABS.
  - The vehicle was driven with parking brake pulled.
  - The vehicle was driven with brake dragging.
  - The vehicle was stuck in mud, sand, etc.
  - Wheel spin occurred while driving.
  - Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to read “Precautions for Electrical Circuit Service: in Section 00 in related manual” before inspection and observe what is written there.
- Be sure to use the trouble diagnosis procedure as described in “ABS Check: ”. Failure to follow it may result in incorrect diagnosis. (Some other diagnosis trouble code may be stored by mistake in the memory of ABS control module during inspection.)
- When disconnecting ABS control module connector (1), pull down lock lever (2) of connector.
  When connecting, set the connector on ABS hydraulic unit / control module assembly and pull up the lock lever (2) until it locks.



I4RH01450001-01

[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

- When disconnecting ESP® control module connector (1), pull up lock lever (2) of connector.
  When connecting, set the connector on ESP® hydraulic unit / control module assembly and pull down the lock lever (2) until it locks.



I6JB01450001-02

[A]: Disconnect	C: Pull up to disconnect
[B]: Connect	D: Pull down to connect

- Communication of ECM, BCM, ABS (ESP®) control module (if equipped), 4WD control module (if equipped), immobilizer control module (ICM) (if equipped), combination meter and steering angle sensor (if equipped) is established by CAN (Controller Area Network).Therefore, be sure to read “Precautions for Installing Mobile Communication Equipment: in Section 00 in related manual” before inspection and handle CAN communication line.

Precautions in On-Vehicle Service

S5JB0B4500002

When connector is connected to ABS (ESP®) hydraulic unit / control module assembly, do not disconnect connectors of sensors with ignition switch ON.Otherwise, DTC will be set in ABS (ESP®) control module.

Precautions in Hydraulic Unit Operation Check

S5JB0B4500003

ABS (ESP®) hydraulic unit / control module assembly function is checked by correct wheel lock / release condition when brake pressure is pressurized / depressurized using SUZUKI scan tool. The hydraulic unit operation check referring to “Hydraulic Unit Operation Check: ” should be performed to confirm the correct brake pipe connection in the following cases.

- ABS (ESP®) hydraulic unit / control module assembly was replaced.
- Brake pipe and/or hose were replaced.

General Description

ABS Description

S5JB0B4501001

ABS is controlled by ABS control module or by ESP® control module (if equipped).
ABS activation and control with ESP® are done by ESP® hydraulic unit / control module assembly.Regarding TCS and stability control excluding ABS system with ESP®, refer to Section 4F.
The ABS (Antilock Brake System) controls the fluid pressure applied to the wheel cylinder of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied.
This ABS has also the following function.
While braking is applied, but before ABS control becomes effective, braking force is distributed between the front and rear so as to prevent the rear wheels from being locked too early for better stability of the vehicle.
The main component parts of this ABS include the following parts in addition to those of the conventional brake system.

- Wheel speed sensor which senses revolution speed of each wheel and outputs its signal.
- ABS warning lamp which lights to inform abnormality when system fails to operate properly.
- ABS (ESP®) hydraulic unit / control module assembly is incorporated ABS (ESP®) control module, ABS (ESP®) hydraulic unit (actuator assembly), solenoid valve power supply driver (transistor), solenoid valve driver (transistor), pump motor driver (transistor).
  - ABS (ESP®) control module which sends operation signal to ABS (ESP®) hydraulic unit to control fluid pressure applied to each wheel cylinder based on signal from each wheel speed sensor so as to prevent wheel from locking.
  - ABS (ESP®) hydraulic unit which operates according to signal from ABS (ESP®) control module to control fluid pressure applied to wheel cylinder of each 4 wheels.
  - Solenoid valve power supply driver (transistor) which supplies power to solenoid valve in ABS (ESP®) hydraulic unit.
  - Solenoid valve driver (transistor) which controls each solenoid valves in ABS (ESP®) hydraulic unit.
  - Pump motor driver (transistor) which supplies power to pump motor in ABS (ESP®) hydraulic unit.

This ABS is equipped with Electronic Brake force Distribution (EBD) system that controls a fluid pressure of rear wheels to best condition, which is the same function as that of proportioning valve, by the signal from wheel sensor independently of change of load due to load capacity and so on. And if the EBD system fails to operate properly, the brake warning lamp lights to inform abnormality.

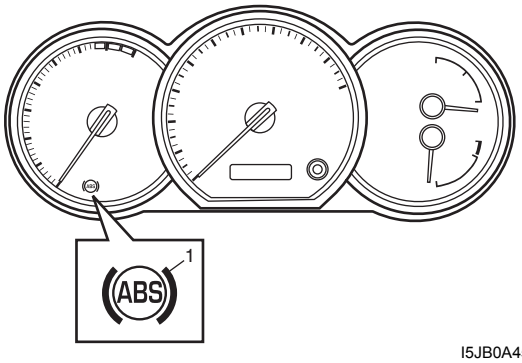
ABS Hydraulic Unit / Control Module Assembly Description

S5JB0B4501002

ABS (ESP®) control module is a component of ABS (ESP®) hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ABS (ESP®) 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 (1) as described.



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- 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 (ESP®) control module.

CAN Communication System Description

S5JB0B4501003

Refer to “CAN Communication System Description: in Section 1A” for CAN communication system description.
ABS communicates control data with each control module as follows.

ABS Transmission Data

				ECM	Combination Meter	4WD control module (if equipped)
ABS (ESP®) control module	Transmit	DATA	Torque up request	○		
			Wheel speed signal (front)	○		○
			Wheel speed signal (rear right)	○		○
			Wheel speed signal (rear left)	○		○
			ABS active	○		○
			ABS indication on		○	
			EBD indication on		○	
			ABS diagnostic trouble codes		○	

I5JB0B450001-01

ABS Reception Data

				ECM
ABS (ESP®) control module	Receive	DATA	Brake pedal switch active	○

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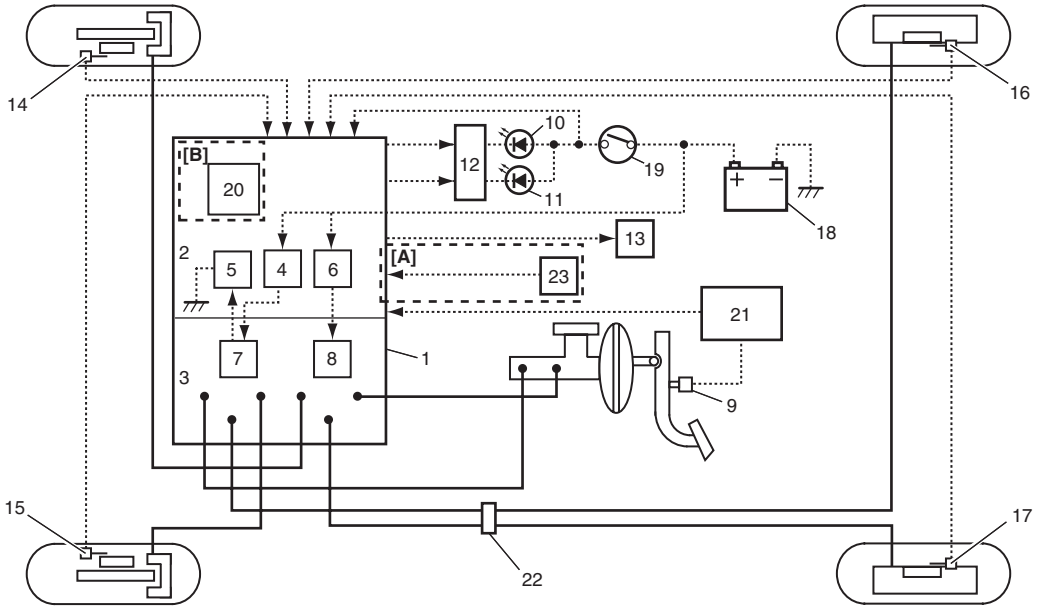
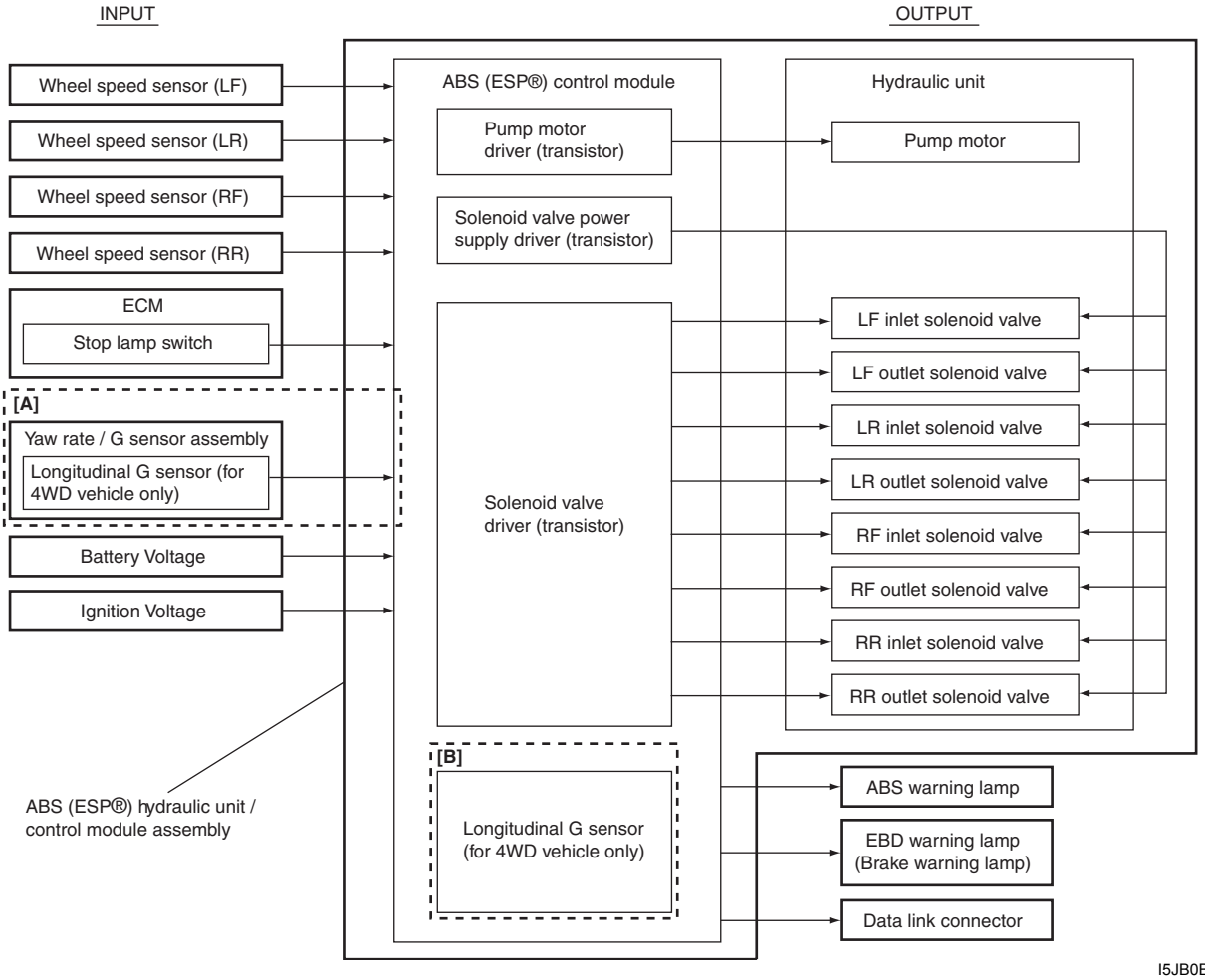
Schematic and Routing Diagram

ABS Schematic

S5JB0B4502001





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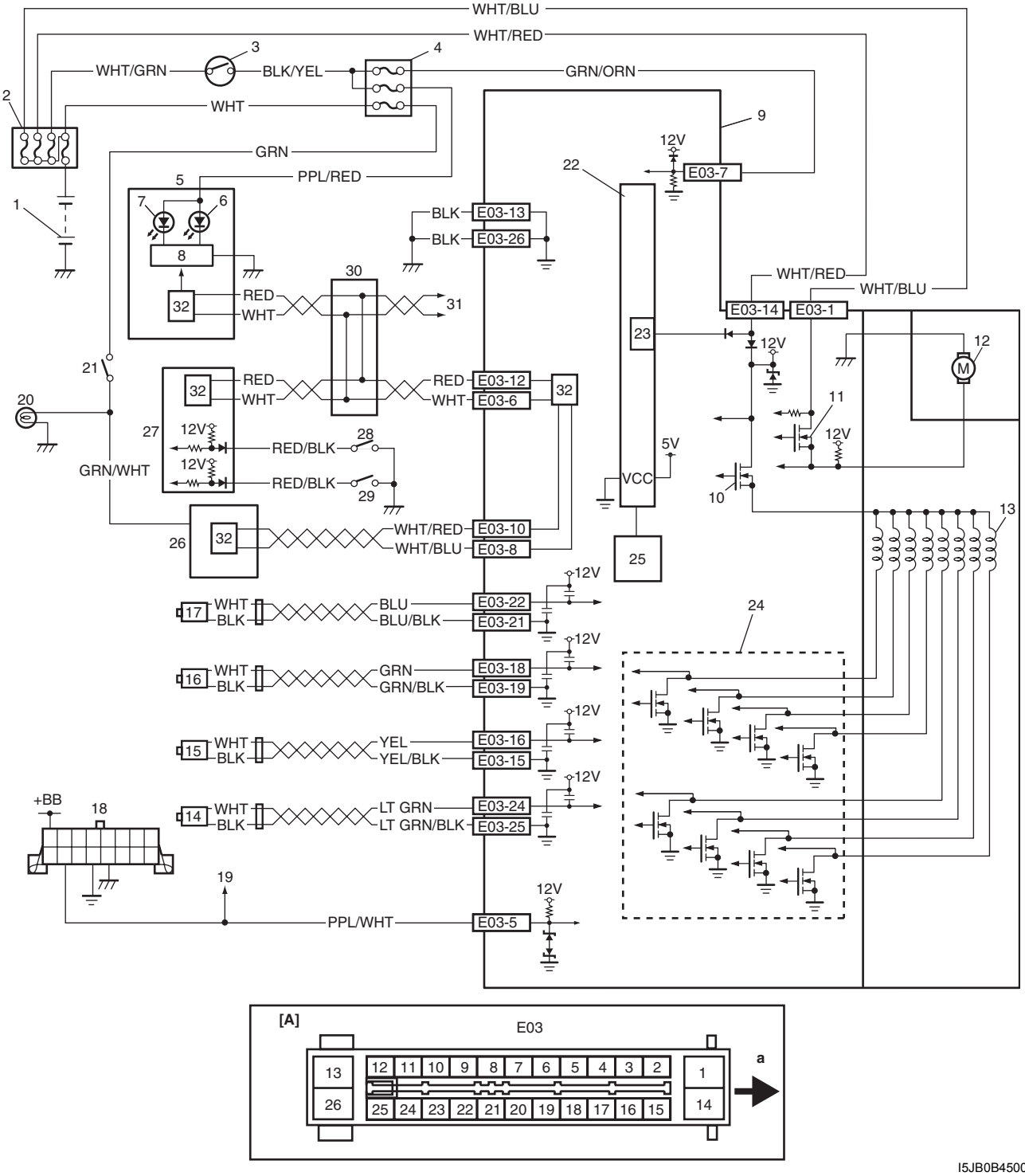
[A]: With ESP®	8. Pump motor	17. Wheel speed sensor (Left-rear)
[B]: Without ESP®	9. Stop lamp switch	18. Battery
1. ABS (ESP®) hydraulic unit / control module assembly	10. ABS warning lamp	19. Ignition switch
2. ABS (ESP®) control module	11. EBD warning lamp (Brake warning lamp)	20. G sensor (for 4WD vehicle only)

3. ABS (ESP®) hydraulic unit	12. Lamp driver module	21. ECM
4. Solenoid valve power supply driver (transistor)	13. Data link connector	22. 4 way joint
5. Solenoid valve driver (transistor)	14. Wheel speed sensor (Right-front)	23. Yaw rate / G sensor assembly
6. Pump motor driver (transistor)	15. Wheel speed sensor (Left-front)	
7. Solenoid valve	16. Wheel speed sensor (Right-rear)	

ABS Wiring Circuit Diagram

S5JB0B4502002

The figure shows for vehicle without ESP®. For vehicle equipped with ESP®, refer to “Electronic Stability Program Wiring Circuit Diagram: in Section 4F”.



I5JB0B450004-01

[A]: Terminal arrangement of ABS hydraulic unit / control module assembly	11. Pump motor driver (transistor)	23. Internal memory
a: Upside	12. Pump motor	24. Solenoid valve driver (transistor)

1. Battery	13. Solenoid valves	25. G sensor (4WD vehicle only)
2. Main fuse box	14. Right-rear wheel speed sensor	26. ECM
3. Ignition switch	15. Left-rear wheel speed sensor	27. BCM
4. Junction block assembly	16. Right-front wheel speed sensor	28. Brake fluid level switch
5. Combination meter	17. Left-front wheel speed sensor	29. Parking brake switch
6. ABS warning lamp	18. Data link connector	30. CAN junction
7. EBD warning lamp (Brake warning lamp)	19. To ECM, SDM, BCM, 4WD control module and immobilizer control module (ICM)	31. To 4WD control module and immobilizer control module (ICM)
8. Lamp driver module	20. Stop lamp	32. CAN driver
9. ABS hydraulic unit / control module assembly	21. Brake light switch	
10. Solenoid valve power supply driver (transistor)	22. Power control unit	

Terminal		Wire color	Circuit
E03	1	WHT/BLU	Pump motor driver (Transistor)
	2	—	—
	3	—	—
	4	—	—
	5	PPL/WHT	Dark link connector
	6	WHT	CAN communication line (low) for combination meter
	7	GRN/ORN	Ignition switch
	8	WHT/BLU	CAN communication line (low) for ECM
	9	—	—
	10	WHT/RED	CAN communication line (high) for ECM
	11	—	—
	12	RED	CAN communication line (high) for combination meter
	13	BLK	Ground
	14	WHT/RED	Solenoid valve power supply driver (Transistor)
	15	YEL/BLK	Left–rear wheel speed sensor (–)
	16	YEL	Left–rear wheel speed sensor (+)
	17	—	—
	18	GRN	Right–front wheel speed sensor (+)
	19	GRN/BLK	Right–front wheel speed sensor (–)
	20	—	—
	21	BLU/BLK	Left–front wheel speed sensor (–)
	22	BLU	Left–front wheel speed sensor (+)
	23	—	—
	24	LT GRN	Right–rear wheel speed sensor (+)
	25	LT GRN/BLK	Right–rear wheel speed sensor (–)
	26	BLK	Ground

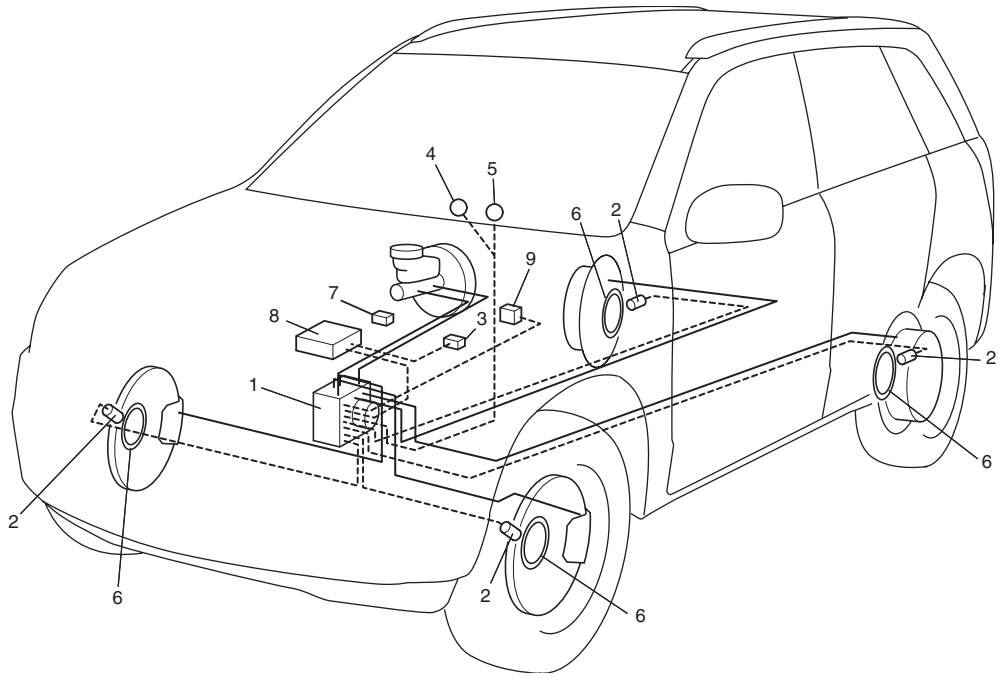
Component Location

ABS Components Location

S5JB0B4503001

NOTE

As for the difference of RH steering vehicle and LH steering vehicle, the location of the combination meter, data link connector, stop lamp switch and the brake master cylinder assembly only changes.



I6JB01450004-01

1. ABS (ESP®) hydraulic unit / control module assembly	6. Wheel encoder (included in wheel hub assembly)
2. Wheel speed sensors	7. Data link connector
3. Stop lamp switch	8. ECM
4. ABS warning lamp	9. Yaw rate / G sensor assembly (with ESP®)
5. EBD warning lamp (Brake warning lamp)	

Diagnostic Information and Procedures

ABS Check

S5JB0B4504001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Malfunction analysis** 1) Perform “Customer complaint analysis: ”. 2) Perform “Problem symptom confirmation: ”. 3) Perform “DTC check, record and clearance: ” and recheck DTC. *Is there any malfunction DTC?*	Go to Step 4.	Go to Step 2.
2	☞ **Driving test** 1) Perform “Step 2: Driving Test: ”. *Is trouble symptom identified?*	Go to Step 3.	Go to Step 6.
3	☞ **DTC check** 1) Perform “DTC Check: ”. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **ABS check** 1) Inspect and repair referring to applicable DTC flow. *Does trouble recur?*	Go to Step 5.	Go to Step 7.
5	☞ **Brakes diagnosis** 1) Inspect and repair referring to “Brakes Symptom Diagnosis: in Section 4A in related manual”. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
6	☞ **Check for intermittent problem** 1) Check intermittent troubles referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual” and related circuit of trouble code recorded in Step 1. *Does trouble recur?*	Go to Step 4.	Go to Step 7.
7	☞ **Final confirmation test** 1) Perform “Step 7: Final Confirmation Test: ”. *Does trouble recur?*	Go to Step 3.	End.

Step 1: Malfunction Analysis

Customer complaint analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such a questionnaire form as shown in the following will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date of Reg:	Date of problem:	Mileage:

Problem Symptoms	● ABS warning lamp abnormal: fails to turn on/fails to go off/flashes ● Abnormal noise while vehicle is running: from motor, from valve, other_____ ● Wheel is locked at braking: ● Pump motor does not stop (running): ● Braking does not work: ● Other:
Frequency of occurrence	● Continuous/Intermittent (times a day, a month)/ other_____
Conditions for Occurrence of Problem	● Vehicle at stop & ignition switch ON: ● When starting: at initial start only/at every start/Other_____ ● Vehicle speed: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other_____ ● Road surface condition: Paved road/rough road/snow-covered road/ other_____ ● Chain equipment:
Environmental Condition	● Weather: fair/cloudy/rain/snow/other_____ ● Temperature: °F (°C)
Diagnostic Trouble Code	● First check: Normal code/malfunction code ( ) ● Second check after test drive: Normal code/malfunction code ( )

I2RH01450014-01

Problem symptom confirmation

Check if what the customer claimed in "Customer Questionnaire" is actually found in the vehicle and if that symptom is found, whether it is identified as a failure. (This step should be shared with the customer if possible.) Check warning lamps related to brake system referring to "EBD Warning Lamp (Brake Warning Lamp) Check: in related manual" and "ABS Warning Lamp Check: ".

DTC check, record and clearance

Perform "DTC Check: " procedure, record it and then clear it referring to "DTC Clearance: in related manual".
Recheck DTC referring to "DTC Check: ".
When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to "Step 4: ABS Check: " to proceed the diagnosis.
When DTC which is recorded at DTC check procedure is not indicated anymore after performing DTC clearance, ABS (ESP®) control module does not perform the system diagnosis, or temporary abnormality may occur, therefore go to "Step 2: Driving Test: " to proceed the diagnosis.

Step 2: Driving Test

Test drive the vehicle at 40 km/h for more than a minute and check if any trouble symptom (such as abnormal lighting of ABS warning light) exists.
If the malfunction DTC is confirmed again at ignition switch ON, driving test as described is not necessary. Proceed to Step 3.

Step 3: DTC Check
Recheck DTC referring to “DTC Check: ”.

Step 4: ABS Check
According to ABS Check for the DTC confirmation in Step 3, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator assembly or other part and repair or replace faulty parts.

Step 5: Brakes Diagnosis
Check the parts or system suspected as a possible cause referring to “Brakes Symptom Diagnosis: in Section 4A in related manual” and based on symptoms appearing on the vehicle (symptom obtained through Steps 1 and 2 and repair or replace faulty parts, if any).

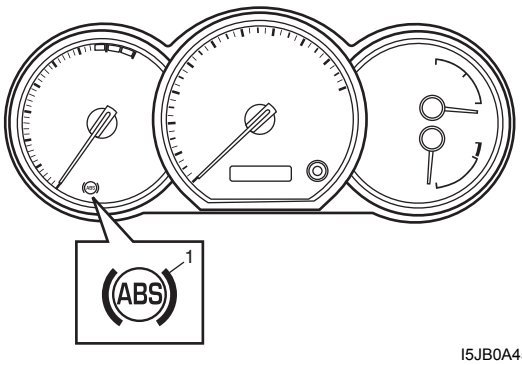
Step 6: Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual” and related circuit of trouble code recorded in Step 1 to 3.

Step 7: Final Confirmation Test
Confirm that the problem symptom has gone and the ABS is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once referring to “DTC Clearance: in related manual” and perform test driving and confirm that no DTC is indicated.

ABS Warning Lamp Check

S5JB0B4504002

1) Turn ignition switch ON.
2) Check that ABS warning lamp (1) comes ON for about 2 seconds and then goes off.
   If any faulty condition is found, advance to “ABS Warning Lamp Does Not Come ON at Ignition Switch ON: ” and “ABS Warning Lamp Comes ON Steady: ”.



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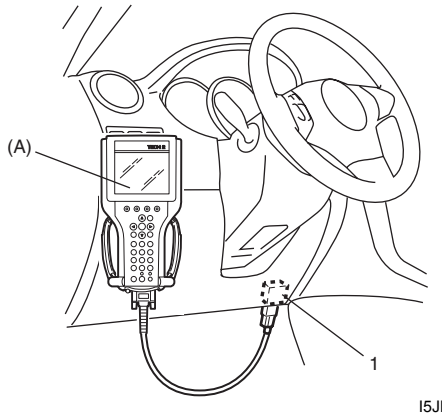
DTC Check

S5JB0B4504004

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (1).

   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 and print it or write it down. Refer to SUZUKI scan tool operator’s manual for further details.

   NOTE

   If SUZUKI scan tool can not communicate ABS (ESP®) hydraulic unit / control module, perform “Serial Data Link Circuit Check: in related manual”.

5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from DLC.

DTC Table

S5JB0B4504005

⚠ CAUTION

Be sure to perform "ABS Check: " before starting diagnosis.

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	
NO DTC	Normal	
☞C1015	G sensor circuit failure (for 4WD vehicle)	
☞C1021	RF	Wheel speed sensor circuit failure
☞C1025	LF	
☞C1031	RR	
☞C1035	LR	
☞C1022	RF	Wheel speed sensor or encoder failure
☞C1026	LF	
☞C1032	RR	
☞C1036	LR	
☞C1041	RF	Inlet solenoid valve circuit failure
☞C1042		Outlet solenoid valve circuit failure
☞C1045	LF	Inlet solenoid valve circuit failure
☞C1046		Outlet solenoid valve circuit failure
☞C1051	RR	Inlet solenoid valve circuit failure
☞C1052		Outlet solenoid valve circuit failure
☞C1055	LR	Inlet solenoid valve circuit failure
☞C1056		Outlet solenoid valve circuit failure
☞C1057	ABS (ESP®) control module power supply circuit failure	
☞C1061	Pump motor and/or motor driver circuit failure	
☞C1063	Solenoid valve power supply driver circuit failure	
☞C1071	ABS (ESP®) control module internal defect	
☞U1073	Control Module Communication Bus Off	
☞U1100	Lost Communication with ECM (Reception error)	

Scan Tool Data

S5JB0B4504007

The parameter data below are values measured with the scan tool when the normally operating vehicle is under the following conditions. When taking measurements for comparison by using the scan tool, be sure to check that the vehicle is under the following conditions.

- Apply parking brake and block wheels.
- Ignition switch ON.
- Turn OFF air conditioner (if equipped).
- Apply no load to power steering (if equipped). (Don't turn it)
- Turn OFF all electric loads (except ignition).
- No DTC.
- ABS is not operated. (Normal braking operation)

Scan Tool Data	Standards	Condition
Battery Voltage	10.0 – 16.0 V	—
Pump Motor Driver	0.0 V	—
RF Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
LF Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
RR Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
LR Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
Brake Switch	ON	Brake pedal depressed
	OFF	Brake pedal released
G sensor	0 ± 0.09G	Place vehicle on the level

Scan Tool Data Definition

Battery Volt (V): Battery Voltage is an analog input signal read by the ABS (ESP®) control module. Certain ABS (ESP®) control module functions will be modified if the battery voltage falls below or rises above programmed thresholds.

Pump Motor Driver (V): This parameter indicates the operational condition of the pump motor driver (transistor).

RF Wheel Speed, LF Wheel Speed, RR Wheel Speed and LF Wheel Speed (km/h, MPH): Wheel speed is an ABS (ESP®) control module internal parameter. It is computed by reference pulses from the wheel speed sensor.

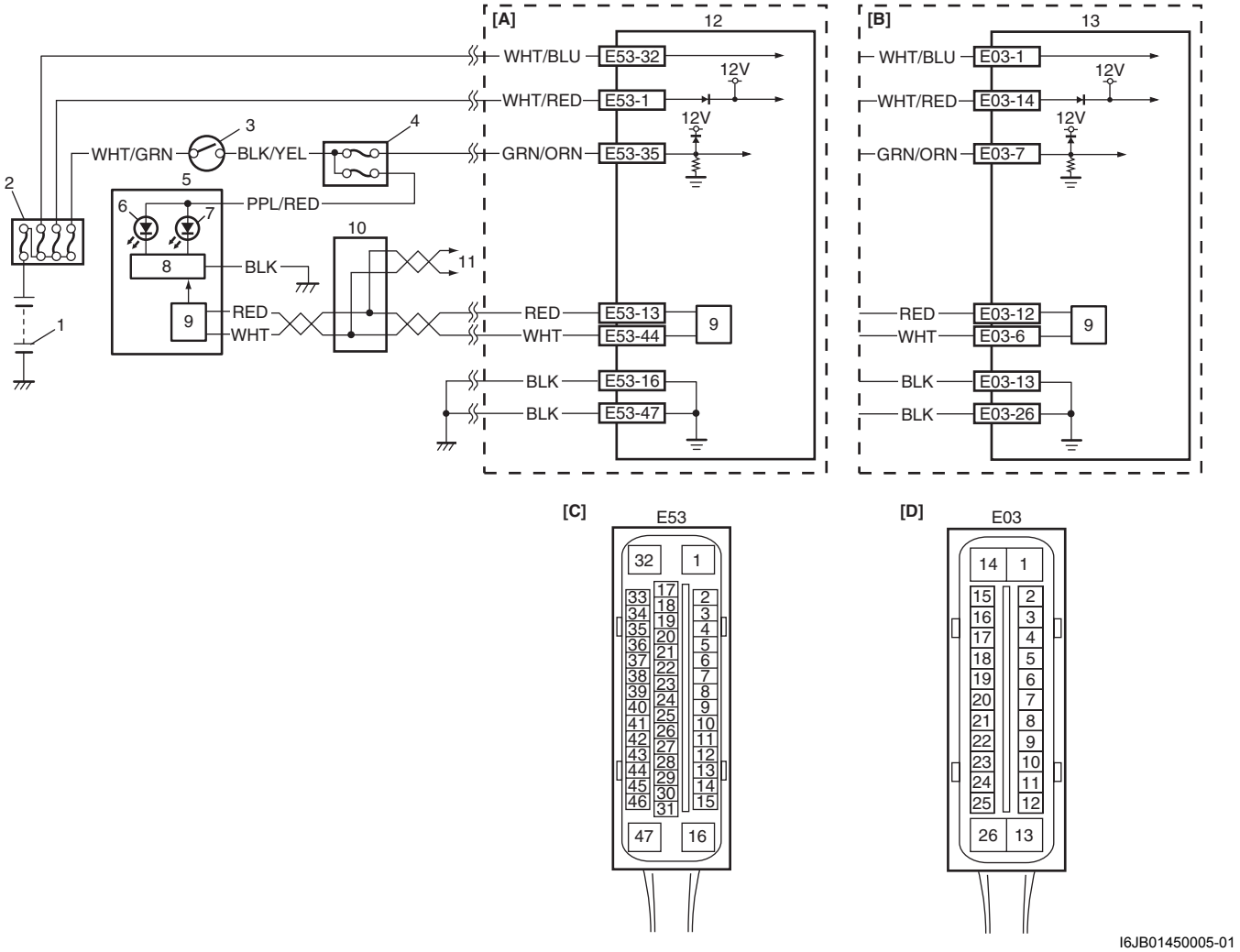
Brake Switch (ON, OFF): This switch signal informs the ABS (ESP®) control module whether the brake is active or not.

G Sensor (G): The G-Sensor converts gravity during the vehicle acceleration / deceleration in to a voltage conditions and controls the ABS for 4WD vehicle without ESP®.
Vehicle acceleration is measured by yaw rate / G sensor assembly and output to ESP® control module by pulse signal for 4WD vehicle with ESP®.

ABS Warning Lamp Does Not Come ON at Ignition Switch ON

S5JB0B4504008

Wiring Diagram



I6JB01450005-01

[A]: With ESP®	3. Ignition switch	9. CAN driver
[B]: Without ESP®	4. Junction block assembly	10. Junction connector
[C]: ESP® control module connector (viewed from terminal side)	5. Combination meter	11. To BCM, 4WD control module, immobilizer control module (ICM) and steering angle sensor
[D]: ABS control module connector (viewed from terminal side)	6. ABS warning lamp	12. ESP® hydraulic unit / control module assembly
1. Battery	7. EBD warning lamp (Brake warning lamp)	13. ABS hydraulic unit / control module assembly
2. Main fuse box	8. Lamp driver module	

Circuit Description

Operation (ON/OFF) of ABS warning lamp is controlled by ABS (ESP®) control module through lamp driver module in combination meter.

If the antilock brake system is in good condition, ABS (ESP®) control module turns ABS warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning lamp is turned ON continuously by ABS (ESP®) control module. Also, it is turned ON continuously by lamp driver module when the connector of ABS (ESP®) control module is disconnected.

Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Do other warning lamps come ON?*	Go to Step 2.	Go to Step 3.
2	1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to OFF position and check DTC. *Is there DTC U1073?*	Go to "DTC U1073: Control Module Communication Bus Off: ".	Substitute a known-good combination meter and recheck. If ABS warning lamp remains OFF, substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.
3	*Is Circuit fuse for combination meter in good condition?*	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	Check CAN communication circuit between combination meter and ABS hydraulic unit / control module referring to "DTC U1073: Control Module Communication Bus Off: ". *Is CAN communication circuit in good condition?*	Go to Step 5.	Repair or replace.
5	1) Remove combination meter with ignition switch turned OFF. 2) Check for proper connection to "PPL/RED" and "BLK" wire of combination meter connector. 3) If OK, turn ON ignition switch and measure voltage at "PPL/RED" wire of combination meter connector and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 6.	Repair power supply circuit for combination meter.
6	1) Measure resistance between "BLK" wire of combination meter connector and vehicle body ground. *Is resistance less than 2 Ω?*	Replace combination meter.	"BLK" circuit open or high resistance.

ABS Warning Lamp Comes ON Steady

S5JB0B4504009

Wiring Diagram

Refer to “ABS Warning Lamp Does Not Come ON at Ignition Switch ON: ”.

Circuit Description

Operation (ON/OFF) of ABS warning lamp is controlled by ABS (ESP®) control module through lamp driver module in combination meter.

If the antilock brake system is in good condition, ABS (ESP®) control module turns ABS warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning lamp is turned ON continuously by ABS (ESP®) control module. Also, it is turned ON continuously by lamp driver module when the connector of ABS (ESP®) control module is disconnected.

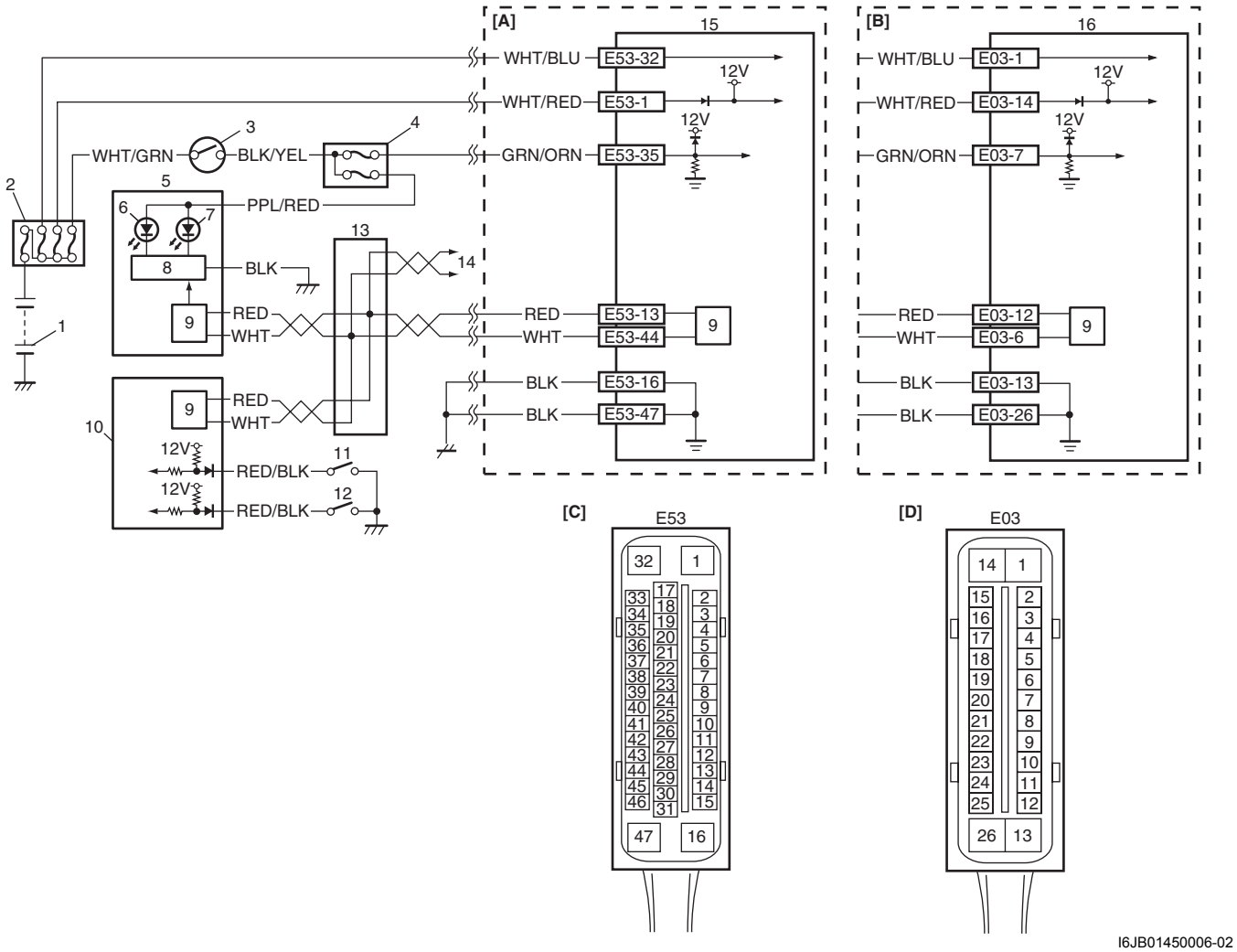
Troubleshooting

Step	Action	Yes	No
1	1) Perform diagnostic trouble code check. *Is there any DTC(s)?*	Go applicable DTC diag. flow.	Go to Step 2.
2	*Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check circuit for short to ground.
3	1) Turn ignition switch to OFF. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-7”, “E03-13” and “E03-26” (or “E53-16”, “E53-35” and “E53-47”). 4) If OK then turn ignition switch to ON position and measure voltage between terminal “E03-7” (or “E53-35”) and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“GRN/ORN” 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” (or “E53-1” and “E53-32”). 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E03-1”, “E03-14” (or “E53-1”, “E53-32”) and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	“WHT/RED” and/or “WHT/BLU” circuit open.
5	1) Turn ignition switch to OFF and measure resistance between each terminal of “E03-13”, “E03-26” (or “E53-16”, “E53-47”) and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ABS (ESP®) hydraulic unit / control module open or high resistance.
6	Check CAN communication circuit between combination meter and ABS (ESP®) hydraulic unit / control module referring to “DTC U1073: Control Module Communication Bus Off: ”. *Is CAN communication circuit in good condition?*	Substitute a known-good combination meter and recheck. If ABS warning lamp remains ON, substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	Repair or replace.

EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady

S5JB0B4504011

Wiring Diagram



I6JB01450006-02

[A]: With ESP®	4. Junction block assembly	11. Parking brake switch
[B]: Without ESP®	5. Combination meter	12. Brake fluid level switch
[C]: ESP® control module connector (viewed from terminal side)	6. ABS warning lamp	13. Junction connector
[D]: ABS control module connector (viewed from terminal side)	7. EBD warning lamp (Brake warning lamp)	14. ESP® hydraulic unit / control module assembly
1. Battery	8. Lamp driver module	15. ABS hydraulic unit / control module assembly
2. Main fuse box	9. CAN driver	16. To 4WD control module, immobilizer control module (ICM) and steering angle sensor
3. Ignition switch	10. BCM	

Circuit Description

EBD warning lamp (brake warning lamp) is controlled by parking brake switch, brake fluid level switch and ABS (ESP®) hydraulic unit / control module assembly through lamp driver module in combination meter.
EBD warning lamp turns ON when parking brake switch is ON and/or brake fluid level is lower than minimum level.
The information of parking brake switch and brake fluid level are transmitted from BCM to lamp driver module in combination meter through CAN communication line.

Troubleshooting

Step	Action	Yes	No
1	1) Make sure that: • Parking brake is completely released. • Brake fluid level is upper than the minimum level. *Are the check results OK?*	Go to Step 2.	Release parking brake completely and/or replenish brake fluid.
2	1) Turn ignition switch to ON position. *Does ABS warning lamp come on steady?*	Perform “ABS Warning Lamp Comes ON Steady: ” previously outlined.	Go to Step 3.
3	1) CAN communication circuit between combination meter, ABS hydraulic unit / control module and BCM referring to “DTC U1073: Control Module Communication Bus Off: ”. *Is CAN communication circuit in good condition?*	Substitute a known-good combination meter and recheck. If ABS warning lamp remains ON, substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	Repair or replace.

DTC C1015: G Sensor Circuit Failure (For 4WD Vehicle)

S5JB0B4504013

For vehicle equipped with ESP®, go to “DTC C1015 / C1017 / C1023: Longitudinal G Sensor / Lateral G Sensor / Yaw Rate Sensor in Yaw Rate / G Sensor Assembly Failure: in Section 4F”.

Description

If the signal voltage of G sensor while at a stop does not vary of from that while running, this DTC is set.
Therefore, this DTC may be set when a vehicle is lifted up and its wheel(s) is turned. In such case, clear the DTC and check again.

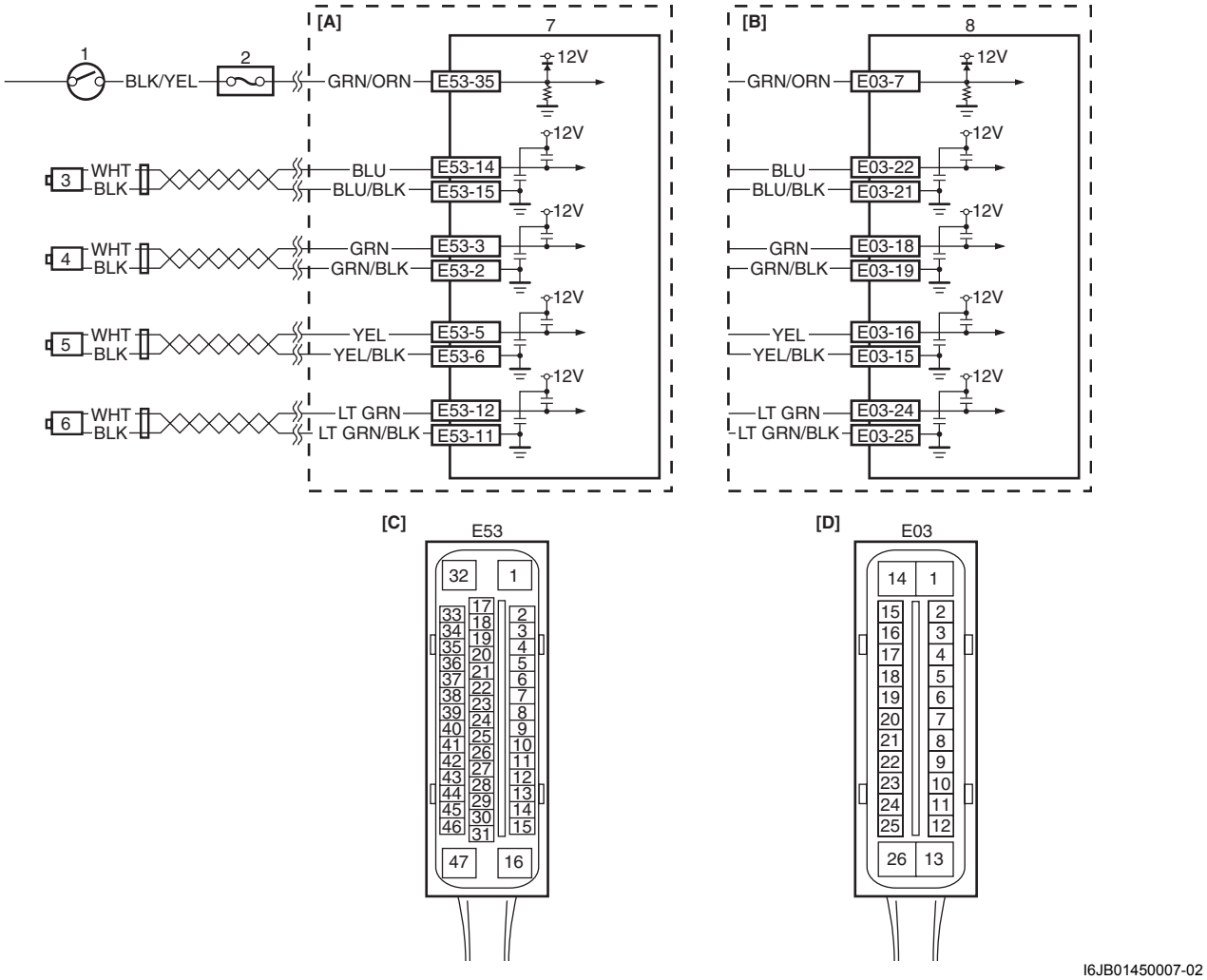
DTC Troubleshooting

1) Ignition switch OFF.
2) Check for proper connection from harness to control module.
3) If OK, substitute an ABS hydraulic unit/control module assembly with correct part number.
4) Recheck system.

DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Encoder Failure

S5JB0B4504014

Wiring Diagram



I6JB01450007-02

[A]: With ESP®	1. Ignition switch	5. Left-rear wheel speed sensor
[B]: Without ESP®	2. Junction block assembly	6. Right-rear wheel speed sensor
[C]: ESP® control module connector (viewed from terminal side)	3. Left-front wheel speed sensor	7. ESP® hydraulic unit / control module assembly
[D]: ABS control module connector (viewed from terminal side)	4. Right-front wheel speed sensor	8. ABS hydraulic unit / control module assembly

DTC Detecting Condition

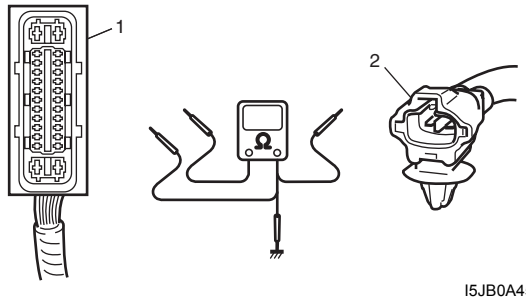
The ABS (ESP®) control module monitors the voltage at the terminal of each sensor while the ignition switch is ON. When the voltage is not within the specified range, an applicable DTC will be set. Also, when no sensor signal is inputted at running, an applicable DTC will be set.

NOTE

When the vehicle was operated in any of the following ways, one of these DTCs may be set even when the sensor is in good condition. If such possibility is suspected, clear DTC once referring to "DTC Clearance: in related manual" and then performing the driving test as described in Step 2 of "ABS Check: ", check whether or not any abnormality exists.

- **The vehicle was driven with parking brake pulled.**
- **Wheel spin occurred while driving.**
- **Wheel(s) was turned while the vehicle was jacked up.**
- **The vehicle was stuck.**

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Turn ignition switch OFF. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS control module at each sensor terminal. 4) If OK, then turn ignition switch ON and measure voltage between applicable sensor terminal of module connector and vehicle body ground. *Is it 0 V?*	Go to Step 4.	ABS wheel speed sensor circuit shorted to power.
3	1) Disconnect applicable wheel speed sensor coupler with ignition switch OFF. 2) Measure resistance between the following points. • Both ABS (ESP®) hydraulic unit / control module connector (1) terminals a pair of applicable sensor terminals. This check result should be no continuity. • Between applicable sensor terminal of ABS (ESP®) hydraulic unit / control module connector and vehicle body ground. This check result should be no continuity. • Between applicable sensor terminal of module connector and corresponding terminal of ABS wheel speed sensor connector (2) in main harness (for front sensor) or floor harness (for rear sensor). This check result should be continuity.  I5JB0A450014-02 *Are each check results OK?*	Go to Step 4.	Circuit open or short to ground.

Step	Action	Yes	No
4	1) Remove applicable ABS wheel speed sensor. 2) Check sensor for damage or foreign material attached. *Is it in good condition?*	Go to Step 5.	Clean, repair or replace.
5	Check front and/or rear encoder for the following (remove front and/or rear drive shaft): • Encoder surface neither crack nor damaged • No foreign material being attached • Encoder not being eccentric • Wheel bearing free from excessive play *Are they in good condition?*	Go to Step 6.	Clean, repair or replace wheel hub assembly.
6	1) Install wheel speed sensor to knuckle. 2) Tighten sensor bolt to specified torque and check that there is no clearance between sensor and knuckle. *Is it OK?*	Go to Step 7.	Replace wheel speed sensor.
7	Refer to “Front Wheel Speed Sensor On-Vehicle Inspection: in related manual” and/or “Rear Wheel Speed Sensor On-Vehicle Inspection: in related manual”, check output voltage or waveform. *Is specified voltage and/or waveform obtained?*	Substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	Replace sensor and recheck.

DTC C1041 / C1042 / C1043 / C1044 / C1045 / C1046 / C1051 / C1052 / C1053 / C1054 / C1055 / C1056: Inlet Solenoid Circuit Failure, Outlet Solenoid Circuit Failure, Master Cylinder Cut Solenoid Circuit Failure, Low Pressure Solenoid Circuit Failure

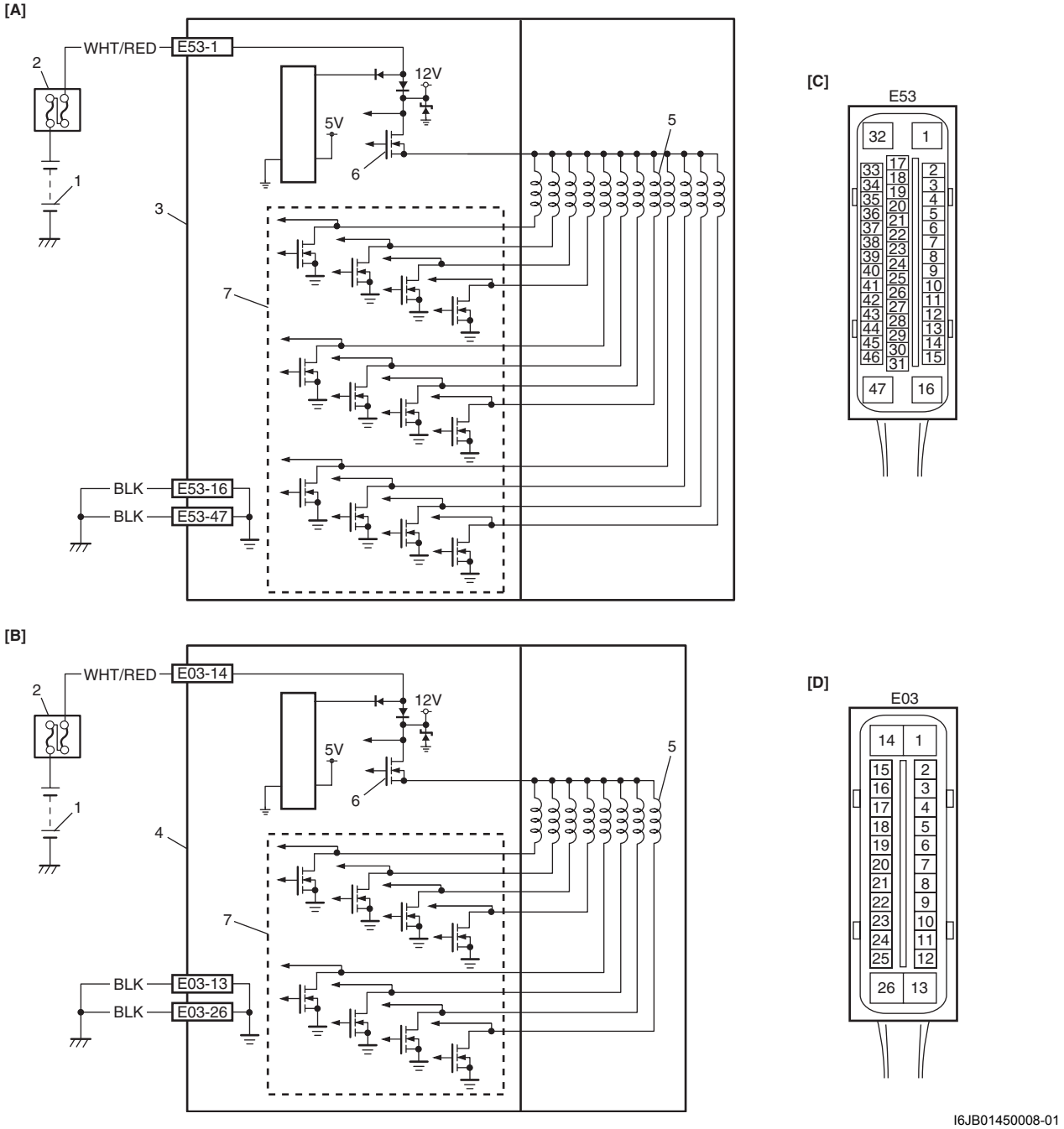
S5JB0B4504015

DTC C1041 / C1045 / C1051 / C1055: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit Failure
DTC C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Circuit Failure
DTC C1043 / C1044: Master Cylinder Cut Solenoid Circuit No. 1 / No. 2 Failure
DTC C1053 / C1054: Low Pressure Solenoid Circuit No. 1 / No. 2 Failure

NOTE

The DTC C1043, C1044, C1053 and C1054 are DTC only for ESP®

Wiring Diagram



I6JB01450008-01

[A]: With ESP®	1. Battery	5. Solenoid valve

[B]: Without ESP®	2. Main fuse box	6. Solenoid valve power supply driver (transistor)
[C]: ESP® control module connector (viewed from terminal side)	3. ESP® hydraulic unit / control module assembly	7. Solenoid valve driver
[D]: ABS control module connector (viewed from terminal side)	4. ABS hydraulic unit / control module assembly	

DTC Detecting Condition

The ABS (ESP®) control module monitors the output from the valve.
When the output of each valve exceeds the specified value compared with the signal sent from ABS (ESP®) control module, this DTC is set.

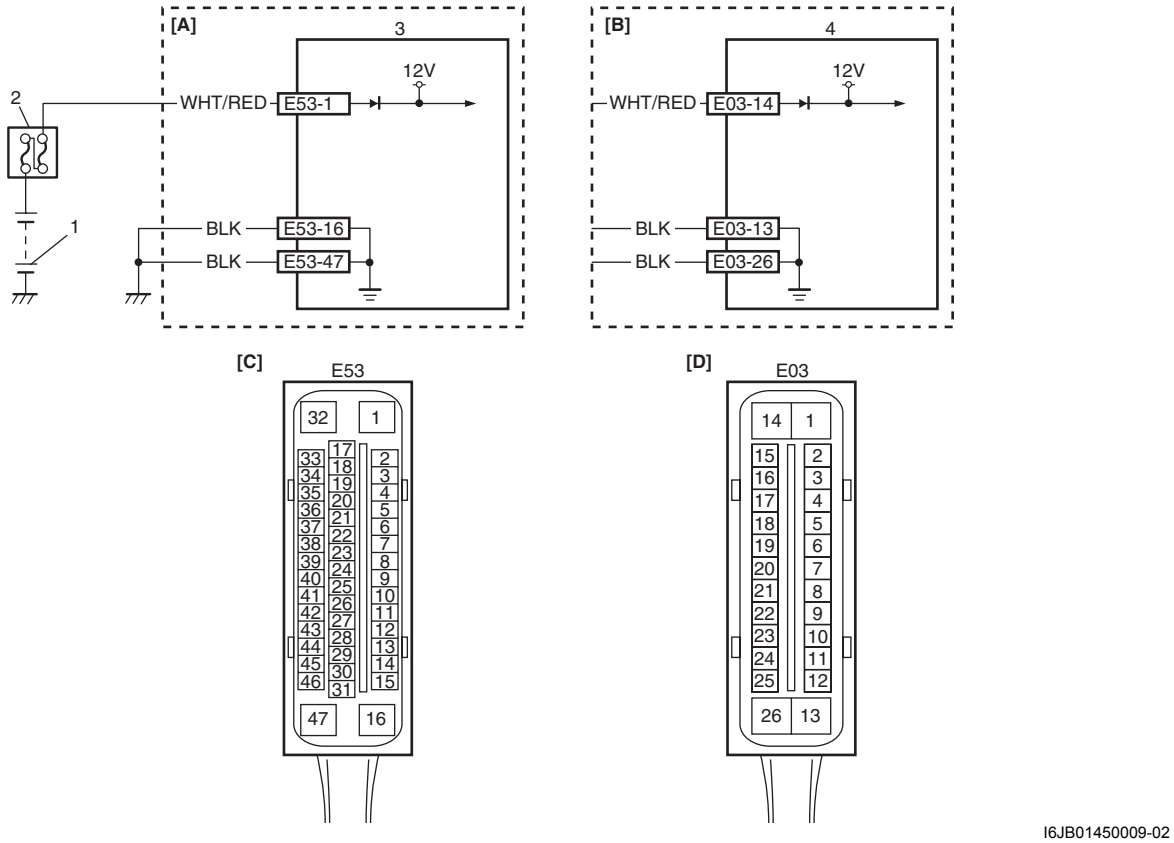
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Turn ignition switch to OFF position. 2) Disconnect ABS (ESP®) hydraulic unit / control module connector. 3) Check for proper connection to ABS (ESP®) hydraulic unit / control module connector at terminal "E03-14" (or "E53-1"). 4) If OK, then measure voltage between terminal "E03-14" (or "E53-1") of module connector and "E03-26" (or "E53-47"). *Is it 10 – 14 V?*	Substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	"WHT/RED" or "BLK" circuit open.

DTC C1057: ABS (EPS®) Control Module Power Supply Circuit Failure

S5JB0B4504016

Wiring Diagram



I6JB01450009-02

[A]: With ESP®	[D]: ABS control module connector (viewed from terminal side)	3. ESP® hydraulic unit / control module assembly
[B]: Without ESP®	1. Battery	4. ABS hydraulic unit / control module assembly
[C]: ESP® control module connector (viewed from terminal side)	2. Main fuse box	

DTC Detecting Condition

The ABS (ESP®) control module monitors the power source voltage at terminal “E03-14” (or “E53-1”). When the power source voltage becomes extremely high or low while vehicle is running at more than 20 km/h (13 MPH), this DTC will be set. As soon as the power source voltage becomes normal, the ABS warning lamp will be turned off and the ABS (ESP®) control module will return to normal operation, but the set DTC will be remain.

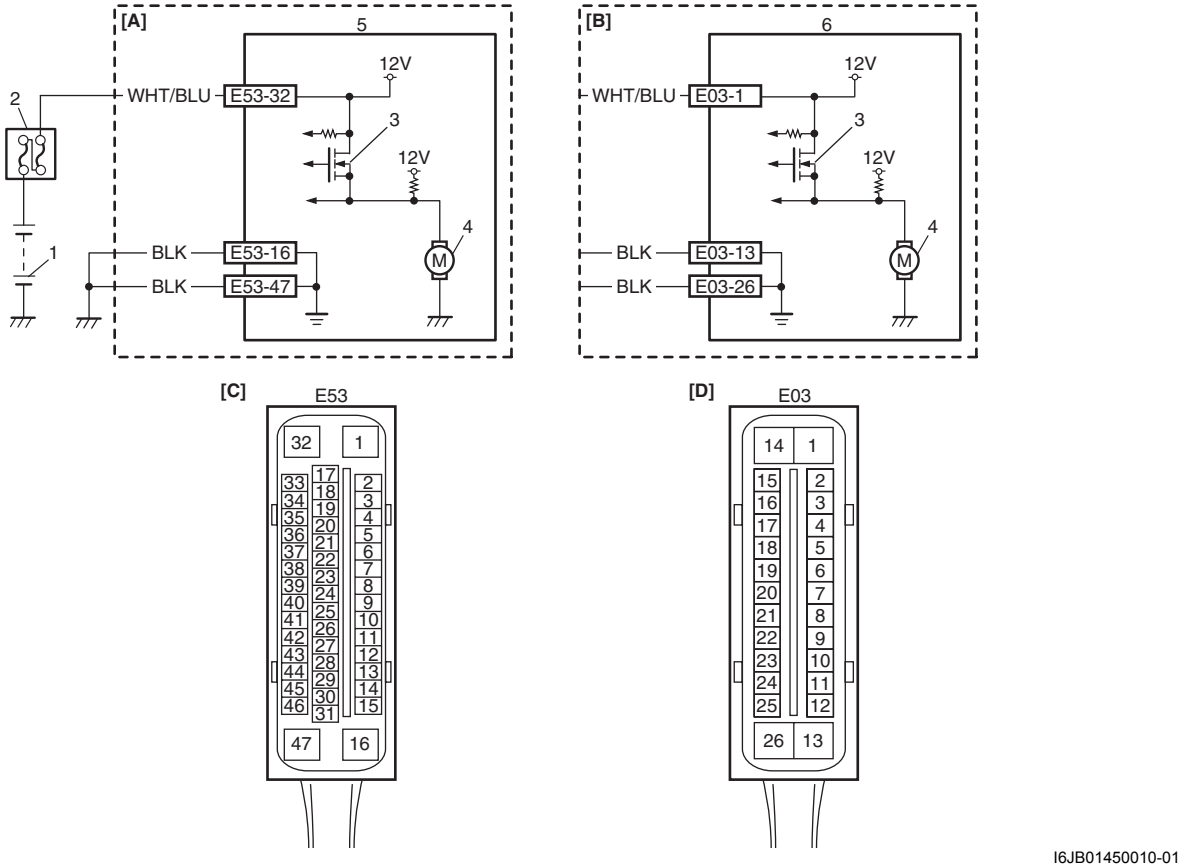
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Disconnect ABS (ESP®) hydraulic unit / control module connector with ignition switch turned OFF. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-14" and "E03-13" (or "E53-1" and "E53-47"). 3) If OK, then turn ignition switch to ON position and measure voltage between terminals "E03-14" and "E03-13" (or "E53-1" and "E53-47"). *Is voltage 9.7 ± 0.3 V or more?*	Go to Step 5.	Go to Step 3.
3	1) Turn ignition switch to OFF. 2) Check for proper connection to ABS (ESP®) hydraulic unit / control module connector at terminals "E03-13" and "E03-26" (or "E53-16" and "E53-47"). 3) If OK then turn ignition switch to ON and measure resistance between each terminal of "E03-13" and "E03-26" (or "E53-16" and "E53-47") and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 4.	"BLK" wire circuit in open or high resistance.
4	1) Measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 9.7 ± 0.3 V or more?*	Imperfect short between "WHT/RED" wire circuit and body ground.	Check charging system referring to "Generator Test (Undercharged Battery Check): in Section 1J".
5	1) Measure voltage between terminals "E03-14" and "E03-13" (or "E53-1" and "E53-47") with engine running. *Is voltage 18 ± 1.0 V or less?*	Poor connection of "E03-14" and/or "E03-13" (or "E53-1" and/or "E53-47") terminals. If the terminals are in good condition, substitute a known-good ABS (ESP®) hydraulic unit / control module and recheck.	Check charging system referring to "Generator Test (Overcharged Battery Check): in Section 1J".

DTC C1061: Pump Motor and/or Motor Driver Circuit Failure

S5JB0B4504017

Wiring Diagram



I6JB01450010-01

[A]: With ESP®	1. Battery	5. ESP® hydraulic unit / control module assembly
[B]: Without ESP®	2. Main fuse box	6. ABS hydraulic unit / control module assembly
[C]: ESP® control module connector (viewed from terminal side)	3. Pump motor driver (transistor)	
[D]: ABS control module connector (viewed from terminal side)	4. Pump motor	

DTC Detecting Condition

The ABS (ESP®) control module monitors the voltage at monitor terminal of pump motor circuit constantly with the ignition switch turned ON. It sets this DTC when the voltage at the monitor terminal does not become high / low according to ON/OFF commands to the motor driver (transistor) of the module (does not follow these commands).

DTC Troubleshooting

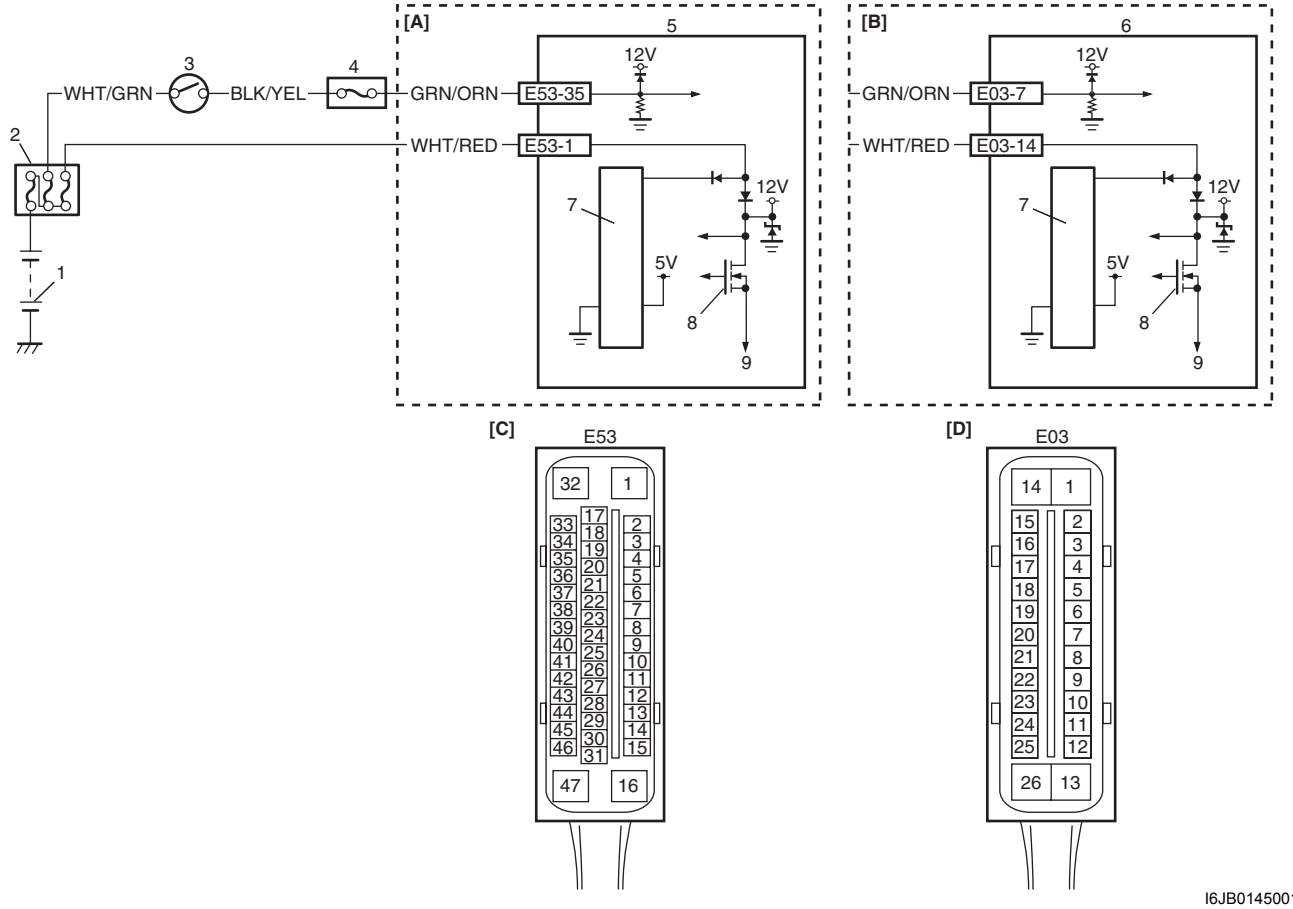
Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Turn Ignition switch to OFF position. 2) Disconnect ABS (ESP®) hydraulic unit / control module connector. 3) Check for proper connection to ABS (ESP®) hydraulic unit / control module connector at terminal "E03-1" (or "E53-32"). 4) If OK, then measure voltage between terminal "E03-1" (or "E53-32") of module connector and body ground. *Is it 10 – 14 V?*	Go to Step 3.	"WHT/BLU" circuit open.

Step	Action	Yes	No
3	Measure resistance between terminal “E03-13” and “E03-26” (or “E53-16” and “E53-47”) of ABS (ESP®) hydraulic unit / control module connector and vehicle body ground. *Is resistance less than 1 Ω?*	Substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	Ground circuit for ABS (ESP®) hydraulic unit / control module open or high resistance.

DTC C1063: Solenoid Valve Power Supply Driver Circuit Failure

S5JB0B4504018

Wiring Diagram



I6JB01450011-02

[A]: With ESP®	2. Main fuse box	7. Power control unit
[B]: Without ESP®	3. Ignition switch	8. Solenoid valve power supply driver (transistor)
[C]: ESP® control module connector (viewed from terminal side)	4. Junction block assembly	9. To solenoid valve
[D]: ABS control module connector (viewed from terminal side)	5. ESP® hydraulic unit / control module assembly	
1. Battery	6. ABS hydraulic unit / control module assembly	

DTC Detecting Condition

ABS (ESP®) control module monitors the voltage at the terminal of solenoid circuit constantly with ignition switch turned ON. Also, immediately after ignition switch is turned ON, perform initial check as follows.
Switch solenoid valve power supply driver (transistor) in the order of OFF → ON and check if voltage changes to Low → High. If anything faulty is found in the initial check and when the voltage is low with ignition switch turned ON, this DTC will be set.

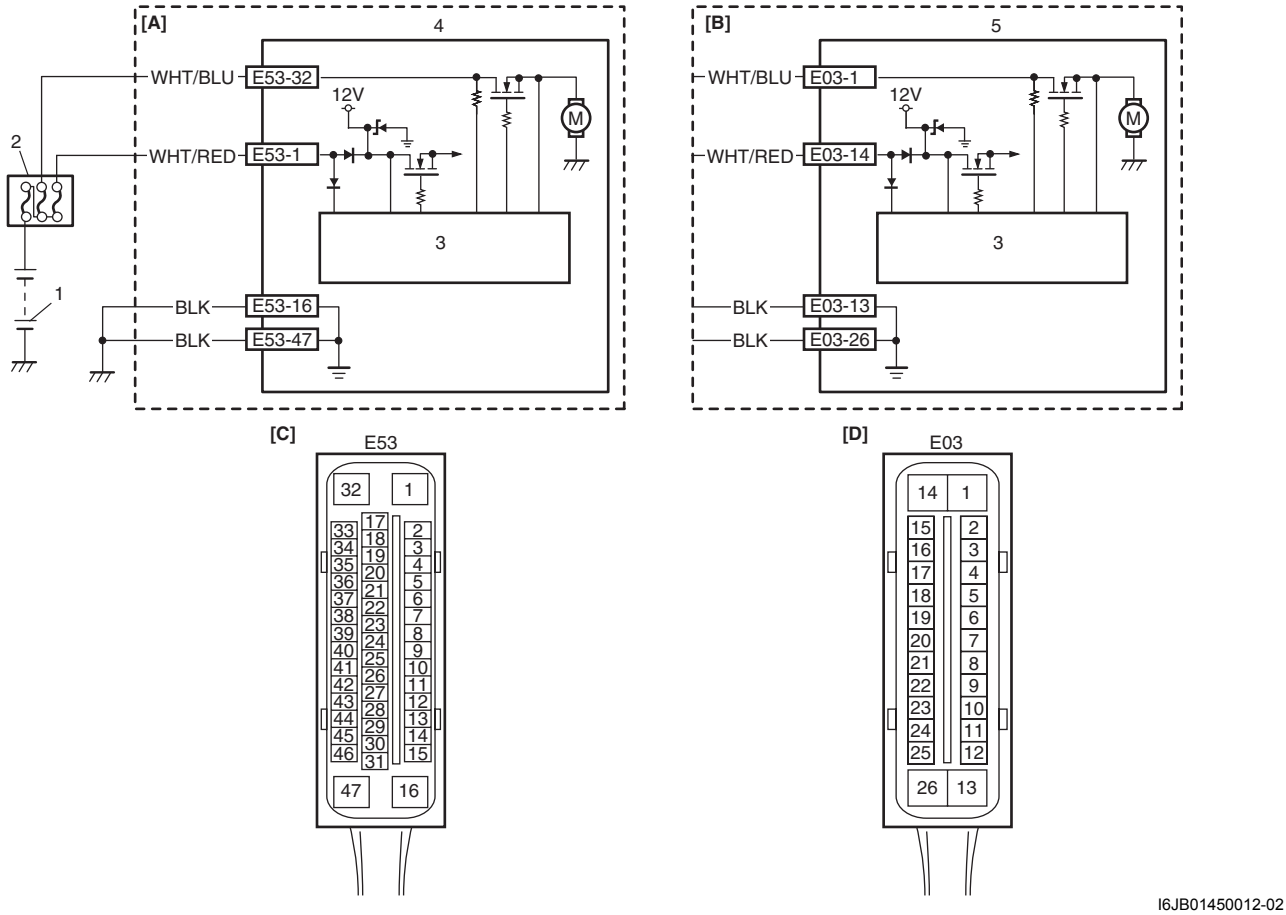
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	Check battery voltage. *Is it about 11 V or higher?*	Go to Step 3.	Check charging system referring to "Battery Inspection: in Section 1J" and "Generator Test (Undercharged Battery Check): in Section 1J".
3	Check main fuse for ABS solenoid and its terminal. *Is it in good condition?*	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	1) Turn ignition switch to OFF position. 2) Disconnect ABS (ESP®) hydraulic unit / control module connector. 3) Check for proper connection to ABS (ESP®) hydraulic unit / control module at terminal "E03-14" (or "E53-1"). 4) If OK, then measure voltage between connector terminal "E03-14" (or "E53-1") and body ground. *Is it 10 – 14 V?*	Substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	"WHT/BLU" circuit imperfect short to ground.

DTC C1071: ABS (ESP®) Control Module Internal Defect

S5JB0B4504019

Wiring Diagram



I6JB01450012-02

[A]: With ESP®	[D]: ABS control module connector (viewed from terminal side)	3. Power control unit
[B]: Without ESP®	1. Battery	4. ESP® hydraulic unit / control module assembly
[C]: ESP® control module connector (viewed from terminal side)	2. Main fuse box	5. ABS hydraulic unit / control module assembly

DTC Detecting Condition

This DTC will be set when an internal malfunction is detected in the ABS (ESP®) control module.

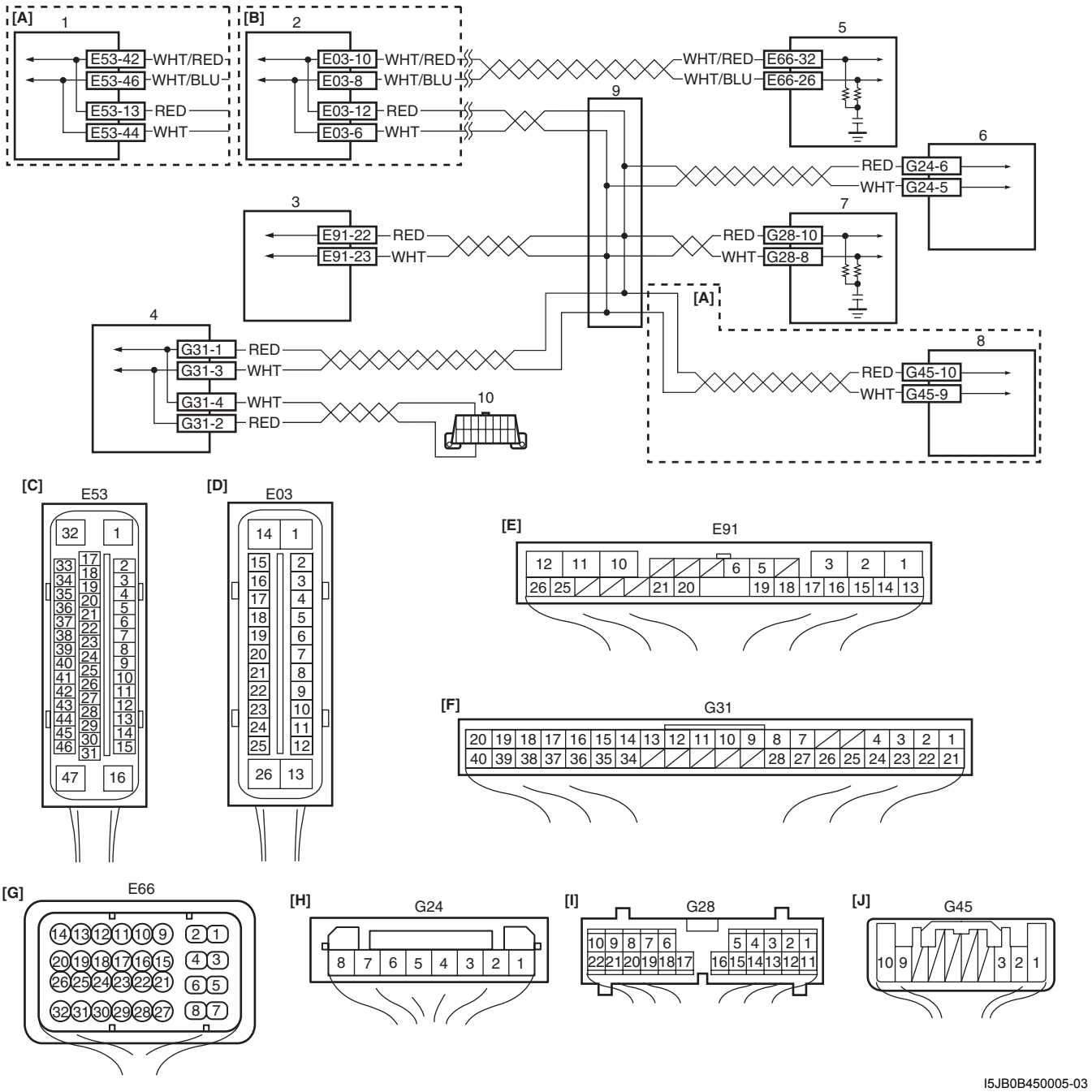
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	Clear all DTCs and check DTC. *Is it DTC C1071?*	Go to Step 3.	Could be a temporary malfunction of the ABS (ESP®) control module.
3	1) Check for proper connection of ABS (ESP®) hydraulic unit / control module connector. 2) If OK, disconnect ABS hydraulic unit / control module connector and check the following. • Voltage "E03-1" (or "E53-32") terminal: 10 – 14 V • Voltage "E03-14" (or "E53-1") terminal: 10 – 14 V • Resistance between "E03-13" (or "E53-16") and body ground: Continuity • Resistance between "E03-26" (or "E53-47") and body ground: Continuity *Are the check result as specified?*	Replace ABS (ESP®) hydraulic unit / control module assembly.	Repair "WHT/RED", "WHT/BLU" and/or "BLK" circuit and recheck.

DTC U1073: Control Module Communication Bus Off

S5JB0B4504020

Wiring Diagram



I5JB0B450005-03

[A]: With ESP®	[H]: Immobilizer Control module (ICM) connector (viewed from harness side)	5. ECM
[B]: Without ESP®	[I]: Combination meter connector (viewed from harness side)	6. Immobilizer Control module (ICM) (if equipped)
[C]: ESP® control module connector (viewed from terminal side)	[J]: Steering angle sensor connector (viewed from harness side)	7. Combination meter
[D]: ABS control module connector (viewed from terminal side)	1. ESP® hydraulic unit / control module assembly	8. Steering angle sensor
[E]: 4WD control module connector (viewed from harness side)	2. ABS hydraulic unit / control module assembly	9. Junction connector
[F]: BCM connector (viewed from harness side)	3. 4WD control module (if equipped)	10. Data link connector (DLC)
[G]: ECM connector (viewed from harness side)	4. BCM	

DTC Detecting Condition

Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck DTC. *Is DTC U1073 indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00 in related manual".
3	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. *Is each CAN communication circuit in good condition?*	Go to Step 4.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00 in related manual".
4	1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector and check DTC for ABS (ESP®) in turn. • ECM • BCM • 4WD control module (if equipped) • Immobilizer Control module (ICM) (if equipped) • Combination meter • Steering angle sensor (with ESP®) *Is DTC U1073 detected?*	Check ABS (ESP®) control module power and ground circuit. If circuits are OK, substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

DTC U1100: Lost Communication with ECM (Reception Error)

S5JB0B4504021

Wiring Diagram

Refer to “DTC U1073: Control Module Communication Bus Off: ”.

DTC Detecting Condition

Reception error of communication data for ECM is detected more than specified time continuously.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “ABS Check” performed?*	Go to Step 2.	Go to “ABS Check: ”.
2	Check DTC in ABS (ESP®). *Is DTC U1073 detected?*	Go to “DTC U1073: Control Module Communication Bus Off: ”.	Go to Step 3.
3	1) Check connection of connectors of all control modules communicating by means of CAN. 2) Check DTC for ABS (ESP®). *Is DTC U1100 detected?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”.
4	1) Turn ignition switch to OFF position. 2) Disconnect connectors of ABS hydraulic unit / control module and ECM. 3) Check CAN communication circuit between ABS and ECM for open, short and high resistance. *Is CAN communication circuit in good condition?*	Go to Step 6.	Repair or replace the CAN communication line.
5	1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 5 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 7.	Repair or replace the CAN communication line.
6	1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector and check DTC for ABS (ESP®) in turn. • ECM • BCM • 4WD control module (if equipped) • Immobilizer Control module (ICM) (if equipped) • Combination meter • Steering angle sensor (with ESP®) *Is DTC U1073 detected?*	Check ABS (ESP®) control module power and ground circuit. If circuits are OK, substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

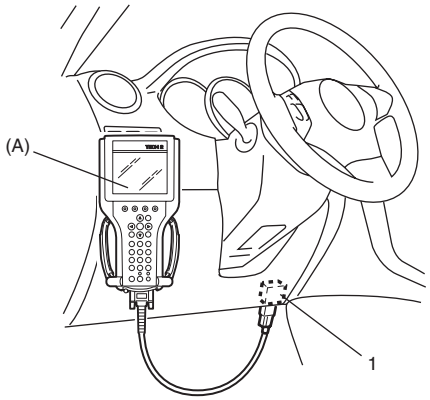
Repair Instructions

Hydraulic Unit Operation Check

S5JB0B4506001

1) Check that basic brake system other than ABS or ESP® is in good condition.
2) Check that battery voltage is 11 V or higher.
3) Lift up vehicle.
4) Set transmission to neutral and release parking brake.
5) Turn each wheel gradually by hand to check if brake dragging occurs. If it does, correct.
6) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

   Special tool
   (A): SUZUKI scan tool



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7) Turn ignition switch to ON position and select menu to “HYDRAULIC CONTROL TEST” under “miscellaneous test” (“MISC. TEST”) mode of SUZUKI scan tool. Refer to SUZUKI scan tool operator’s manual for further details.

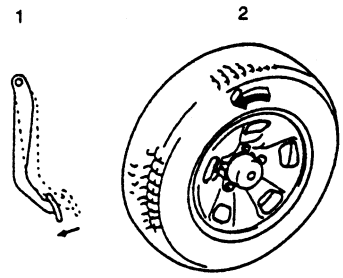
NOTE

“Press” in the menu is functionable only vehicle with ESP®.

8) Perform the following checks with help of another person.
   - Depressurization check
     Step on brake pedal (1) and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person’s hand. At this time, check whether the wheel rotates freely due to brake depressurization.
   - Pressurization check
     Step off brake pedal (1) and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person’s hand. At this time, check whether the wheel locks due to brake pressurization.

NOTE

Pressurization / Depressurization by SUZUKI scan tool is available for 0.5 second.



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9) Check for all 4-wheels condition respectively. If a faulty condition is found, replace hydraulic unit / control module assembly.
10) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

ABS (ESP®) Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

S5JB0B4506003

⚠ CAUTION

Never disassemble ABS (ESP®) hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS (ESP®) hydraulic unit / control module assembly.

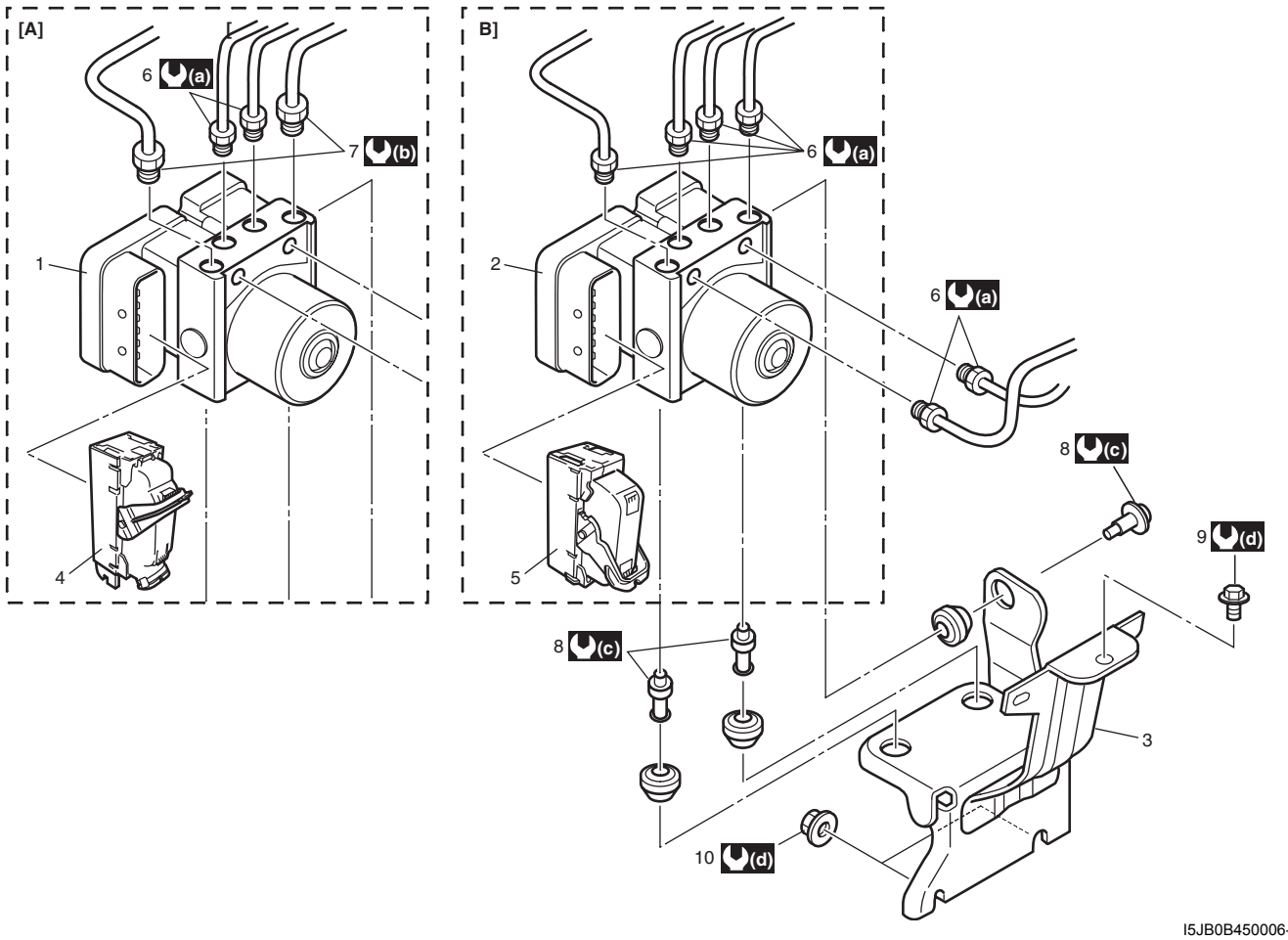
Check hydraulic unit for fluid leakage.
If any, repair or replace.

ABS (ESP®) Hydraulic Unit / Control Module Assembly Removal and Installation

S5JB0B4506004

⚠ CAUTION

Never disassemble ABS (ESP®) hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS (ESP®) hydraulic unit / control module assembly.



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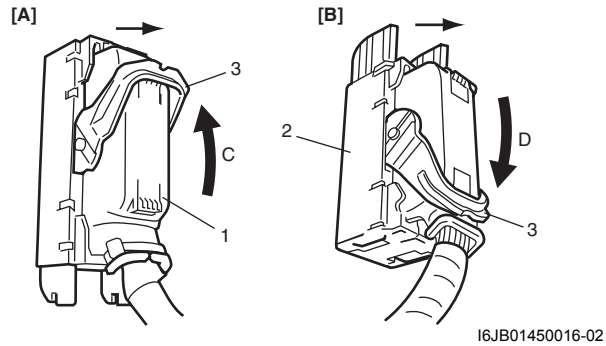
[A]: With ESP®	5. ABS control module connector	(a) : 16 N·m (1.6 kgf-m, 11.5 lb-ft)
[B]: Without ESP®	6. Brake pipe flare nut for M10	(b) : 19 N·m (1.9 kgf-m, 14.0 lb-ft)
1. ABS hydraulic unit / control module assembly	7. Brake pipe flare nut for M12	(c) : 9 N·m (0.9 kgf-m, 6.5 lb-ft)
2. ESP® hydraulic unit / control module assembly	8. ABS (ESP®) hydraulic unit / control module assembly bolt	(d) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
3. Bracket	9. ABS (ESP®) hydraulic unit / control module assembly bracket bolt	
4. ESP® control module connector	10. ABS (ESP®) hydraulic unit / control module assembly bracket nut	

Removal

1) Disconnect negative (–) cable from battery.
2) Remove ECM referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.
3) Disconnect ABS (ESP®) control module connector as shown in figure.



I6JB01450016-02

[A]: With ESP®	1. ESP® control module connector
[B]: Without ESP®	2. ABS control module connector
C: Pull up to disconnect	3. Lock
D: Pull down to disconnect	

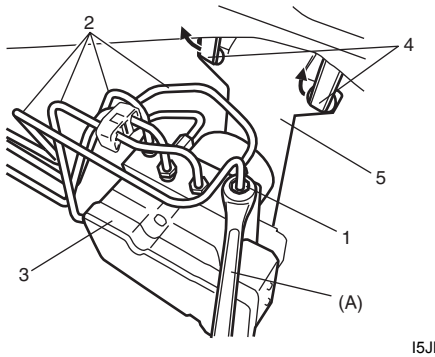
4) Using special tool, loosen flare nuts (1) and disconnect brake pipes (2) from ABS (ESP®) hydraulic unit / control module assembly (3).

Special tool
(A): 09950–78220

NOTE

Put bleeder plug cap or the like onto pipe to prevent fluid from spilling. Do not allow brake fluid to get on painted surfaces.

5) Disconnect harness clamps (4) from bracket (5).



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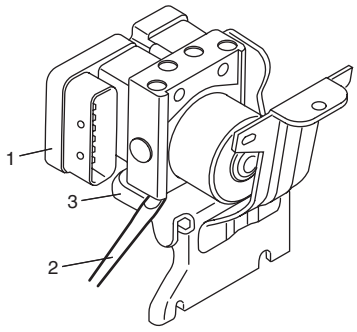
6) Remove ABS (ESP®) hydraulic unit / control module with bracket from vehicle by removing bracket bolt and two bracket nuts.
7) Remove bolt and pull out ABS (ESP®) hydraulic unit / control module assembly (1) from bracket (3) using flat end rod or the like (2).

⚠ CAUTION

- **Do not give an impact to hydraulic unit.**
- **Use care not to allow dust to enter hydraulic unit.**
- **Do not place hydraulic unit on its side or upside down. Handling it in inappropriate way will affect its original performance.**



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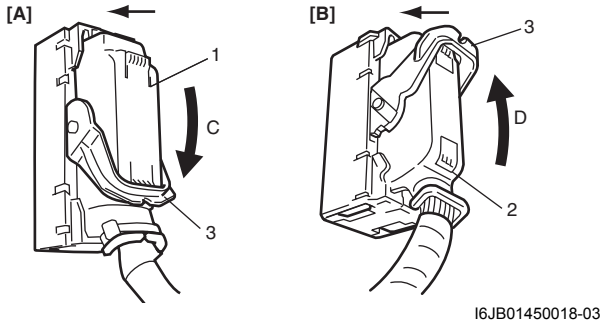
Installation

1) Install hydraulic unit / control module assembly by reversing removal procedure.

Tightening torque
Brake pipe flare nut for M10: 16 N·m (1.6 kgf-m, 11.5 lb-ft)
Brake pipe flare nut for M12: 19 N·m (1.9 kgf-m, 14.0 lb-ft)
ABS (ESP®) hydraulic unit / control module assembly bolt: 9 N·m (0.9 kgf-m, 6.5 lb-ft)
ABS (ESP®) hydraulic unit / control module assembly bracket bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
ABS (ESP®) hydraulic unit / control module assembly bracket nut: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

2) Connect ABS (ESP®) control module connector and lock it as shown in figure.



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[A]: With ESP®	1. ESP® control module connector
[B]: Without ESP®	2. ABS control module connector
[C]: Pull down until lock to disconnect	3. Lock
[D]: Pull up until lock to disconnect	

3) Install ECM referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.
4) Connect negative (–) cable at battery.
5) Bleed air from brake system referring to “Air Bleeding of Brake System: in Section 4A in related manual”.
6) Check each installed part for fluid leakage and perform “Hydraulic Unit Operation Check: ”.

NOTE

For new ABS (ESP®) hydraulic unit / control module assembly, if “ABS (ESP®) Hydraulic Unit Operation Check”. has not been performed, ABS warning lamp may flash when ignition switch is turned ON position. Accordingly preform “Hydraulic Unit Operation Check: ” to stop flashing of ABS warning lamp.

Specifications

Tightening Torque Specifications

S5JB0B4507001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Brake pipe flare nut for M10	16	1.6	11.5	☞
Brake pipe flare nut for M12	19	1.9	14.0	☞
ABS (ESP®) hydraulic unit / control module assembly bolt	9	0.9	6.5	☞
ABS (ESP®) hydraulic unit / control module assembly bracket bolt	25	2.5	18.0	☞
ABS (ESP®) hydraulic unit / control module assembly bracket nut	25	2.5	18.0	☞

NOTE

The specified tightening torque is also described in the following.
“ABS (ESP®) Hydraulic Unit / Control Module Assembly Removal and Installation: ”

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

Special Tools and Equipment

Special Tool

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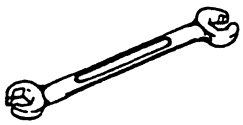
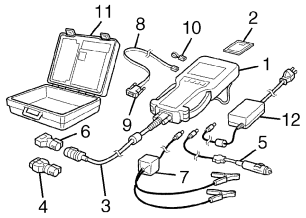
09950–78220 Flare nut wrench (10 mm) ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 

Electronic Stability Program

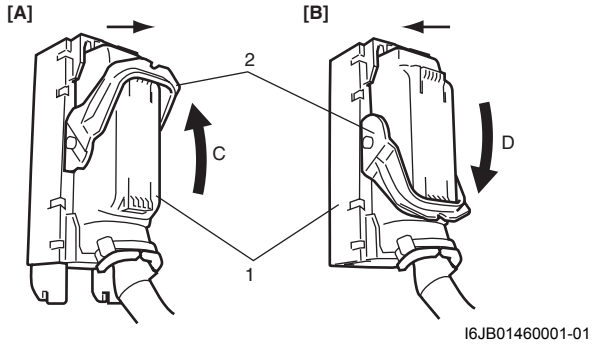
Precautions

Precautions in Diagnosing Troubles

S5JB0B4600006

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow “Electronic Stability Program Check: ”.

- Diagnostic information stored in ESP® 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.
- If the vehicles was operated in any of the following ways, ESP® warning lamp may light momentarily but this does not indicate anything abnormal in ESP®.
  - The vehicle was driven with parking brake pulled.
  - The vehicle was driven with brake dragging.
  - The vehicle was stuck in mud, sand, etc.
  - Wheel spin occurred while driving.
  - Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to read “Precautions for Electrical Circuit Service: in Section 00 in related manual” before inspection and observe what is written there.
- Be sure to use the trouble diagnosis procedure as described in “Electronic Stability Program Check: ”. Failure to follow it may result in incorrect diagnosis. (Some other diagnosis trouble code may be stored by mistake in the memory of ESP® control module during inspection.)
- When disconnecting ESP® control module connector (1), pull up lock lever (2) of connector.
  When connecting, set the connector on ESP® hydraulic unit / control module assembly and pull down the lock lever (2) until it locks.



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[A]: Disconnect	C: Pull up to disconnect
[B]: Connect	D: Pull down to connect

- Communication of ECM, BCM, ESP® (ABS) control module (if equipped), 4WD control module (if equipped), immobilizer control module (ICM) (if equipped), combination meter and steering angle sensor (if equipped) is established by CAN (Controller Area Network).
  Therefore, be sure to read “Precaution for CAN Communication System: in Section 00 in related manual” before inspection and handling CAN communication line.

Precautions in On-Vehicle Service

S5JB0B4600007

When connector is connected to ESP® hydraulic unit / control module assembly, do not disconnect connectors of sensors with ignition switch ON. Otherwise, DTC will be set in ESP® control module.

Precautions in Hydraulic Unit Operation Check

S5JB0B4600008

ESP® hydraulic unit / control module assembly function is checked by correct wheel lock / release condition when brake pressure is pressurized / depressurized using SUZUKI scan tool. The hydraulic unit operation check referring to “Hydraulic Unit Operation Check: in Section 4E” should be performed to confirm the correct brake pipe connection in the following cases.

- ESP® hydraulic unit / control module assembly was replaced.
- Brake pipe and/or hose were replaced.

Precautions in Sensor Calibration

S5JB0B4600009

ESP® control module stores calibration points data of yaw rate / G sensor assembly and master cylinder pressure sensor. Steering angle sensor stores calibration point data of itself.
TCS and stability control system use these sets of data.
When the following operation is done, calibration should be performed since the original calibration points are deleted.

Sensor	Procedures required calibration
Steering angle sensor	• Power is not supplied to steering angle sensor. (battery and/or fuse is removed.) • Steering angle sensor is replaced. • Power is not supplied to ESP® control module. (battery, fuse and/or connector is removed.) • ESP® hydraulic unit / control module assembly is replaced.
Master cylinder pressure sensor	• ESP® hydraulic unit / control module assembly is removed or replaced.
Yaw rate / G sensor assembly	• Yaw rate / G sensor assembly is removed or replaced. • ESP® hydraulic unit / control module assembly is replaced.

Perform sensor calibration according to “Sensor Calibration: ”.

Precautions in Speedometer Test or Other Tests

S5JB0B4600010

When performing speedometer or other tests using speedometer tester or chassis dynamometer, ESP® function must be deactivated by using SUZUKI scan tool (not by ESP® OFF switch) to complete the tests correctly. ESP® OFF switch turns ESP® function off temporarily and ESP® function recovers and activates at 30 km/h (18.5 mph) or more. Refer to SUZUKI scan tool operator's manual for further details.

General Description

Electronic Stability Program Description

S5JB0B4601006

Electronic Stability Program (ESP®) main function is to control ABS / EBD, TCS and stability.

- ABS / EBD
  ABS function is that four wheel brake forces are independently varied with referring each wheel slip condition.
  EBD function is that front and rear wheel braking forces are varied with referring loading distribution of the vehicle.
  ABS improves the vehicle stability, controllability and braking performance.
  For the details, refer to “ABS Description: in Section 4E”.
- TCS (Traction Control System)
  TCS function is that engine torque is controlled and brake is applied with referring wheel spin condition during vehicle starting and accelerating.
- Stability control system
  Stability control system is that engine torque is controlled and brake is applied with referring vehicle condition (over steering, under steering) during cornering.

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ESP® Hydraulic Unit / Control Module Assembly Description

S5JB0B4601007

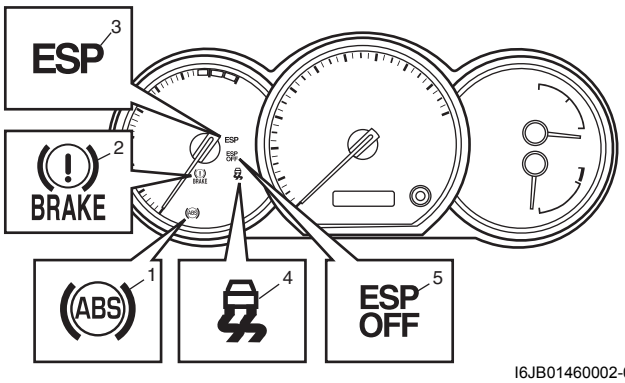
ESP® control module is a component of ESP® hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ESP® control module monitors each input and output signals. When ESP® control module detects any malfunction, some of ABS warning lamp (1), EBD warning lamp (brake warning lamp) (2), ESP® warning lamp (3), SLIP indicator lamp (4), ESP® OFF lamp (5) are turned ON and indicate the abnormality to driver.

- When ignition switch is turned ON, ABS warning lamp, EBD warning lamp, ESP® warning lamp, SLIP indicator lamp and ESP® OFF lamp light for 2 seconds to check its circuit.
- When no abnormality is detected (the system is in good condition), ABS warning lamp, EBD warning lamp, ESP® warning lamp, SLIP indicator lamp and ESP® OFF lamp turn OFF after 2 seconds.

- When an abnormality in the system is detected, some of ABS warning lamp, EBD warning lamp (brake warning lamp), ESP® warning lamp, SLIP indicator lamp and/or ESP® OFF lamp are turned ON and the area where that abnormality lies is stored in the memory in ESP® control module.



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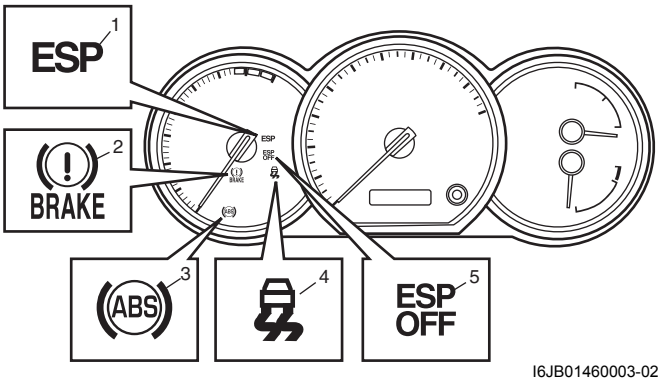
Fail-Safe Mode

When ESP® control module detects abnormality, the system goes into fail-safe mode. And some of functions of ABS, TCS, stability control system are shut down. For details of fail safe mode, refer to “Fail-Safe Table: ”.

Warning Lamp, Indicator Lamp Description

S5JB0B4601008

There are five types of warning lamp and indicator lamp in instrument cluster, which are controlled by ESP® control module. They give warning / indication to driver by changing the modes light ON / blinking / light OFF.



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1. ESP® warning lamp	3. ABS warning lamp	5. ESP® OFF lamp
2. EBD warning lamp (brake warning lamp)	4. SLIP indicator lamp	

The followings are the condition and operation of warning lamps and indicator lamps.

Warning lamp / Indicator lamp	Condition and operation
ABS warning lamp	If ABS has abnormality, the lamp turns “ON”.
EBD warning lamp (brake warning lamp)	• If EBD system has abnormality, the lamp turns “ON”. • If bake fluid level in reservoir is lower than minimum level, the lamp turns “ON”. • Parking brake switch is ON, the lamp turns “ON”.
ESP® warning lamp	If ESP® system (other than ABS) has abnormality, the lamp turns “ON”.
SLIP indicator lamp	• If stability control system and traction control system is active, the lamp blinks at 5 Hz. • If Steering angle sensor calibration is incompleted, the lamp blinks at 1 Hz.
ESP® OFF lamp	• If ESP® OFF switch is turned “ON”, the ESP® OFF lamp light up. When it is “ON”, TCS and stability control system functions are controlled not to work. However, when the speed is over 30 km/h (18.5 mph), ESP® OFF lamp is turned “OFF” and TCS and stability control system function is back to work automatically. • When transfer shift position (if equipped) is in 4L-lock, the ESP® OFF lamp light up to indicate engine torque down and stability control system in TCS are controlled not to activate to increase the driving force. However, the brake-traction control works through ESP® OFF lamp light up. • ESP® OFF lamp light up to indicate that brake control of traction control function is controlled not to act if brake pad temperature is over 350 °C (662 °F) and any of wheel is in wheel spin condition.

CAN Communication System Description

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Refer to “CAN Communication System Description: in Section 1A” for CAN communication system description. ESP® control module communicates control data with each control module as follows.

ESP® Control Module Transmission Data

				ECM	Combination Meter	4WD control module (if equiped)	Steering angle sensor
ESP® control module	Transmit	DATA	Torque up request	○			
			Torque down request	○			
			Wheel speed signal (front)	○		○	
			Wheel speed signal (rear right)	○		○	
			Wheel speed signal (rear left)	○		○	
			ESP® system (other than ABS) active	○	○	○	
			ABS active	○		○	
			ESP® OFF indication ON		○		
			ESP® indication ON		○		
			ABS indication ON		○		
			EBD indication ON		○		
			Steering angle neutral position				○

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ESP® Control Module Reception Data

				ECM	BCM	4WD control module (if equipped)	Steering angle sensor
ESP® control module	Receive	DATA	Engine torque signal	○			
			Accelerator pedal position	○			
			Engine speed	○			
			Cruise control signal (if equipped)	○			
			Brake pedal switch signal	○			
			Brake fluid level switch signal		○		
			Parking brake switch signal		○		
			4WD shift position (if equipped)			○	
			Steering angle signal				○

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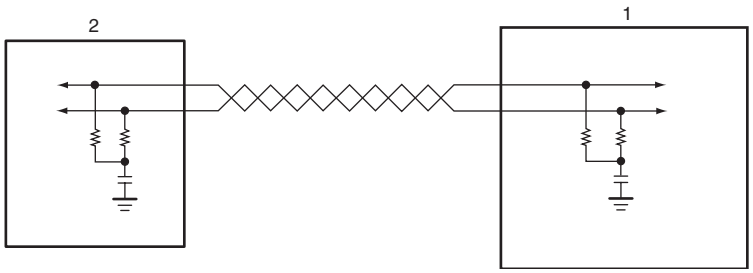
CAN Communication System For Electronic Stability Program Description

S5JB0B4601010

There is CAN communication system only for ESP® control module (1) and yaw rate / G sensor assembly (2). This CAN communication system is independent from other control modules.



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ESP® communicates control data with yaw rate / G sensor assembly as follows.

ESP® Transmission Data to Yaw Rate / G Sensor Assembly

- Longitudinal G neutral position
- Lateral G neutral position

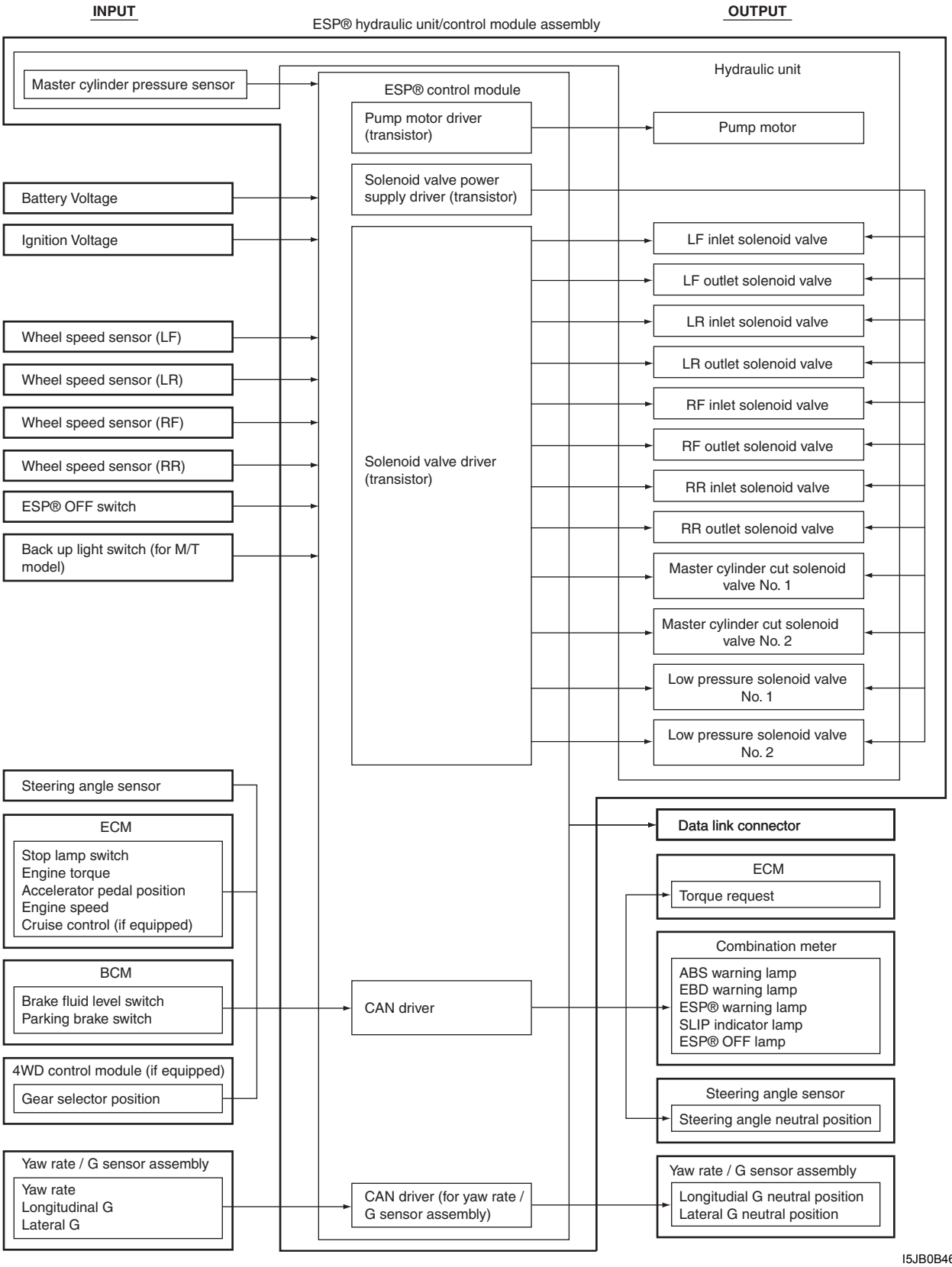
ESP® Reception Data from Yaw Rate / G Sensor Assembly

- Vehicle yaw rate signal
- Vehicle longitudinal G signal
- Vehicle lateral G signal
- Yaw rate / G sensor assembly related malfunction

Schematic and Routing Diagram

Electronic Stability Program Schematic

S5JB0B4602003



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Electronic Stability Program Wiring Circuit Diagram

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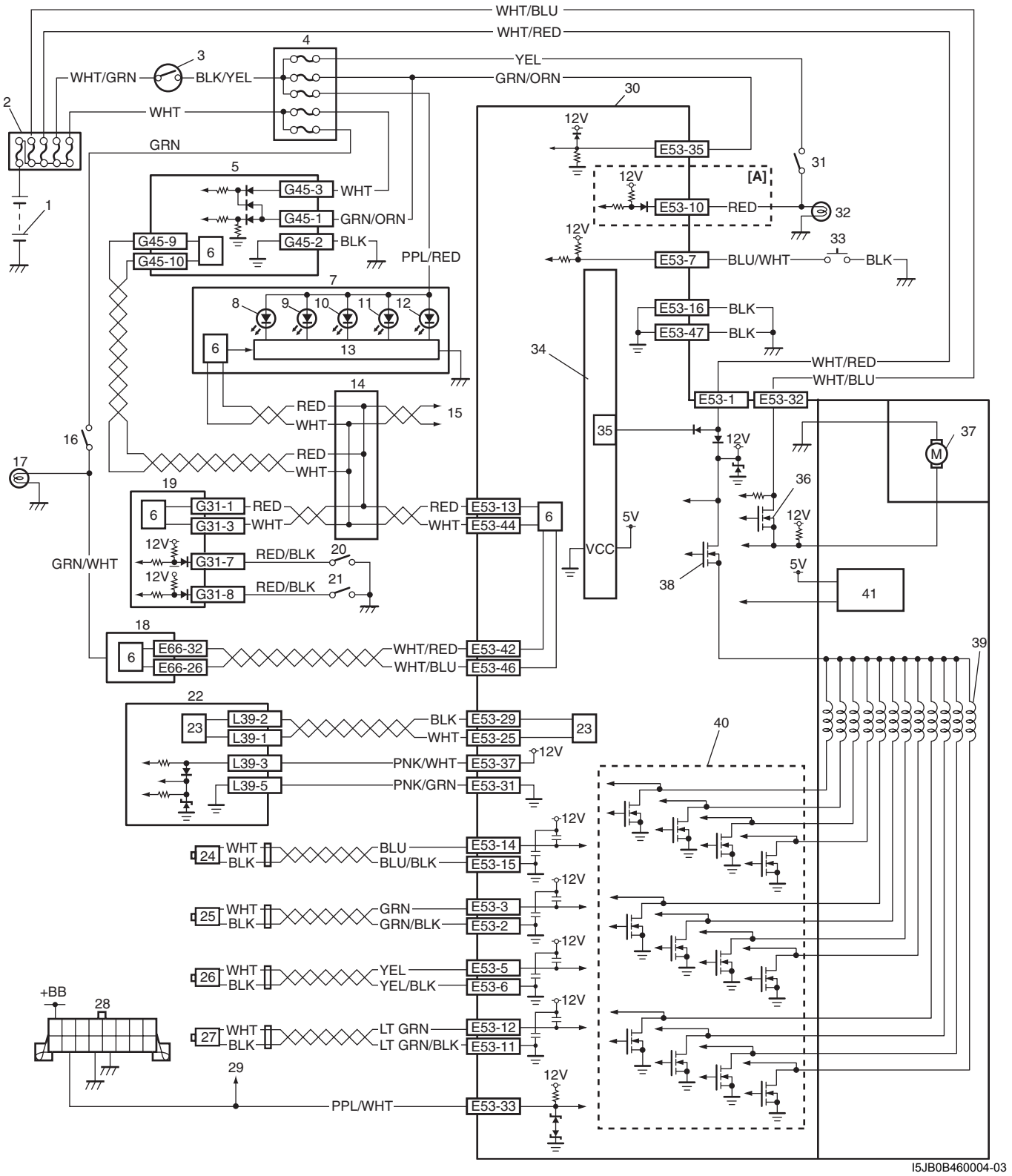

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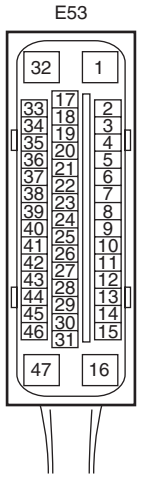
[A]: For M/T model	14. Junction connector	28. Data link connector
1. Battery	15. To 4WD control module and immobilizer control module (ICM)	29. To ECM, SDM, BCM, 4WD control module and immobilizer control module (ICM)
2. Main fuse box	16. Stop lamp switch	30. ESP® hydraulic unit / control module assembly
3. Ignition switch	17. Stop lamp	31. Back up light switch
4. Junction block assembly	18. ECM	32. Back-up light
5. Steering angle sensor	19. BCM	33. ESP® OFF switch

6. CAN driver	20. Brake fluid level switch	34. Power control unit
7. Combination meter	21. Parking brake switch	35. Internal memory
8. SLIP indicator lamp	22. Yaw rate / G sensor assembly	36. Pump motor driver (transistor)
9. ESP® OFF lamp	23. CAN driver (for yaw rate / G sensor assembly)	37. Pump motor
10. ESP® warning lamp	24. Left-front wheel speed sensor	38. Solenoid valve power supply driver (transistor)
11. ABS warning lamp	25. Right-front wheel speed sensor	39. Solenoid valves
12. EBD warning lamp (brake warning lamp)	26. Left-rear wheel speed sensor	40. Solenoid valve driver (transistor)
13. Lamp driver module	27. Right-rear wheel speed sensor	41. Master cylinder pressure sensor

Terminal Arrangement of ESP® Control Module Connector (Viewed from Terminal Side)



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Terminal	Circuit	Terminal	Circuit
E53-1	Solenoid valve power supply driver (transistor)	E53-25	CAN communication line (low) for yaw rate / G sensor assembly
E53-2	Right-front wheel speed sensor (–)	E53-26	—
E53-3	Right-front wheel speed sensor (+)	E53-27	—
E53-4	—	E53-28	—
E53-5	Left-rear wheel speed sensor (+)	E53-29	CAN communication line (high) for yaw rate / G sensor assembly
E53-6	Left-rear wheel speed sensor (–)	E53-30	—
E53-7	Fluid pressure switch signal	E53-31	Ground for yaw rate / G sensor assembly
E53-8	—	E53-32	Pump motor driver (transistor)
E53-9	—	E53-33	Dark link connector
E53-10	Back up light Input (for M/T model)	E53-34	—
E53-11	Right-rear wheel speed sensor (–)	E53-35	Ignition switch
E53-12	Right-rear wheel speed sensor (+)	E53-36	—
E53-13	CAN communication line (high)	E53-37	Power source for yaw rate / G sensor assembly
E53-14	Left-front wheel speed sensor (+)	E53-38	—
E53-15	Left-front wheel speed sensor (–)	E53-39	—
E53-16	Ground	E53-40	—
E53-17	—	E53-41	—
E53-18	—	E53-42	CAN communication line (high) for ECM
E53-19	—	E53-43	—
E53-20	—	E53-44	CAN communication line (low)
E53-21	—	E53-45	—
E53-22	—	E53-46	CAN communication line (low) for ECM
E53-23	—	E53-47	Ground
E53-24	—		

Component Location

Electronic Stability Program Component Location

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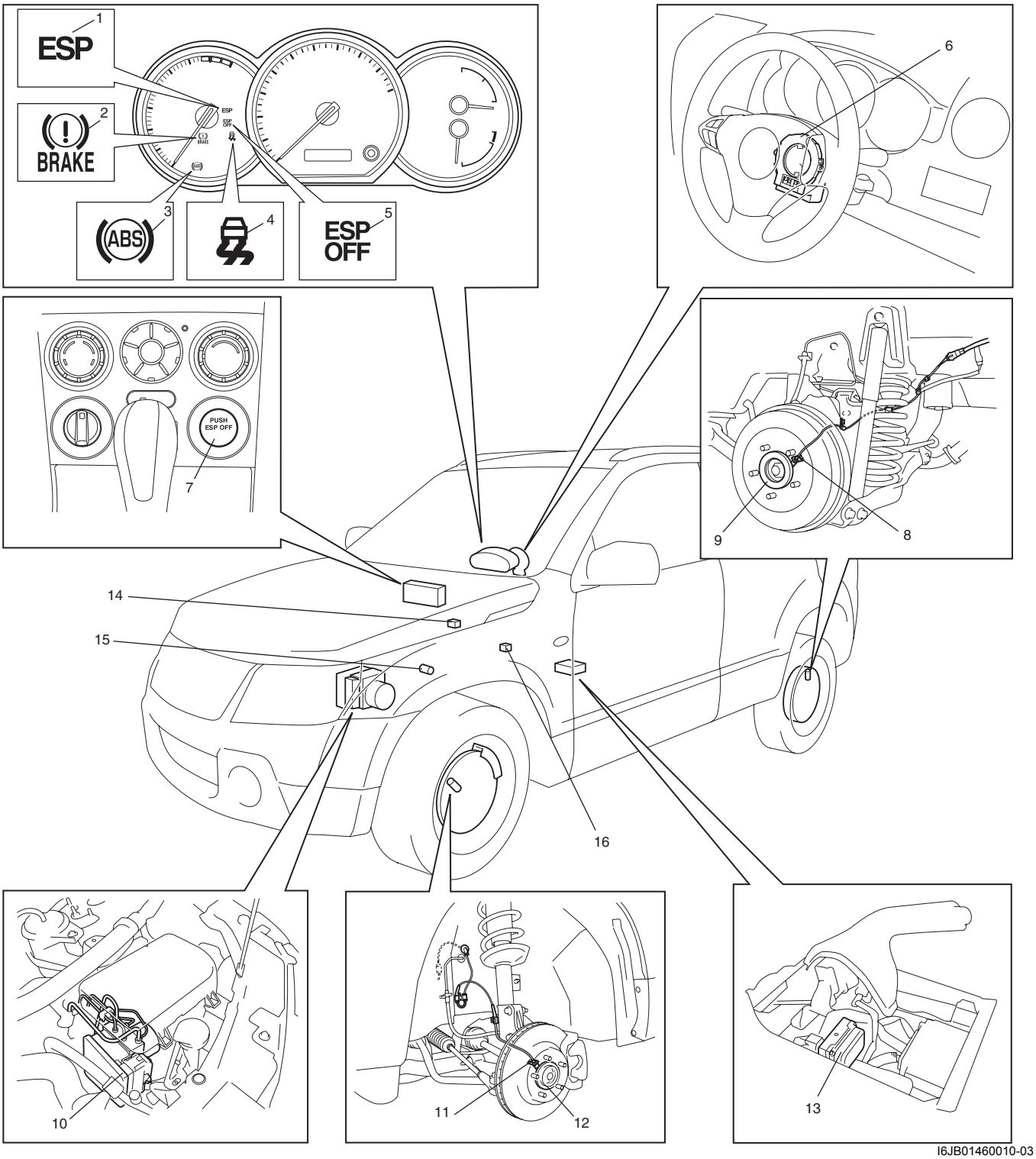

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1. ESP® warning lamp	7. ESP® OFF switch	13. Yaw rate / G sensor assembly
2. EBD warning lamp (brake warning lamp)	8. Rear wheel speed sensor	14. Data link connector
3. ABS warning lamp	9. Rear wheel encoder	15. Back up light switch
4. SLIP indicator lamp	10. ESP® hydraulic unit / control module assembly	16. Stop lamp switch
5. ESP® OFF lamp	11. Front wheel speed sensor	
6. Steering angle sensor	12. Front wheel encoder	

Diagnostic Information and Procedures

Electronic Stability Program Check

S5JB0B4604046

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Malfunction analysis** 1) Perform “Customer complaint analysis: ”. 2) Perform “Problem symptom confirmation: ”. 3) Perform “DTC check, record and clearance: ” and recheck DTC. *Is there any malfunction DTC?*	Go to Step 4.	Go to Step 2.
2	☞ **Driving test** 1) Perform “Step 2: Driving Test: ”. *Is trouble symptom identified?*	Go to Step 3.	Go to Step 6.
3	☞ **DTC check** 1) Perform “DTC Check: ”. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **ESP® check** 1) Inspect and repair referring to applicable DTC flow. *Does trouble recur?*	Go to Step 5.	Go to Step 7.
5	☞ **Brakes diagnosis** 1) Inspect and repair referring to “Brakes Symptom Diagnosis: in Section 4A in related manual”. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
6	☞ **Intermittent problem check** 1) Check intermittent troubles referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual” and related circuit of trouble code recorded in Step 1. *Does trouble recur?*	Go to Step 4.	Go to Step 7.
7	☞ **Final confirmation test** 1) Perform “Step 7: Final Confirmation Test: ”. *Does trouble recur?*	Go to Step 3.	End.

Step 1: Malfunction Analysis

Customer complaint analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such a questionnaire form as shown in the following will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date of Reg:	Date of problem:	Mileage:

Problem Symptoms	● ESP® warning lamp abnormal: fails to turn on / fails to turn off ● ABS warning lamp abnormal: fails to turn on / fails to turn off ● EBD warning lamp abnormal: fails to turn on / fails to turn off ● Abnormal noise while vehicle is running: from motor, from valve, other_____ ● Wheel is locked at braking: ● Wheel is skidded at turning. ● Pump motor does not stop (running): ● Braking does not work: ● Other:
Frequency of occurrence	● Continuous/Intermittent (times a day, a month)/ other_____
Conditions for Occurrence of Problem	● Vehicle at stop & ignition switch ON: ● When starting: at initial start only/at every start/Other_____ ● Vehicle speed: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other_____ ● Road surface condition: Paved road/rough road/snow-covered road/ other_____ ● Chain equipment:
Environmental Condition	● Weather: fair/cloudy/rain/snow/other_____ ● Temperature: °F (°C)
Diagnostic Trouble Code	● First check: Normal code/malfunction code ( ) ● Second check after test drive: Normal code/malfunction code ( )

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Problem symptom confirmation

If symptom in "Customer Questionnaire" is found or reproduced in the vehicle, confirm the symptom is problem or not. (This step should be done with the customer if possible.) Check warning lamps related to brake system referring to "EBD Warning Lamp (Brake Warning Lamp) Check: in Section 4E in related manual", "ABS Warning Lamp Check: in Section 4E" and "ESP, Warning lamp Check: ".

DTC check, record and clearance

Perform "DTC Check: " procedure, record it and then clear it referring to "DTC Clearance: ".
Recheck DTC referring to "DTC Check: ".
When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to "Step 4: ESP, Check: " to proceed the diagnosis.
When DTC which is recorded at DTC check procedure is not indicated anymore after performing DTC clearance, ESP® control module does not perform the system diagnosis, or temporary abnormality may occur, therefore go to "Step 2: Driving Test: " to proceed the diagnosis.

Step 2: Driving Test
Test the vehicle turning (counter) clockwise at 40 km/h for more than a minute and check if any trouble symptom (such as abnormal lighting of ESP® warning lamp and/or ABS warning lamp) exists.
If the malfunction DTC is confirmed at ignition switch ON, proceed to Step 3.
If the malfunction DTC is not confirmed at ignition switch ON, proceed to Step 6.

Step 3: DTC Check
Recheck DTC referring to “DTC Check: ”.

Step 4: ESP® Check
According to ESP® Check for the DTC confirmation in Step 3, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator assembly or other part and repair or replace faulty parts.

Step 5: Brakes Diagnosis
Check the parts or system suspected as a possible cause referring to “Brakes Symptom Diagnosis: in Section 4A in related manual” and based on symptoms appearing on the vehicle (symptom obtained through Steps 1 and 2 and repair or replace faulty parts, if any).

Step 6: Intermittent Problem Check
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual” and related circuit of trouble code recorded in Step 1 to 3.

Step 7: Final Confirmation Test
Confirm that the problem symptom has gone and the ESP® is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once referring to “DTC Clearance: ” and perform test driving and confirm that no DTC is indicated.

ESP® Warning lamp Check

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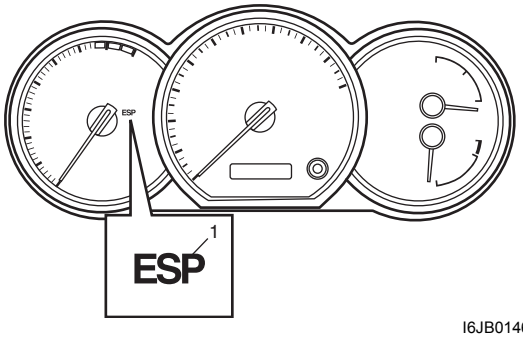
1) Turn ignition switch ON.
2) Check that ESP® warning lamp (1) comes ON for about 2 seconds and then goes off.
   If any faulty condition is found, advance to “ESP, Warning Lamp Does Not Come ON at Ignition Switch ON: ” or “ESP, Warning Lamp Comes ON Steady: ”.



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ABS Warning Lamp Check

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Refer to “ABS Warning Lamp Check: in Section 4E”.

EBD Warning Lamp (Brake Warning Lamp) Check

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Refer to “EBD Warning Lamp (Brake Warning Lamp) Check: in Section 4E in related manual”.

DTC Check

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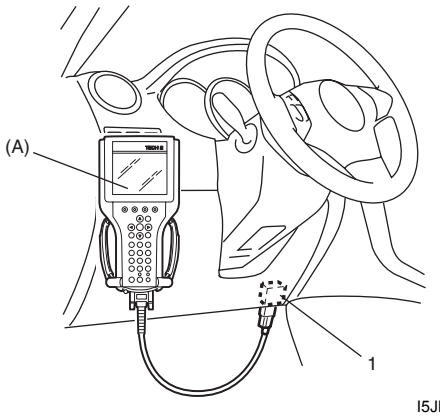
1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (1).

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 and print it or write it down. Refer to SUZUKI scan tool operator's manual for further details.

NOTE

If SUZUKI scan tool can not communicate ESP® control module, perform "Serial Data Link Circuit Check: ".

5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from DLC.

DTC Table

S5JB0B4604051

⚠ CAUTION

Be sure to perform "Electronic Stability Program Check: " before starting diagnosis.

DTC (displayed on SUZUKI scan tool)	Diagnostic Items		Detecting condition (DTC will be set when detecting)	ABS warning lamp	EBD warning lamp	ESP® warning lamp
NO DTC	Normal		—	—	—	—
☞ C1015	Longitudinal G sensor in yaw rate / G sensor assembly failure		Longitudinal G sensor signal is out of specified range. (for 4WD vehicle)	○	—	○
☞ C1016	Stop lamp switch failure		Vehicle behavior and stop lamp switch signal is disagreed for specified time.	—	—	—
☞ C1017	Lateral G sensor in yaw rate / G sensor assembly failure		Lateral G sensor signal is out of specified range.	—	—	○
☞ C1018	Brake fluid level switch failure		• Brake fluid level is too low. • Input voltage of brake fluid level switch to BCM is low.	—	—	○
☞ C1020	Master cylinder pressure sensor power supply failure		Power supply voltage to master cylinder pressure sensor in ESP® hydraulic unit / control module assembly is too low.	—	—	○
☞ C1021	RF	Wheel speed sensor circuit failure	Wheel sensor signal is out of specified range.	○	*1	○
☞ C1025	LF					
☞ C1031	RR					
☞ C1035	LR					

DTC (displayed on SUZUKI scan tool)	Diagnostic Items		Detecting condition (DTC will be set when detecting)	ABS warning lamp	EBD warning lamp	ESP® warning lamp
☞ C1022	RF	Wheel speed sensor or encoder failure	Abnormal wheel speed sensor signal is detected.	○	*1	○
☞ C1026	LF					
☞ C1032	RR					
☞ C1036	LR					
☞ C1023	Yaw rate sensor in yaw rate / G sensor assembly failure		• Yaw rate sensor signal is out of range. • Vehicle behavior and yaw rate signal is disagreed.	—	—	○
☞ C1024	Steering angle sensor circuit failure		• Steering angle sensor internal defect is detected by CPU in steering angle sensor. • Steering angle sensor signal is out of specified range.	—	—	○
☞ C1027	ESP® OFF switch circuit failure		Mechanical switch failure, failure in switch wiring is shorted to ground.	—	—	—
☞ C1028	Master cylinder pressure sensor circuit failure		Input signal voltage from master cylinder pressure sensor in ESP® control module is too high or low.	—	—	○
☞ C1034	Yaw rate / G sensor assembly power supply failure		Power supply voltage of yaw rate / G sensor assembly is too high when ignition switch OFF. Power supply voltage of yaw rate / G sensor assembly is too low when ignition switch ON.	*2	—	○
☞ C1037	Steering angle sensor power supply failure		Power supply voltage to steering angle sensor is too low.	—	—	○
☞ C1038	Steering angle sensor detect rolling counter failure with ESP® control module		ESP® control module rolling counter failure is detected by steering angle sensor.	—	—	○
☞ C1039	Yaw rate / G sensor assembly internal failure		Yaw rate / G sensor assembly internal failure is detected.	*2	—	○
☞ C1040	Stability control system function failure		Stability control is active for more than specified time without yaw rate change.	—	—	○

DTC (displayed on SUZUKI scan tool)	Diagnostic Items		Detecting condition (DTC will be set when detecting)	ABS warning lamp	EBD warning lamp	ESP® warning lamp
☞ C1041	RF	Inlet solenoid valve circuit failure	Mismatching solenoid output and solenoid monitor is detected.	○	○	○
☞ C1042		Outlet solenoid valve circuit failure				
☞ C1045	LF	Inlet solenoid valve circuit failure				
☞ C1046		Outlet solenoid valve circuit failure				
☞ C1051	RR	Inlet solenoid valve circuit failure				
☞ C1052		Outlet solenoid valve circuit failure				
☞ C1055	LR	Inlet solenoid valve circuit failure				
☞ C1056		Outlet solenoid valve circuit failure				
☞ C1043	Master cylinder cut solenoid valve circuit No.1 failure					
☞ C1044	Master cylinder cut solenoid valve circuit No.2 failure					
☞ C1053	Low pressure solenoid valve circuit No.1 failure					
☞ C1054	Low pressure solenoid valve circuit No.2 failure					
☞ C1050	Back switch failure (for M/T model)		Back up light switch and/or switch circuit failure is detected.	—	—	○
☞ C1057	ESP® (ABS) control module power supply circuit failure *3		ESP® (ABS) control module power supply voltage is too high.	○	○	○
			ESP® (ABS) control module power supply voltage is too low.	○	*5	○
☞ C1061	Pump motor and/or motor circuit failure		Defective pump motor and/or motor power supply voltage is too low.	○	—	○
☞ C1063	Solenoid valve power supply driver circuit failure		Mismatching solenoid output and solenoid monitor is detected.	○	○	○
☞ C1071	ESP® (ABS) control module internal defect		ESP® (ABS) control module internal defect is detected.	○	○	○
☞ C1073	Lost communication with yaw rate / G sensor assembly		CAN line communication error in ESP® control module and yaw rate / G sensor assembly is detected.	*2	—	○
☞ C1075	Steering angle sensor calibration incomplete *4		Missing steering angle sensor calibration point data is detected.	—	—	—
☞ C1076	Master cylinder pressure sensor calibration incomplete		Master cylinder pressure sensor calibration is incompleted.	—	—	○
☞ C1077	Longitudinal G sensor in yaw rate / G sensor assembly calibration incomplete		Longitudinal G sensor in yaw rate / G sensor assembly calibration is incompleted. (for 4WD vehicle)	○	—	○
☞ C1078	Lateral G sensor in yaw rate / G sensor assembly calibration incomplete		Lateral G sensor in yaw rate / G sensor assembly calibration is incompleted.	—	—	○
☞ C1090	ECM detect rolling counter failure with ESP® control module		ESP® control module rolling counter failure is detected by ECM.	—	—	○

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning lamp	EBD warning lamp	ESP® warning lamp
☞ C1091	ECM data in CAN line failure	ECM sent invalid signal to ESP® control module.	—	—	○
☞ C1093	4WD control module data in CAN line failure (if equipped 4WD control module)	4WD control module sent invalid signal to ESP® control module			
☞ U1073	Control module communication bus off	Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	—	—	○
☞ U1100	Lost communication with ECM (reception error)	ECM message data is missing from CAN communication.	—	—	○
☞ U1126	Lost communication with steering angle sensor (reception error)	Steering angle sensor message data is missing from CAN communication.			
☞ U1139	Lost communication with 4WD control module (reception error) (if equipped 4WD control module)	4WD control module message data is missing from CAN communication.			
☞ U1140	Lost communication with BCM (reception error)	BCM message data is missing from CAN communication.			

NOTE

- **"○" in ABS warning lamp, EBD warning lamp and ESP® warning lamp column of the above table means warning lamp is lit when DTC is detected.**
- ***1: If two or more wheel speed sensor are defective, ABS warning lamp, EBD warning lamp and ESP® warning lamp are lit and all the control functions are deactivated. If one wheel speed sensor is defective, ABS warning lamp and ESP® warning lamp are lit and ABS and TCS / stability control are deactivated.**
- ***2: For 4WD vehicle, ABS warning lamp and ESP® warning lamp are lit and ABS and TCS / stability control are deactivated. For 2WD vehicle, ESP® warning lamp is lit and TCS / stability control is deactivated.**
- ***3: SLIP indicator lamp and ESP® OFF lamp turn ON when power supply circuit voltage is low.**
- ***4: SLIP indicator lamp flashes continuously at Intervals of 1 Hz.**
- ***5: EBD warning lamp is lit when power supply circuit voltage is too low.**

DTC Clearance

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⚠ WARNING

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure or using SUZUKI scan tool.

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 to ON position.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further derails.

NOTE

For DTC C 1021, C1022, C1025, C1026, C1031, C1032, C1035, C1036 and C1061, confirm that ABS warning lamp turns off after performing Step 2 of "Test Driving" under "Electronic Stability Program Check: ", and then clear the DTCs.

4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.
5) Perform "Driving Test" (Step 2 of "Electronic Stability Program Check: ") and "DTC Check: " and confirm that NO DTC is displayed on scan tool.

Fail-Safe Table

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When any of the following DTC(s) is detected, ESP® system is in fail-safe mode per its DTC and ABS, EBD and/or TCS / stability functions are deactivated until the resolution is applied.

DTC No.	Fail-safe operation			Fail-safe condition resolutive
	ABS	EBD	TCS / stability	
☞ C1015	X	○	X	When no DTC is detected by ESP® control module, after ignition switch turned OFF to ON.
☞ C1016	○	○	○	—
☞ C1017	○	○	X	When no DTC is detected by ESP® control module, after ignition switch turned OFF to ON.
☞ C1018	○	○	X	
☞ C1020	○	○	X	
☞ C1021	X	*1	X	When estimated vehicle speed exceeds 10 km/h (6.5 mile/h) and no DTC is detected by ESP® control module.
☞ C1025				
☞ C1031				
☞ C1035				
☞ C1022	X	*1	X	
☞ C1026				
☞ C1032				
☞ C1036				
☞ C1023	○	○	X	When no DTC is detected by ESP® control module, after ignition switch turned OFF to ON.
☞ C1024	○	○	X	
☞ C1027 *3	○	○	○	—

DTC No.	Fail-safe operation			Fail-safe condition resolutive
	ABS	EBD	TCS / stability	
☞ C1028	○	○	X	When no DTC is detected by ESP® control module, after ignition switch turned OFF to ON.
☞ C1034	*2	○	X	
☞ C1037	○	○	X	
☞ C1038	○	○	X	
☞ C1039	*2	○	X	
☞ C1040	○	○	X	
☞ C1041	X	X	X	When no DTC is detected by ESP® control module, after ignition switch turned OFF to ON.
☞ C1042				
☞ C1043				
☞ C1044				
☞ C1045				
☞ C1046				
☞ C1051				
☞ C1052				
☞ C1053				
☞ C1054				
☞ C1055				
☞ C1056				
☞ C1050	○	○	X	When no DTC is detected by ESP® control module, after ignition switch turned OFF to ON.
☞ C1057	X	*4	X	
☞ C1061	X	○	X	When estimated vehicle speed exceeds 10 km/h (6.5 mile/h) and no DTC is detected by ESP® control module.
☞ C1063	X	X	X	When no DTC is detected by ESP® control module, after ignition switch turned OFF to ON.
☞ C1071	X	X	X	
☞ C1073	*2	○	X	
☞ C1075	○	○	X	Steering angle sensor calibration completed.
☞ C1076	○	○	X	Master cylinder pressure sensor calibration completed.
☞ C1077	X	○	X	Yaw rate / G sensor assembly calibration completed.
☞ C1078	○	○	X	

DTC No.	Fail-safe operation			Fail-safe condition resolutive
	ABS	EBD	TCS / stability	
☞ C1090	○	○	X	When no DTC is detected by ESP® control module, after ignition switch turned OFF to ON.
☞ C1091	○	○	X	
☞ C1093				
☞ U1073	○	○	X	
☞ U1100	○	○	X	
☞ U1126				
☞ U1139				
☞ U1140				

NOTE

- **○: Activated**
- **X: Deactivated**
- ***1: If two or more wheel speed sensor are defective, ABS warning lamp, EBD warning lamp and ESP® warning lamp are lit and all the control functions are deactivated. If one wheel speed sensor is defective, ABS warning lamp and ESP® warning lamp are lit and ABS and TCS / stability control are deactivated.**
- ***2: For 4WD vehicle, ABS warning lamp and ESP® warning lamp are lit and ABS and TCS / stability control are deactivated. For 2WD vehicle, ESP® warning lamp is lit and TCS / stability control is deactivated.**
- ***3: ESP® OFF mode is cancelled and all control functions are activated.**
- ***4: EBD control function is activated only if power supply circuit is low voltage malfunction.**

Scan Tool Data

S5JB0B4604054

The parameter data below are values measured with the scan tool when the normally operating vehicle is under the following conditions. When taking measurements for comparison by using the scan tool, be sure to check that the vehicle is under the following conditions.

- Apply parking brake and block wheels.
- Ignition switch ON.
- Turn OFF air conditioning (if equipped).
- Set front wheels in straight-ahead position and hands off steering wheel.
- Turn OFF all electric loads (except ignition).
- Check that there is no DTC.

Scan Tool Data	Standards	Condition
Battery Voltage	10.0 – 16.0 V	—
Pump Motor Driver	0.0 V	—
RF Wheel Speed	0 km/h, 0.0 MPH	Vehicle is in stationary condition.
LF Wheel Speed	0 km/h, 0.0 MPH	Vehicle is in stationary condition.
RR Wheel Speed	0 km/h, 0.0 MPH	Vehicle is in stationary condition.
LR Wheel Speed	0 km/h, 0.0 MPH	Vehicle is in stationary condition.
Brake Switch	ON	Brake pedal is depressed
	OFF	Brake pedal is released
G sensor	0 ± 0.1 G	Vehicle is on the level
Master Cyl Press	0 ± 0.8 MPa	Brake pedal is released
G Sensor (lateral)	0 ± 0.1 G	Vehicle is on the level
Yaw rate sensor	0 ± 4 Deg/s	Vehicle is on the level
Steering angle Sen	0 ± 3°	Front wheels are in straight-ahead position
Stability control	INACTIVE	Stability control system is not working
TCS control (brake)	INACTIVE	Active brake by TCS is not working
TCS control (engine)	INACTIVE	Torque control by TCS is not working
ESP® off state (cont)	ESP® ON	ESP® OFF switch is OFF condition
	ESP® OFF	ESP® OFF switch is ON condition
Steering angle Sen	Neutral	Front wheels are in straight-ahead position

Scan Tool Data Definition

Battery Volt (V): Battery Voltage is an analog input signal read by the ESP® control module. Certain ESP® control module functions will be modified if the battery voltage falls below or rises above programmed thresholds.

Pump Motor Driver (V): This parameter indicates the operational condition of the pump motor driver (transistor).

RF Wheel Speed, LF Wheel Speed, RR Wheel Speed and LR Wheel Speed (km/h, MPH): Wheel speed is ESP® control module internal parameter. It is computed by reference pulses from the wheel speed sensor.

Brake Switch (ON, OFF): This switch signal informs the ESP® control module whether the brake is active or not.

G Sensor (G): Vehicle acceleration is measured by yaw rate / G sensor assembly and output to ESP® control module by pulse signal for 4WD vehicle.

Master Cyl Press (MPa): Brake fluid pressure from brake master cylinder.

G Sensor (lateral) (G): Lateral acceleration is measured by yaw rate / G sensor assembly and output to ESP® control module by pulse signal.

Yaw rate sensor (Deg/s): Yaw rate sensor is measured by yaw rate / G sensor assembly and output to ESP® control module by pulse signal.

Steering angle Sen (°): Steering wheel rotation angle is measured by steering angle sensor and output to ESP® control module by pulse signal.

Stability control (ACTIVE, INACTIVE): This indicates stability control in activation / deactivation.

TCS control (brake) (ACTIVE, INACTIVE): This indicates brake function of TCS in activation / deactivation.

TCS control (engine) (ACTIVE, INACTIVE): This indicates torque control of TCS in activation / deactivation.

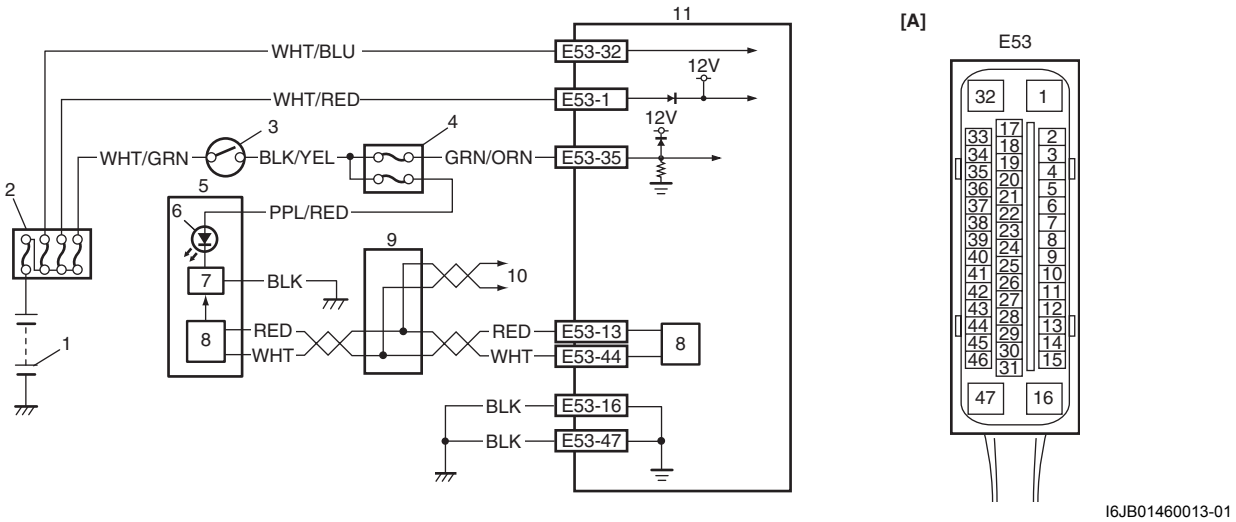
ESP® off state (cont) (ESP® ON, ESP® OFF): State of ESP® OFF switch.

Steering angle Sen (Neutral, NONnewtral): This indicates steering wheel angle measured by steering angle sensor is in straight-ahead or not.

ESP® Warning Lamp Does Not Come ON at Ignition Switch ON

S5JB0B4604055

Wiring Diagram



I6JB01460013-01

[A]: ESP® control module connector (viewed from terminal side)	4. Junction block assembly	8. CAN driver
1. Battery	5. Combination meter	9. Junction connector
2. Main fuse box	6. ESP® warning lamp	10. To BCM, 4WD control module, immobilizer control module (ICM) and steering angle sensor
3. Ignition switch	7. Lamp driver module	11. ESP® hydraulic unit / control module assembly

Circuit Description

Operation (ON/OFF) of ESP® warning lamp is controlled by ESP® control module through lamp driver module in combination meter.

If ESP® system is in good condition, ESP® control module turns ESP® warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ESP® warning lamp is turned ON continuously by ESP® control module. Also, it is turned ON continuously by lamp driver module when the connector of ESP® control module is disconnected.

Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Do other warning lamps come ON?*	Go to Step 2.	Go to Step 3.
2	1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to OFF position and check DTC. *Is there DTC U1073?*	Go to "DTC C1073: Lost Communication With Yaw Rate / G Sensor Assembly: ".	Substitute a known-good combination meter and recheck. If ESP® warning lamp remains OFF, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.
3	*Is Circuit fuse for combination meter in good condition?*	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	1) Check CAN communication circuit between combination meter and ESP® control module referring to "DTC C1073: Lost Communication With Yaw Rate / G Sensor Assembly: " *Is CAN communication circuit in good condition?*	Go to Step 5.	Repair or replace.

Step	Action	Yes	No
5	1) Remove combination meter with ignition switch turned OFF. 2) Check for proper connection to “PPL/RED” and “BLK” wire of combination meter connector. 3) If OK, turn ON ignition switch and measure voltage at “PPL/RED” wire of combination meter connector and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 6.	Repair power supply circuit for combination meter.
6	1) Measure resistance between “BLK” wire of combination meter connector and vehicle body ground. *Is resistance less than 2 Ω?*	Replace combination meter.	“BLK” circuit open or high resistance.

ESP® Warning Lamp Comes ON Steady

S5JB0B4604056

Wiring Diagram

Refer to “ESP, Warning Lamp Does Not Come ON at Ignition Switch ON: ”.

Circuit Description

Operation (ON/OFF) of ESP® warning lamp is controlled by ESP® control module through lamp driver module in combination meter.

If ESP® system is in good condition, ESP® control module turns ESP® warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ESP® warning lamp is turned ON continuously by ESP® control module. Also, it is turned ON continuously by lamp driver module when the connector of ESP® control module is disconnected.

Troubleshooting

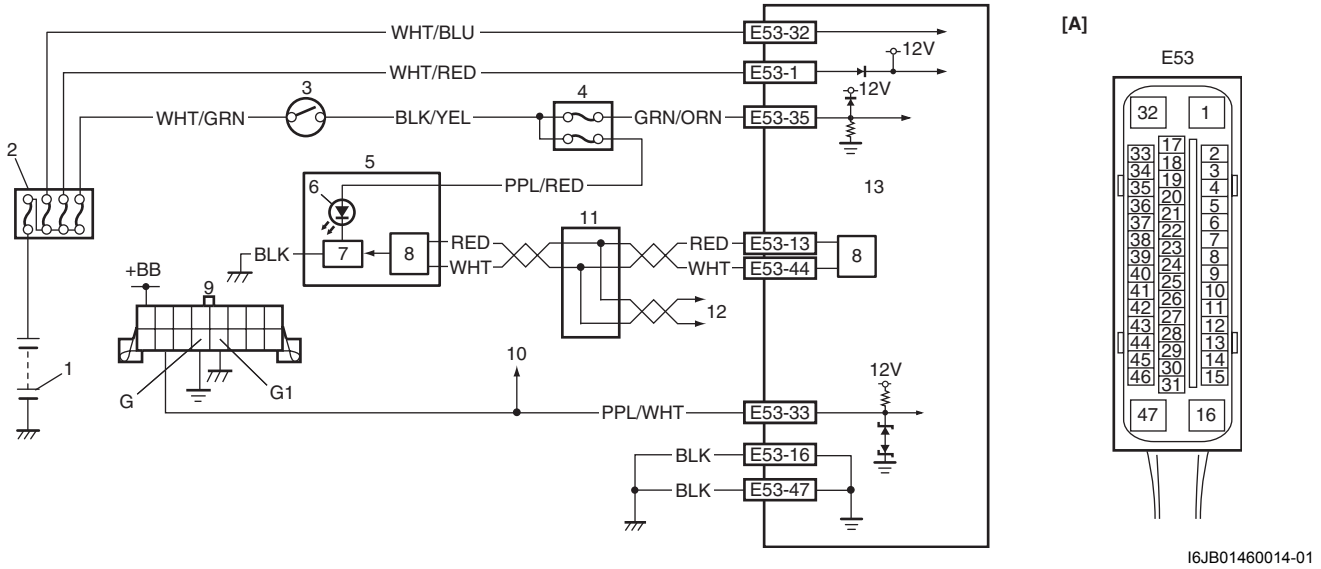
Step	Action	Yes	No
1	1) Perform diagnostic trouble code check. *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	*Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check circuit for short to ground.
3	1) Turn ignition switch to OFF. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector at terminals “E53-35”, “E53-16” and “E53-47”. 4) If OK then turn ignition switch to ON position and measure voltage between terminal “E53-35” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“GRN/ORN” circuit open.
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals “E53-1” and “E53-32”. 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E53-1”, “E53-32” and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	“WHT/RED” and/or “WHT/BLU” circuit open.
5	1) Turn ignition switch to OFF and measure resistance between each terminal of “E53-16”, “E53-47” and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ESP® control module open or high resistance.

Step	Action	Yes	No
6	1) Check CAN communication circuit between combination meter and ESP® control module referring to “DTC U1073: Control Module Communication Bus Off: ”. *Is CAN communication circuit in good condition?*	Substitute a known-good combination meter and recheck. If ESP® warning lamp remains ON, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair or replace.

Serial Data Link Circuit Check

S5JB0B4604057

Wiring Diagram



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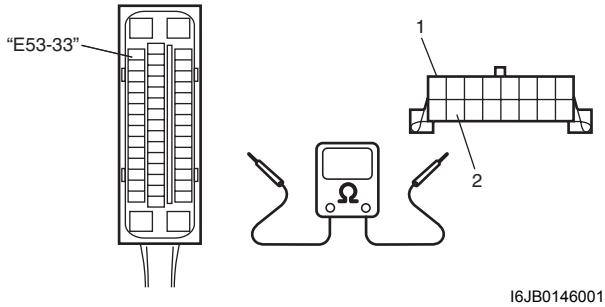
[A]: ESP® control module connector (viewed from terminal side)	5. Combination meter	10. To ECM, BCM, SDM, 4WD control module and immobilizer control module (ICM)
1. Battery	6. ESP® warning lamp	11. Junction connector
2. Main fuse box	7. Lamp driver module	12. To ECM, BCM, 4WD control module, immobilizer control module (ICM) and steering angle sensor
3. Ignition switch	8. CAN driver	13. ESP® hydraulic unit / control module assembly
4. Junction block assembly	9. Data link connector (DLC)	

Inspection

Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Does ESP® warning lamp come ON?*	Go to Step 2.	Go to Step 6.
2	1) Turn ignition switch to OFF position. *Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check for short.
3	1) Disconnect ESP® control module connector. 2) Check for proper connection to ESP® control module connector at terminal “E53-35”. 3) If OK then turn ignition switch to ON position and measure voltage between terminal “E53-35” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“GRN/ORN” wire circuit open.

Step	Action	Yes	No
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals “E53-1” and “E53-32”. 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E53-1”, “E53-32” and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	“WHT/RED” and/or “WHT/BLU” wire circuit open.
5	1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals “E53-16” and “E53-47”. 3) If OK, measure resistance between each terminal of “E53-16”, “E53-47” and vehicle body ground. *Are resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ESP® control module open or high resistance.
6	1) Check if communication is possible by trying communication with other controller (ECM, BCM, 4WD control module, SDM or immobilizer control module (ICM)). *Is it possible to communicate with other controller?*	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. *Is voltage 10 – 12 V?*	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. *Is each resistance 1 Ω or less?*	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 “E53-33” (“PPL/WHT” wire) terminal for serial data circuit. 3) If OK, then check resistance between “E53-33” (“PPL/WHT” wire) terminal and “PPL/WHT” wire terminal (2) for serial data circuit in DLC (1). *Is resistance 1 Ω or less?* 	Substitute a known-good ESP® hydraulic unit / control module and recheck.	Repair high resistance or open in “PPL/WHT” wire circuit for anti lock brake system.

DTC C1015 / C1017 / C1023: Longitudinal G Sensor / Lateral G Sensor / Yaw Rate Sensor in Yaw Rate / G Sensor Assembly Failure

S5JB0B4604058

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1015: Longitudinal G sensor signal is out of specified range. (for 4WD vehicle) **C1017:** Lateral G sensor signal is out of specified range. **C1023:** • Yaw rate sensor signal is out of range. • Vehicle behavior and yaw rate signal is disagreed.	• Yaw rate / G sensor assembly • ESP® control module

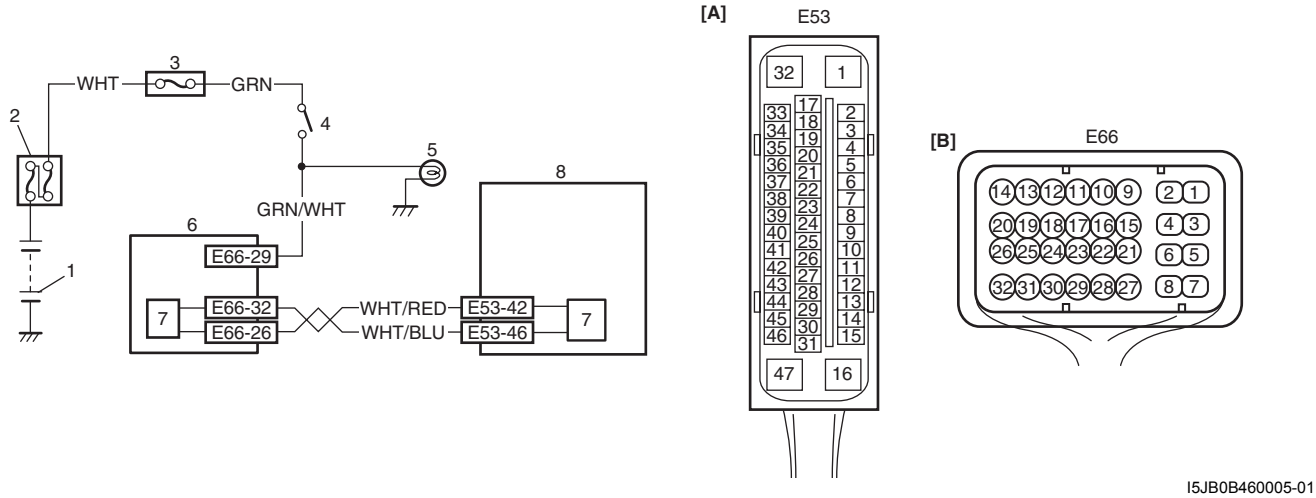
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Are DTC C1034 and/or C1073 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check sensor calibration** 1) Calibrate yaw rate / G sensor assembly referring to "Sensor Calibration: ". 2) Clear all DTCs and check DTC for ESP®. *Are DTC C1015, C1017 and/or C1023 still detected?*	Go to Step 4.	Yaw rate / G sensor assembly calibration is incompleted.
4	**Check yaw rate / G sensor assembly** 1) Check yaw rate / G sensor assembly referring to "Yaw Rate / G Sensor Assembly On-Vehicle Inspection: ". *Is it good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Replace yaw rate / G sensor assembly.

DTC C1016: Stop Lamp Switch Circuit Failure

S5JB0B4604059

Wiring Diagram



I5JB0B460005-01

[A]: ESP® control module connector (viewed from terminal side)	3. Junction block assembly	7. CAN driver
[B]: ECM connector (viewed from harness side)	4. Stop lamp switch	8. ESP® hydraulic unit control module assembly
1. Battery	5. Stop lamp	
2. Main fuse box	6. ECM	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Vehicle behavior and stop lamp switch signal is disagreed for specified time.	• Back up light switch circuit • Back up light switch • ECM • ESP® control module

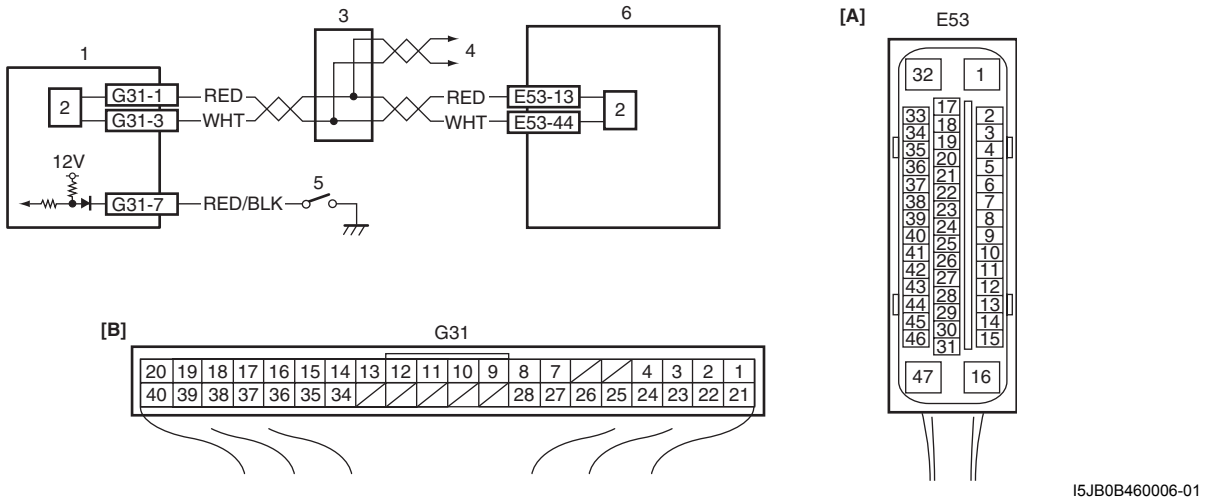
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is DTC U1100 detected?*	Go to "DTC U1100: Lost Communication with ECM (Reception Error): ".	Go to Step 3.
3	**DTC check for ECM** 1) Check DTC for ECM. *Is DTC P0571 detected?*	Go to "DTC P0571: Brake Switch "A" Circuit Malfunction: in Section 1A".	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC C1018: Brake Fluid Level Switch Failure

S5JB0B4604060

Wiring Diagram



I5JB0B460006-01

[A]: ESP® control module connector (viewed from terminal side)	2. CAN driver	5. Brake fluid level switch
[B]: BCM connector (viewed from harness side)	3. Junction connector	6. ESP® hydraulic unit control module assembly
1. BCM	4. To 4WD control module, immobilizer control module (ICM), combination meter and steering angle sensor	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• Brake fluid level is too low. • Input voltage of brake fluid level switch to BCM low.	• Brake fluid level • Brake fluid level switch circuit • Brake fluid level switch • BCM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**Check brake fluid level** 1) Check brake fluid level in reservoir. *Is brake fluid level upper than the minimum level?*	Go to Step 3.	Replenish brake fluid to reservoir.
3	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is DTC U1140 detected?*	Go to "DTC U1140: Lost Communication with BCM (Reception Error): ".	Go to Step 3.

Step	Action	Yes	No
4	**Check brake fluid level switch** 1) Turn ignition switch to OFF position. 2) Disconnect brake fluid level switch connector. 3) Check for proper connection at each terminal of brake fluid level switch connector. 4) If OK, then check brake fluid level switch referring to "Brake Fluid Level Switch Inspection: in Section 9C in related manual". *Is check result OK?*	Go to Step 5.	Replace brake fluid level switch.
5	**Check brake fluid level switch circuit** 1) Disconnect BCM connector. 2) Check for proper connection to BCM connector at "G31-7" terminal. 3) If OK, then check resistance between "G31-7" terminal and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"BLKL/RED" wire circuit short to ground.
6	**Check BCM** 1) Connect brake fluid level switch connector and BCM connector. 2) Check voltage at "G31-7" terminal of BCM referring to "Inspection of BCM and its Circuits: in Section 10B". *Is voltage in good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM and recheck.

DTC C1020: Master Cylinder Pressure Sensor Power Supply Failure

S5JB0B4604061

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Power supply voltage to master cylinder pressure sensor in ESP® hydraulic unit / control module assembly is too low.	• ESP® control module

DTC Troubleshooting

1) Turn ignition switch to OFF position.
2) Check for proper connection from harness to ESP® control module.
3) If OK, substitute an ESP® hydraulic unit / control module assembly with correct part number.
4) Recheck system.

DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Encoder Failure

S5JB0B4604087

Refer to “DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Encoder Failure: in Section 4E”.

DTC C1024: Steering Angle Sensor Circuit Failure

S5JB0B4604063

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• Steering angle sensor internal defect is detected by CPU in steering angle sensor. • Steering angle sensor signal is out of specified range.	• Steering angle sensor • ESP® control module

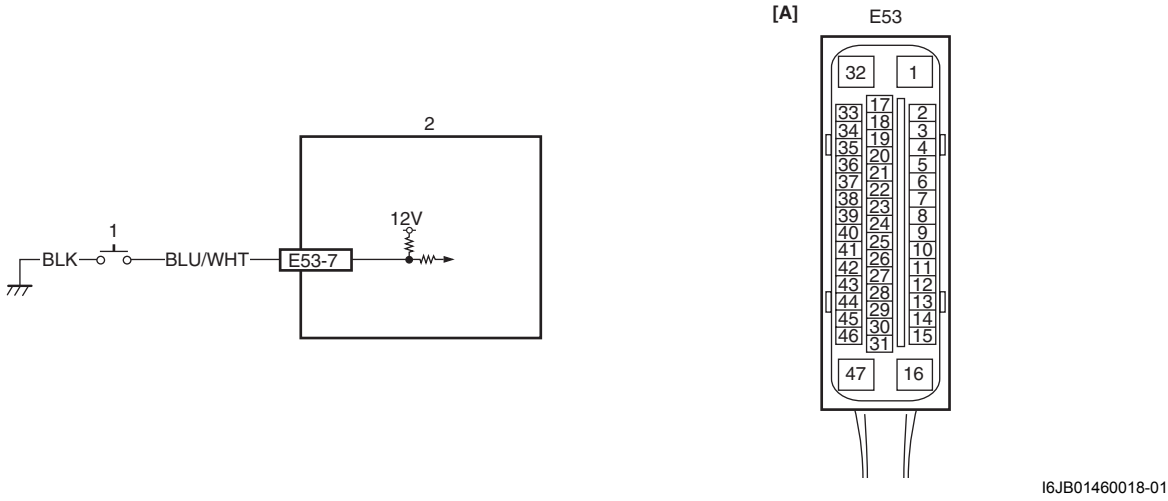
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check: ”.
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Are DTC C1037 and/or U1126 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check sensor calibration** 1) Calibrate steering angle sensor referring to “Sensor Calibration: ”. 2) Clear all DTC(s) and recheck DTC for ESP®. *Is DTC C1024 still detected?*	Go to Step 4.	Steering angle sensor calibration is incompleted.
4	**Check steering angle sensor** 1) Check steering angle sensor referring to “Steering Angle Sensor On-Vehicle Inspection: ”. *Is it good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Replace steering angle sensor.

DTC C1027: ESP® OFF Switch Circuit Failure

S5JB0B4604064

Wiring Diagram



I6JB01460018-01

[A]: ESP® control module connector (viewed from terminal side)	1. ESP® OFF Switch	2. ESP® hydraulic unit control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Mechanical switch failure, failure in switch wiring is shorted to ground.	• ESP® OFF switch • ESP® OFF switch circuit • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**Check ESP® OFF switch condition** *Is ESP® OFF switch is OFF condition?*	Go to Step 3.	ESP® OFF switch turned OFF condition and recheck.
3	**Check ESP® OFF switch** 1) Turn ignition switch to OFF position. 2) Remove ESP® OFF switch referring to "ESP, OFF Switch Removal and Installation: ". 3) Check for proper connection at each terminal of ESP® OFF switch. 4) If OK, then check ESP® OFF switch referring to "ESP, OFF Switch Inspection: ". *Is it good condition?*	Go to Step 4.	Replace ESP® OFF switch.
4	**Check ESP® OFF switch circuit** 1) Disconnect ESP® control module connector. 2) Check for proper connection to ESP® control module connector at "E53-7" terminal. 3) If OK, then check resistance between "E53-7" terminal and vehicle body ground. *Is resistance infinity?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"BLU/WHT" wire circuit short to ground.

DTC C1028: Master Cylinder Pressure Sensor Circuit Failure

S5JB0B4604065

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Input signal voltage from master cylinder pressure sensor in ESP® control module is too high or low.	• Leakage or air in the hydraulic brake system • Clearance between brake pad and disc too high • ESP® control module

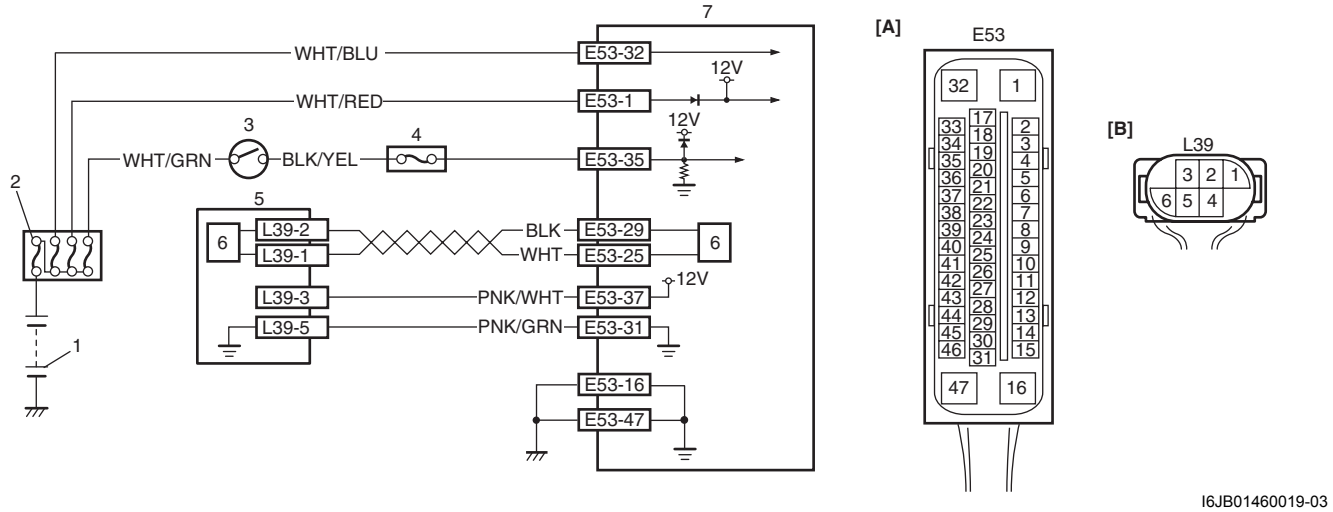
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**Check brake system** 1) Check brake system as follows. • Leakage or air in the hydraulic brake system • Clearance between brake pad and disc too high *Are they in good condition?*	Go to Step 3.	Repair, replace or adjust.
3	**Check sensor calibration** 1) Calibrate master cylinder pressure sensor referring to "Sensor Calibration: ". 2) Clear all DTC(s) and check DTC for ESP®. *Is DTC C1024 still detected?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Master cylinder pressure sensor calibration is incompleted.

DTC C1034: Yaw Rate / G Sensor Assembly Power Supply Failure

S5JB0B4604066

Wiring Diagram



I6JB01460019-03

[A]: ESP® control module connector (viewed from terminal side)	2. Main fuse box	5. Yaw rate / G sensor assembly
[B]: Yaw rate / G sensor assembly connector (viewed from harness side)	3. Ignition switch	6. CAN driver
1. Battery	4. Junction block assembly	7. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• Power supply voltage of yaw rate / G sensor assembly is too high when ignition switch OFF. • Power supply voltage of yaw rate / G sensor assembly is too low when ignition switch ON.	• Yaw rate / G sensor assembly power supply circuit • ESP® control module power supply circuit • Yaw rate / G sensor assembly • ESP® control module

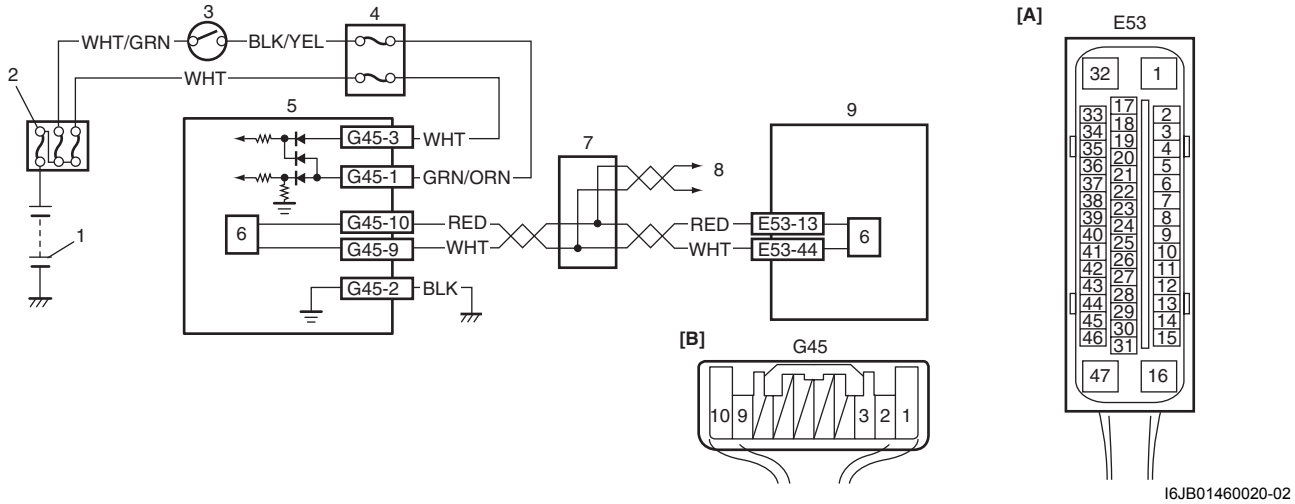
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Are DTC C1057 and/or C1073 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check yaw rate / G sensor assembly power supply circuit** 1) Turn ignition switch to OFF position. 2) Disconnect yaw rate / G sensor assembly connector. 3) Check for proper connection to yaw rate / G sensor assembly connector terminals at "L39-3" and "L39-5". 4) If OK, then measure voltage between connector terminal "L39-3" and vehicle body ground. *Is it 0 V?*	Go to Step 4.	Go to Step 5.
4	**Check yaw rate / G sensor assembly power supply circuit** 1) Measure voltage between connector terminal "L39-3" and "L39-5" with ignition switch turned ON. *Is it 10 – 14 V?*	Substitute a known-good yaw rate / G sensor assembly and recheck.	Go to Step 5.
5	**Check yaw rate / G sensor assembly power supply circuit** 1) Turn ignition switch to OFF position. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector terminals at "E53-31" and "E53-37". 4) If OK, then measure voltage between connector terminal "E53-37" and vehicle body ground. *Is it 0 V?*	Go to Step 6.	"PNK/WHT" wire circuit shorted to power circuit.
6	**Check yaw rate / G sensor assembly power supply circuit** 1) Measure resistance between the following points. • Between terminal "E53-37" of module connector and terminal "L39-3" of sensor terminal. • Between terminal "E53-31" of module connector and terminal "L39-5" of sensor terminal. *Are resistance less than 2 Ω?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"PNK/WHT" and/or "PNK/GRN" wire circuit open or high resistance.

DTC C1037: Steering Angle Sensor Power Supply Failure

S5JB0B4604067

Wiring Diagram



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[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	7. Junction connector
[B]: Steering angle sensor connector (viewed from harness side)	4. Junction block assembly	8. To BCM, 4WD control module, immobilizer control module (ICM) and combination meter
1. Battery	5. Steering angle sensor	9. ESP® hydraulic unit / control module assembly
2. Main fuse box	6. CAN driver	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Power supply voltage to steering angle sensor is too low.	• Steering angle sensor power supply circuit • Steering angle sensor • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2	Go to "Electronic Stability Program Check: ".
2	**Check steering angle sensor power supply circuit** 1) Check circuit fuses for steering angle sensor and its circuit. *Is it good condition?*	Go to Step 3.	Replace fuse and check for short circuit to ground.
3	**Check steering angle sensor power supply circuit** 1) Turn ignition switch to OFF position. 2) Disconnect steering angle sensor connector. 3) Check for proper connection to steering angle sensor connector terminals at "E45-1", "E45-2" and "E45-3". 4) If OK, then measure voltage between connector terminal "E45-3" and vehicle body ground. *Is it 10 – 14V?*	Go to Step 4.	"WHT" wire circuit open.
4	**Check steering angle sensor power supply circuit** 1) Measure voltage between connector terminal "E45-1" and vehicle body ground with ignition switch turned ON. *Is it 10 – 14V?*	Go to Step 5.	"GRN/ORN" wire circuit open.

Step	Action	Yes	No
5	**Check steering angle sensor power supply circuit** 1) Turn ignition switch to OFF position. 2) Measure resistance between connector terminal “E45-2” and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 6.	“BLK” wire circuit open or high resistance.
6	**Check steering angle sensor** 1) Connect steering angle sensor connector. 2) Check steering angle sensor referring to “Steering Angle Sensor On-Vehicle Inspection: ”. *Is it good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Replace steering angle sensor.

DTC C1038: Steering Angle Sensor Detect Rolling Counter Failure with ESP® Control Module

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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ESP® control module rolling counter failure is detected by steering angle sensor.	• CAN communication circuit • Steering angle sensor • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check: ”.
2	**Check DTC for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is there any DTC(s) other than C1038 and C1090?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check ESP® control module** 1) Turn ignition switch to OFF position. 2) Substitute a known-good steering angle sensor. 3) Calibrate all sensors referring to “Sensor Calibration: ”. 4) Clear all DTC(s) and recheck DTC. *Is DTC C1038 still detected?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Steering angle sensor was malfunction.

DTC C1039: Yaw Rate / G Sensor Assembly Internal Failure

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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Yaw rate / G sensor assembly internal failure is detected.	• Yaw rate / G sensor assembly • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Are DTC C1034 and/or C1073 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check sensor calibration** 1) Calibrate yaw rate / G sensor assembly referring to "Sensor Calibration: ". 2) Clear all DTC(s) and check DTC for ESP®. *Is DTC C1039 still detected?*	Go to Step 4.	Yaw rate / G sensor assembly calibration is incompleted.
4	**Check yaw rate / G sensor assembly** 1) Check yaw rate / G sensor assembly referring to "Yaw Rate / G Sensor Assembly On-Vehicle Inspection: ". *Is it good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Replace yaw rate / G sensor assembly.

DTC C1040: Stability Control System Function Failure

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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Stability control is active for more than specified time without yaw rate change.	• ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**Check DTC for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is there any DTC(s) other than C1040?*	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly and check DTC.

DTC C1041 / C1042 / C1043 / C1044 / C1045 / C1046 / C1051 / C1052 / C1053 / C1054 / C1055 / C1056: Inlet Solenoid Circuit Failure, Outlet Solenoid Circuit Failure, Master Cylinder Cut Solenoid Circuit Failure, Low Pressure Solenoid Circuit Failure

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DTC C1041 / C1045 / C1051 / C1055: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit Failure

DTC C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Circuit Failure

DTC C1043 / C1044: Master Cylinder Cut Solenoid Circuit No. 1 / No. 2 Failure

DTC C1053 / C1054: Low Pressure Solenoid Circuit No. 1 / No. 2 Failure

Refer to “DTC C1041 / C1042 / C1043 / C1044 / C1045 / C1046 / C1051 / C1052 / C1053 / C1054 / C1055 / C1056: Inlet Solenoid Circuit Failure, Outlet Solenoid Circuit Failure, Master Cylinder Cut Solenoid Circuit Failure, Low Pressure Solenoid Circuit Failure: in Section 4E”.

DTC C1050: Back Switch Failure (For M/T Model)

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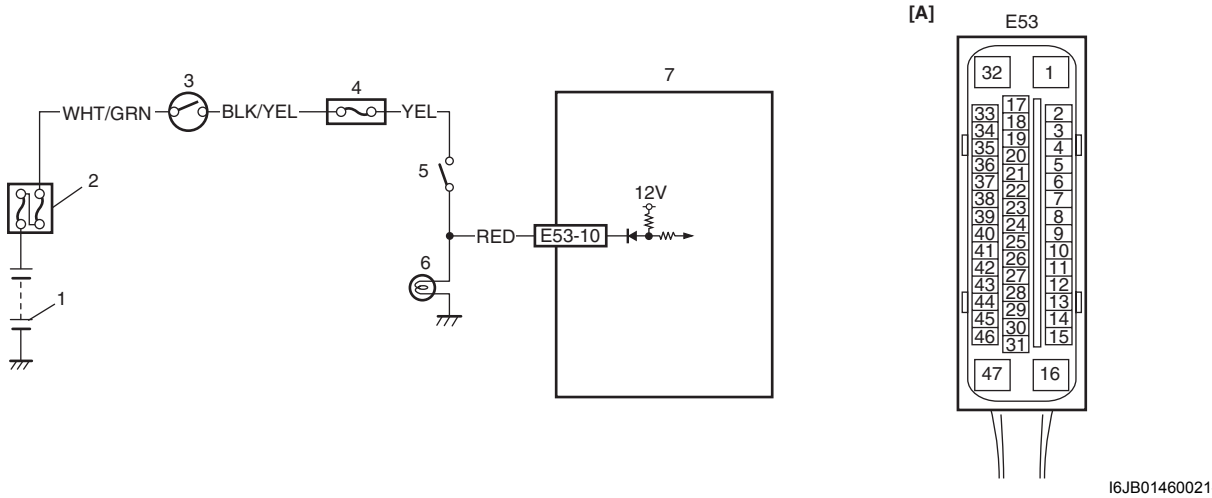
Wiring Diagram



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[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	6. Back-up light
1. Battery	4. Junction block assembly	7. ESP® hydraulic unit control module assembly
2. Main fuse box	5. Back up light switch	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Back up light switch and/or switch circuit failure is detected.	• Back-up light • Back up light switch • Back up light switch circuit • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**Check back up light switch and its circuit** 1) Turn ignition switch to ON position. 2) Check back-up lights, back up light switch and their circuit check referring to "Back-Up Light Symptom Diagnosis: in Section 9B in related manual". *Are they in good condition?*	Go to Step 3.	Repair or replace.
3	**Check back up light switch circuit** 1) Turn ignition switch to OFF position. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector terminal at "E53-10". 4) If OK, then measure voltage between connector terminal "G53-10" and vehicle body ground. *Is it 0 V?*	Go to Step 4.	"RED" wire circuit shorted to power circuit.
4	**Check back up light switch circuit** 1) Turn ignition switch to ON position. 2) Measure voltage between connector terminal "G53-10" and vehicle body ground with the shift lever in "Reverse" position. *Is it 10 – 14 V?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"RED" wire circuit open.

DTC C1057: ESP® (ABS) control module power supply circuit failure

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Refer to "DTC C1057: ABS (EPS,) Control Module Power Supply Circuit Failure: in Section 4E".

DTC C1061: Pump Motor and/or Motor Driver Circuit Failure

S5JB0B4604074

Refer to "DTC C1061: Pump Motor and/or Motor Driver Circuit Failure: in Section 4E".

DTC C1063: Solenoid Valve Power Supply Driver Circuit Failure

S5JB0B4604075

Refer to "DTC C1063: Solenoid Valve Power Supply Driver Circuit Failure: in Section 4E".

DTC C1071: ESP® (ABS) Control Module Internal Defect

S5JB0B4604076

Refer to "DTC C1071: ABS (ESP,) Control Module Internal Defect: in Section 4E".

DTC C1073: Lost Communication With Yaw Rate / G Sensor Assembly

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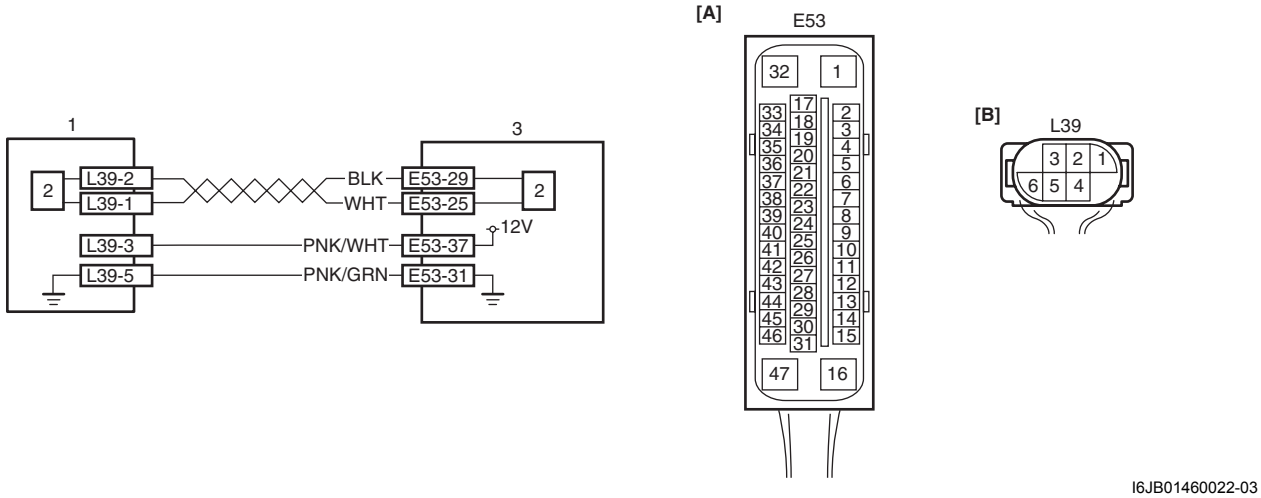
Wiring Diagram



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[A]: ESP® control module connector (viewed from terminal side)	1. Yaw rate / G sensor assembly	3. ESP® hydraulic unit control module assembly
[B]: Yaw rate / G sensor assembly connector (viewed from harness side)	2. CAN driver (for yaw rate / G sensor assembly)	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
CAN line communication error in ESP® control module and yaw rate / G sensor assembly is detected.	• CAN communication circuit (for yaw rate / G sensor assembly) • Yaw rate / G sensor assembly • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC. *Is DTC C1057 detected?*	Go to "DTC C1057: ABS (EPS,) Control Module Power Supply Circuit Failure: in Section 4E".	Go to Step 3.
3	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN (for yaw rate / G sensor assembly). 2) Check DTC for ESP®. *Is DTC C1073 detected?*	Go to Step 4.	Check for intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00 in related manual".
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module and yaw rate / G sensor assembly. *Is each CAN communication circuit between ESP® control module and yaw rate / G sensor assembly opened, shorted or high resistance?*	Repair or replace the CAN communication line.	Go to Step 5.

Step	Action	Yes	No
5	**Check yaw rate / G sensor assembly** 1) Substitute a known-good yaw rate / G sensor assembly. 2) Connect connectors to ESP® control module and yaw rate / G sensor assembly. 3) Clear all DTC(s) and check DTC for ESP®. *Is DTC C1073 still detected?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Yaw rate / G sensor assembly malfunction.

DTC C1075 / 1076 / 1077 / 1078: Steering Angle Sensor / Master Cylinder Pressure Sensor / Longitudinal G Sensor / Lateral G Sensor in Yaw Rate / G Sensor Assembly Calibration Incomplete

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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1075: Missing steering angle sensor calibration point data is detected.	• Steering angle sensor • Steering angle sensor calibration is incompleted • ESP® control module
C1076: Master cylinder pressure sensor calibration is incompleted.	• Master cylinder pressure sensor • Master cylinder pressure sensor calibration is incompleted • ESP® control module
C1077: Longitudinal G sensor in yaw rate / G sensor assembly calibration is incompleted. (for 4WD vehicle)	• Yaw rate / G sensor assembly • Longitudinal G sensor calibration is incompleted • ESP® control module
C1078: Lateral G sensor in yaw rate / G sensor assembly calibration is incompleted.	• Yaw rate / G sensor assembly • Lateral G sensor calibration is incompleted • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is there any DTC(s) other than C1075, C1076, C1077 and C1078?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check sensor calibration** 1) Calibrate all sensors referring to "Sensor Calibration: ". 2) Clear all DTC(s) and recheck DTC for ESP®. *Is DTC C1075, C1076, C1077 and/or C1078 still detected?*	DTC C1075: Replace steering angle sensor. DTC C1076: Replace ESP® hydraulic unit / control module assembly. DTC C1077 / 1078: Replace yaw rate / G sensor assembly.	Calibration is incompleted.

DTC C1090: ECM Detect Rolling Counter Failure with ESP® Control Module

S5JB0B4604079

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ESP® control module rolling counter failure is detected by ECM.	• CAN communication circuit • ECM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is there any DTC(s) other than C1038 and C1090?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**DTC check for ECM** 1) Check DTC for ECM. *Is DTC U0073 and/or DTC U0121 detected?*	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC C1091 / 1093: ECM / 4WD Control Module Data in CAN Line Failure

S5JB0B4604089

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1091: ECM sent invalid signal to ESP® control module.	• Engine control system • ECM • ESP® control module
C1093: 4WD control module sent invalid signal to ESP® control module. (if equipped 4WD control module)	• 4WD control system • 4WD control module • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check other control module than ESP®** 1) Check DTC for ECM and/or 4WD control module. *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC U1073: Control Module Communication Bus Off

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Refer to "DTC U1073: Control Module Communication Bus Off: in Section 4E".

DTC U1100: Lost Communication with ECM (Reception Error)

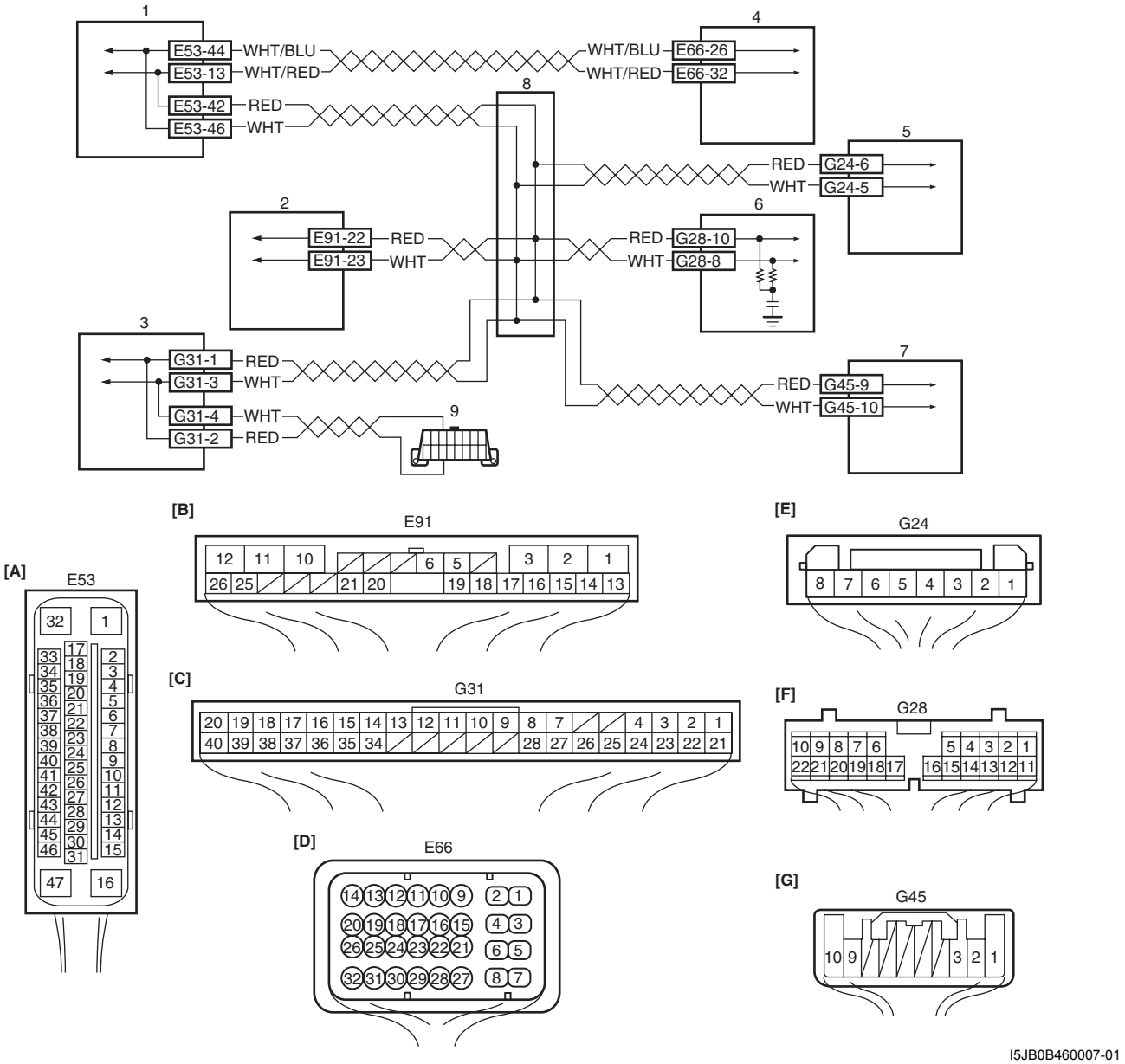
S5JB0B4604082

Refer to "DTC U1100: Lost Communication with ECM (Reception Error): in Section 4E".

DTC U1126: Lost Communication with Steering Angle Sensor (Reception Error)

S5JB0B4604084

Wiring Diagram



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[A]: ESP® control module connector (viewed from terminal side)	[G]: Steering angle sensor connector (viewed from harness side)	6. Combination meter
[B]: 4WD control module connector (viewed from harness side)	1. ESP® hydraulic unit / control module assembly	7. Steering angle sensor
[C]: BCM connector (viewed from harness side)	2. 4WD control module (if equipped)	8. Junction connector
[D]: ECM connector (viewed from harness side)	3. BCM	9. Data link connector (DLC)
[E]: Immobilizer Control module (ICM) connector (viewed from harness side)	4. ECM	
[F]: Combination meter connector (viewed from harness side)	5. Immobilizer Control module (ICM) (if equipped)	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Steering angle sensor message data is missing from CAN communication.	• CAN communication circuit • Steering angle sensor • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check: ".
2	**DTC check for ESP®** 1) Check DTC for ESP®. *Is DTC U1126 and DTC U1073 detected together?*	Go to "DTC U1073: Control Module Communication Bus Off: in Section 4E".	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) Check DTC for ESP® *Is DTC U1126 detected?*	Go to Step 4.	Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00 in related manual".
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module and steering angle sensor communicating by means of CAN. *Is each CAN communication circuit between ESP® control module and steering angle sensor opened, shorted or high resistance?*	Repair or replace the CAN communication line.	Go to Step 5.
5	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. *Is each CAN communication circuit between disconnected control modules (other than ESP® control module and steering angle sensor) opened, shorted or high resistance?*	Go to Step 6.	Repair or replace the CAN communication line.
6	**DTC check for ESP®** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector and check DTC for ESP® in turn. • ECM • BCM • 4WD control module (if equipped) • Immobilizer Control module (ICM) (if equipped) • Combination meter • Steering angle sensor *Is DTC U1126 detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

DTC U1139: Lost Communication with 4WD Control Module (Reception Error) (If Equipped 4WD Control Module)

S5JB0B4604085

Wiring Diagram

Refer to “DTC U1126: Lost Communication with Steering Angle Sensor (Reception Error): ”.

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
4WD control module message data is missing from CAN communication.	• CAN communication circuit • 4WD control module • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check: ”.
2	**DTC check for ESP®** 1) Check DTC for ESP®. *Is DTC U1139 and DTC U1073 detected together?*	Go to “DTC U1073: Control Module Communication Bus Off: in Section 4E”.	Go to Step 3.
3	**DTC check for 4WD control module** 1) Check DTC for 4WD control module. *Is DTC P1073 detected?*	Go to “DTC U1073: Control Module Communication Buss Off: in Section 3C”.	Go to Step 4.
4	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Check DTC for ESP®. *Is DTC U1139 detected?*	Go to Step 4.	Check for intermittent trouble referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”.
5	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module and 4WD control module communicating by means of CAN. *Is each CAN communication circuit between ESP® control module and 4WD control module opened, shorted or high resistance?*	Repair or replace the CAN communication line.	Go to Step 6.
6	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. *Is each CAN communication circuit between disconnected control modules (other than ESP® control module and 4WD control module) opened, shorted or high resistance?*	Repair or replace the CAN communication line.	Go to Step 7.

Step	Action	Yes	No
7	**DTC check for ESP®** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector and check DTC for ESP® in turn. • ECM • BCM • 4WD control module • Immobilizer control module (ICM) (if equipped) • Combination meter • Steering angle sensor *Is DTC U1139 detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

DTC U1140: Lost Communication with BCM (Reception Error)

S5JB0B4604086

Wiring Diagram

Refer to “DTC U1126: Lost Communication with Steering Angle Sensor (Reception Error): ”.

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
BCM message data is missing from CAN communication.	• CAN communication circuit • 4WD control module • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check: ”.
2	**DTC check for ESP®** 1) Check DTC for ESP®. *Is DTC U1101 and DTC U1073 detected together?*	Go to “DTC U1073: Control Module Communication Bus Off: in Section 4E”.	Go to Step 3.
3	**DTC check for BCM** 1) Check DTC for BCM. *Is DTC P1073 detected?*	Go to “DTC U1073 (No. 1073): Control Module Communication Bus Off: in Section 10B”.	Go to Step 4.
4	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Check DTC for ESP®. *Is DTC U1139 detected?*	Go to Step 4.	Check for intermittent trouble referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”.
5	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module and BCM communicating by means of CAN. *Is each CAN communication circuit between ESP® control module and BCM opened, shorted or high resistance?*	Repair or replace the CAN communication line.	Go to Step 6.
6	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. *Is each CAN communication circuit between disconnected control modules (other than ESP® control module and BCM) opened, shorted or high resistance?*	Repair or replace the CAN communication line.	Go to Step 7.
7	**DTC check for ESP®** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector and check DTC for ESP® in turn. • ECM • BCM • 4WD control module • Immobilizer control module (ICM) (if equipped) • Combination meter • Steering angle sensor *Is DTC U1139 detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

Repair Instructions

Hydraulic Unit Operation Check

S5JB0B4606025

Refer to “Hydraulic Unit Operation Check: in Section 4E”.

Sensor Calibration

S5JB0B4606087

⚠ CAUTION

If any DTC(s) other than C1075, C1076, C1077 or C1078 are detected. Repair the detected DTC first.

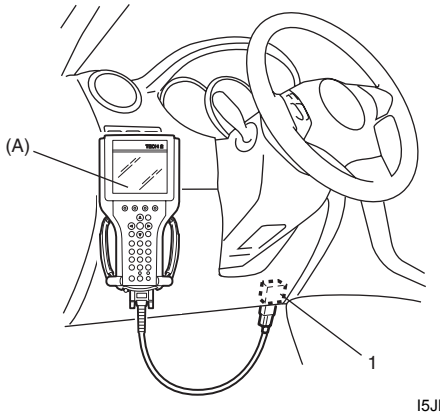
NOTE

Steering angle sensor calibration is needed when battery, dome fuse or the steering angle sensor is removed.
This sensor calibration can be done with/ without SUZUKI Scan Tool.
When ESP® control module and/or yaw rate / G sensor assembly is removed, sensor calibration is needed with SUZUKI Scan Tool.

Sensor Calibration (Using SUZUKI Scan Tool)

1) Set steering wheel in straight-ahead position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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3) Turn ignition switch to ON position and confirm that only any of DTC(s) C1075, C1076, C1077 and/or C1078 is detected. If any other DTC are detected, repair the detected DTC.
4) Park and level the vehicle with parking brake, stop engine with ignition switch ON, set steering in straight and without stepping on the brake.

⚠ CAUTION

Hold the above condition in Step 4) to calibrate sensor correctly until sensor calibration completed.

5) Select menu “SENSOR CALIBRATION” under “MISC. TEST” mode of SUZUKI scan tool and calibrate sensor. Refer to scan tool operator's manual for further derails.
6) After completing the calibration, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

Steering Angle Sensor Calibration (Not Using SUZUKI Scan Tool)

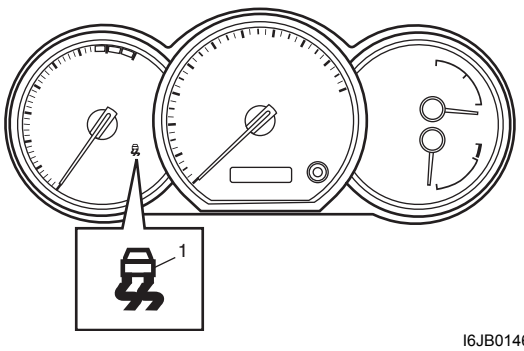
⚠ CAUTION

When power is not supplied to the steering angle sensor by removing battery or fuse, steering angle sensor should be calibrated.

1) Set steering wheel in straight-ahead position.
2) Connect battery terminals and/or fuse and start engine.

⚠ CAUTION

When power is not supplied to the steering angle sensor by removing battery or fuse, DTC C1075 is detected and SLIP indicator lamp (1) flashes.
If DTC other than C1075 is detected, SLIP indicator lamp flushes and other indicator illuminate. In that case, repair the detected DTC first.



I6JB01460024-02

3) Drive vehicle straight on level ground at 15 km/h (9.5 mph) or above for few seconds without spinning wheels. And confirm that SLIP indicator lamp is OFF.

ESP® Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

S5JB0B4606089

Refer to “ABS (ESP,) Hydraulic Unit / Control Module Assembly On-Vehicle Inspection: in Section 4E”.

ESP® Hydraulic Unit / Control Module Assembly Removal and Installation

S5JB0B4606090

Refer to “ABS (ESP,) Hydraulic Unit / Control Module Assembly Removal and Installation: in Section 4E”.

Front Wheel Speed Sensor On-Vehicle Inspection

S5JB0B4606091

Refer to “Front Wheel Speed Sensor On-Vehicle Inspection: in Section 4E in related manual”.

Front Wheel Speed Sensor Removal and Installation

S5JB0B4606092

Refer to “Rear Wheel Speed Sensor Removal and Installation: in Section 4E in related manual”.

Front Wheel Speed Sensor Inspection

S5JB0B4606093

Refer to “Rear Wheel Speed Sensor Inspection: in Section 4E in related manual”.

Rear Wheel Speed Sensor On-Vehicle Inspection

S5JB0B4606094

Refer to “Front Wheel Speed Sensor On-Vehicle Inspection: ” since rear wheel speed sensor is the same as front wheel speed sensor.

Rear Wheel Speed Sensor Removal and Installation

S5JB0B4606095

Refer to “Rear Wheel Speed Sensor Removal and Installation: in Section 4E in related manual”.

Rear Wheel Speed Sensor Inspection

S5JB0B4606096

Refer to “Rear Wheel Speed Sensor Inspection: ” since rear wheel speed sensor is the same as front wheel speed sensor.

Front Wheel Encoder On-Vehicle Inspection

S5JB0B4606097

Refer to “Front Wheel Encoder On-Vehicle Inspection: in Section 4E in related manual”.

Front Wheel Encoder Removal and Installation

S5JB0B4606098

⚠ CAUTION

Front wheel encoder is included in front wheel hub assembly. If front wheel encoder needs to replaced, replace it as a front wheel hub assembly.

For removal and installation of front wheel hub assembly, referring to “Front Wheel Hub Assembly Removal and Installation: in Section 2B in related manual”.

Rear Wheel Encoder On-Vehicle Inspection

S5JB0B4606099

Refer to “Front Wheel Encoder On-Vehicle Inspection: in Section 4E in related manual”.

Rear Wheel Encoder Removal and Installation

S5JB0B4606100

⚠ CAUTION

Rear wheel encoder is included in rear wheel hub assembly. If rear wheel encoder needs to replaced, replace it as a rear wheel hub assembly.

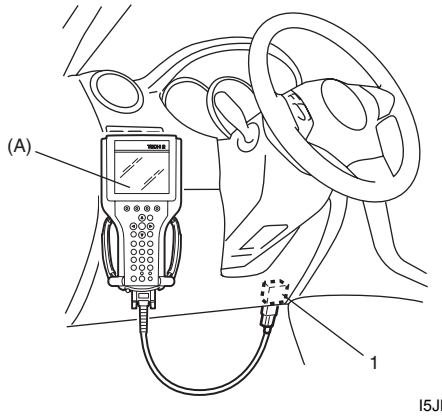
For removal and installation of front wheel hub assembly, referring to “Rear Wheel Hub Assembly Removal and Installation: in Section 2C in related manual”.

Master Cylinder Pressure Sensor On-Vehicle Inspection

S5JB0B4606101

1) Calibrate master cylinder pressure sensor referring to “Sensor Calibration: ”.
2) Check that basic brake system other than ESP® referring to “Brake Diagnosis Note: in Section 4A in related manual”.
3) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



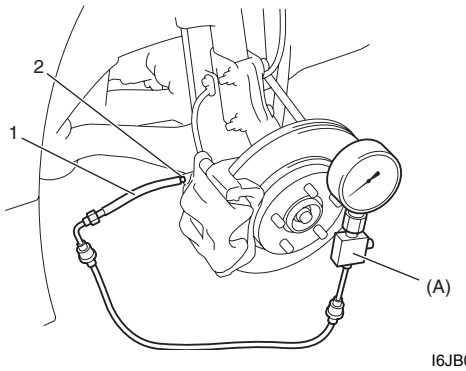
I5JB0A450008-01

4) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool. Refer to scan tool operator's manual for further derails.
5) When brake pedal is released, check “Master Cyl Press” under “DATA LIST” of SUZUKI scan tool.
If pressure is out of specification, replace ESP® hydraulic unit / control module assembly.

Master cylinder pressure specification
Brake pedal released: 0 ± 0.8 MPa (0 ± 8 kg/cm², 0 ± 113 psi)

6) Hoist vehicle and remove right-side front wheel.
7) Connect special tool with rubber hose (1) to Front brake caliper bleeder plug (2).

Special tool
(A): 09956–02311



I6JB01460025-01

8) When bleeder plug loosen and depress brake pedal to make special tool gauge reading 10 MPa (100 kg/cm², 1422 psi), check “Master Cyl Press” under “DATA LIST” of SUZUKI scan tool.
If pressure displayed on SUZUKI scan tool is out of specification, replace ESP® hydraulic unit / control module assembly.

Master cylinder pressure specification
Brake pedal depressed 10 MPa (100 kg/cm², 1422 psi): 10 ± 1.2 MPa (100 ± 12 kg/cm², 1422 ± 170 psi)

9) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.
10) Tighten bleeder plug and bleed air from brake system referring to “Air Bleeding of Brake System: in Section 4A in related manual”.

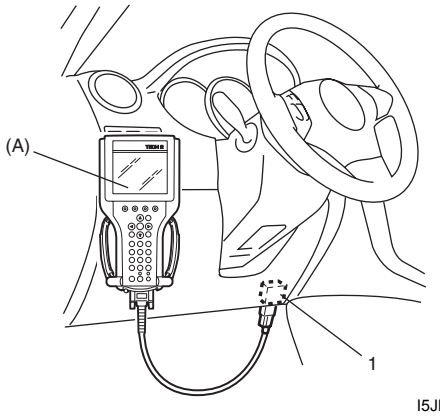
Yaw Rate / G Sensor Assembly On-Vehicle Inspection

S5JB0B4606102

Longitudinal G Inspection

1) Calibrate yaw rate / G sensor assembly referring to “Sensor Calibration: ”.
2) Park and level the vehicle with parking brake and fix wheels with chokes.
3) Check yaw rate / G sensor assembly installation condition.
4) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



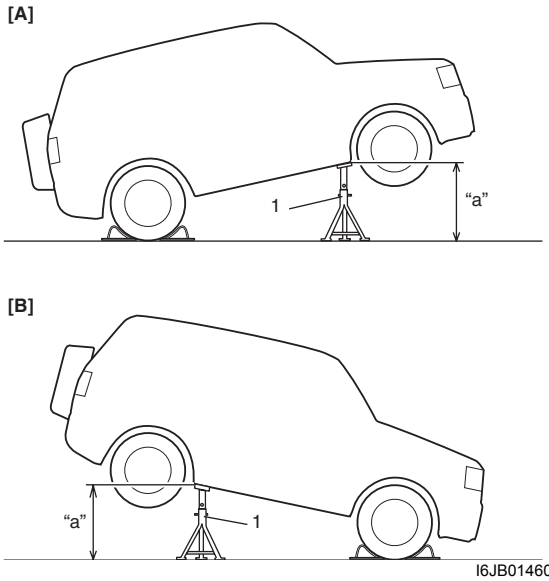
I5JB0A450008-01

5) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool. Refer to scan tool operator's manual for further derails.
6) Check “G Sensor” under “DATA LIST” of SUZUKI scan tool in the following vehicle conditions.
   - Level condition
   - Front-up condition
   - Rear-up condition

   If Longitudinal G condition is out of specification, replace yaw rate / G sensor assembly.

Longitudinal G specification

Vehicle condition	Longitudinal G
Level condition	**0 ± 0.1 G**
Front-up condition	**0.1 ± 0.1 G**
Rear-up condition	**–0.1 ± 0.1 G**



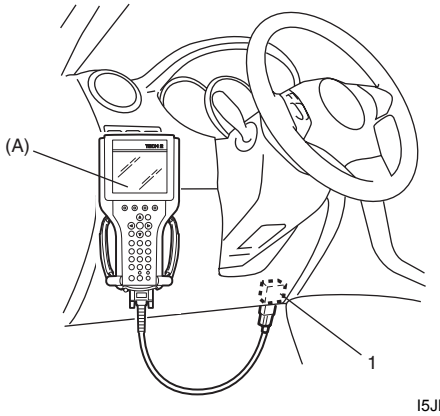
I6JB01460026-01

[A]: Front-up condition	“a”: Approx 400 mm (15.75 in.)
[B]: Rear-up condition	1. Safety stand

Lateral G Inspection

1) Calibrate yaw rate / G sensor assembly referring to “Sensor Calibration: ”.
2) Park and level the vehicle with parking brake and fix wheels with chokes.
3) Check yaw rate / G sensor assembly installation condition.
4) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



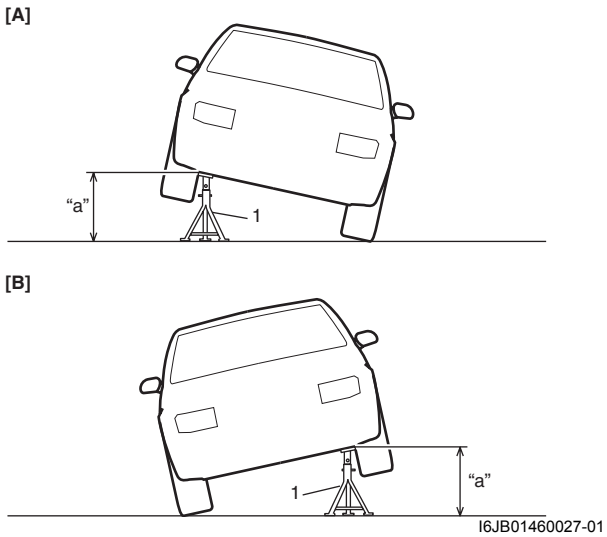
I5JB0A450008-01

5) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool. Refer to scan tool operator's manual for further derails.
6) Check “G Sensor (lateral)” under “DATA LIST” of SUZUKI scan tool in the following vehicle conditions.
   - Level condition
   - Right-up condition
   - Left-up condition

   If Lateral G condition is out of specification, replace yaw rate / G sensor assembly.

Lateral G specification

Vehicle condition	G Sensor (lateral)
Level condition	0 ± 0.1 G
Right -up condition	0.1 ± 0.1 G
Left-up condition	–0.1 ± 0.1 G



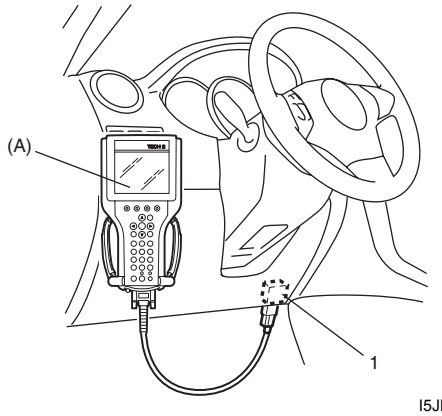
I6JB01460027-01

[A]: Right-up condition	“a”: Approx 350 mm (13.78 in.)
[B]: Left-up condition	1. Safety stand

Yaw Rate Inspection

1) Calibrate yaw rate / G sensor assembly referring to “Sensor Calibration: ”.
2) Check yaw rate / G sensor assembly installation condition.
3) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



I5JB0A450008-01

4) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool. Refer to scan tool operator's manual for further derails.
5) Check “Yaw rate sensor” under “DATA LIST” of SUZUKI scan tool in the following vehicle conditions.
   - Parking condition
   - Drive vehicle in right turning condition with steering wheel fully turned
   - Drive vehicle in left turning condition with steering wheel fully turned

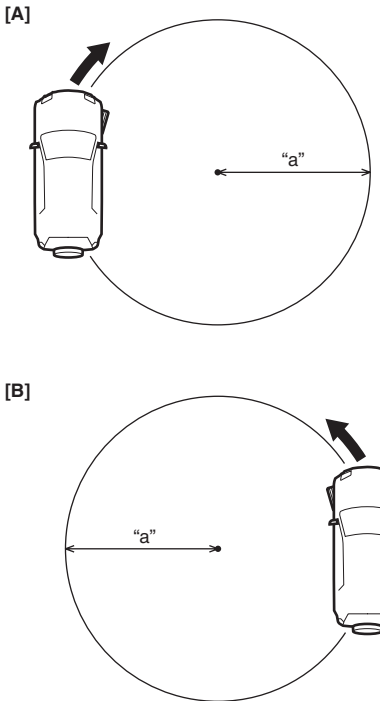
   If yaw rate condition is out of specification, replace yaw rate / G sensor assembly.

Yaw rate specification

Vehicle condition	Yaw rate
Parking	**0 ± 4 deg/s**
Right turning	**30 ± 4 deg/s**
Left turning	**–30 ± 4 deg/s**

NOTE

- **Drive the vehicle on level ground and at 10 km/h (6.2 mph).**
- **Minimum turning radius is 5.3 m (17.4 ft).**



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[A]: Right turning	“a”: Approx 5.3 m (17.4 ft.)
[B]: Left turning	

Yaw Rate / G Sensor Assembly Removal and Installation

S5JB0B4606103

⚠ CAUTION

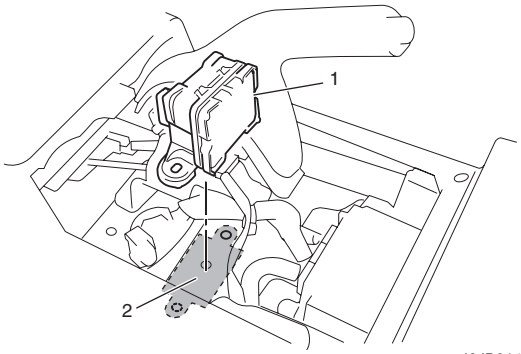
- **When yaw rate / G sensor assembly is replaced, ESP® control module needs zero calibration. Perform zero calibration by SUZUKI scan tool referring to “Sensor Calibration: ”.**
- **Regarding yaw rate / G sensor assembly removal/installation, confirm specified torque and never use impact wrench to avoid damage.**
- **When handling the yaw rate / G sensor assembly, be careful not to drop it or apply an impact to it.**
  If an excessive impact was applied, never attempt disassembly or repair but replace it with a new one.

Removal

1) Disconnect negative (–) cable at battery.
2) Remove console rear panel referring to “Console Box Components: in Section 9H in related manual”.
3) Remove yaw rate / G sensor assembly from floor panel.

Installation

1) Before installing yaw rate / G sensor assembly (1), check installing condition as follows.
   - Deformations around sensor installation area (2) (in floor panel).
   - Foreign matters on mating surface between sensor and floor panel.



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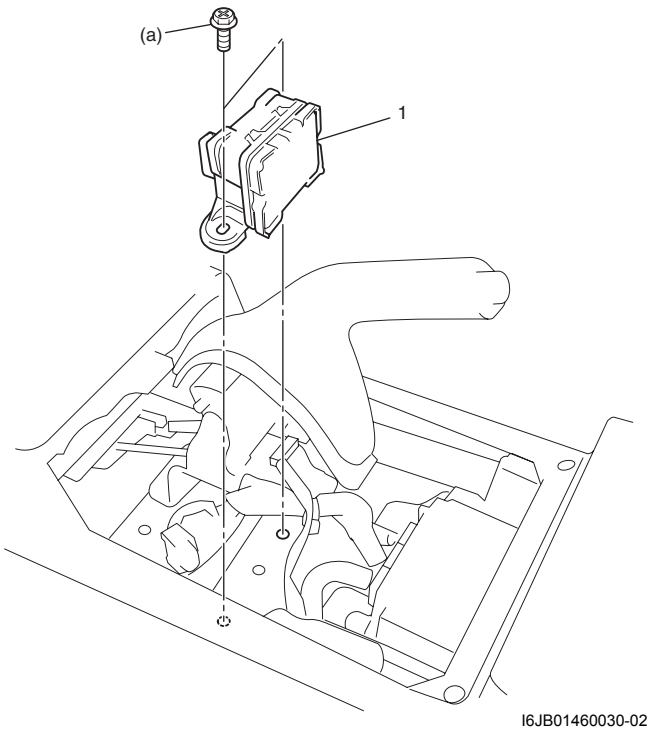
2) Install yaw rate / G sensor assembly (1) to floor panel.

Tightening torque
Yaw rate / G sensor assembly bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)



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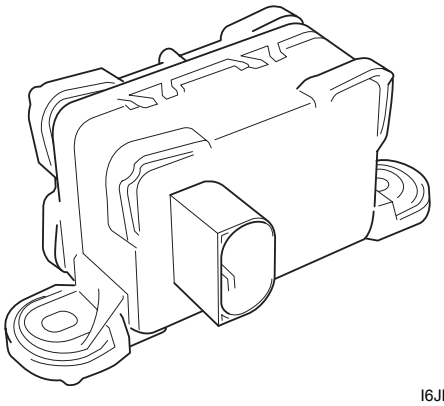
3) Install console rear panel referring to “Console Box Components: in Section 9H in related manual”.
4) Connect negative (–) cable to battery.
5) After completing installation, calibrate yaw rate / G sensor assembly referring to “Sensor Calibration: ”.

Yaw Rate / G Sensor Inspection

S5JB0B4606104

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.

If it is found faulty, replace yaw rate / G sensor assembly.



I6JB01460031-01

Steering Angle Sensor On-Vehicle Inspection

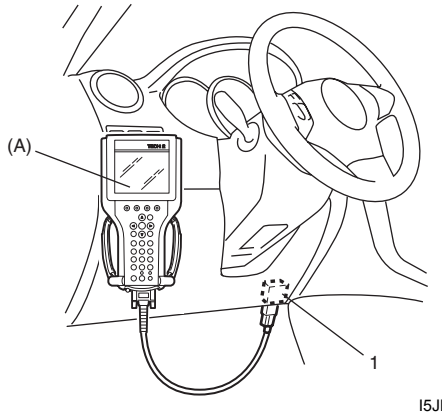
S5JB0B4606105

⚠ CAUTION

Before each inspection, confirm steering angle sensor calibration is completed.
If calibration is incompleted, calibrate sensor referring to “Sensor Calibration: ”.

1) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



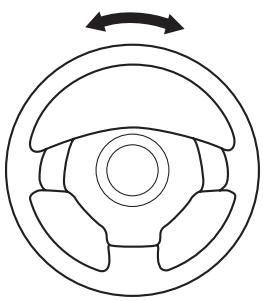
I5JB0A450008-01

2) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool.
Refer to scan tool operator's manual for further derails.
3) Check “Steering angle Sen” under “DATA LIST” of SUZUKI scan tool in the following steering wheel conditions.
   - Front wheels in straight-ahead position
   - Rotate steering wheel a round in clockwise (counter clockwise) from straight-ahead position

If steering angle condition is out of specification, replace steering angle sensor.

Steering angle Specification

Vehicle condition	Steering angle
Front wheels in straight-ahead position	**0 ± 3°**
Rotate steering wheel a round in clockwise	**360 ± 3°**
Rotate steering wheel a round in counterclockwise	**–360 ± 3°**



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Steering Angle Sensor Removal and Installation

S5JB0B4606106

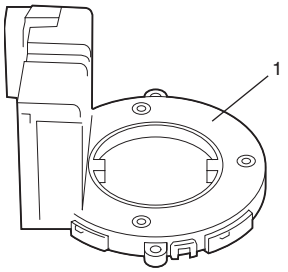
Refer to “Steering Angle Sensor Removal and Installation: in Section 6B”.

Steering Angle Sensor Inspection

S5JB0B4606107

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.

If it is found faulty, replace steering angle sensor (1).



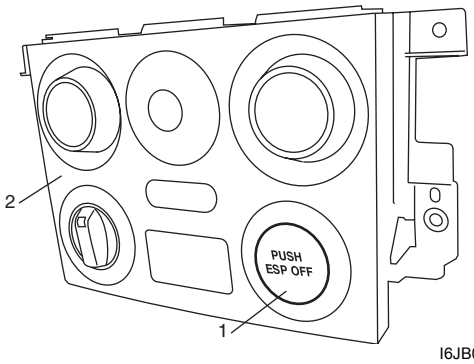
I6JB01460033-01

ESP® OFF Switch Removal and Installation

S5JB0B4606024

Removal

1) Disconnect negative (–) cable at battery.
2) Remove center garnish with audio unit (if equipped) and HVAC control module referring to “Audio Unit Removal and Installation: in Section 9C in related manual”.
3) Remove HVAC control module from center garnish, referring to “HVAC Control Module Removal and Installation: in Section 7A in related manual”.
4) Remove ESP® OFF Switch (1) from center garnish (2).



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Installation

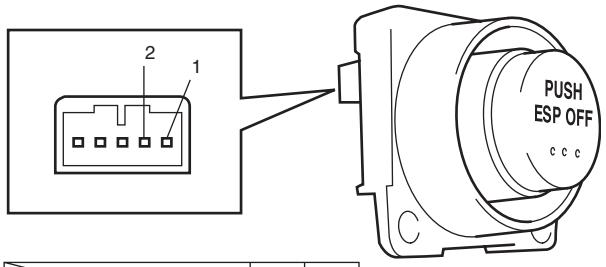
Reverse removal procedure.

ESP® OFF Switch Inspection

S5JB0B4606108

Check for continuity between terminals at each switch position.

If check result is not as specified, replace ESP® OFF switch.



Terminal / ESP OFF switch	1	2
FREE		
PUSH	○	○

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Specifications

Tightening Torque Specifications

S5JB0B4607001

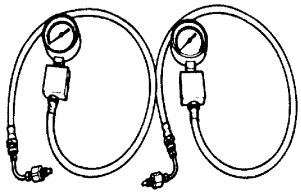
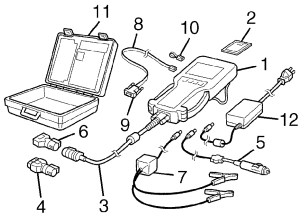
Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Yaw rate / G sensor assembly bolt	8	0.8	6.0	☞

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

Special Tools and Equipment

Special Tool

S5JB0B4608001

09956–02311 Brake pressure gauge ☞		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 5

Transmission / Transaxle

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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 manual.

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Precautions

Precautions

Precautions for Transmission / Transaxle

S5JB0B5000001

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

Fastener Caution
Refer to “Fastener Caution: in Section 00 in related manual”.

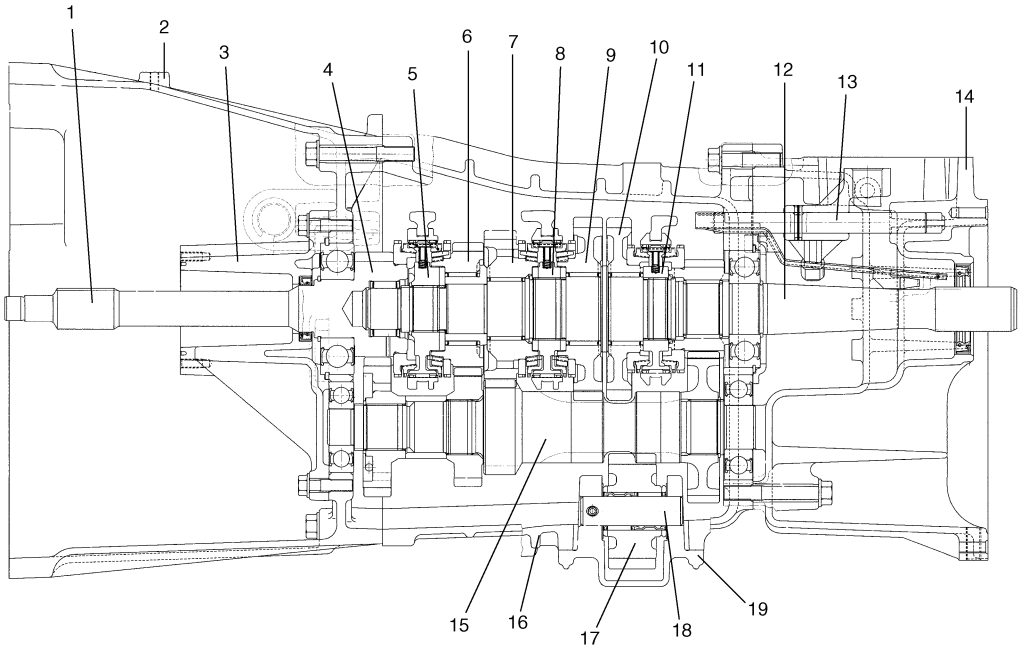
Manual Transmission/Transaxle

General Description

Manual Transmission Construction

S5JB0B5201001

The manual transmission consists of the input shaft, main shaft, countershaft and reverse idle gear shaft which are installed in the die-cast aluminum alloy case. This transmission provides five forward speeds and one reverse speed. The 1st, 2nd and 3rd speeds are for speed reduction drive, 4th speed is for direct drive 5th speed is for speed increasing drive. The low speed (1st and 2nd) synchronizer is mounted on the main shaft and engaged with the main shaft 1st or 2nd gear. The high speed (3rd and 4th) synchronizer is mounted on of the main shaft and engaged with the main shaft 3rd gear or input shaft 4th gear. The 5th & reverse synchronizer is mounted on the main shaft and engaged with the main shaft 5th or reverse gear. The gear shift lever case is located at the upper behind the transmission case and has a cam which prevents direct gear shifting from the 5th speed gear into the reverse gear. The double cone synchronizing mechanism is provided to 1st gear synchromesh. The triple cone synchronizing mechanism is provided to 2nd and 3rd gear synchromesh.
As the die-cast aluminum alloy case are sealed with liquid type gasket, it is necessary to use genuine sealant or its equivalent on its mating surface when reassembling them. Also, the case fastening bolts must be tightened to specified torque by means of the torque wrench and tightening over or below the specified torque should be avoided. The description under “Repair Instructions” covers the transfer partially which is next to the transmission as well, but their gear boxes are independent and each of them has its own drain and filler plugs for the oil change or the level check.



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1. Input shaft	6. 3rd gear	11. 5th & reverse synchronizer hub	16. Rear case
2. Transmission front case	7. 2nd gear	12. Main shaft	17. Reverse idle gear
3. Input shaft bearing retainer	8. Low speed synchronizer hub	13. Reverse shift shaft	18. Reverse idle gear shaft
4. 4th gear	9. 1st gear	14. Adapter case	19. Reverse idle gear case
5. High speed synchronizer hub	10. Reverse gear	15. Countershaft	

Diagnostic Information and Procedures

Manual Transmission Symptom Diagnosis

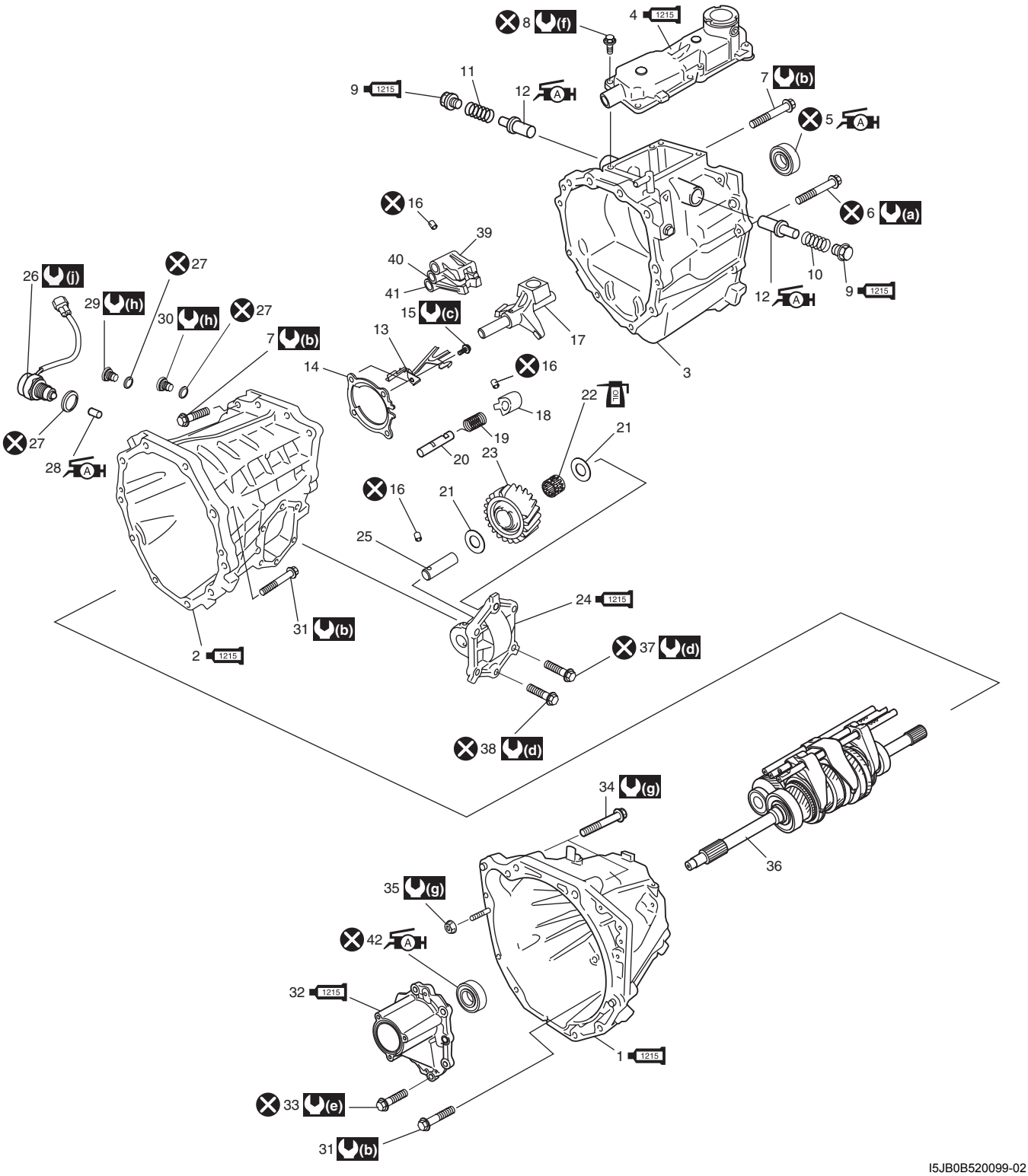
S5JB0B5204001

Condition	Possible cause	Correction / Reference Item
Gear slipping out of mesh	Worn shift fork shaft	*Replace.*
	Worn shift fork or synchronizer sleeve	*Replace.*
	Weak or damaged locating spring	*Replace.*
	Worn bearings on input shaft, countershaft or main shaft	*Replace.*
	Worn chamfered tooth on sleeve or gear	*Replace sleeve and gear.*
	Missing or disengagement of snap ring(s)	*Install or replace.*
Gears refusing to disengage	Weakened or broken synchronizer key spring	*Replace.*
	Distorted shift shaft or shift fork	*Replace.*
Hard shifting	Improper clutch pedal free travel	*Replace pedal arm and/or clutch master cylinder.*
	Distorted or broken clutch disc	*Replace.*
	Damaged clutch pressure plate	*Replace clutch cover.*
	Air in clutch hydraulic system	*Bleed air.*
	Fluid leakage from clutch fluid line	*Locate leaking point and repair.*
	Worn synchronizer ring	*Replace.*
	Worn chamfered tooth on sleeve or gear	*Replace sleeve and gear.*
	Distorted shift shaft	*Replace.*
Noise	Inadequate or insufficient lubricant	*Replenish.*
	Damaged or worn bearing(s)	*Replace.*
	Damaged or worn gear(s)	*Replace.*
	Damaged or worn synchronizer ring	*Replace.*
	Damaged or worn chamfered tooth on sleeve or gear	*Replace.*

Repair Instructions

Manual Transmission Assembly Components

S5JB0B5206001



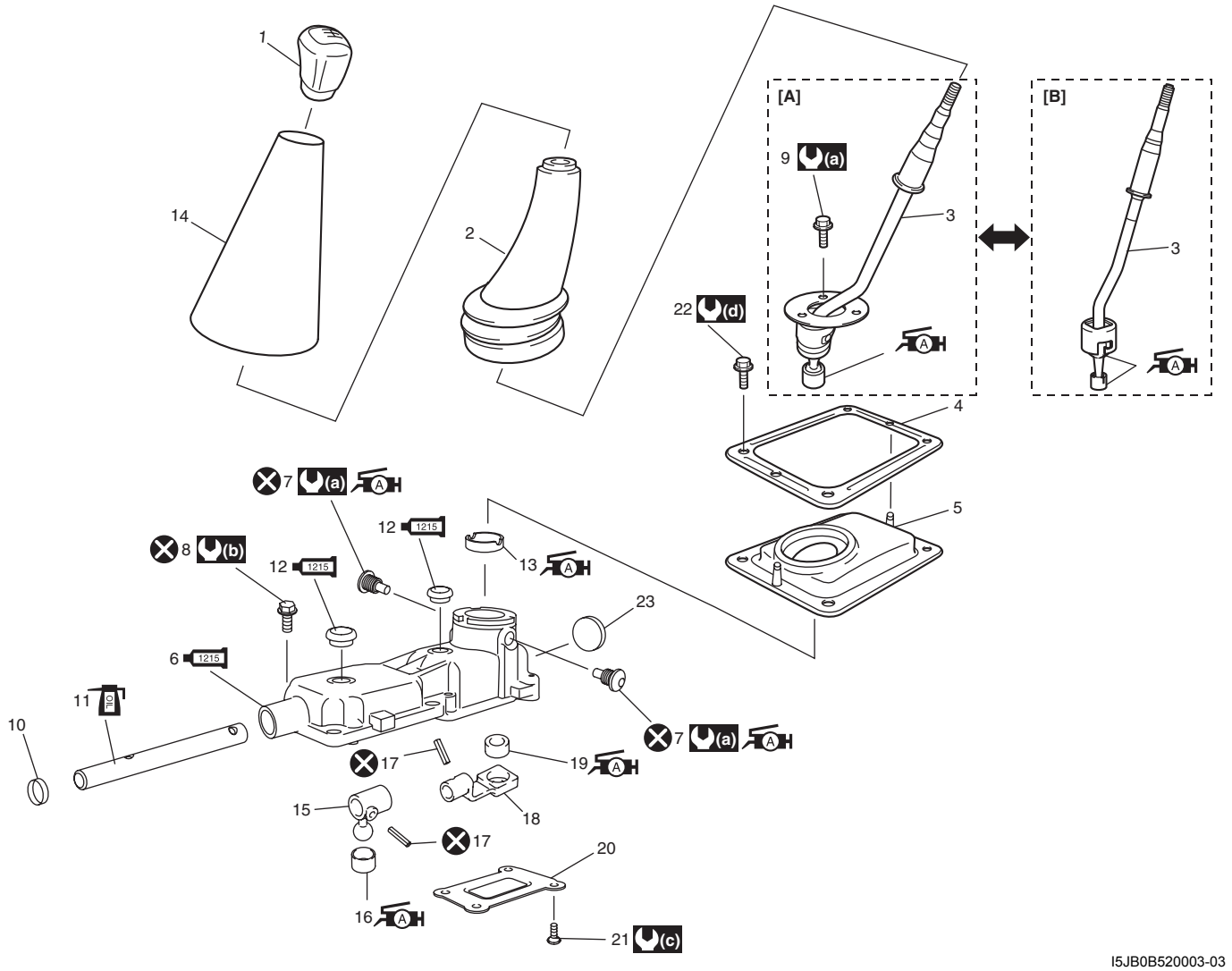
I5JB0B520099-02

1215 1. Transmission front case : Apply sealant 99000-31110 to mating surface of front case and rear case.	19. Reverse shift limit cam spring	37. Reverse idle gear case No.1 bolt
1215 2. Transmission rear case : Apply sealant 99000-31110 to mating surface of rear case and adapter case.	20. Reverse shift shaft	38. Reverse idle gear case No.2 bolt
3. Adapter case	21. Reverse idle gear washer	39. 5th & reverse gear shift yoke

1215 4. Gear shift lever case assembly : Apply sealant 99000-31110 to mating surface of gear shift lever case assembly and rear case.	22. Reverse idle gear needle bearing	40. High speed gear shift yoke
A 5. Adapter case oil seal : Apply grease 99000-25010 to oil seal lip.	23. Reverse idle gear	41. Low speed gear shift yoke
6. Adapter case No.1 bolt	1215 24. Reverse idle gear case : Apply sealant 99000-31110 to mating surface of reverse idle gear case and rear case.	A 42. Input shaft bearing retainer oil seal : Apply grease 99000-25010 to oil seal lip.
7. Adapter case No.2 bolt	25. Reverse idle gear shaft	(a) : 54 N·m (5.4 kgf-m, 39.0 lb-ft)
8. Gear shift lever case bolt	26. Back up light switch	(b) : 45 N·m (4.5 kgf-m, 32.5 lb-ft)
1215 9. Select return bolt : Apply sealant 99000-31110 to all around thread part of bolt	27. Washer	(c) : 22 N·m (2.2 kgf-m, 16.0 lb-ft)
10. Select return low speed spring (short)	A 28. Back up light switch pin : Apply grease 99000-25010 to end of pin.	(d) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
11. Select return 5th & reverse spring (long)	29. Oil level/filler plug	(e) : 26 N·m (2.6 kgf-m, 19.0 lb-ft)
A 12. Select guide pin	30. Oil drain plug	(f) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
13. Oil gutter	31. Transmission front case bolt	(g) : 55 N·m (5.5 kgf-m, 40.0 lb-ft)
14. Rear bearing plate	1215 32. Input shaft bearing retainer : Apply sealant 99000-31110 to mating surface of input shaft bearing retainer and front case.	(h) : 35 N·m (3.5 kgf-m, 25.5 lb-ft)
15. Rear bearing plate bolt	33. Input shaft bearing retainer bolt	(j) : 39 N·m (3.9 kgf-m, 28.5 lb-ft)
16. Pin	34. Transmission to engine bolt	: Do not reuse.
17. Gear shift & select lever assembly	35. Transmission to engine nut	: Apply transmission oil.
18. Reverse shift limit cam	36. Input shaft, main shaft & countershaft assembly	

Gear Shift Lever Case Assembly Components

S5JB0B5206002

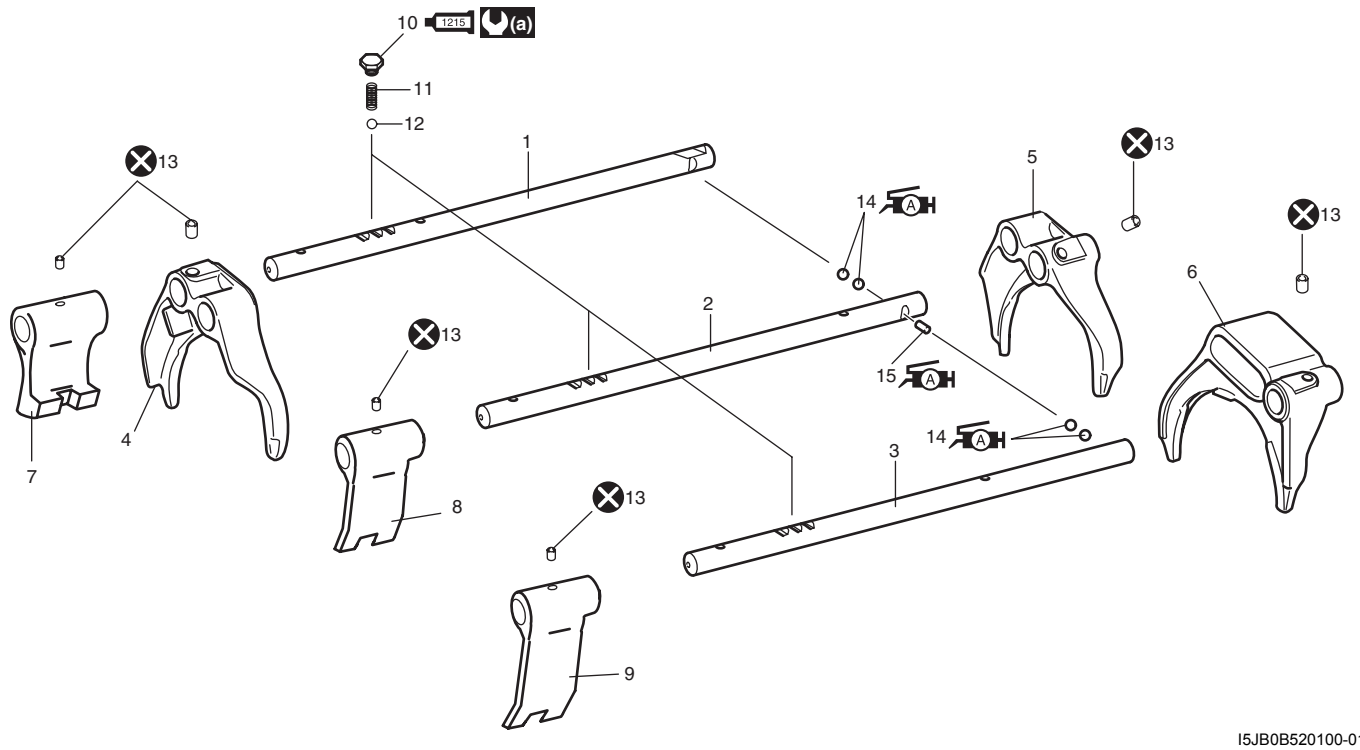


I5JB0B520003-03

[A]: Fix with bolt type	10. Gear shift lever case front plug	21. Gear shift lever case plate screw
[B]: Fix without bolt type	11. Gear shift shaft	22. Control lever boot cover bolt
1. Gear shift control lever knob	1215 12. Gear shift lever case upper plug : Apply sealant 99000-31110 to plug.	23. Gear shift lever case rear plug
2. Gear shift control lever boot No.2	13. Gear shift lever case seat : Apply grease 99000-25010 to inside and outside of seat.	(a) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
3. Gear shift control lever assembly : Apply grease 99000-25010 to bush of lever.	14. Gear shift lever silencer	(b) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
4. Gear shift control boot cover	15. Gear shift lever	(c) : 6 N·m (0.6 kgf-m, 4.5 lb-ft)
5. Gear shift control lever boot No.1	16. Gear shift control lever bush : Apply grease 99000-25010 to inside of bush.	(d) : 12 N·m (1.2 kgf-m, 9.0 lb-ft)
1215 6. Gear shift lever case : Apply sealant 99000-31110 to mating surface of gear shift lever case and rear case.	17. Pin	: Do not reuse.
7. Control lever locating bolt : Apply grease 99000-25010 to end of bolt.	18. Gear shift arm	FO : Apply transmission oil.
8. Gear shift lever case bolt	19. Gear shift control bush : Apply grease 99000-25010 to inside and outside of bush.	
9. Gear shift lever case cover bolt	20. Gear shift case plate	

Gear Shift Shaft and Fork Components

S5JB0B5206004

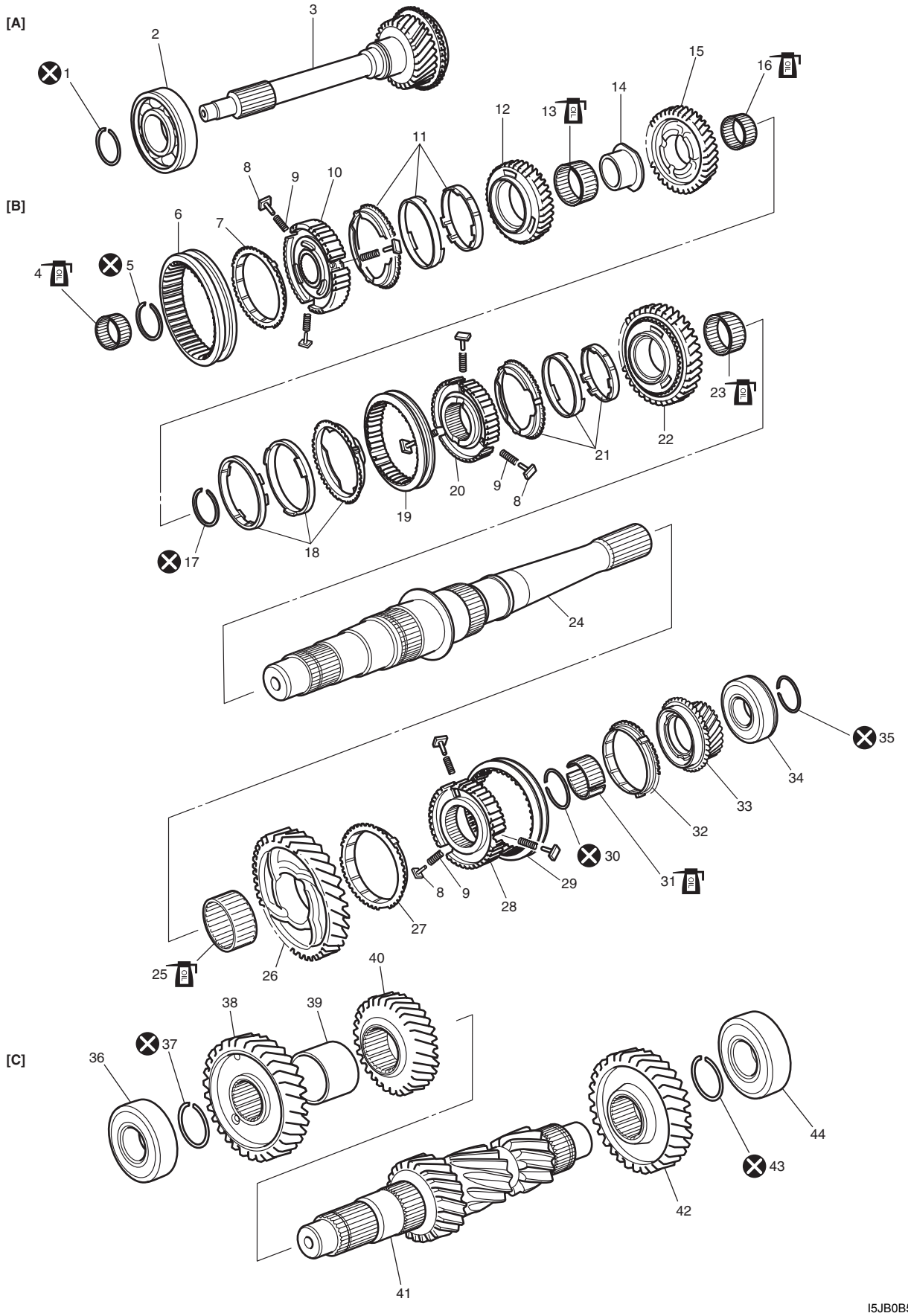


I5JB0B520100-01

1. 5th & reverse gear shift shaft	7. 5th & reverse gear shift yoke	13. Pin
2. High speed gear shift shaft	8. High speed gear shift yoke	A 14. Gear shift shaft ball : Apply grease 99000-25010 to ball.
3. Low speed gear shift shaft	9. Low speed gear shift yoke	A 15. Shift shaft interlock pin : Apply grease 99000-25010 to pin.
4. 5th & reverse gear shift fork	1215 10. Gear shift locating bolt : Apply sealant 99000-31110 to bolt thread.	(a) : 19 N·m (1.9 kgf-m, 14.0 lb-ft)
5. High speed gear shift fork	11. Gear shift locating spring	: Do not reuse.
6. Low speed gear shift fork	12. Gear shift locating ball	

Input Shaft Assembly, Main Shaft Assembly and Countershaft Assembly Components

S5JB0B5206005



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[A]: Input shaft assembly	15. 2nd gear	32. 5th gear synchronizer ring
[B]: Main shaft assembly	16. 2nd gear needle bearing	33. 5th gear

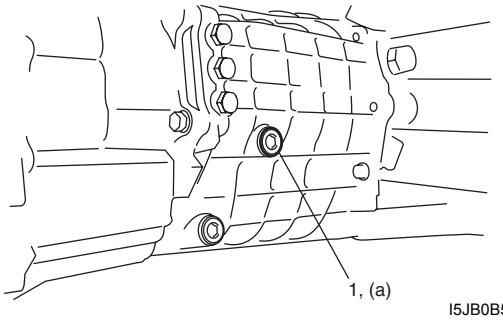
[C]: Countershaft assembly	17. Low speed synchronizer hub circlip	34. Input shaft rear bearing
1. Input shaft front bearing circlip	18. 2nd gear synchronizer ring assembly	35. Input shaft rear bearing circlip
2. Input shaft front bearing	19. Low speed synchronizer sleeve	36. Countershaft front bearing
3. Input shaft	20. Low speed synchronizer hub	37. Countershaft front bearing circlip
4. Input shaft needle bearing	21. 1st gear synchronizer ring assembly	38. Countershaft reduction gear
5. High speed synchronizer hub circlip	22. 1st gear	39. Countershaft high speed gear spacer
6. High speed synchronizer sleeve	23. Low gear needle bearing	40. Countershaft 3rd gear
7. 4th gear synchronizer ring	24. Main shaft	41. Countershaft
8. Synchronizer key	25. Reverse gear needle bearing	42. Countershaft 5th gear
9. Synchronizer key spring	26. Reverse gear	43. Countershaft rear bearing circlip
10. High speed synchronizer hub	27. Reverse gear synchronizer ring	44. Countershaft rear bearing
11. 3rd gear synchronizer ring assembly	28. 5th & reverse synchronizer hub	: Do not reuse.
12. 3rd gear	29. 5th & reverse synchronizer sleeve	: Apply transmission oil.
13. 3rd gear needle bearing	30. 5th & reverse synchronizer hub circlip	
14. 3rd gear bush	31. 5th gear needle bearing	

Manual Transmission Oil Level Check

S5JB0B5206034

1) Lift up vehicle and check oil leakage.
2) Remove oil level/filler plug (1) with washer and check oil level is lower end of oil level/filler plug hole (2). If oil is insufficient, pour specified oil up to plug hole.
3) Install oil level/filler plug with new washer, and then tighten it to specified torque.

Tightening torque
Transmission oil level / filler plug (a): 35 N·m (3.5 kgf-m, 25.0 lb-ft)



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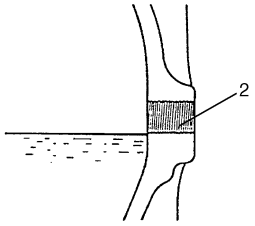

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Manual Transmission Oil Change

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1) Before changing oil, be sure to stop engine and lift vehicle horizontally.
2) With vehicle lifted up, check leakage. If leakage exists, correct or repair it.
3) Remove oil level/filler plug (2) with washer.
4) Remove drain plug (1) with washer, and drain oil.
5) Install drain plug with new washer, and tighten it to specified torque.

Tightening torque
Transmission oil drain plug (a): 35 N·m (3.5 kgf-m, 25.0 lb-ft)

NOTE

If water or rust is mixed in drained oil, be sure to check breather hose and boot of transmission.

6) Pour new specified oil until oil level reaches bottom of oil filler plug hole (3) as shown in figure.

NOTE

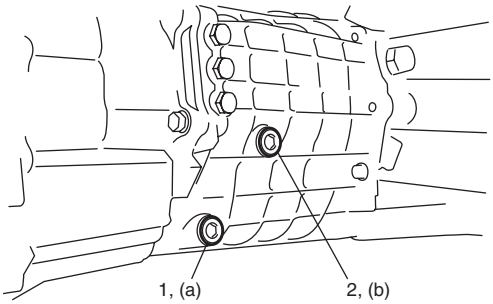
It is highly recommended to use API 75 W-90 gear oil.

Gear oil specifications
: API GL-4 (For SAE classification, refer to viscosity chart [A] in figure.)

Transmission gear oil capacity (Reference)
2.0 liters (4.2 / 3.5 US / Imp. pt)

7) Install oil level/filler plug with new washer, and then tighten it to specified torque.

Tightening torque
Oil filler plug (b): 35 N·m (3.5 kgf-m, 25.0 lb-ft)



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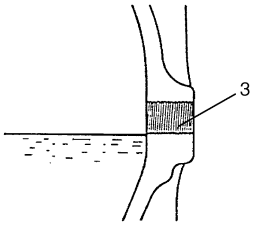

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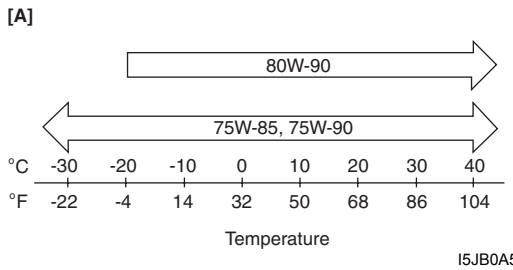


I5JB0A520021-02

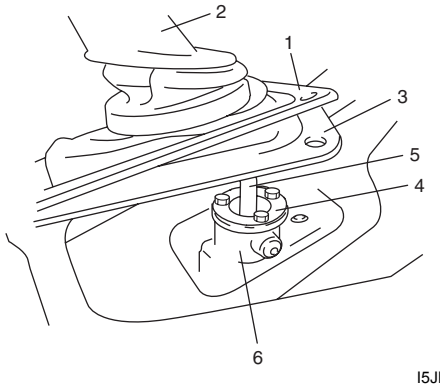
Transmission Shift Control Lever Removal and Installation

S5JB0B5206007

Fix with bolt type

Removal

1) Remove front console box referring to “Console Box Components: in Section 9H in related manual”.
2) Lift up boot cover (1), boot (2) and sheet (3).
3) Remove case cover (4) and take out shift control lever (5) from gear shift lever case (6).



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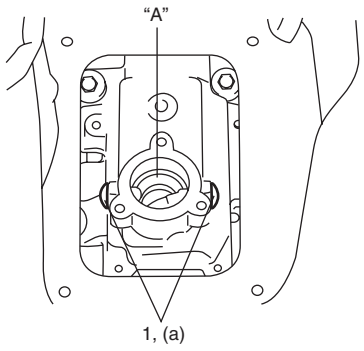
Installation

1) Tighten new control lever locating bolts (1) to specified torque, if removed.

Tightening torque
Control lever locating bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

2) Apply grease to pivot portions and seat, then install shift control lever.

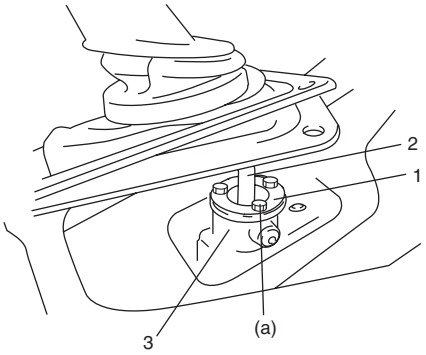
“A”: Grease 99000–25010 (SUZUKI Super Grease A)



I5JB0B520008-01

3) Set shift control lever (2) to gear shift lever case.
4) Install case cover (1) to gear shift lever case (3). Tighten case cover bolt to specified torque.

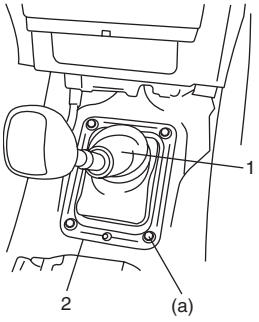
Tightening torque
Case cover bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)



I5JB0B520009-01

5) Install sheet, boot (1) with boot cover (2) to floor panel.

Tightening torque
Control lever boot cover bolt (a): 12 N·m (1.2 kgf-m, 9.0 lb-ft)



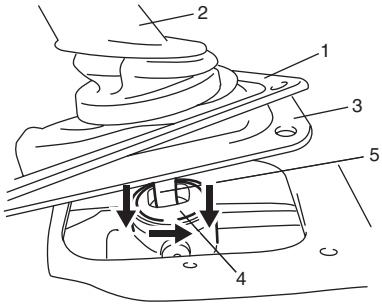
I5JB0A520027-02

6) Install front console box referring to “Console Box Components: in Section 9H in related manual”.

Fix without bolt type

Removal

1) Remove front console box referring to “Console Box Components: in Section 9H in related manual”.
2) Lift up boots cover (1), boot (2) and sheet (3).
3) With gear shift control case cover (4) pushed down with fingers, turn it to counter clockwise and take out shift control lever (5).



I5JB0B520111-02

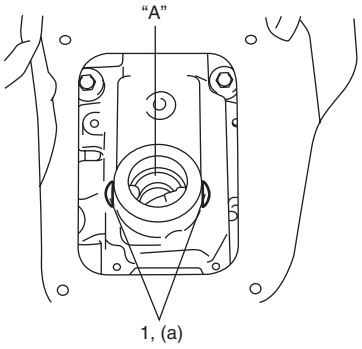
Installation

1) Tighten new control lever locating bolts (1) to specified torque, if removed.

Tightening torque
Control lever locating bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

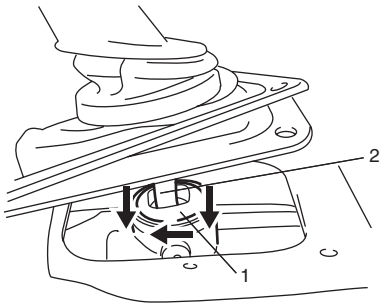
2) Apply grease to pivot portions and seat, then install shift control lever.

“A”: Grease 99000–25010 (SUZUKI Super Grease A)



I5JB0B520112-01

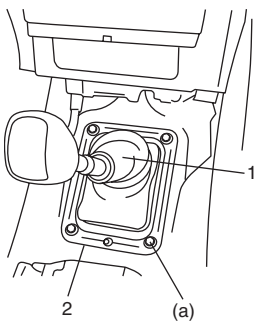
3) Set shift control lever (2) to gear shift lever case.
4) With gear shift control case cover (1) pushed down by hand, turn gear shift control case cover (1) to clockwise.



I5JB0B520113-01

5) Install sheet, boot (1) with boot cover (2) to floor panel.

Tightening torque
Control lever boot cover bolt (a): 12 N·m (1.2 kgf-m, 9.0 lb-ft)



I5JB0A520027-02

6) Install front console box referring to “Console Box Components: in Section 9H in related manual”.

Transmission Shift Control Lever Inspection

S5JB0B5206008

- Check transmission shift control lever lower portion and control lever locating sheet for excessive wear.
- Check boot for damage.

Correct or replace if necessary.

Back Up Light Switch Removal and Installation

S5JB0B5206009

Removal

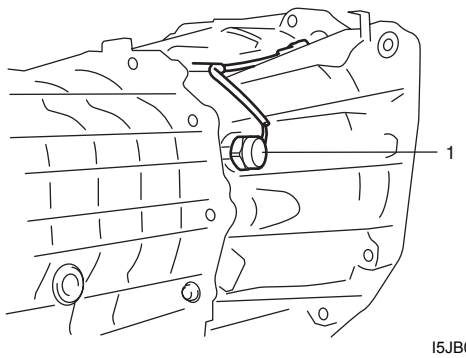
⚠ WARNING

Refrain from work while exhaust No.2 pipe is hot.

NOTE

- **When replacing switch, use care not to let dust enter transmission through switch hole.**

1) Hoist vehicle and disconnect connector from back up light switch.
2) Remove back up light switch (1), washer and pin from transmission front case.



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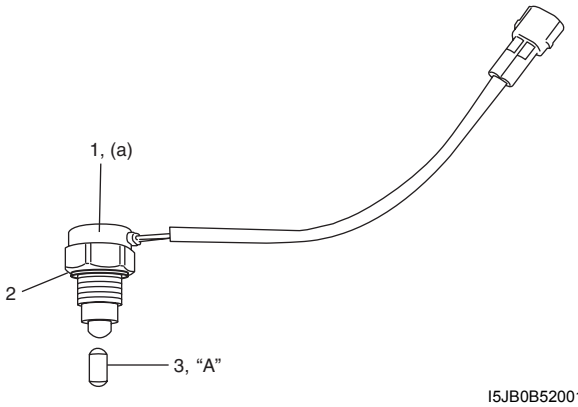
Installation

Reverse removal procedure for installation noting the following.

- Apply grease to back up light switch pin (3) and then install back up light switch (1), new washer (2) and pin to transmission front case.

  "A": Grease 99000–25010 (SUZUKI Super Grease A)

  Tightening torque
  Back up light switch (a): 39 N·m (3.9 kgf-m, 28.5 lb-ft)



I5JB0B520011-01

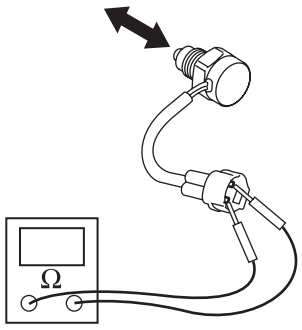
- Check back up light for proper function with ignition switch turned ON and reverse position.

Back Up Light Switch Inspection

S5JB0B5206010

Check back up light switch for function using ohmmeter. If resistance is not as specified below, replace back up light switch.

Back up lamp switch specification
Switch ON (Push): Continuity
Switch OFF (Release): No continuity



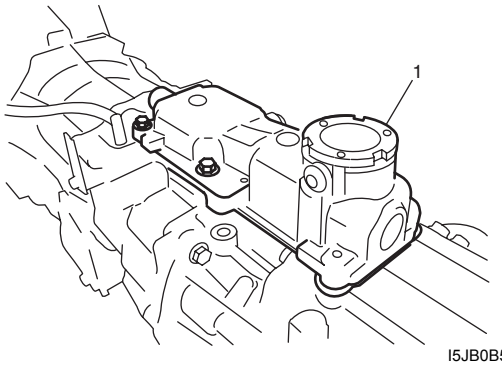
I5JB0B520012-01

Gear Shift Lever Case Assembly Removal and Installation

S5JB0B5206014

Removal

1) Dismount transmission assembly referring to “Manual Transmission Assembly Dismounting and Remounting: ”
2) Remove gear shift lever case assembly (1) from transmission adapter case.

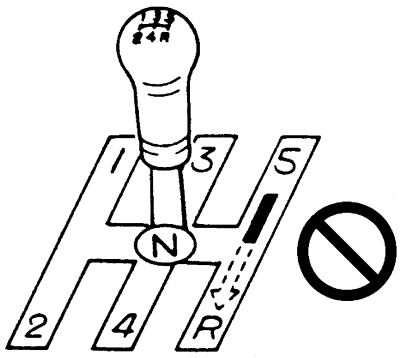


I5JB0B520013-01

Installation

NOTE

- **Install gear shift lever case to transmission adapter case without using sealant for functional check.**
- **Install shift control lever and check to make sure that it shifts smoothly according to shift pattern as shown in the figure.**



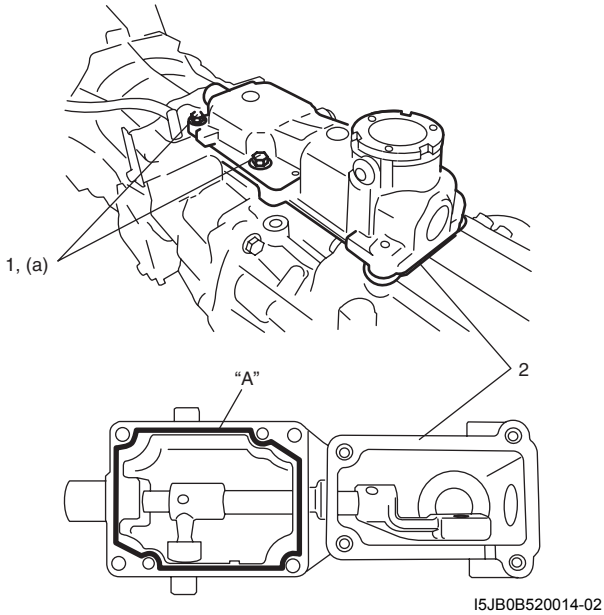
I5JB0A520010-01

1) Clean mating surface of both adapter case and gear shift lever case (2), and uniformly apply sealant to lever case as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, and then mate it with gear shift lever case.

“A”: Sealant 99000–31110 (SUZUKI Bond No.1215)

2) Install lever case to adapter case, and then tighten new lever case bolts (1) to specified torque.

Tightening torque
Gear shift lever front case bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)



I5JB0B520014-02

3) Remount transmission assembly referring to “Manual Transmission Assembly Dismounting and Remounting: ”

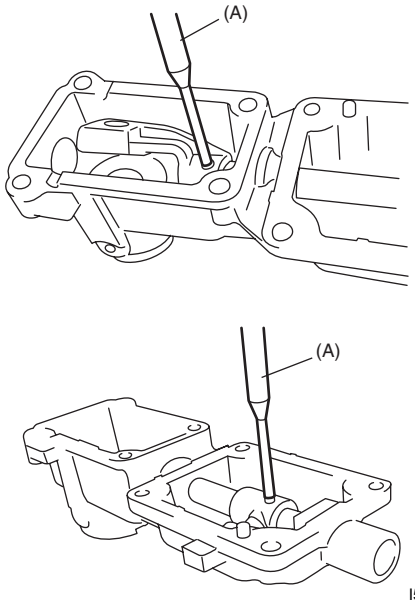
Gear Shift Lever Case Assembly Disassembly and Reassembly

S5JB0B5206015

Disassembly

1) Remove gear shift case plate.
2) Drive out gear shift arm pin and gear shift lever pin using special tool, and then disassemble components parts.

Special tool
(A): 09922–85811

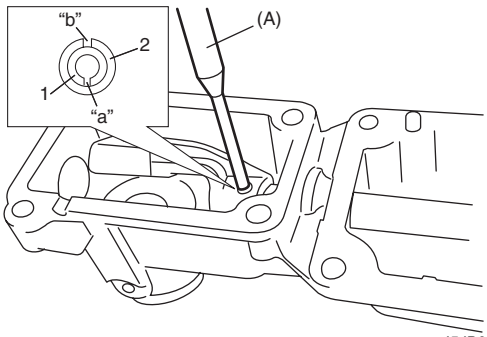


I5JB0B520015-01

Reassembly

1) Clean all pants thoroughly, inspect them and replace with new one as required.
2) Assemble components parts referring to “Gear Shift Lever Case Assembly Components: ”.
3) Set new gear shift arm inner pin (1) and outer pin (2) facing each gap (“a”, “b”) in the opposite direction as shown in figure.
Drive gear shift arm pins and gear shift lever pins by using special tool.

Special tool
(A): 09922–85811



I5JB0B520016-01

4) Install gear shift case plate to gear shift lever case and tighten them to specified torque.

Tightening torque
Gear shift lever case plate screw: 6 N·m (0.6 kgf-m, 4.5 lb-ft)

Gear Shift Lever Case Assembly Inspection

S5JB0B5206016

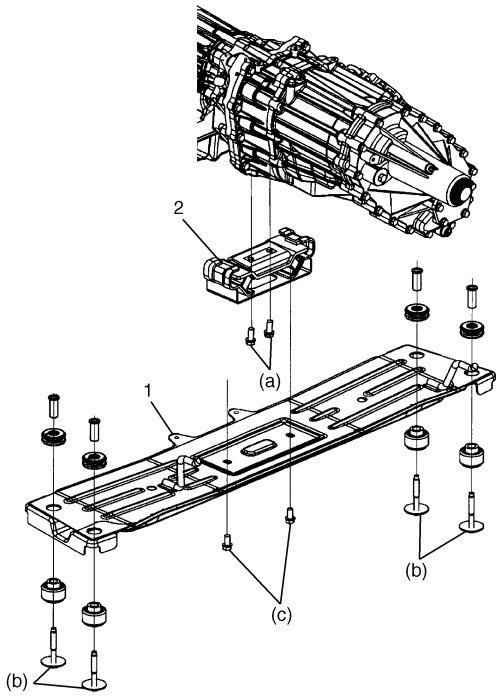
- Check that gear shift shaft moves smoothly without abnormal noise. If abnormality is found, replace defective part.
- Check bushes and boot for damage and deterioration. If abnormality is found, replace defective part.

Engine Rear Mounting Replacement

S5JB0B5206017

When replacement of mounting parts are necessary, torque bolts as specified below.

Tightening torque
Engine rear mounting No.1 bolt (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)
Engine rear mounting member bolt (b): 55 N·m (5.5 kgf-m, 40.0 lb-ft)
Engine rear mounting No.2 bolt (c): 55 N·m (5.5 kgf-m, 40.0 lb-ft)



I5JB0A520015-01

1. Engine rear mounting member	2. Engine rear mounting

Manual Transmission Assembly Dismounting and Remounting

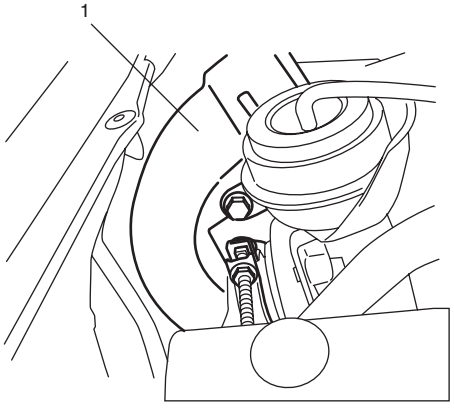
S5JB0B5206018

Dismounting

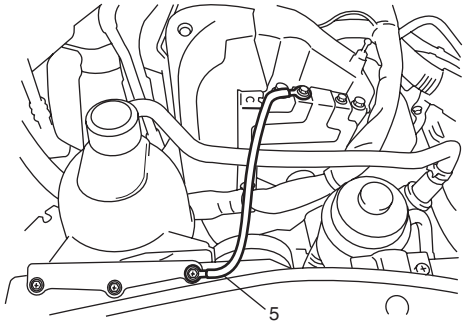
1) Disconnect negative (–) cable of battery.
2) Remove transmission shift control lever referring to “Transmission Shift Control Lever Removal and Installation: ”.
3) Remove turbocharger inlet pipe (1), vacuum pump (2), engine hanger bracket, throttle body (3), noise suppressor wire (5) and air intake pipe (4).

⚠ CAUTION

When removing manual transmission, after remove turbocharger inlet pipe, noise suppressor wire and vacuum pump. Otherwise, heater hoses, noise suppressor wire and vacuum pump is damaged.

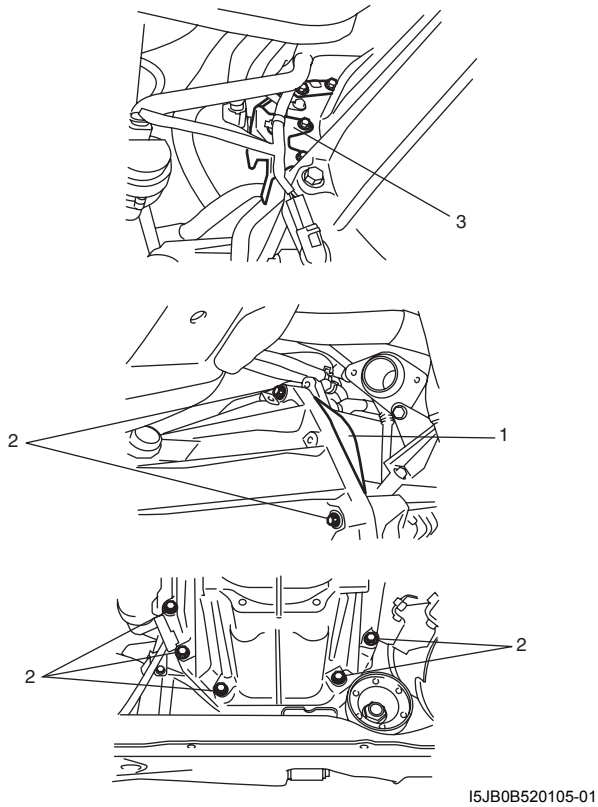


I5JB0B520103-01



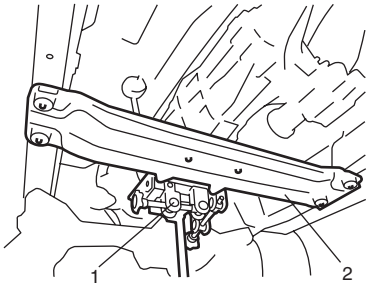
I5JB0B520017-02

4) Detach engine harness clamps and ground wire harness from transmission front case.
5) Remove starting motor fastening bolts and transmission fastening bolts.
6) Disconnect clutch fluid pipe from joint referring to “Clutch Fluid Pipe and Hose Removal and Installation: in Section 5C in related manual”.
7) Hoist vehicle.
8) Drain oil from transmission and transfer.
9) Remove propeller shafts referring to “Propeller Shaft Removal and Installation: in Section 3D”.
10) Remove exhaust No. 2 pipe.
11) Remove engine under cover.
12) Disconnect the following couplers and release their harness from clamps.
    - CKP sensor
    - Back up light switch
    - Transfer shift actuator
    - 4L/N switch
    - Center differential lock switch
13) Remove clutch housing plate (1) and harness bracket (3).
14) Remove transmission fastening nut and bolts (2).



I5JB0B520105-01

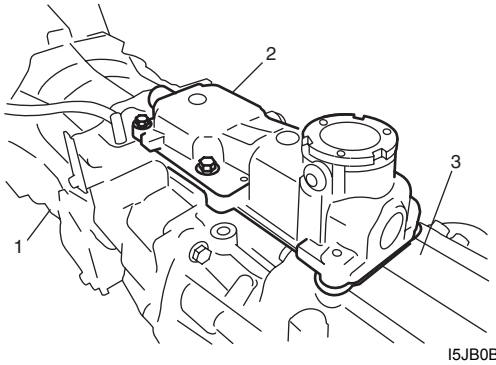
15) Apply transmission jack (1) and remove engine rear mounting member (2) taking off its bolts.



I5JB0A520029-01

16) After removing mounting member, move rearward transmission and transfer assemblies placed on jack and then lower them.

17) Separate gear shift lever case assembly (2) and transfer assembly (3) from transmission assembly (1).



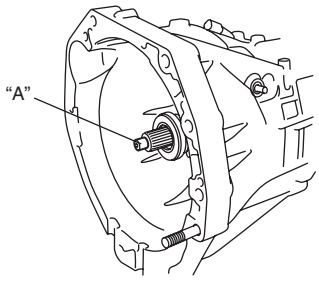
I5JB0B520019-01

Remounting

For remounting, reverse dismounting procedure noting the following.

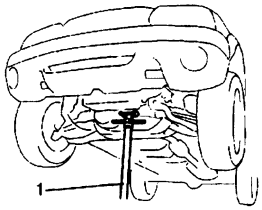
- Apply grease to input shaft.

  "A": Grease 99000–25010 (SUZUKI Super Grease A)



I5JB0A520031-01

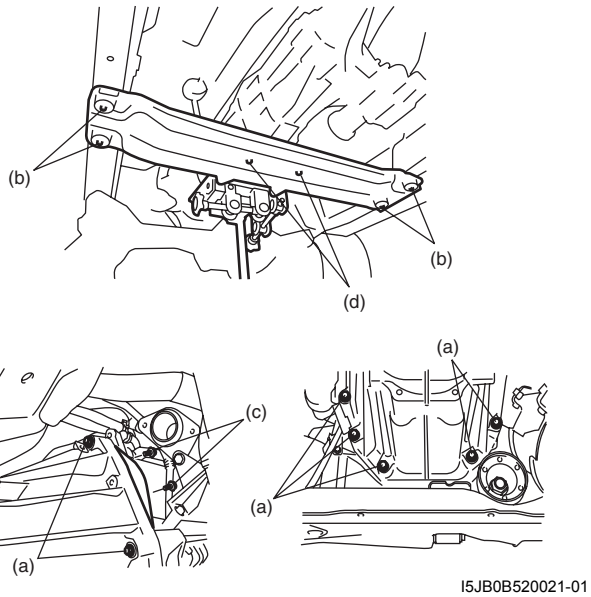
- Slant the rear of the engine down, using support device (1) and install transmission to engine.



I3JA01520024-01

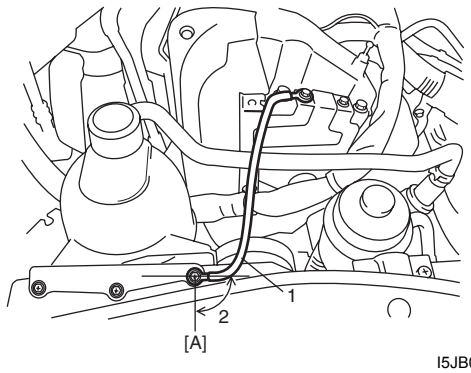
- Use specified torques as given below.

  Tightening torque
  Transmission to engine bolt and nut (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)
  Engine rear mounting member bolt (b): 55 N·m (5.5 kgf-m, 40.0 lb-ft)
  Clutch housing plate bolt (c): 11 N·m (1.1 kgf-m, 8.0 lb-ft)
  Engine rear mounting No.2 bolt (d): 55 N·m (5.5 kgf-m, 40.0 lb-ft)



I5JB0B520021-01

- Set each clamp for wiring and hose securely.
- Install noise suppressor wire (1) at specified position as shown in figure.



I5JB0B520020-01

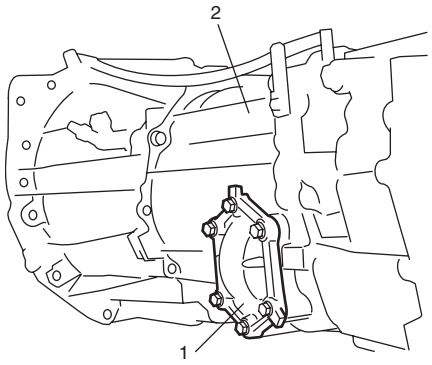
[A]: Forward	2. Installation position (90°)

- Install shift control lever referring to “Transmission Shift Control Lever Removal and Installation: ”.
- Connect clutch fluid joint to pipe of clutch operating cylinder assembly referring to “Clutch Operating Cylinder Assembly Removal and Installation: in Section 5C”.
- Install exhaust No.2 pipe referring to “Exhaust System Components: in Section 1K”.
- Fill gear oil to transmission referring to “Manual Transmission Oil Change: ”.
- Fill gear oil to transfer referring to “Transfer Oil Change: in Section 3C in related manual”.
- Connect battery and check function of engine, clutch, transmission and transfer.
- Install propeller shafts referring to “Propeller Shaft Removal and Installation: in Section 3D”.

Manual Transmission Unit Disassembly

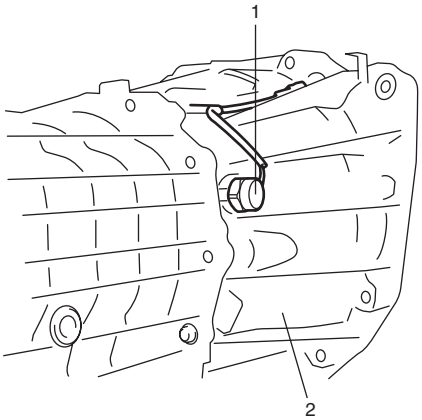
S5JB0B5206019

1) Remove clutch operating cylinder assembly from transmission front case referring to “Clutch Operating Cylinder Assembly Removal and Installation: in Section 5C”
2) Remove reverse idle gear case (1) from rear case (2).



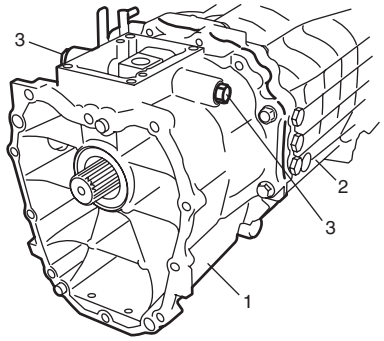
I5JB0B520022-01

3) Remove back up light switch (1), washer and pin from front case (2).



I5JB0B520023-01

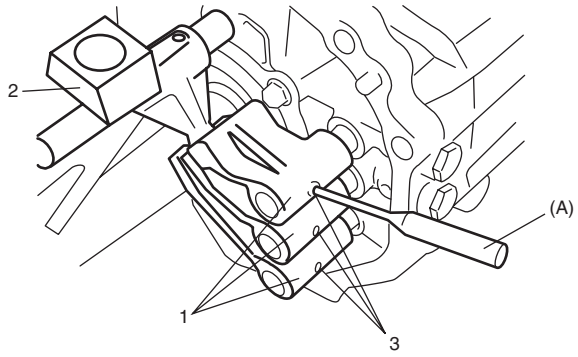
4) Remove select return bolt (3), springs and guide pins, and then remove adapter case (1) from rear case (2).



I5JB0B520024-01

5) Drive out each gear shift yoke pin (3) using special tool and then remove each gear shift yoke (1) and gear shift & select lever assembly (2).

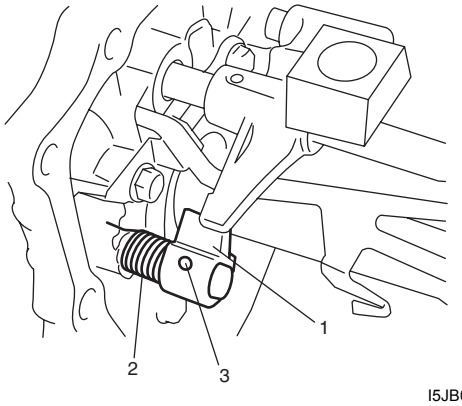
Special tool
(A): 09922–85811



I5JB0B520025-01

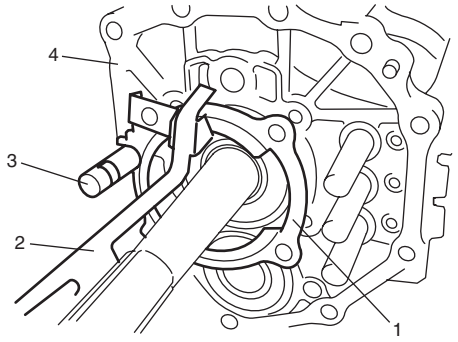
6) Drive out reverse shift limit cam pin (3) using special tool and then remove reverse shift limit cam (1) and spring (2).

Special tool
(A): 09922–85811



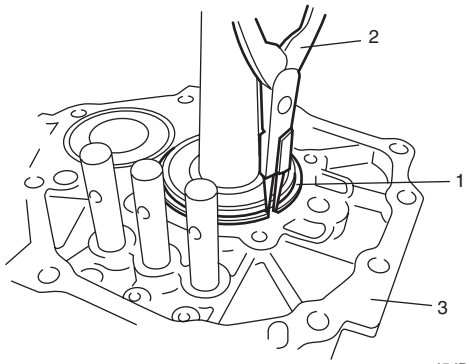
I5JB0B520026-01

7) Remove rear bearing plate (1), oil gutter (2) and reverse shift shaft (3) from rear case (4).



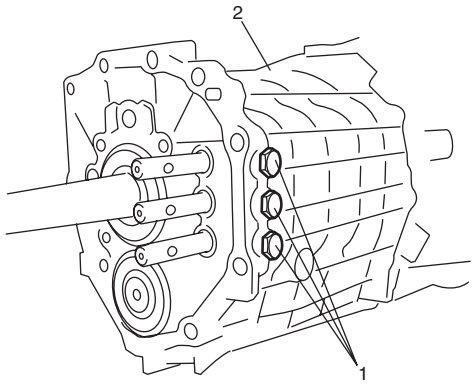
I5JB0B520027-01

8) Remove rear main shaft circlip (1) from rear case (3) using snap ring pliers (2).



I5JB0B520028-01

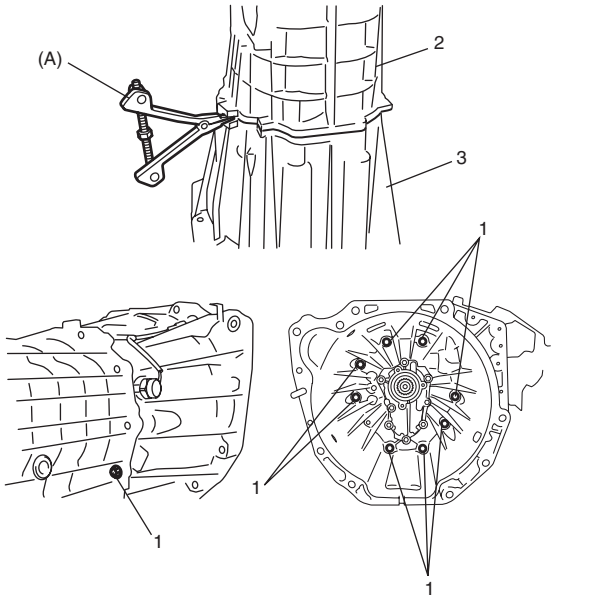
9) Remove locating bolts (1) from rear case (2), then take out locating springs and balls.



I5JB0B520029-01

10) Remove rear case to front case bolts (1), then separate rear case (2) from front case (3) using special tool.

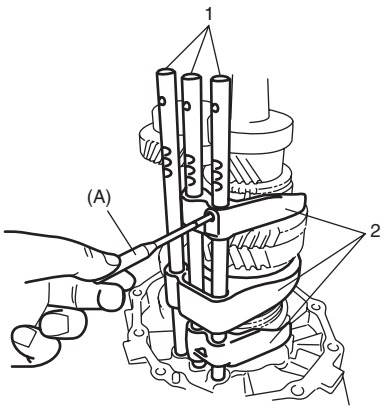
Special tool
(A): 09912–34510



I5JB0B520030-01

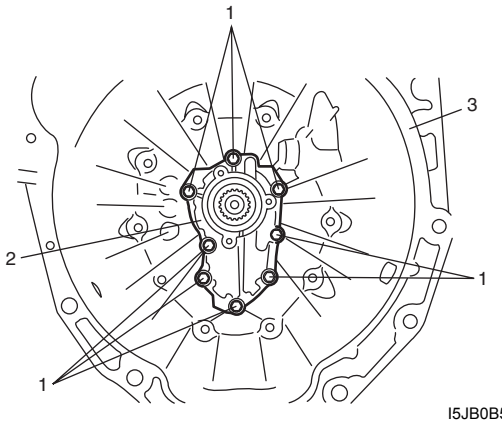
11) Drive out each gear shift shaft pin using special tool and then remove each gear shift shaft (1), fork (2), ball and inter lock pin.

Special tool
(A): 09922–85811



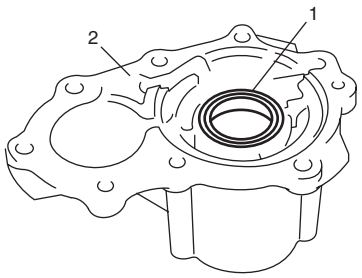
I5JB0B520031-01

12) Remove input shaft bearing retainer to front case bolt (1), then separate input shaft bearing retainer (2) from front case (3).



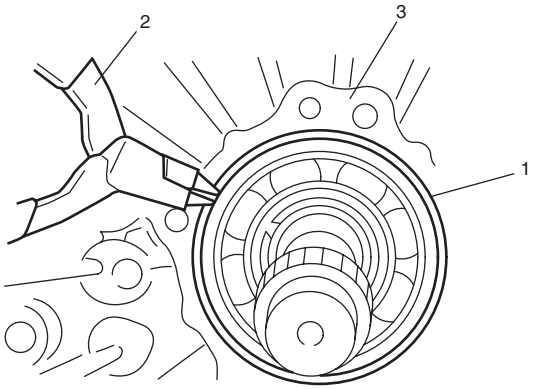
I5JB0B520032-01

13) Remove oil seal (1) from input shaft bearing retainer (2) using flat end rod or the like, if necessary.



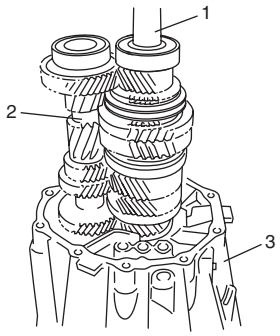
I5JB0B520033-01

14) Remove input shaft front bearing circlip (1) from front case (3) using snap ring pliers (2).



I5JB0B520034-01

15) Remove input shaft assembly, main shaft assembly (1) and countershaft assembly (2) all together from front case (3) tapping input shaft end by plastic hammer lightly.

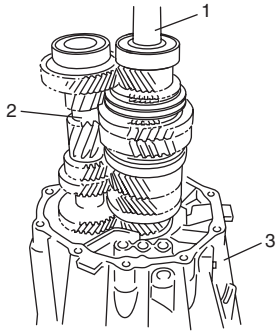


I5JB0B520035-01

Manual Transmission Unit Reassembly

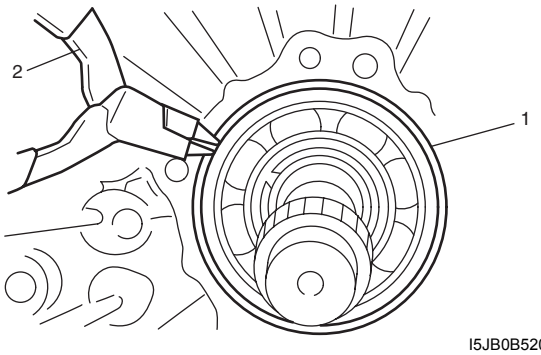
S5JB0B5206020

1) Assemble input shaft assembly, main shaft assembly (1) and countershaft assembly (2), and then install them all together into front case (3).



I5JB0B520035-01

2) Install new input shaft front bearing circlip (1) to front case using snap ring pliers (2)



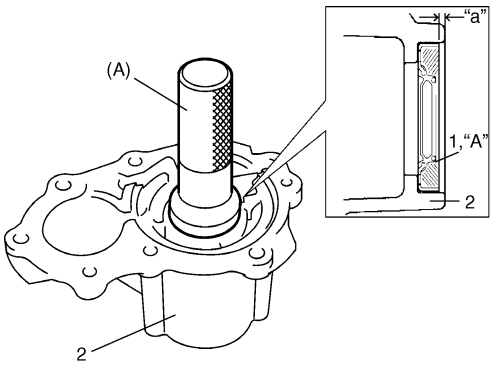
I5JB0B520036-02

3) Install new oil seal (1) to input shaft bearing retainer (2) facing its spring side upward in figure using special tool and hammer and then apply grease to oil seal lip.

Special tool
(A): 09913–76010

"A": Grease 99000–25010 (SUZUKI Super Grease A)

Install position oil seal
"a": 0 – 1.0 mm (0 – 0.0039 in.)



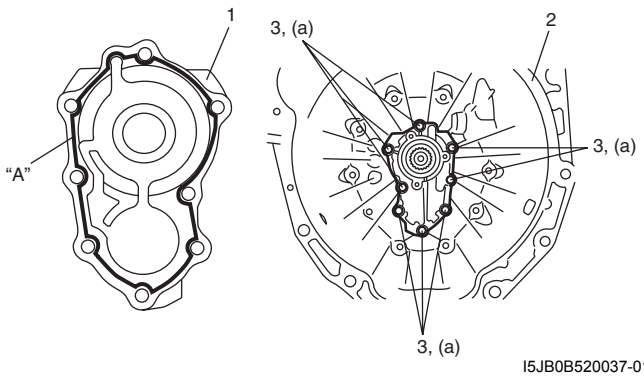
I5JB0B520038-01

4) Clean mating surfaces of both input shaft bearing retainer (1) and front case (2), and uniformly apply sealant to input shaft bearing retainer as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, and then mate it with front case.

"A": Sealant 99000–31110 (SUZUKI Bond No.1215)

5) Install input shaft bearing retainer to front case with new bolts. Tighten bolts (3) to specified torque.

Tightening torque
Input shaft bearing retainer bolt (a): 26 N·m (2.6 kgf-m, 19.0 lb-ft)

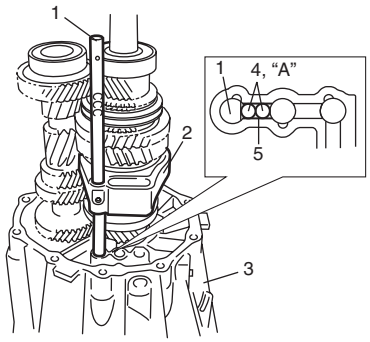


I5JB0B520037-01

6) Install low speed gear shift shaft (1) and low speed gear shift fork (2) to front case (3).

7) Apply grease to gear shift shaft balls (4), and then install it to hole of front case (5) between low speed gear shift shaft and high speed gear shift shaft.

"A": Grease 99000–25010 (SUZUKI Super Grease A)

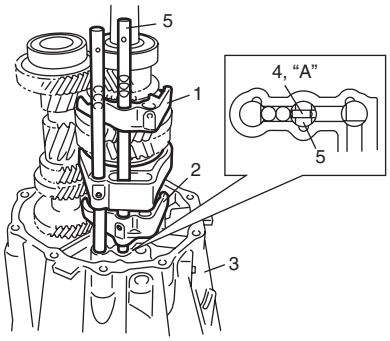


I5JB0B520039-01

8) Install 5th & reverse gear shift fork (1) and high speed gear shift fork (2) to front case (3).

9) Apply grease to inter lock pin (4), and install it to high speed gear shift shaft (5), and then install high speed gear shift shaft to front case.

"A": Grease 99000–25010 (SUZUKI Super Grease A)

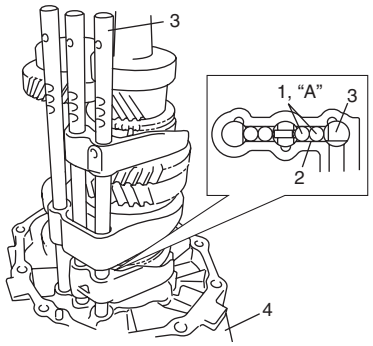


I5JB0B520040-03

10) Apply grease to gear shift shaft balls (1), and then install it to hole of front case (2) between high speed gear shift shaft and 5th & reverse gear shift shaft.

11) Install 5th & reverse gear shift shaft (3) to front case (4).

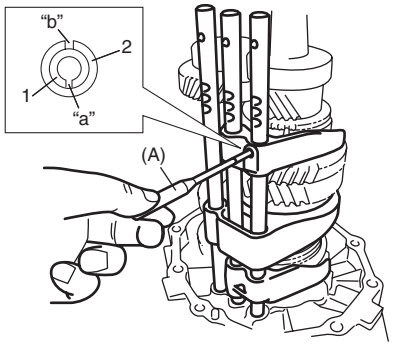
"A": Grease 99000–25010 (SUZUKI Super Grease A)



I5JB0B520041-02

12) Set new gear shift shaft inner pin (1) and outer pin (2) facing each gap (“a”, “b”) in the opposite direction as shown in figure. Drive each gear shift shaft pin by using special tool.

Special tool
(A): 09922–85811



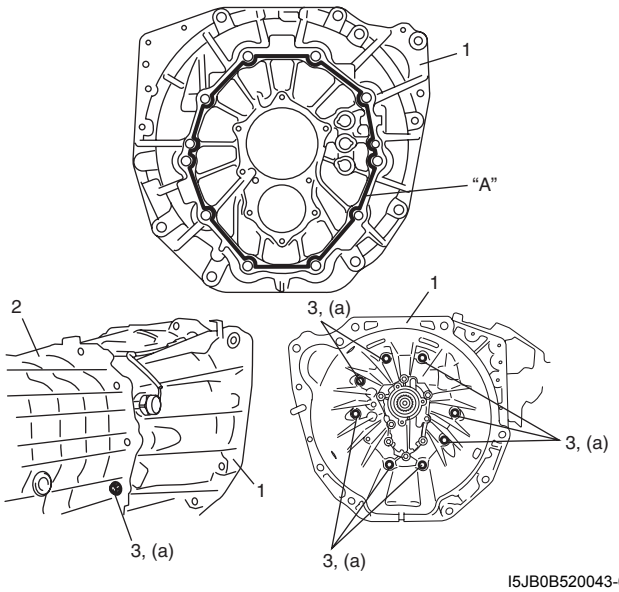
I5JB0B520042-01

13) Clean mating surfaces of both front case (1) and rear case (2), and uniformly apply sealant to front case as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, and then mate it with rear case.

“A”: Sealant 99000–31110 (SUZUKI Bond No.1215)

14) Install front case to rear case. Tighten front case bolts (3) to specified torque.

Tightening torque
Front case bolt (a): 45 N·m (4.5 kgf-m, 32.5 lb-ft)

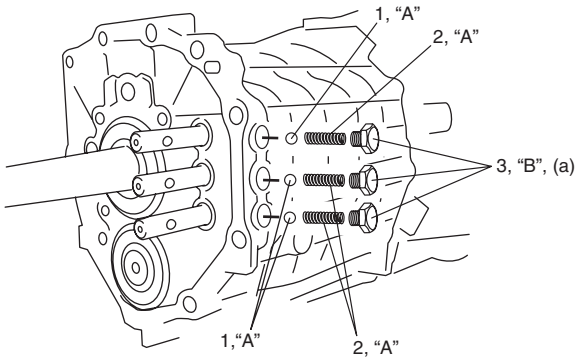


I5JB0B520043-02

15) Apply grease to gear shift locating balls (1) and springs (2), then install them. Apply sealant to gear shift locating bolts (3), and then tighten bolts to specified torque.

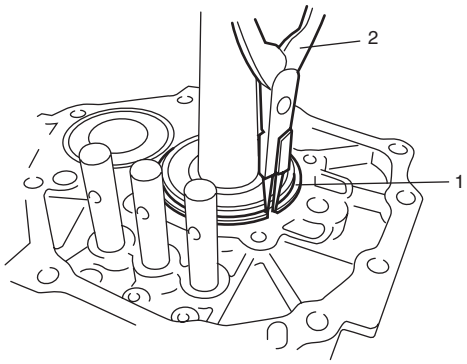
“A”: Grease 99000–25010 (SUZUKI Super Grease A)
“B”: Sealant 99000–31110 (SUZUKI Bond No.1215)

Tightening torque
Gear shift locating bolt (a): 19 N·m (1.9 kgf-m, 14.0 lb-ft)



I5JB0B520044-01

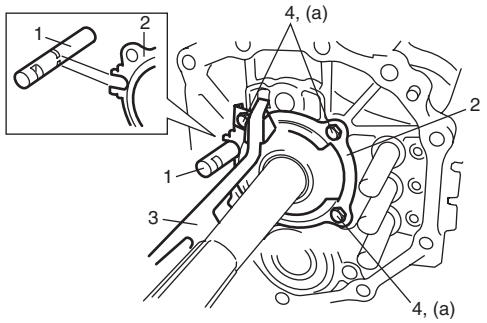
16) Install new circlip (1) of main shaft rear bearing to rear case using snap ring pliers (2).



I5JB0B520045-01

17) Install reverse shift shaft (1), rear bearing plate (2) and oil gutter (3) as shown in figure. Tighten rear bearing plate bolts (4) to specified torque.

Tightening torque
Rear bearing plate bolt (a): 22 N·m (2.2 kgf-m, 16.0 lb-ft)

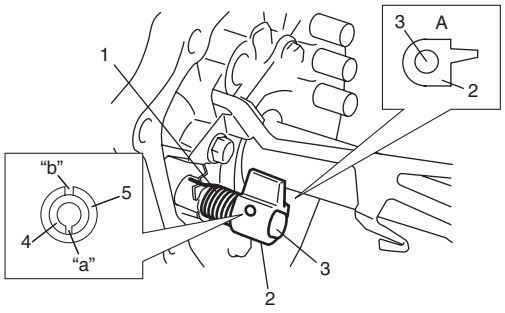


I5JB0B520046-01

18) Install reverse shift limit spring (1) and cam (2) to reverse shift shaft (3), and then hook spring to rear bearing plate.

19) Set new gear shift shaft inner pin (4) and outer pin (5) facing each gap (“a”, “b”) in the opposite direction as shown in figure. Drive gear shift shaft pins by using special tool.

Special tool
: 09922–85811



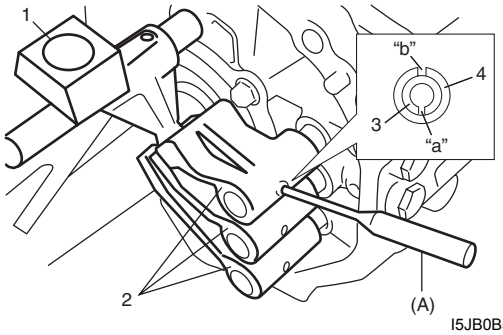
I5JB0B520047-04

A: Upper side

20) Install gear shift & select lever assembly (1) and each gear shift yoke (2).

21) Set new gear shift yoke inner pin (3) and outer pin (4) facing each gap (“a”, “b”) in the opposite direction as shown in figure. Drive gear shift yoke pin by using special tool.

Special tool
(A): 09922–85811



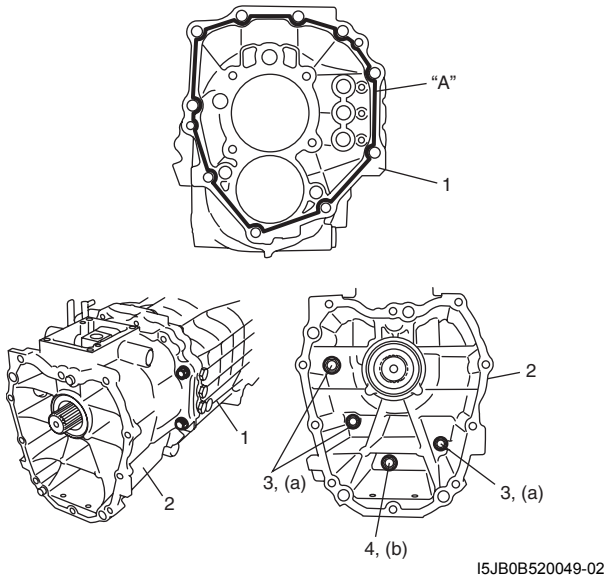
I5JB0B520048-02

22) Clean mating surfaces of both rear case (1) and adapter case (2), and uniformly apply sealant to rear case as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, and then mate it with adapter case.

“A”: Sealant 99000–31110 (SUZUKI Bond No.1215)

23) Install rear case to adapter case. Tighten adapter case No.1 bolts (3) and new adapter case No.2 bolt (4) to specified torque.

Tightening torque
Adapter case No.1 bolt (a): 45 N·m (4.5 kgf-m, 32.5 lb-ft)
Adapter case No.2 bolt (b): 54 N·m (5.4 kgf-m, 39.0 lb-ft)



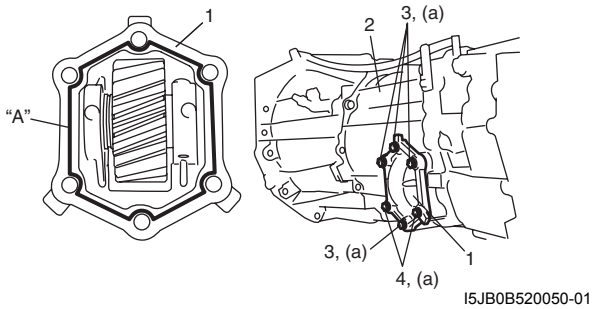
I5JB0B520049-02

24) Clean mating surfaces of both reverse idle gear case (1) and rear case (2), and uniformly apply sealant to reverse idle gear case as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, and then mate it with rear case.

"A": Sealant 99000–31110 (SUZUKI Bond No.1215)

25) Install reverse idle gear case to rear case with new bolts. Tighten No.1 bolts (3) and No.2 bolts (4) to specified torque.

Tightening torque
Reverse idle gear case No.1 bolt and No.2 bolt (a): 26 N·m (2.6 kgf-m, 19.0 lb-ft)

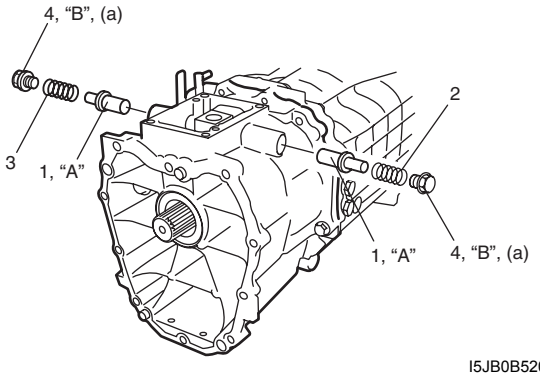


I5JB0B520050-01

26) Apply grease to select guide pins (1), and then install select guide pins, select return low speed spring (short) (2) and select return 5th & reverse spring (long) (3). Apply sealant to select return bolts, and then tighten bolts (4) to specified torque.

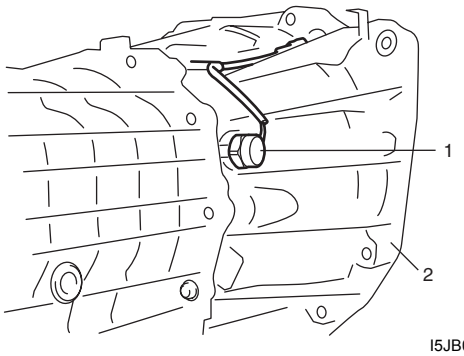
"A": Grease 99000–25010 (SUZUKI Super Grease A)
"B": Sealant 99000–31110 (SUZUKI Bond No.1215)

Tightening torque
Select return bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



I5JB0B520051-01

27) Install buck up light switch (1), new washer and pin to front case (2) referring to "Back Up Light Switch Removal and Installation: ".



I5JB0B520052-01

28) Install clutch operating cylinder assembly to transmission front case referring to "Clutch Operating Cylinder Assembly Removal and Installation: in Section 5C".

Locating Spring Inspection

S5JB0B5206021

Check locating springs for deterioration and replace with new ones if necessary.

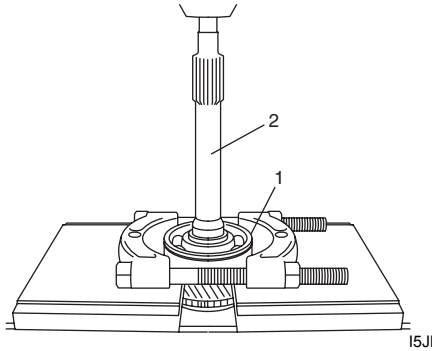
Locating spring free length
Standard: 44.6 mm (1.756 in.)
Service limit: 40.1 mm (1.579 in.)

Input Shaft Assembly Disassembly and Reassembly

S5JB0B5206031

Disassembly

1) Remove input shaft circlip from input shaft using snap ring pliers.
2) Remove input shaft bearing (1) from input shaft (2) using bearing puller and hydraulic press.

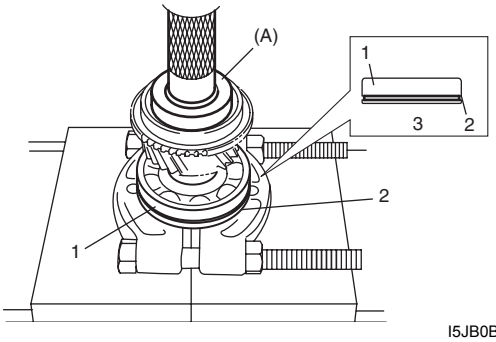


I5JB0B520053-01

Reassembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) Drive in input shaft bearing (1) onto input shaft facing groove (2) side to downward in figure (3) using special tool and hydraulic press.

Special tool
(A): 09913–75520

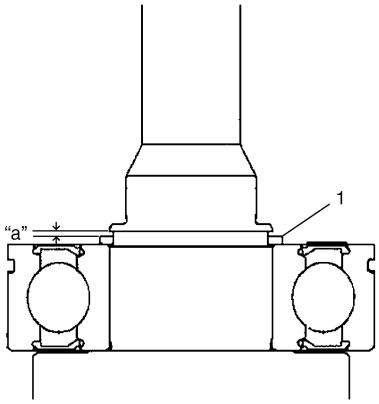


I5JB0B520054-02

3) Select circlip (1) that will make thrust clearance “a” of bearing 0.15 mm (0.006 in) or less and install it.

Available circlip thickness

1.89 mm (0.074 in.)	2.07 mm (0.081 in.)
1.98 mm (0.078 in.)	



I5JB0B520055-01

Input Shaft Inspection

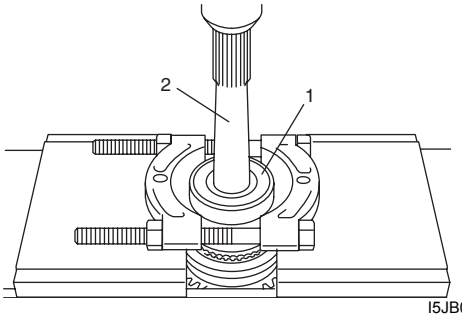
S5JB0B5206032

- Check chamfered teeth of gear for damage and excessive wear, and replace as necessary.
- Check spline portions and replace parts if excessive wear is found.
- Check bearing for smooth rotation and replace it if abnormality is found.

Main Shaft Disassembly

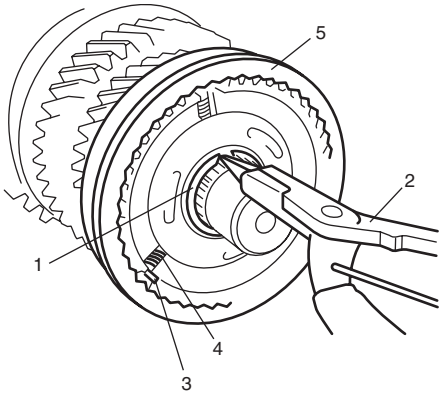
S5JB0B5206022

1) Remove main shaft bearing circlip using snap ring pliers.
2) Remove main shaft bearing (1) from main shaft (2) using bearing puller and hydraulic press.



I5JB0B520056-01

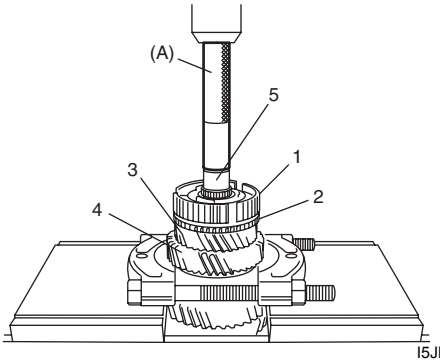
3) Remove circlip (1) using snap ring pliers (2) and then pull out high speed synchronizer sleeve (5) from high speed synchronizer hub gradually with holding down synchronizer key (3) in order to prevent synchronizer keys and springs (4) from jumping out.



I5JB0B520057-01

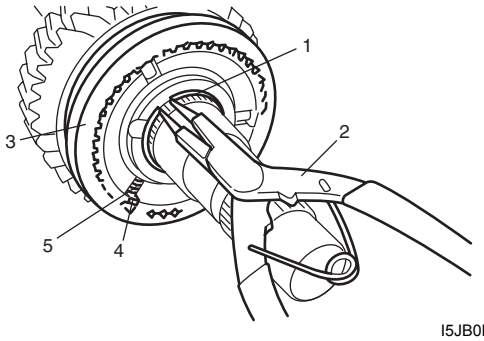
4) Remove high speed synchronizer hub (1), 3rd gear synchronizer ring assembly (2), 3rd gear (3), 3rd gear needle bearing, 3rd gear bush and 2nd gear (4) from main shaft (5) using special tool, bearing puller and hydraulic press.

Special tool
(A): 09925–98220



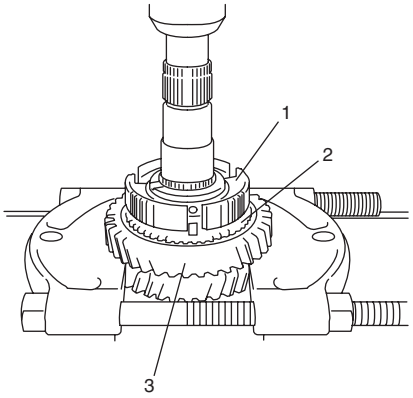
I5JB0B520058-01

5) Remove 2nd gear needle bearing and 2nd gear synchronizer ring assembly.
6) Remove circlip (1) using snap ring pliers (2) and then pull out low speed synchronizer sleeve (3) from low speed synchronizer hub gradually with holding down synchronizer key in order to prevent synchronizer keys (4) and synchronizer key springs (5) from jumped out.



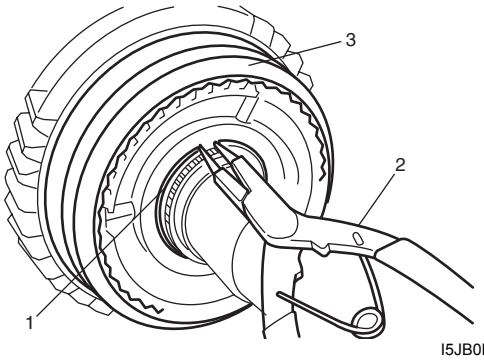
I5JB0B520059-01

7) Remove low speed synchronizer hub (1), 1st gear synchronizer ring assembly (2) and 1st gear (3) using bearing puller and hydraulic press, and then 1st gear needle bearing.



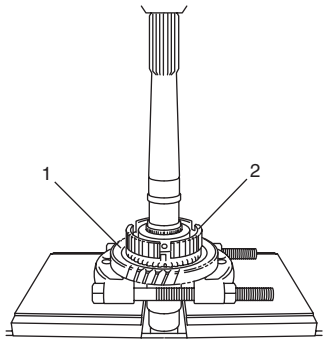
I5JB0B520060-01

8) Remove 5th gear, synchronizer ring and needle bearing.
9) Remove circlip (1) using snap ring pliers (2) and then pull out 5th & reverse synchronizer sleeve (3) from 5th & reverse synchronizer hub gradually with holding down synchronizer key in order to prevent synchronizer keys and springs from jumped out.



I5JB0B520106-01

10) Remove reverse gear (1), reverse gear synchronizer ring and 5th & reverse synchronizer hub (2) using bearing puller and hydraulic press, and then reverse gear needle bearing.



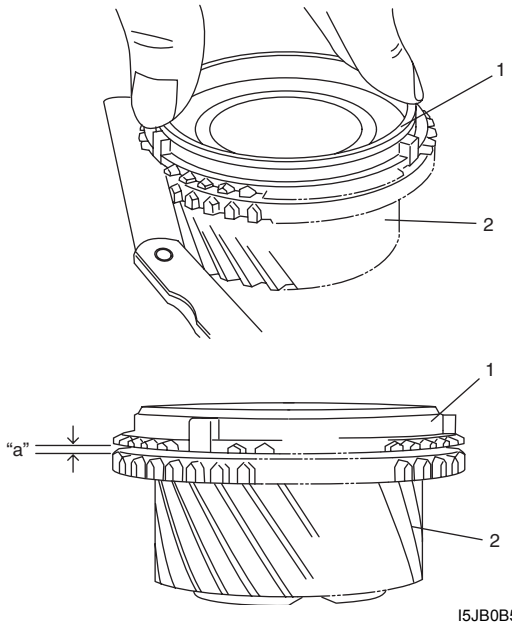
I5JB0B520062-01

Main Shaft Inspection

S5JB0B5206023

- Check clearance “a” between synchronizer outer ring (1) and gear (2) while lightly pushing synchronizer ring by hand, and also check chamfered tooth of gear and synchronizer outer ring. Also, check gear tooth. Replace with new one if necessary.

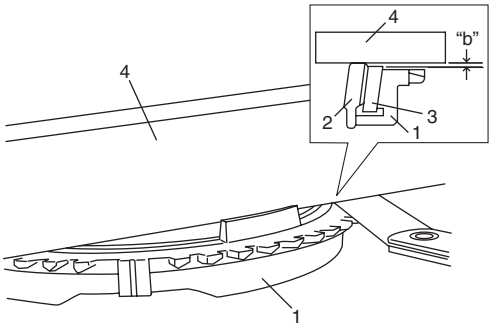
Clearance “a” between synchronizer outer ring and gear (4th, 5th and reverse)
Standard: 1.0 – 1.5 mm (0.040 – 0.059 in.)
Service limit: 0.7 mm (0.028 in.)



I5JB0B520063-02

- Put synchronizer outer ring (1), inner ring (2) and center cone (3) together and then measure step difference “b” between outer ring and inner ring using straight edge (4). And also check chamfered tooth of gear and synchronizer ring. Also, check gear tooth. Replace with new one if necessary.

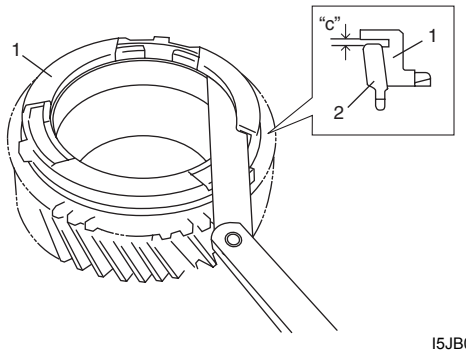
  Difference “b” between synchronizer outer ring and center cone (1st)
  Standard: 0.4 – 0.8 mm (0.016 – 0.031 in.)
  Service limit: 0.2 mm (0.008 in.)



I5JB0B520064-02

- Check clearance “c” between synchronizer outer ring (1) and center cone (2). If clearance exceeds limit, replace with new one.

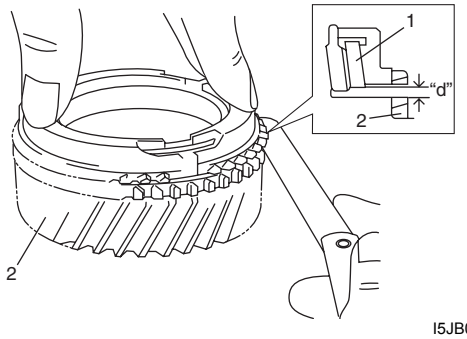
  Clearance “c” between synchronizer outer ring and center cone (1st, 2nd and 3rd)
  Standard: 0.41 – 0.7 mm (0.016 – 0.028 in.)
  Service limit: 0.3 mm (0.012 in.)



I5JB0B520065-04

- Check clearance “d” between synchronizer center cone (1) and gear (2) while lightly pushing synchronizer outer ring by the hand, and also check chamfered tooth of gear and synchronizer center cone. Also, check gear tooth. Replace with new one if necessary.

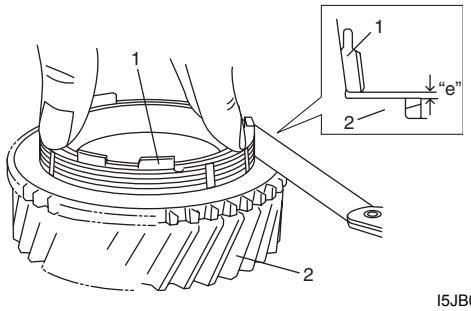
  Clearance “d” between synchronizer center cone and gear (2nd and 3rd)
  Standard: 0.2 – 0.9 mm (0.008 – 0.035 in.)
  Service limit: 0.1 mm (0.004 in.)



I5JB0B520066-03

- Check clearance “e” between synchronizer inner ring (1) and gear (2) while lightly pushing synchronizer inner ring by the hand, and also check chamfered tooth of gear and synchronizer inner ring. Also, check gear tooth. Replace with new one if necessary.

  Clearance “e” between synchronizer inner ring and gear (2nd and 3rd)
  Standard: 0.7 – 1.5 mm (0.028 – 0.059 in.)
  Service limit: 0.3 mm (0.012 in.)



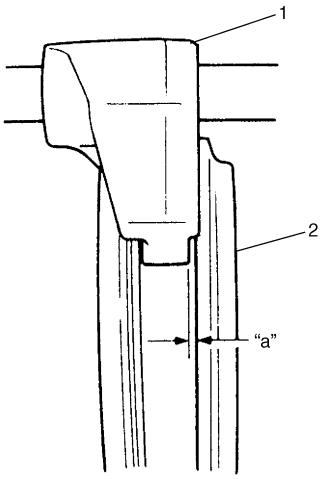
I5JB0B520067-03

- Check clearance “a” between fork (1) and sleeve (2). Replace those parts if it exceeds limit.

NOTE

For correct judgement of parts replacement, carefully inspect contact portion of fork and sleeve.

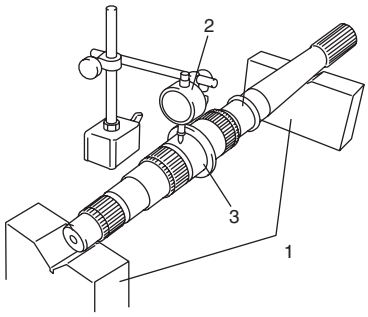
Clearance “a” between fork and sleeve
Standard: 0.05 – 0.25 mm (0.002 – 0.010 in.)
Service limit: 0.45 mm (0.018 in.)



I5JB0B520068-01

- Using “V” blocks (1) and dial gauge (2), check runout. If runout exceeds limit below, replace main shaft (3).

Main shaft runout
Limit: 0.02 mm (0.0008 in.)



I5JB0B520069-01

- Check chamfered part of each sleeve for damage and excessive wear, and replace as necessary.
- Check each synchronizer key and synchronizer key spring and replace as necessary.
- Check spline portions and replace parts if excessive wear is found.
- Check bearing for smooth rotation and replace it if abnormality is found.

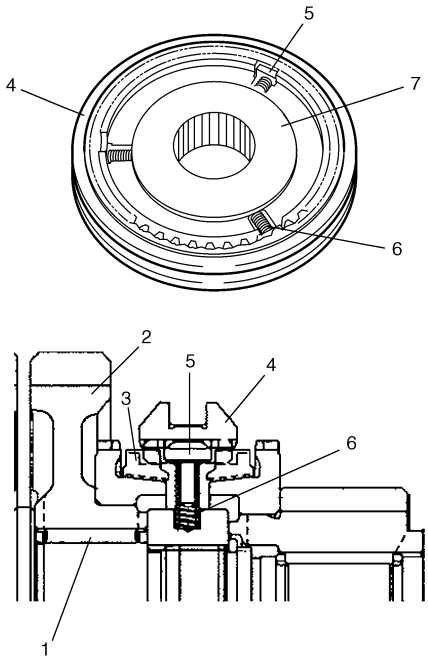
Main Shaft Reassembly

S5JB0B5206024

NOTE

- **Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.**
- **Use new circlips on shaft for installation. Do not reuse circlips.**

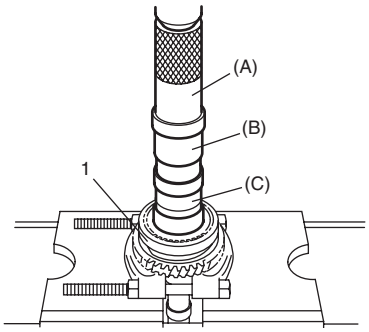
1) Clean all components thoroughly, inspect them for any abnormality and replace with new one as necessary.
2) Apply oil to reverse gear needle bearing (1), and then install needle bearing, reverse gear (2) and reverse gear synchronizer ring (3) to main shaft.
3) Assemble 5th & reverse synchronizer sleeve (4), synchronizer key (5), synchronizer key spring (6) and hub (7) as shown in figure.



I5JB0B520107-01

4) Drive in 5th & reverse synchronizer assembly (1) using bearing puller, special tools and hydraulic press.

Special tool
(A): 09913–85210
(B): 09945–55410
(C): 09940–54910

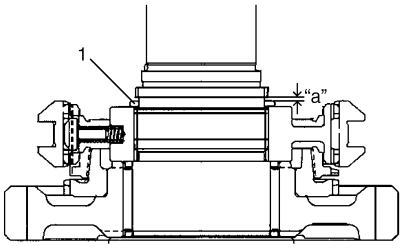


I5JB0B520071-01

5) Select circlip (1) that will make thrust clearance “a” of synchronizer hub 0.15 mm (0.006 in) or less and install it.

Available circlip thickness

1.86 mm (0.073 in.)	**2.04 mm (0.080 in.)**
1.95 mm (0.077 in.)	

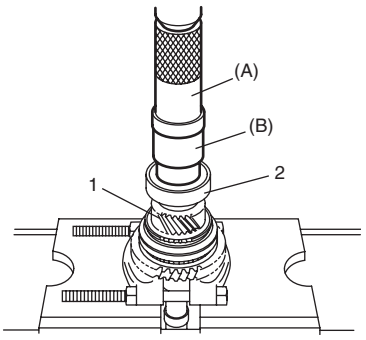


I5JB0B520072-02

6) Apply oil to 5th gear needle bearing, and then install needle bearing, 5th gear (1) and 5th gear synchronizer ring to main shaft.

7) Drive in main shaft bearing (2) using bearing puller, special tools and hydraulic press.

Special tool
(A): 09913–85210
(B): 09945–55410

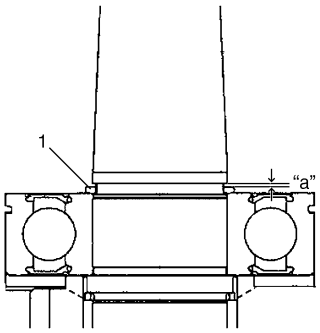


I5JB0B520073-01

8) Select circlip (1) that will make thrust clearance “a” of bearing 0.15 mm (0.006 in) or less and install it.

Available circlip thickness

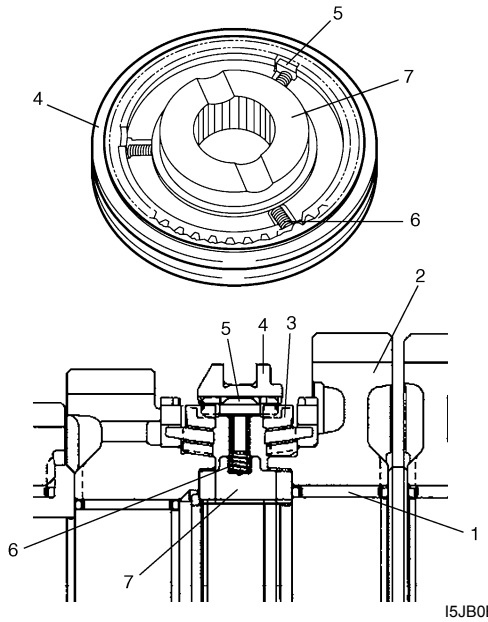
1.77 mm (0.070 in.)	**2.04 mm (0.080 in.)**
1.86 mm (0.073 in.)	**2.13 mm (0.084 in.)**
1.95 mm (0.077 in.)	**2.22 mm (0.087 in.)**



I5JB0B520074-02

9) Apply oil to 1st gear needle bearing (1), and then install needle bearing, 1st gear (2) and 1st gear synchronizer ring assembly (3) to main shaft.

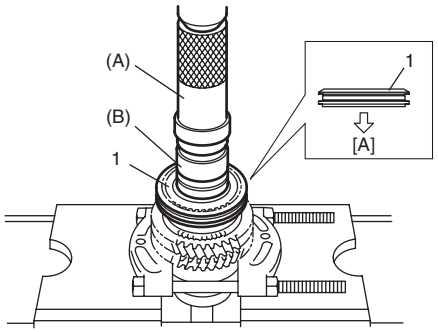
10) Assemble low speed synchronizer sleeve (4), key (5), key spring (6) and hub (7) as shown in figure.



I5JB0B520075-01

11) Drive in low speed synchronizer assembly (1) using bearing puller, special tools and hydraulic press, in specified direction as shown in figure.

Special tool
(A): 09913–85210
(B): 09940–54910



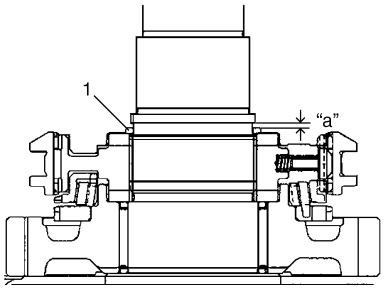
I5JB0B520076-02

[A]: 1st gear side

12) Select circlip (1) that will make thrust clearance “a” of synchronizer hub 0.15 mm (0.006 in) or less and install it.

Available circlip thickness

1.86 mm (0.073 in.)	**2.04 mm (0.080 in.)**
1.95 mm (0.077 in.)	

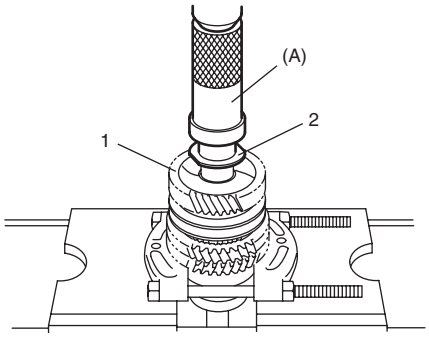


I5JB0B520077-02

13) Apply oil to 2nd gear needle bearing, and then install 2nd gear synchronizer ring assembly, needle bearing and 2nd gear (1) to main shaft.

14) Drive in 3rd gear bush (2) using bearing puller, special tool and hydraulic press.

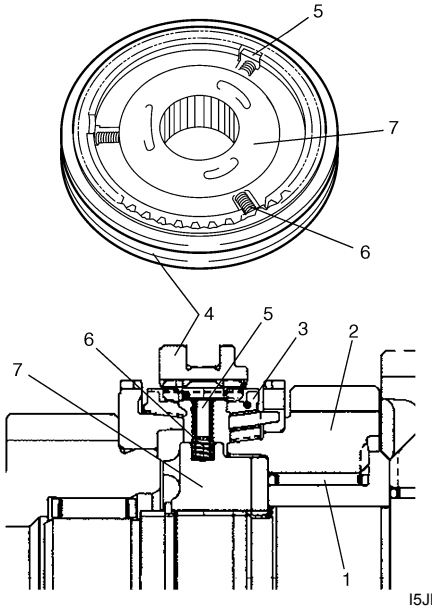
Special tool
(A): 09913–85210



I5JB0B520078-02

15) Apply oil to 3rd gear needle bearing (1), and then install needle bearing, 3rd gear (2) and 3rd gear synchronizer ring assembly (3) to main shaft.

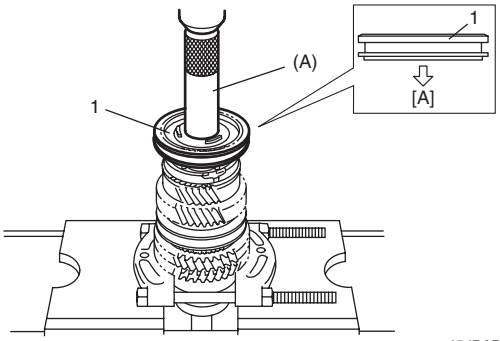
16) Assemble high speed synchronizer sleeve (4), key (5), key spring (6) and hub (7) as shown in figure.



I5JB0B520108-01

17) Drive in high speed synchronizer assembly (1) using bearing puller, special tools and hydraulic press, in specified direction as shown in figure.

Special tool
(A): 09913–84510



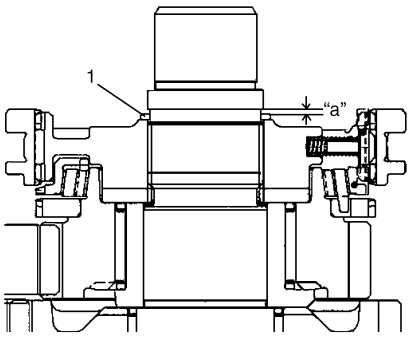
I5JB0B520080-03

[A]: 3rd gear side

18) Select circlip (1) that will make thrust clearance “a” of synchronizer hub 0.105 mm (0.004 in) or less and install it.

Available circlip thickness

1.500 mm (0.059 in.)	**1.635 mm (0.064 in.)**
1.545 mm (0.061 in.)	**1.680 mm (0.066 in.)**
1.590 mm (0.063 in.)	**1.725 mm (0.068 in.)**



I5JB0B520081-01

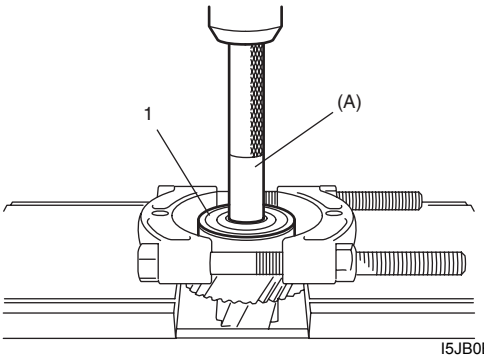
Countershaft Assembly Disassembly and Reassembly

S5JB0B5206025

Disassembly

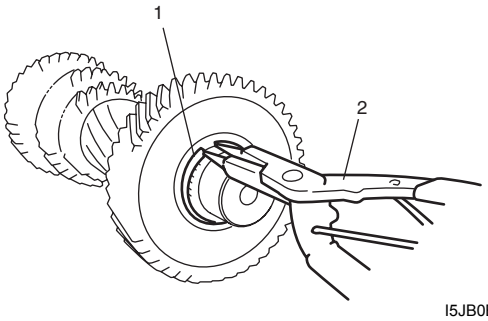
1) Remove countershaft rear bearing (1) using bearing puller, special tool and hydraulic press.

Special tool
(A): 09925–98221



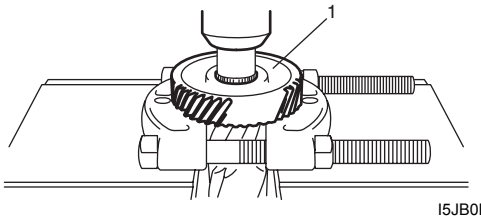
I5JB0B520082-01

2) Remove circlip (1) from countershaft using snap ring pliers (2).



I5JB0B520083-02

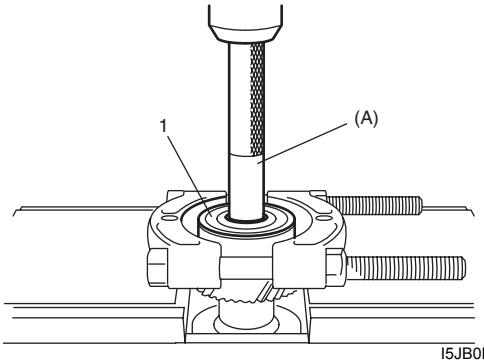
3) Remove countershaft 5th gear (1) using bearing puller and hydraulic press.



I5JB0B520084-01

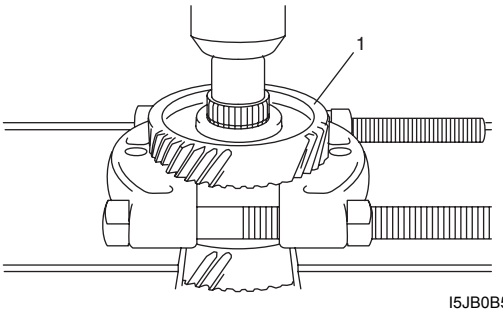
4) Remove countershaft front bearing (1) using bearing puller, special tool and hydraulic press.

Special tool
(A): 09925–98221



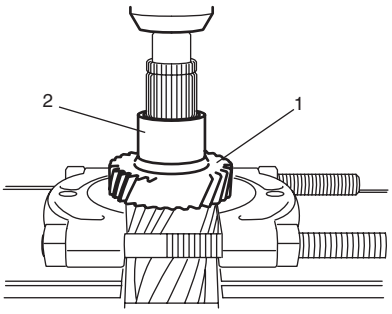
I5JB0B520085-01

5) Remove circlip from countershaft using snap ring pliers and then remove countershaft reduction gear (1) using bearing puller and hydraulic press.



I5JB0B520086-01

6) Remove countershaft 3rd gear (1) and spacer (2) using bearing puller and hydraulic press.

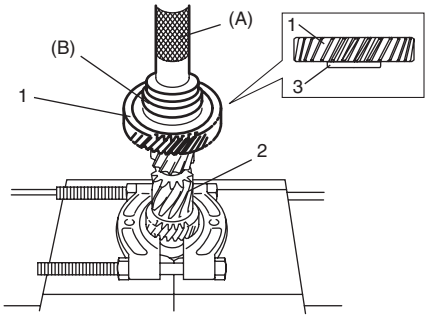


I5JB0B520087-01

Reassembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new one as necessary.
2) Drive in countershaft 5th gear (1) to countershaft (2) facing its long flange (3) side downward in figure using bearing puller, special tools and hydraulic press.

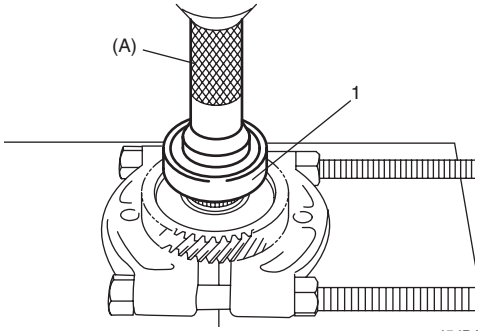
Special tool
(A): 09913–75510
(B): 09924–07710



I5JB0B520088-03

3) Install circlip to countershaft using snap ring pliers.
4) Drive in countershaft rear bearing (1) using bearing puller, special tool and hydraulic press.

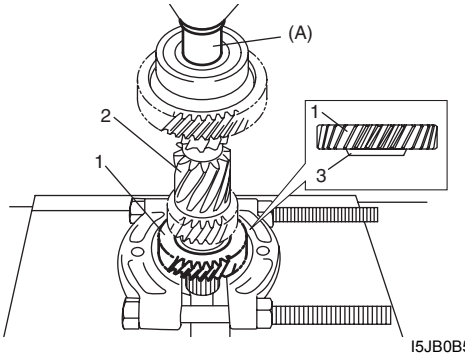
Special tool
(A): 09913–76010



I5JB0B520089-01

5) Drive in countershaft 3rd gear (1) to countershaft (2) facing its long flange (3) side downward in figure using bearing puller, special tool and hydraulic press.

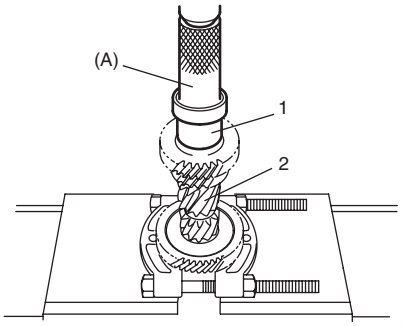
Special tool
(A): 09924–74590



I5JB0B520090-03

6) Drive in countershaft high speed gear spacer (1) to countershaft (2) using bearing puller, special tool and hydraulic press.

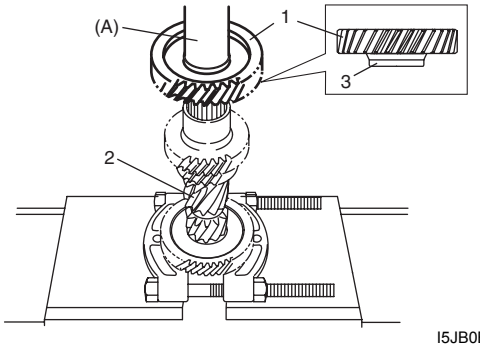
Special tool
(A): 09913–85210



I5JB0B520091-01

7) Drive in countershaft reduction gear (1) to countershaft (2) facing its long flange (3) side downward in figure using bearing puller, special tool and hydraulic press.

Special tool
(A): 09913–84510

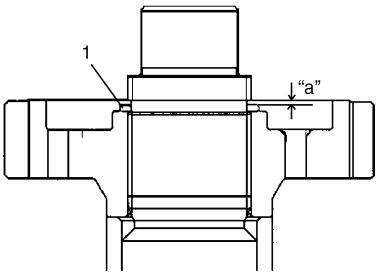


I5JB0B520092-02

8) Select circlip (1) that will make thrust clearance “a” of synchronizer hub 0.15 mm (0.006 in) or less and install it.

Available circlip thickness

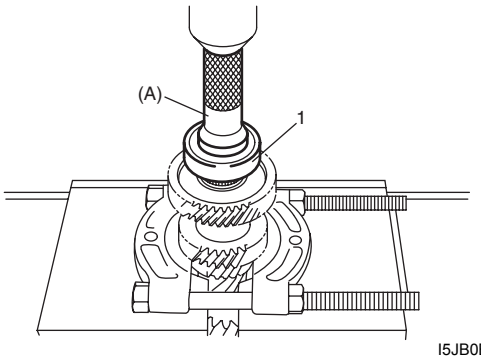
1.50 mm (0.059 in.)	1.68 mm (0.066 in.)
1.59 mm (0.063 in.)	



I5JB0B520093-01

9) Drive in countershaft front bearing (1) using bearing puller, special tool and hydraulic press.

Special tool
(A): 09913–76010



I5JB0B520094-02

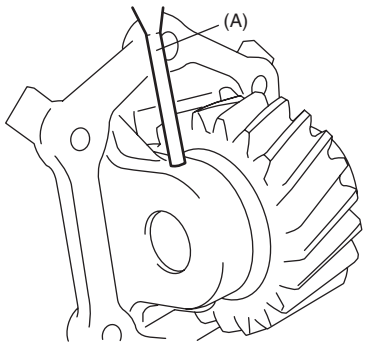
Reverse Idle Gear Assembly Disassembly and Reassembly

S5JB0B5206033

Disassembly

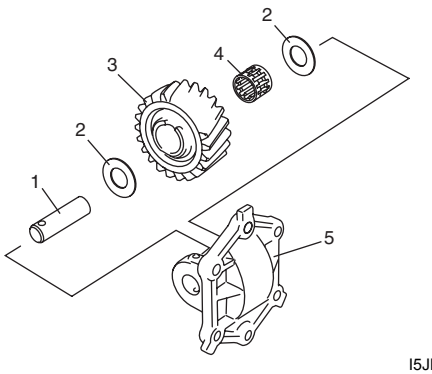
1) Drive out reverse idle gear shaft pin using special tool.

Special tool
(A): 09922–85811



I5JB0B520095-01

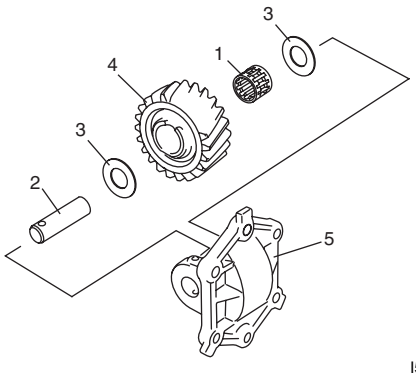
2) Remove reverse idle gear shaft (1), reverse idle gear washer (2), reverse idle gear (3) and reverse idle gear needle bearing (4) from reverse idle gear case (5).



I5JB0B520109-01

Reassembly

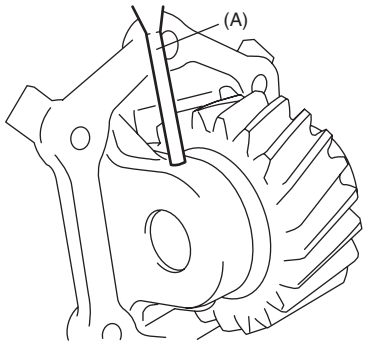
1) Apply oil to reverse idle gear needle bearing (1), and then install reverse idle gear shaft (2), washer (3), needle bearing and reverse idle gear (4) to reverse idle gear case (5).



I5JB0B520110-01

2) Drive in reverse idle gear shaft pin using special tool.

Special tool
(A): 09922–85811



I5JB0B520095-01

Countershaft and Reverse Idle Gear Inspection

S5JB0B5206026

- Check chamfered teeth of gear for damage and excessive wear, and replace as necessary.
- Check spline portions and replace parts if excessive wear is found.
- Check bearing for smooth rotation and replace it if abnormality is found.

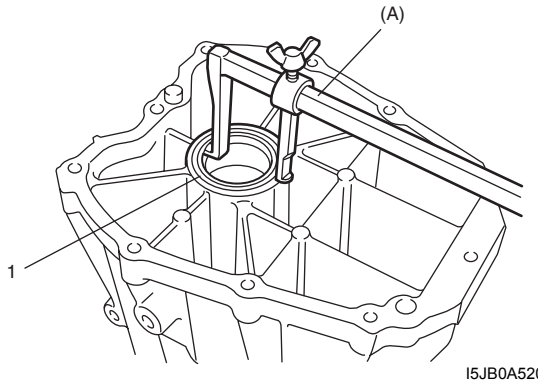
Manual Transmission Adapter Case Disassembly and Assembly

S5JB0B5206030

Disassembly

Remove oil seal (1) from adapter case using special tool.

Special tool
(A): 09913–50121



I5JB0A520086-01

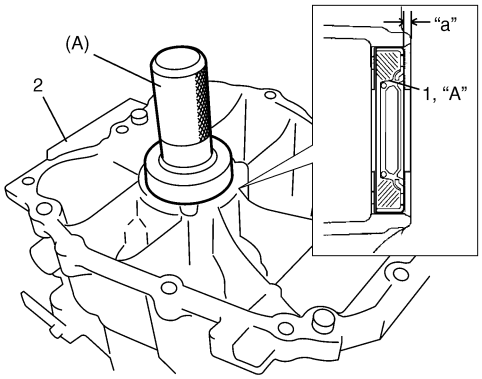
Assembly

1) Install new oil seal (1) to adapter case (2) facing its spring side upward in figure using special tool and hammer and then apply grease to oil seal lip.

Special tool
(A): 09913–75520

“A”: Grease 99000–25010 (SUZUKI Super Grease A)

Installation position oil seal
“a”: 1.5 – 2.5 mm (0.059 – 0.098 in.)



I5JB0B520098-01

Specifications

Tightening Torque Specifications

S5JB0B5207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Transmission oil level / filler plug	35	3.5	25.0	☞
Transmission oil drain plug	35	3.5	25.0	☞
Oil filler plug	35	3.5	25.0	☞
Control lever locating bolt	10	1.0	7.5	☞ / ☞
Case cover bolt	10	1.0	7.5	☞
Control lever boot cover bolt	12	1.2	9.0	☞ / ☞
Back up light switch	39	3.9	28.5	☞
Gear shift lever front case bolt	23	2.3	17.0	☞
Gear shift lever case plate screw	6	0.6	4.5	☞
Engine rear mounting No.1 bolt	55	5.5	40.0	☞
Engine rear mounting member bolt	55	5.5	40.0	☞ / ☞
Engine rear mounting No.2 bolt	55	5.5	40.0	☞ / ☞
Transmission to engine bolt and nut	55	5.5	40.0	☞
Clutch housing plate bolt	11	1.1	8.0	☞
Input shaft bearing retainer bolt	26	2.6	19.0	☞
Front case bolt	45	4.5	32.5	☞
Gear shift locating bolt	19	1.9	14.0	☞
Rear bearing plate bolt	22	2.2	16.0	☞
Adapter case No.1 bolt	45	4.5	32.5	☞
Adapter case No.2 bolt	54	5.4	39.0	☞
Reverse idle gear case No.1 bolt and No.2 bolt	26	2.6	19.0	☞
Select return bolt	25	2.5	18.0	☞

NOTE

The specified tightening torque is also described in the following.
“Manual Transmission Assembly Components: ”
“Gear Shift Lever Case Assembly Components: ”
“Gear Shift Shaft and Fork Components: ”

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

Special Tools and Equipment

Recommended Service Material

S5JB0B5208001

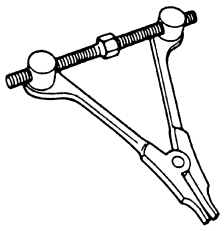
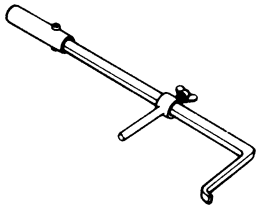
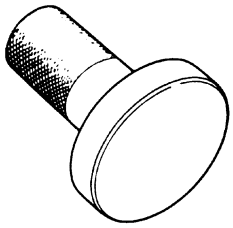
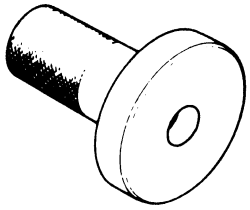
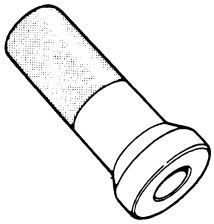
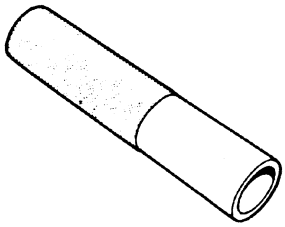
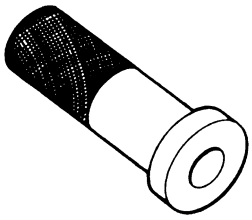
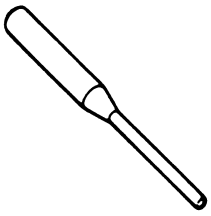
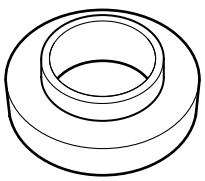
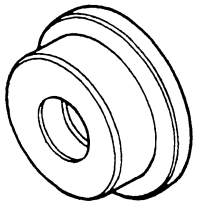
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1215	P/No.: 99000–31110	☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞

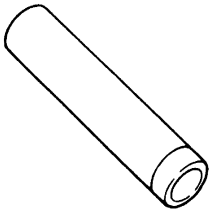
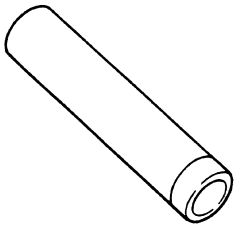
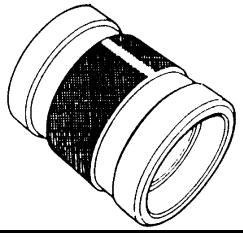
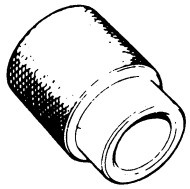
NOTE

Required service material is also described in the following.
“Manual Transmission Assembly Components: ”
“Gear Shift Lever Case Assembly Components: ”
“Gear Shift Shaft and Fork Components: ”
“Input Shaft Assembly, Main Shaft Assembly and Countershaft Assembly Components: ”

Special Tool

S5JB0B5208002

09912–34510 Case separator ☞ 	09913–50121 Oil seal remover ☞ 
09913–75510 Bearing installer ☞ 	09913–75520 Bearing installer ☞ / ☞ 
09913–76010 Bearing installer ☞ / ☞ / ☞ 	09913–84510 Bearing installer ☞ / ☞ 
09913–85210 Bearing installer ☞ / ☞ / ☞ / ☞ / ☞ 	09922–85811 Spring pin remover (4.5 mm) ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 
09924–07710 Synchronizer hub installer ☞ 	09924–74590 Input shaft oil seal installer attachment ☞ 

09925–98220 Bearing installer ☞ 	09925–98221 Bearing installer ☞ / ☞ 
09940–54910 Front fork oil seal install driver ☞ / ☞ 	09945–55410 Bushing installer ☞ / ☞ 

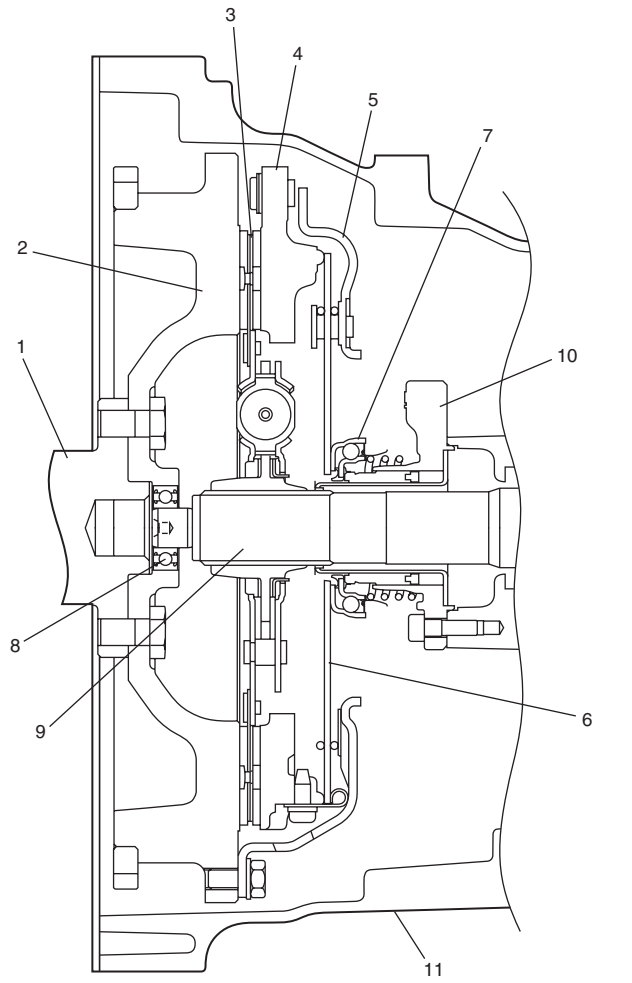
Clutch

General Description

Clutch (Hydraulic Type) Construction

S5JB0B5301001

The clutch is a diaphragm-spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward.
The disc, carrying torsional coil springs, is positioned on the transmission 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 transmission input shaft.
Clutch fluid is supplied from brake fluid reservoir.
Clutch fluid level can be checked by brake fluid level of brake fluid reservoir.



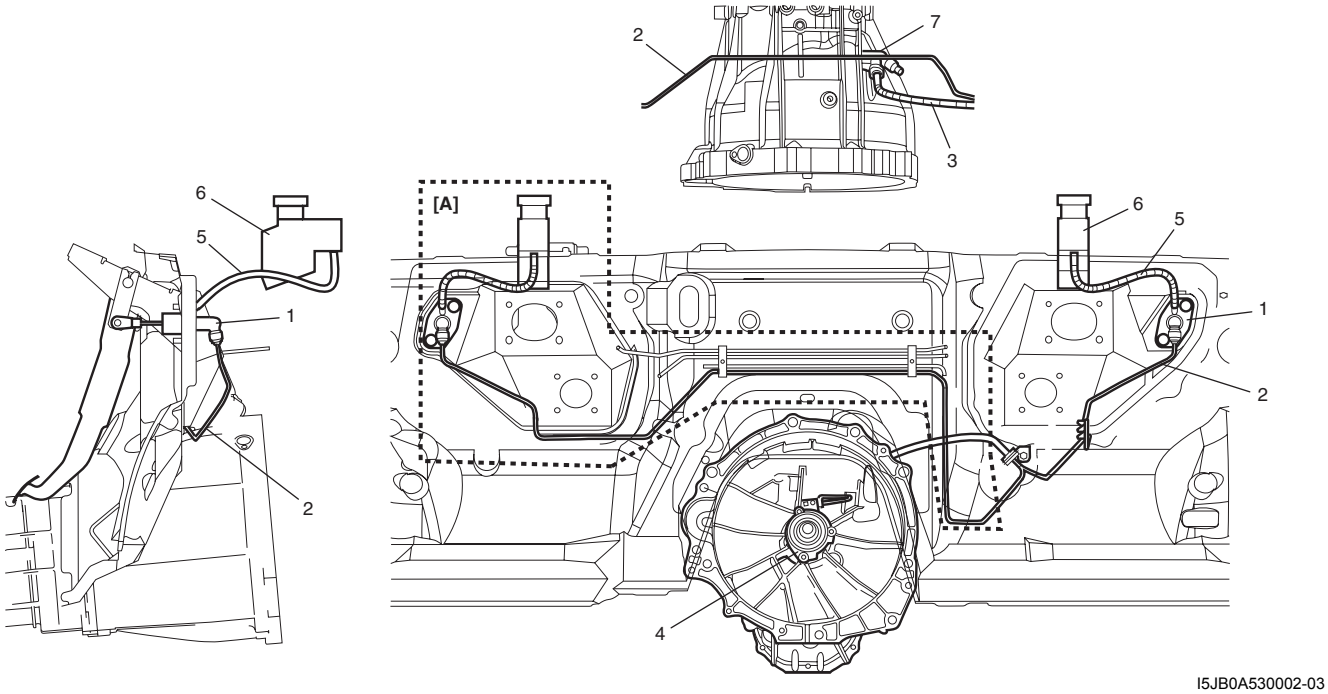
I5JB0A530001-01

1. Crankshaft	7. Release bearing
2. Flywheel	8. Input shaft bearing
3. Clutch disc	9. Input shaft
4. Pressure plate	10. Operating cylinder
5. Clutch cover	11. Clutch housing
6. Diaphragm spring	

Component Location

Clutch Fluid Pipe and Hose Location

S5JB0B5303001



I5JB0A530002-03

[A]: Right-hand steering vehicle	3. Clutch fluid hose	6. Brake master cylinder reservoir
1. Clutch master cylinder	4. Clutch operating cylinder assembly	7. Clutch fluid pipe joint
2. Clutch fluid pipe	5. Clutch reservoir hose	

Diagnostic Information and Procedures

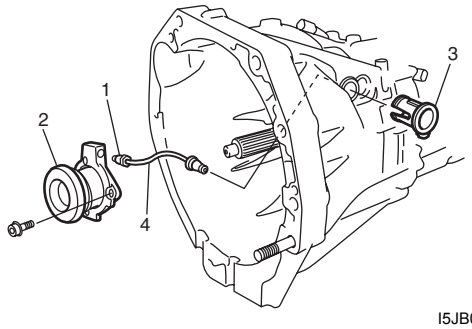
Air Bleeding of Clutch System

S5JB0B5304005

⚠ CAUTION

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleed air from clutch system. Refer to “Air Bleeding of Brake System: in Section 4A in related manual” for air bleeding procedure.



I5JB0A530017-01

Repair Instructions

Clutch Master Cylinder Removal and Installation

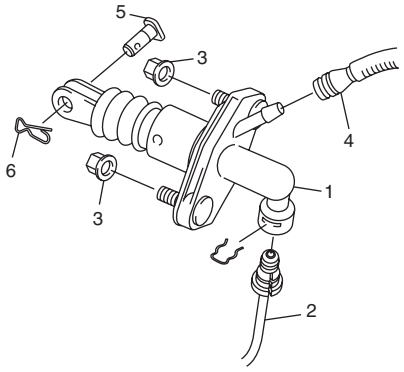
S5JB0B5306005

⚠ CAUTION

- **Do not allow fluid to get on painted surfaces. It may cause painted surface damage.**
- **Do not disassemble clutch master cylinder.**

Removal

1) Clean around reservoir cap of brake master cylinder and take out fluid with syringe or such.
2) Detach main fuse box.
3) Disconnect fluid pipe (2) and reservoir hose (4) from master cylinder assembly (1).
4) Remove clip (6) and push rod clevis pin (5).
5) Remove master cylinder attaching nuts (3).
6) Remove master cylinder assembly (1) and gasket.



I5JB0A530013-01

Installation

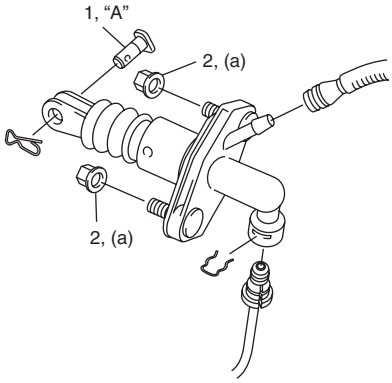
Reverse removal procedure for installation noting the following.

- Apply grease to push rod clevis pin (1).

"A": Grease 99000–25100 (SUZUKI Silicone Grease)

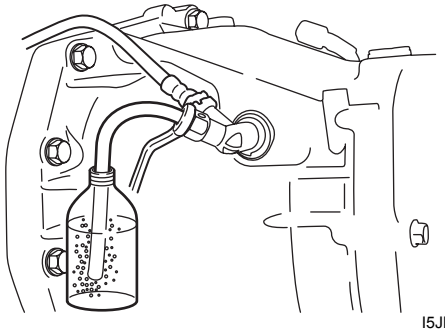
- Tighten master cylinder attaching nuts (2) to specified torque.

Tightening torque
Clutch master cylinder attaching nut (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)



I5JB0A530014-01

- Fill reservoir with specified brake fluid and check fluid leakage.
- After installation, bleed air from clutch system and check clutch pedal free travel. Refer to "Air Bleeding of Clutch System: " for air bleeding procedure.



I5JB0A530015-03

Clutch Operating Cylinder Assembly Removal and Installation

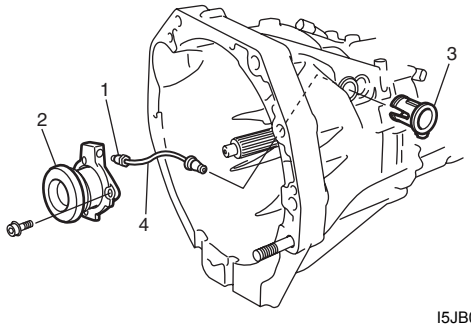
S5JB0B5306007

⚠ 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 transmission assembly referring to “Manual Transmission Assembly 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 transmission front case and then remove clutch fluid pipe (4).
5) Remove clutch operating cylinder assembly from transmission front case.



I5JB0A530017-01

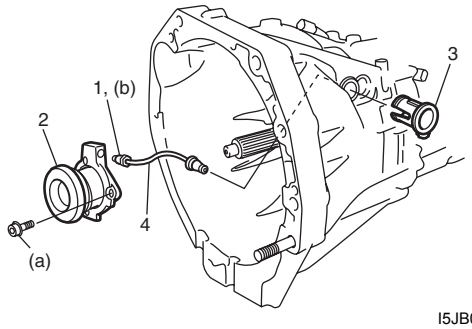
Installation

1) Install clutch operating cylinder assembly (2) to transmission front case. Tighten mounting bolts to specified torque.

Tightening torque
Clutch operating cylinder assembly mounting bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

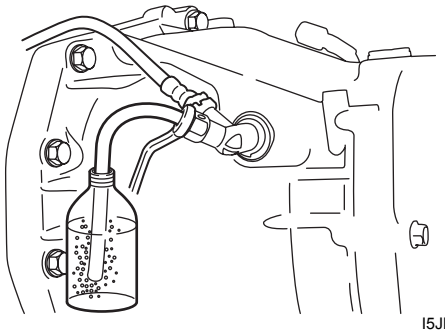
2) Connect clutch fluid pipe (4) to clutch operating cylinder assembly temporarily.
3) Install clutch pipe joint sleeve (3) to transmission front case securely and then tighten clutch fluid pipe flare nut (1) to specified torque.

   Tightening torque
   Clutch fluid pipe flare nut (b): 16 N·m (1.6 kgf-m, 11.5 lb-ft)



I5JB0A530018-01

4) Remount transmission assembly referring to “Manual Transmission Assembly 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.

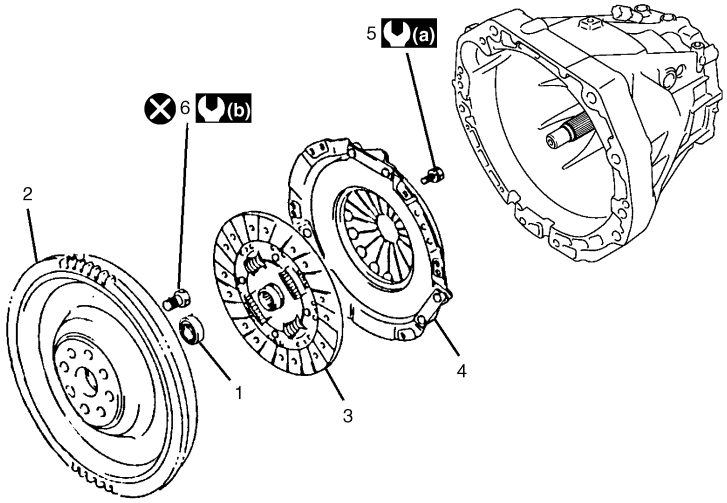


I5JB0A530015-03

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 Cover, Clutch Disc and Flywheel Components

S5JB0B5306008



I5JB0A530022-01

1. Input shaft bearing	4. Clutch cover	(a) : 20 N·m (2.0 kgf-m, 14.5 lb-ft)
2. Flywheel	5. Clutch cover bolt	(b) : 65 N·m (6.5 kgf-m, 47.0 lb-ft)
3. Clutch disc	6. Flywheel bolt	⊗ : Do not reuse.

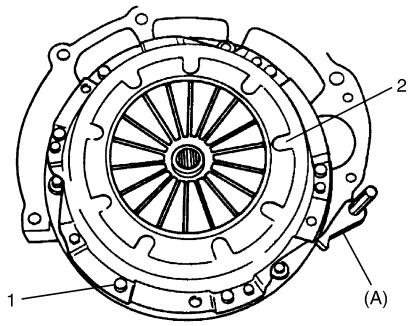
Clutch Cover, Clutch Disc and Flywheel Removal and Installation

S5JB0B5306009

Removal

1) Dismount transmission assembly referring to "Manual Transmission Assembly Dismounting and Remounting: in Section 5B".
2) Hold flywheel stationary with special tool and remove clutch cover bolts (1), clutch cover (2) and clutch disc.

Special tool
(A): 09924–17811



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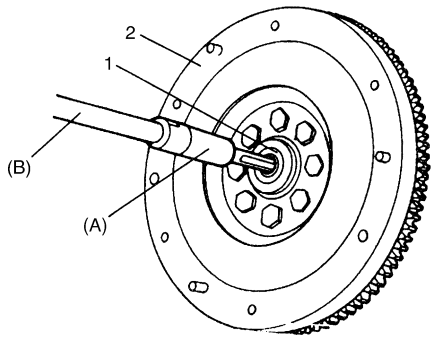
3) Pull out input shaft bearing (1) by using special tools.

Special tool
(A): 09921–26020
(B): 09930–30104



I2RH01530023-01

4) Remove flywheel from crankshaft.

Installation

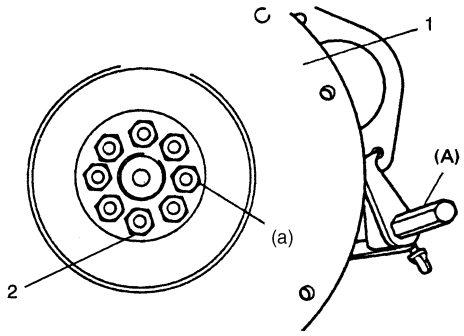
NOTE

Before installation, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

1) Install flywheel (1) to crankshaft and tighten new bolts (2) to specification.

Special tool
(A): 09924–17811

Tightening torque
Flywheel bolt (a): 65 N·m (6.5 kgf-m, 47.0 lb-ft)



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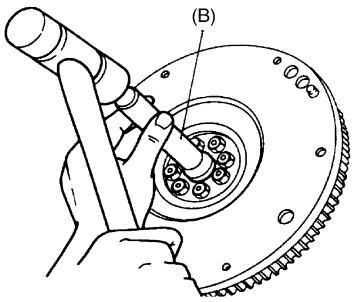
2) Using special tool, install input shaft bearing to flywheel.

Special tool
(B): 09925–98210



IYSQ01530022-01

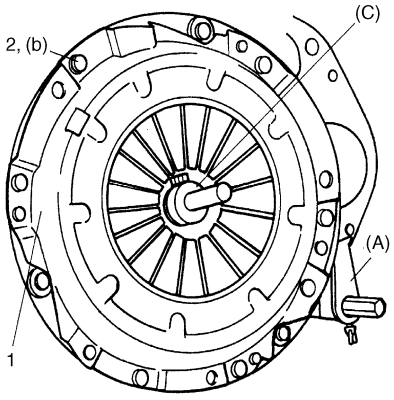
3) Aligning clutch disc to flywheel center by using special tool, install clutch cover (1) and bolts (2). Then tighten bolts to specification.

NOTE

- **While tightening clutch cover bolts, compress clutch disc with special tool by hand so that disc centered.**
- **Tighten cover bolts little by little evenly in diagonal order.**

Special tool
(A): 09924–17811
(C): 09923–36320

Tightening torque
Clutch cover bolt (b): 20 N·m (2.0 kgf-m, 14.5 lb-ft)



IYSQ01530023-01

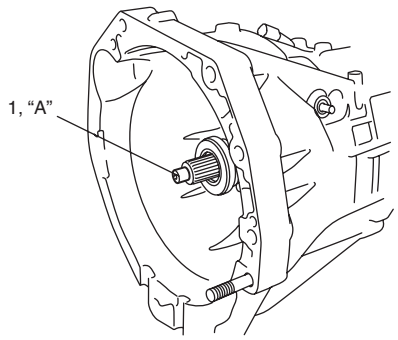
4) Slightly apply grease to input shaft (1).

"A": Grease 99000–25210 (SUZUKI Super Grease I)

5) Join transmission assembly with engine. Refer to "Manual Transmission Assembly Dismounting and Remounting: in Section 5B".

NOTE

Turn crankshaft with wrench from front while inserting transmission input shaft (1) to clutch disc until splines mesh.



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Specifications

Tightening Torque Specifications

S5JB0B5307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Clutch master cylinder attaching nut	23	2.3	17.0	☞
Clutch operating cylinder assembly mounting bolt	10	1.0	7.5	☞
Clutch fluid pipe flare nut	16	1.6	11.5	☞
Flywheel bolt	65	6.5	47.0	☞
Clutch cover bolt	20	2.0	14.5	☞

NOTE

The specified tightening torque is also described in the following.
"Clutch Cover, Clutch Disc and Flywheel Components: "

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

Special Tools and Equipment

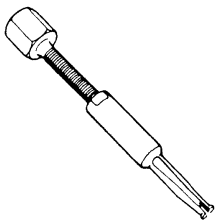
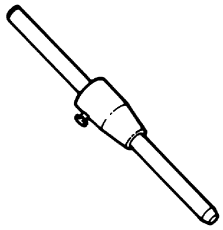
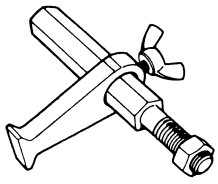
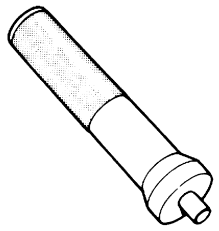
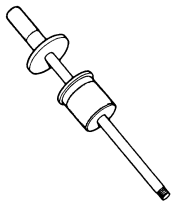
Recommended Service Material

S5JB0B5308001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Silicone Grease	P/No.: 99000–25100	☞
	SUZUKI Super Grease I	P/No.: 99000–25210	☞

Special Tool

S5JB0B5308002

09921–26020 Bearing remover ☞		09923–36320 Clutch center guide (15 mm) ☞	
09924–17811 Flywheel holder ☞ / ☞ / ☞		09925–98210 Input shaft bearing installer ☞	
09930–30104 Sliding shaft ☞			

Section 6

Steering

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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 manual.

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Steering Wheel and Column

General Description

Steering Wheel and Column Construction

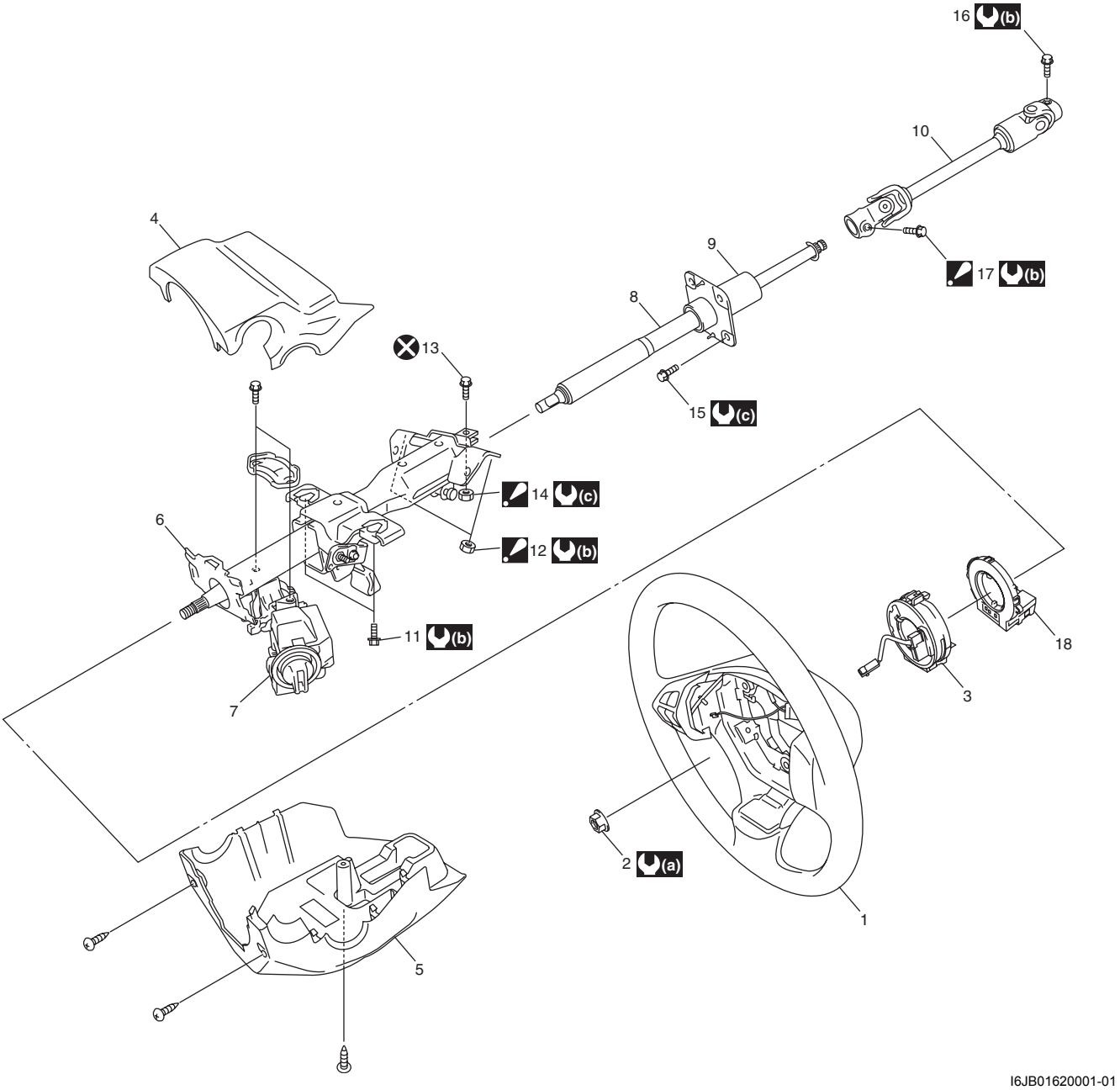
S5JB0B6201001

This double tube type steering column has the following three important features in addition to the steering function:

- The column is energy absorbing, designed to compress in a front-end collision.
- The ignition switch and lock are mounted conveniently on this column.
- With the column mounted lock, the ignition and steering operations can be locked to inhibit theft of the vehicle.

To insure the energy absorbing action, it is important that only the specified screws, bolts and nuts be used as designated, and that they are tightened to the specified torque. When the column assembly (6) is removed from the vehicle, special care must be taken in handling it. Use of a steering wheel puller or a sharp blow on the end of the steering shaft, leaning on the assembly, or dropping the assembly could shear the plastic shear pins which maintain column length and position.

The driver air bag (inflator) module is one of the supplemental restraint (air bag) system components and is mounted to the center of the steering wheel (1). During certain frontal crashes, the air bag system supplements the restraint of the driver's and passenger's seat belts by deploying the air bags. The air bag (inflator) module should be handled with care to prevent accidental deployment. When servicing, be sure to observe "Precautions on Service and Diagnosis of Air Bag System: in Section 8B in related manual".



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1. Steering wheel	9. Steering column lower seal	17. Steering lower shaft assembly upper joint bolt : After tightening all mounting bolts and nuts and all joint bolts and nuts, tighten lower shaft lower joint bolt.
2. Steering shaft nut	10. Steering lower shaft assembly	18. Steering angle sensor (if equipped)
3. Contact coil cable assembly	11. Steering column assembly mounting bolt	(a) : 33 N·m (3.3 kgf-m, 24.0 lb-ft)
4. Steering column upper cover	12. Steering column assembly mounting nut : After tightening column mounting nut, tighten column mounting bolt.	(b) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
5. Steering column lower cover	13. Steering upper shaft assembly upper joint bolt	(c) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
6. Steering column assembly	14. Steering upper shaft assembly upper joint nut : After tightening upper shaft mounting bolts, tighten upper shaft joint nut.	: Do not reuse.
7. Steering lock assembly	15. Steering upper shaft mounting bolt	
8. Steering upper shaft assembly	16. Steering lower shaft assembly lower joint bolt	

Repair Instructions

Contact Coil Cable Assembly Removal and Installation

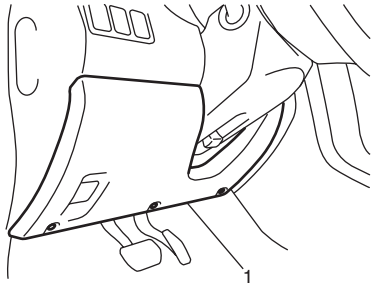
S5JB0B6206003

⚠ CAUTION

Do not turn contact coil cable assembly more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

Removal

1) Remove steering wheel from steering column. Refer to “Steering Wheel Removal and Installation: in related manual”.
2) Remove steering column hole cover (1).



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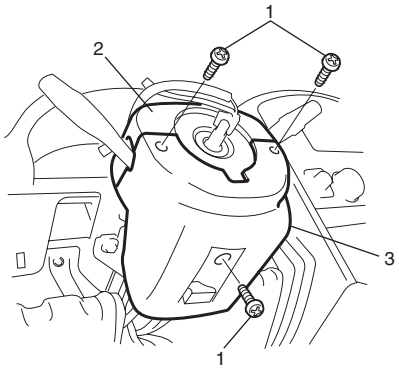
3) Remove steering column cover screws (1) (3 pieces).
4) Separate upper cover (2) and lower cover (3), then remove them.



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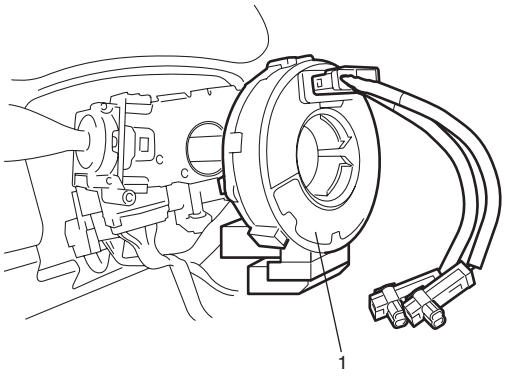
5) Disconnect all connectors for contact coil cable assembly.
6) Remove contact coil cable assembly (1) with steering angle sensor (if equipped) from steering column.



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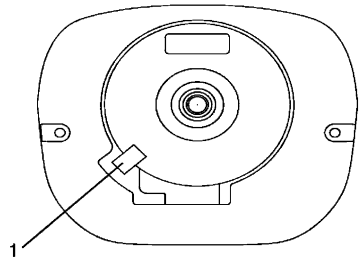
7) Separate steering angle sensor from contact coil cable assembly referring to “Steering Angle Sensor Removal and Installation: ”.

Installation

1) Check to make sure that vehicle’s front tires are set at straight-ahead position and then ignition switch is at “LOCK” position.
2) Install contact coil cable assembly to steering column.

NOTE

New contact coil cable assembly is supplied with contact coil cable assembly set and held at its center position with a lock pin (1). Remove this lock pin after installing contact coil cable assembly to steering column.



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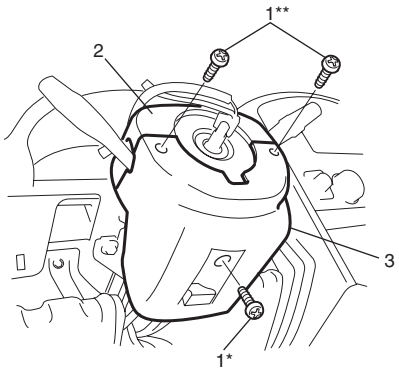
3) Connect all connectors that have been removed in "Removal".
4) Install steering column upper cover (2) and lower cover (3), and then tighten steering column cover screws (1).

⚠ CAUTION

When installing lower cover (3) and upper cover (2), be careful so that each lead wire is not caught between covers.



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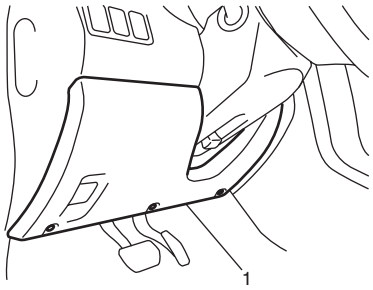
*:	Standard screw
**:	Tapping screw

5) Install steering column hole cover (1).



I5JB0A620011-01

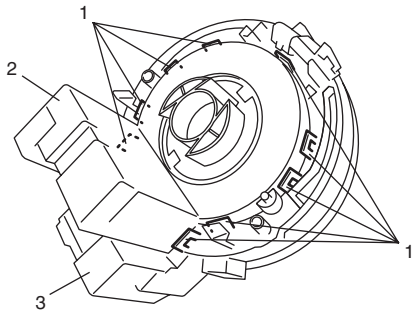
6) Install steering wheel to steering column. Refer to "Steering Wheel Removal and Installation: in related manual".

Steering Angle Sensor Removal and Installation

S5JB0B6206014

Removal

1) Remove steering wheel and contact coil cable assembly. Refer to "Steering Wheel Removal and Installation: in related manual" and "Contact Coil Cable Assembly Removal and Installation: ".
2) Remove steering angle sensor (2) from contact coil cable assembly (3) while opening fitting parts (1) of contact coil cable assembly.



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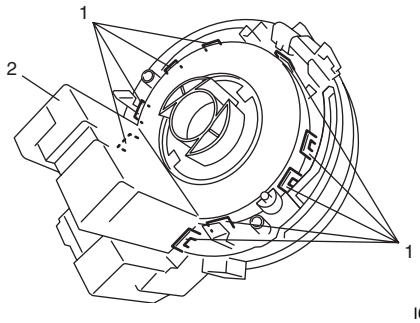
Installation

1) Install steering angle sensor (2) by fitting engagement parts (1) of contact coil cable assembly to claws of steering angle sensor as shown in figure.



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2) Install contact coil cable assembly and steering wheel. Refer to "Contact Coil Cable Assembly Removal and Installation: " and "Steering Wheel Removal and Installation: in related manual".

Steering Angle Sensor Inspection

S5JB0B6206015

Refer to "Steering Angle Sensor Inspection: in Section 4F".

Steering Column Assembly Removal and Installation

S5JB0B6206006

⚠ CAUTION

Once the steering column assembly is removed from the vehicle, the column is extremely susceptible to damage.
Dropping the column assembly on its end could collapse the steering shaft or loosen the plastic shear pins which maintain column length leaning on the column assembly could cause it to bend or deform.
Any of the above damage could impair the column's collapsible design.
When loosening steering column mounting bolts and nuts, make sure that steering column assembly and steering upper shaft assembly have been separated. Loosening them with steering column assembly and steering upper shaft assembly assembled could cause damage to upper joint and mounting bracket in steering upper shaft assembly.

Removal

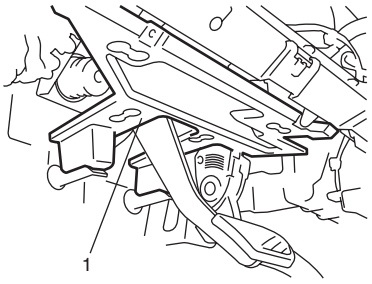
⚠ WARNING

Never rest a steering column assembly on the steering wheel with air bag (inflator) module face down and column vertical. Otherwise personal injury may result.

⚠ CAUTION

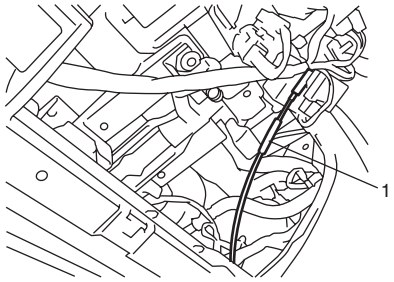
Never turn steering wheel while steering column with steering wheel is removed. Turning steering wheel more than about two and a half turns will break contact coil cable assembly.

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to "Disabling Air Bag System: in Section 8B in related manual".
3) Remove steering wheel and contact coil cable assembly. Refer to "Steering Wheel Removal and Installation: in related manual" and "Contact Coil Cable Assembly Removal and Installation: ".
4) Remove instrument panel under cover (1) from instrument panel.



I5JB0A620018-01

5) Remove immobilizer control module (ICM) referring to "Immobilizer Control Module (ICM) Removal and Installation: in Section 10C".
6) Remove lighting switch referring to "Headlight Switch (in Lighting Switch) Removal and Installation: in Section 9B in related manual".
7) Remove washer switch referring to "Windshield Wiper and Washer Switch Removal and Installation: in Section 9D in related manual".
8) Disconnect connector from steering lock assembly.
9) For A/T vehicle, disconnect shift (key) interlock cable (1) from ignition switch with ignition switch turned at ACC position.
   After disconnecting, turn ignition switch to LOCK position.



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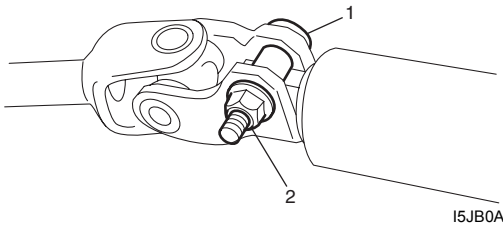
10) Remove steering upper shaft upper joint bolt (1) and nut (2).

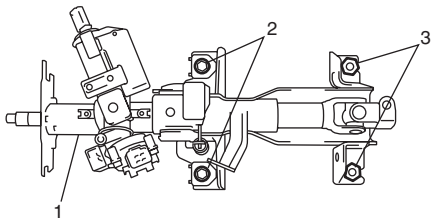


I5JB0A620020-01

11) Remove column support bracket. (if equipped)
12) Remove steering column assembly (1) mounting bolts (2) and nuts (3).

NOTE

Do not move tilt lever before till mounting bolts and nuts are tightened completely.



I5JB0A620021-01

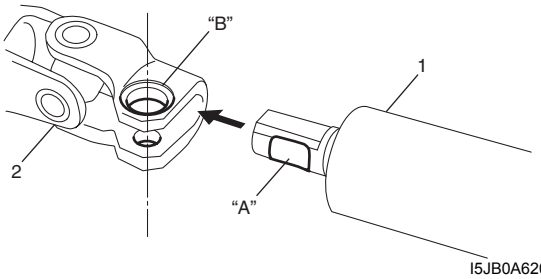
13) Remove steering column assembly from vehicle.

Installation

⚠ CAUTION

After tightening steering column assembly mounting bolts and nuts, steering shaft joint bolts should be tightened.

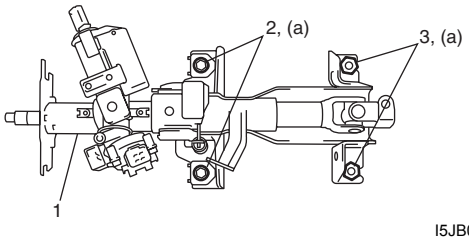
1) Be sure that front wheels and steering wheel are in straight-ahead position.
2) Align flat part "A" of steering upper shaft upper joint (1) with bolt hole "B" of steering column assembly (2) as shown in the figure. Then connect steering upper shaft upper joint.



I5JB0A620022-01

3) Install steering column assembly (1) with contacting upper side of lower bracket slits to mounting bolts. Tighten steering column lower mounting nuts (3) first and then upper mounting bolts (2) to specified torque.

Tightening torque
Steering column assembly mounting bolt and nut (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



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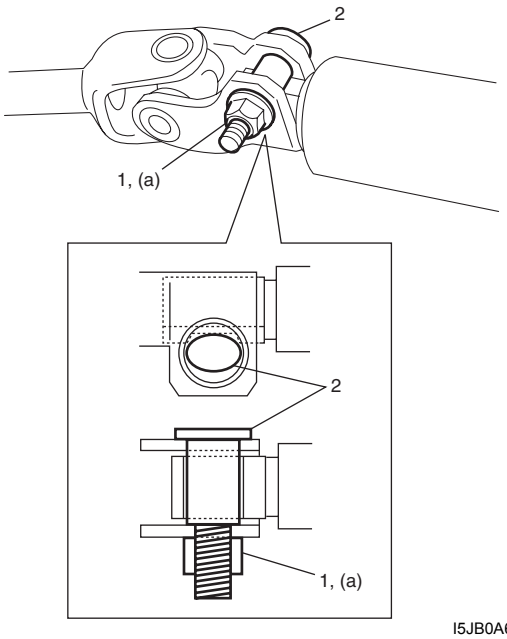
4) Install column support bracket. (if equipped)
5) Install new steering upper shaft upper joint bolt (2) and nut (1). Tighten new steering upper shaft upper joint nut (1) to specified torque.

NOTE

Do not reuse steering upper shaft upper joint bolt and nut.
Be sure to use new bolt and nut when installing.

Tightening torque
Steering upper shaft assembly upper joint nut (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)



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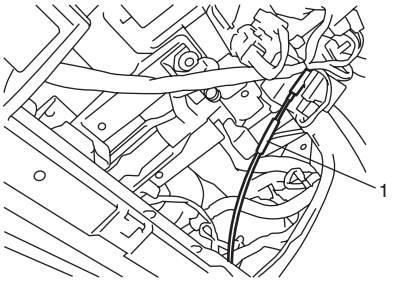
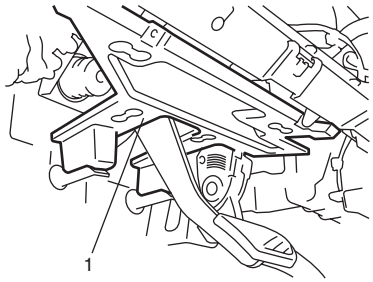
6) For A/T vehicle, connect shift (key) interlock cable (1) to ignition switch with ignition switch turned at ACC position.
And then turn ignition switch LOCK position.



I5JB0A620019-01

7) Connect steering lock assembly connector.
8) Install washer switch referring to "Windshield Wiper and Washer Switch Removal and Installation: in Section 9D in related manual".
9) Install lighting switch referring to "Headlight Switch (in Lighting Switch) Removal and Installation: in Section 9B in related manual".
10) Install immobilizer control module (ICM) referring to "Immobilizer Control Module (ICM) Removal and Installation: in Section 10C".

11) Install instrument panel under cover (1) to instrument panel.



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12) Install steering wheel and contact coil cable assembly by referring to “Steering Wheel Removal and Installation: in related manual” and “Contact Coil Cable Assembly Removal and Installation: ”.
13) Connect negative (–) cable to battery.
14) After installing steering column assembly, be sure to enable air bag system by referring to “Enabling Air Bag System: in Section 8B in related manual”.

Specifications

Tightening Torque Specifications

S5JB0B6207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Steering column assembly mounting bolt and nut	25	2.5	18.0	☞
Steering upper shaft assembly upper joint nut	23	2.3	17.0	☞

NOTE

The specified tightening torque is also described in the following.
“Steering Wheel and Column Construction: ”

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

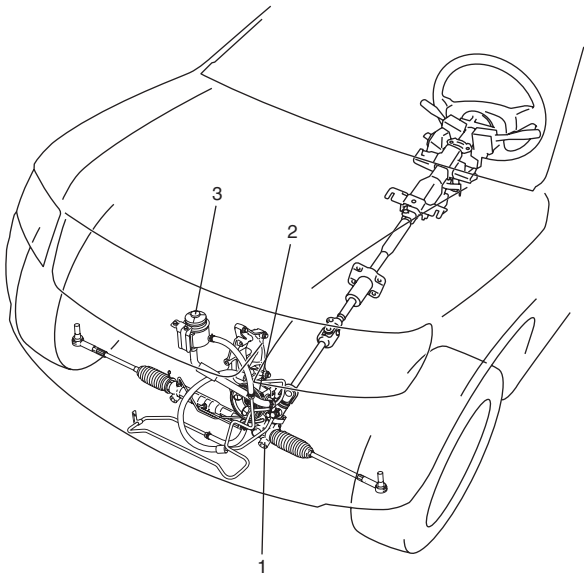
Power Assisted Steering System

General Description

P/S System Construction

S5JB0B6301001

The power steering (P/S) system in this vehicle reduces the driver's effort needed in turning the steering wheel by utilizing the hydraulic pressure generated by the power steering (P/S) pump (2) which is driven by the engine.
It is an integral type with the rack and pinion gears and the control valve unit, hydraulic pressure cylinder unit all built in the steering gear case (1).



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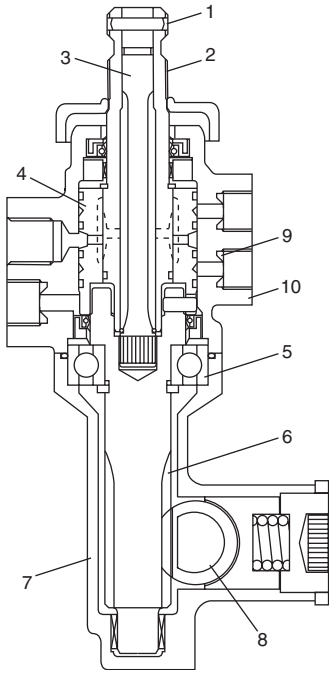
3. P/S fluid reservoir

Steering Gear Case Construction

S5JB0B6301002

The steering gear case consists of two sections: one including a cylinder and the other a valve. Main components of the cylinder section are a gear case (7), a rack (8) and a tube and those of the valve section are a valve case (10), a sleeve (4) and a stub shaft (2). The sleeve is linked with the pinion (6) through a pin (1) and the valve and stub shaft are integrated into one unit. Then the pinion and the stub shaft are linked to each other by means of the torsion bar (3).
Thus, when the stub shaft moves, the valve changes its position, thereby switching the hydraulic passage from the pump to the cylinder to help steering operation.
When turning the steering wheel feels heavy due to P/S fluid leakage or for some other reason (i.e., when in the manual steering mode), the stub shaft and pinion are in direct linkage and the force is output directly through the pinion and rack.



I5JB0A630002-01

5. Bearing
9. Ferrule

P/S Pump Construction

S5JB0B6301003

The power steering pump is a vane type and is driven by the V-ribbed belt from the crankshaft.

Power steering (P/S) pump specifications

Model		Vane type
Hydraulic pressure control	**Relieved pressure**	**7850 kPa (79.3 kg/cm^2, 1128 psi)**
	Control device	**Flow control valve and relief valve**

Flow Control Valve (Relief Valve)

As the discharge rate of the P/S pump increases in proportion to the pump revolution speed, a flow control valve is added to control it so that the optimum amount of fluid for steering operation is supplied according to the engine speed (driving condition).

Diagnostic Information and Procedures

P/S System Symptom Diagnosis

S5JB0B6304001

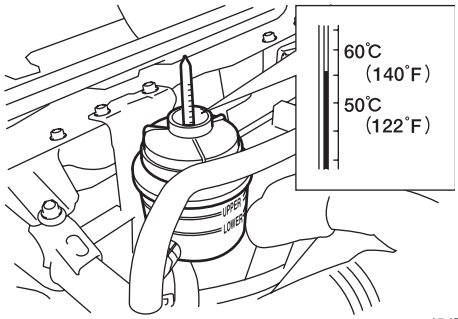
Condition	Possible cause	Correction / Reference Item
Steering wheel feels heavy (at low speed)	Fluid deteriorated, low viscosity, different type of fluid mixed	*Replace fluid.*
	Pipes or hoses deformed, air entering through joint	*Replace defective part.*
	Insufficient air purging from P/S circuit	*Purge air.*
	P/S belt worn, lacking in tension	*Replace belt and/or tensioner as necessary.*
	Tire inflation pressure excessively low	*Inflate tire.*
	Front end alignment out of order	*Check and adjust front end alignment.*
	Steering wheel installed improperly (twisted)	*Install steering wheel correctly.*
	Bind in tie-rod or tie-rod end ball joint	*Replace defective part.*
	P/S pump hydraulic pressure fails to increase	*Check pressure and repair or replace defective part.*
	P/S pump hydraulic pressure increases but slowly	*Check pressure and repair or replace defective part.*
	Steering gear case malfunction	*Replace gear case.*
Steering wheel feels heavy momentarily when turning it to the left or right	Air drawn in due to insufficient amount of fluid	*Add fluid and purge air.*
	Slipping P/S belt	*Replace belt and/or tensioner as necessary.*
	P/S pump hydraulic pressure fails to increase	*Check pressure and repair or replace defective part.*
	P/S pump hydraulic pressure increases but slowly	*Check pressure and repair or replace defective part.*
	Steering gear case malfunction	*Replace gear case.*
Poor recovery from turns	Deformed pipes or hoses	*Replace defective part.*
	Steering column installed improperly	*Install steering column correctly.*
	Front end alignment out of order	*Check and adjust front end alignment.*
	Ball joints binding	*Replace defective part.*
	P/S pump hydraulic pressure fails to increase	*Check pressure and repair or replace defective part.*
	P/S pump hydraulic pressure increases but slowly	*Check pressure and repair or replace defective part.*
	Steering gear case malfunction	*Replace gear case.*
Vehicle pulls to one side during straight driving	Mismatched or uneven tire	*Replace tire.*
	Low or uneven tire inflation pressure	*Inflate tires to proper pressure or adjust right and left tires inflation pressure.*
	Brake dragging in one wheel	*Repair.*
	Front end alignment out of order	*Check and adjust front end alignment.*
	Rear end alignment out of order	*Check and adjust rear end alignment.*
	Malfunction of control valve in gear case	*Replace gear case.*

Condition	Possible cause	Correction / Reference Item
Steering wheel play is large and vehicle wanders	Refer to “Steering Symptom Diagnosis: in Section 6A in related manual”.	
Fluid leakage	Loose joints of (hydraulic pressure) pipes and hoses	*Retighten.*
	Deformed or damaged pipes or hoses	*Replace defective part.*
Abnormal noise	Air drawn in due to insufficient amount of fluid	*Add fluid and purge air.*
	Air mixed into fluid from pipes or hoses	*Replace pipes or hoses.*
	Slipping (loose) P/S belt	*Replace tensioner as necessary.*
	Worn P/S belt	*Replace belt.*
	Loose gear case fastening bolt	*Retighten bolts.*
	Loose linkage or joints	*Retighten.*
	Pipes or hoses in contact with part of vehicle body	*Install pipes and hoses correctly.*
	Vanes of P/S pump defective	*Replace defective part or P/S pump assembly.*
	Malfunction of control valve in gear case	*Replace gear case or P/S pump assembly.*
	Bearing of P/S pump shaft defective	*Replace bearing or P/S pump assembly.*

Steering Force Check

S5JB0B6304003

1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check that tire inflation pressure is as specified. (Refer to tire placard.)
3) Start engine and keep it running till power steering fluid is warmed to 50 to 60 °C (122 to 140 °F).



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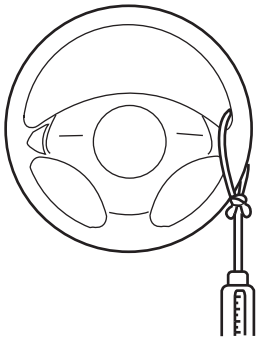
4) With engine idling, measure steering force by pulling spring balancer hooked on steering wheel in tangential direction.

Steering force
Less than 30 N (3.0 kg, 6.6 lb)



I5JB0A630057-01

Hydraulic Pressure in P/S Circuit Check

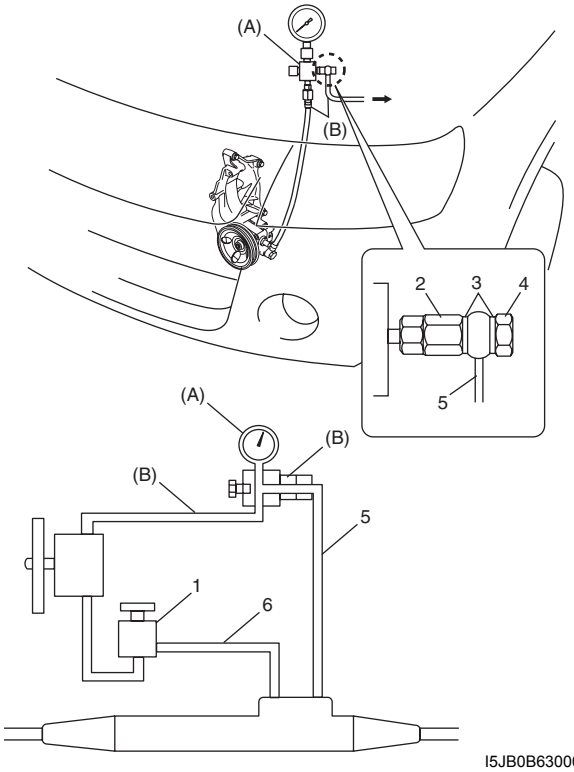
S5JB0B6304006

1) After cleaning joint of high pressure hose and P/S pump thoroughly, disconnect hose from pump and install special tool (oil pressure gauge, attachment and hose).

⚠ CAUTION

Take care not to cause damage to A/C condenser during service operation, if equipped.

Special tool
(A): 09915–77412
(B): 09915–77420

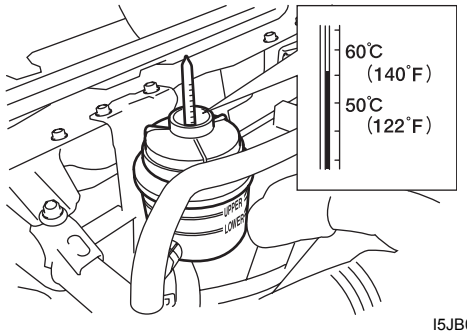


I5JB0B630003-01

1.	P/S fluid reservoir
2.	Attachment
3.	Gasket
4.	Union bolt
5.	High pressure side
6.	Low pressure side

2) Check each connection for fluid leakage and bleed air. Refer to “P/S System Air Bleeding Procedure: in related manual”.

3) With engine idling, turn steering wheel and warm up engine till temperature of fluid in tank rises to 50 – 60 °C (122 – 140 °F).



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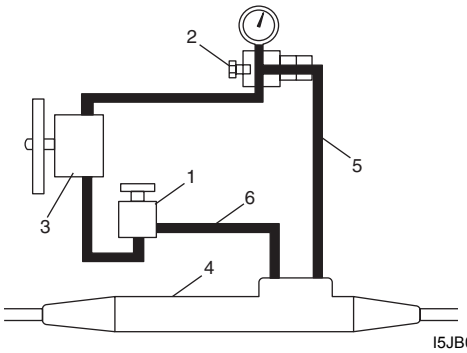
4) Check back pressure by measuring hydraulic pressure with engine idling and hands off steering wheel.
When back pressure is higher than specified values, check control valve and piping for clogging.

Back pressure
Lower than 1000 kPa (10 kg/cm², 142 psi)



I5JB0A630008-01

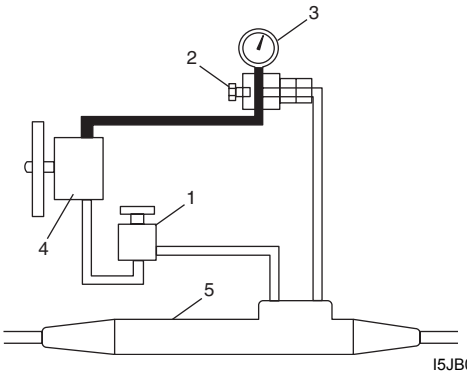
1.	P/S fluid reservoir
2.	Gauge valve (open)
3.	P/S pump
4.	P/S gear case
5.	High pressure side
6.	Low pressure side

5) Check relief pressure.
   a) Increase engine speed to about 600 r/min. (rpm). Close gauge valve gradually while watching pressure increase indicated by gauge and take reading of relief pressure (maximum hydraulic pressure).
   If it is higher than specified values, possible cause is malfunction of relief valve.
   If it is lower than specified values, possible cause is either failure of P/S pump or settling of relief valve spring.

   Relief pressure when gauge value is closed : 7650 – 8340 kPa (77.3 – 84.2 kg/cm², 1099 – 1197 psi)

⚠ CAUTION

Be sure not to close gauge valve for longer than 10 seconds.



I5JB0A630009-04

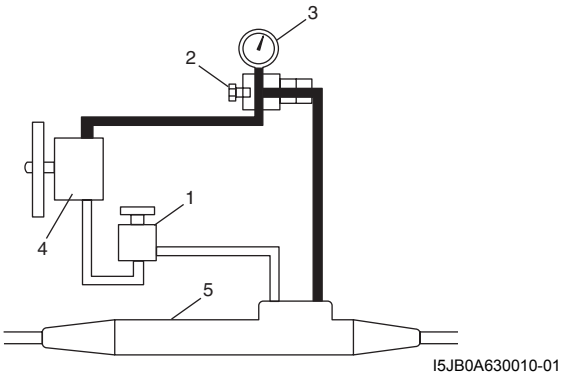
1.	P/S fluid reservoir
2.	Gauge valve (shut)
3.	Oil pressure gauge
4.	P/S pump
5.	P/S gear case

   b) Open gauge valve fully and increase engine speed to about 1500 r/min. (rpm). Then turn steering wheel to the left or right fully and take reading of relief pressure.
   If it is higher than specified values, possible cause is malfunction of relief valve.
   If it is lower than specified values, possible cause is failure in steering gear case. Replace gear case.

   Relief pressure when gauge value is opened : 7650 – 8340 kPa (77.3 – 84.2 kg/cm², 1099 – 1197 psi)

⚠ CAUTION

Be sure not to hold steering wheel at fully turned position for longer than 10 seconds.



I5JB0A630010-01

1.	P/S fluid reservoir
2.	Gauge valve (open)
3.	Oil pressure gauge
4.	P/S pump
5.	P/S gear case

Repair Instructions

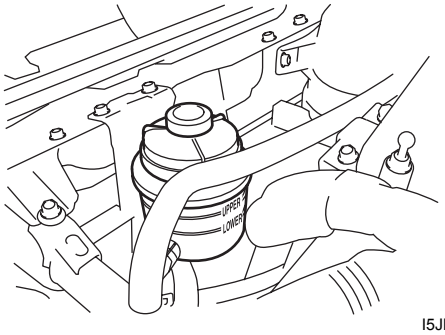
P/S Fluid Level Check

S5JB0B6306002

With engine stopped, check fluid level indicated on P/S fluid reservoir, which should be between “UPPER” and “LOWER” marks. If it is lower than “LOWER” mark, fill fluid up to “UPPER” mark.

NOTE

- **Be sure to use an specified power steering fluid.**
- **Fluid level should be checked when fluid is cool.**



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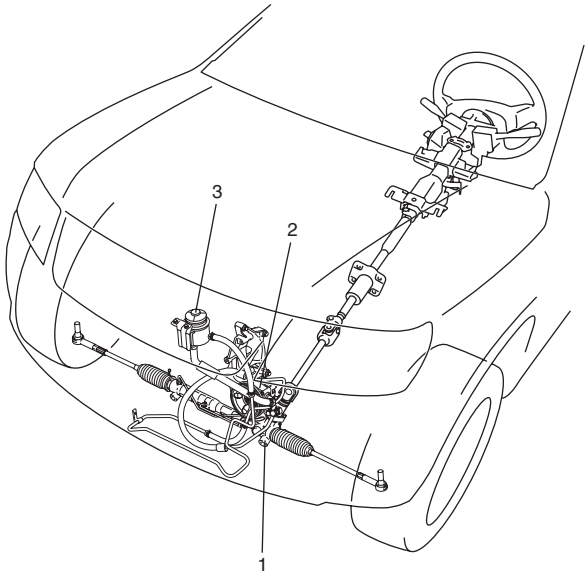
P/S Fluid Leakage Check

S5JB0B6306003

Start engine and turn steering wheel fully to the right and left so that maximum hydraulic pressure is provided. Then visually check P/S gear case assembly (1), P/S pump (2) and P/S fluid reservoir (3) themselves and each joint of their connecting pipes for leakage.

⚠ CAUTION

Never keep steering wheel turned fully for longer than 10 seconds.



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P/S Pump and A/C Compressor (If Equipped) Drive Belt Removal and Installation

S5JB0B6306008

Refer to “Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J”.

P/S Gear Case Assembly Removal and Installation

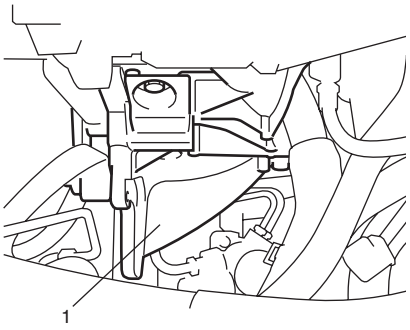
S5JB0B6306014

⚠ CAUTION

Never disassemble P/S gear case assembly. Disassembling will adversely affect original performance of P/S gear case assembly.

Removal

1) Disconnect negative (–) cable at battery.
2) Take out P/S fluid in reservoir with syringe or such.
3) Hoist vehicle and remove both right and left wheels.
4) Disconnect both right and left tie-rod ends from knuckle referring to Step 2) to 3) of “Removal” in “Tie-Rod End Removal and Installation: in related manual”.
5) Remove generator referring to “Generator Dismounting and Remounting: in Section 1J”.
6) Remove P/S pump referring to “P/S Pump Removal and Installation: ”.
7) Remove P/S pump bracket (1).



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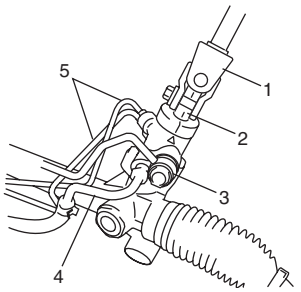
8) Disconnect steering lower shaft assembly (1) from pinion shaft of P/S gear case assembly (2) referring to Step 5) of “Removal” in “Steering Lower Shaft Assembly Removal and Installation: in Section 6B in related manual”.
9) Disconnect high pressure pipe (3) from P/S gear case assembly.
10) Disconnect low pressure pipe (4) from P/S gear case assembly.
11) Remove P/S gear case cylinder pipes (5) from P/S gear case assembly.



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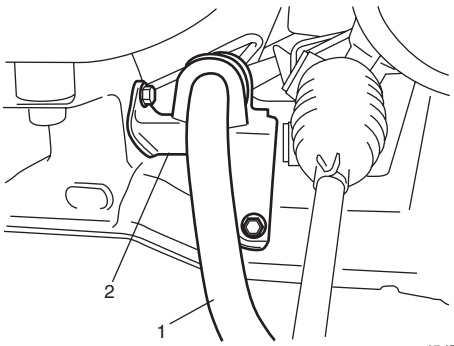
12) Remove stabilizer bar mount bolt and stabilizer joint.

NOTE

Do not remove stabilizer bar from vehicle.

13) Remove stabilizer bar mount bracket (2) from left side of front suspension frame.



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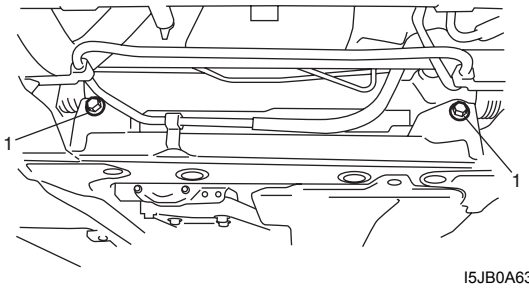
14) Remove bolts (1) and then take off P/S gear case assembly from left side of vehicle.

NOTE

P/S gear case assembly cannot be removed from the right side of vehicle.

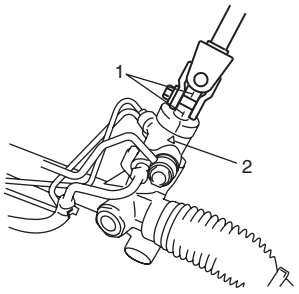


I5JB0A630019-01

Installation

Reverse removal procedure for installation of P/S gear case, noting the following points.

- After confirming that front tire is in straight position, install P/S gear case to body temporarily. Next, with tie-rod end installed to knuckle, set rack in position close to neutral. Then obtain the neutral state by aligning match marks (1) on pinion shaft and steering gear case (2) and insert steering lower joint into pinion shaft.
  Refer to Step 3) of “Installation” in “Steering Lower Shaft Assembly Removal and Installation: in Section 6B in related manual”.



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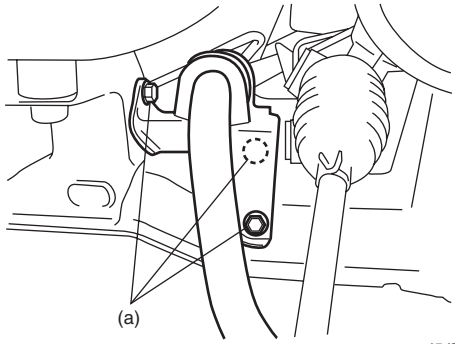
⚠ CAUTION

Be sure to confirm that steering wheel and front tires (wheels) are in straight position when inserting steering lower joint into steering pinion shaft.

- If a plug was put to disconnected pipe when removing steering gear case, remove that plug before reconnecting pipe.
- Use specified torque as given below.

Tightening torque
Steering lower shaft bolt: 25 N·m (2.5 kgf-m, 18.5 lb-ft)
Gear case high pressure pipe union bolt: 35 N·m (3.5 kgf-m, 25.5 lb-ft)
Gear case cylinder pipe flare nut: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Gear case mounting bolt: 105 N·m (10.5 kgf-m, 76.0 lb-ft)
Gear case low pressure pipe flare nut: 35 N·m (3.5 kgf-m, 25.5 lb-ft)
P/S pump bracket bolt: 55 N·m (5.5 kgf-m, 40.0 lb-ft)
Stabilizer bar mount bracket mount bolt (a): 60 N·m (6.0 kgf-m, 43.0 lb-ft)

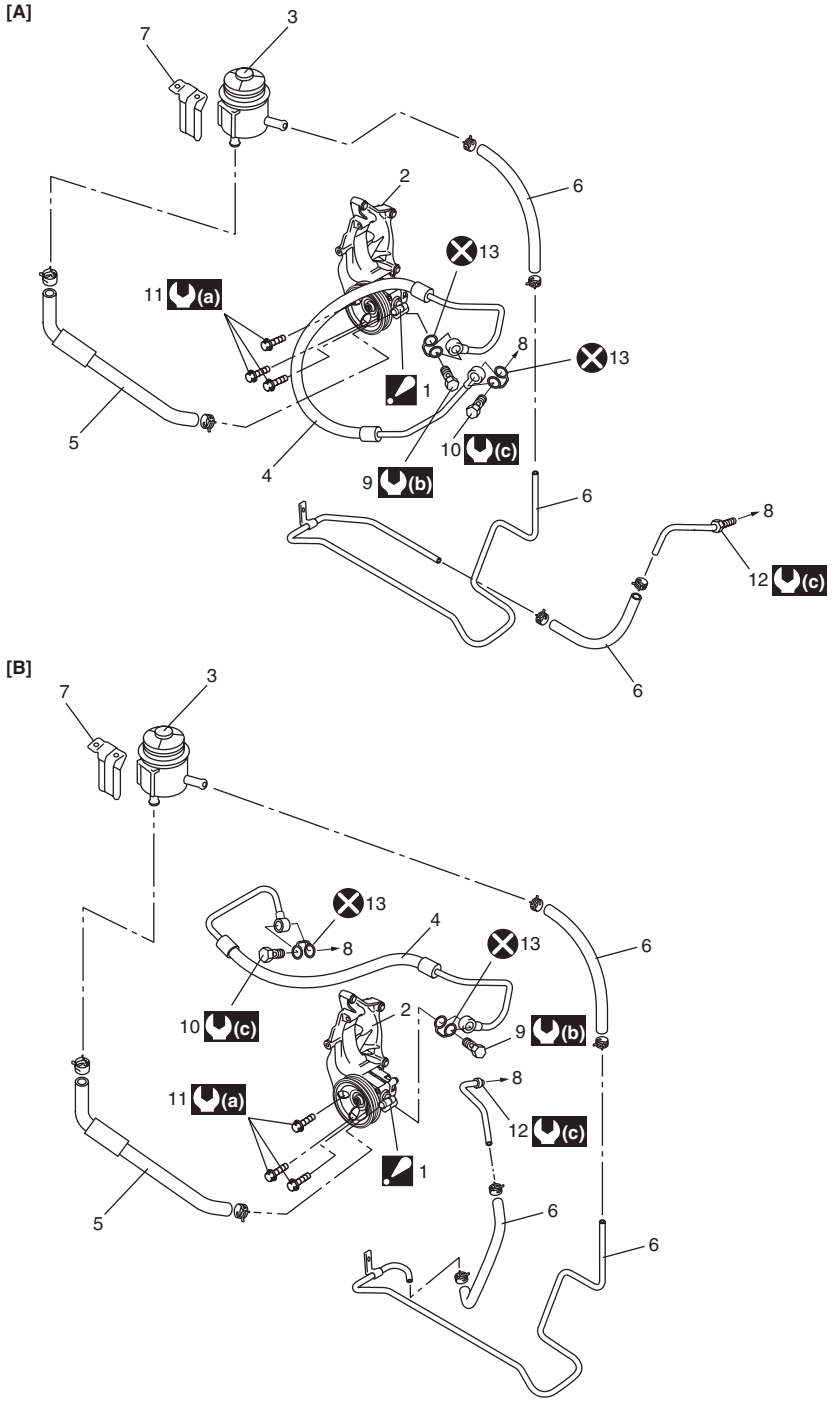


I5JB0A630021-02

- After installation, be sure to fill specified P/S fluid and bleed air. Refer to “P/S System Air Bleeding Procedure: in related manual”.
- Check toe setting. Adjust as required. Refer to “Front Wheel Alignment Inspection and Adjustment: in Section 2B in related manual”.

P/S Hose / Pipe Components

S5JB0B6306018



I5JB0B630006-02

[A]: LH steering vehicle	6. Low pressure return hose	13. Washer
[B]: RH steering vehicle	7. P/S fluid reservoir bracket	(a) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
1. P/S pump assembly : Never disassemble.	8. To P/S gear case	(b) : 60 N·m (6.0 kgf-m, 43.5 lb-ft)
2. Bracket	9. P/S pump high pressure pipe union bolt	(c) : 35 N·m (3.5 kgf-m, 25.5 lb-ft)
3. P/S fluid reservoir	10. P/S gear case high pressure pipe union bolt	: Do not reuse.
4. High pressure hose and pipe	11. P/S pump mounting bolt	
5. Suction hose	12. P/S gear case low pressure pipe flare nut	

P/S Pump Removal and Installation

S5JB0B6306019

Removal

⚠ CAUTION

Never disassemble P/S pump for diesel engine model. Disassembly will spoil its original performance. If faulty condition is found, replace it with new one.

NOTE

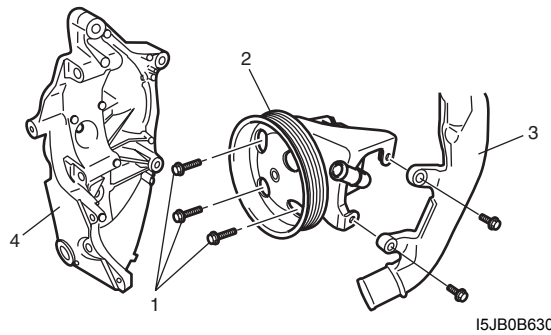
Be sure to clean each joint of suction and discharge sides thoroughly before removal.

1) Disconnect negative (–) cable at battery.
2) Remove generator referring to “Generator Dismounting and Remounting: in Section 1J”.
3) Take out P/S fluid in reservoir with syringe or such.
4) Disconnect high pressure pipe and suction hose from P/S pump.

NOTE

As fluid flows out of disconnected joints, put a receptacle under joints or a plug to pipe.

5) Remove P/S pump mounting bolts (1).
6) Remove radiator inlet pipe No.1 bracket (3), and then remove P/S pump (2).



I5JB0B630007-01

4.	P/S pump bracket

NOTE

Plug each port of removed pump to prevent dust or any other foreign matter from entering.

Installation

Reverse removal procedure, and then noting the following instructions.

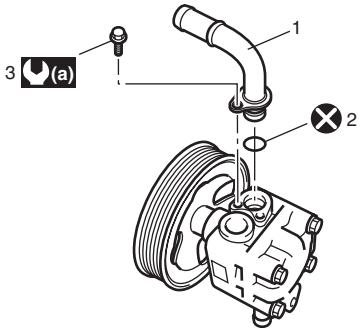
NOTE

Fill specified power steering fluid after installation and bleed air without failure. (Refer to “P/S System Air Bleeding Procedure: in related manual”.)

Tightening torque
P/S pump mounting bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
P/S pump high pressure pipe union bolt: 60 N·m (6.0 kgf-m, 43.0 lb-ft)

P/S Pump Assembly Components

S5JB0B6306022



I5JB0B630008-01

1.	Suction connector
2.	O-ring
3.	Suction connector bolt
(a)	: 3.7 N·m (0.37 kgf-m, 2.7 lb-ft)
⊗	: Do not reuse.

P/S Pump Inspection

S5JB0B6306025

Check P/S pump as follows.

- Damage of pump body.
- Oil leakage from pump body.
- Wear and damage of pulley.
- Abnormal noise when pulley is turned by hand.

If abnormality is found, replace P/S pump with new one.

Specifications

Tightening Torque Specifications

S5JB0B6307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Steering lower shaft bolt	25	2.5	18.5	☞
Gear case high pressure pipe union bolt	35	3.5	25.5	☞
Gear case cylinder pipe flare nut	25	2.5	18.0	☞
Gear case mounting bolt	105	10.5	76.0	☞
Gear case low pressure pipe flare nut	35	3.5	25.5	☞
P/S pump bracket bolt	55	5.5	40.0	☞
Stabilizer bar mount bracket mount bolt	60	6.0	43.0	☞
P/S pump mounting bolt	25	2.5	18.0	☞
P/S pump high pressure pipe union bolt	60	6.0	43.0	☞

NOTE

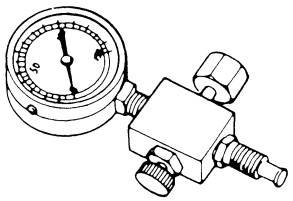
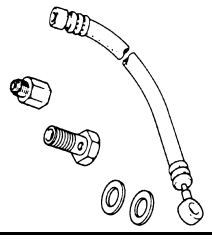
The specified tightening torque is also described in the following.
“P/S Hose / Pipe Components: ”
“P/S Pump Assembly Components: ”

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

Special Tools and Equipment

Special Tool

S5JB0B6308001

09915–77412 Oil pressure gauge ☞		09915–77420 Oil pressure gauge attachment and hose set ☞	

Section 7

HVAC

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Heater and Ventilation

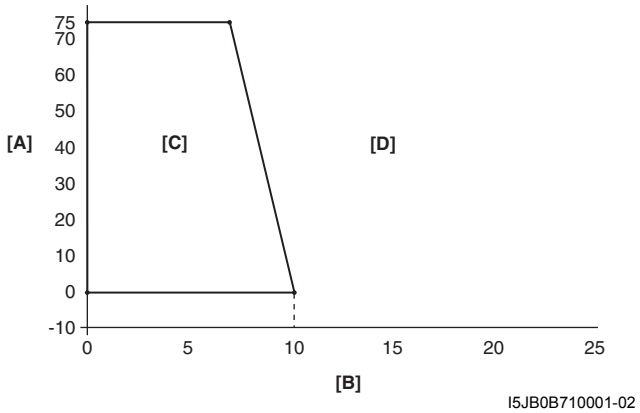
General Description

Additional Heater System Description

S5JB0B7101005

This system, consisting of ECM, additional heater assembly and 3 relays, warms up the engine coolant which flows through the heater core while the engine is warmed up, thereby promoting interior heating. It is not activated during pre/post heating by glow plug. Not during pre/post heating by glow plug, it is activated on the following conditions.

- Ten seconds have passed after the engine start.
- The battery voltage is more than 12.2 V.
- The engine speed is more than 700 rpm.
- The engine coolant and the intake air temperature is as shown in the graph below.



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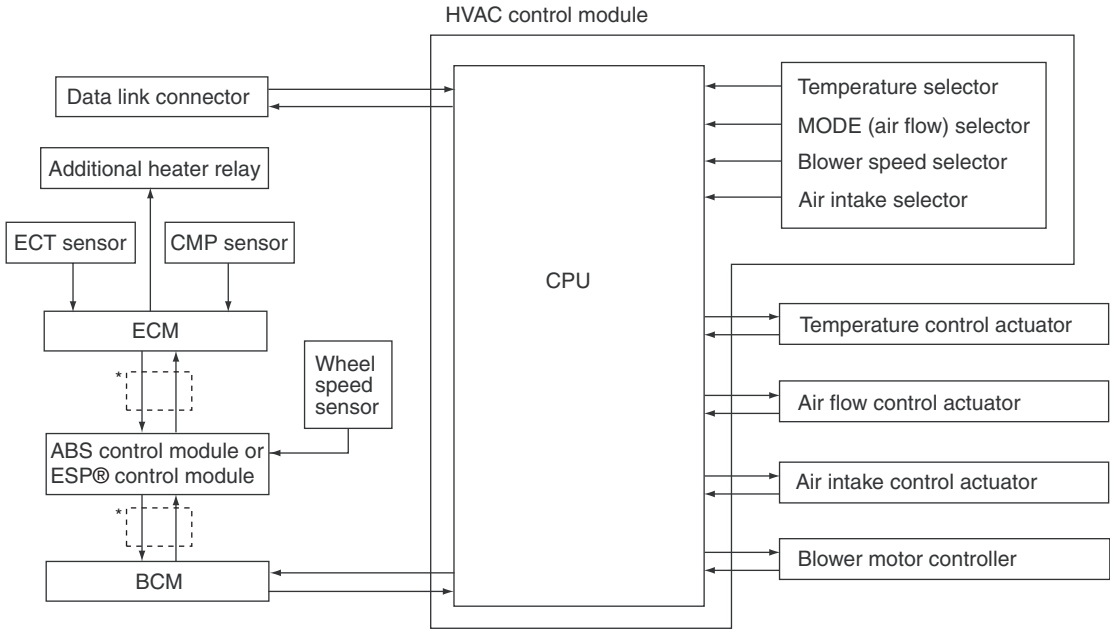
[A]: Engine coolant temperature (°C)	[C]: ON
[B]: Intake air temperature (°C)	[D]: OFF

Schematic and Routing Diagram

Electronic Control Input / Output Table (for Vehicle without A/C)

S5JB0B7102002



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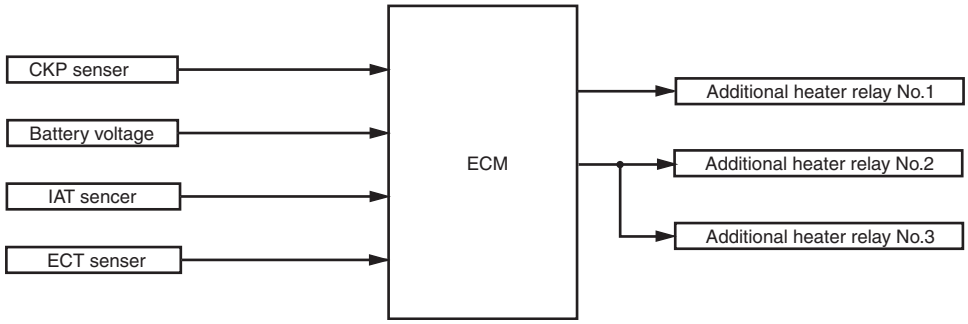
*: CAN communication

Additional Heater System Input / Output Table

S5JB0B7102004



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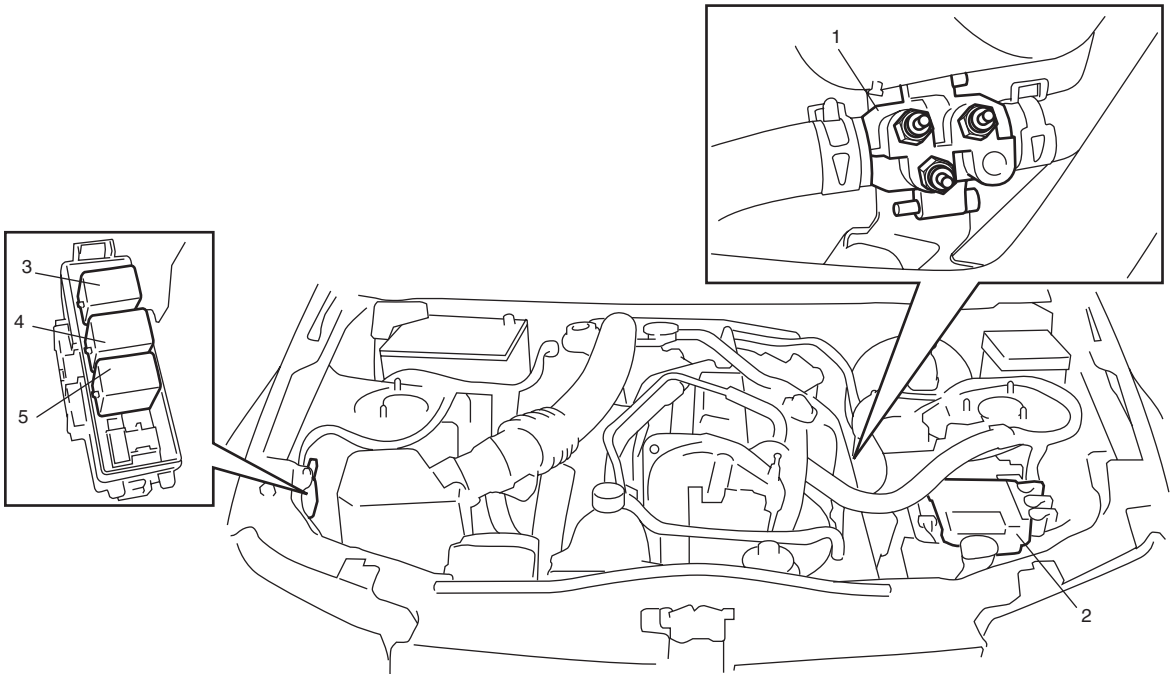
Additional Heater System Component Location

S5JB0B7102005



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1. Additional heater assembly	3. Additional heater relay No.1	5. Additional heater relay No.3
2. ECM	4. Additional heater relay No.2	

Diagnostic Information and Procedures

Heater and Ventilation Symptom Diagnosis

S5JB0B7104008

Condition	Possible cause	Correction / Reference Item
Blower won't work even when blower speed selector is ON	Blower fuse blown	*Replace fuse to check for short.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in related manual".*
	Blower motor relay faulty	*Check relay referring to "Blower Motor Relay Inspection: in related manual".*
	Blower motor controller faulty	*Check blower motor controller referring to "Blower Motor Controller Inspection: in related manual".*
	Blower speed selector faulty	*Check HVAC control module referring to "HVAC Control Module and Its Circuits Inspection (for Vehicle without A/C): in related manual" or "HVAC Control Module and Its Circuits Inspection: in Section 7B in related manual".*
	Wiring or grounding faulty	*Repair as necessary.*
Air temperature is not changed even when temperature selector is changed	Temperature control door broken	*Repair Temperature control door.*
	Linkage broken	*Check actuator linkage referring to "Actuator Linkage Inspection: in related manual".*
	Heater hoses leaking or clogged	*Replace hoses.*
	Heater core leaking or clogged	*Replace heater core referring to "Heater Core Removal and Installation: ".*
	Temperature control actuator faulty	*Check temperature control actuator referring to "Temperature Control Actuator Inspection: in related manual".*
	Temperature selector faulty	*Check HVAC control module referring to "HVAC Control Module and Its Circuits Inspection (for Vehicle without A/C): in related manual" or "HVAC Control Module and Its Circuits Inspection: in Section 7B in related manual".*
Air outlet port is not changed when air flow selector is changed	Air flow control door broken	*Repair air flow control door.*
	Linkage broken	*Check actuator linkage referring to "Actuator Linkage Inspection: in related manual".*
	Air flow control actuator faulty	*Check air flow control actuator referring to "Air Flow Control Actuator Inspection: in related manual".*
	Mode selector faulty	*Check HVAC control module referring to "HVAC Control Module and Its Circuits Inspection (for Vehicle without A/C): in related manual" or "HVAC Control Module and Its Circuits Inspection: in Section 7B in related manual".*
No fresh air inlet is changed.	Fuse blown	*Check related fuses and check for short circuit to ground.*
	Air intake control actuator faulty	*Check air intake control actuator.*
	Air intake control door broken	*Repair air intake control door.*
	Linkage broken	*Check actuator linkage referring to "Actuator Linkage Inspection: in related manual".*
	Air intake selector faulty	*Check HVAC Control module referring to "HVAC Control Module and Its Circuits Inspection (for Vehicle without A/C): in related manual" or "HVAC Control Module and Its Circuits Inspection: in Section 7B in related manual".*
	Wiring or grounding faulty	*Repair or replace as necessary.*

Condition	Possible cause	Correction / Reference Item
Heating performance is poor (for additional heater system)	Fuse blown	*Check related fuses and check for short circuit to ground.*
	Additional heater relays faulty	*Check additional heater relays referring to "Additional Heater Relay Inspection: ".*
	Additional heater assembly faulty	*Check additional heater assembly referring to "Additional Heater Assembly On-Vehicle Inspection: ".*
	ECM faulty	*Check ECM.*
	Wiring or grounding faulty	*Repair as necessary.*

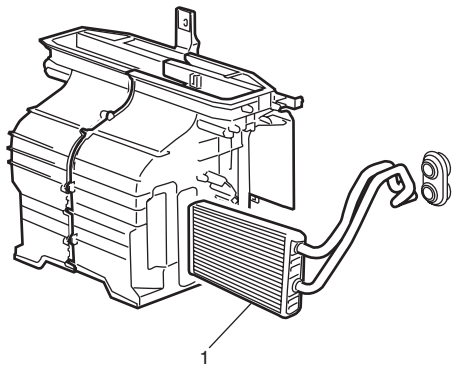
Repair Instructions

Heater Core Removal and Installation

S5JB0B7106010

Removal

1) Remove instrument panel referring to "Instrument Panel Removal and Installation: in Section 9C in related manual".
2) Remove HVAC unit. Refer to "HVAC Unit Removal and Installation: in Section 7B".
3) Remove heater core pipe clamp and then, pull out heater core (1) from HVAC unit.



I6JB01710006-01

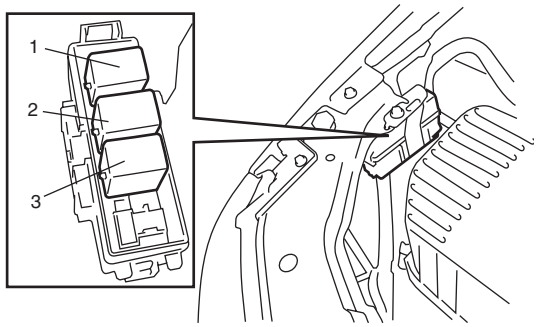
Installation

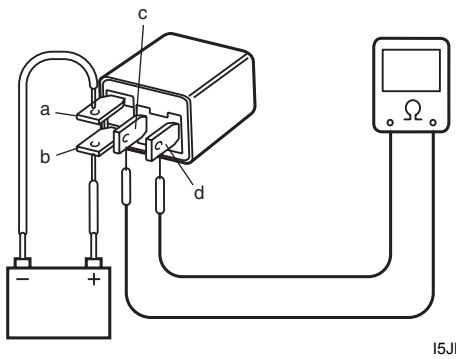
1) Install heater core by reversing removal procedure, noting the following items.
   - When installing heater core, be careful not to damage fins of heater core.
   - When installing each part, be careful not to catch any wiring harness.
2) Fill engine coolant referring to step 13) to 20) of "Cooling System Refilling: in Section 1F".
3) Enable air bag system referring to "Enabling Air Bag System: in Section 8B in related manual".

Additional Heater Relay Inspection

S5JB0B7106024

1) Disconnect negative (–) cable at battery.
2) Remove additional heater relay No.1 (1), No.2 (2) and No.3 (3) from vehicle.
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.
   Check that there is continuity between terminal "c" and "d".If there is no continuity, replace relay.





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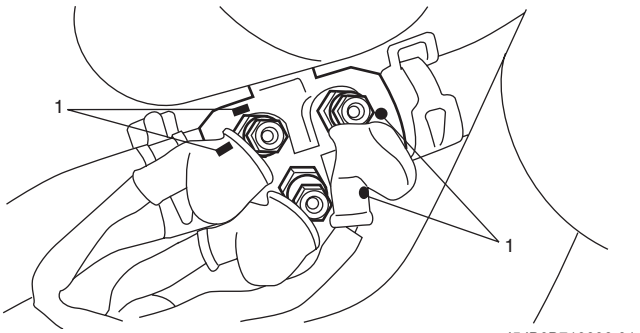
Additional Heater Assembly On-Vehicle Inspection

S5JB0B7106025

1) Disconnect negative (–) cable at battery.
2) Disconnect wires from additional heater terminals.

NOTE

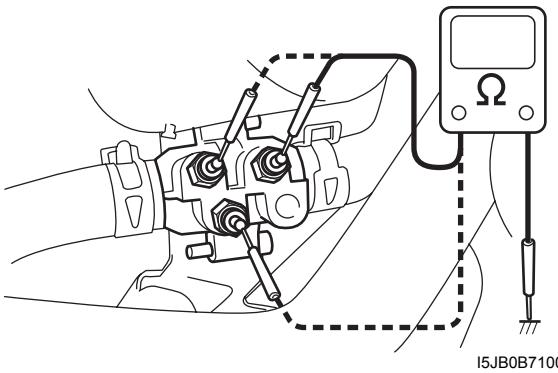
Make alignment marks (1) on wires and additional heater body for a guide during reinstallation, if necessary.



I5JB0B710006-01

3) Check resistance between each terminal of additional heater and vehicle body ground. If resistance is out of specification, replace additional heater assembly with new one.

Additional heater terminal resistance
0.55 – 0.65 Ω at 20 °C (68 °F)



I5JB0B710007-01

Additional Heater Assembly Removal and Installation

S5JB0B7106026

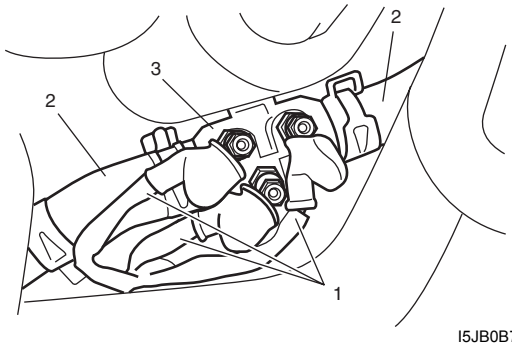
Removal

1) Disconnect negative (–) cable at battery.
2) Drain engine coolant referring to "Cooling System Draining: in Section 1F".
3) Remove intercooler outlet pipe referring to "Intercooler and Air Intake Pipe Components: in Section 1D".
4) Disconnect additional heater wires (1) and heater hoses (2) from additional heater assembly (3).

NOTE

Make alignment marks on wires and additional heater body for a guide during reinstallation, if necessary.

5) Remove additional heater assembly (3) from its bracket.



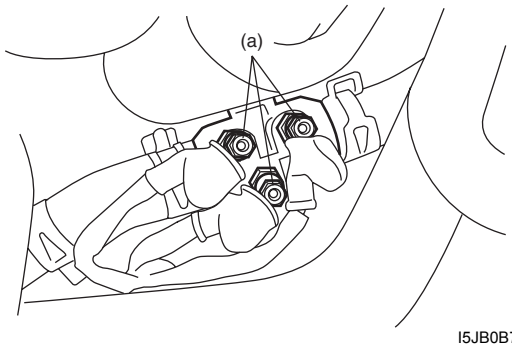
I5JB0B710008-01

Installation

Reverse the removal procedure for installation noting the followings.

- Tighten additional heater wire nuts to specified torque.

Tightening torque
Additional heater wire nut (a): 4 N·m (0.4 kgf-m, 3.0 lb-ft)



I5JB0B710009-01

- Fill engine coolant referring to step 13) to 20) of "Cooling System Refilling: in Section 1F".

Specifications

Tightening Torque Specifications

S5JB0B7107001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Additional heater wire nut	4	0.4	3.0	☞

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

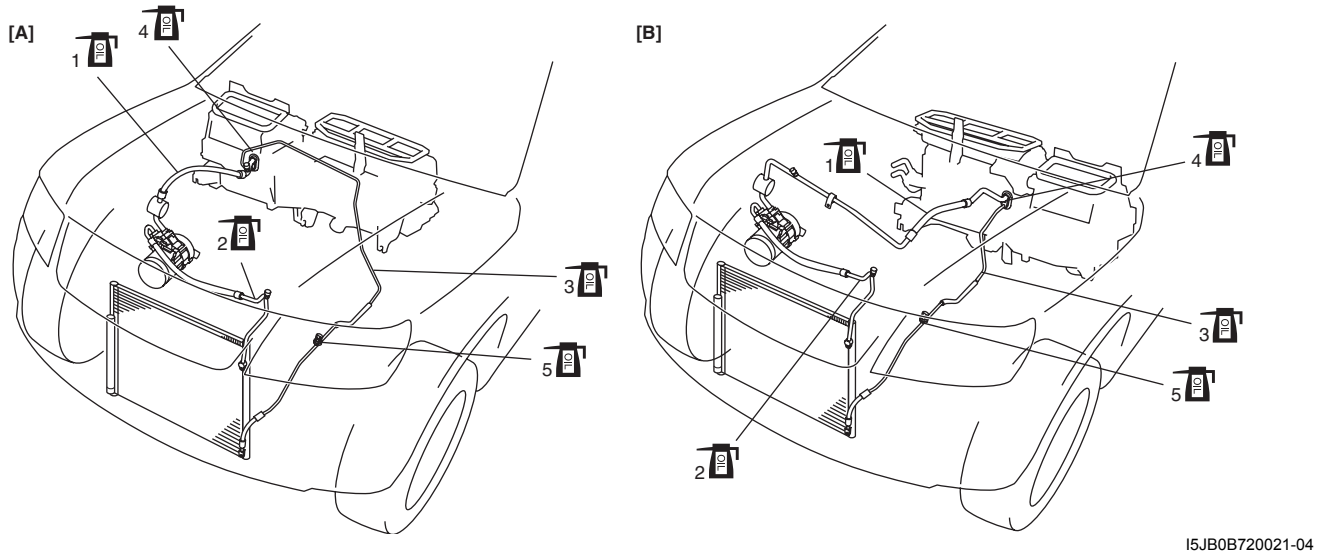
Air Conditioning System

Precautions

Precautions on Servicing Refrigerant Line

S5JB0B7200005

- When connecting hoses and pipes, apply a few drops of compressor oil (refrigerant oil) to seats of coupling nuts and O-ring.



I5JB0B720021-04

[A]: LH steering vehicle	2. Discharge hose	5. Pressure sensor
[B]: RH steering vehicle	3. Liquid pipe	: Apply compressor oil (refrigerant oil) to O-ring.
1. Suction hose	4. Expansion valve	

- Never use heat for bending pipes. When bending a pipe, try to make its bending radius as slight 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 tightening or loosening a fitting, use two wrenches, one for turning and the other for support.
- Tighten bolts to specified torque.

  Tightening torque
  Refrigerant line bolt: 12 N·m (1.2 kgf-m, 9.0 lb-ft)

- Route drain hose so that drained water does not make any contact to vehicle components.

Precautions on Replenishing Compressor Oil

S5JB0B7200008

When replacing air conditioning parts with new ones, it is necessary to replenish oil by the amount supposedly remaining in each part.

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 20 cm^3 (20 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 (1) by the amount required for air conditioner cycle. Therefore, when using a new compressor for replacement, drain oil from it by the amount calculated as follows.

"C" = "A" – "B"
"C": Amount of oil to be drained
"A": Amount of oil sealed in a new compressor
"B": Amount of oil remaining in removed compressor

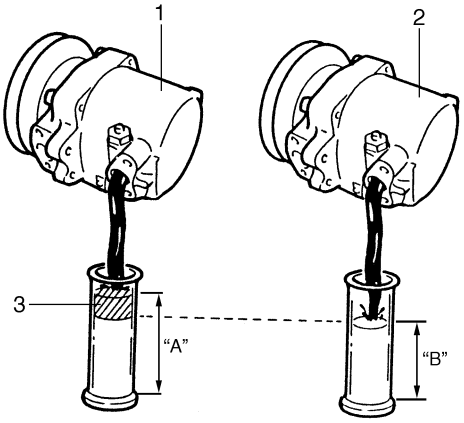
NOTE

Compressor assembly supplied from factory is filled up with the following amount of oil.

: Compressor oil 99000–99022–00E (Compressor oil (DH-PS, 250cc))

Amount of oil in new compressor
150 (+20, –0) cm^3 (150 (+20, –0) cc)

Amount of compressor oil to be replenished after part replacement
Evaporator: 50 cm^3 (50 cc)
Condenser: 30 cm^3 (30 cc)
Receiver / dryer: 10 cm^3 (10 cc)
Hoses: 10 cm^3 (10 cc)
Pipes: 10 cm^3 (10 cc)



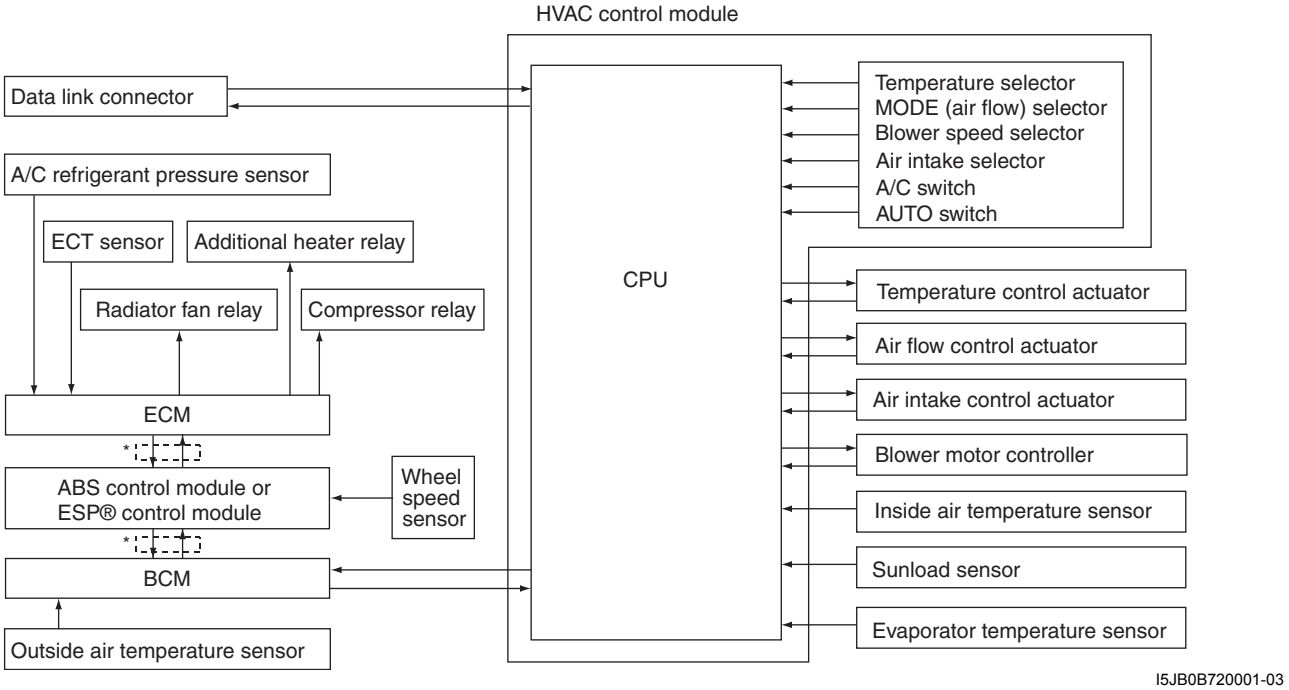
I5JB0A720003-01

2.	Removed compressor
3.	Excess oil (A – B)

General Description

Auto A/C Electronic Control Input / Output Table

S5JB0B7201003

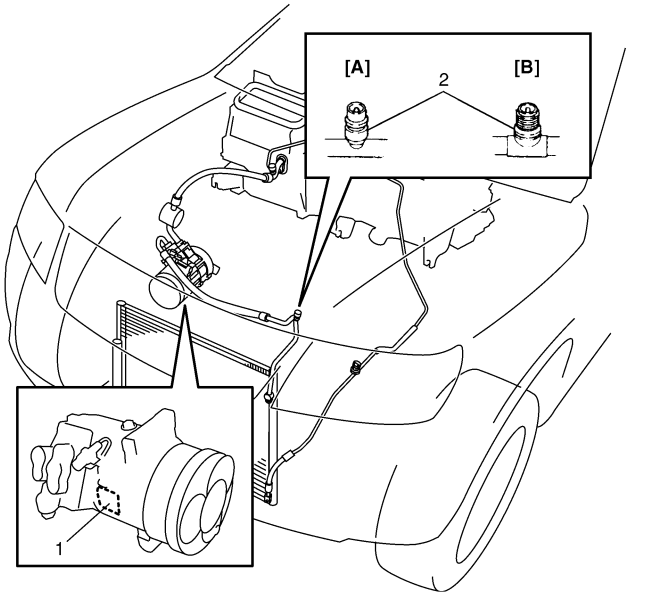


I5JB0B720001-03

A/C Refrigerant Type Description

S5JB0B7201005

Whether the A/C in the vehicle being serviced uses HFC-134a (R-134a) or CFC-12 (R-12) is indicated on LABEL (1) on the compressor. Also, it can be checked by the shape of the service (charge) valve (2).



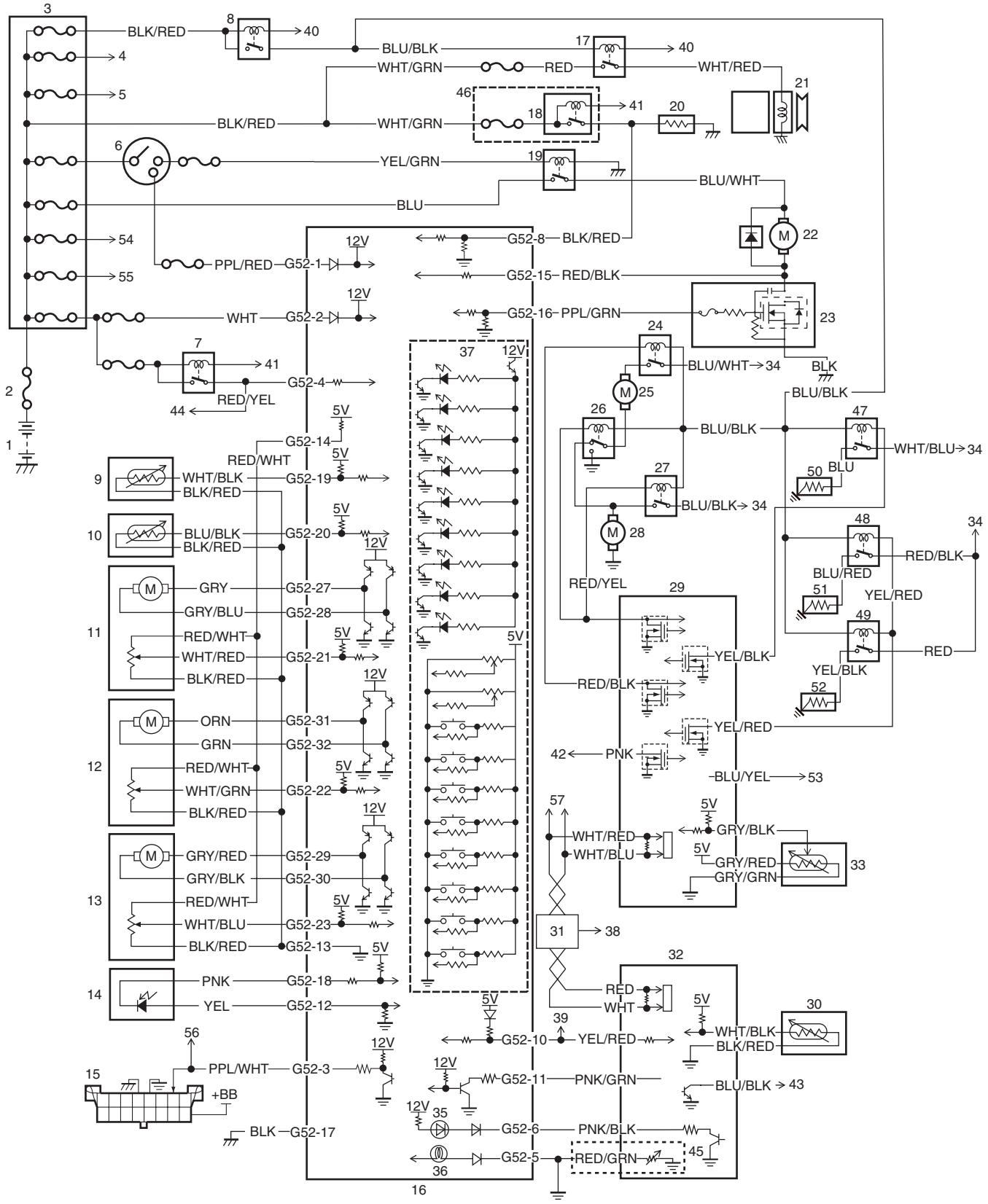
I5JB0B720002-02

[A]:	HFC-134a (R-134a)
[B]:	CFC-12 (R-12)

Schematic and Routing Diagram

A/C System Wiring Circuit Diagram

S5JB0B7202001



I5JB0B720003-02

1. Battery	20. Rear defogger	39. To information display
2. Main fuse	21. A/C compressor	40. To ECM
3. Fuse box	22. Blower motor	41. To BCM

4. To radiator fan relay No.1	23. Blower motor selector	42. To compressor relay
5. To radiator fan relay No.3	24. Radiator fan relay No.1	43. To rear defogger relay
6. Ignition switch	25. Radiator fan No.1	44. To combination switch
7. Small lamp relay	26. Radiator fan relay No.2	45. AUTO-ON head light system vehicle
8. Main relay	27. Radiator fan relay No.3	46. Integration relay No.1
9. Evaporator temperature sensor	28. Radiator fan No.2	47. Additional heater relay No.1
10. Inside air temperature sensor	29. ECM	48. Additional heater relay No.2
11. Temperature control actuator	30. Outside temperature sensor	49. Additional heater relay No.3
12. Air intake control actuator	31. ABS or ESP® control module	50. Additional heater No.1
13. Air flow control actuator	32. BCM	51. Additional heater No.2
14. Sunload sensor	33. Refrigerant pressure sensor	52. Additional heater No.3
15. Data link connector	34. To fuse box	53. To main relay
16. HVAC control module	35. Theft deterrent light	54. To additional heater relay No.1
17. Compressor relay	36. Illumination lamp	55. To additional heater relay No.2 and No.3
18. Rear defogger relay	37. Indicator lamp, switch, selector	56. To ECM, TCM, BCM, ABS or ESP® control module, SDM, 4WD control module and Immobilizer control module (ICM)
19. Blower motor relay	38. To wheel speed sensor	57. To TCM, 4WD control module, keyless start control module, Immobilizer control module (ICM), combination meter and steering angle sensor

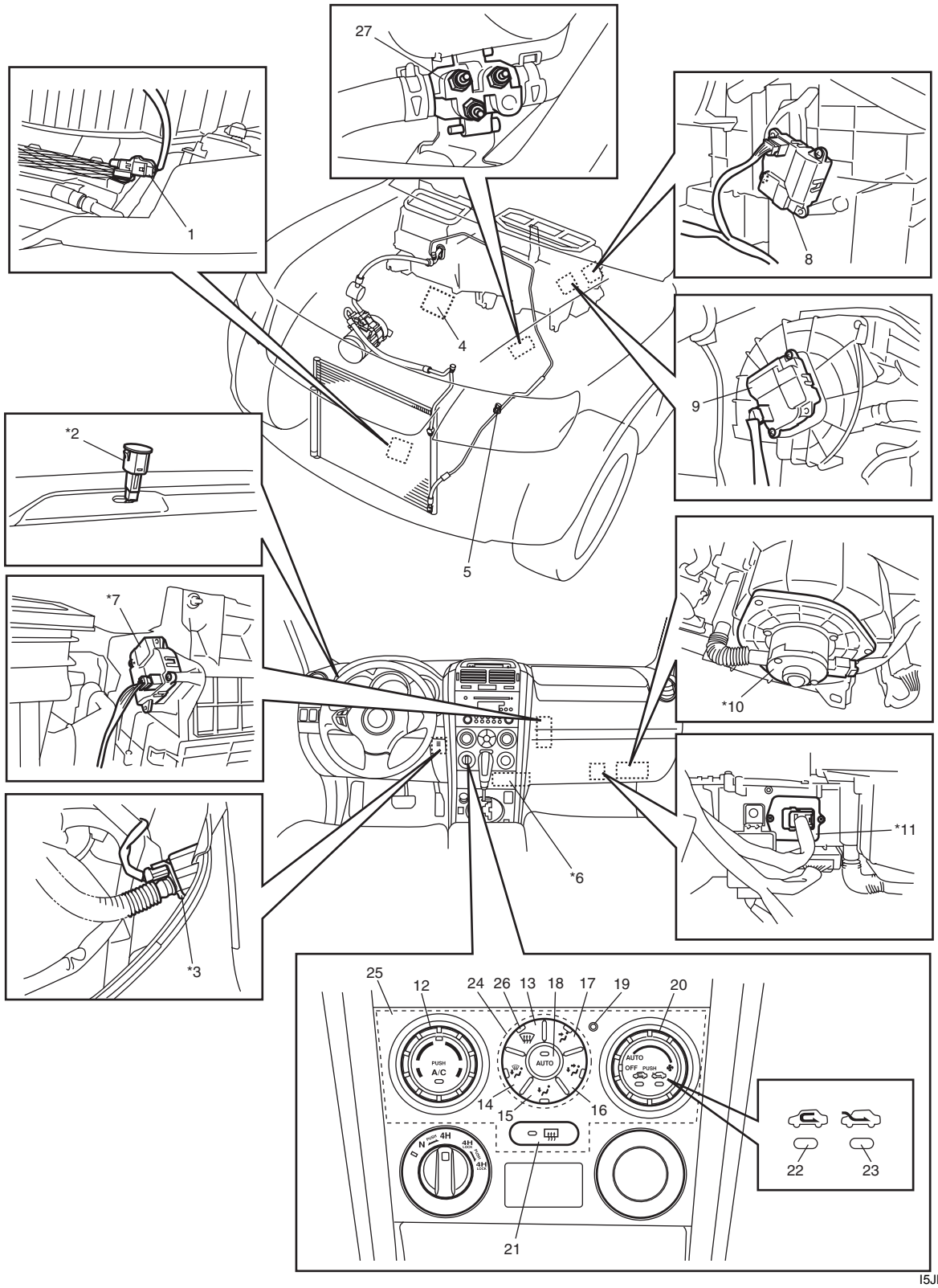
Component Location

A/C Control System Components Location

S5JB0B7203002

NOTE

The figure shows left-hand steering vehicle. For right-hand vehicle, parts with (*) are installed at the opposite side.



I5JB0B720004-04

1. Outside temperature sensor	10. Blower motor	19. Theft deterrent light

2. Sunload sensor	11. Blower motor controller	20. Blower speed selector / Air intake selector
3. Inside temperature sensor	12. Temperature selector / A/C switch	21. Rear defogger switch
4. ECT sensor	13. “DEF” switch	22. “REC” indicator lamp
5. Refrigerant pressure sensor	14. “DEF / FOOT” switch	23. “FRE” indicator lamp
6. Evaporator temperature sensor	15. “FOOT” switch	24. MODE selector
7. Air intake control actuator	16. “BI-LEVEL” switch	25. HVAC control module (vehicle with A/C)
8. Temperature control actuator	17. “VENT” switch	26. “DEF” indicator lamp
9. Air flow control actuator	18. “AUTO” switch	27. Additional heater assembly

Diagnostic Information and Procedures

Scan Tool Data

S5JB0B7204006

As the data values given below are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the 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
☞ TEMP CONT SWITCH	Each reference value is relative to the position of temperature selector of HVAC control module.		Max Cool, 18 °C (61 °F) – 28 °C (81 °F), Max Hot
☞ CABIN TEMPERATURE	Reference value is relative to in car temperature.		–40 °C – 87.5 °C (–40 °F – 189.5 °F)
☞ OUT SIDE AIR TEMP	Reference value is relative to outside air temperature.		–40 °C – 87.5 °C (–40 °F – 189.5 °F)
☞ EVAPORATOR TEMP	Reference value is relative to temperature of evaporator.		–40 °C – 87.5 °C (–40 °F – 189.5 °F)
☞ COOLANT TEMP	At specified idle speed after warming up		–40 °C – 215 °C (–40 °F – 419 °F)
☞ SUN LOAD	Reference value depends on the situation.		0 W/m^2 – 4447.8 W/m^2
☞ MODE CONT SWITCH	Each reference value is relative to the position of airflow selector of HVAC control module.		AUTO, VENT, BI-LEVEL, FOOT, DEF-FOOT DEF
☞ FAN CONT SWITCH	Each reference value is relative to the position of blower speed selector of HVAC control module.		AUTO, OFF 1st, 2nd – 7th, 8th
☞ FAN DESIRE VOLT	Reference value is relative to the position of blower speed selector of HVAC control module.		0 – 16.0 V
☞ AIR MIX POS SENSOR	Reference value is relative to the position of temperature selector of HVAC control module.		Approx. 1.5 V (Max Hot)
			Approx. 4.5 V (Max Cool)
☞ R/F POS SENSOR	Reference value is relative to the position of air intake selector of HVAC control module. (LH steering vehicle)		Approx. 4.0 V (REC)
			Approx. 0.9 V (FRE)
☞ R/F POS SENSER	Reference value is relative to the position of air intake selector of HVAC control module. (RH steering vehicle)		Approx. 0.9 V (REC)
			Approx. 4.0 V (FRE)
☞ MODE POS SENSOR	Reference value is relative to the position of airflow selector of HVAC control module.		Approx. 0.5 V (DEF)
			Approx. 4.5 V (VENT)
☞ A/C CONT SIG	A/C system is ON.		ON
	A/C system is OFF.		OFF
☞ AIR INTAKE MODE	Fresh air (FRE) mode is activated.		FRE
	Recirculation air (REC) mode is activated.		REC
	AUTO mode is activated.		AUTO
☞ A/C COMP CLUCH	Magnet clutch is engaged.		ON
	Magnet clutch is not engaged.		OFF
☞ REFRIGERANT PRESSURE	Engine running.	A/C system is ON (compressor is operating) at ambient temperature: 30 °C (86 °F)	For more details, refer to pressure of high pressure gauge under “A/C System Performance Inspection: ”.
		A/C system is ON (compressor is not operating) at ambient temperature: 30 °C (86 °F) and engine coolant temperature: 90 °C – 100 °C (194 °F – 212 °F)	600 – 1000 kPa after longer than 10 min from A/C switch turned off.
☞ A/C INDICATOR LAMP	A/C indicator lamp is lighted.		ON
	A/C indicator lamp is not lighted.		OFF
☞ FRE INDICATOR LAMP	Fresh air (FRE) indicator lamp is lighted.		ON
	Fresh air (FRE) indicator lamp is not lighted.		OFF
☞ REC INDICATOR LAMP	Recirculation air (REC) indicator lamp is lighted.		ON
	Recirculation air (REC) indicator lamp is not lighted.		OFF
☞ REAR DEF INDICATOR	Rear defogger indicator lamp is lighted.		ON
	Rear defogger indicator lamp is not lighted.		OFF
☞ SUPPLEMENT HT 1	Additional heater relay No.1 is ON.		ON
	Additional heater relay No.1 is OFF.		OFF

Scan Tool Data	Condition	Normal Condition / Reference Value
☞ SUPPLEMENT HT 2	Additional heater relay No.2 is ON.	ON
	Additional heater relay No.2 is OFF.	OFF
☞ SUPPLEMENT HT 3	Additional heater relay No.3 is ON.	ON
	Additional heater relay No.3 is OFF.	OFF
☞ VEHICLE SPEED	Vehicle stops.	0 km/h (0 mph)
☞ ENGINE SPEED	Engine is running at idle.	Engine idle speed is display

Scan Tool Data Definitions

TEMP CONT SWITCH: Position of temperature control selector of HVAC control module

CABIN TEMPERATURE: In-car temperature detected by inside air temperature sensor installed in HVAC control module

OUTSIDE AIR TEMP (OUTSIDE AIR TEMPERATURE): Outside air temperature detected by outside air temperature sensor installed in front bumper member

EVAPORATOR TEMP: Temperature of air passed through evaporator

COOLANT TEMP: Engine coolant temperature detected by engine coolant temperature sensor

SUN LOAD: Amount of sunlight detected by sunload sensor installed on the driver side on the dashboard

MODE CONT SWITCH: Position of airflow selector of HVAC control module

FAN CONT SWITCH: Position of air speed selector of HVAC control module

FAN DESIRE VOLT: Voltage for blower motor

AIR MIX POS SENSOR: Input signal from position sensor in temperature control actuator

MODE POS SENSOR: Input signal form position sensor in air flow control actuator

R/F POS SENSOR (AIR FLOW CONTROL ACTUATOR POSITION SENSOR): Input signal from position sensor in air intake control actuator

A/C CONT SIG (ON or OFF): State of A/C indicator lamp

AIR INTAKE MODE (FRE, REC or MIX): State of air intake mode

A/C COMP CLUCH: State of magnet clutch

REFRIGERANT PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE): This parameter indicates A/C refrigerant absolute pressure calculated by ECM

A/C INDICATOR LAMP (ON or OFF): State of A/C indicator lamp

FRE INDICATOR LAMP (ON or OFF): State of fresh air (FRE) indicator lamp

REC INDICATOR LAMP (ON or OFF): State of recirculation air (REC) indicator lamp

REAR DEF INDICATOR (ON or OFF): State of rear defogger indicator lamp

VEHICLE SPEED: This parameter indicates vehicle speed calculated by BCM.

ENGINE SPEED: This parameter indicates engine speed calculated by ECM.

SUPPLEMENT HT 1 (ON or OFF): State of additional heater relay No. 1

SUPPLEMENT HT 2 (ON or OFF): State of additional heater relay No. 2

SUPPLEMENT HT 3 (ON or OFF): State of additional heater relay No. 3

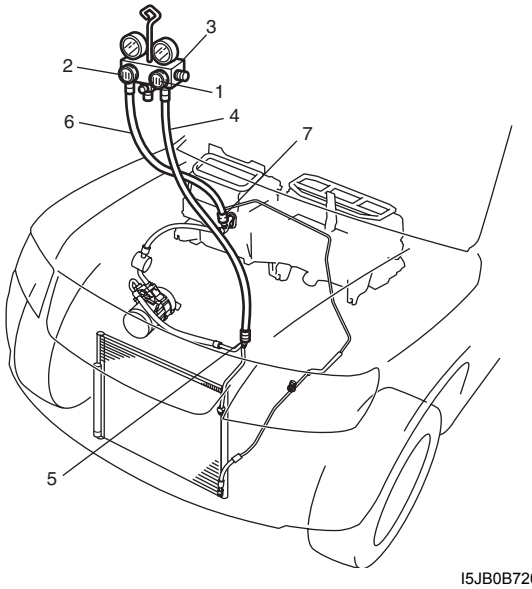
A/C System Performance Inspection

S5JB0B7204008

1) Confirm that vehicle and environmental conditions are as follows.
   - Vehicle is put indoors.
   - Ambient air temperature is within 15 – 35 °C (59 – 95 °F).
   - Relative humidity is within 30 – 70%.
   - There is no wind indoors.
   - HVAC unit is normal condition.
   - There is no air leakage from air ducts.
   - Condenser fins are clean.
   - Are filter is not clogged with dirt and dust.
   - Battery voltage is 12 V or more.
   - Radiator cooling fan operates normally.
2) Make sure that high pressure valve (1) and low pressure valve (2) of manifold gauge (3) are firmly closed.
3) Connect high pressure charging hose (4) to high pressure service valve (5) on vehicle, and connect low pressure charging hose (6) to low pressure service valve (7) on vehicle.
4) Bleed the air in charging hoses by loosening their respective nuts on manifold gauge, utilizing the refrigerant pressure. When a hiss is heard, immediately tighten nut.

⚠ WARNING

Make sure to connect high and low pressure charging hoses to correct valves. Connecting them in the other way around may cause charging hoses and refrigerant container to burst.



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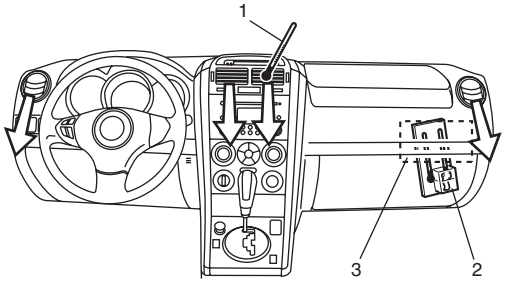
5) Warm up engine to normal operating temperature (engine coolant temperature at 80 – 90 °C (176 – 194 °F)) and keep it at specified idle speed.
6) Operate A/C at the following conditions.
   - A/C switch at ON position
   - Blower speed selector at max position
   - Air flow selector at “VENT” position
   - Temperature selector at max cool position
   - Vehicle door at all open
   - Air inlet door at recirculation position
7) Wait for ten minutes to stabilize A/C operation.
8) Keep all windows, doors and engine food open.
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 (3) of HVAC unit.



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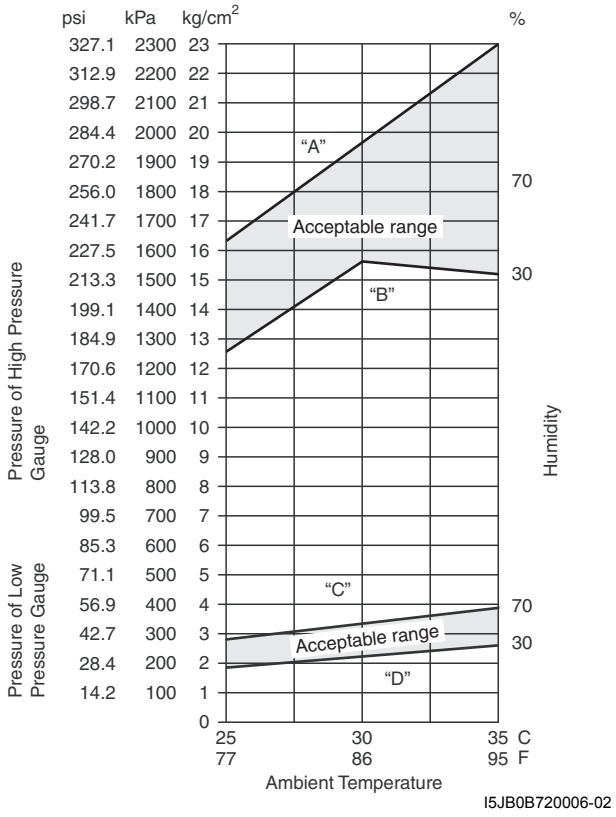
10) Check for each pressure of low side and high side if it is within shaded range of graph. If each gauge reading is out of specified pressure, correct defective part referring to the table.

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): 1570 – 1970 kPa (15.7 – 19.7 kg/cm², 223 – 280 psi)
Pressure on high pressure gauge (LO): 230 – 330 kPa (2.3 – 3.3 kg/cm², 33 – 47 psi)

NOTE

Pressure registered on gauge varies with ambient temperature. Therefore, use the graphs when determining if pressures are normal or not.



High pressure gauge

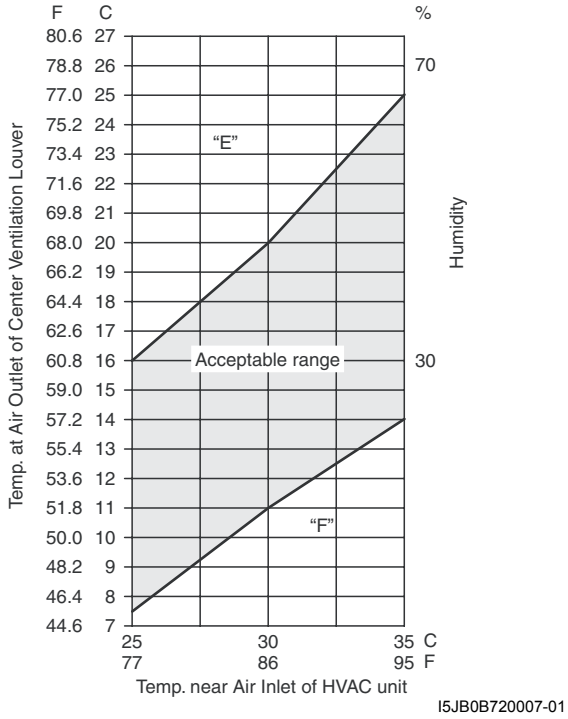
Condition	Possible Cause	Correction
Pressure is higher than acceptable range ("A" area)	Refrigerant overcharged	Recharge.
	Expansion valve frozen or clogged	Check expansion valve.
	Clogged refrigerant passage of high side	Clean or replace.
	Radiator cooling fan malfunction (Insufficient cooling of condenser)	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 graph.
For example, if A/C evaporator inlet port temperature is 30 °C (86 °F) and center ventilation louver temperature is 15 °C (59 °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.



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 damper 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 approximate 30 °C (86 °F), it is possible to diagnose A/C system in detail referring to the following table.

Condition			Possible Cause	Correction
Manifold Gauge	MPa (kg/cm^2) (psi)	Detail		
Lo	Hi			
0.23 – 0.33 (2.3 – 3.3) (33 – 47)	1.57 – 1.97 (15.7 – 19.7) (223 – 280)	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 receiver/dryer 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. Evacuate the A/C system and recharge with fresh refrigerant.
Normal: 0.23 – 0.33 (2.3 – 3.3) (33 – 47) ↑↓ Abnormal: Negative pressure	Normal: 1.57– 1.97 (15.7 – 19.7) (223 – 280) ↑↓ 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. 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 a gas 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/cm²) (psi)	Detail		
Lo	Hi			
0.35 – 0.45 (3.5 – 4.5) (50 – 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 fan operation.	Adjust refrigerant to specified amount. Clean condenser. Inspect and repair radiator 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. 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.

A/C System Symptom Diagnosis

S5JB0B7204009

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 Charging A/C with Refrigerant: ".*
	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Evaporator temperature sensor faulty	*Check evaporator temperature sensor referring to "A/C Evaporator Temperature Sensor Inspection: in related manual".*
	A/C refrigerant pressure sensor faulty	*Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection: ".*
	Wiring or grounding faulty	*Repair as necessary.*
	ECT sensor faulty	*Check ECT sensor referring to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C".*
	ECM faulty	*Check ECM.*
	HVAC control module faulty	*Check HVAC control module referring to "HVAC Control Module and Its Circuits Inspection: in related manual".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Operating Check: ".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
	Compressor relay faulty	*Check compressor relay referring to "A/C Compressor Relay Inspection: ".*
	Temperature selector, blower speed selector, and/or air flow selector faulty	*Check HVAC control module referring to "HVAC Control Module and Its Circuits Inspection: in related manual".*
	BCM faulty	*Check BCM referring to "Inspection of BCM and its Circuits: in Section 10B".*

Condition	Possible cause	Correction / Reference Item
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 Motor On-Vehicle Inspection: in Section 1F".*
	ECM faulty	*Check ECM.*
	HVAC control module faulty	*Check HVAC control module referring to "HVAC Control Module and Its Circuits Inspection: in related manual".*
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 controller faulty	*Check blower motor controller referring to "Blower Motor Controller Inspection: in Section 7A in related manual".*
	Blower speed selector faulty	*Check blower speed selector referring to "HVAC Control Module and Its Circuits Inspection: in related manual".*
	HVAC control module faulty	*Check HVAC control module referring to "HVAC Control Module and Its Circuits Inspection: in related manual".*
	Wiring or grounding faulty	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in Section 7A in related manual".*
	Blower motor relay faulty	*Check blower motor relay referring to "Blower Motor Relay Inspection: in Section 7A in related manual".*

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 "A/C Condenser Assembly On-Vehicle Inspection: in related manual".*
	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator temperature sensor referring to "A/C Evaporator Inspection: in related manual" and "A/C Evaporator Temperature Sensor Inspection: in related manual".*
	Evaporator temperature sensor faulty	*Check evaporator temperature sensor referring to "A/C Evaporator Temperature Sensor Inspection: in related manual".*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve On-Vehicle Inspection: in related manual".*
	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 Operating Check: ".*
	Compressor faulty	*Check compressor.*
	Air in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Charging A/C with Refrigerant: ".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Heater and ventilation system faulty	*Check HVAC unit.*
	Temperature selector faulty	*Check temperature selector referring to "HVAC Control Module and Its Circuits Inspection: in related manual".*
	HVAC control module faulty	*Check HVAC control module referring to "HVAC Control Module and Its Circuits Inspection: in related manual".*
	Temperature control actuator faulty	*Check temperature control actuator referring to "Temperature Control Actuator Inspection: in related manual".*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in Section 7A in related manual".*
	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 On-Vehicle Inspection: in related manual".*
	Excessive moisture in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Charging A/C with Refrigerant: ".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Operating Check: ".*
	Excessive amount of refrigerant	*Check the amount of refrigerant.*

Condition	Possible cause	Correction / Reference Item
Cool air comes out only at high speed	Condenser clogged	*Check condenser referring to "A/C Condenser Assembly On-Vehicle Inspection: in related manual".*
	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 Charging A/C with Refrigerant: ".*
	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 and evaporator temperature sensor referring to "A/C Evaporator Inspection: in related manual" and "A/C Evaporator Temperature Sensor Inspection: in related manual".*
Insufficient air flow of cooled air	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator temperature sensor referring to "A/C Evaporator Inspection: in related manual" and "A/C Evaporator Temperature Sensor Inspection: in related manual".*
	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 in related manual".*
	Wiring or grounding faulty	*Repair as necessary.*

DTC B1557: Wheel Speed Sensor and/or Its Circuit Malfunction

S5JB0B7204028

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• Wheel speed sensor circuit • ABS or ESP® control module • Wheel speed sensor • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ABS or ESP® for DTC. *Is there DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036?*	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

DTC B1561: Engine Coolant Temperature Sensor and/or Its Circuit Malfunction

S5JB0B7204029

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• ECT sensor circuit • ECT sensor • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P0115?*	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

DTC B1563: A/C Refrigerant Pressure Sensor and/or Its Circuit Malfunction

S5JB0B7204031

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • HVAC control module • ECM

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM for DTC. *Are there DTC P0532 or P0533?*	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

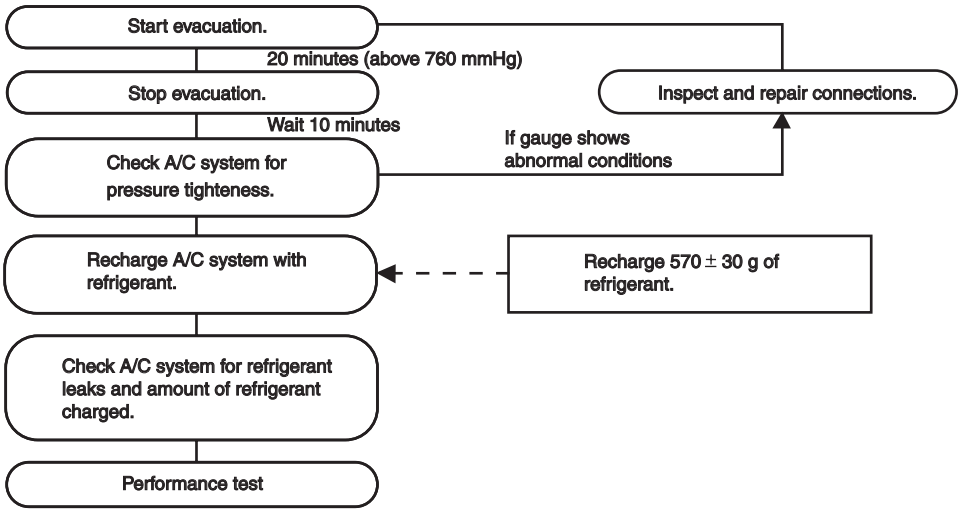
Repair Instructions

Operation Procedure for Charging A/C with Refrigerant

S5JB0B7206001

⚠ WARNING

- **Your eyes should not be exposed to refrigerant (liquid).**
  Any liquid Refrigerant-134a escaping by accident shows a temperature as low as approx. –6 °C (21.2 °F) below freezing point. Should liquid HFC-134a (R-134a) get into your eyes, it may cause a serious injury. To protect your eyes against such accident, it is necessary to always wear goggles. Should it occur that HFC-134a (R-134a) strikes your eye(s), consult a doctor immediately.
  - **Do not use your hand to rub the affected eye(s). Instead, use quantities of 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) is 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.**



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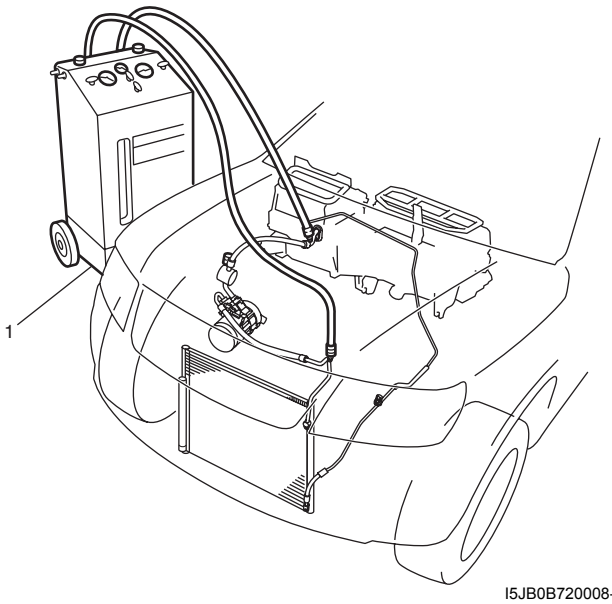
Recovery

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment (1). Discharging refrigerant HFC-134a (R134a) 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. Refer to "Precautions on Replenishing Compressor Oil: ".**
- **When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.**



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Evacuation

⚠ CAUTION

Do not evacuate before recovering refrigerant in system.

NOTE

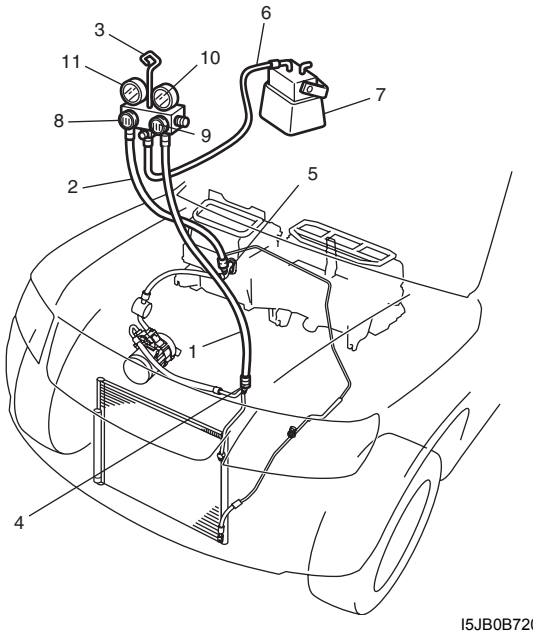
Once A/C system circuit is opened (exposed to atmospheric air) air conditioning system must be evacuated by using a vacuum pump. The A/C system should be attached with a manifold gauge set, and should be evacuated for approx. 20 minutes.

1) Connect high charging hose (1) and low charging hose (2) of manifold gauge set (3) respectively as follows:
   High charging hose (1) → High pressure charging valve (4) on discharge hose
   Low charging hose (2) → Low pressure charging valve (5) on suction pipe
2) Attach center charging hose (6) of manifold gauge set (3) to vacuum pump (7).
3) Operate vacuum pump (7), and then open discharge-side valve (9) (Hi) of manifold gauge set (3).
   If there is no blockage in the system, there will be an indication on high pressure gauge (10).
   In this case, open the other-side valve (8) (Lo) of the set and repair the system.
4) Approx. 10 minutes later, low pressure gauge (11) should show a vacuum lower than –100 kPa (–1.0 kg/cm ^{2}, –760 mmHg, –14.2 psi) providing no leakage exists.

NOTE

- **If the system does not show a vacuum below –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.2 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 20 minutes.
6) Continue evacuation until low pressure gauge indicates a vacuum less than –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.2 psi), and then close both valves (8), (9).
7) Stop vacuum pump (7). Disconnect center charging hose (6) from pump inlet. Now, the system is ready for charging refrigerant.



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Checking of A/C System for Pressure Leaks
After completing the evacuation, close manifold gauge high pressure valve (Hi) and low-pressure valve (Lo) 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, 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 through low pressure-side of A/C system at after the initial charging is performed from the high-pressure side with the engine stopped.**
- **Never charge to high pressure-side of A/C system with engine running.**
- **Do not charge 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 charging.**
- **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 charging. Reversing in direction causes liquid refrigerant to enter compressor, causing troubles, such as compression of liquid refrigerant and the like.**

NOTE

The A/C system contains HFC-134a (R-134a). Described here is a method to charge the A/C 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.

Charge proper amount of refrigerant accurately in accordance with the following procedure.

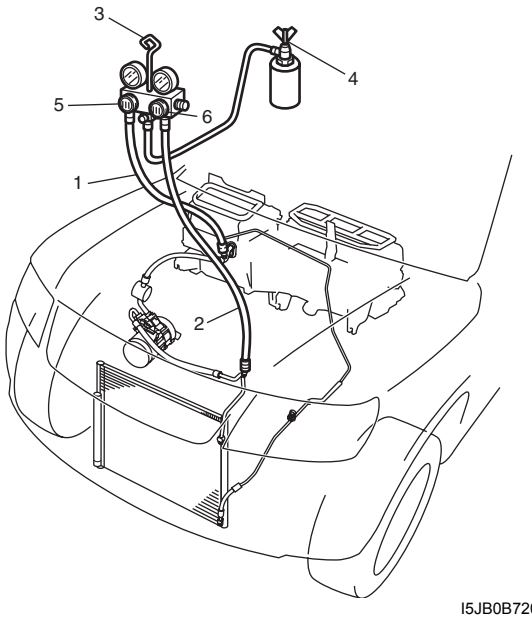
Specified amount of refrigerant
570 ± 30 g (20.1 ± 1.0 oz)

The initial charging of the A/C system is performed from 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 to make sure that 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. Thus open refrigerant container valve (4) to purge the charging line.
3) Open the high-pressure side valve (6) and charge refrigerant to system.
4) After a while, open the low-pressure side valve (5) and close the high-pressure side valve (6).

⚠ WARNING

Make sure that high pressure-side valve is closed securely.



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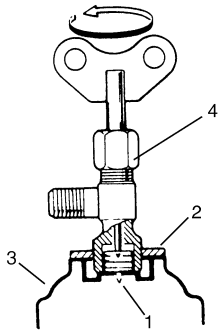
5) Start engine and keep engine speed at 1,500 rpm. Then, operate A/C system.
6) Charge A/C system with refrigerant in vapor state. At this time, refrigerant container should be held upright.
7) When refrigerant container (3) is emptied, the use following procedure to replace it with a new refrigerant container (3).
   a) Close low pressure valve.
   b) Replace empty container (3) with a refrigerant container which has been charged with refrigerant. When using refrigerant container tap valve (4), use the following procedure for replacement.
      i) Retract needle (1) and remove refrigerant container tap valve (4) by loosening its plate nut (2).
      ii) Install previously-removed refrigerant container tap valve (4) to a new refrigerant container (3).



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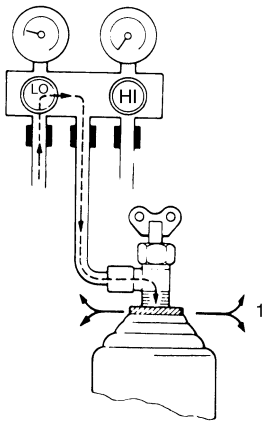
   c) Purge any air existing in center charging hose. When using refrigerant container tap valve, use the following procedure to purge air.
      i) Once fully tighten refrigerant container tap valve and then loosen (open) plate nut slightly.
      ii) Open low pressure valve of manifold gauge set a little.
      iii) As soon as refrigerant comes out with a “hiss” (1) through a clearance between refrigerant container and tap valve, tighten plate nut as well as manifold gauge set low pressure valve.
      iv) 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 (570 ± 30 g) of refrigerant or when low pressure gauge and high pressure gauge have indicated the following specified value, close low pressure side valve on manifold gauge set.

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	1570 – 1970 kPa 15.7 – 19.7 kg/cm^2 223 – 282 psi
Pressure on low pressure gauge	230 – 330 kPa 2.3 – 3.3 kg/cm^2 33 – 47 psi

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:

1) Close low pressure side valve of manifold gauge set. (The high pressure side valve is closed continuously during the process of charging.)
2) Close refrigerant container valve.
3) Stop engine.
4) Using shop rag, remove charging hoses from service valves. This operation must be performed quickly.
5) 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 lines and/or connections, it is advisable to check for leaks.
Common sense should be used in performing any 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.

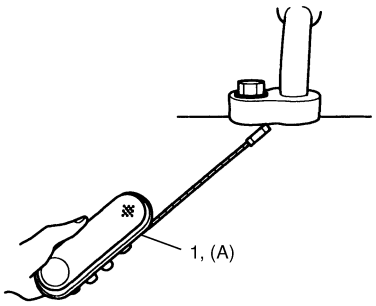
Liquid leak detector

⚠ WARNING

- **To prevent explosions or fires, make sure that there are no flammables in the vicinity.**
- **When exposed to fire, the refrigerant turns into a poisonous gas (phosgene). Do not inhale this gas.**

There are a number of fittings and places throughout the air conditioning 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 bubbles will form within seconds if there is a leak.
For confined areas, such as sections of the evaporator and condenser, an electronic (gas) leak detector (1) is more practical for determining leaks.

Special tool
(A): 09990–86011



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HVAC Unit Removal and Installation

S5JB0B7206008

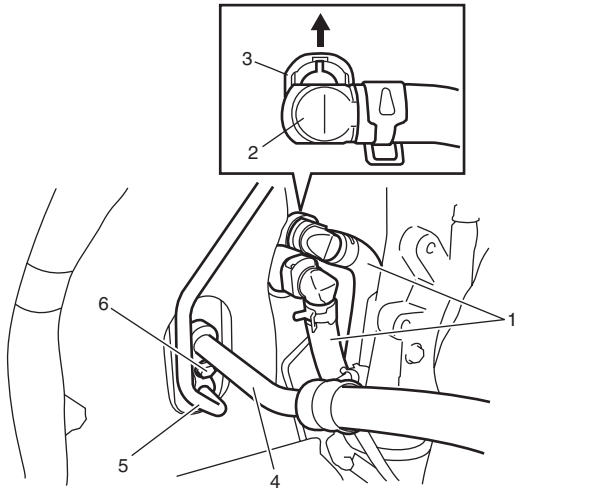
Removal

⚠ WARNING

Failure to follow the following procedure and WARNING may cause air bag deployment, personal injury, damage to parts, or air bag being unable to deploy.

- **Never rest a steering column assembly on steering wheel with air bag (inflator) module face down and column vertical.**
- **When handling the air bag (inflator) modules (driver and passenger), be careful not to drop it or apply an impact to it. If an excessive impact was applied (e.g., dropped from a height of 91.4 cm (3 feet) or more, never attempt disassembly or repair but replace it with a new one.**
- **When grease, cleaning agent. Oil, water, etc. has got onto air bag (inflator) modules (driver and passenger), wipe off immediately with a dry cloth.**

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B in related manual”.
3) Recover refrigerant from A/C system using recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Charging A/C with Refrigerant: ”.
4) Drain engine coolant referring to “Cooling System Draining: in Section 1F”.
5) Remove heater hoses (1) from HVAC unit as follows.
   a) Release lock plate (3) completely in arrow direction.
   b) Remove quick joint (2).
6) Disconnect suction hose (4) and condenser outlet hose (5) by removing attaching bolt (6).



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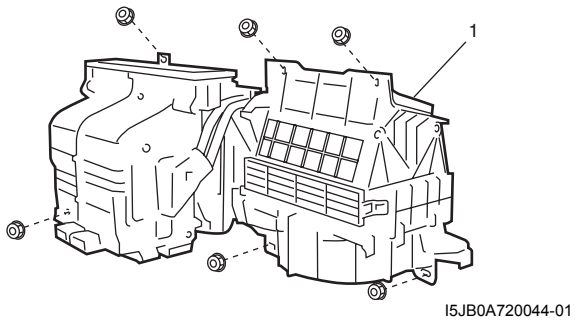
7) Remove instrument panel referring to “Instrument Panel Removal and Installation: in Section 9C in related manual”.
8) Disconnect rear duct from HVAC unit.
9) Detach wiring, connectors and clamps from HVAC unit.
10) Remove HVAC unit (1).



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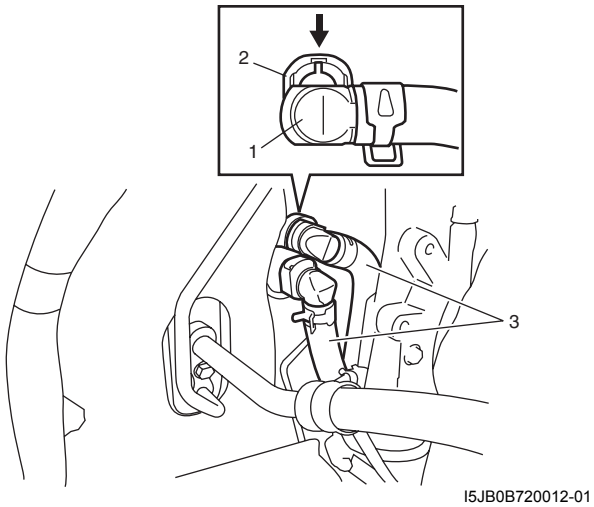
Installation

1) Install HVAC unit by reversing removal procedure, noting the following items.
   - When installing each part, be careful not to catch any wiring harness.
   - Connect quick joint (1) to HVAC unit, and then push lock plate (2) completely in arrow direction.



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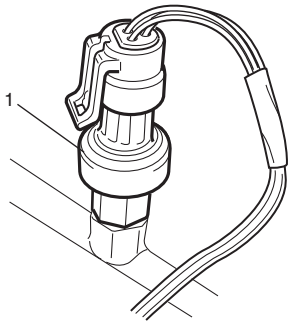
3. Heater hose

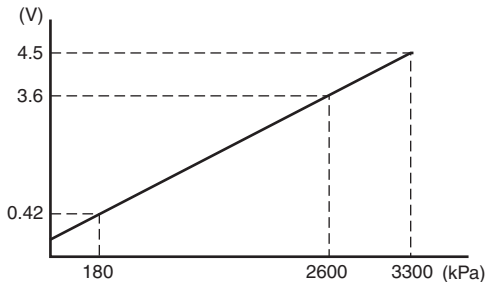
   - Replenish specified amount of compressor oil to compressor suction side referring to “Precautions on Replenishing Compressor Oil: ”.
   - Install the padding (1) to the installation hole uniformly.
   - Fill engine coolant referring to step 13) to 20) of “Cooling System Refilling: in Section 1F”.
   - Enable air bag system referring to “Enabling Air Bag System: in Section 8B in related manual”.
   - Evacuate and charge system. Refer to “Operation Procedure for Charging A/C with Refrigerant: ”.

A/C Refrigerant Pressure Sensor and Its Circuit Inspection

S5JB0B7206015

1) Connect manifold gauge set to the charging valves.
2) Check output voltage for A/C refrigerant pressure sensor (1) between each sensor terminal, and then compare measured voltage with specified voltage in graph.
   If it does not show such characteristic as shown in graph, replace refrigerant pressure sensor with new one.





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A/C Refrigerant Pressure Sensor Removal and Installation

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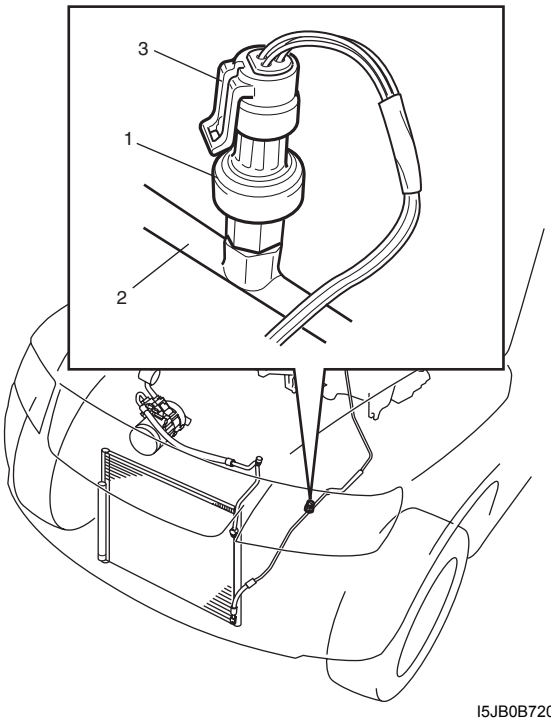
Removal

1) Recover refrigerant from the A/C system with the recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Charging A/C with Refrigerant: ”.
2) Disconnect negative (–) cable from battery.
3) Disconnect A/C refrigerant pressure sensor connector (3).
4) Remove A/C refrigerant pressure sensor (1) from liquid pipe (2).



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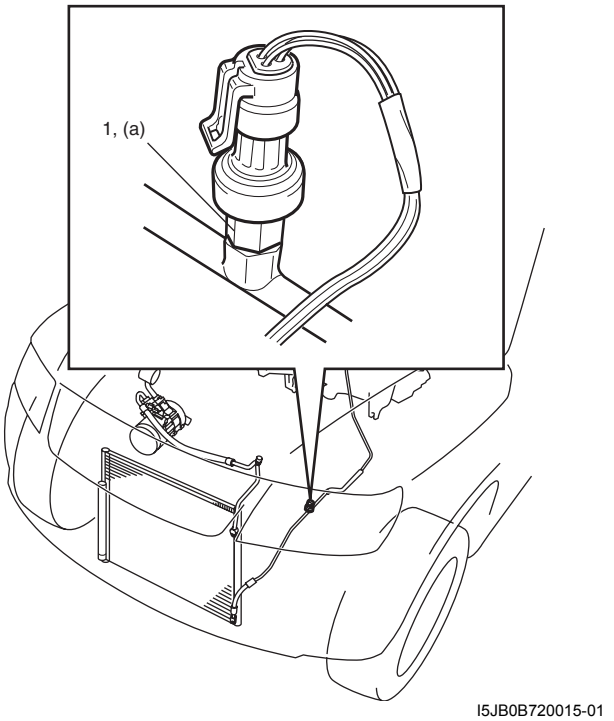
Installation

Reverse removal procedure noting the following instructions.

- Apply compressor oil to O-ring of A/C refrigerant pressure sensor.
- Tighten A/C refrigerant pressure sensor (1) to specified torque.

  Tightening torque
  A/C refrigerant pressure sensor (a): 9 N·m (0.9 kgf-m, 6.5 lb-ft)



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- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Charging A/C with Refrigerant: ”.

A/C Compressor Drive Belt Inspection

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Refer to “Accessory Drive Belt Inspection: in Section 1J”.

A/C Compressor Drive Belt Removal and Installation

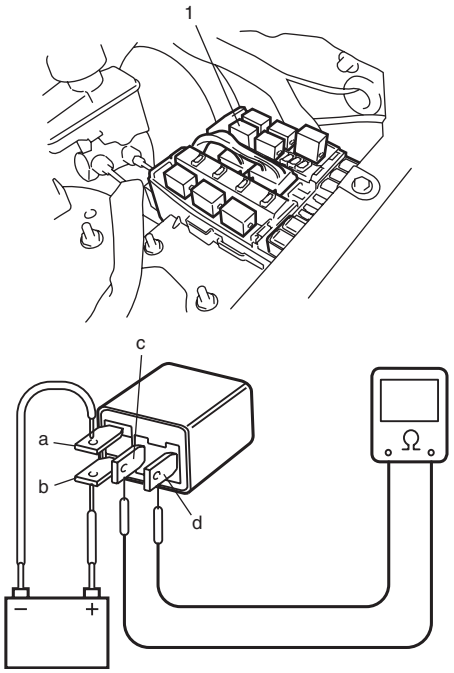
S5JB0B7206031

Refer to “Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J”.

A/C Compressor Relay Inspection

S5JB0B7206032

1) Disconnect negative (–) cable at battery.
2) Remove compressor relay (1) from vehicle.
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 to 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.

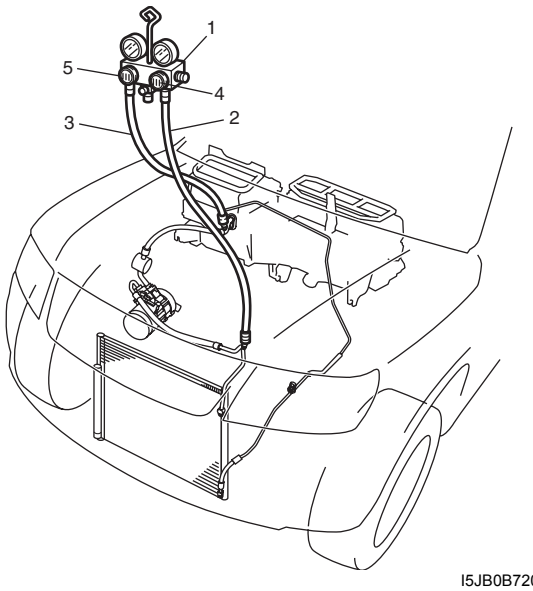


I5JB0A720056-01

Compressor Assembly On-Vehicle Inspection

S5JB0B7206033

1) Install manifold gauge set (1) as shown in figure.
2) Close Hi (4) and Lo (5) side valves.



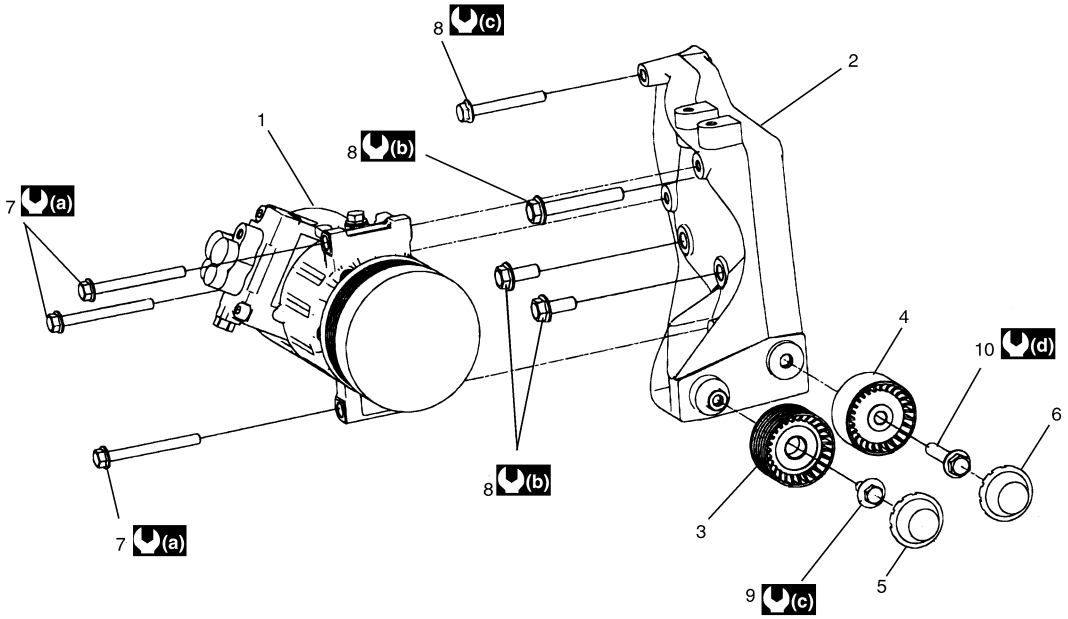
I5JB0B720016-02

2.	High pressure side (Delivery side hose)
3.	Low pressure side (Suction side pipe)

3) Run engine at fast idle.
4) Check compressor for the following items.
   If any of the checks indicated a defect, repair compressor.
   - High pressure gauge reading is not low and low pressure gauge reading is not higher than normal.
   - Metallic sound
   - Leakage from compressor

Compressor Assembly and Compressor Bracket Components

S5JB0B7206047



I5JB0B720017-05

1. Compressor assembly	8. Compressor bracket mount bolt
2. Compressor bracket	9. Idler bolt No.1
3. Idler pulley No.1	10. Idler bolt No.2
4. Idler pulley No.2	(a) : 25 N·m (2.5 kgf-m, 18.5 lb-ft)
5. Dust cover No.1	(b) : 40 N·m (4.0 kgf-m, 29.0 lb-ft)
6. Dust cover No.2	(c) : 28 N·m (2.8 kgf-m, 20.5 lb-ft)
7. Compressor mount bolt	(d) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)

Compressor Assembly Removal and Installation

S5JB0B7206035

Removal

1) Run engine at idle with A/C ON for 10 minutes.
2) Disconnect negative (–) cable at battery.
3) Recover refrigerant from the A/C system using recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Charging A/C with Refrigerant: ”.

NOTE

The amount of compressor oil at removed must be measured and the same amount must be poured when installing the compressor.

4) Disconnect MAF sensor coupler, and then remove air cleaner assembly.
5) Remove A/C compressor drive belt referring to “Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J”.
6) Disconnect magnet clutch connector.
7) Disconnect suction hose and discharge hose from compressor.

NOTE

Cap open fitting immediately to keep moisture out of system.

8) Remove compressor from its mount.

Installation

⚠ CAUTION

Be sure to use HFC-134a (R-134a) compressor oil.

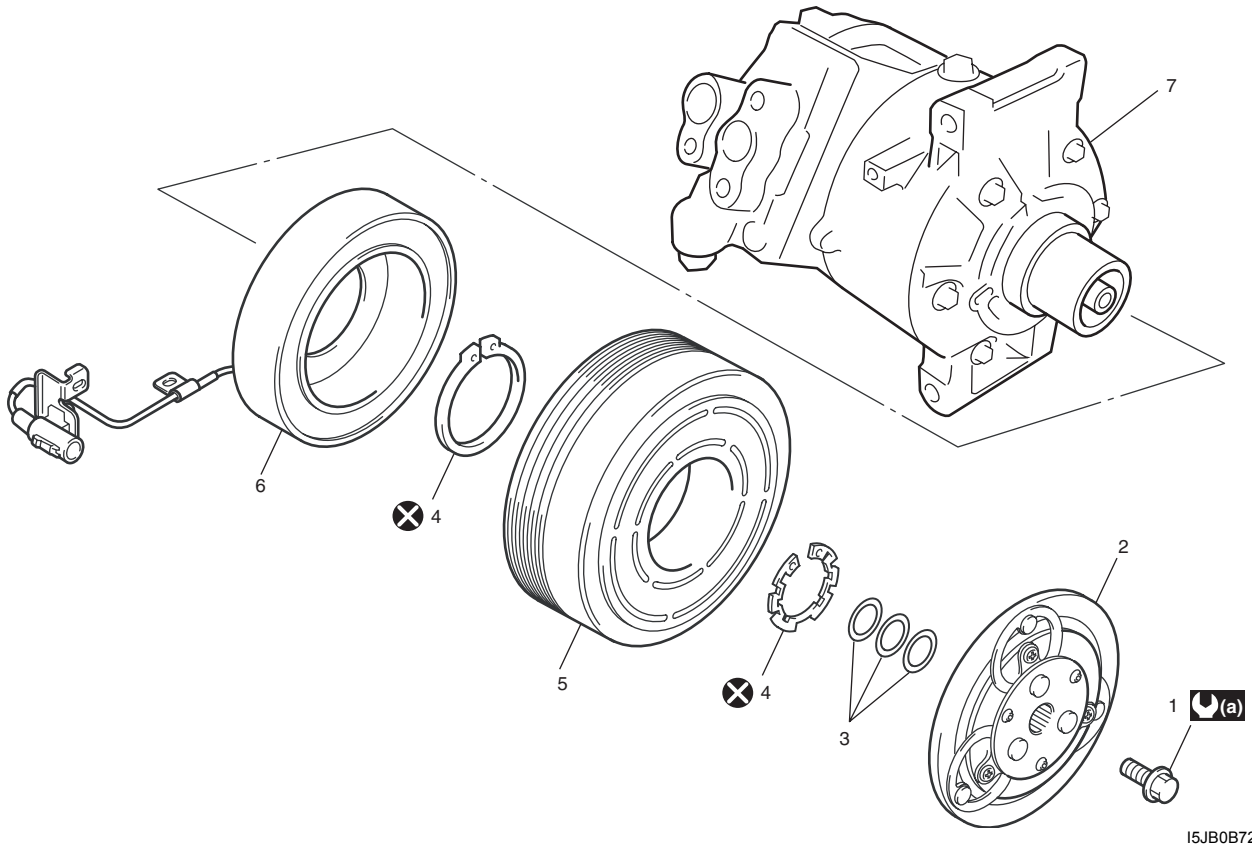
Reverse removal procedure noting the following instructions.

- If compressor is replaced, pour new compressor oil referring to “Precautions on Replenishing Compressor Oil: ”.
- Evacuate and charge system referring to “Evacuation” and “Charge” in “Operation Procedure for Charging A/C with Refrigerant: ”.
- Install drive belt referring to “Accessory Drive Belt and Idler Pulley Removal and Installation: in Section 1J”.

Tightening torque
Compressor mounting bolt : 25 N·m (2.5 kgf-m, 18.0 lb-ft)

Magnet Clutch Components

S5JB0B7206037



I5JB0B720018-02

1. Armature plate bolt	4. Circlip	7. Compressor body assembly
2. Armature plate	5. Magnet clutch pulley	(a) : 21 N·m (2.1 kgf-m, 15.5 lb-ft)
3. Shim(s)	6. Magnet clutch coil	⊗ : Do not reuse.

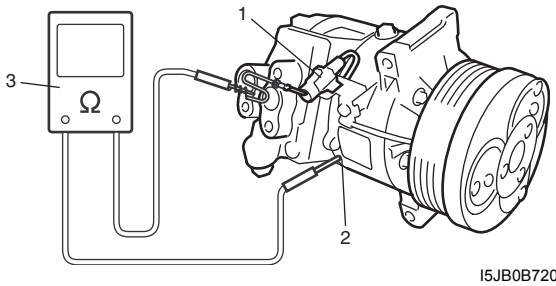
Magnet Clutch Operating Check

S5JB0B7206039

Check the following items.
If any detects are found, repair or replace magnet clutch assembly.

- Inspect armature plate and rotor for signs of oil.
- Check clutch bearings for noise and grease leakage.
- Using an ohmmeter (3), measure resistance of stator coil between clutch lead wire (1) and body ground (2). If measured resistance is not within tolerance, replace coil.

Specified current of magnet clutch
Approx. 3.8 – 6.0 Ω at 25 °C (77 °F)



I5JB0B720022-02

Magnet Clutch Removal and Installation

S5JB0B7206041

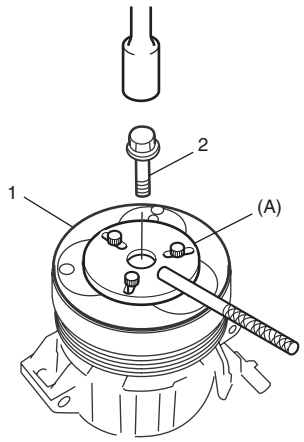
Removal

1) Remove compressor from vehicle referring to “Compressor Assembly Removal and Installation: ”.
2) Fix armature plate (1) with special tool (A) and remove armature plate bolt.

Special tool
(A): 09991–06310

NOTE

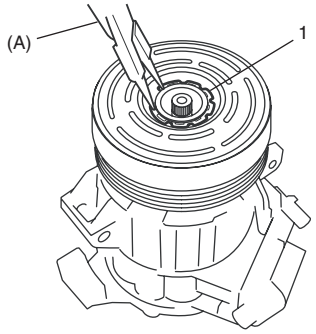
Do not reuse armature plate bolt.



I5JB0A720071-01

3) Remove armature plate.
4) Remove shim(s) from shaft.
5) Using special tool (A), remove snap ring (1).

Special tool
(A): 09900–06107

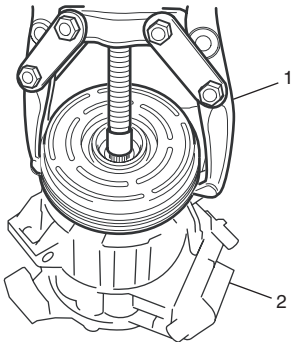


I5JB0A720072-01

6) Remove magnet clutch pulley (1) with puller (2).

NOTE

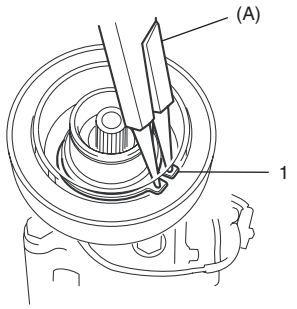
Be careful not to damage pulley.



I5JB0A720073-01

7) Remove snap ring (1) using special tool (B), and then remove magnet clutch coil (1).

Special tool
(A): 09900–06107



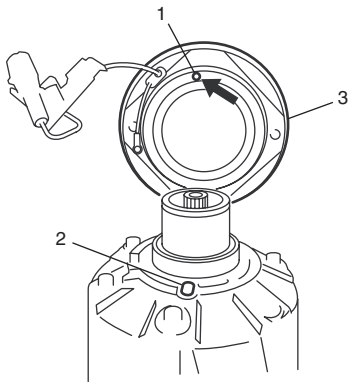
I5JB0A720074-02

Installation

1) Install magnet clutch coil (3).

NOTE

Protrusion (1) on underside of magnet clutch coil and hole (2) on compressor body assembly must match to stop movement of magnet clutch coil and to locate lead wire correctly.



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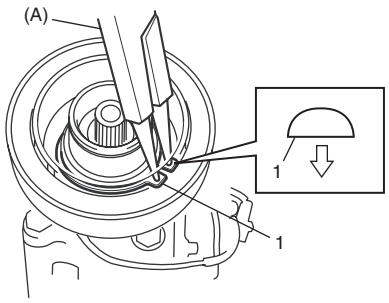
2) Install new snap ring (1) using special tool (A).

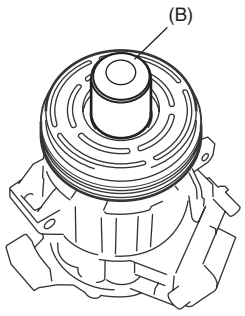
Special tool
(B): 09900–06107



I5JB0A720088-04

3) Install magnet clutch pulley.
   a) Set magnet clutch horizontally over clutch installation boss.
   b) Place special tool (B) onto magnet clutch bearing. Ensure that edge rests only inner rase of bearing.

Special tool
(B): 09951–15510



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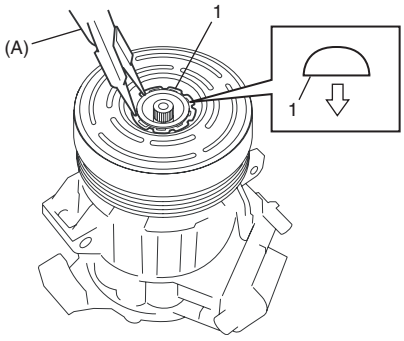
   c) Install new snap ring (1) using special tool (A).

Special tool
(A): 09900–06107

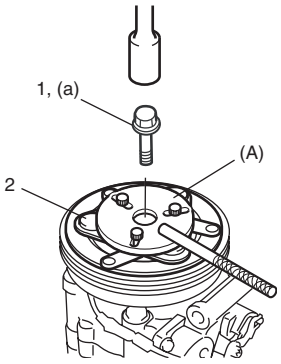


I5JB0A720077-01

4) Install armature plate (1).
5) Using special tool (A), tighten new armature plate bolt (2) to specified torque.

Tightening torque
Armature plate bolt (a): 21 N·m (2.1 kgf-m, 15.5 lb-ft)

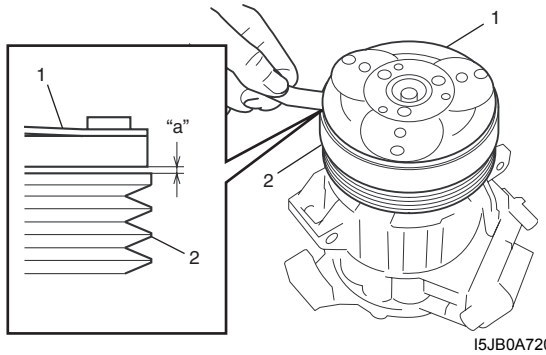
Special tool
(A): 09991–06310



I5JB0B720019-01

6) Adjust clearance between armature plate (1) and magnet clutch pulley by putting shim(s) on compressor shaft. To measure the clearance, perform the following steps.
   a) Put compressor in a vise.
   b) Set dial gauge on magnet clutch plate, and then adjust its pointer at 0.
   c) Connect battery positive terminal (+) to magnet clutch coil lead wire.
   d) Connect battery negative terminal (–) to compressor body assembly. (At this point, armature plate and magnet clutch pulley (2) are kept in contact.)
   e) Disconnect battery negative terminal (–) to compressor body assembly. (At this point, armature plate and magnet clutch pulley (2) are not in contact.)
   f) Read stroke of armature plate from dial gauge by performing Step d) and e) repeatedly. (Stroke of armature plate is clearance between armature plate and magnet clutch pulley (2).)

Standard clearance between armature plate and magnet clutch
"a": 0.3 – 0.6 mm (0.012 – 0.024 in.)



I5JB0A720078-02

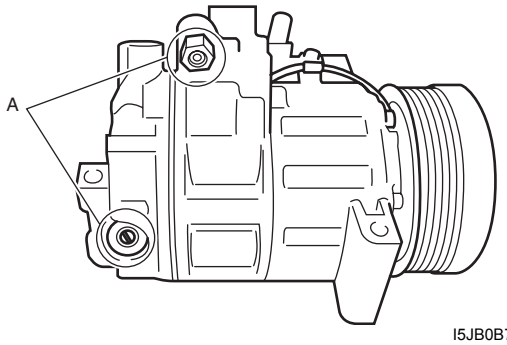
7) Install compressor to vehicle referring to "Compressor Assembly Removal and Installation: ".

Relief Valve On-Vehicle Inspection

S5JB0B7206045

Using special tool (A), check is there is refrigerant leakage.
If there is refrigerant leakage, replace compressor body.

Special tool
(A): 09990–86011



I5JB0B720020-01

A: Checking point

Specifications

Tightening Torque Specifications

S5JB0B7207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Refrigerant line bolt	12	1.2	9.0	☞
A/C refrigerant pressure sensor	9	0.9	6.5	☞
Compressor mounting bolt	25	2.5	18.0	☞
Armature plate bolt	21	2.1	15.5	☞

NOTE

The specified tightening torque is also described in the following.
"Compressor Assembly and Compressor Bracket Components: "
"Magnet Clutch Components: "

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

Special Tools and Equipment

Recommended Service Material

S5JB0B7208001

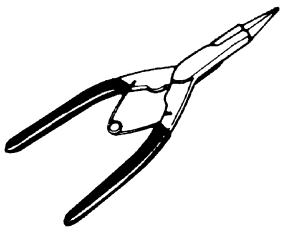
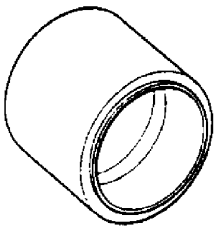
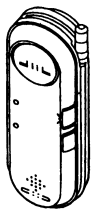
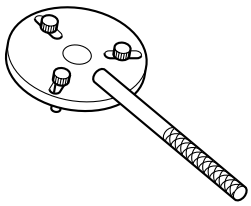
Material	SUZUKI recommended product or Specification		Note
Compressor oil	Compressor oil (DH-PS, 250cc)	P/No.: 99000–99022–00E	☞

NOTE

Required service material is also described in the following.
“Precautions on Servicing Refrigerant Line: ”

Special Tool

S5JB0B7208002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ / ☞ / ☞		09951–15510 Magnet clutch installer ☞	
09990–86011 Gas leak detector ☞ / ☞		09991–06310 Armature plate holder ☞ / ☞	

Section 9

Body, Cab and Accessories

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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 manual.

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Wiring Systems

General Description

Abbreviations

S5JB0B9101001

Abbreviation	Full term	Abbreviation	Full term
2WD	2 wheel drive vehicles	IF EQPD	If equipped
4WD	4 wheel drive vehicles	IG	Ignition
A/B	Air bag	IG COIL	Ignition coil
A/C	Air conditioning	ILL	Illumination
A/LEV	Auto leveling	IND	Indicator
A/T	Automatic transaxle	INT	Intermittent
ACC	Accessory	ISC	Idle speed control
BCM	Body control module	J/B	Junction block
CAN	Controller area network	J/C	Joint connector
CKP	Crank shaft position	L	Left
CMP	Cam shaft position	LED	Light emitting diode
COMB	Combination	LHD	Left hand drive vehicle
DLC	Data link connector	LO	Low
DRL	Daytime running light	MAP	Manifold absolute pressure
DSL	Diesel engine	M/T	Manual transaxle
ECM	Engine control module	O/D	Over drive
ECT	Engine coolant temperature	P/N	Power normal
EGR	Exhaust gas recirculation	P/S	Power steering
ELCM	EVAP leak check module	PSP	Power steering pressure
ESP®	Electronic stability program	R	Right
EVAP	Evaporative	RHD	Right hand drive vehicle
FWD	Forward	SDM	Sensing and diagnostic module
HI	High	ST	Starter
HID	High intensity discharge	TCC	Torque converter clutch
HLC	Head light cleaner	TCM	Transmission control module
IAC	Idle air control	VSS	Vehicle speed sensor
IAT	Intake air temperature	VSV	Vacuum switching valve
ICM	Immobilizer control module	5 dr	5 door

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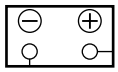
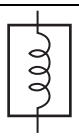
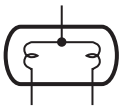
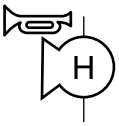
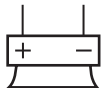
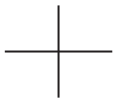
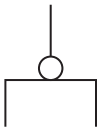
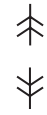
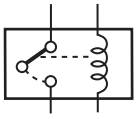
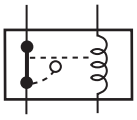
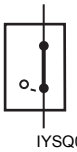
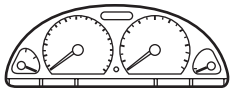
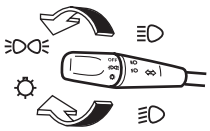
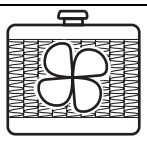
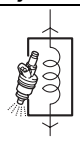
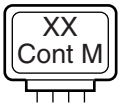
Symbols and Marks

S5JB0B9101003

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	 I5JB0B910995-02
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	Keyless entry	Immobilizer system	Combination meter	Lighting switch
I2RH01910912-01	I3JA01910902-01	I5RH01910901-01	 I2RH01910915-01	 I2RH01910916-01
Headlight leveling	Hazard warning light	Front fog light	Rear fog light	Spark plug
I3JA01910904-01	I3JA01910905-01	I3JA01910906-01	I3JA01910907-01	I2RH01910921-01
Radiator fan	Fuel pump	Injector	XX control module	Windshield wiper
 I2RH01910922-01	I3JA01910908-01	 I2RH01910924-01	 I2RH01910925-01	I3JA01910909-01
Windshield washer	Rear wiper	Rear washer	Rear defogger	Power window
I3JA01910910-01	I3JA01910911-01	I3JA01910912-01	I2RH01910930-01	I3JA01910913-01
Power door lock	Power mirror	A/B	Pretensioner	Passenger side
I3JA01910914-01	I3JA01910915-01	I3JA01910916-01	I3JA01910917-01	I3JA01910918-01
Driver side	Seat heater	A/C	Power steering	Side air-bag (R)
I3JA01910919-01	I2RH01910938-01	I3JA01910920-01	I3JA01910921-01	I4JA01910901-01
Side air-bag (L)	Side curtain air-bag (R)	Side curtain air bag (L)	Glow plug	
I4JA01910902-01	I5RS0A910958-01	I5RS0A910959-01	I4JA01910903-01	

Harness Routing and Connector Layout Diagram

Connector Layout Diagram

S5JB0B910A001

Refer to “Engine Compartment: ”.
Refer to “Instrument Panel: ”.
Refer to “Door, Roof: ”.
Refer to “Floor: ”.
Refer to “Rear: ”.
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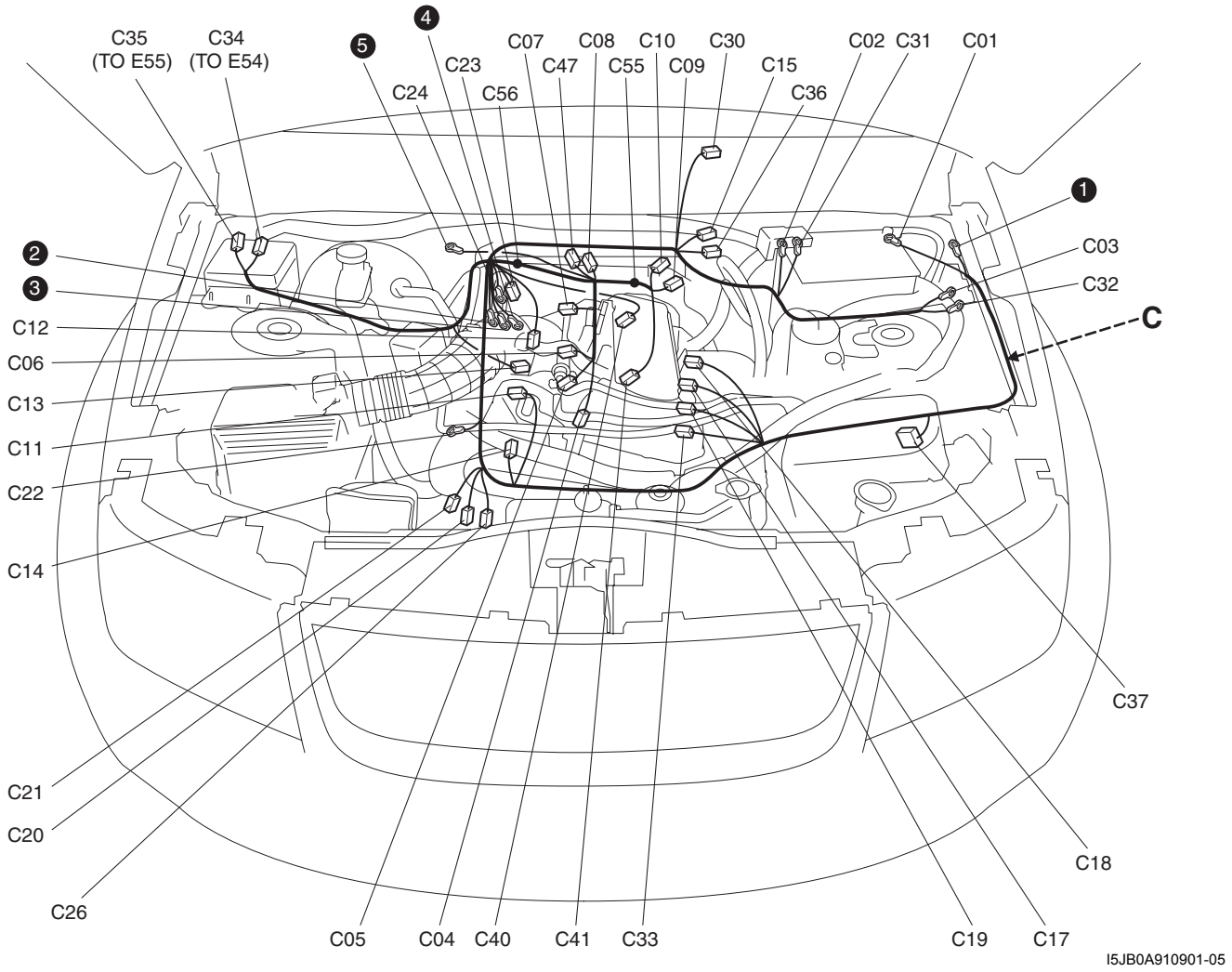
Engine Compartment

S5JB0B910A002

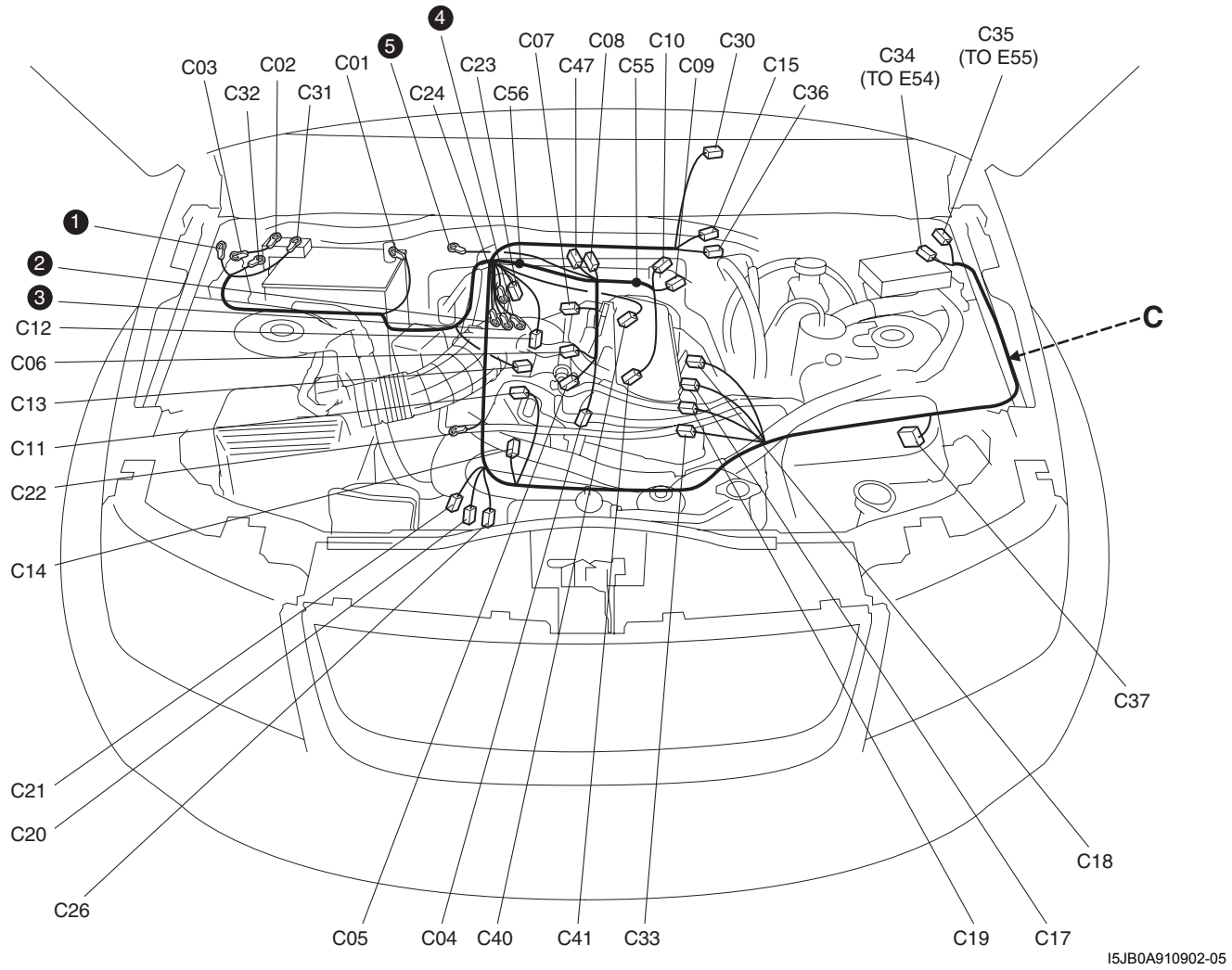
C: Engine harness (M16A RHD)



C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/-	Battery (–)	C21/GRN	Generator #1
C02/-	Battery fuse box	C22/-	Generator #2
C03/-	Fuse box No.1	C23/BLK	Starting motor #1
C04/GRY	Injector #1	C24/-	Starting motor #2
C05/GRY	Injector #2	C26/GRY	Knock sensor
C06/GRY	Injector #3	C30/BLK (M/T)	Back-up light switch
C07/GRY	Injector #4	C31/-	Battery fuse box
C08/BLK	CMP sensor	C32/-	Fuse box No.1
C09/BLK	ECT sensor	C33/N	P/S pump pressure switch
C10/GRY	EGR stepper motor	C34/N	Main harness (To E54)
C11/BLK	Throttle position sensor	C35/BLU	Main harness (To E55)
C12/BLK	MAP sensor	C36/GRY	A/F sensor
C13/BLK	MAF sensor	C37/GRY	ECM
C14/BLK	EVAP canister purge valve	C40/GRY	IG coil #1 & #4
C15/N	Heated oxygen sensor	C41/GRY	IG coil #2 & #3
C17/BLK	A/C compressor	C47/BLK	Noise filter
C18/N	Oil pressure sensor	C55/-	Weld splice
C19/BLU	VVT solenoid	C56/-	Weld splice
C20/N	CKP sensor		

C: Engine harness (M16A LHD)

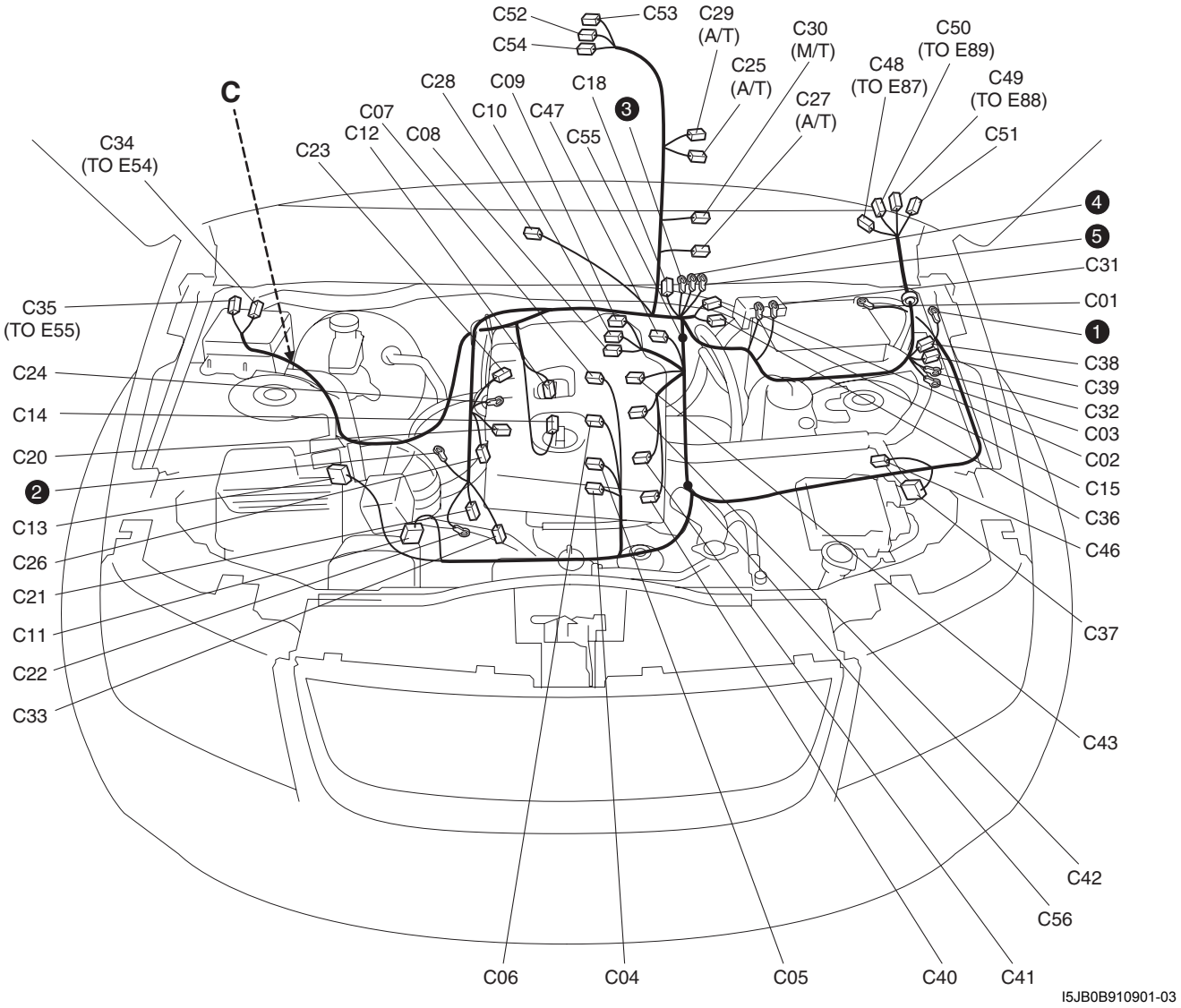


I5JB0A910902-05

C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/-	Battery (–)	C21/GRN	Generator #1
C02/-	Battery fuse box	C22/-	Generator #2
C03/-	Fuse box No.1	C23/BLK	Starting motor #1
C04/GRY	Injector #1	C24/-	Starting motor #2
C05/GRY	Injector #2	C26/GRY	Knock sensor
C06/GRY	Injector #3	C30/BLK (M/T)	Back-up light switch
C07/GRY	Injector #4	C31/-	Battery fuse box
C08/BLK	CMP sensor	C32/-	Fuse box No.1
C09/BLK	ECT sensor	C33/N	P/S pump pressure switch
C10/GRY	EGR stepper motor	C34/N	Main harness (To E54)
C11/BLK	Throttle position sensor	C35/BLU	Main harness (To E55)
C12/BLK	MAP sensor	C36/GRY	A/F sensor
C13/BLK	MAF sensor	C37/GRY	ECM
C14/BLK	EVAP canister purge valve	C40/GRY	IG coil #1 & #4
C15/N	Heated oxygen sensor	C41/GRY	IG coil #2 & #3
C17/BLK	A/C compressor	C47/BLK	Noise filter
C18/N	Oil pressure sensor	C55/-	Weld splice
C19/BLU	VVT solenoid	C56/-	Weld splice
C20/N	CKP sensor		

C: Engine harness (J20A RHD)

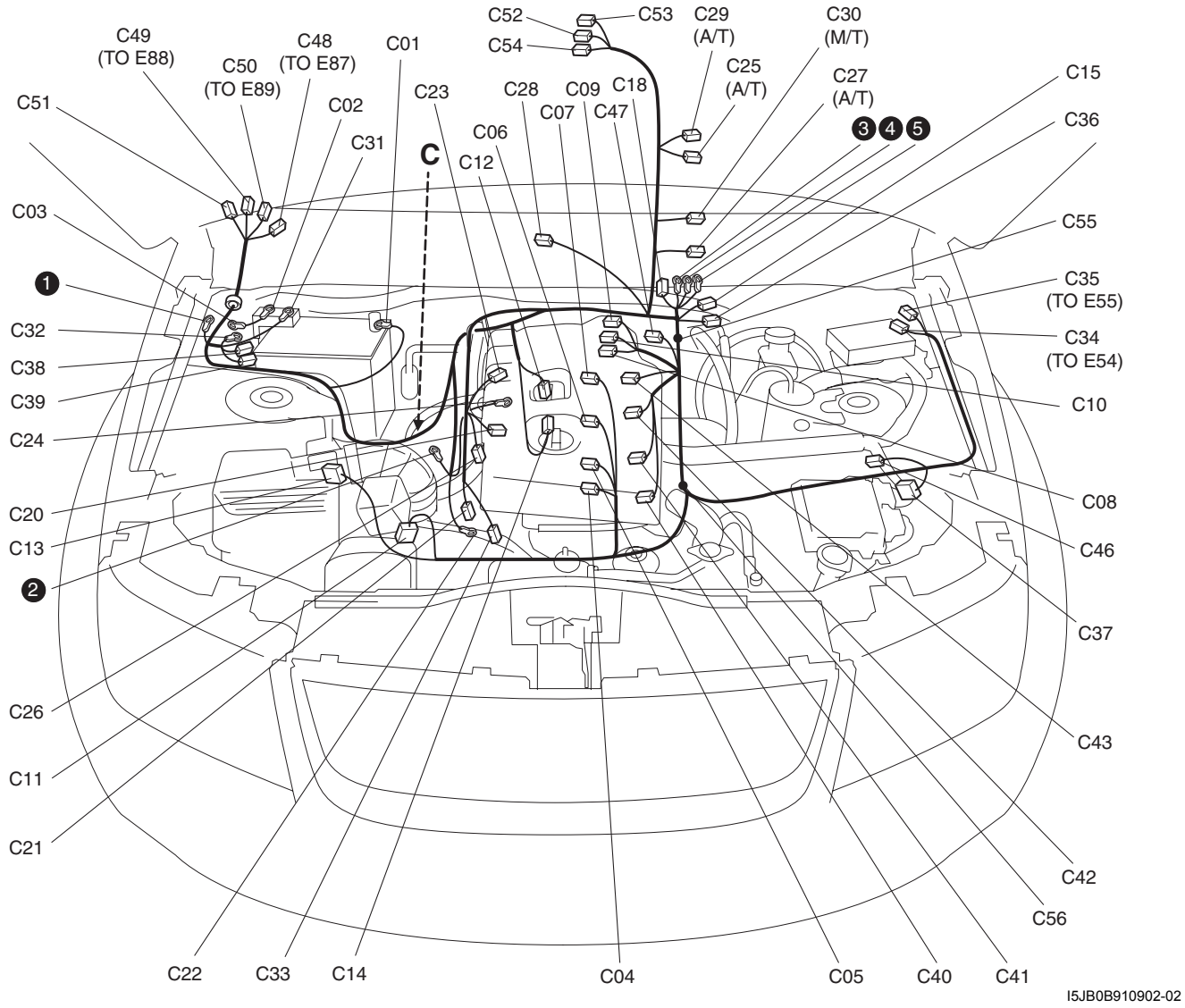


C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/-	Battery (–)	C30/BLK (M/T)	Back-up light switch
C02/-	Battery fuse box	C31/-	Battery fuse box
C03/-	Fuse box No.1	C32/-	Fuse box No.1
C04/GRY	Injector #1	C33/N	P/S pump pressure switch
C05/GRY	Injector #2	C34/N	Main harness (To E54)
C06/GRY	Injector #3	C35/BLU	Main harness (To E55)
C07/GRY	Injector #4	C36/GRY	A/F sensor
C08/GRY	CMP sensor	C37/GRY	ECM
C09/BLK	ECT sensor	C38/BLK	Current sensor
C10/GRY	EGR stepper motor	C39/GRY	Fuse box No.1
C11/BLK	Throttle position sensor	C40/GRY	IG coil #1
C12/BLK	MAP sensor	C41/GRY	IG coil #2
C13/BLK	MAF sensor	C42/GRY	IG coil #3
C14/BLK	EVAP canister purge valve	C43/GRY	IG coil #4
C15/N	Heated oxygen sensor	C46/BRN	Intake control valve
C18/N	Oil pressure sensor	C47/N	Noise filter
C20/GRY	CKP sensor	C48/N	Main harness (To E87)
C21/GRN	Generator #1	C49/N	Main harness (To E88)
C22/-	Generator #2	C50/N	Main harness (To E89)

No./Color	Connective position	No./Color	Connective position
C23/BLK	Starting motor #1	C51/BLU	J/C
C24/-	Starting motor #2	C52/BLK	T/F 4L switch
C25/BLU (A/T)	Output shaft speed sensor	C53/N	T/F position switch
C26/GRY	Knock sensor	C54/GRY	T/F actuator
C27/BLU (A/T)	Input shaft speed sensor	C55/-	Weld splice
C28/GRY (A/T)	Transmission range sensor	C56/-	Weld splice
C29/GRY (A/T)	Shift solenoid		

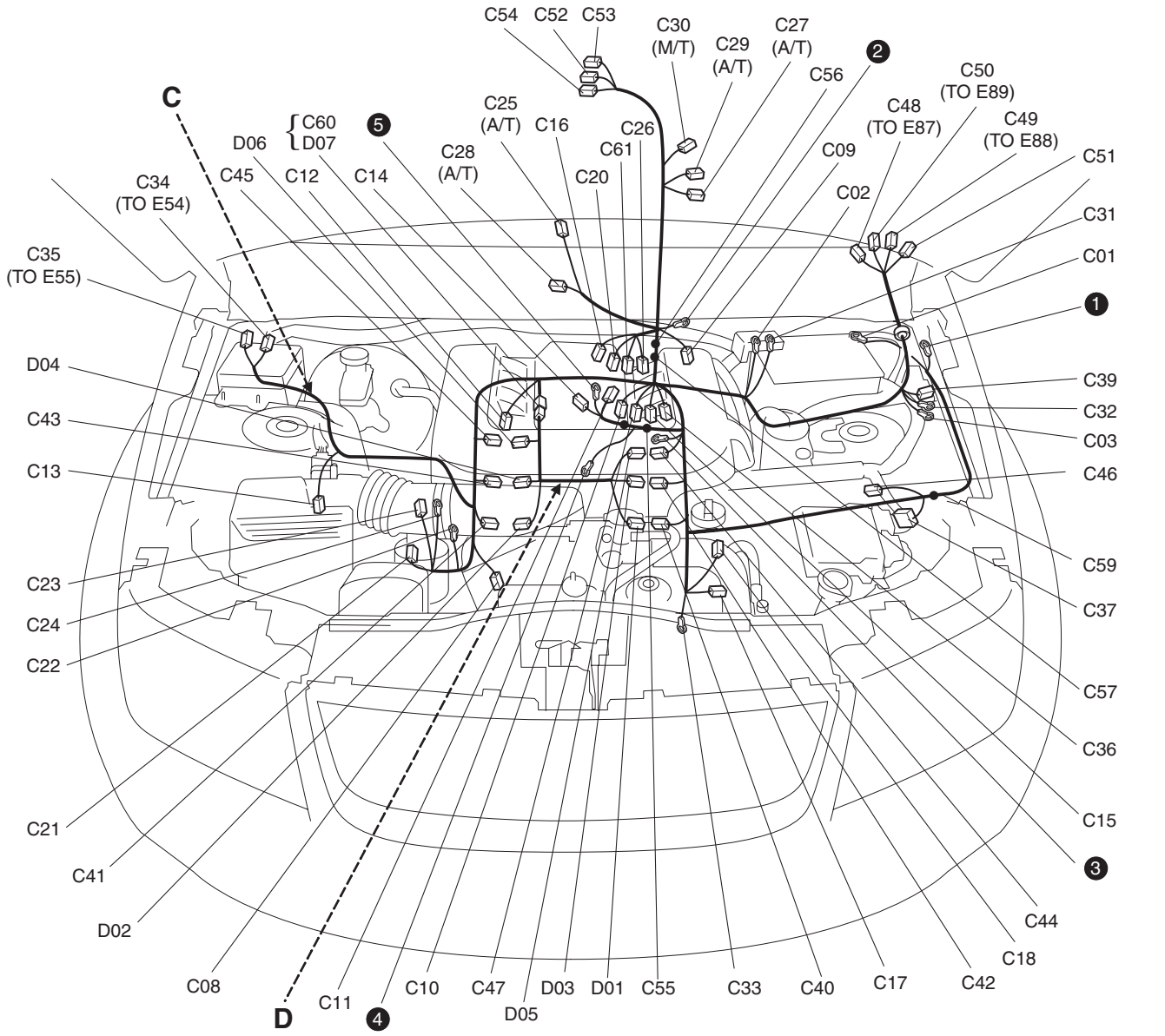
C: Engine harness (J20A LHD)



C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/-	Battery (–)	C30/BLK (M/T)	Back-up light switch
C02/-	Battery fuse box	C31/-	Battery fuse box
C03/-	Fuse box No.1	C32/-	Fuse box No.1
C04/GRY	Injector #1	C33/N	P/S pump pressure switch
C05/GRY	Injector #2	C34/N	Main harness (To E54)
C06/GRY	Injector #3	C35/BLU	Main harness (To E55)
C07/GRY	Injector #4	C36/GRY	A/F sensor
C08/GRY	CMP sensor	C37/GRY	ECM
C09/BLK	ECT sensor	C38/BLK	Current sensor
C10/GRY	EGR stepper motor	C39/GRY	Fuse box No.1
C11/BLK	Throttle position sensor	C40/GRY	IG coil #1
C12/BLK	MAP sensor	C41/GRY	IG coil #2
C13/BLK	MAF sensor	C42/GRY	IG coil #3
C14/BLK	EVAP canister purge valve	C43/GRY	IG coil #4
C15/N	Heated oxygen sensor	C46/BRN	Intake control valve
C18/N	Oil pressure sensor	C47/BLK	Noise filter
C20/GRY	CKP sensor	C48/N	Main harness (To E87)
C21/GRN	Generator #1	C49/N	Main harness (To E88)
C22/-	Generator #2	C50/N	Main harness (To E89)
C23/BLK	Starting motor #1	C51/BLU	J/C
C24/-	Starting motor #2	C52/BLK	T/F 4L switch
C25/BLU (A/T)	Output shaft speed sensor	C53/N	T/F position switch
C26/GRY	Knock sensor	C54/GRY	T/F actuator
C27/BLU (A/T)	Input shaft speed sensor	C55/-	Weld splice
C28/GRY (A/T)	Transmission range sensor	C56/-	Weld splice
C29/GRY (A/T)	Shift solenoid		

C: Engine harness / D: Injector harness (H27A RHD)



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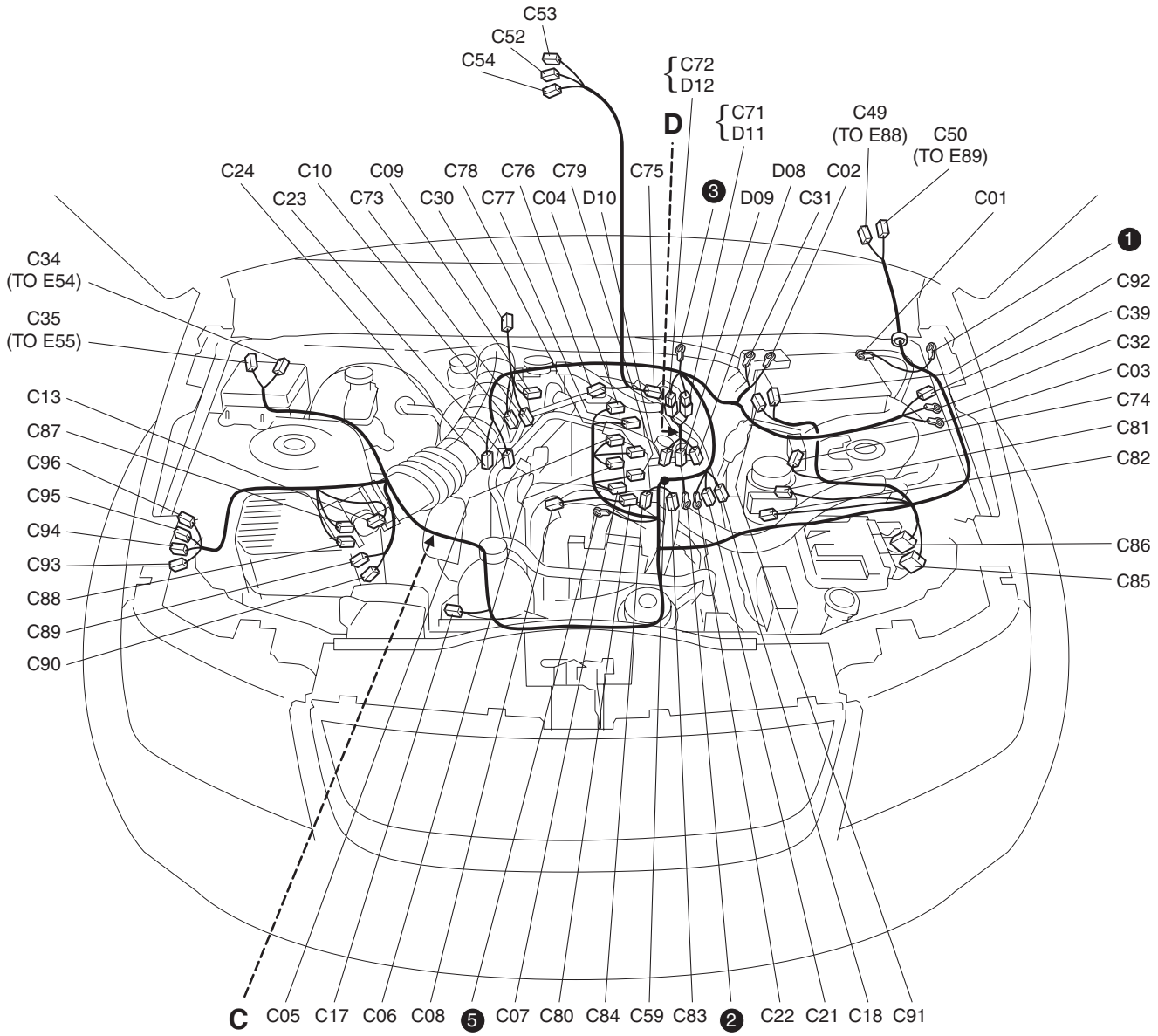
C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/-	Battery (–)	C34/N	Main harness (To E54)
C02/-	Battery fuse box	C35/BLU	Main harness (To E55)
C03/-	Fuse box No.1	C36/GRY	A/F sensor #1
C08/GRY	CMP sensor	C37/N	ECM
C09/BLK	ECT sensor	C39/GRY	Fuse box No.1
C10/GRY	EGR stepper motor	C40/GRY	IG coil #1
C11/BLK	Throttle position sensor	C41/GRY	IG coil #2
C12/BLK	MAP sensor	C42/GRY	IG coil #3
C13/BLK	MAF sensor	C43/GRY	IG coil #4
C14/BLU	EVAP canister purge valve	C44/GRY	IG coil #5
C15/GRN	Heated oxygen sensor #1	C45/GRY	IG coil #6
C16/GRN	Heated oxygen sensor #2	C46/BRN	Intake control valve
C17/BLK	A/C compressor	C47/BLK	Noise filter
C18/N	Oil pressure sensor	C48/N	Main harness (To E87)
C20/GRY	CKP sensor	C49/N	Main harness (To E88)
C21/GRN	Generator #1	C50/N	Main harness (To E89)
C22/-	Generator #2	C51/N	J/C
C23/BLK	Starting motor #1	C52/BLK	T/F 4L switch
C24/-	Starting motor #2	C53/N	T/F position switch
C25/BLU (A/T)	Output shaft speed sensor	C54/GRY	T/F actuator
C26/GRY	Knock sensor	C55/-	Weld splice
C27/BLU (A/T)	Input shaft speed sensor	C56/-	Weld splice
C28/GRY (A/T)	Transmission range sensor	C57/-	Weld splice
C29/GRY (A/T)	Shift solenoid	C58/-	Weld splice
C30/BLK (M/T)	Back-up light switch	C59/-	Weld splice
C31/-	Battery fuse box	C60/GRY	Injector harness (To D07)
C32/-	Fuse box No.1	C61/GRY	A/F sensor #2
C33/N	P/S pump pressure switch		

D: Injector harness

No./Color	Connective position	No./Color	Connective position
D01/GRY	Injector #1	D05/GRY	Injector #5
D02/GRY	Injector #2	D06/GRY	Injector #6
D03/GRY	Injector #3	D07/GRY	Engine harness (To C60)
D04/GRY	Injector #4		

C: Engine harness / D: Injector harness (DSL RHD)



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C: Engine harness

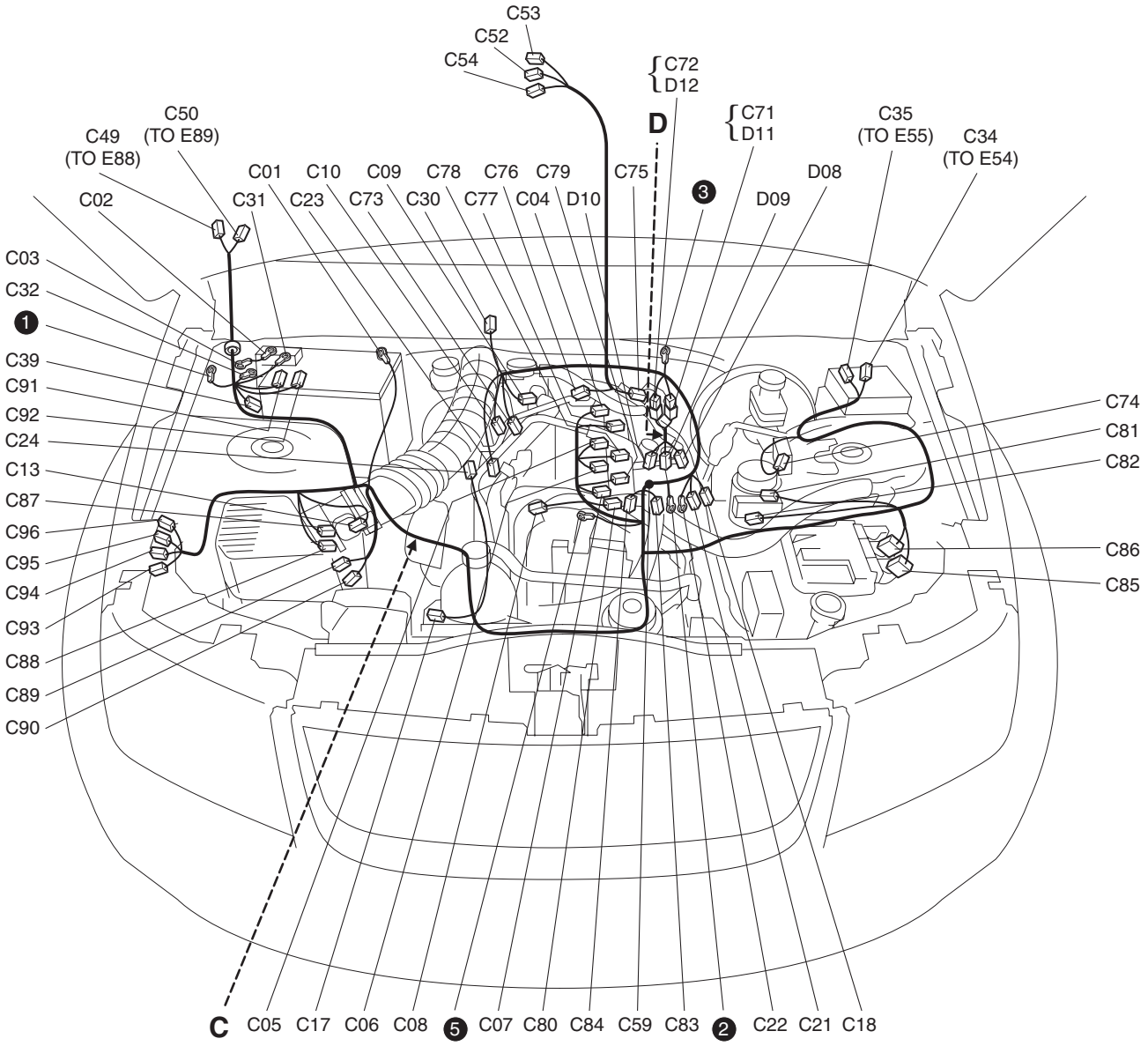
No./Color	Connective position	No./Color	Connective position
C01/-	Battery (–)	C59/-	Weld splice
C02/-	Battery fuse box	C70/BLK	Turbo cooling pump
C03/-	Fuse box No.1	C71/BLK	Injector harness (To D11)
C04/BLK	Injector #1	C72/BLK	Injector harness (To D12)
C05/BLK	Injector #2	C73/YEL	Up stream turbine temperature sensor
C06/BLK	Injector #3	C74/BLK	Glow plug relay
C07/BLK	Injector #4	C75/BLK	Inlet throttle valve
C08/BLK	CMP sensor	C76/BLK	Boost pressure sensor
C09/BLK	ECT sensor	C77/BLK	Glow plug #1
C10/GRY	EGR stepper motor	C78/BLK	Glow plug #2
C13/BLK	MAF sensor	C79/BLK	Glow plug #3
C17/BLK	Oil pressure sensor	C80/BLK	Glow plug #4
C20/BLK	CKP sensor	C81/BLK	Fuel heater
C21/GRY	Generator #1	C82/BLK	Water in fuel sensor
C22/-	Generator #2	C83/BLK	Flow governor
C23/-	Starting motor #1	C84/BLK	Rail pressure sensor
C24/-	Starting motor #2	C85/GRY	ECM
C30/N	Back-up light switch	C86/BRN	ECM

No./Color	Connective position	No./Color	Connective position
C31/-	Battery fuse box	C87/GRY	Up stream temperature sensor
C32/-	Fuse box No.1	C88/GRY	Down stream temperature sensor
C34/N	Main harness (To E54)	C89/BLK	Differential temperature sensor
C35/N	Main harness (To E55)	C90/BLK	Turbo cooling control valve
C39/GRY	Fuse box No.1	C91/GRY	Battery fuse box
C49/N	Main harness (To E88)	C92/BRN	Battery fuse box
C50/N	Main harness (To E89)	C93/N	Thermo plug relay #1
C52/BLK	T/F 4L switch	C94/N	Thermo plug relay #2
C53/N	T/F position switch	C95/N	Thermo plug relay #3
C54/GRY	T/F actuator		

D: Injector harness

No./Color	Connective position	No./Color	Connective position
D08/-	Thermo plug #1	D11/BLK	Engine harness (To C71)
D09/-	Thermo plug #2	D12/BLK	Engine harness (To C72)
D10/-	Thermo plug #3		

C: Engine harness / D: Injector harness (DSL LHD)



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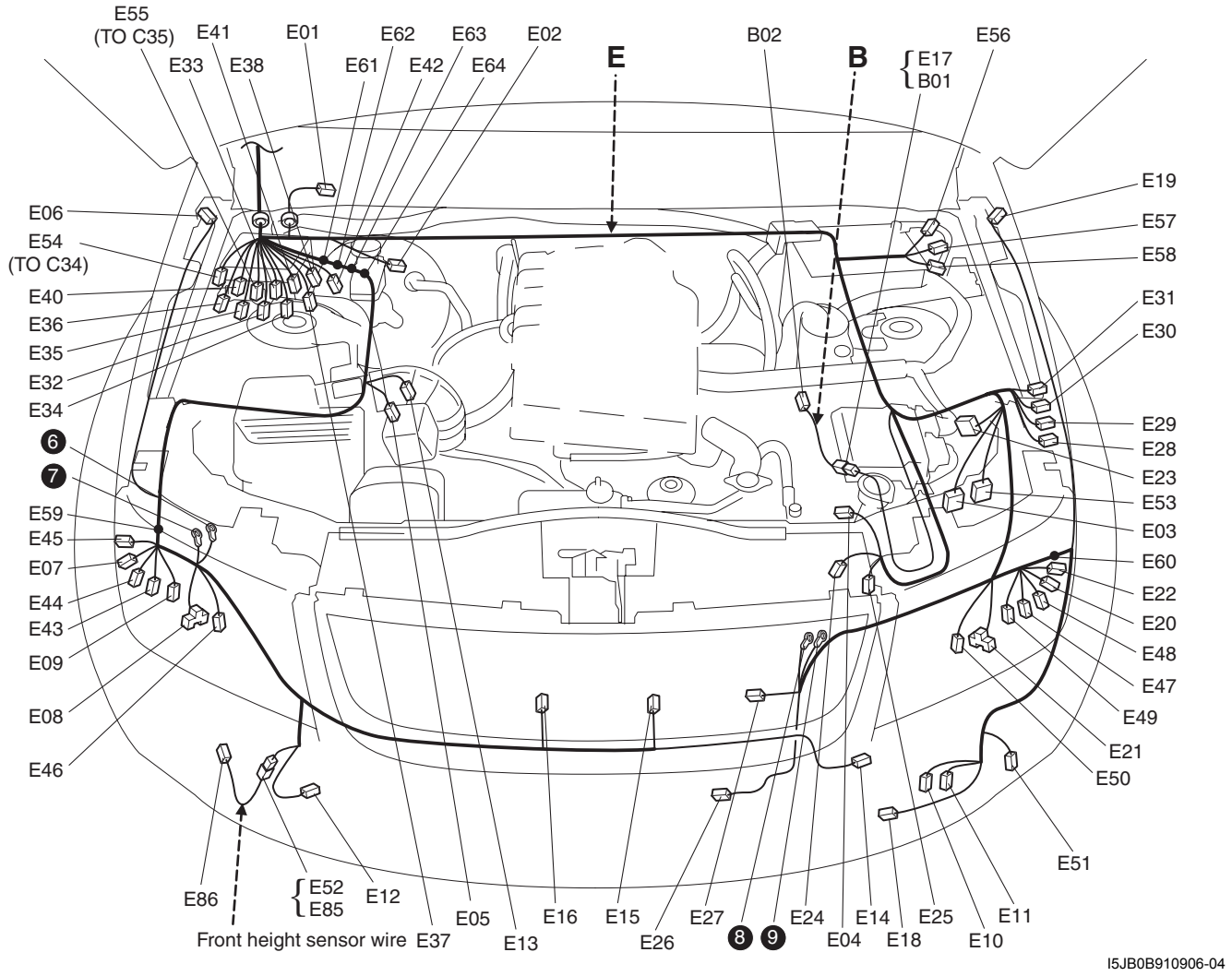
C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/-	Battery (–)	C59/-	Weld splice
C02/-	Battery fuse box	C70/BLK	Turbo cooling pump
C03/-	Fuse box No.1	C71/BLK	Injector harness (To D11)
C04/BLK	Injector #1	C72/BLK	Injector harness (To D12)
C05/BLK	Injector #2	C73/YEL	Up stream turbine temperature sensor
C06/BLK	Injector #3	C74/BLK	Glow plug relay
C07/BLK	Injector #4	C75/BLK	Inlet throttle valve
C08/BLK	CMP sensor	C76/BLK	Boost pressure sensor
C09/BLK	ECT sensor	C77/BLK	Glow plug #1
C10/GRY	EGR stepper motor	C78/BLK	Glow plug #2
C13/BLK	MAF sensor	C79/BLK	Glow plug #3
C17/BLK	Oil pressure sensor	C80/BLK	Glow plug #4
C20/BLK	CKP sensor	C81/BLK	Fuel heater
C21/GRY	Generator #1	C82/BLK	Water in fuel sensor
C22/-	Generator #2	C83/BLK	Flow governor
C23/-	Starting motor #1	C84/BLK	Rail pressure sensor
C24/-	Starting motor #2	C85/GRY	ECM
C30/N	Back-up light switch	C86/BRN	ECM
C31/-	Battery fuse box	C87/GRY	Up stream temperature sensor
C32/-	Fuse box No.1	C88/GRY	Down stream temperature sensor
C34/N	Main harness (To E54)	C89/BLK	Differential temperature sensor
C35/N	Main harness (To E55)	C90/BLK	Turbo cooling control valve
C39/GRY	Fuse box No.1	C91/GRY	Battery fuse box
C49/N	Main harness (To E88)	C92/BRN	Battery fuse box
C50/N	Main harness (To E89)	C93/N	Thermo plug relay #1
C52/BLK	T/F 4L switch	C94/N	Thermo plug relay #2
C53/N	T/F position switch	C95/N	Thermo plug relay #3
C54/GRY	T/F actuator		

D: Injector harness

No./Color	Connective position	No./Color	Connective position
D08/-	Thermo plug #1	D11/BLK	Engine harness (To C71)
D09/-	Thermo plug #2	D12/BLK	Engine harness (To C72)
D10/-	Thermo plug #3		

B: A/C compressor wire / E: Main harness, Front height sensor wire (Petrol RHD)



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B: A/C compressor wire

No./Color	Connective position	No./Color	Connective position
B01/BLK	Main Harness (To E17)	B02/BLK	A/C compressor

E: Main harness

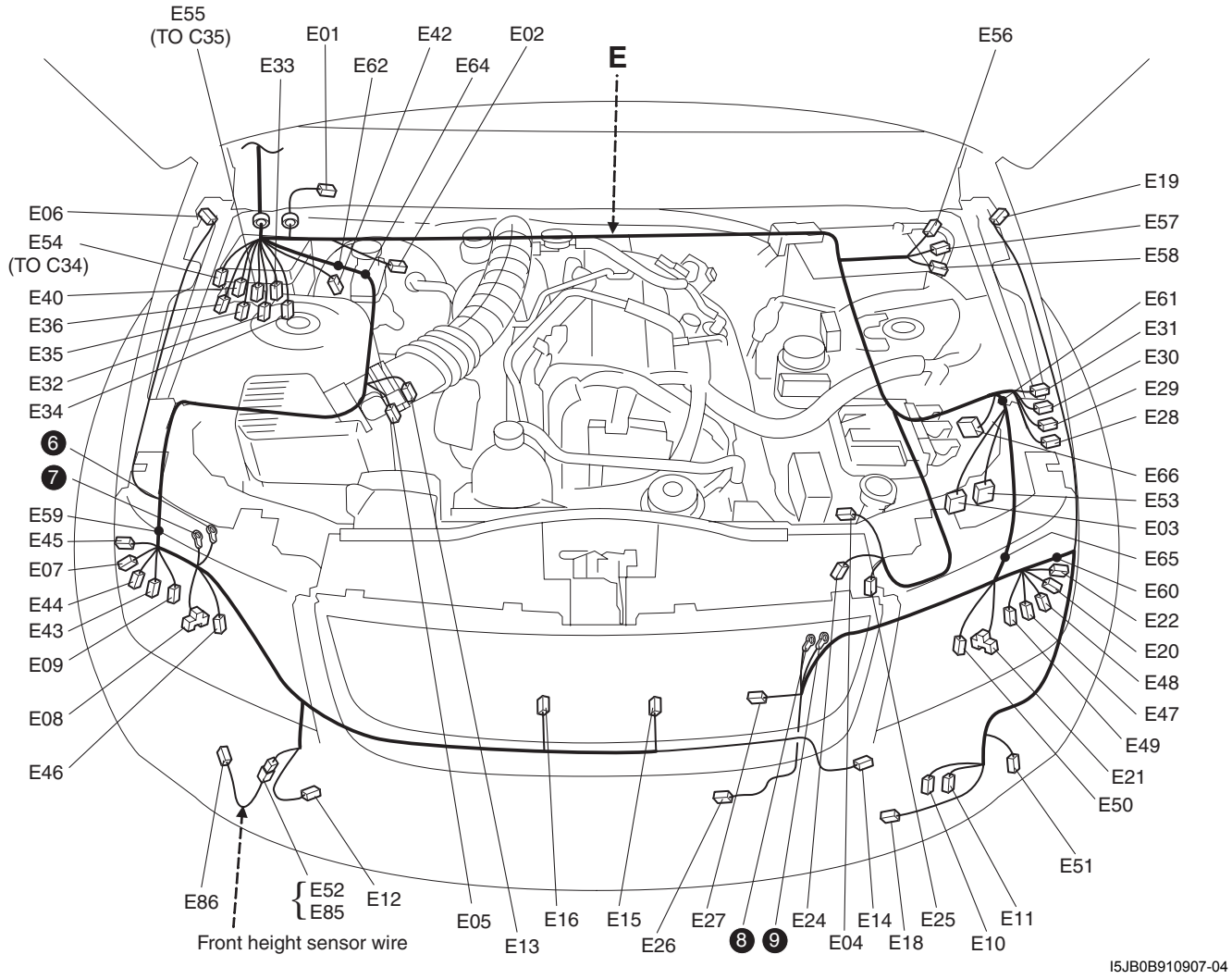
No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E33/BLK	Fuse box No.2 (Heater motor relay & Main relay & Fuel pump relay)
E02/GRY	Brake fluid level switch	E34/BLK (M16A)	Fuse box No.2 (A/C compressor relay & Heated oxygen relay)
E03/BLK	ABS control module	E35/N	Power integration No.1 (Mirror heater relay & Fog lamp relay)
E04/BLK	A/C pressure sensor	E36/N	Power integration No.1 (Horn relay & Rear defogger relay)
E05/N	Wheel speed sensor (FR)	E37/N (J20A, H27A)	Power integration No.2 (A/C compressor relay & Heated oxygen relay)
E06/N	Side turn signal light (R)	E38/N (J20A, H27A)	Power integration No.2 (A/T relay)
E07/N	Front position light (R)	E40/GRY	Power integration No.1
E08/BLK (3 dr)	Headlight (R)	E41/N (J20A, H27A)	Power integration No.2

No./Color	Connective position	No./Color	Connective position
E09/GRY	Front turn signal light (R)	E42/N	Fuse box No.2
E10/N	Windshield washer motor	E43/GRY (5 dr)	HID headlight (R)
E11/N	Rear washer motor	E44/BLK (5 dr)	Headlight LO (R)
E12/BLK	Front fog light (R)	E45/GRY	Headlight beam leveling actuator (R)
E13/YEL	Forward sensor (Driver side)	E46/BLK (5 dr)	Headlight HI (R)
E14/BLK	Ambient temperature sensor	E47/GRY (5 dr)	HID headlight (L)
E15/BLK	Horn (HI)	E48/BLK (5 dr)	Headlight LO (L)
E16/BLK	Horn (LO)	E49/GRY	Headlight beam leveling actuator (L)
E17/BLK	A/C compressor wire (To B01)	E50/BLK (5 dr)	Headlight HI (L)
E18/BLK	Front fog light (L)	E51/N	HLC motor
E19/N	Side turn signal light (L)	E52/BLK	Front height sensor wire (To E85)
E20/GRY	Front turn signal light (L)	E53/BLK (IF EQPD)	ESP® control module
E21/BLK (3 dr)	Headlight (L)	E54/N	Engine harness (To C34)
E22/N	Front position light (L)	E55/BLU	Engine harness (To C35)
E23/GRY	ECM	E56/BLK	Fuse box No.1
E24/YEL	Forward sensor (Passenger side)	E57/BLK	Fuse box No.1
E25/GRY	Wheel speed sensor (FL)	E58/GRY	Fuse box No.1
E26/BLK	Radiator fan motor #1	E59/-	Weld splice
E27/GRY	Radiator fan motor #2	E60/-	Weld splice
E28/BLK	Relay box (Throttle motor relay)	E61/-	Weld splice
E29/BLK	Relay box (Radiator fan relay #1)	E62/-	Weld splice
E30/BLK	Relay box (Radiator fan relay #2)	E63/-	Weld splice
E31/BLK	Relay box (Radiator fan relay #3)	E64/-	Weld splice
E32/BLK	Fuse box No.2 (Starting motor relay & Headlight HI relay & Headlight LO relay)		

E: Front height sensor wire

No./Color	Connective position	No./Color	Connective position
E85/BLK	Main Harness (To E52)	E86/BLK	Front height sensor

E: Main harness, Front height sensor wire (DSL RHD)



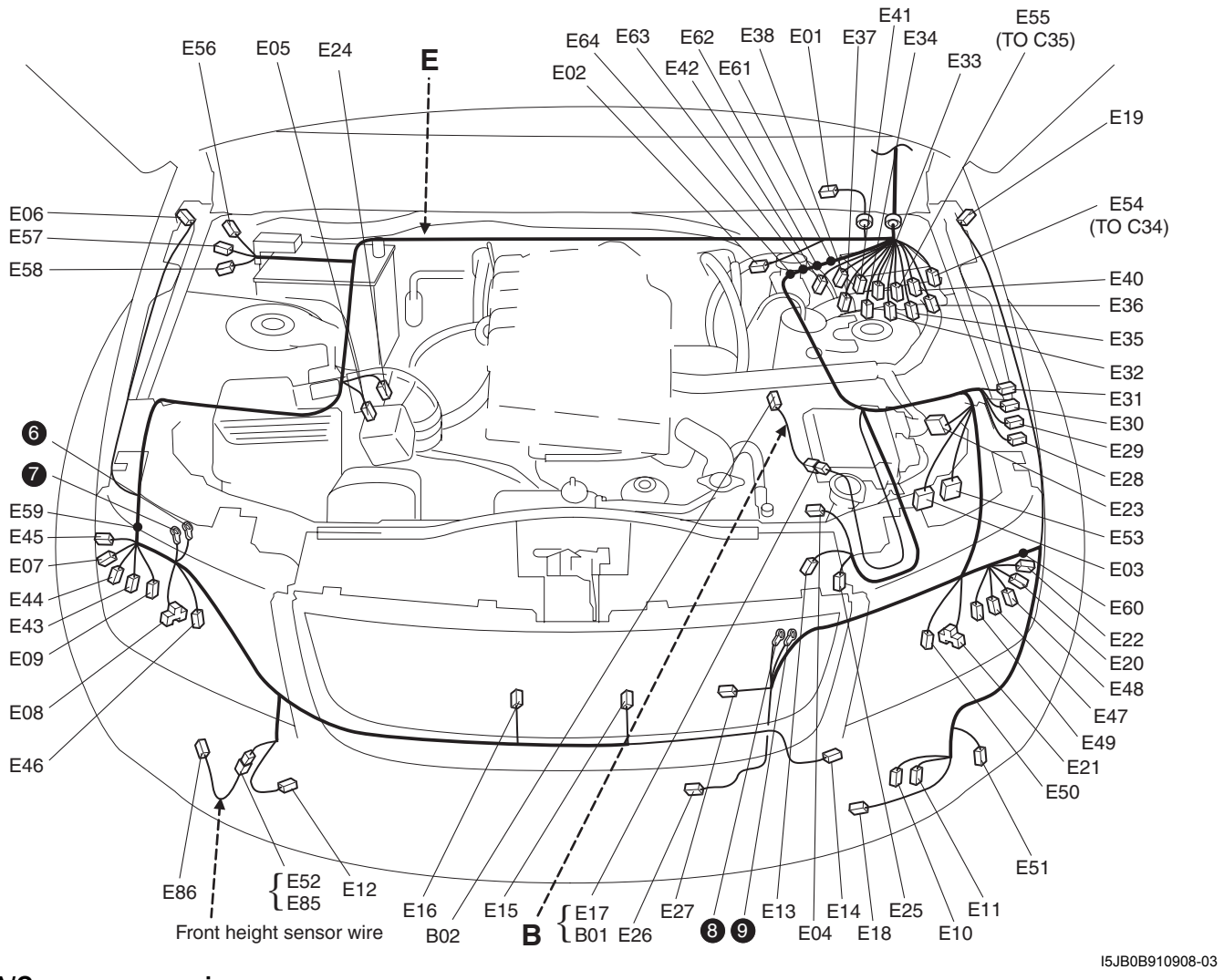
E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E33/BLK	Fuse box No.2 (Heater motor relay & Main relay & A/C compressor relay)
E02/GRY	Brake fluid level switch	E34/N	Fuse box No.2 (Fuel heater relay & Turbo cooling pump relay)
E03/BLK	ABS control module	E35/N	Power integration No.1 (Mirror heater relay & Fog lamp relay)
E04/BLK	A/C pressure sensor	E36/N	Power integration No.1 (Horn relay & Rear defogger relay)
E05/N	Wheel speed sensor (FR)	E40/GRY	Power integration No.1
E06/N	Side turn signal light (R)	E42/N	Fuse box No.2
E07/N	Front position light (R)	E43/GRY (5 dr)	HID headlight (R)
E08/BLK (3 dr)	Headlight (R)	E44/BLK (5 dr)	Headlight LO (R)
E09/GRY	Front turn signal light (R)	E45/GRY	Headlight beam leveling actuator (R)
E10/N	Windshield washer motor	E46/BLK (5 dr)	Headlight HI (R)
E11/N	Rear washer motor	E47/GRY (5 dr)	HID headlight (L)
E12/BLK	Front fog light (R)	E48/BLK (5 dr)	Headlight LO (L)
E13/YEL	Forward sensor (Driver side)	E49/GRY	Headlight beam leveling actuator (L)
E14/BLK	Ambient temperature sensor	E50/BLK (5 dr)	Headlight HI (L)
E15/BLK	Horn (HI)	E51/N	HLC motor
E16/BLK	Horn (LO)	E52/BLK	Front height sensor wire (To E85)
E18/BLK	Front fog light (L)	E53/BLK (IF EQPD)	ESP® control module
E19/N	Side turn signal light (L)	E54/N	Engine harness (To C34)
E20/GRY	Front turn signal light (L)	E55/N	Engine harness (To C35)
E21/BLK (3 dr)	Headlight (L)	E56/BLK	Fuse box No.1
E22/N	Front position light (L)	E57/BLK	Fuse box No.1
E24/YEL	Forward sensor (Passenger side)	E58/GRY	Fuse box No.1
E25/GRY	Wheel speed sensor (FL)	E59/-	Weld splice
E26/BLK	Radiator fan motor #1	E60/-	Weld splice
E27/GRY	Radiator fan motor #2	E61/-	Weld splice
E28/BLK	Relay box (Fuel pump relay)	E62/-	Weld splice
E29/BLK	Relay box (Radiator fan relay #1)	E64/-	Weld splice
E30/BLK	Relay box (Radiator fan relay #2)	E65/-	Weld splice
E31/BLK	Relay box (Radiator fan relay #3)	E66/BLK	ECM
E32/BLK	Fuse box No.2 (Starting motor relay & Headlight HI relay & Headlight LO relay)		

E: Front height sensor wire

No./Color	Connective position	No./Color	Connective position
E85/BLK	Main Harness (To E52)	E86/BLK	Front height sensor

B: A/C compressor wire / E: Main harness, Front height sensor wire (Petrol LHD)



B: A/C compressor wire

No./Color	Connective position	No./Color	Connective position
B01/BLK	Main Harness (To E17)	B02/BLK	A/C compressor

E: Main harness

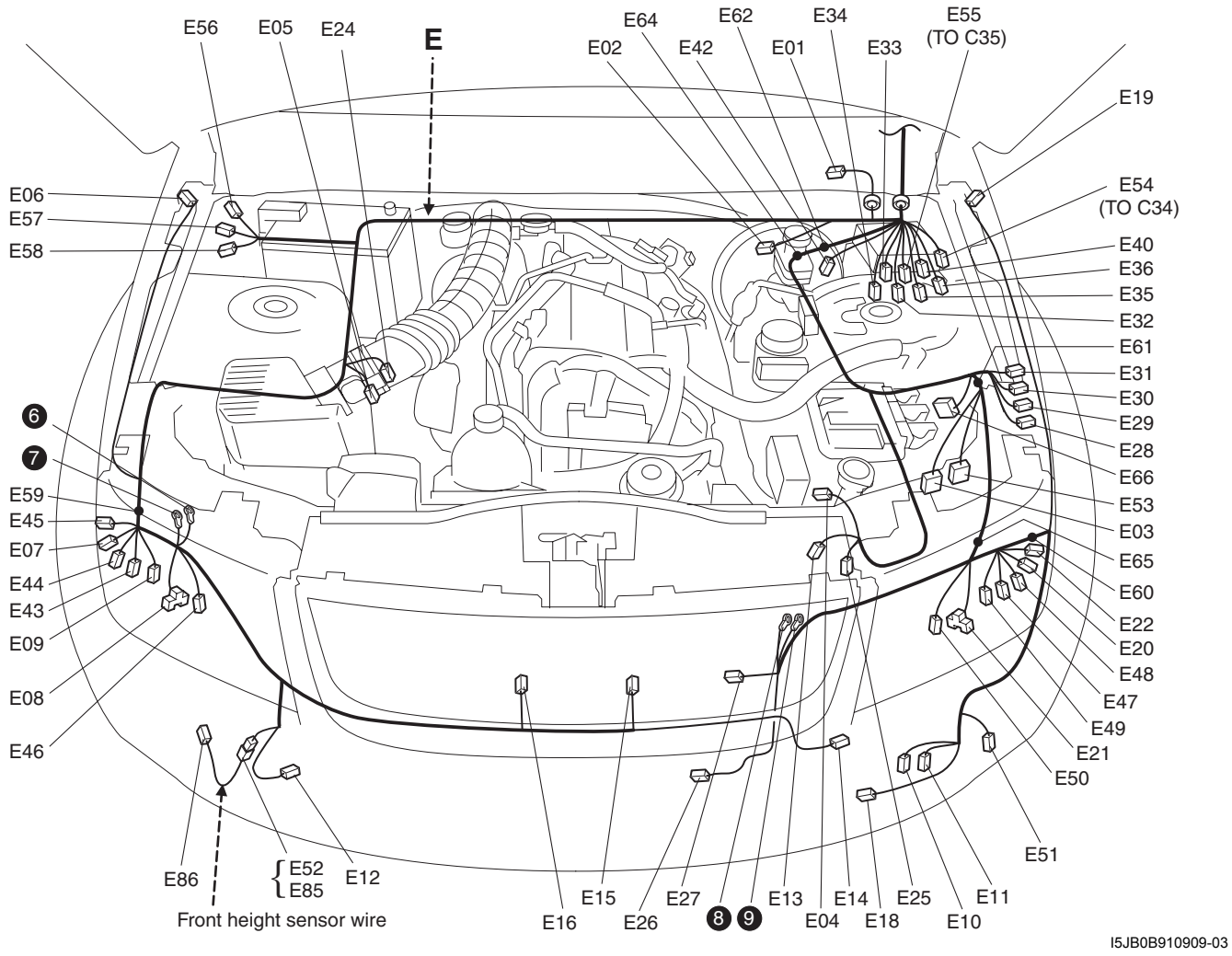
No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E33/BLK	Fuse box No.2 (Heater motor relay & Main relay & Fuel pump relay)
E02/GRY	Brake fluid level switch	E34/BLK (M16A)	Fuse box No.2 (A/C compressor relay & Heated oxygen relay)
E03/BLK	ABS control module	E35/N	Power integration No.1 (Mirror heater relay & Fog lamp relay)
E04/BLK	A/C pressure sensor	E36/N	Power integration No.1 (Horn relay & Rear defogger relay)
E05/N	Wheel speed sensor (FR)	E37/N (J20A)	Power integration No.2 (A/C compressor relay & Heated oxygen relay)
E06/N	Side turn signal light (R)	E38/N (J20A)	Power integration No.2 (A/T relay)
E07/N	Front position light (R)	E40/GRY	Power integration No.1
E08/BLK (3 dr)	Headlight (R)	E41/N (J20A)	Power integration No.2
E09/GRY	Front turn signal light (R)	E42/N	Fuse box No.2
E10/N	Windshield washer motor	E43/GRY (5 dr)	HID headlight (R)

No./Color	Connective position	No./Color	Connective position
E11/N	Rear washer motor	E44/BLK (5 dr)	Headlight LO (R)
E12/BLK	Front fog light (R)	E45/GRY	Headlight beam leveling actuator (R)
E13/YEL	Forward sensor (Driver side)	E46/BLK (5 dr)	Headlight HI (R)
E14/BLK	Ambient temperature sensor	E47/GRY (5 dr)	HID headlight (L)
E15/BLK	Horn (HI)	E48/BLK (5 dr)	Headlight LO (L)
E16/BLK	Horn (LO)	E49/GRY	Headlight beam leveling actuator (L)
E17/BLK	A/C compressor wire (To B01)	E50/BLK (5 dr)	Headlight HI (L)
E18/BLK	Front fog light (L)	E51/N	HLC motor
E19/N	Side turn signal light (L)	E52/BLK	Front height sensor wire (To E85)
E20/GRY	Front turn signal light (L)	E53/BLK (IF EQPD)	ESP® control module
E21/BLK (3 dr)	Headlight (L)	E54/BLU	Engine harness (To C34)
E22/N	Front position light (L)	E55/N	Engine harness (To C35)
E23/GRY	ECM	E56/BLK	Fuse box No.1
E24/YEL	Forward sensor (Passenger side)	E57/BLK	Fuse box No.1
E25/GRY	Wheel speed sensor (FL)	E58/GRY	Fuse box No.1
E26/BLK	Radiator fan motor #1	E59/-	Weld splice
E27/GRY	Radiator fan motor #2	E60/-	Weld splice
E28/BLK	Relay box (Throttle motor relay)	E61/-	Weld splice
E29/BLK	Relay box (Radiator fan relay #1)	E62/-	Weld splice
E30/BLK	Relay box (Radiator fan relay #2)	E63/-	Weld splice
E31/BLK	Relay box (Radiator fan relay #3)	E64/-	Weld splice
E32/BLK	Fuse box No.2 (Starting motor relay & Headlight HI relay & Headlight LO relay)		

E: Front height sensor wire

No./Color	Connective position	No./Color	Connective position
E85/BLK	Main Harness (To E52)	E86/BLK	Front height sensor

E: Main harness, Front height sensor wire (DSL LHD)



E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E33/BLK	Fuse box No.2 (Heater motor relay & Main relay & A/C compressor relay)
E02/GRY	Brake fluid level switch	E34/N	Fuse box No.2 (Fuel heater relay & Turbo cooling pump relay)
E03/BLK	ABS control module	E35/N	Power integration No.1 (Mirror heater relay & Fog lamp relay)
E04/BLK	A/C pressure sensor	E36/N	Power integration No.1 (Horn relay & Rear defogger relay)
E05/N	Wheel speed sensor (FR)	E40/GRY	Power integration No.1
E06/N	Side turn signal light (R)	E42/N	Fuse box No.2
E07/N	Front position light (R)	E43/GRY (5 dr)	HID headlight (R)
E08/BLK (3 dr)	Headlight (R)	E44/BLK (5 dr)	Headlight LO (R)
E09/GRY	Front turn signal light (R)	E45/GRY	Headlight beam leveling actuator (R)
E10/N	Windshield washer motor	E46/BLK (5 dr)	Headlight HI (R)
E11/N	Rear washer motor	E47/GRY (5 dr)	HID headlight (L)
E12/BLK	Front fog light (R)	E48/BLK (5 dr)	Headlight LO (L)
E13/YEL	Forward sensor (Driver side)	E49/GRY	Headlight beam leveling actuator (L)
E14/BLK	Ambient temperature sensor	E50/BLK (5 dr)	Headlight HI (L)
E15/BLK	Horn (HI)	E51/N	HLC motor
E16/BLK	Horn (LO)	E52/BLK	Front height sensor wire (To E85)
E18/BLK	Front fog light (L)	E53/BLK (IF EQPD)	ESP® control module
E19/N	Side turn signal light (L)	E54/BLU	Engine harness (To C34)
E20/GRY	Front turn signal light (L)	E55/N	Engine harness (To C35)
E21/BLK (3 dr)	Headlight (L)	E56/BLK	Fuse box No.1
E22/N	Front position light (L)	E57/BLK	Fuse box No.1
E24/YEL	Forward sensor (Passenger side)	E58/GRY	Fuse box No.1
E25/GRY	Wheel speed sensor (FL)	E59/-	Weld splice
E26/BLK	Radiator fan motor #1	E60/-	Weld splice
E27/GRY	Radiator fan motor #2	E61/-	Weld splice
E28/BLK	Relay box (Fuel pump relay)	E62/-	Weld splice
E29/BLK	Relay box (Radiator fan relay #1)	E64/-	Weld splice
E30/BLK	Relay box (Radiator fan relay #2)	E65/-	Weld splice
E31/BLK	Relay box (Radiator fan relay #3)	E66/BLK	ECM
E32/BLK	Fuse box No.2 (Starting motor relay & Headlight HI relay & Headlight LO relay)		

E: Front height sensor wire

No./Color	Connective position	No./Color	Connective position
E85/BLK	Main Harness (To E52)	E86/BLK	Front height sensor

Instrument Panel

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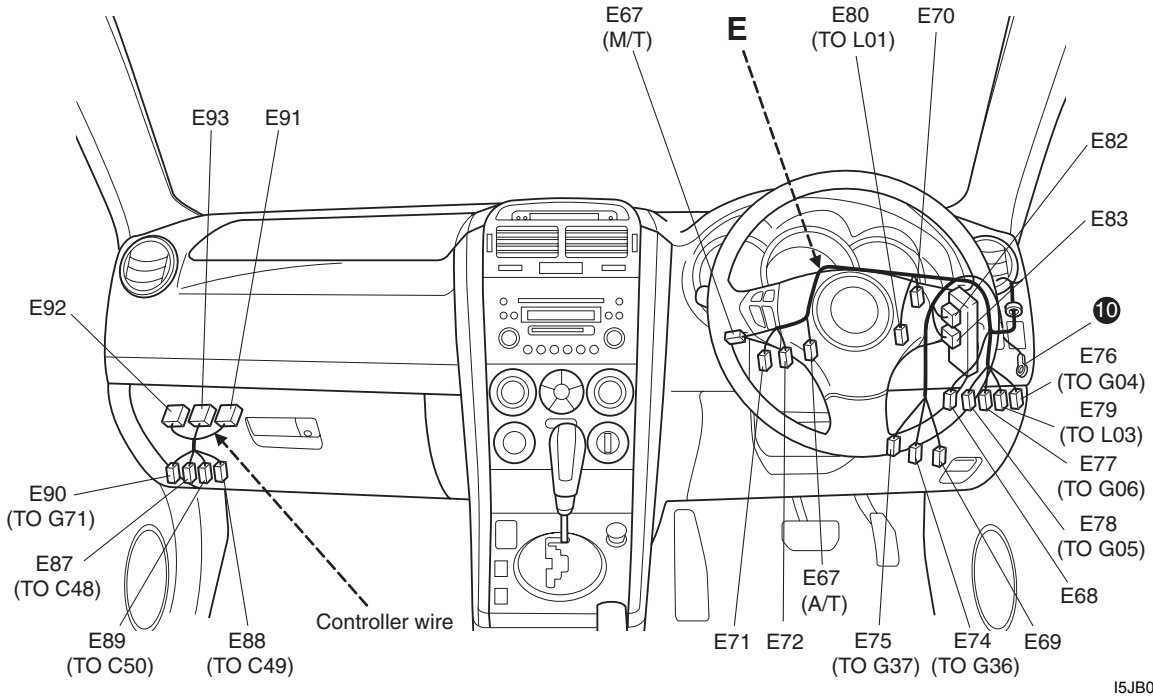
E: Main harness, Controller wire (Petrol RHD)



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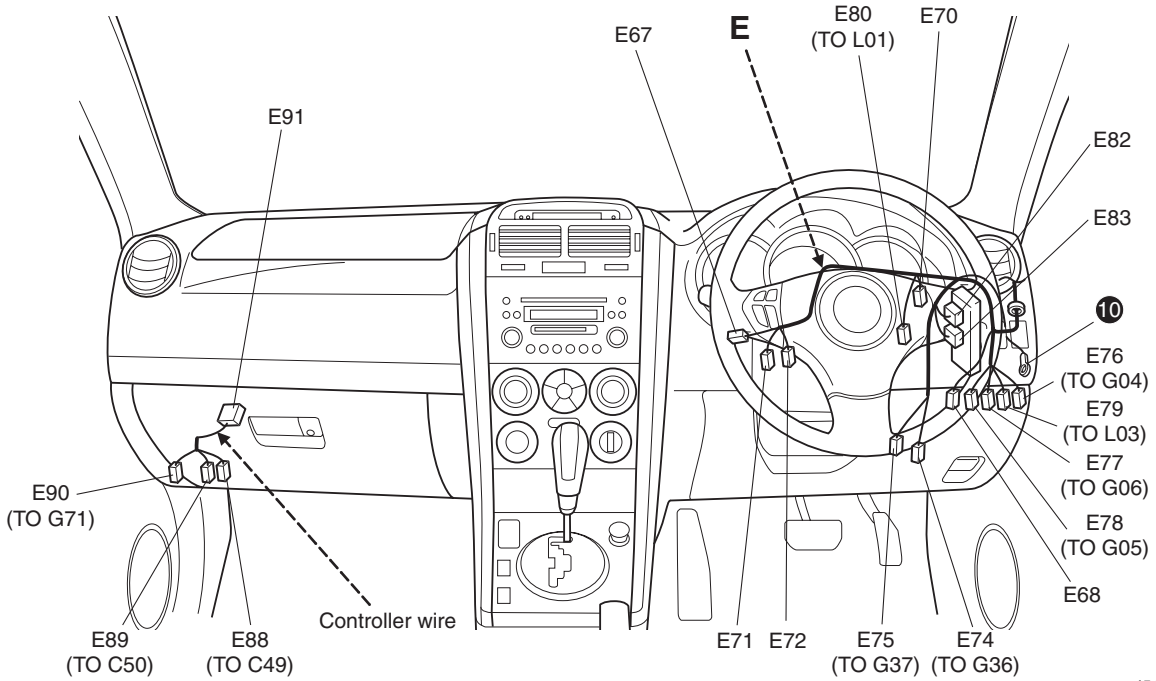
E: Main harness

No./Color	Connective position	No./Color	Connective position
E67/N	Brake lamp switch	E76/N	Instrument panel harness (To G04)
E68/BLK	Acceleration pedal sensor	E77/YEL	Instrument panel harness (To G06)
E69/N (IF EQPD)	Diagnosis connector #1	E78/GRY	Instrument panel harness (To G05)
E70/BLK	Diode #1	E79/YEL	Floor harness (To L03)
E71/N	Clutch switch	E80/N	Floor harness (To L01)
E72/N	Clutch 4WD switch	E82/N	J/B
E74/N	Instrument panel harness (To G36)	E83/N	J/B
E75/N	Instrument panel harness (To G37)		

E: Controller wire

No./Color	Connective position	No./Color	Connective position
E87/N	Engine harness (To C48)	E91/N	4WD control module
E88/N	Engine harness (To C49)	E92/N	TCM
E89/N	Engine harness (To C50)	E93/N	TCM
E90/BLU	Instrument panel harness (To G71)		

E: Main harness, Controller wire (DSL RHD)



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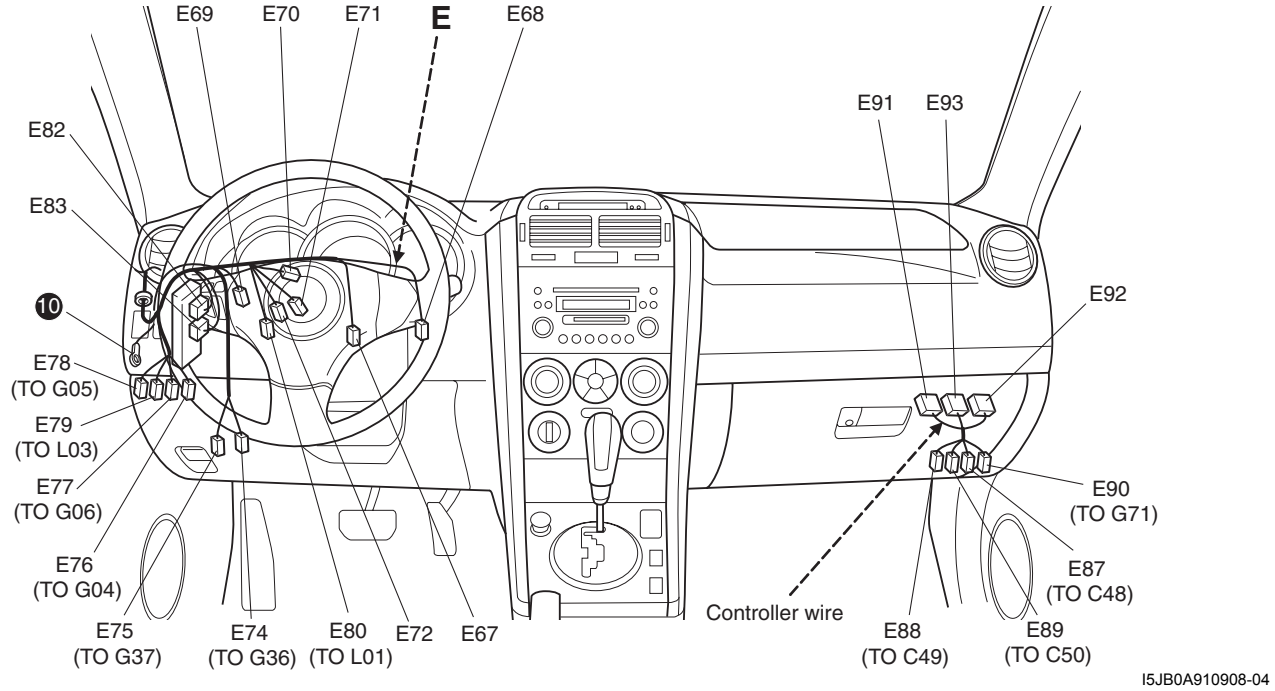
E: Main harness

No./Color	Connective position	No./Color	Connective position
E67/N	Brake lamp switch	E76/N	Instrument panel harness (To G04)
E68/BLK	Acceleration pedal sensor	E77/N	Instrument panel harness (To G06)
E70/BLK	Diode #1	E78/GRY	Instrument panel harness (To G05)
E71/N	Clutch switch	E79/YEL	Floor harness (To L03)
E72/N	Clutch 4WD switch	E80/N	Floor harness (To L01)
E74/N	Instrument panel harness (To G36)	E82/N	J/B
E75/N	Instrument panel harness (To G37)	E83/N	J/B

E: Controller wire

No./Color	Connective position	No./Color	Connective position
E88/N	Engine harness (To C49)	E90/BLU	Instrument panel harness (To G71)
E89/N	Engine harness (To C50)	E91/N	4WD control module

E: Main harness, Controller wire (Petrol LHD)



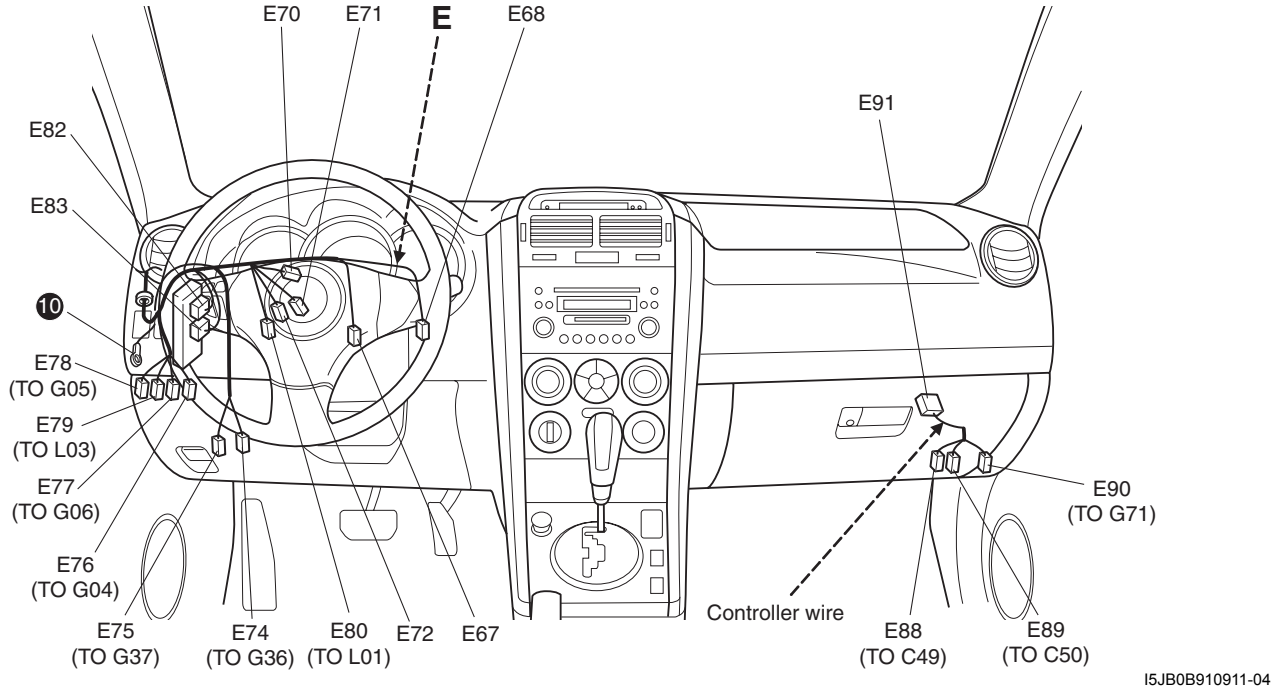
E: Main harness

No./Color	Connective position	No./Color	Connective position
E67/N	Brake lamp switch	E76/N	Instrument panel harness (To G04)
E68/BLK	Acceleration pedal sensor	E77/N	Instrument panel harness (To G06)
E69/N	Diagnosis connector #1	E78/GRY	Instrument panel harness (To G05)
E70/BLK	Diode #1	E79/YEL	Floor harness (To L03)
E71/N	Clutch switch	E80/N	Floor harness (To L01)
E72/N	Clutch 4WD switch	E82/N	J/B
E74/N	Instrument panel harness (To G36)	E83/N	J/B
E75/N	Instrument panel harness (To G37)		

E: Controller wire

No./Color	Connective position	No./Color	Connective position
E87/N	Engine harness (To C48)	E91/N	4WD control module
E88/N	Engine harness (To C49)	E92/N	TCM
E89/N	Engine harness (To C50)	E93/N	TCM
E90/BLU	Instrument panel harness (To G71)		

E: Main harness, Controller wire (DSL LHD)



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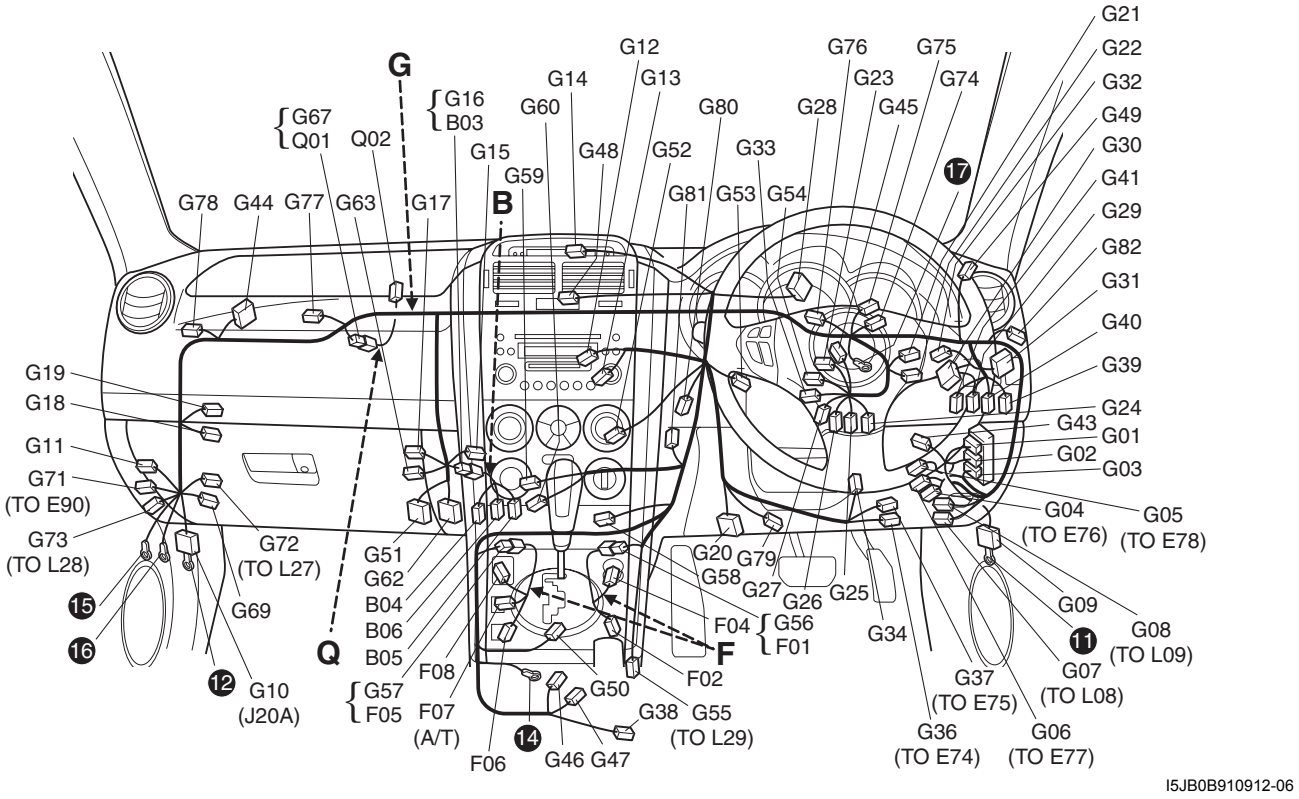
E: Main harness

No./Color	Connective position	No./Color	Connective position
E67/N	Brake lamp switch	E76/N	Instrument panel harness (To G04)
E68/BLK	Acceleration pedal sensor	E77/YEL	Instrument panel harness (To G06)
E70/BLK	Diode #1	E78/GRY	Instrument panel harness (To G05)
E71/N	Clutch switch	E79/YEL	Floor harness (To L03)
E72/N	Clutch 4WD switch	E80/N	Floor harness (To L01)
E74/N	Instrument panel harness (To G36)	E82/N	J/B
E75/N	Instrument panel harness (To G37)	E83/N	J/B

E: Controller wire

No./Color	Connective position	No./Color	Connective position
E88/N	Engine harness (To C49)	E90/BLU	Instrument panel harness (To G71)
E89/N	Engine harness (To C50)	E91/N	4WD control module

B: A/C wire / F: Console wire / G: Instrument panel harness / Q: A/B wire (RHD)



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B: A/C wire

No./Color	Connective position	No./Color	Connective position
B03/N	Instrument panel harness (To G16)	B05/YEL	Fresh/Recircle actuator
B04/YEL	Temperature control actuator	B06/YEL	Mode selecting actuator

F: Console wire

No./Color	Connective position	No./Color	Connective position
F01/N	Instrument panel harness (To G56)	F06/GRN	Seat heater switch (Passenger side)
F02/GRN	Seat heater switch (Driver side)	F07/N (A/T)	A/T mode select switch
F04/N	Cigar lighter (ACC socket #3)	F08/N	ACC socket #2
F05/N	Instrument panel harness (To G57)		

G: Instrument panel harness

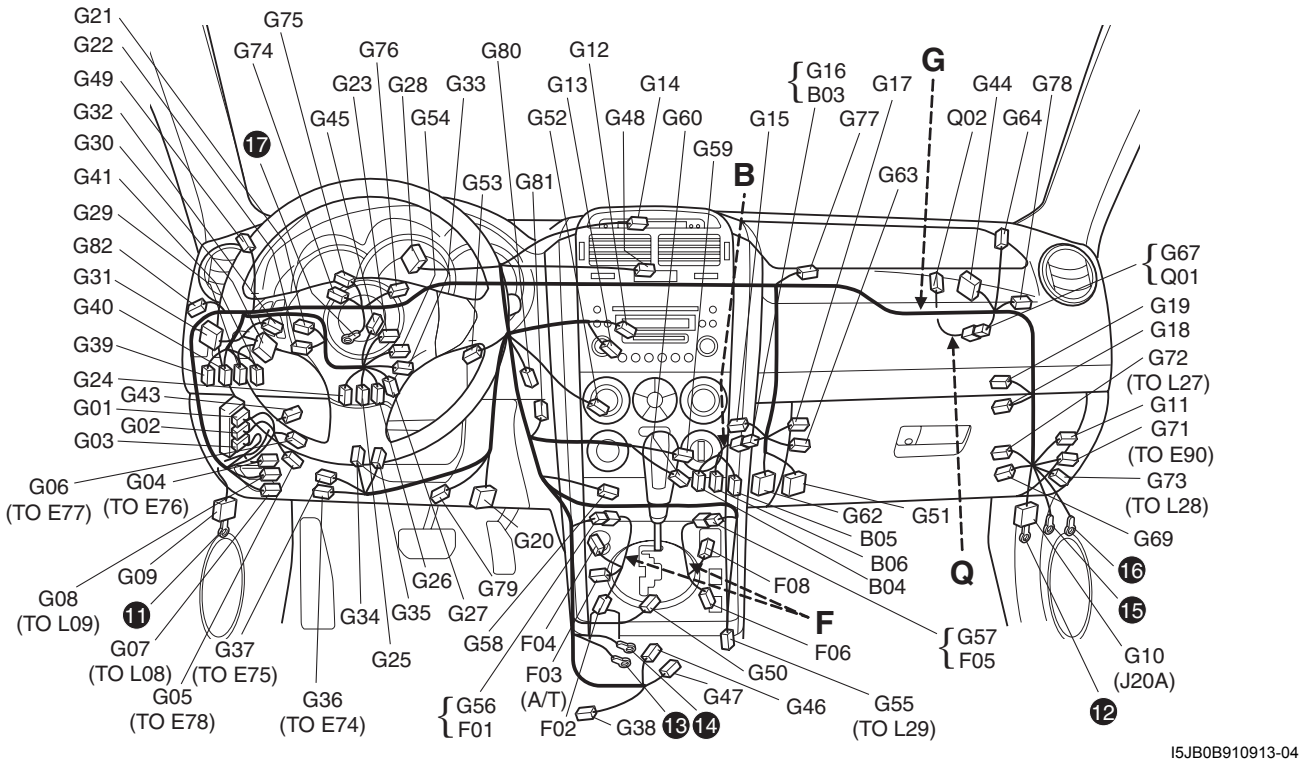
No./Color	Connective position	No./Color	Connective position
G01/N	J/B	G39/ORN	HLC switch
G02/N	J/B	G40/N	Headlight beam leveling switch
G03/N	J/B	G41/GRY	ILL cancel switch
G04/N	Main harness (To E76)	G43/BLK	Diagnosis connector #4
G05/GRY	Main harness (To E78)	G44/N	Smart ECM
G06/YEL	Main harness (To E77)	G45/N (IF EQPD)	Steering angle sensor
G07/N	Floor harness (To L08)	G46/YEL (8ch)	A/B SDM
G08/BLU	Floor harness (To L09)	G47/YEL (4ch)	A/B SDM
G09/N	J/C	G48/ORN	Hazard switch
G10/N (J20A, H27A, DSL)	J/C	G49/N	Sunlight sensor
G11/N	Audio antenna	G50/N	A/T shift lever
G12/BLU	Audio	G51/N	Auto leveling control module
G13/N	Navigation	G52/GRY	Auto A/C
G14/YEL	Multi information display	G53/N	Room temperature sensor
G15/N	EVAP thermistor	G54/BLK	Steering switch
G16/N	A/C wire (To B03)	G55/YEL	Floor harness (To L29)

No./Color	Connective position	No./Color	Connective position
G17/N	Fan driver	G56/N	Console wire (To F01)
G18/N	Blower fan motor	G57/N	Console wire (To F05)
G19/BLK	Diode #2	G58/N (IF EQPD)	Ashtray ILL
G20/BLK	DLC	G59/GRN	4WD switch
G21/N	IG switch	G60/GRN (IF EQPD)	ESP® off switch
G22/N	Main switch (Key switch)	G62/N	HLC control module
G23/BLK	COMB switch	G63/N	Security option
G24/BLK or N	ICM	G67/YEL	Instrument panel harness (To Q01)
G25/N	COMB switch	G69/N	CO adjusting resistor
G26/YEL	Driver inflator	G71/BLU	Controller wire (To E90)
G27/YEL	Driver inflator	G72/N	Floor harness (To L27)
G28/GRN	COMB meter	G73/N	Floor harness (To L28)
G29/GRN	Front fog switch	G74/BLU	J/C
G30/N	BCM	G75/BLU	J/C
G31/N	BCM	G76/N	J/C
G32/N	BCM	G77/N	J/C
G33/N	Steering switch	G78/N	J/C
G34/N	Diagnosis connector #2	G79/BLU	J/C
G36/N	Main harness (To E74)	G80/BLK	J/C
G37/N	Main harness (To E75)	G81/BLK	J/C
G38/N	Parking brake switch	G82/BLU	J/C

Q: A/B wire

No./Color	Connective position	No./Color	Connective position
Q01/YEL	Instrument panel harness (To G67)	Q02/BLK	Passenger inflator

B: A/C wire / F: Console wire / G: Instrument panel harness / Q: A/B wire (LHD)



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B: A/C wire

No./Color	Connective position	No./Color	Connective position
B03/N	Instrument panel harness (To G16)	B05/YEL	Fresh/Recircle actuator
B04/YEL	Temperature control actuator	B06/YEL	Mode selecting actuator

F: Console wire

No./Color	Connective position	No./Color	Connective position
F01/N	Instrument panel harness (To G56)	F05/N	Instrument panel harness (To G57)
F02/GRN	Seat heater switch (Driver side)	F06/GRN	Seat heater switch (Passenger side)
F03/N (A/T)	A/T mode select switch	F08/N	ACC socket #2
F04/N	Cigar lighter (ACC socket #3)		

G: Instrument panel harness

No./Color	Connective position	No./Color	Connective position
G01/N	J/B	G39/ORN	HLC switch
G02/N	J/B	G40/N	Headlight beam leveling switch
G03/N	J/B	G41/GRY	ILL cancel switch
G04/N	Main harness (To E76)	G43/BLK	Diagnosis connector #4
G05/GRY	Main harness (To E78)	G44/N	Smart ECM
G06/YEL	Main harness (To E77)	G45/N (IF EQPD)	Steering angle sensor
G07/N	Floor harness (To L08)	G46/YEL (8ch)	A/B SDM
G08/BLU	Floor harness (To L09)	G47/YEL (4ch)	A/B SDM
G09/N	J/C	G48/ORN	Hazard switch
G10/N (J20A)	J/C	G49/N	Sunlight sensor
G11/N	Audio antenna	G50/N	A/T shift lever
G12/BLU	Audio	G51/N	Auto leveling control module
G13/N	Navigation	G52/GRY	Auto A/C
G14/YEL	Multi information display	G53/N	Room temperature sensor
G15/N	EVAP thermistor	G54/BLK	Steering switch
G16/N	A/C wire (To B03)	G55/YEL	Floor harness (To L29)
G17/N	Fan driver	G56/N	Console wire (To F01)
G18/N	Blower fan motor	G57/N	Console wire (To F05)
G19/BLK	Diode #2	G58/N (IF EQPD)	Ashtray ILL
G20/BLK	DLC	G59/GRN	4WD switch
G21/N	IG switch	G60/GRN (IF EQPD)	ESP® off switch
G22/N	Main switch (Key switch)	G62/N	HLC control module
G23/BLK	COMB switch	G63/N	Security option
G24/BLK	ICM	G64/N	Auto light sensor
G25/N	COMB switch	G67/YEL	Instrument panel harness (To Q01)
G26/YEL	Driver inflator	G69/N	CO adjusting resistor
G27/YEL	Driver inflator	G71/BLU	Controller wire (To E90)
G28/GRN	COMB meter	G72/N	Floor harness (To L27)
G29/GRN	Front fog switch	G73/N	Floor harness (To L28)
G30/N	BCM	G74/BLU	J/C
G31/N	BCM	G75/BLU	J/C
G32/N	BCM	G76/N	J/C
G33/N	Steering switch	G77/N	J/C
G34/N	Diagnosis connector #2	G78/N	J/C
G35/BLU (IF EQPD)	Diagnosis connector #3	G79/BLU	J/C
G36/N	Main harness (To E74)	G80/BLK	J/C
G37/N	Main harness (To E75)	G81/BLK	J/C
G38/N	Parking brake switch	G82/BLU	J/C

Q: A/B wire

No./Color	Connective position	No./Color	Connective position
Q01/YEL	Instrument panel harness (To G67)	Q02/BLK	Passenger inflator

Door, Roof

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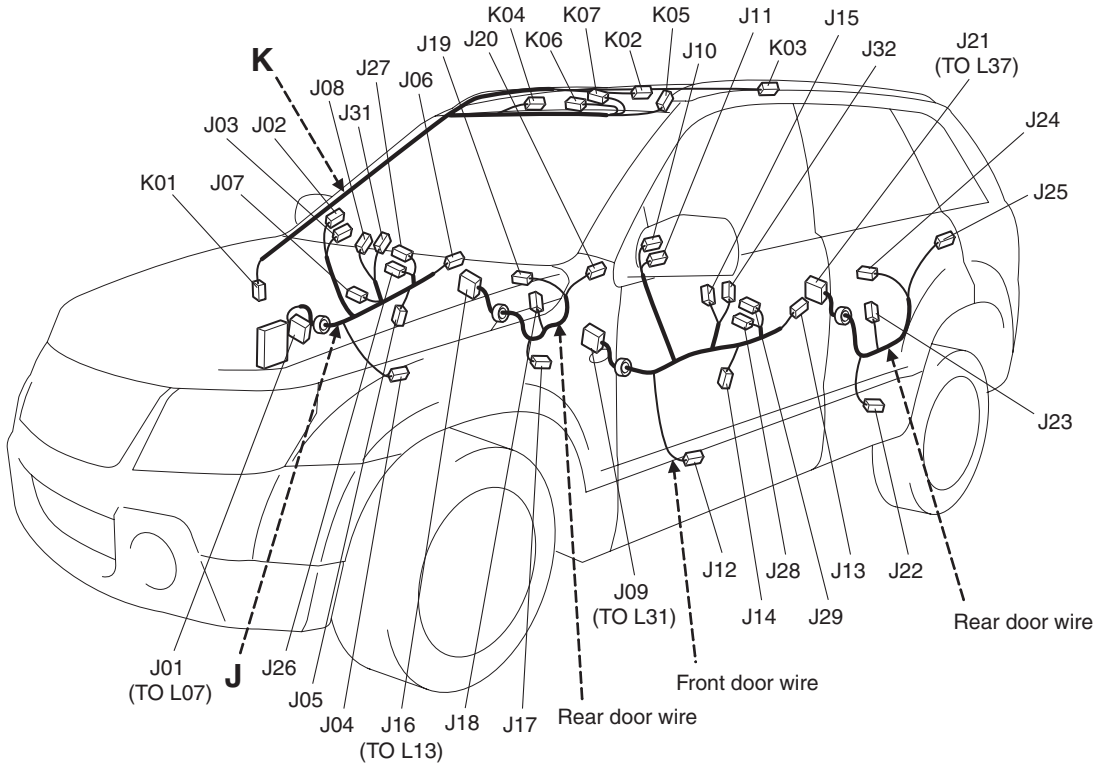
J: Front and rear door wire, rear door joint wire / K: Roof wire (RHD, 5dr)



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J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/GRY	Floor harness (To L07)	J07/N	Power mirror switch (Driver side)
J02/BLK	Tweeter (R)	J08/GRY	Power window main switch
J03/N	Power mirror motor (R)	J26/N	Door antenna (Driver side)
J04/N	Front speaker (R)	J27/N	Request switch (Driver side)
J05/BLK	Front power window motor (Driver side)	J31/N	Curtsy lamp (Driver side)
J06/N	Front door lock motor (Driver side)		

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J09/GRY	Floor harness (To L31)	J14/BLK	Front power window motor (Passenger side)
J10/BLK	Tweeter (L)	J15/N	Power window sub switch
J11/N	Power mirror motor (L)	J28/N	Door antenna (Passenger side)
J12/N	Front speaker (L)	J29/N	Request switch (Passenger side)
J13/N	Front door lock motor (Passenger side)	J32/N	Curtsy lamp (Passenger side)

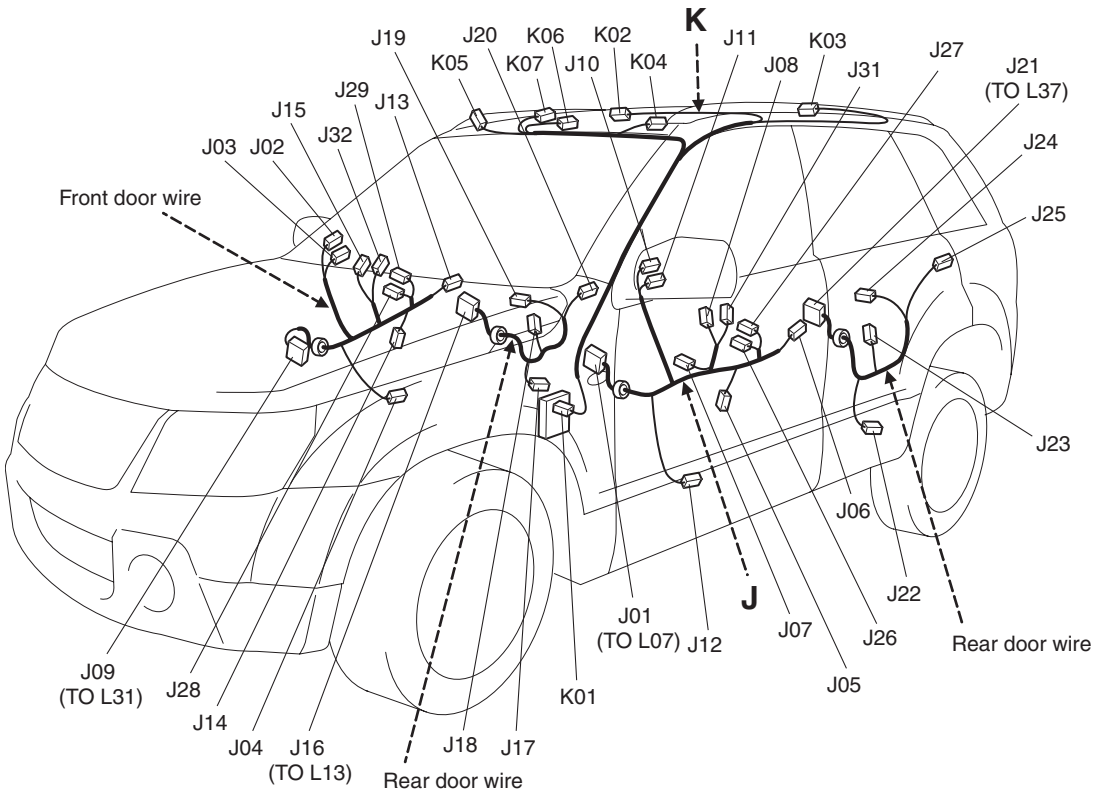
J: Rear door wire

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)
J18/BLK	Rear power window motor (R)	J23/BLK	Rear power window motor (L)
J19/N	Rear power window sub switch (R)	J24/N	Rear power window sub switch (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	K05/N	Vanity lamp (Passenger side)
K02/N	Interior light	K06/N	Sliding roof unit
K03/N	Rear interior light	K07/N	Console (Sliding roof switch & console lamp)
K04/N	Vanity lamp (Driver side)		

J: Front and rear door wire, rear door joint wire / K: Roof wire (LHD, 5dr)



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J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/GRY	Floor harness (To L07)	J11/N	Power mirror motor (L)
J05/BLK	Front power window motor (Driver side)	J12/N	Front speaker (L)
J06/N	Front door lock motor (Driver side)	J26/N	Door antenna (Driver side)
J07/N	Power mirror switch (Driver side)	J27/N	Request switch (Driver side)
J08/GRY	Power window main switch	J31/N	Curtsy lamp (Driver side)
J10/BLK	Tweeter (L)		

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J02/BLK	Tweeter (R)	J14/BLK	Front power window motor (Passenger side)
J03/N	Power mirror motor (R)	J15/N	Power window sub switch
J04/N	Front speaker (R)	J28/N	Door antenna (Passenger side)
J09/GRY	Floor harness (To L31)	J29/N	Request switch (Passenger side)
J13/N	Front door lock motor (Passenger side)	J32/N	Curtsy lamp (Passenger side)

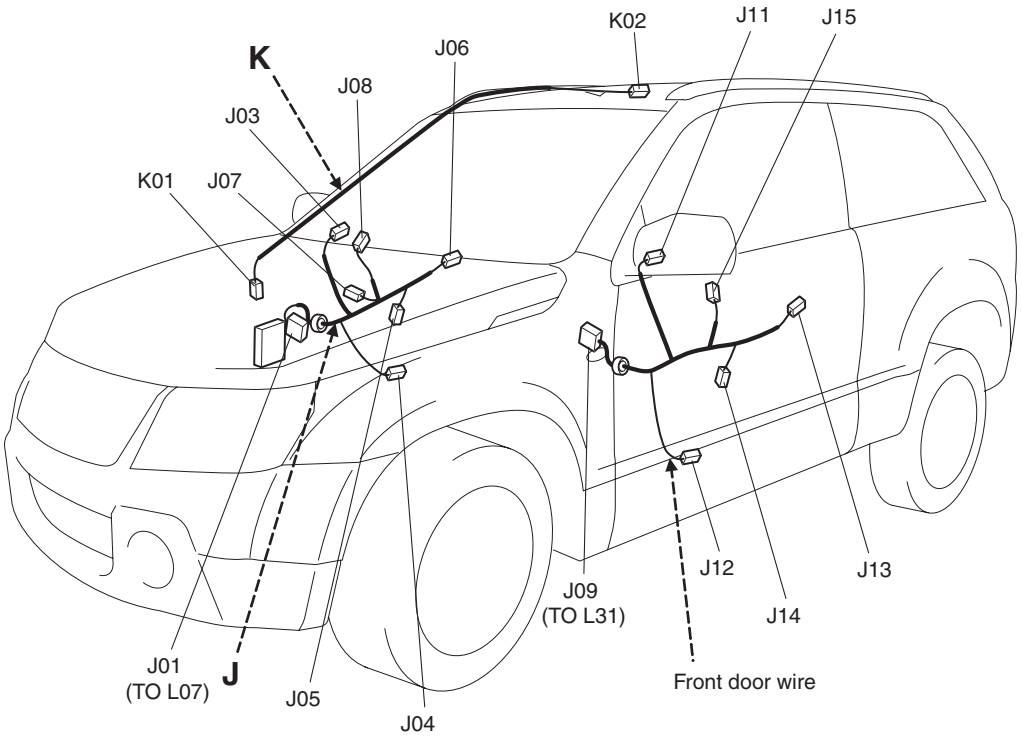
J: Rear door wire

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)
J18/BLK	Rear power window motor (R)	J23/BLK	Rear power window motor (L)
J19/N	Rear power window sub switch (R)	J24/N	Rear power window sub switch (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	K05/N	Vanity lamp (Passenger side)
K02/N	Interior light	K06/N	Sliding roof unit
K03/N	Rear interior light	K07/N	Console (Sliding roof switch & console lamp)
K04/N	Vanity lamp (Driver side)		

J: Front and rear door wire / K: Roof wire (RHD, 3dr)



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J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/GRY	Floor harness (To L07)	J06/N	Front door lock motor (Driver side)
J03/N	Power mirror motor (R)	J07/N	Power mirror switch (Driver side)
J04/N	Front speaker (R)	J08/GRY	Power window main switch
J05/BLK	Front power window motor (Driver side)		

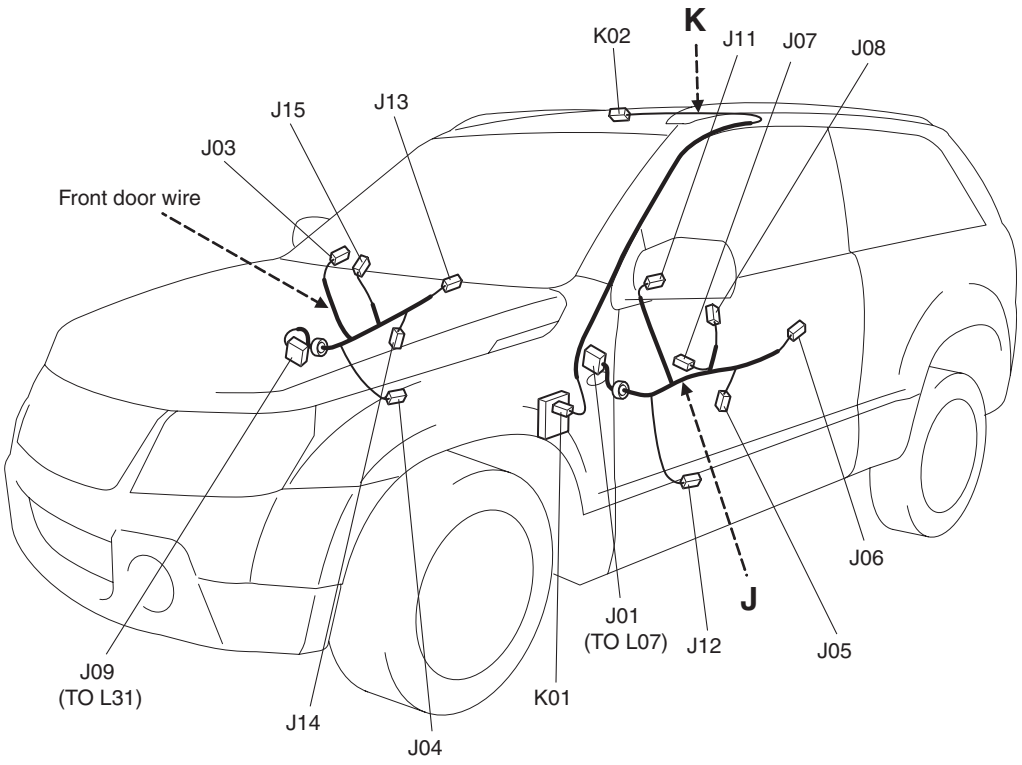
J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J09/GRY	Floor harness (To L31)	J13/N	Front door lock motor (Passenger side)
J11/N	Power mirror motor (L)	J14/BLK	Front power window motor (Passenger side)
J12/N	Front speaker (L)	J15/N	Power window sub switch

K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/N	Interior light

J: Front and rear door wire / K: Roof wire (LHD, 3dr)



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J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/GRY	Floor harness (To L07)	J08/GRY	Power window main switch
J05/BLK	Front power window motor (Driver side)	J11/N	Power mirror motor (L)
J06/N	Front door lock motor (Driver side)	J12/N	Front speaker (L)
J07/N	Power mirror switch (Driver side)		

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J03/N	Power mirror motor (R)	J13/N	Front door lock motor (Passenger side)
J04/N	Front speaker (R)	J14/BLK	Front power window motor (Passenger side)
J09/GRY	Floor harness (To L31)	J15/N	Power window sub switch

K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/N	Interior light

Floor

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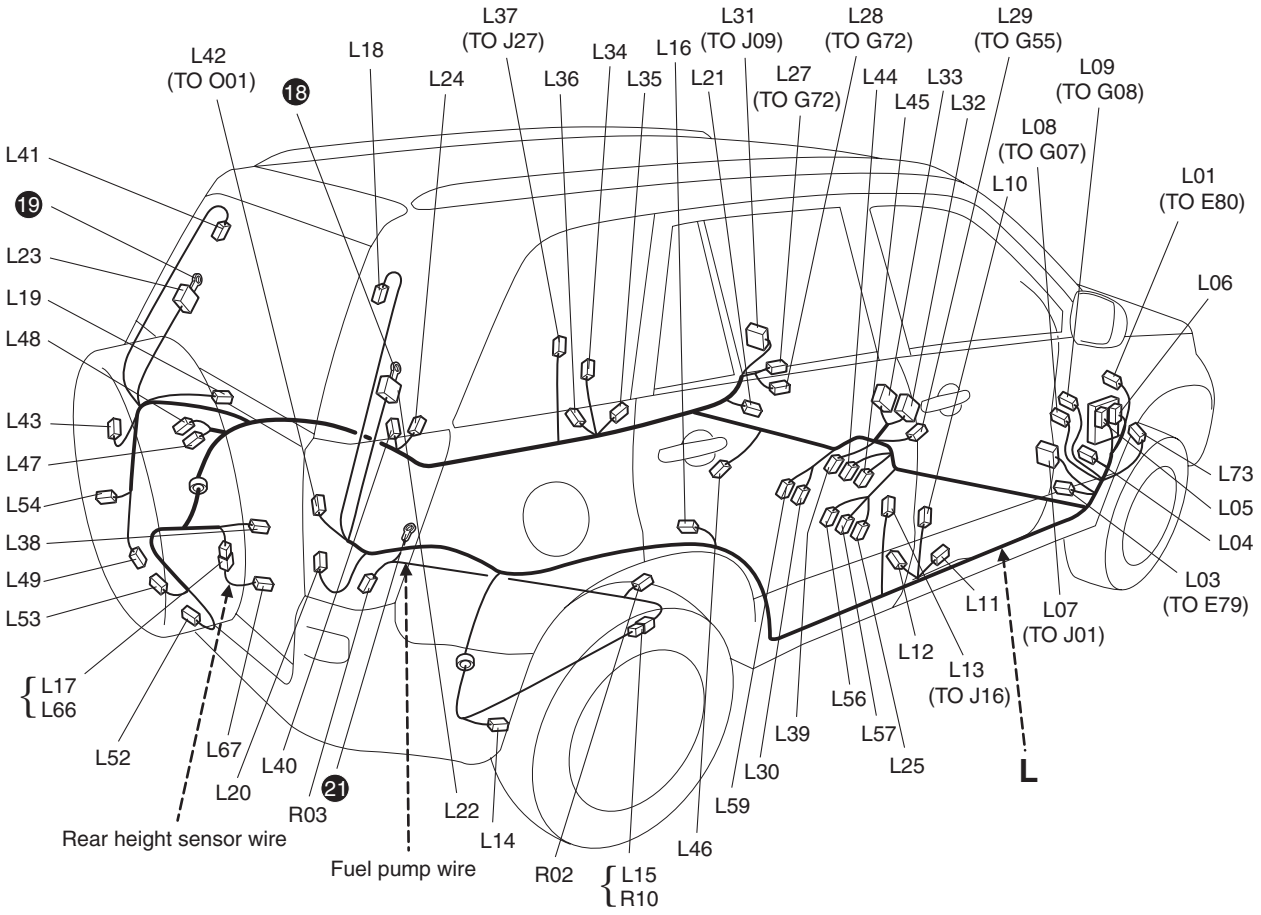
L: Floor harness, Rear height sensor wire / R: Fuel pump wire (RHD, 5dr)



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/N	Main harness (To E80)	L30/YEL	Side air-bag inflator (L)
L03/YEL	Main harness (To E79)	L31/GRY	Front door wire (Passenger side) (To J09)
L04/BLK	Turn signal relay	L32/YEL (8ch)	A/B SDM
L05/N	J/B	L33/YEL (8ch)	A/B SDM
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/GRY	Front door wire (Driver side) (To J01)	L35/YEL	Side air- bag sensor (L)
L08/N	Instrument panel harness (To G07)	L36/BLK	Pretensioner (Passenger side)
L09/BLU	Instrument panel harness (To G08)	L37/N	Rear door wire (L) (To J21)
L10/N	Front door switch (Driver side)	L38/GRY	Wheel speed sensor (RL)
L11/YEL	Side air-bag sensor (R)	L39/GRY (IF EQPD	YAW / G sensor
L12/BLK	Pretensioner (Driver side)	L40/N	Rear door switch (L)
L13/N	Rear door wire (R) (To J16)	L41/BLK	Side curtain air-bag (L)
L14/N	Wheel speed sensor (RR)	L42/N	Rear end door wire (To O01)
L15/GRY	Fuel pump wire (To R01)	L43/N	Rear combination lamp (L)
L16/N	Rear door switch (R)	L44/N	Keyless entry receiver
L17/GRY	Rear height sensor harness (To L66)	L45/BRN	Inside antenna
L18/BLK	Side curtain air-bag (R)	L46/BLK (IF EQPD)	Sub woofer
L19/GRY	Luggage compartment light	L47/N	ACC socket #1
L20/N	Rear combination lamp (R)	L48/N	ACC socket #1
L21/BLK	Diode #3	L49/BRN	Luggage antenna
L22/N	J/C	L52/N	Licence plate light #1
L23/N	J/C	L53/N	Licence plate light #2

No./Color	Connective position	No./Color	Connective position
L24/BLK (IF EQPD)	J/C	L54/N	Rear end door switch
L25/YEL	Side air-bag inflator (R)	L56/N	Seat belt switch (Without seat heater)
L27/N	Instrument panel harness (To G72)	L57/N	Seat heater & Seat belt switch (Driver side)
L28/N	Instrument panel harness (To G73)	L59/N	Seat heater (Passenger side)
L29/YEL	Instrument panel harness (To G55)	L73/N (IF EQPD)	Sub woofer relay

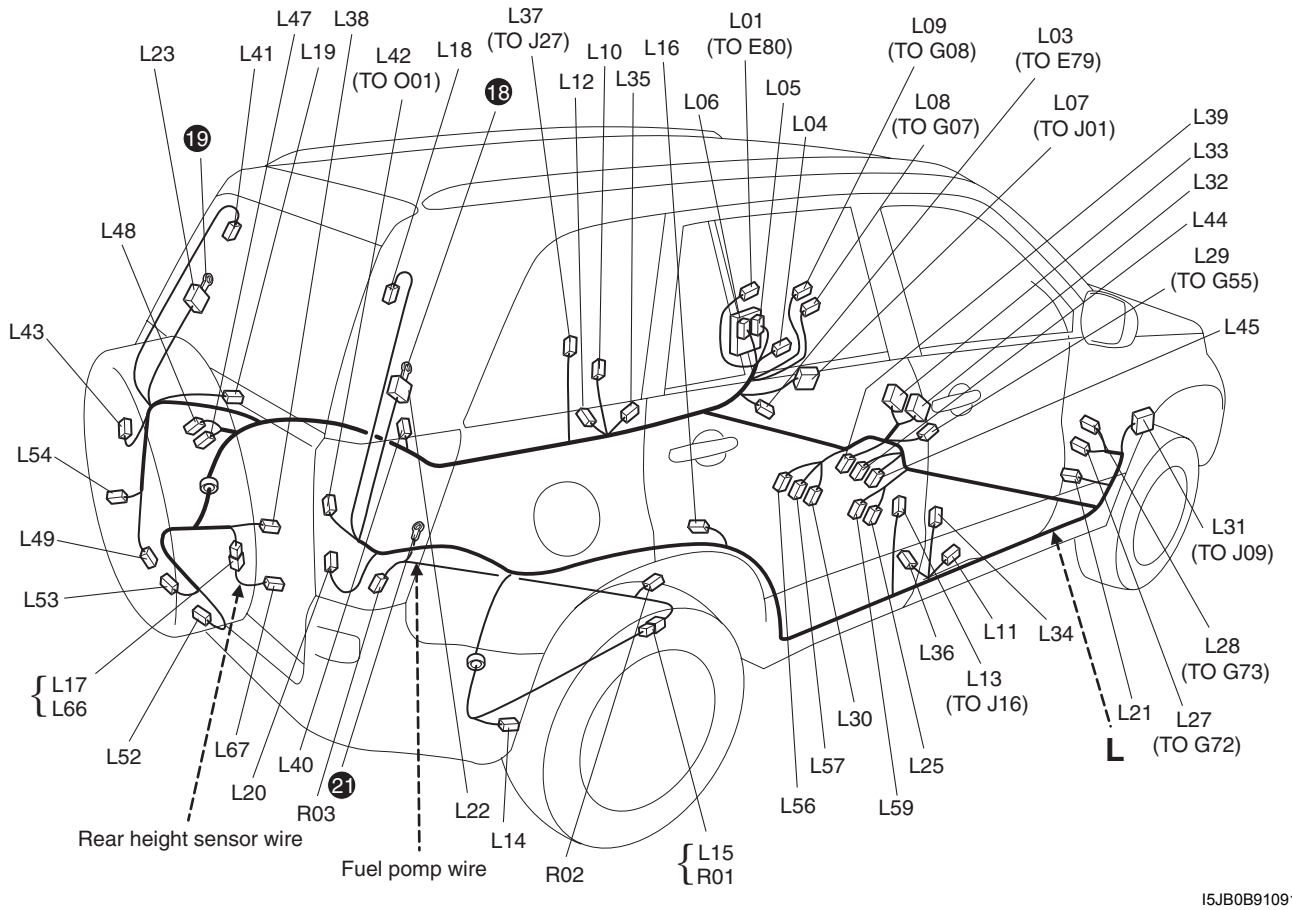
L: Rear height sensor wire

No./Color	Connective position	No./Color	Connective position
L66/N	Floor harness (To L17)	L67/BLK	Rear height sensor

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R03/N	Fuel pump sub gauge
R02/GRY or BLK	Fuel pump and gauge		

L: Floor harness, Rear height sensor wire / R: Fuel pump wire (LHD, 5dr)



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/N	Main harness (To E80)	L30/YEL	Side air-bag inflator (L)
L03/YEL	Main harness (To E79)	L31/GRY	Front door wire (Passenger side) (To J09)
L04/BLK	Turn signal relay	L32/YEL (8ch)	A/B SDM
L05/N	J/B	L33/YEL (8ch)	A/B SDM
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/GRY	Front door wire (Driver side) (To J01)	L35/YEL	Side air- bag sensor (L)
L08/N	Instrument panel harness (To G07)	L36/BLK	Pretensioner (Passenger side)
L09/BLU	Instrument panel harness (To G08)	L37/N	Rear door wire (L) (To J21)
L10/N	Front door switch (Driver side)	L38/GRY	Wheel speed sensor (RL)
L11/YEL	Side air-bag sensor (R)	L39/GRY (IF EQPD)	YAW / G sensor
L12/BLK	Pretensioner (Driver side)	L40/N	Rear door switch (L)
L13/N	Rear door wire (R) (To J16)	L41/BLK	Side curtain air-bag (L)
L14/N	Wheel speed sensor (RR)	L42/N	Rear end door wire (To O01)
L15/GRY	Fuel pump wire (To R01)	L43/N	Rear combination lamp (L)
L16/N	Rear door switch (R)	L44/N	Keyless entry receiver
L17/GRY	Rear height sensor harness (To L66)	L45/BRN	Inside antenna
L18/BLK	Side curtain air-bag (R)	L47/N	ACC socket #1
L19/GRY	Luggage compartment light	L48/N	ACC socket #1
L20/N	Rear combination lamp (R)	L49/BRN	Luggage antenna
L21/BLK	Diode #3	L52/N	Licence plate light #1
L22/N	J/C	L53/N	Licence plate light #2
L23/N	J/C	L54/N	Rear end door switch
L25/YEL	Side air-bag inflator (R)	L56/N	Seat belt switch (Without seat heater)
L27/N	Instrument panel harness (To G72)	L57/N	Seat heater & Seat belt switch (Driver side)
L28/N	Instrument panel harness (To G73)	L59/N	Seat heater (Passenger side)
L29/YEL	Instrument panel harness (To G55)		

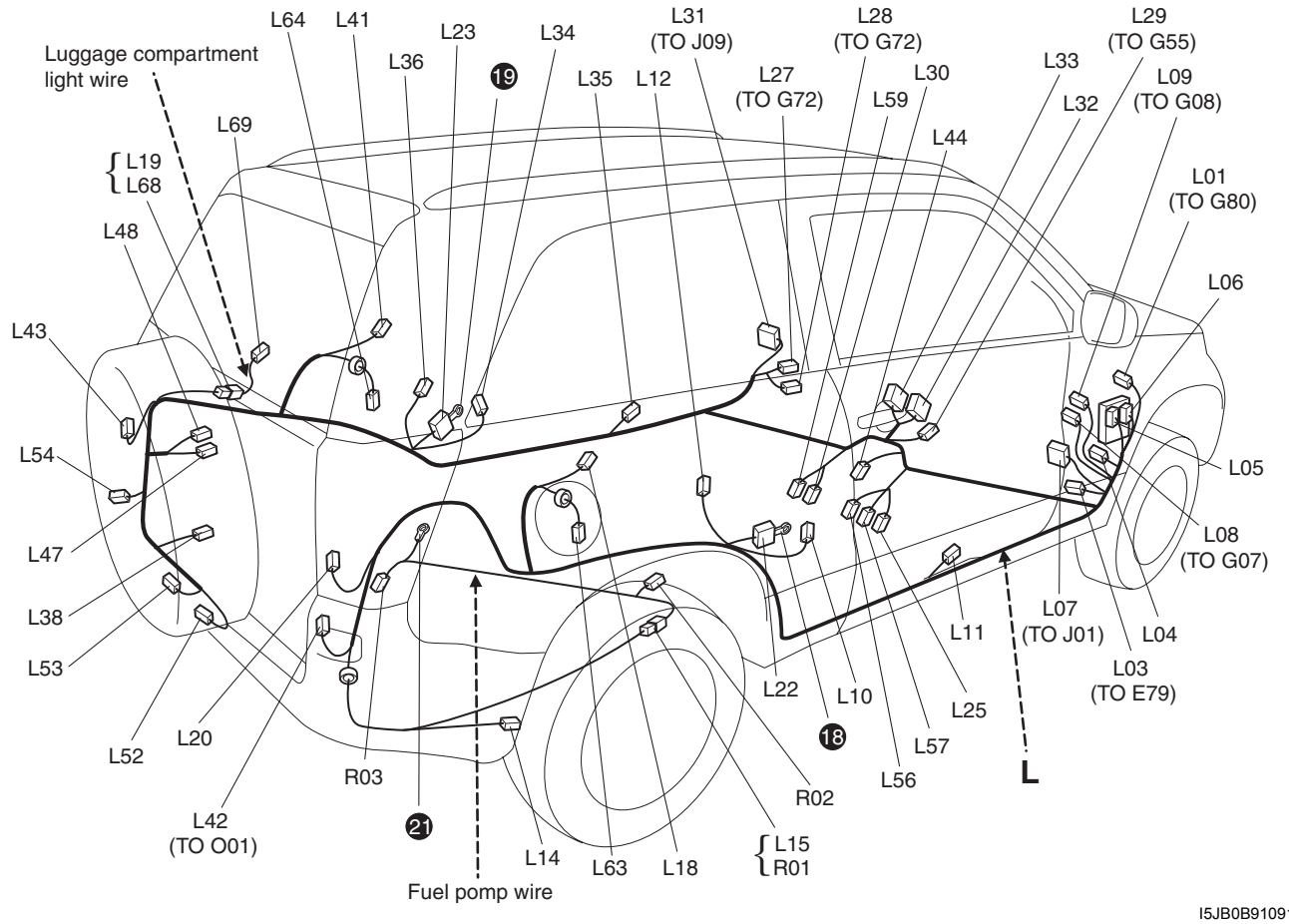
L: Rear height sensor wire

No./Color	Connective position	No./Color	Connective position
L66/N	Floor harness (To L17)	L67/BLK	Rear height sensor

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R03/N	Fuel pump sub gauge
R02/GRY or BLK	Fuel pump and gauge		

L: Floor harness, Luggage compartment light wire, Rear height sensor wire / R: Fuel pump wire (RHD, 3dr)



I5JB0B910916-02

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/N	Main harness (To E80)	L30/YEL	Side air-bag inflator (L)
L03/YEL	Main harness (To E79)	L31/GRY	Front door wire (Passenger side) (To J09)
L04/BLK	Turn signal relay	L32/YEL (8ch)	A/B SDM
L05/N	J/B	L33/YEL (8ch)	A/B SDM
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/GRY	Front door wire (Driver side) (To J01)	L35/YEL	Side air- bag sensor (L)
L08/N	Instrument panel harness (To G07)	L36/BLK	Pretensioner (Passenger side)
L09/BLU	Instrument panel harness (To G08)	L38/GRY	Wheel speed sensor (RL)
L10/N	Front door switch (Driver side)	L41/BLK	Side curtain air-bag (Passenger side)
L11/YEL	Side air-bag sensor (R)	L42/N	Rear end door wire (To O01)
L12/BLK	Pretensioner (Driver side)	L43/N	Rear combination lamp (L)
L14/N	Wheel speed sensor (RR)	L44/N	Keyless entry receiver
L15/GRY	Fuel pump wire (To R01)	L47/N	ACC socket #1
L18/BLK	Side curtain air-bag (Driver side)	L48/N	ACC socket #1
L19/N	Luggage compartment light wire (To L68)	L52/N	Licence plate light #1
L20/N	Rear combination lamp (R)	L53/N	Licence plate light #2
L22/N	J/C	L54/N	Rear end door switch
L23/N	J/C	L56/N	Seat belt switch (Without seat heater)
L25/YEL	Side air-bag inflator (R)	L57/N	Seat heater & Seat belt switch (Driver side)
L27/N	Instrument panel harness (To G72)	L59/N	Seat heater (Passenger side)
L28/N	Instrument panel harness (To G73)	L63/N	Rear speaker (R)
L29/YEL	Instrument panel harness (To G55)	L64/N	Rear speaker (L)

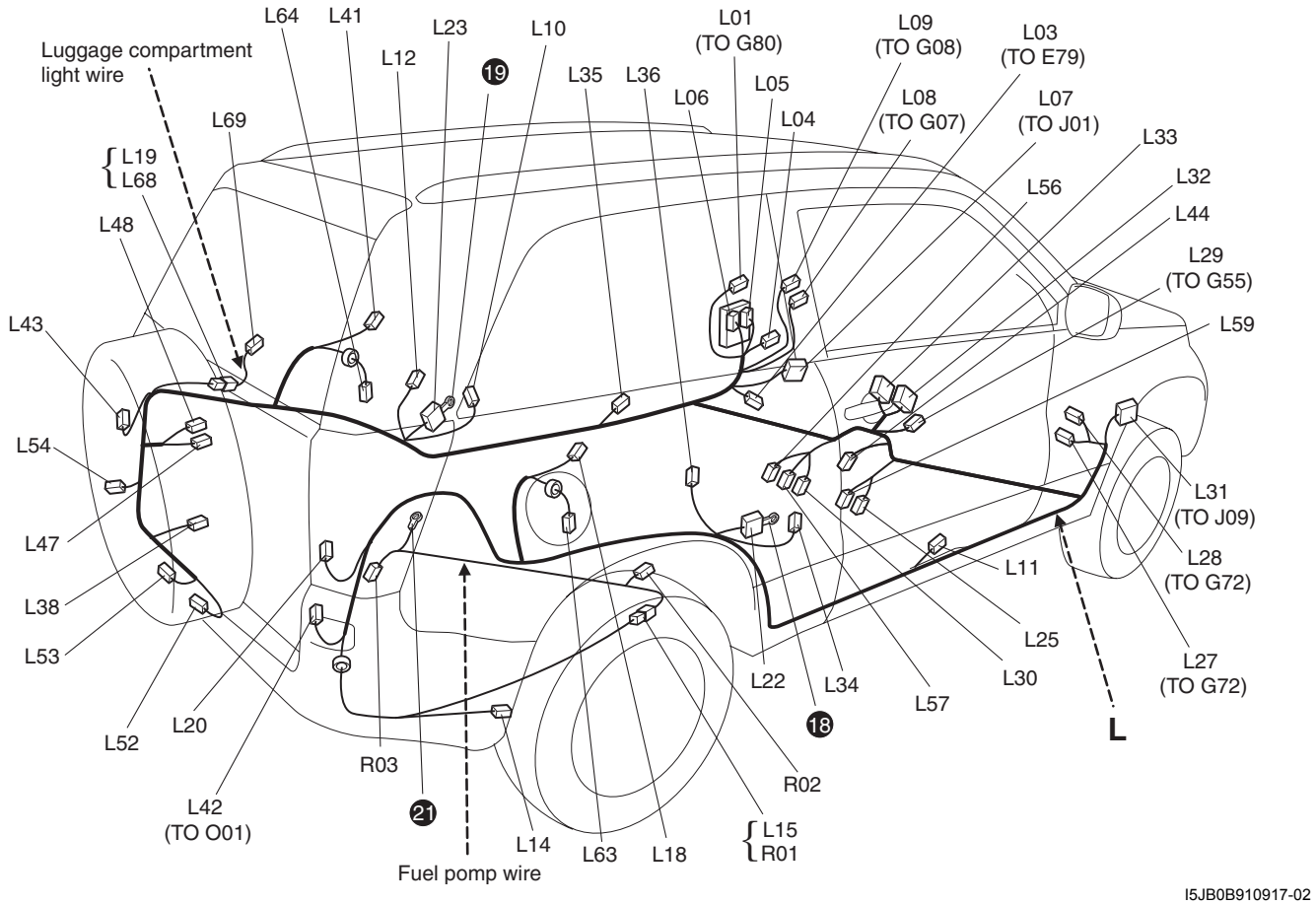
L: Luggage compartment light wire

No./Color	Connective position	No./Color	Connective position
L68/N	Floor harness (To L19)	L69/N	Luggage compartment light

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R03/N	Fuel pump sub gauge
R02/GRY or BLK	Fuel pump and gauge		

L: Floor harness, Luggage compartment light wire, Rear height sensor wire / R: Fuel pump wire (LHD, 3dr)



I5JB0B910917-02

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/N	Main harness (To E80)	L30/YEL	Side air-bag inflator (L)
L03/YEL	Main harness (To E79)	L31/GRY	Front door wire (Passenger side) (To J09)
L04/BLK	Turn signal relay	L32/YEL (8ch)	A/B SDM
L05/N	J/B	L33/YEL (8ch)	A/B SDM
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/GRY	Front door wire (Driver side) (To J01)	L35/YEL	Side air- bag sensor (L)
L08/N	Instrument panel harness (To G07)	L36/BLK	Pretensioner (Passenger side)
L09/BLU	Instrument panel harness (To G08)	L38/GRY	Wheel speed sensor (RL)
L10/N	Front door switch (Driver side)	L41/BLK	Side curtain air-bag (Passenger side)
L11/YEL	Side air-bag sensor (R)	L42/N	Rear end door wire (To O01)
L12/BLK	Pretensioner (Driver side)	L43/N	Rear combination lamp (L)
L14/N	Wheel speed sensor (RR)	L44/N	Keyless entry receiver
L15/GRY	Fuel pump wire (To R01)	L47/N	ACC socket #1
L18/BLK	Side curtain air-bag (Driver side)	L48/N	ACC socket #1
L19/N	Luggage compartment light wire (To L68)	L52/N	Licence plate light #1
L20/N	Rear combination lamp (R)	L53/N	Licence plate light #2
L22/N	J/C	L54/N	Rear end door switch
L23/N	J/C	L56/N	Seat belt switch
L25/YEL	Side air-bag inflator (R)	L57/N	Seat heater (Driver side)
L27/N	Instrument panel harness (To G72)	L59/N	Seat heater (Passenger side)
L28/N	Instrument panel harness (To G73)	L63/N	Rear speaker (R)
L29/YEL	Instrument panel harness (To G55)	L64/N	Rear speaker (L)

L: Luggage compartment light wire

No./Color	Connective position	No./Color	Connective position
L68/N	Floor harness (To L19)	L69/N	Luggage compartment light

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R03/N	Fuel pump sub gauge
R02/GRY or BLK	Fuel pump and gauge		

Rear

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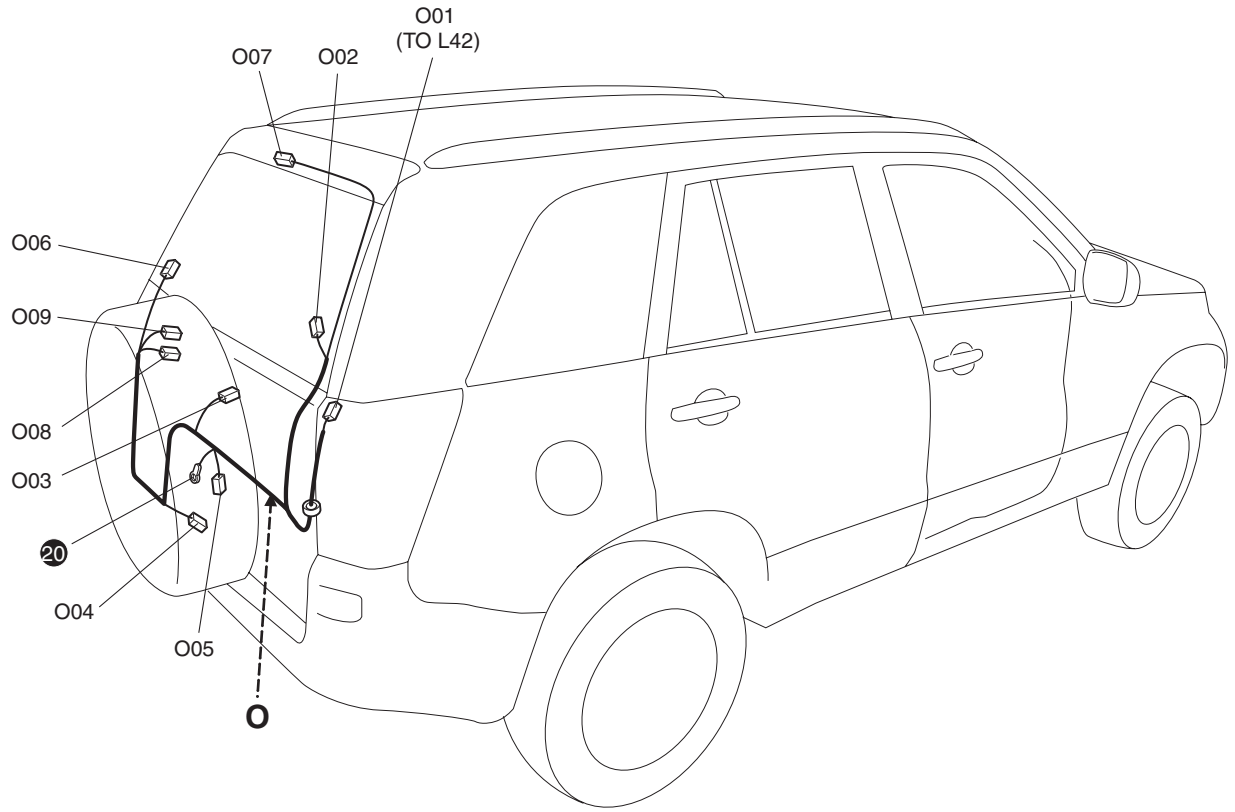
O: Rear end door harness



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O: Rear end door harness

No./Color	Connective position	No./Color	Connective position
O01/N	Floor harness (To L42)	O06/BLK	Rear defogger (–)
O02/BLK	Rear defogger (+)	O07/N	High mounted stop lamp
O03/N	Rear wiper motor	O08/N	Rear end antenna
O04/GRY	Rear end door lock motor	O09/N	Rear end door request switch
O05/N	Rear wiper relay		

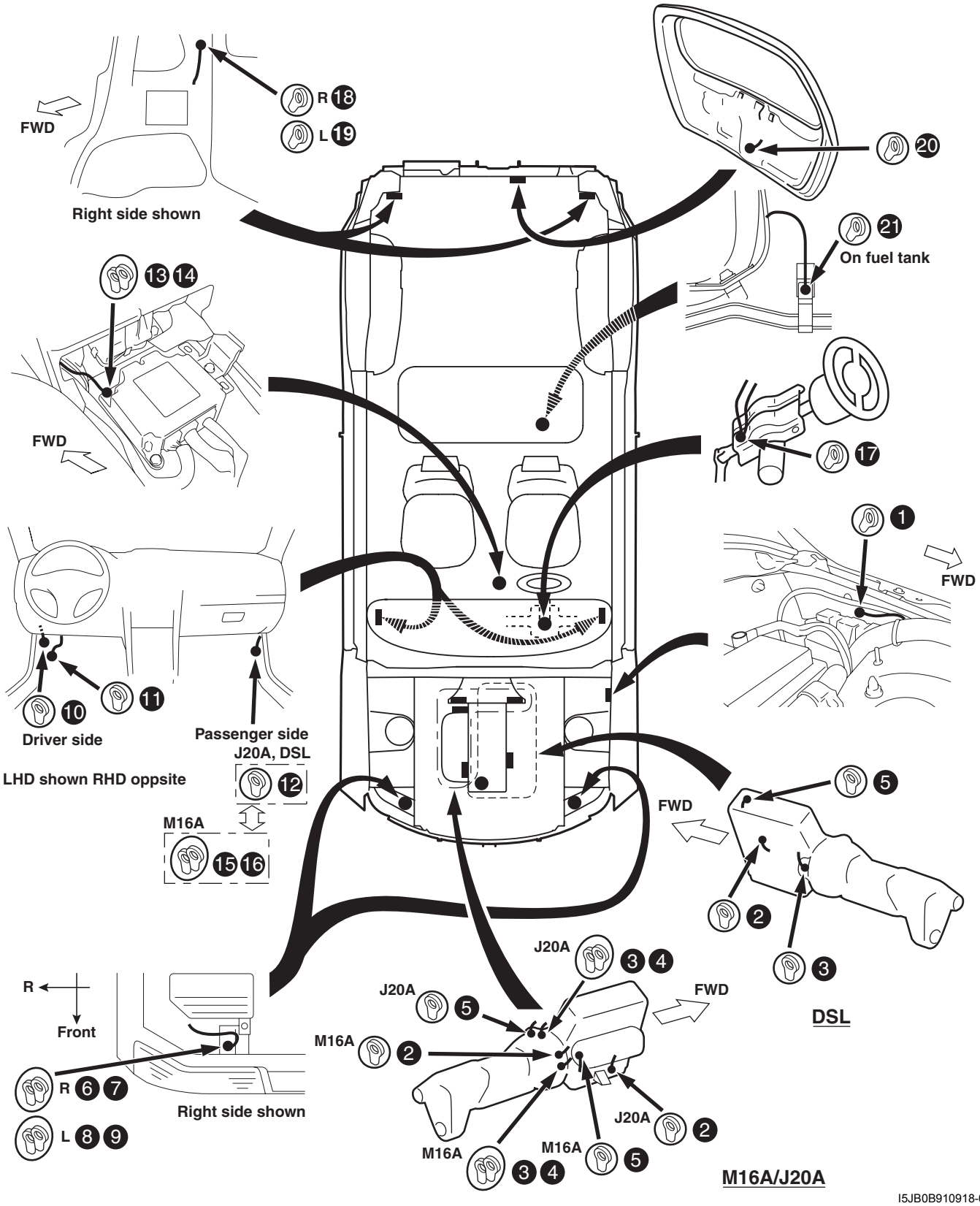
Ground Point

Ground (earth) Point

S5JB0B910C001

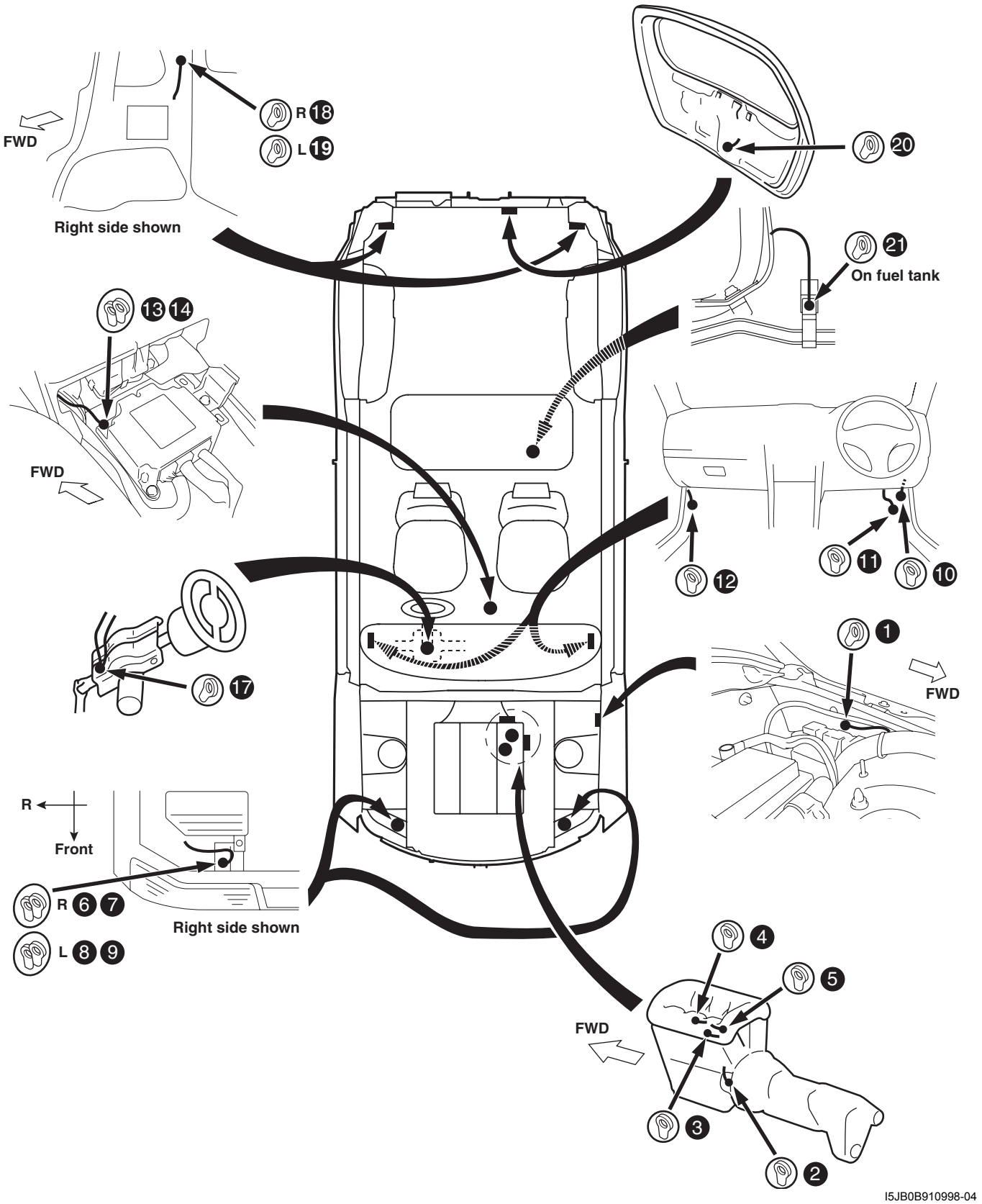
Refer to “Connector Layout Diagram: ”.

M16A, J20A, DSL



I5JB0B910918-09

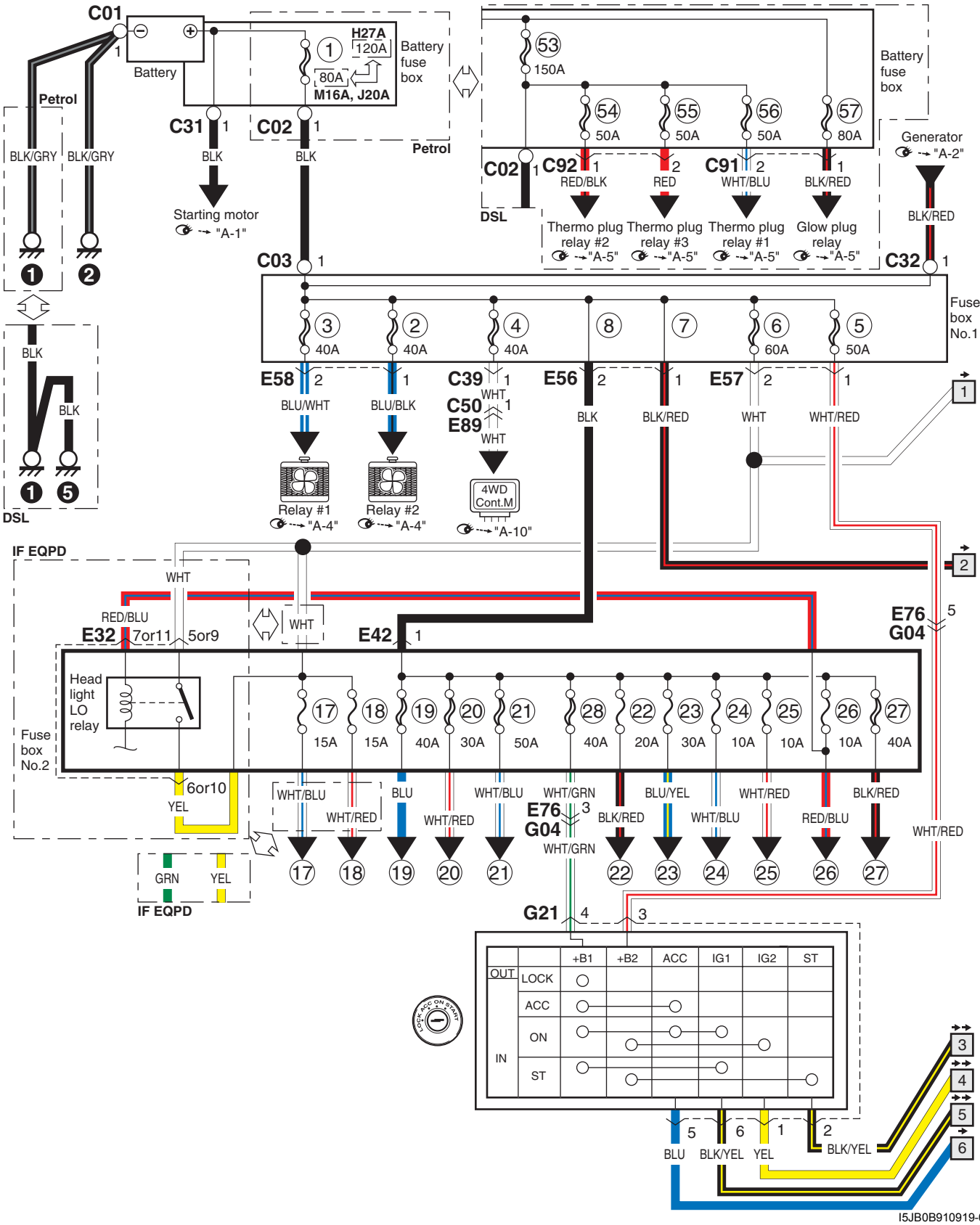
H27A


FWD
R 18
L 19
Right side shown
20
21
On fuel tank
13 14
FWD
12
11
10
17
1
FWD
R
Front
R 6 7
L 8 9
Right side shown
4
5
FWD
3
2
I5JB0B910998-04

Power Supply Diagram

Power Supply Diagram

S5JB0B910D001



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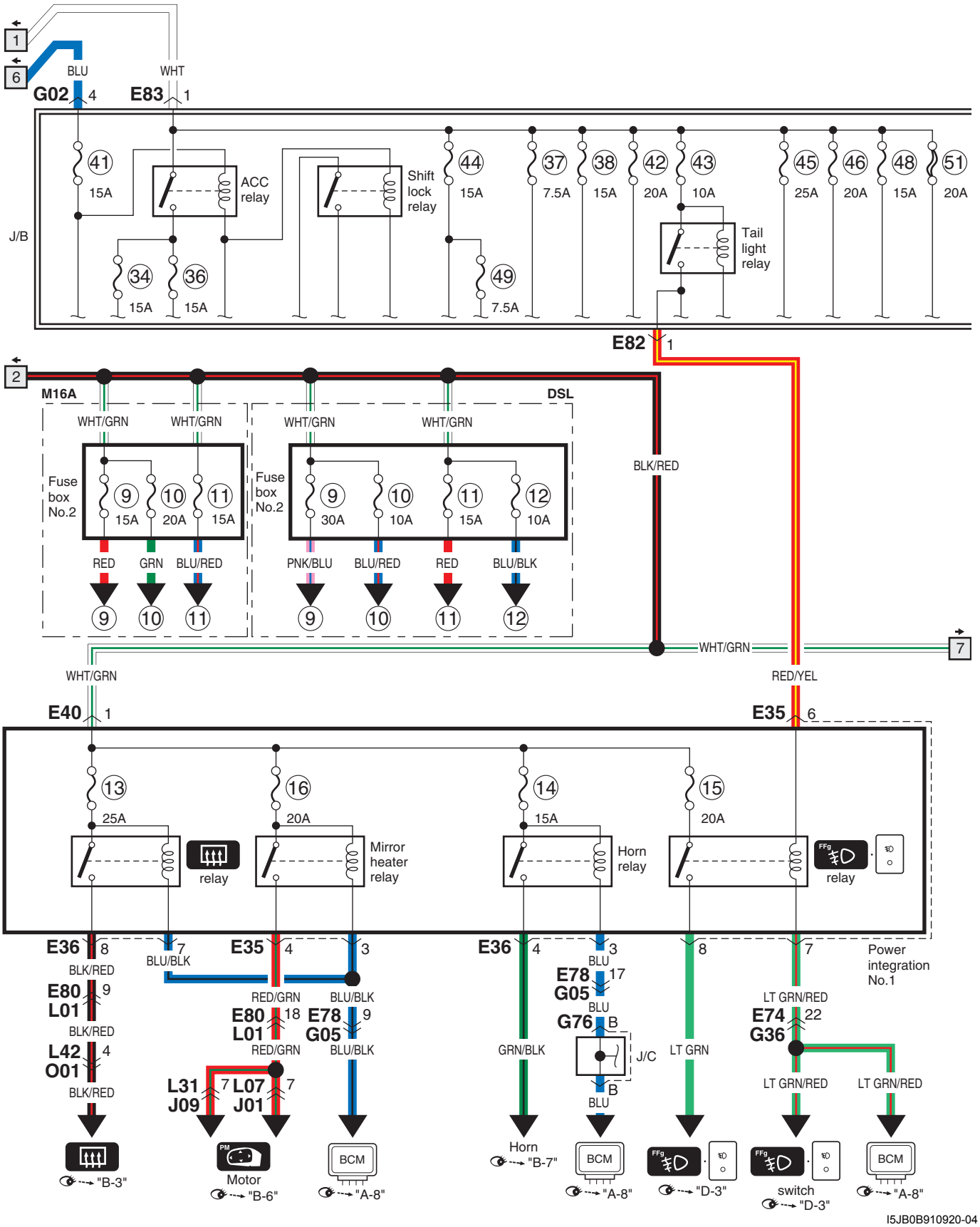
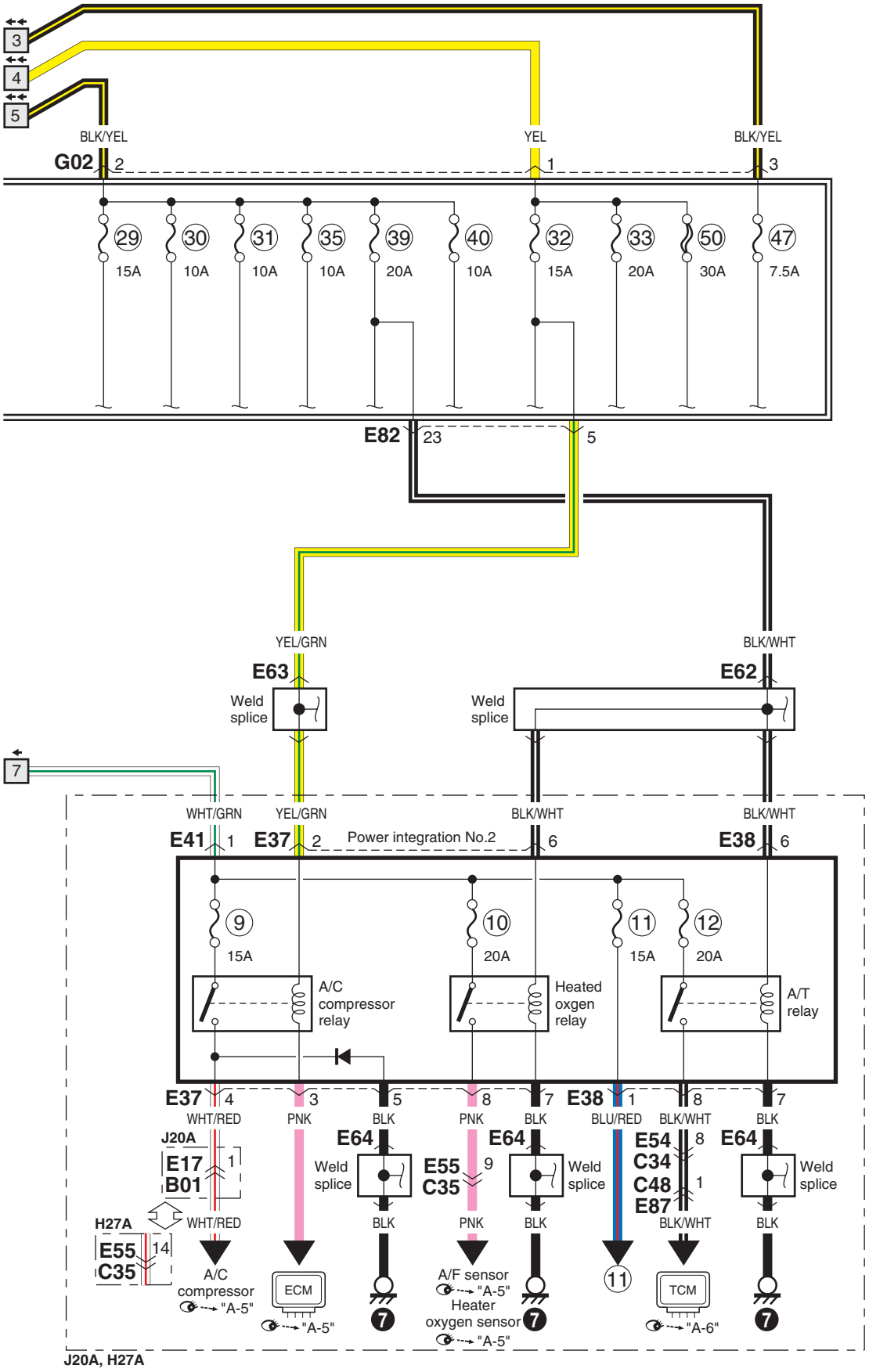

1
6
BLU
WHT
G02 4
E83 1
J/B
41 15A
ACC relay
Shift lock relay
44 15A
37 7.5A
38 15A
42 20A
43 10A
Tail light relay
45 25A
46 20A
48 15A
51 20A
34 15A
36 15A
49 7.5A
E82 1
2
M16A
DSL
WHT/GRN
Fuse box No.2
9 15A
10 20A
11 15A
9 30A
10 10A
11 15A
12 10A
RED
GRN
BLU/RED
PNK/BLU
BLU/BLK
BLK/RED
7
RED/YEL
E40 1
E35 6
13 25A
16 20A
14 15A
15 20A
relay
Mirror heater relay
Horn relay
E36 8
BLU/BLK
E35 4
3
E36 4
3
BLU
E78 17
G05
BLU
G76 B
J/C
8
7
Power integration No.1
E80 9
L01
L42 4
O01
RED/GRN
E80 18
L01
E78 9
G05
L31 7
J09
L07 7
J01
GRN/BLK
LT GRN
LT GRN/RED
E74 22
G36
"B-3"
Motor
"B-6"
BCM
"A-8"
Horn
"B-7"
"A-8"
"D-3"
switch
"D-3"
"A-8"
I5JB0B910920-04



I5JB0B910921-04

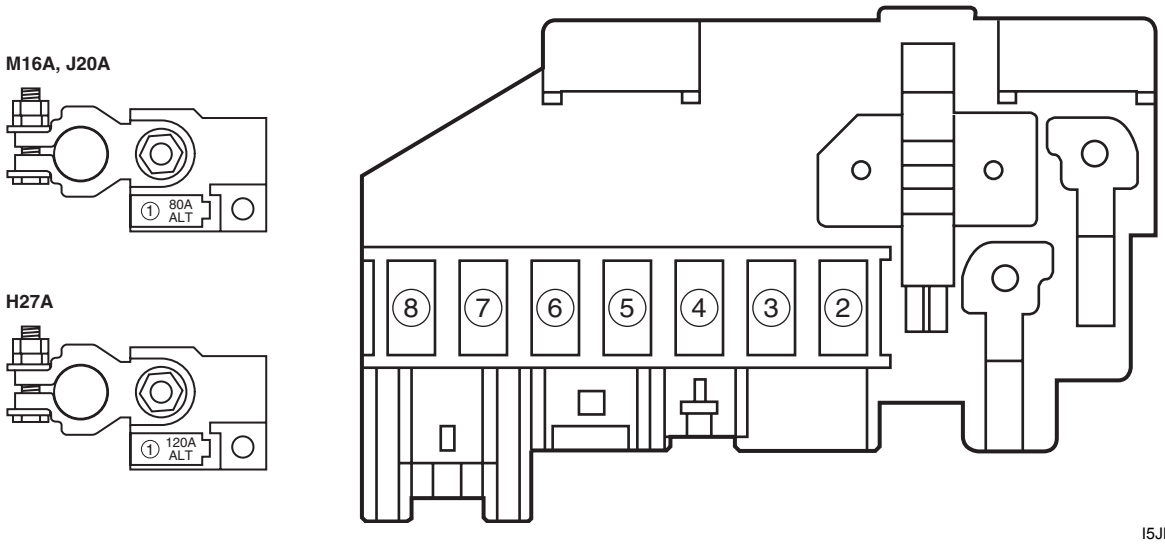
Fuses and the Protected Parts

S5JB0B910D002

The chart below describes what parts each fuse protects.

Fuses in Battery Fuse Box, Fuse Box No.1 (Petrol)

S5JB0B910D003

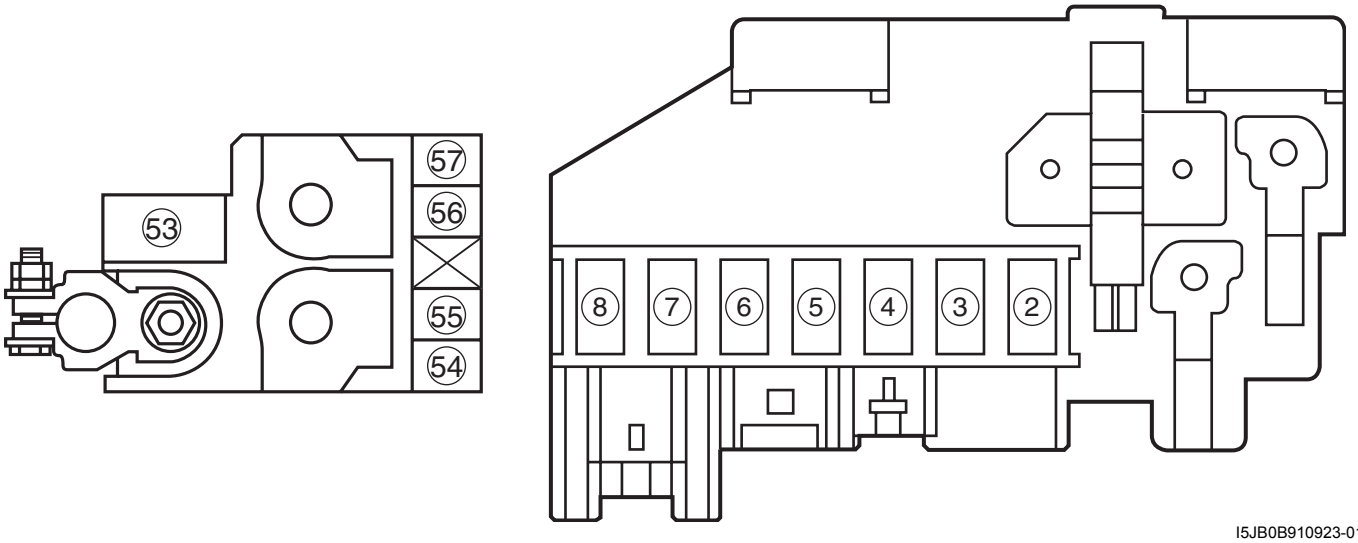


I5JB0B910922-01

No.	Fuse	Protected circuit
①	80 A (M16A, J20A) 120 A (H27A)	All electric circuit
		Battery
		Fuse box No.1
②	40 A	Radiator fan relay #2
③	40 A	Radiator fan relay #1
④	40 A	4WD control module
⑤	50 A	IG switch
⑥	60 A	Fuse box No.2
		Headlight LO relay
		J/B
⑦	NO FUSE	Power integration No.1
		Power integration No.2
		Fuse box No.2
⑧	NO FUSE	Fuse box No.2

Fuses in Battery Fuse Box, Fuse Box No.1 (DSL)

S5JB0B910D009

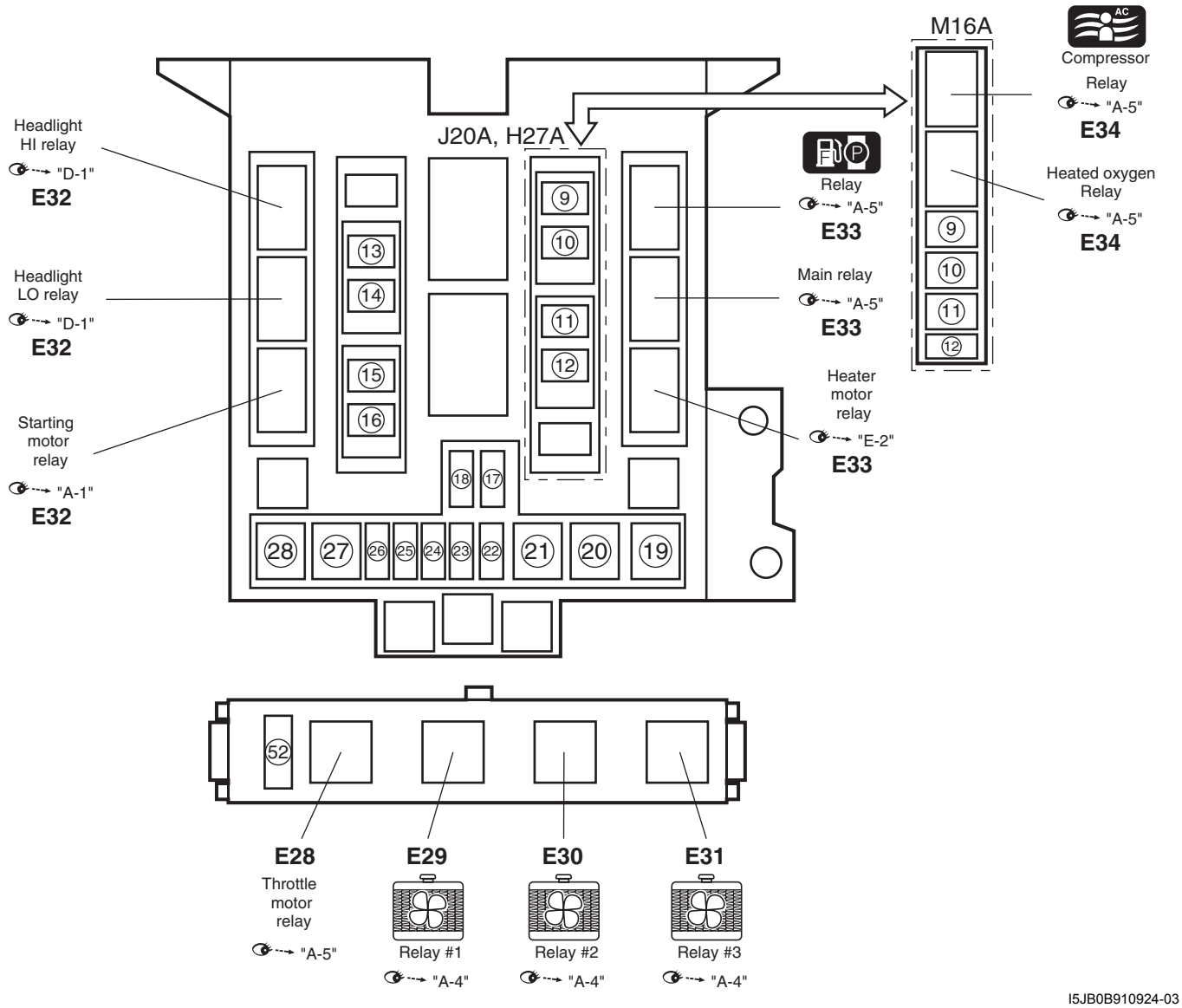


I5JB0B910923-01

No.	Fuse	Protected circuit
②	40 A	Radiator fan relay #2
③	40 A	Radiator fan relay #1
④	40 A	4WD control module
⑤	50 A	IG switch
⑥	60 A	Fuse box No.2
		Headlight LO relay
		J/B
⑦	NO FUSE	Power integration No.1
		Power integration No.2
		Fuse box No.2
⑧	NO FUSE	Fuse box No.2
⑬	150 A	All electric circuit
		Battery
		Fuse box No.1
⑭	50 A	Thermo plug relay #2
⑮	50 A	Thermo plug relay #3
⑯	50 A	Thermo plug relay #1
⑰	80 A	Glow plug relay

Fuse Box No.2 (In Power Integration No.1, Power Integration No.2), Relay Box (Petrol)

S5JB0B910D004



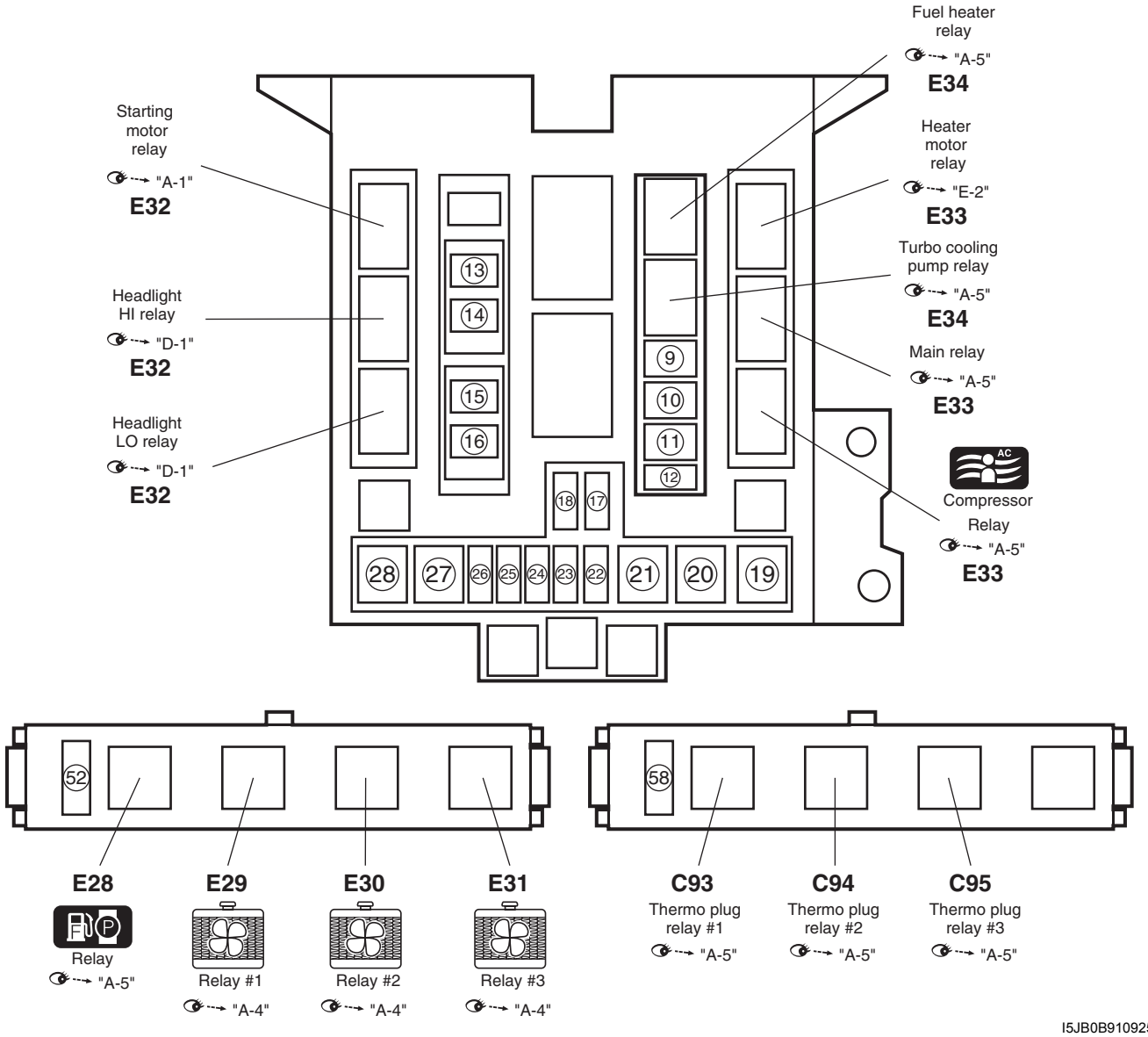
I5JB0B910924-03

No.	Fuse	Description on the cover	Protected circuit
⑨	15 A	CPRSR	A/C compressor relay
⑩	20 A	O2 HTR	Heated oxygen relay
⑪	15 A	THR MOT	Throttle motor relay
⑫	20 A	AT	A/T relay
⑬	25 A	RR DEF	Rear defogger relay
⑭	15 A	HORN	Horn relay
⑮	20 A	FR FOG	Front fog light relay
⑯	20 A	MRR HTR	Mirror heater relay
⑰	15 A	H/L LO L	Headlight LO (L)
			Headlight LO relay
			Headlight HID (L)
⑱	15 A	H/L LO R	Headlight LO (R)
			Headlight LO relay
			Headlight HID (R)
⑲	40 A	FR BLW	Heater motor relay
⑳	30 A	ABS2	ABS control module
			ESP® control module
㉑	50 A	ABS1	ABS control module
			ESP® control module
㉒	20 A	FI	Main relay

No.	Fuse	Description on the cover	Protected circuit
㉓	30 A	H/L CLNR	HLC motor
㉔	10 A	H/L L	Headlight (L)
			Headlight HI (L)
㉕	10 A	H/L R	Headlight (R)
			Headlight HI (R)
㉖	10 A	H/L	Headlight HI relay
			Headlight LO relay
㉗	40 A	ST	Starting motor relay
㉘	40 A	IGN	IG switch
㊷	15 A	DI	BLANK

Fuse Box No.2 (In Power Integration No.1, Power Integration No.2), Relay Box No.1, Relay Box No.2 (DSL)

S5JB0B910D010

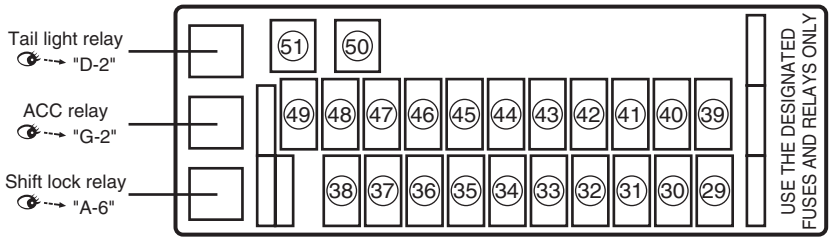


I5JB0B910925-01

No.	Fuse	Description on the cover	Protected circuit
⑨	30 A	F/HTR	Fuel heater relay
⑩	10 A	T/C P	Turbo cooling pump relay
⑪	15 A	A/C	A/C compressor relay
⑫	10 A	F/P	Fuel pump relay
⑬	25 A	RR DEF	Rear defogger relay
⑭	15 A	HORN	Horn relay
⑮	20 A	FR FOG	Front fog light relay
⑯	20 A	MRR HTR	Mirror heater relay
⑰	15 A	H/L LO L	Headlight LO (L)
			Headlight LO relay
			Headlight HID (L)
⑱	15 A	H/L LO R	Headlight LO (R)
			Headlight LO relay
			Headlight HID (R)
⑲	40 A	FR BLW	Heater motor relay
⑳	30 A	ABS2	ABS control module
			ESP® control module
㉑	50 A	ABS1	ABS control module
			ESP® control module
㉒	30 A	FI	Main relay
㉓	30 A	H/L CLNR	HLC motor
㉔	10 A	H/L L	Headlight (L)
			Headlight HI (L)
㉕	10 A	H/L R	Headlight (R)
			Headlight HI (R)
㉖	10 A	H/L	Headlight HI relay
			Headlight LO relay
㉗	40 A	ST	Starting motor relay
㉘	40 A	IGN	IG switch
㊷	15 A	DI	BLANK
㊽	BLANK	BLANK	BLANK

Fuse Box No.3 (In J/B)

S5JB0B910D005



I5JB0A910926-02

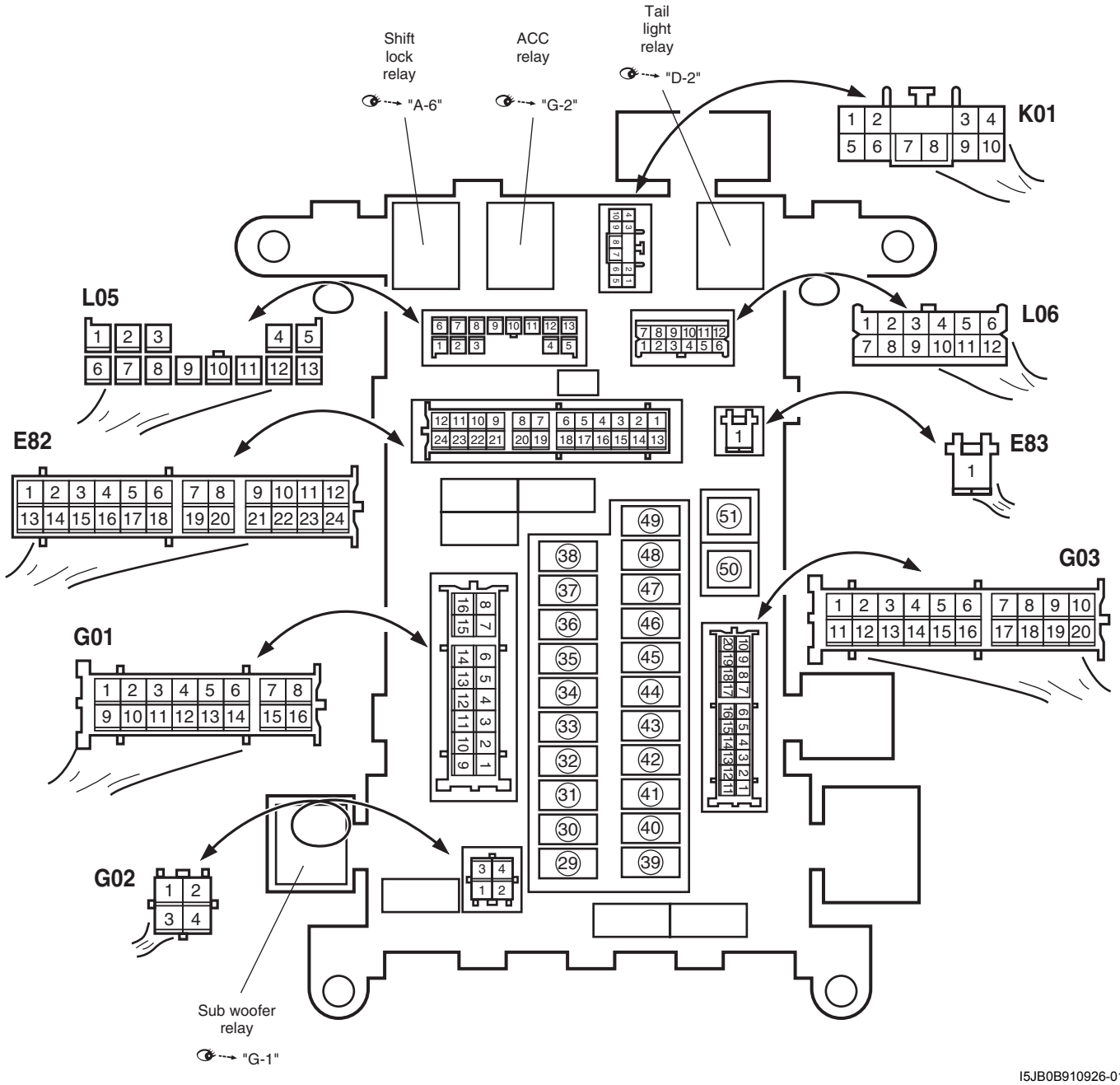
No.	Fuse	Description on the cover	Protected circuit
㉙	15 A	A/B	A/B SDM
㉚	10 A	ABS/ESP®	ABS control module
			ESP® control module
			Steering angle sensor
㉛	10 A	BACK	Smart ECM
			Back-up light switch
			Transmission range sensor
			Headlight beam leveling switch
			Headlight beam leveling actuator (L)
			Headlight beam leveling actuator (R)
			Auto leveling control module
㉜	15 A	IG2 SIG	Radiator fan relay #1
			Radiator fan relay #2
			Radiator fan relay #3
			A/C compressor relay
			Seat heater switch (Driver side)
			Seat heater switch (Passenger side)
			Sliding roof unit
			Heater motor relay
㉝	20 A	WIP	COMB switch
			Windshield washer motor
			Windshield wiper motor
			Rear washer motor
			Rear wiper motor
			Rear wiper relay
			HLC control module
㉞	15 A	ACC2	Cigar lighter (ACC Socket #3)
㉟	10 A	CRUISE	Brake light switch
			Steering switch
㊱	15 A	ACC3	ACC socket #1
			ACC socket #2
㊲	7.5 A	RR FOG	COMB switch (Rear fog light)
㊳	15 A	STOP	Brake light switch
㊴	20 A	IG COIL	Generator
			IG coil #1
			IG coil #2
			IG coil #3
			IG coil #4
			IG coil #5
			IG coil #6
			Noise filter
			ECM
			Fuel pump relay
			Heated oxygen relay
			A/T relay
			ICM
			4WD control module

No.	Fuse	Description on the cover	Protected circuit
㊵	10 A	METER	BCM
			COMB meter
			Turn signal relay
			Auto A/C unit
㊶	15 A	ACC	ACC relay
			BCM
			Power mirror switch
			Smart ECM
			Audio
			Multi information display
			Sub woofer relay
㊷	20 A	D/L	BCM
㊸	10 A	TAIL	Tail light relay
㊹	15 A	DOME	Audio
			Auto A/C unit
			ECM
			DLC
			TCM
			BCM
			Main switch
			Smart ECM
			Multi information display
			COMB meter
			Interior light
			Rear interior light
			Console lamp
			Luggage compartment light
			Curtain lamp (Driver side)
			Curtain lamp (Passenger side)
			Steering angle sensor
㊺	25 A	S/R	Sliding roof unit
㊻	20 A	RR BLW	BLANK
㊼	7.5 A	ST SIG	Starting motor relay
㊽	15 A	HAZ	Turn signal relay
㊾	7.5 A	VANITY	Vanity lamp (Driver side)
			Vanity lamp (passenger side)
㊿	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)
(51)	20 A	P/W T	BLANK

Junction Block (J/B) Connector / Fuse Layout

S5JB0B910D006

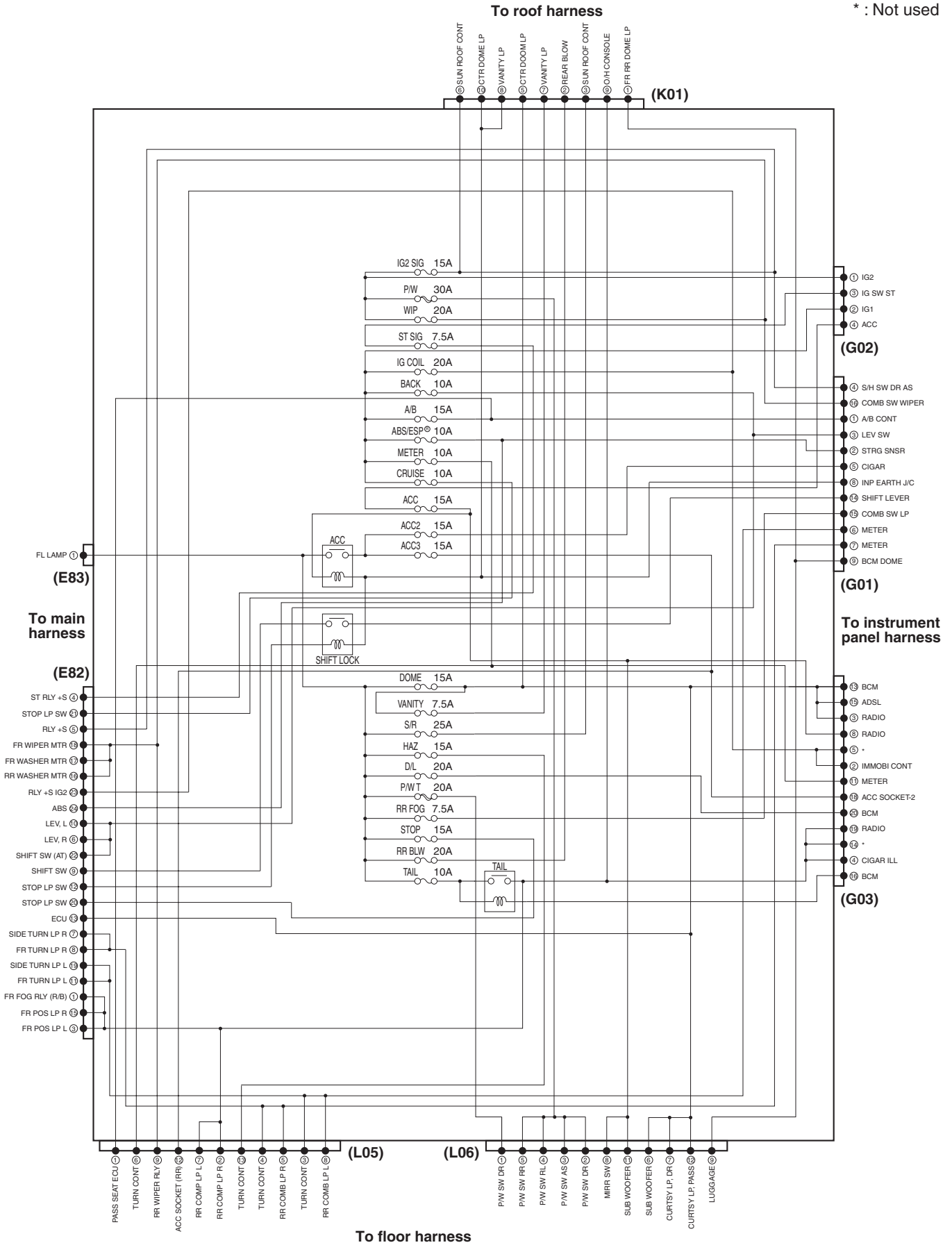
Fuse side



I5JB0B910926-01

Junction Block Inner Circuit (Overview)

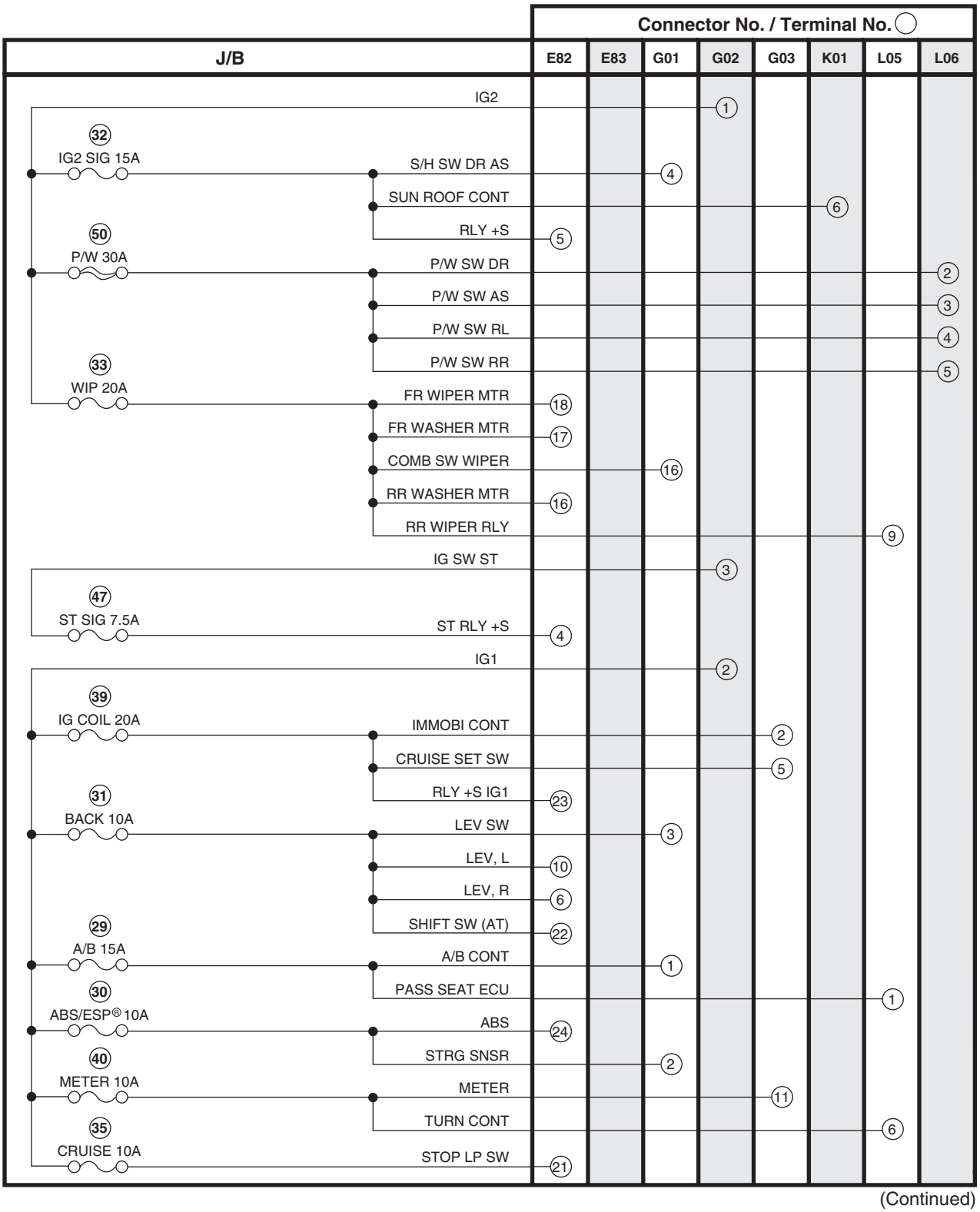
S5JB0B910D007



I5JB0B910994-02

Junction Block Inner Circuit (Detail)

S5JB0B910D008



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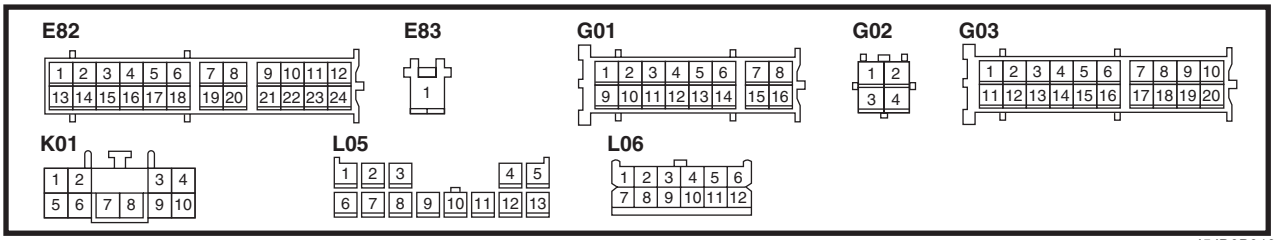

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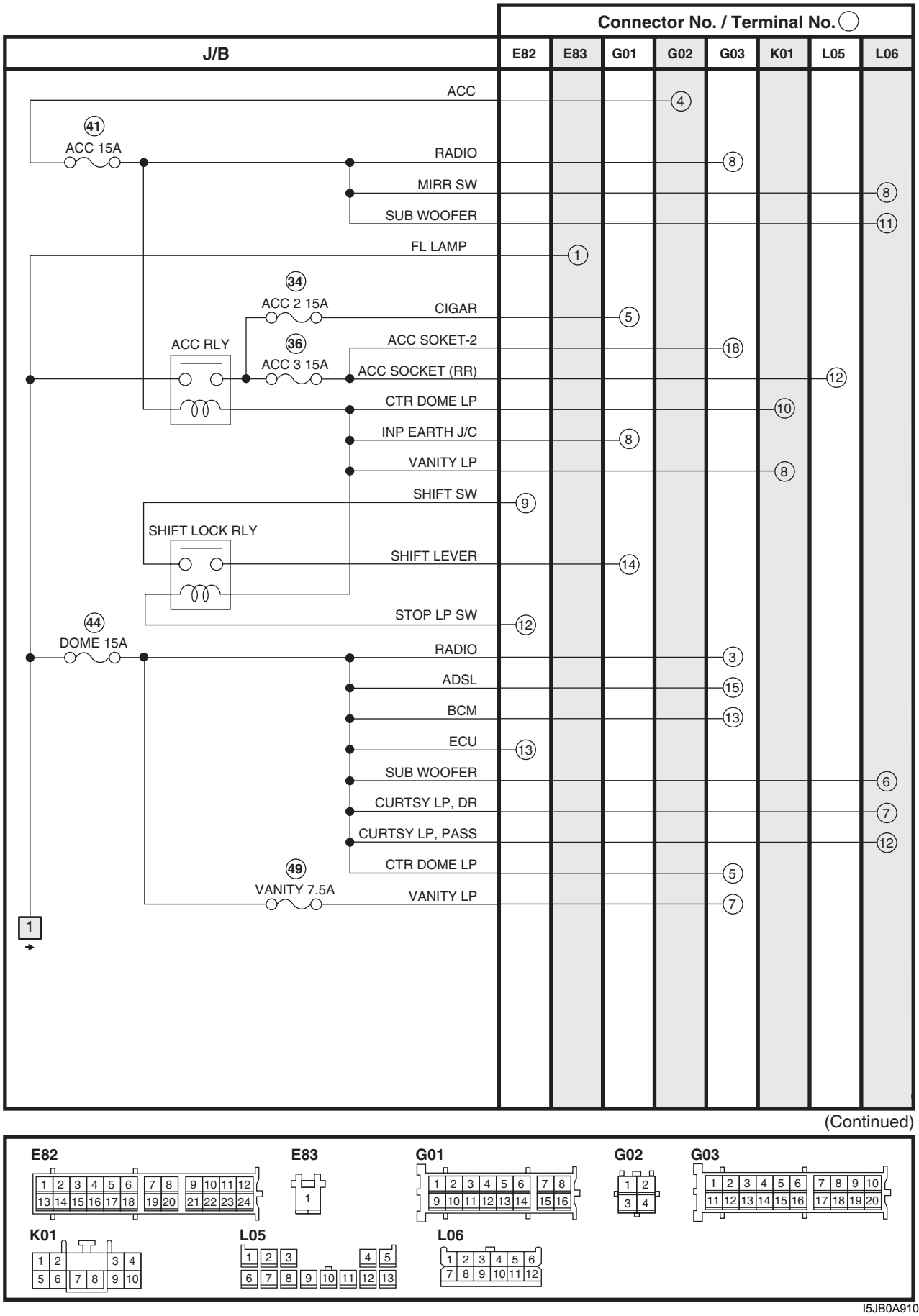
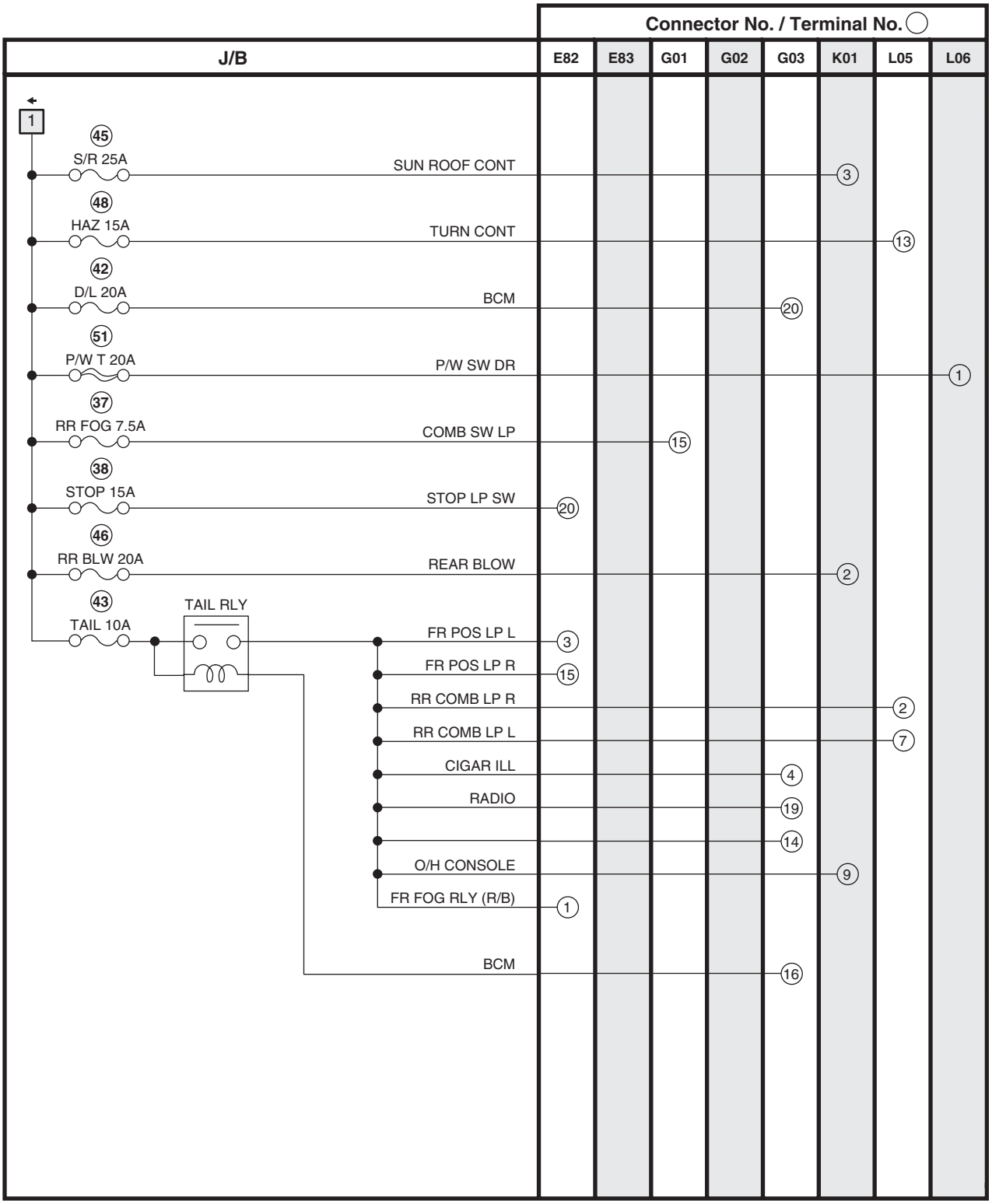

Connector No. / Terminal No.
J/B
E82
E83
G01
G02
G03
K01
L05
L06
ACC
41
ACC 15A
RADIO
MIRR SW
SUB WOOFER
FL LAMP
34
ACC 2 15A
CIGAR
ACC RLY
36
ACC 3 15A
ACC SOKET-2
ACC SOCKET (RR)
CTR DOME LP
INP EARTH J/C
VANITY LP
SHIFT SW
SHIFT LOCK RLY
SHIFT LEVER
STOP LP SW
44
DOME 15A
RADIO
ADSL
BCM
ECU
SUB WOOFER
CURTSY LP, DR
CURTSY LP, PASS
CTR DOME LP
49
VANITY 7.5A
VANITY LP
1
(Continued)
E82
E83
G01
G02
G03
K01
L05
L06
I5JB0A910993-02



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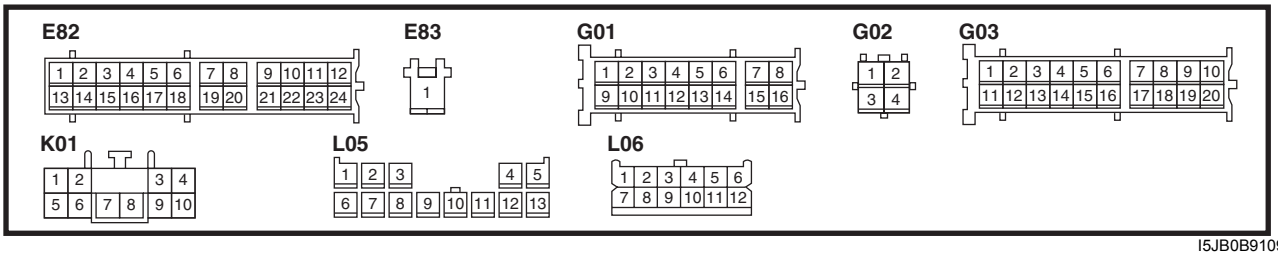

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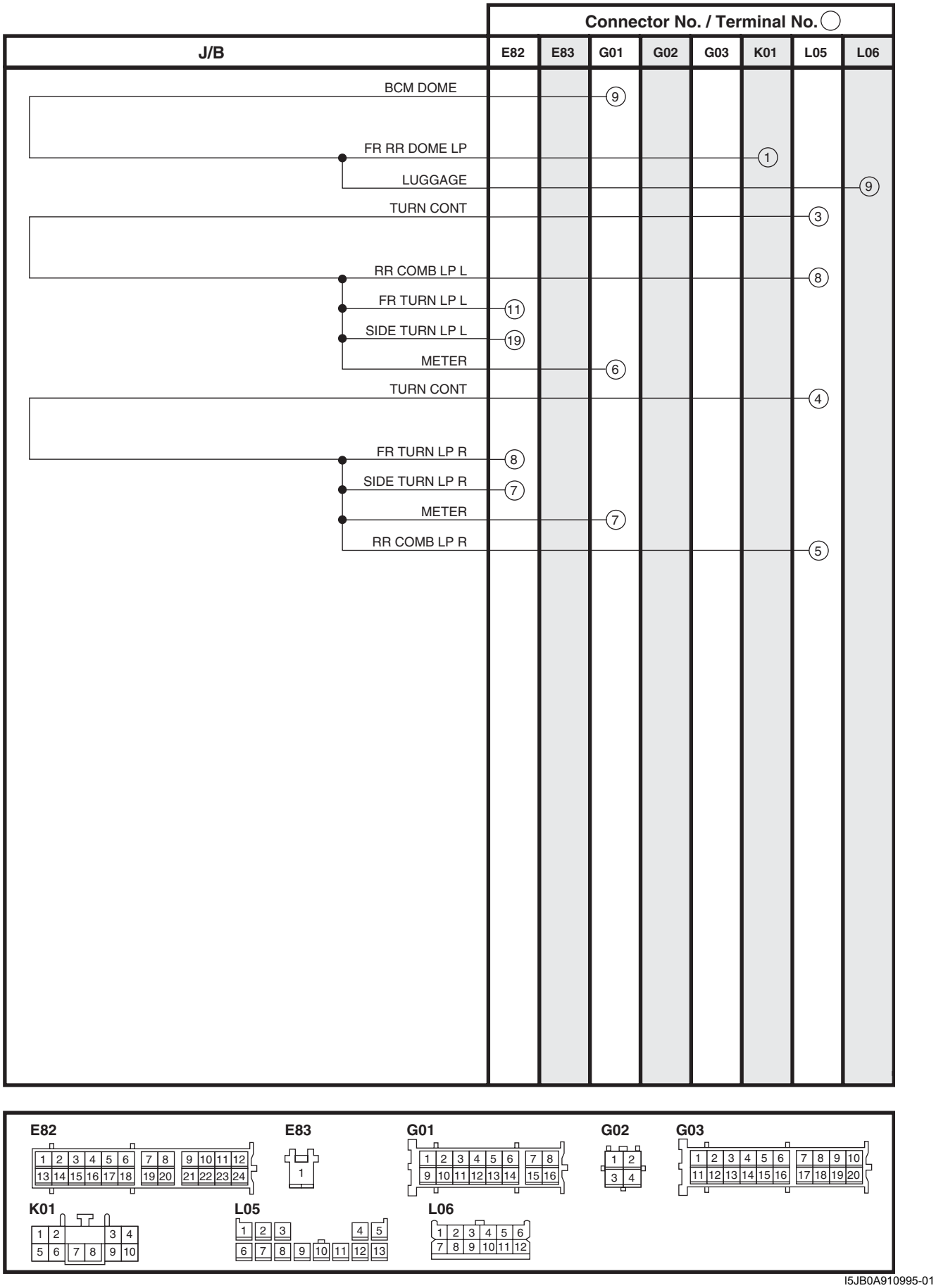

I5JB0A910995-01

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System Circuit Diagram

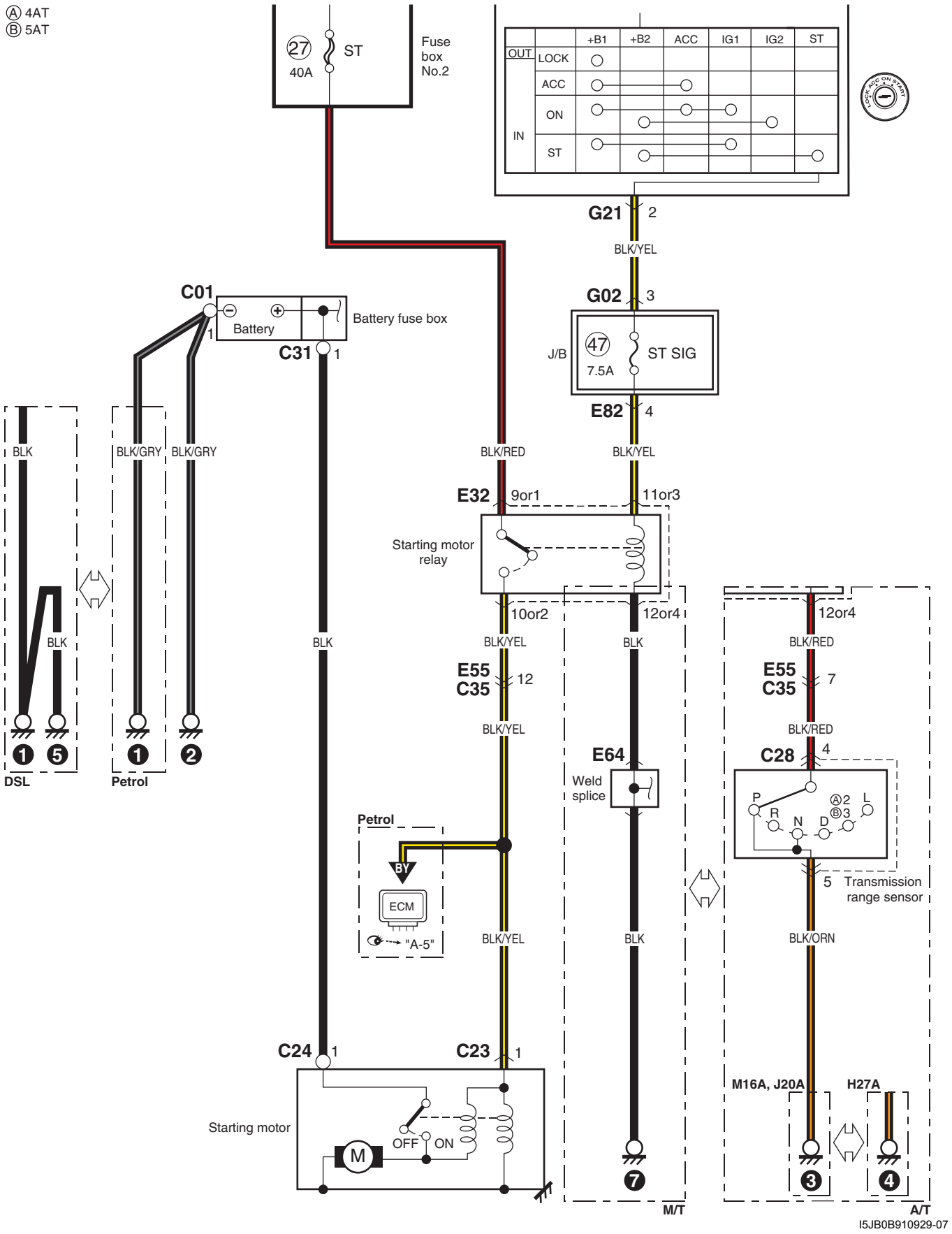
System Circuit Diagram

S5JB0B910E001

Refer to “A-1 Cranking System Circuit Diagram: ”.
Refer to “A-2 Charging System Circuit Diagram: ”.
Refer to “A-3 Ignition System Circuit Diagram (M16A): ”.
Refer to “A-3 Ignition System Circuit Diagram (J20A): ”.
Refer to “A-3 Ignition System Circuit Diagram (H27A): ”.
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 (M16A): ”.
Refer to “A-5 Engine and A/C Control System Circuit Diagram (J20A): ”.
Refer to “A-5 Engine and A/C Control System Circuit Diagram (H27A): ”.
Refer to “A-5 Engine and A/C Control System Circuit Diagram (DSL): ”.
Refer to “A-6 A/T Control System Circuit Diagram: ”.
Refer to “A-7 Immobilizer System Circuit Diagram: ”.
Refer to “A-8 Body Control System Circuit Diagram: ”.
Refer to “A-10 4WD Control System Circuit Diagram: ”
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 “B-10 Sliding Roof Circuit Diagram: ”
Refer to “B-11 Headlight Cleaner Circuit Diagram: ”
Refer to “C-1 Combination Meter Circuit Diagram: ”.
Refer to “D-1 Headlight System Circuit Diagram (One bulb type): ”.
Refer to “D-1 Headlight System Circuit Diagram (With Projector light): ”.
Refer to “D-1 Headlight System Circuit Diagram (With Discharge bulb): ”.
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 (Manual Leveling): ”
Refer to “D-9 Headlight Beam Leveling System Circuit Diagram (Auto Leveling): ”
Refer to “D-10 Rear Fog Light Circuit Diagram: ”
Refer to “E-2 Auto A/C System Circuit Diagram: ”
Refer to “F-1 Air-Bag System Circuit Diagram (4ch): ”.
Refer to “F-1 Air-Bag System Circuit Diagram (8ch): ”.
Refer to “F-2 Anti-Lock Brake System Circuit Diagram: ”.
Refer to “F-3 Electronic Stability Program 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: ”

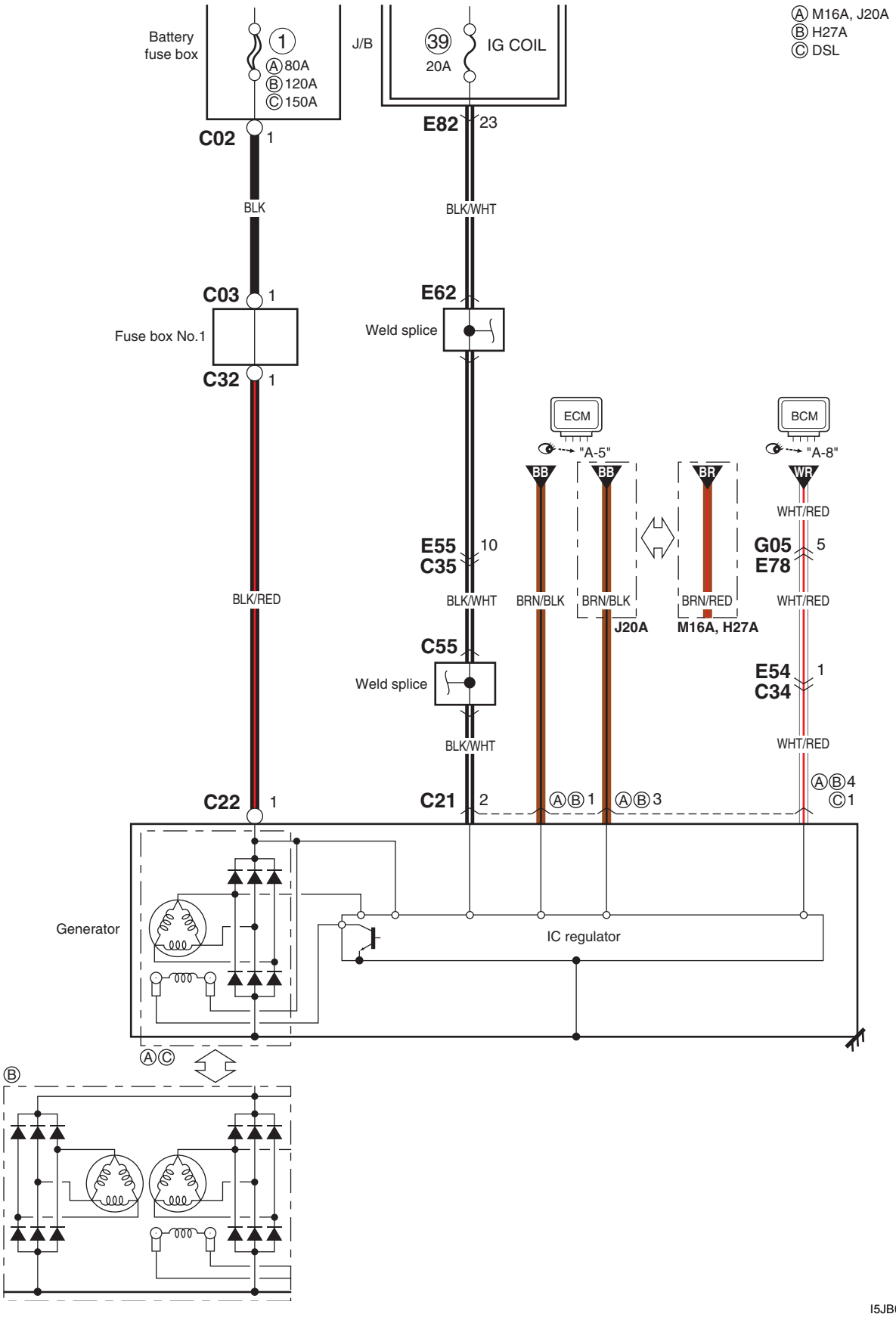
A-1 Cranking System Circuit Diagram

S5JB0B910E002



A-2 Charging System Circuit Diagram

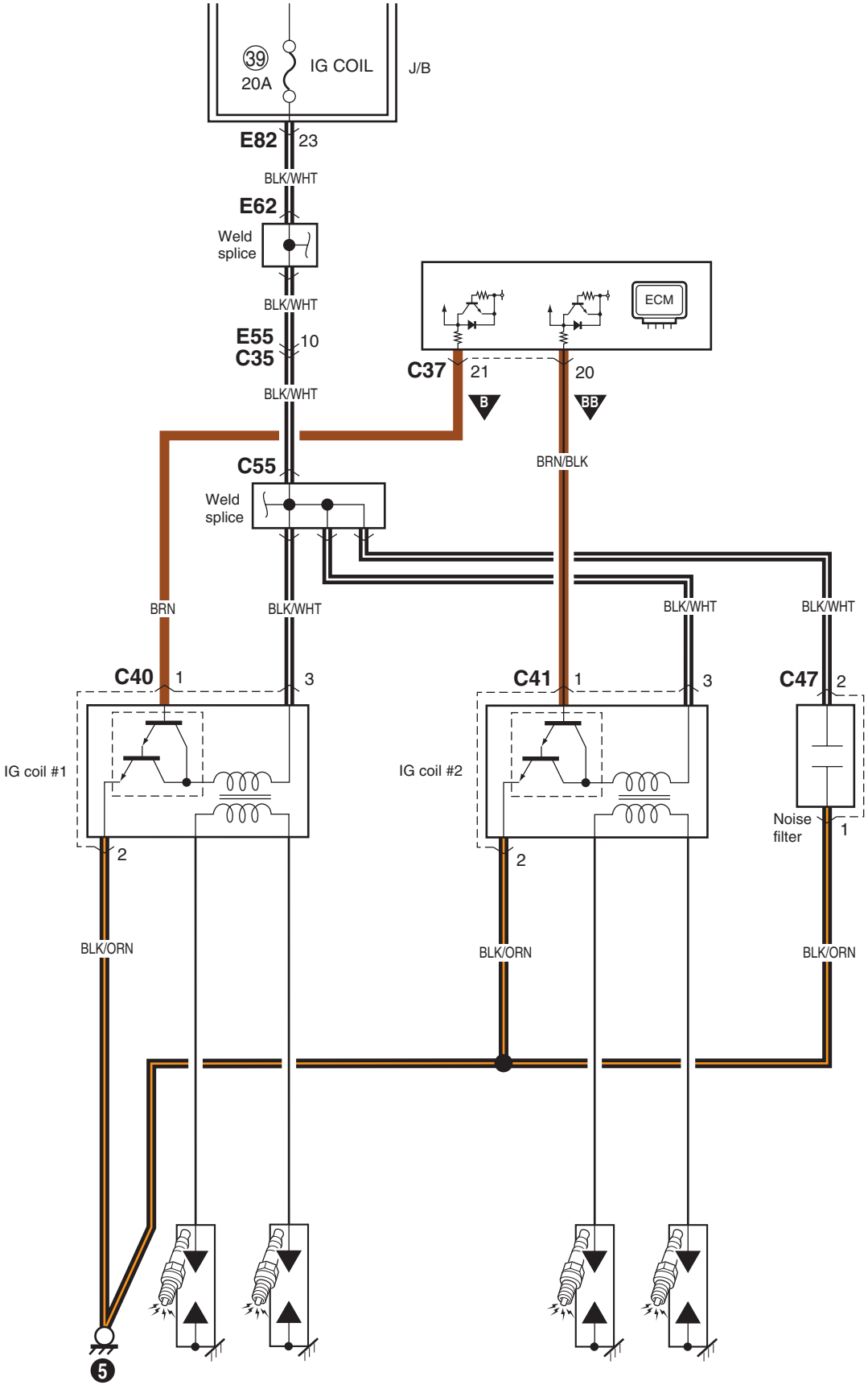
S5JB0B910E003



I5JB0B910930-04

A-3 Ignition System Circuit Diagram (M16A)

S5JB0B910E004



I5JB0A910931-02

A-3 Ignition System Circuit Diagram (J20A)

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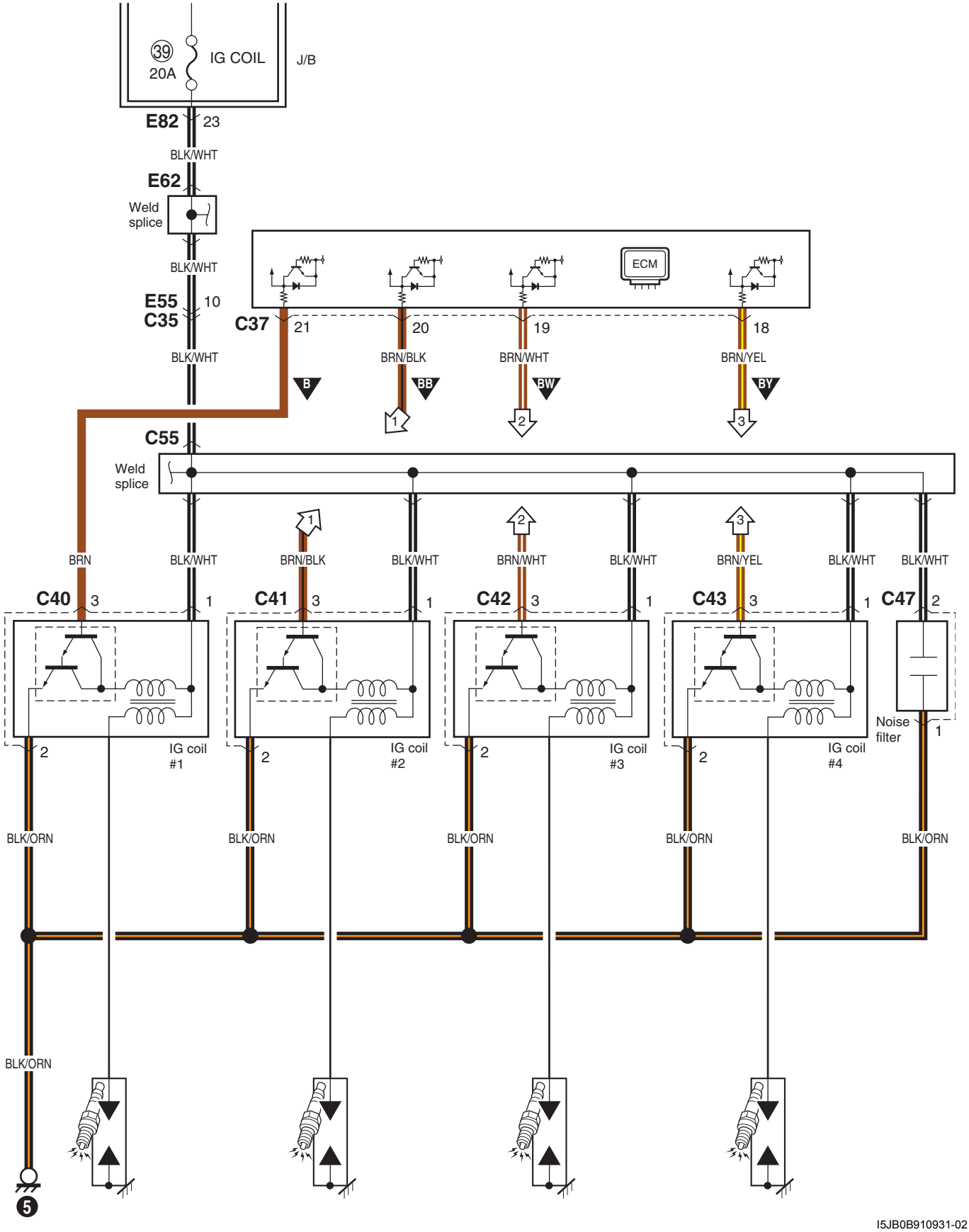

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A-3 Ignition System Circuit Diagram (H27A)

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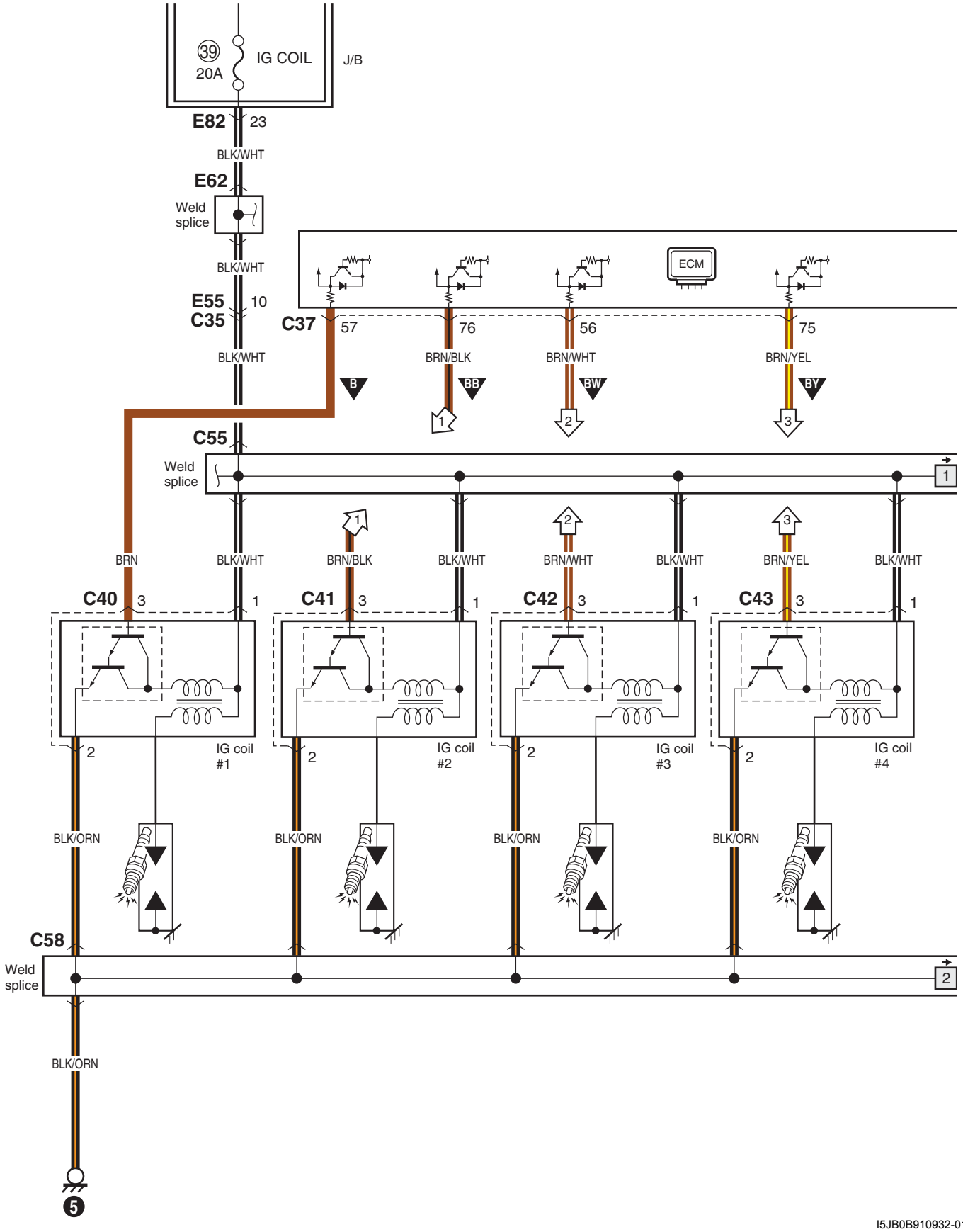

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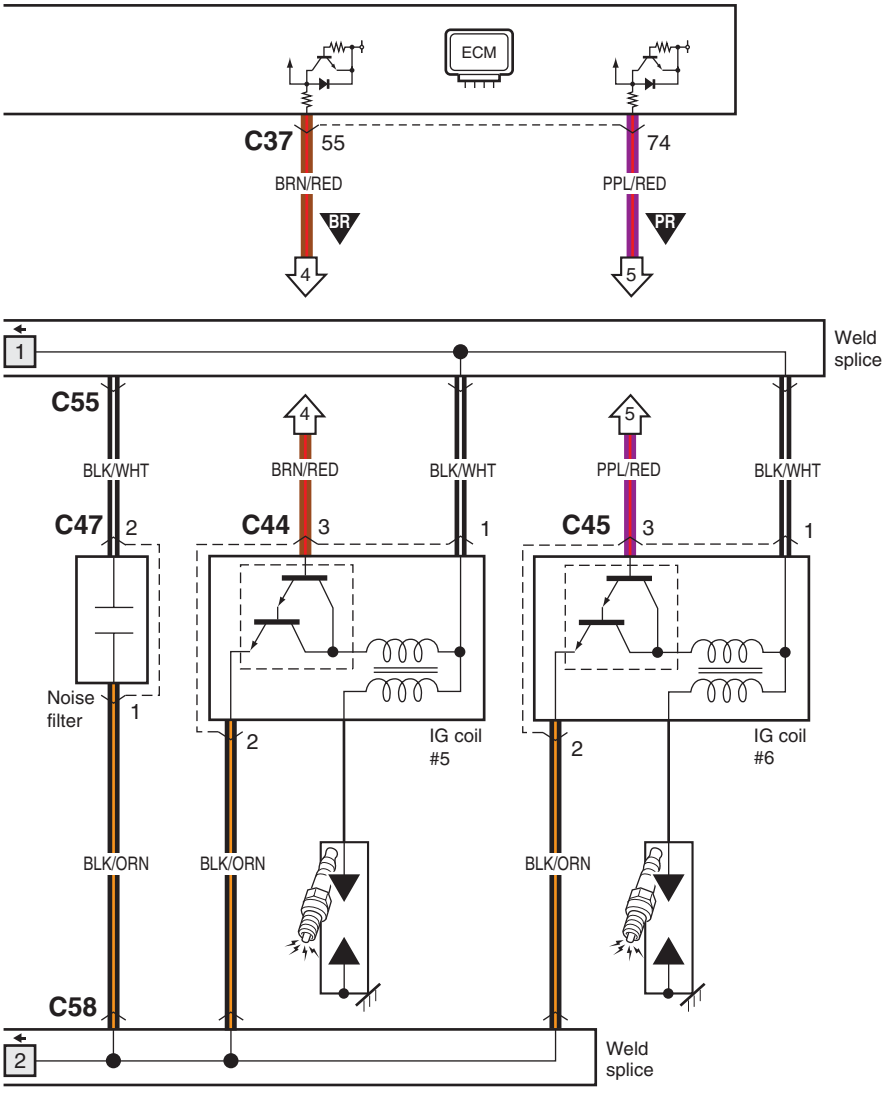
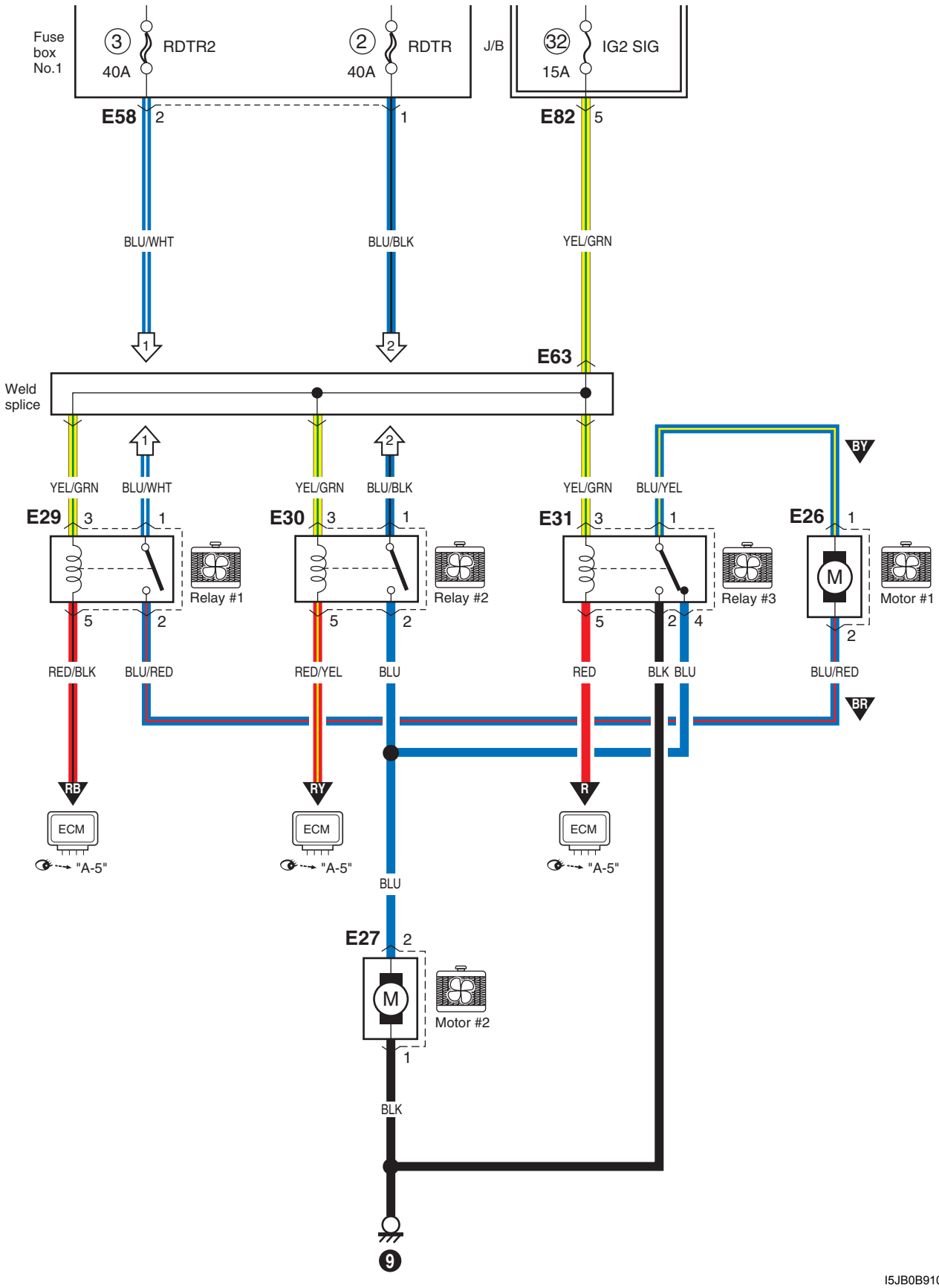


I5JB0B910933-02

A-4 Cooling System Circuit Diagram (Petrol)

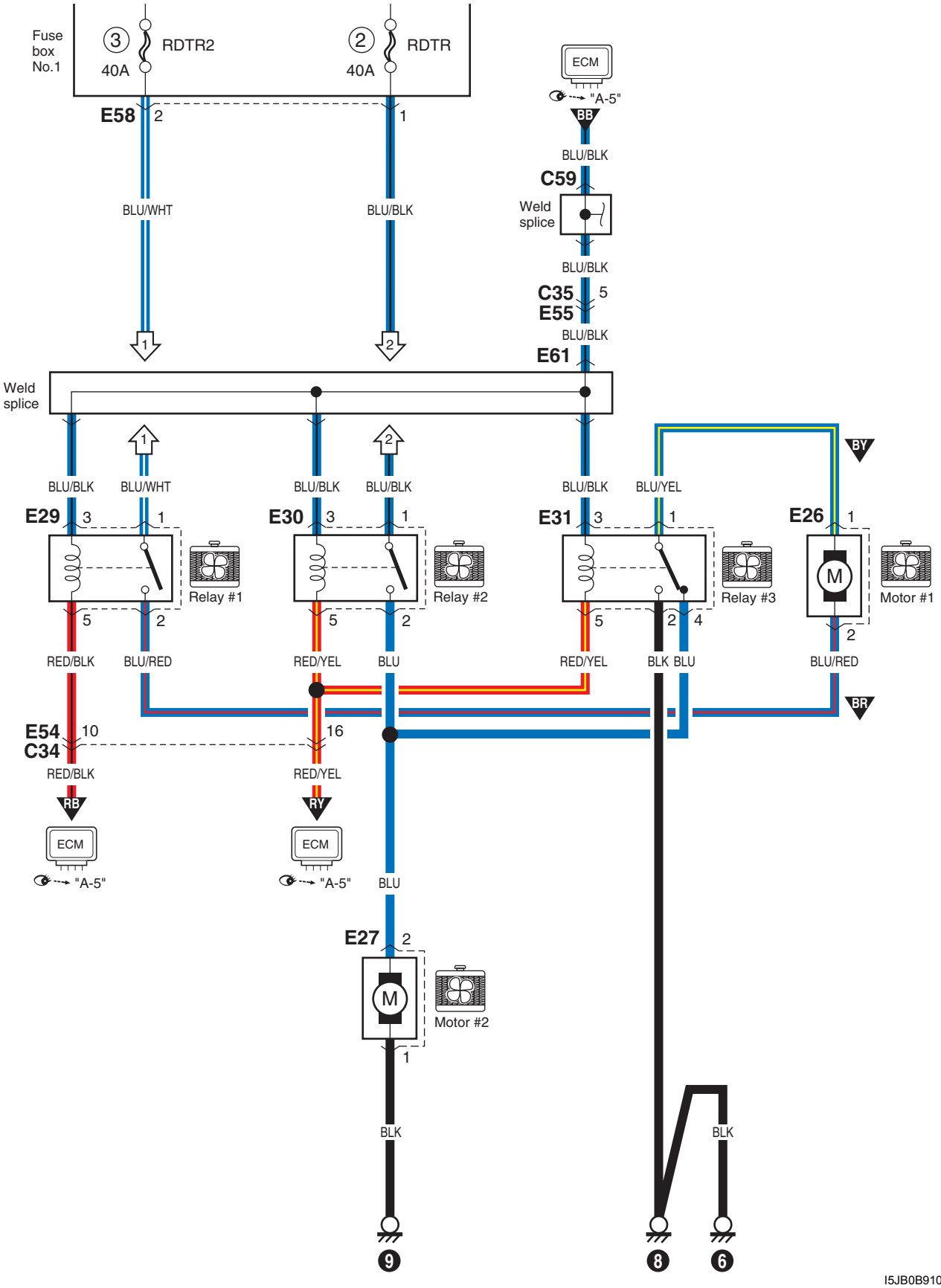
S5JB0B910E006



I5JB0B910934-01

A-4 Cooling System Circuit Diagram (DSL)

S5JB0B910E046



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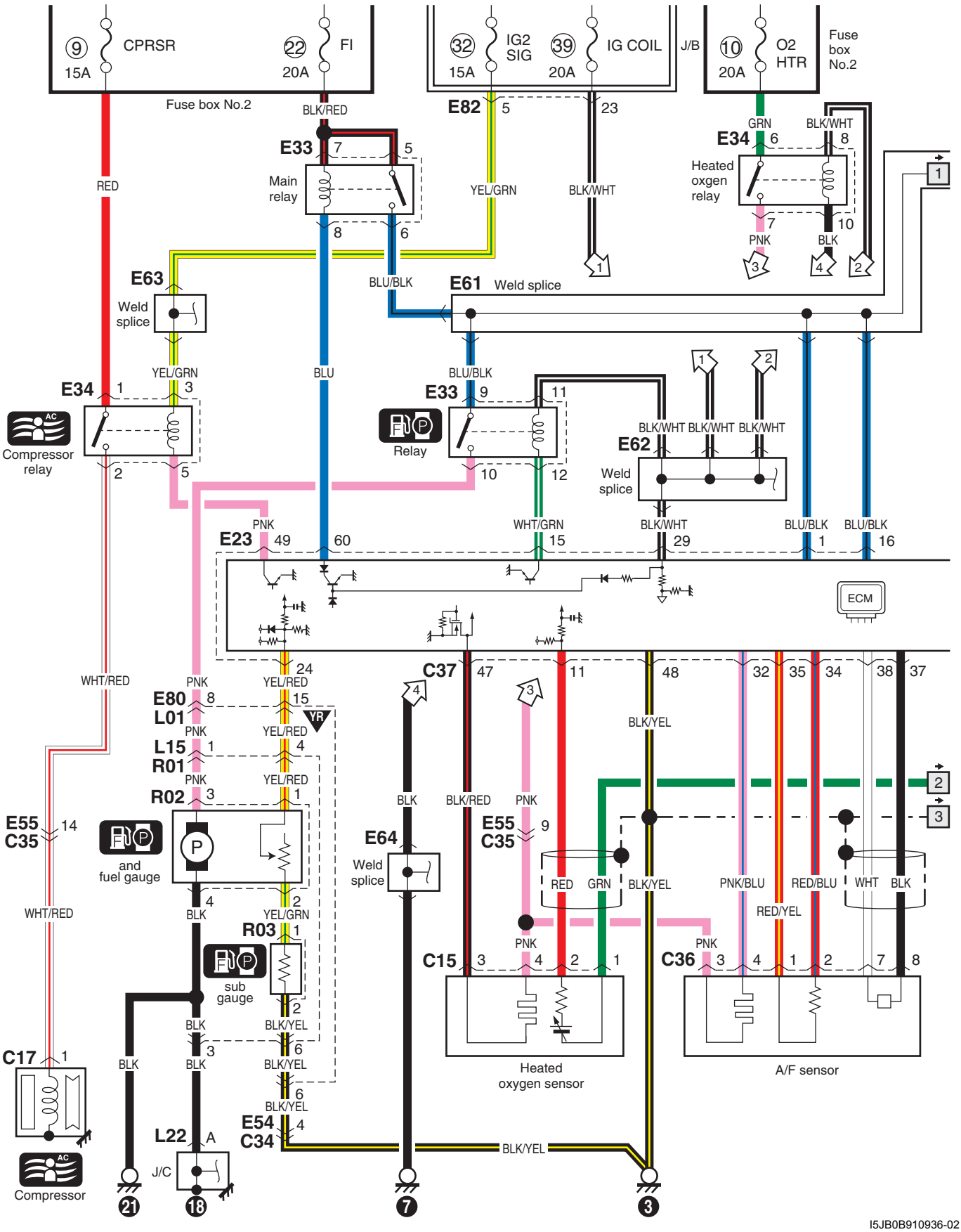
A-5 Engine and A/C Control System Circuit Diagram (M16A)

S5JB0B910E007



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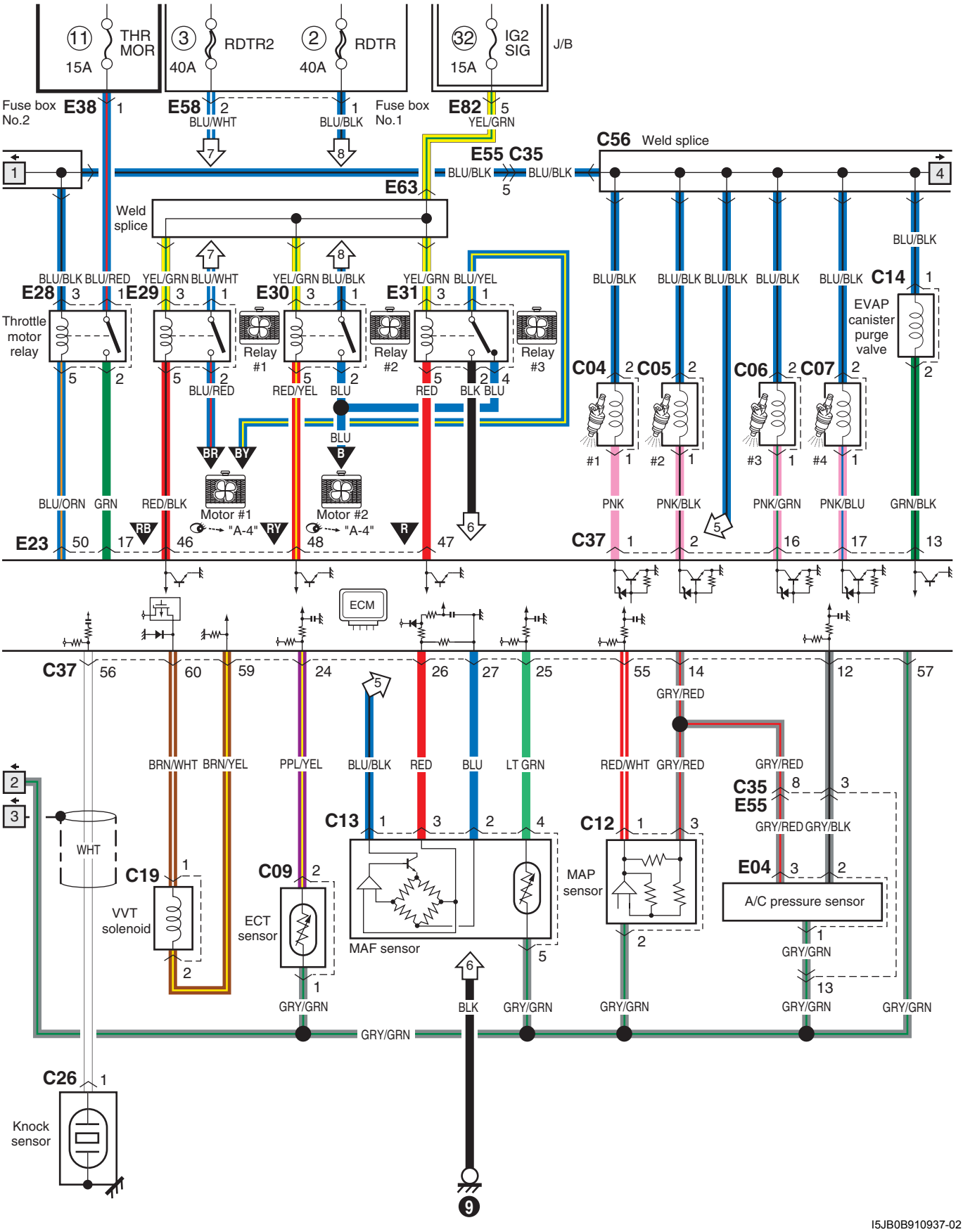

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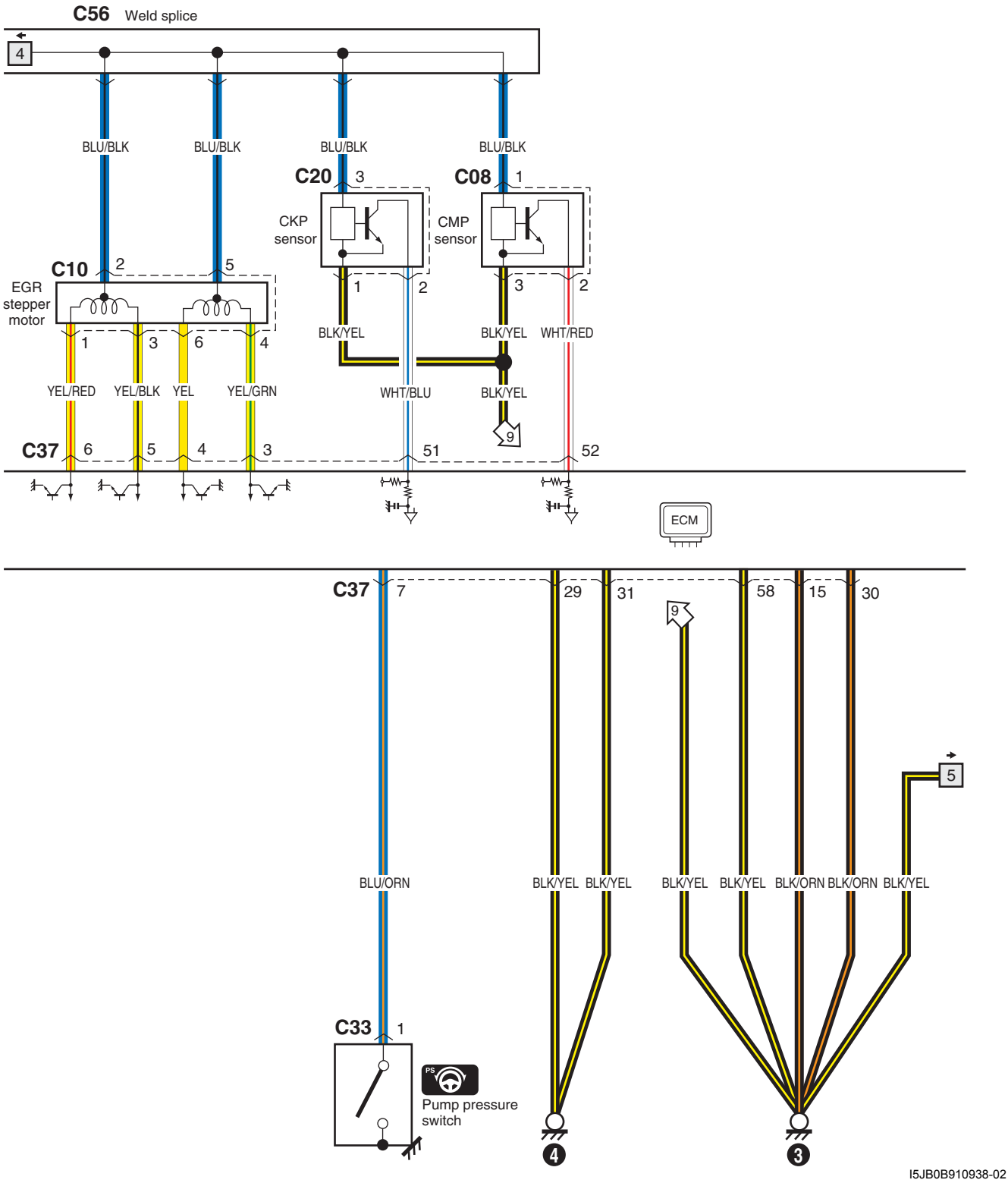

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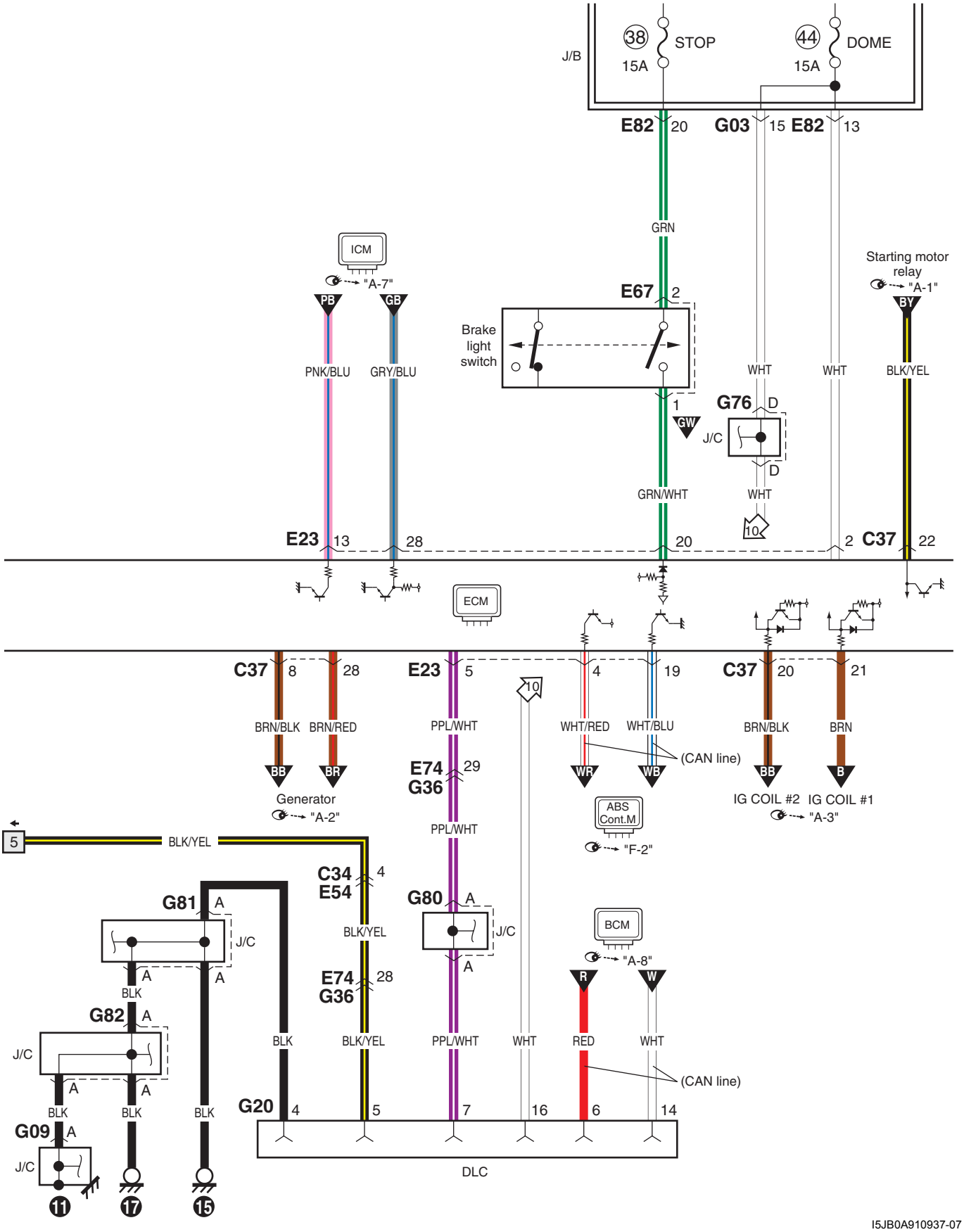

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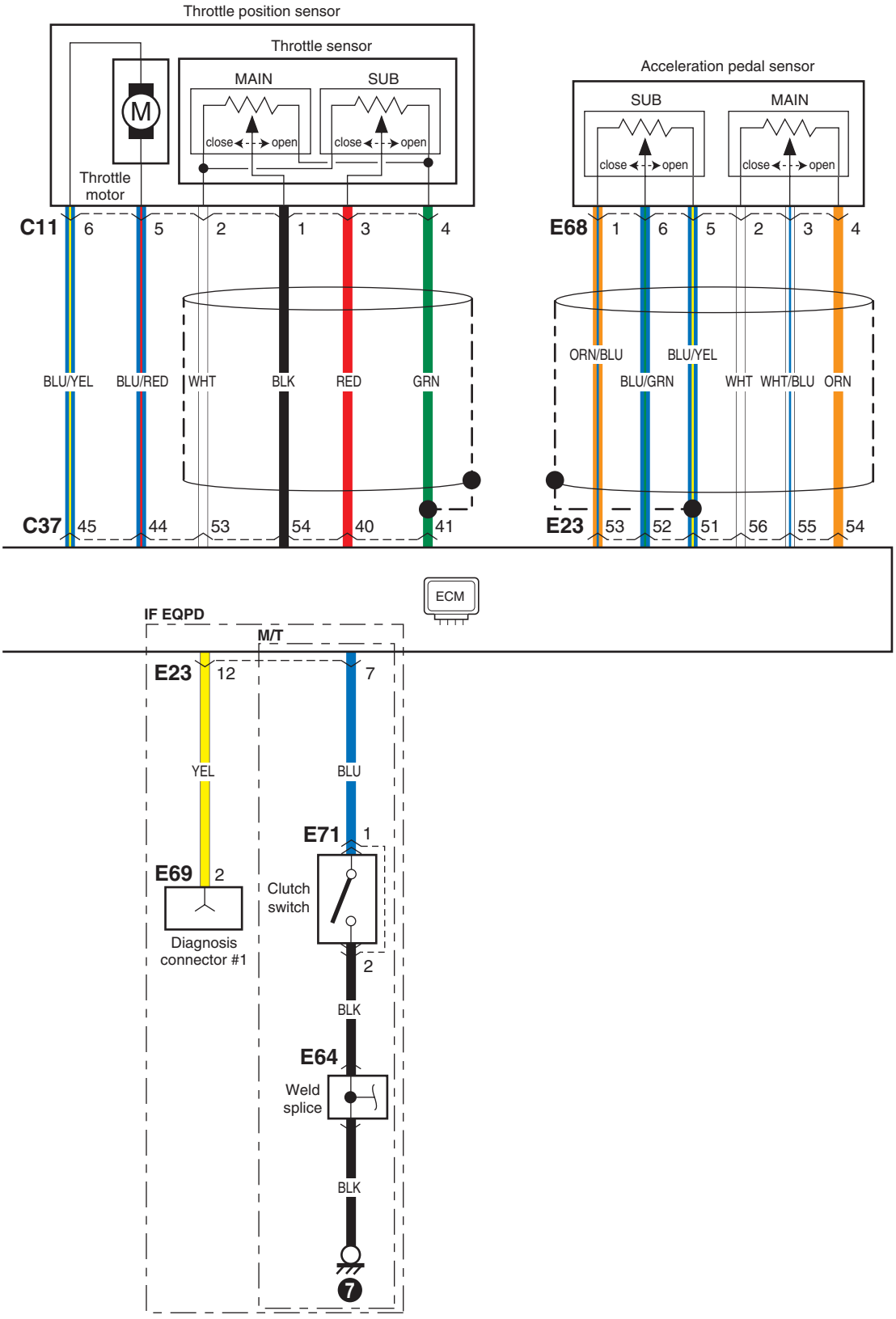
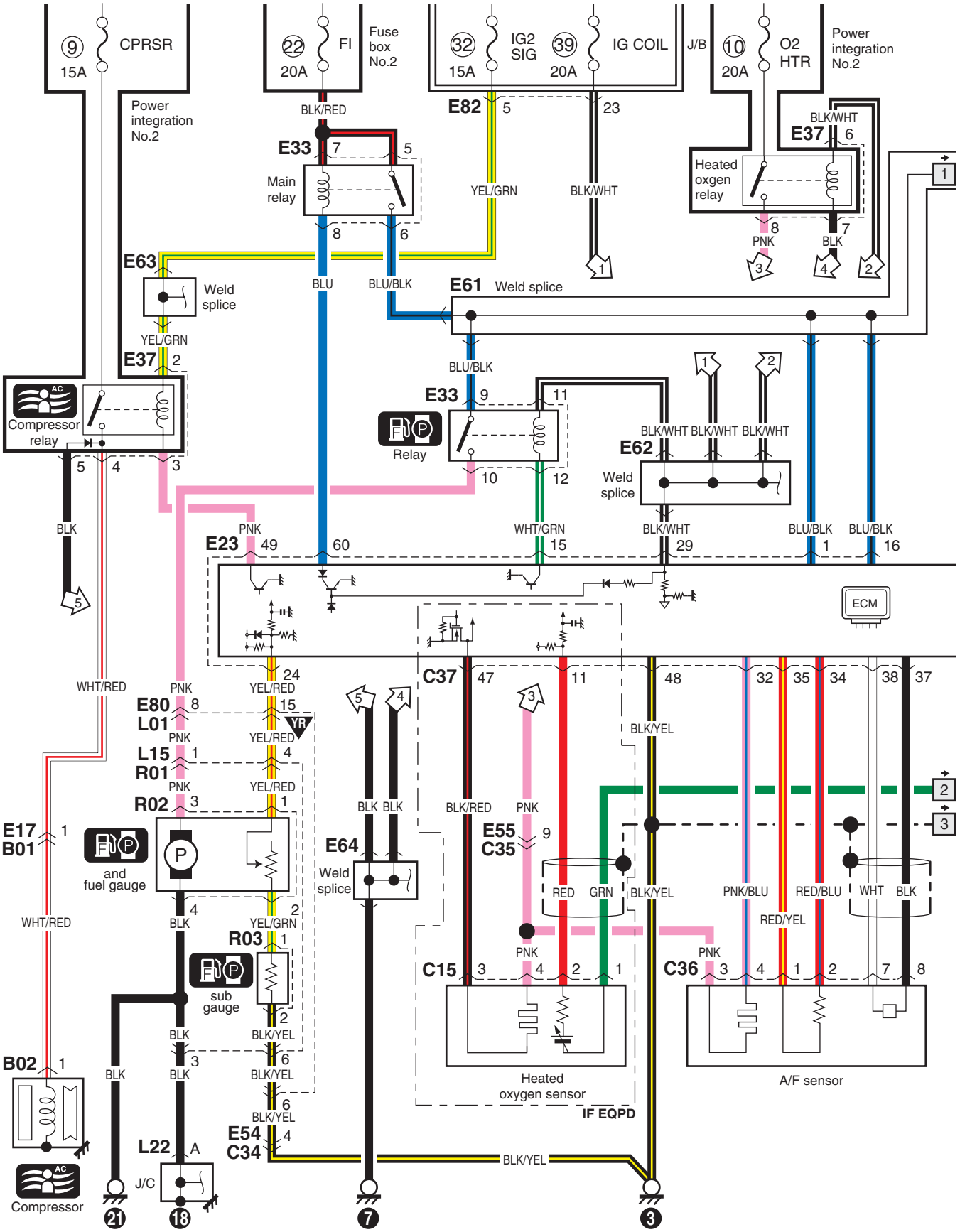


I5JB0B910939-01

A-5 Engine and A/C Control System Circuit Diagram (J20A)

S5JB0B910E008



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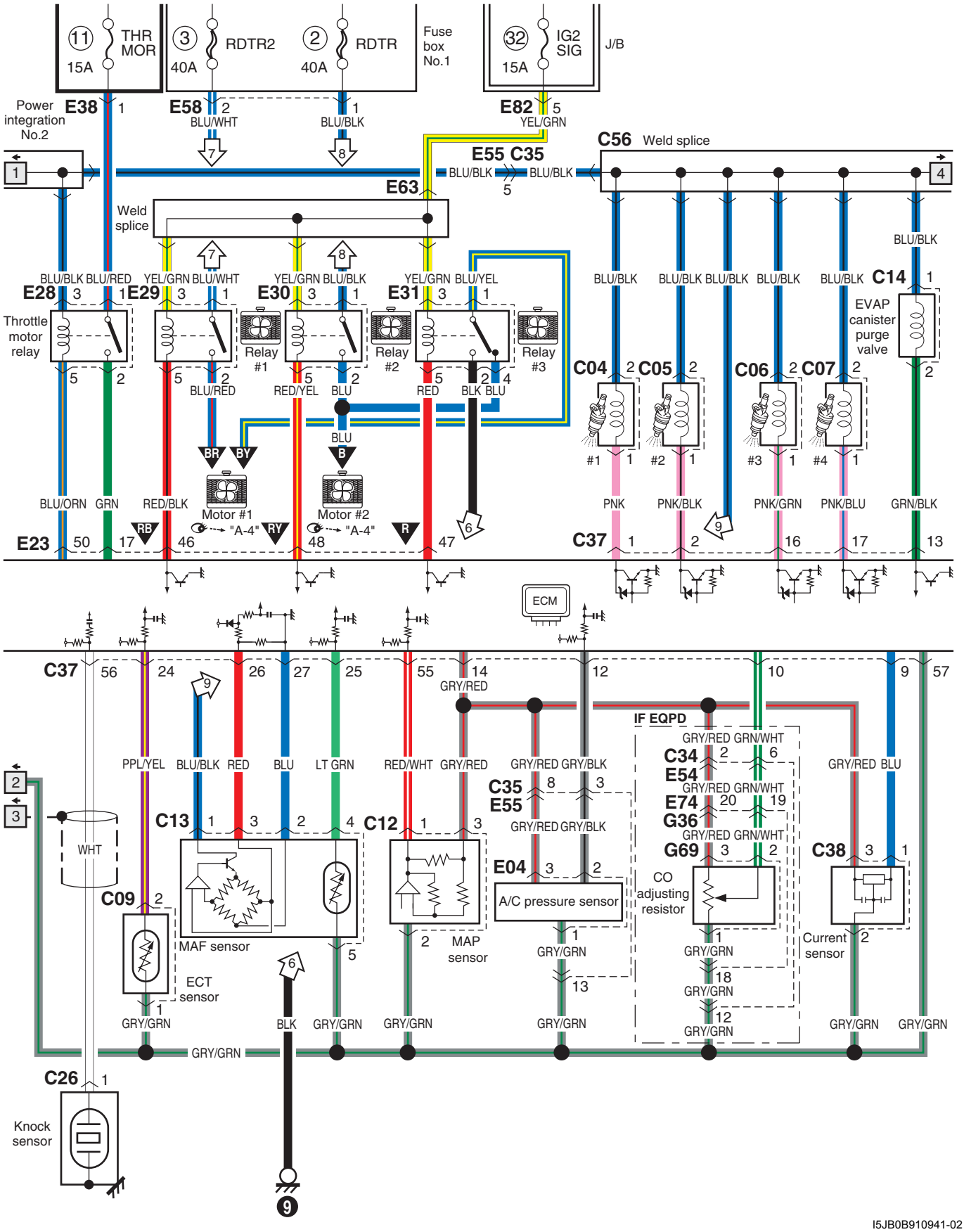
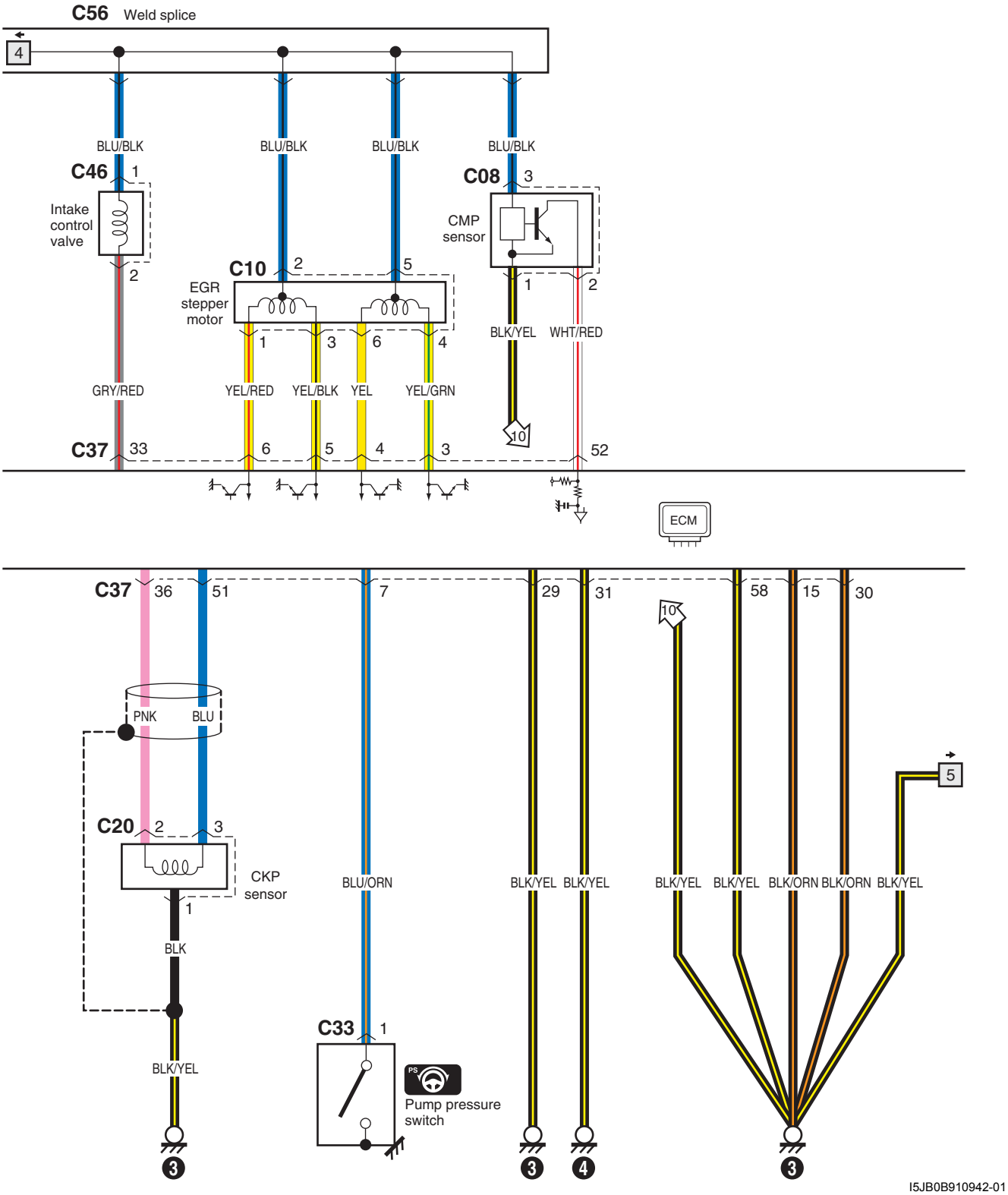

11 THR MOR 15A
3 RDTR2 40A
2 RDTR 40A
Fuse box No.1
32 IG2 SIG 15A
J/B
Power integration No.2
E38
E58
E82
E55 C35
E63
C56 Weld splice
Weld splice
E28
E29
E30
E31
Throttle motor relay
Relay #1
Relay #2
Relay #3
C04
C05
C06
C07
C14
EVAP canister purge valve
Motor #1
Motor #2
"A-4"
E23
C37
ECM
C13
C12
C09
C26
C34
E54
E74
G36
G69
C38
E04
C35
E55
MAF sensor
MAP sensor
ECT sensor
Knock sensor
A/C pressure sensor
CO adjusting resistor
Current sensor
IF EQPD
WHT
BLK
GRY/GRN
I5JB0B910941-02



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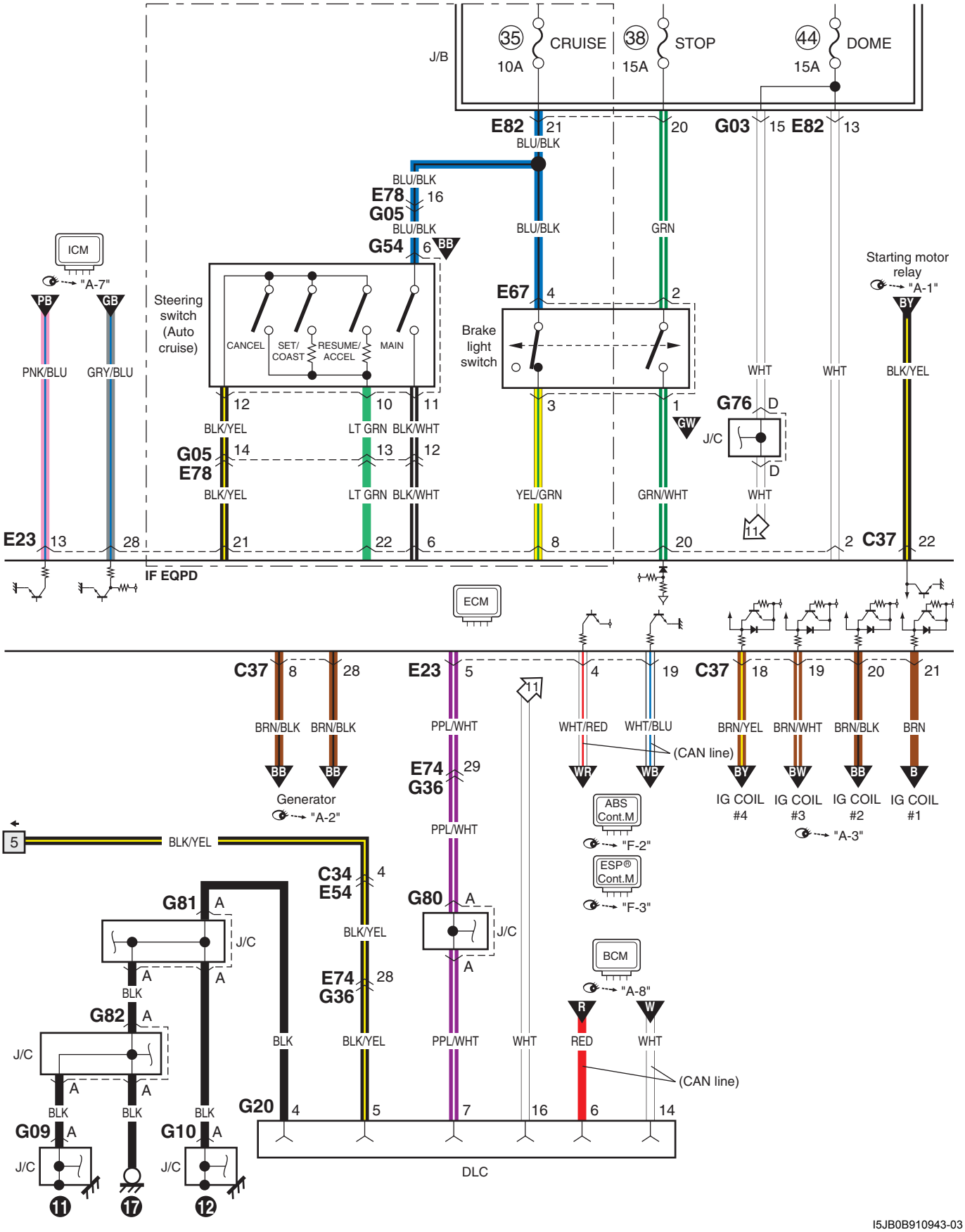

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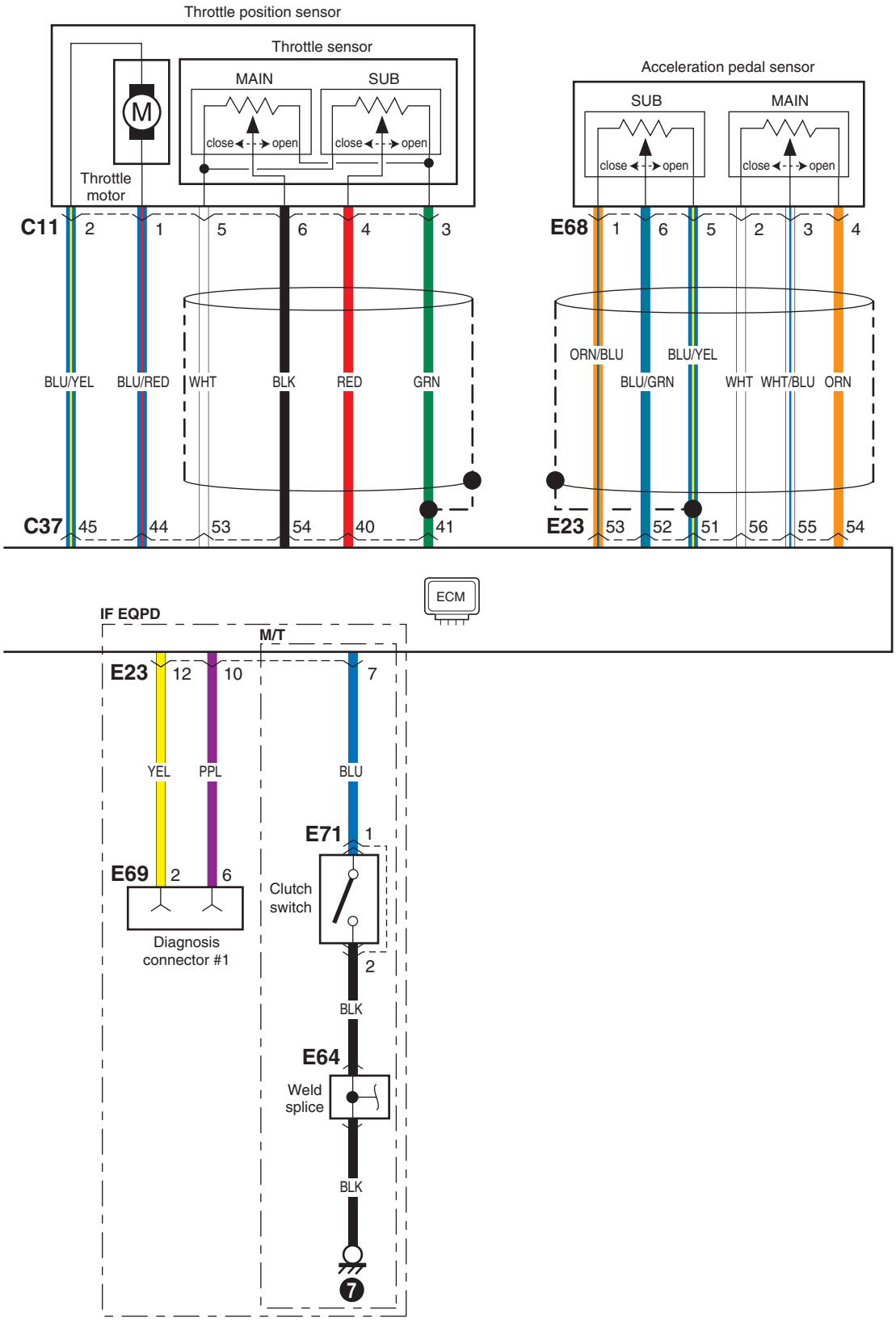
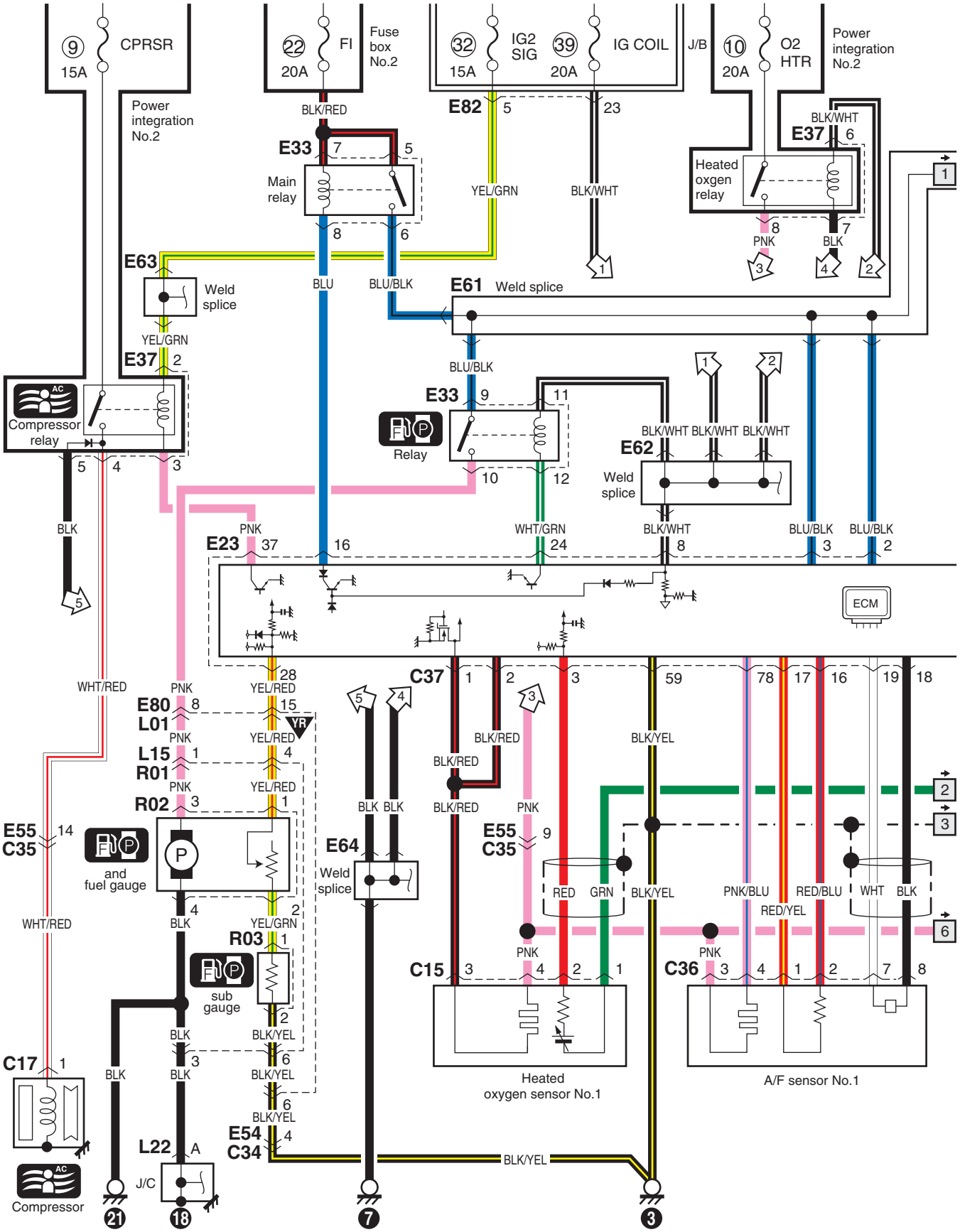


I5JB0B910944-01

A-5 Engine and A/C Control System Circuit Diagram (H27A)

S5JB0B910E047



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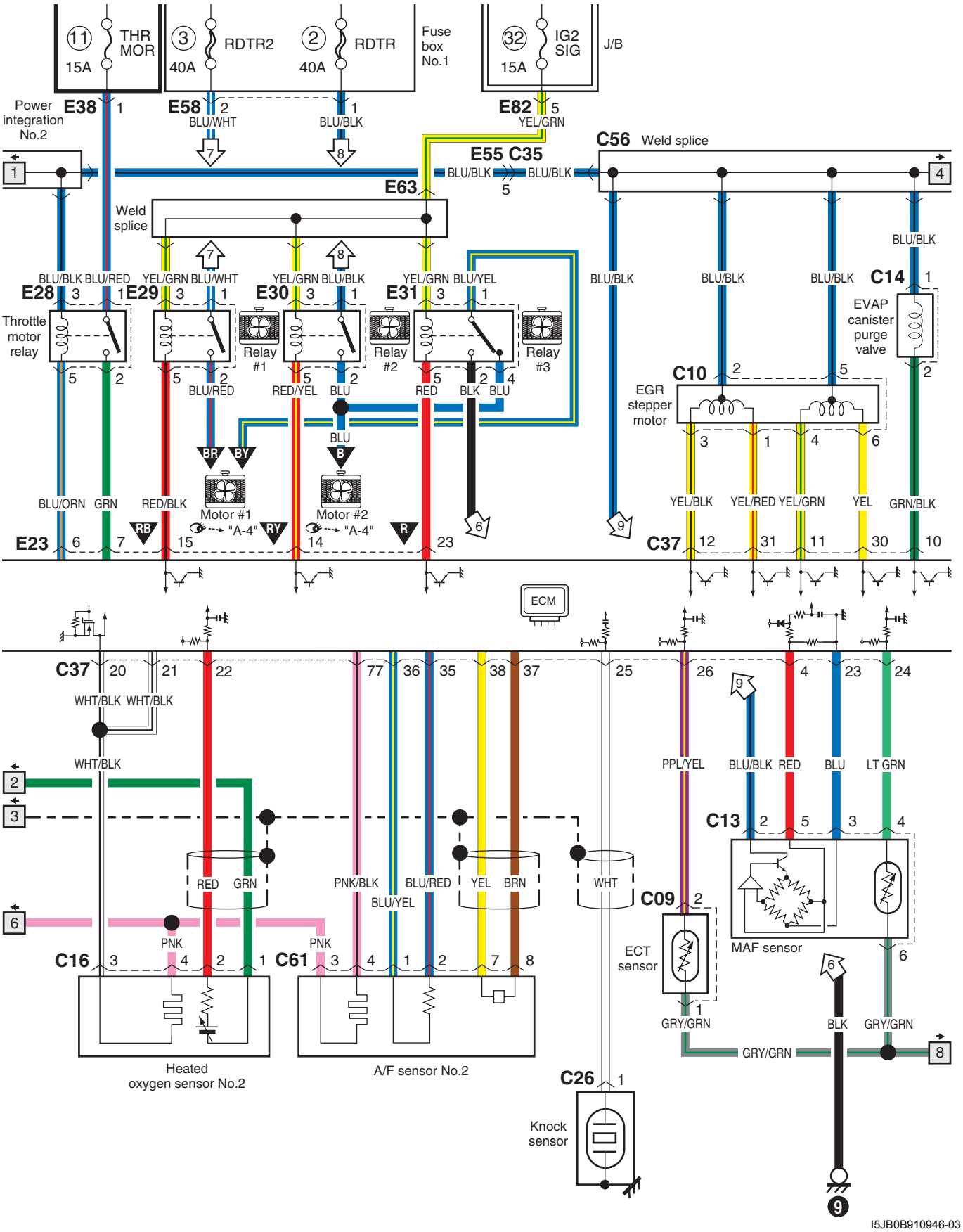
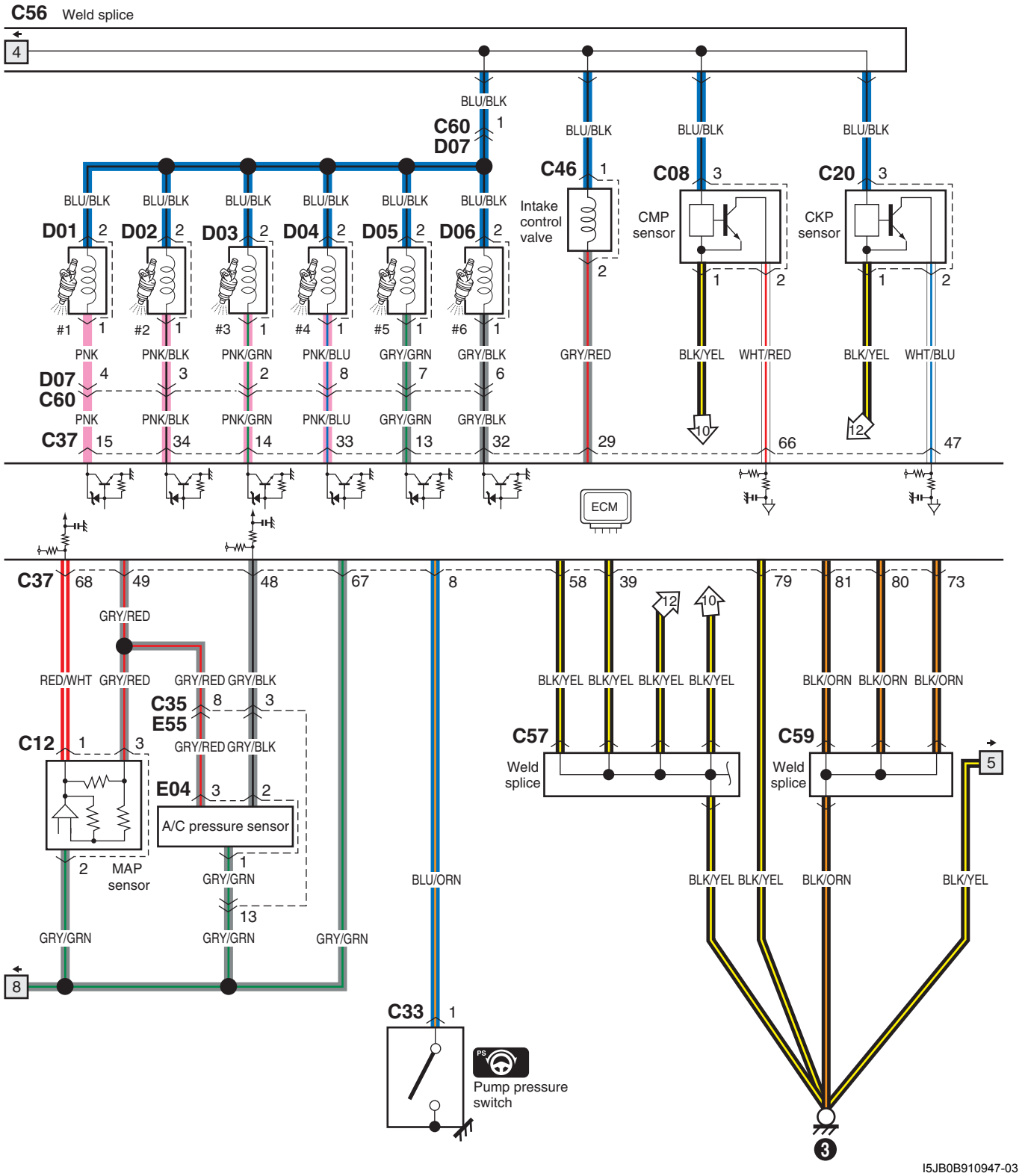
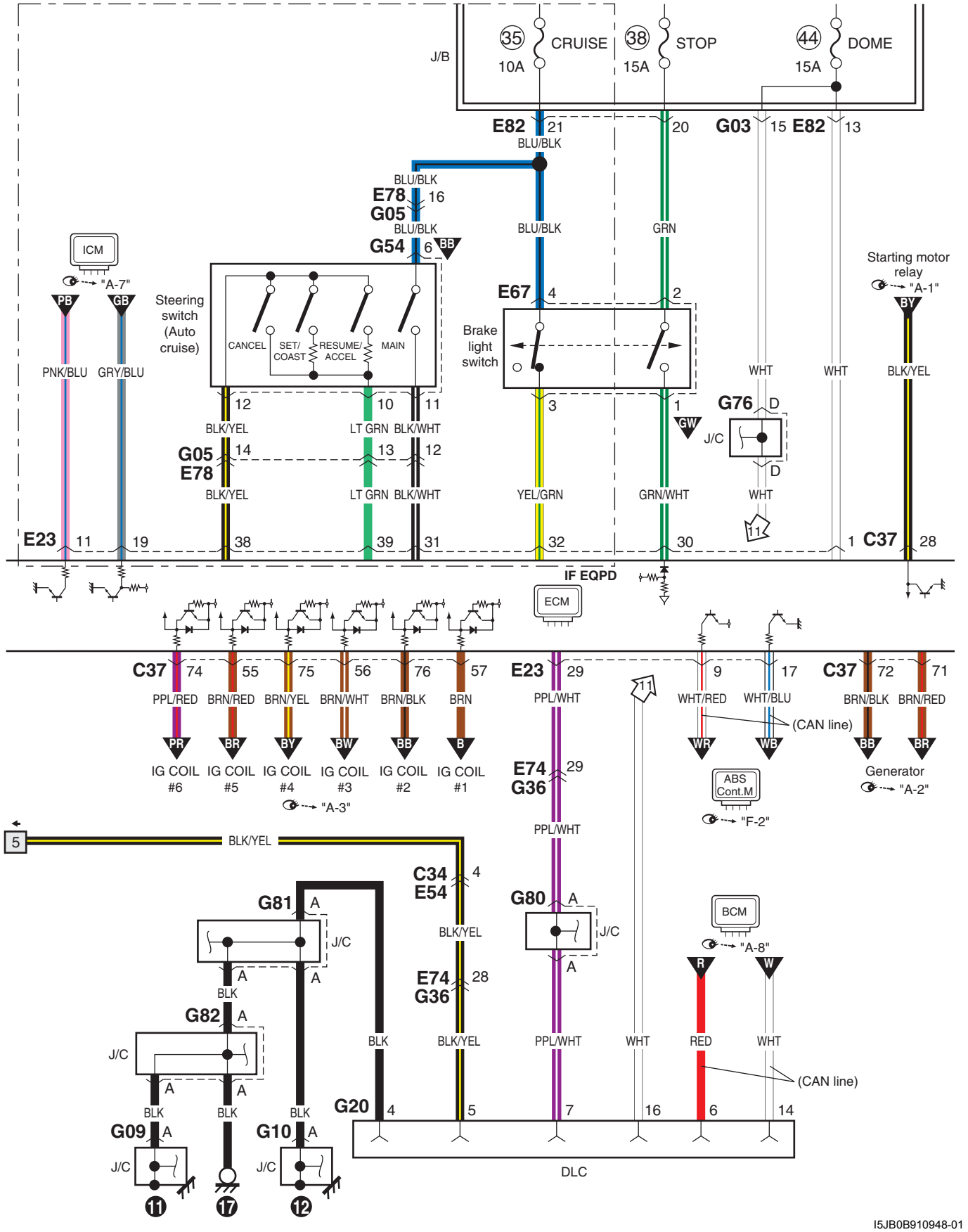
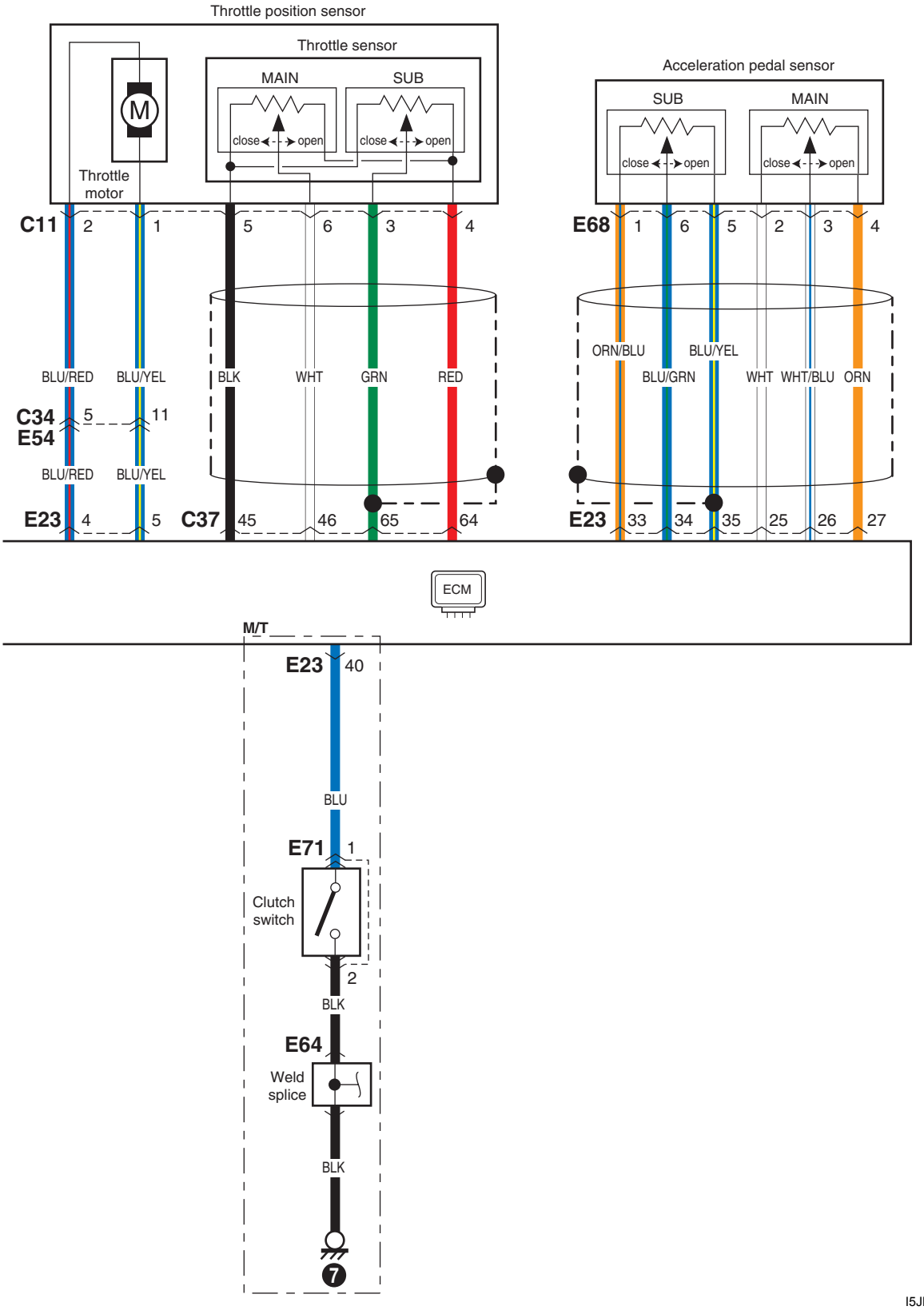

11 THR MOR 15A
3 RDTR2 40A
2 RDTR 40A
Fuse box No.1
32 IG2 SIG 15A
J/B
Power integration No.2
E38
E58
E82
BLU/WHT
BLU/BLK
YEL/GRN
E55 C35
BLU/BLK
C56 Weld splice
E63
Weld splice
BLU/BLK BLU/RED
YEL/GRN BLU/WHT
YEL/GRN BLU/BLK
YEL/GRN BLU/YEL
E28
E29
E30
E31
Throttle motor relay
Relay #1
Relay #2
Relay #3
BLU/RED
RED/YEL
BLU
RED
BLK
BLU
BLU/BLK
C14
EVAP canister purge valve
C10
EGR stepper motor
BLU/ORN
GRN
RED/BLK
Motor #1
"A-4"
Motor #2
"A-4"
E23
C37
YEL/BLK
YEL/RED
YEL/GRN
YEL
GRN/BLK
ECM
WHT/BLK
PPL/YEL
BLU/BLK
RED
BLU
LT GRN
C13
MAF sensor
C09
ECT sensor
RED
GRN
PNK/BLK
BLU/RED
BLU/YEL
YEL
BRN
WHT
PNK
C16
C61
Heated oxygen sensor No.2
A/F sensor No.2
C26
Knock sensor
GRY/GRN
BLK
GRY/GRN
I5JB0B910946-03


C56 Weld splice
4
BLU/BLK
C60
D07
1
BLU/BLK
BLU/BLK
BLU/BLK
C46
1
Intake control valve
2
GRY/RED
C08
3
CMP sensor
1
2
BLK/YEL
WHT/RED
C20
3
CKP sensor
1
2
BLK/YEL
WHT/BLU
D01 2
D02 2
D03 2
D04 2
D05 2
D06 2
#1 1
#2 1
#3 1
#4 1
#5 1
#6 1
PNK
PNK/BLK
PNK/GRN
PNK/BLU
GRY/GRN
GRY/BLK
D07
C60
4
3
2
8
7
6
C37
15
34
14
33
13
32
29
10
66
12
47
ECM
C37
68
49
48
67
8
58
39
12
10
79
81
80
73
GRY/RED
RED/WHT
GRY/RED
GRY/RED
GRY/BLK
C35
E55
8
3
GRY/RED
GRY/BLK
C12
1
3
2
MAP sensor
E04
3
2
A/C pressure sensor
1
GRY/GRN
13
GRY/GRN
GRY/GRN
GRY/GRN
8
BLU/ORN
BLK/YEL
BLK/YEL
BLK/YEL
BLK/YEL
BLK/ORN
BLK/ORN
BLK/ORN
C57
Weld splice
C59
Weld splice
5
BLK/YEL
BLK/YEL
BLK/ORN
BLK/YEL
C33
1
PS
Pump pressure switch
3
I5JB0B910947-03



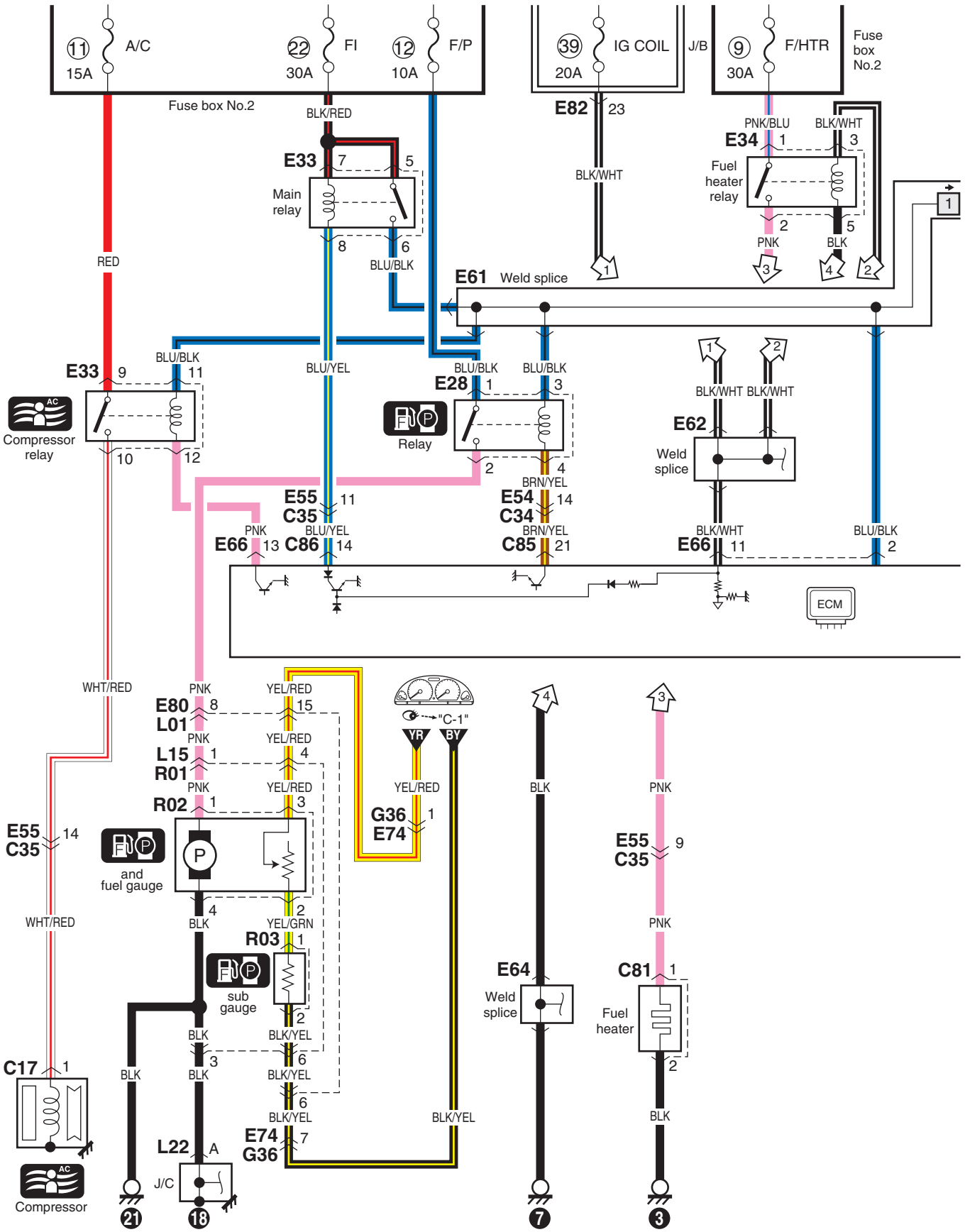
I5JB0B910948-01



I5JB0B910949-01

A-5 Engine and A/C Control System Circuit Diagram (DSL)

S5JB0B910E048



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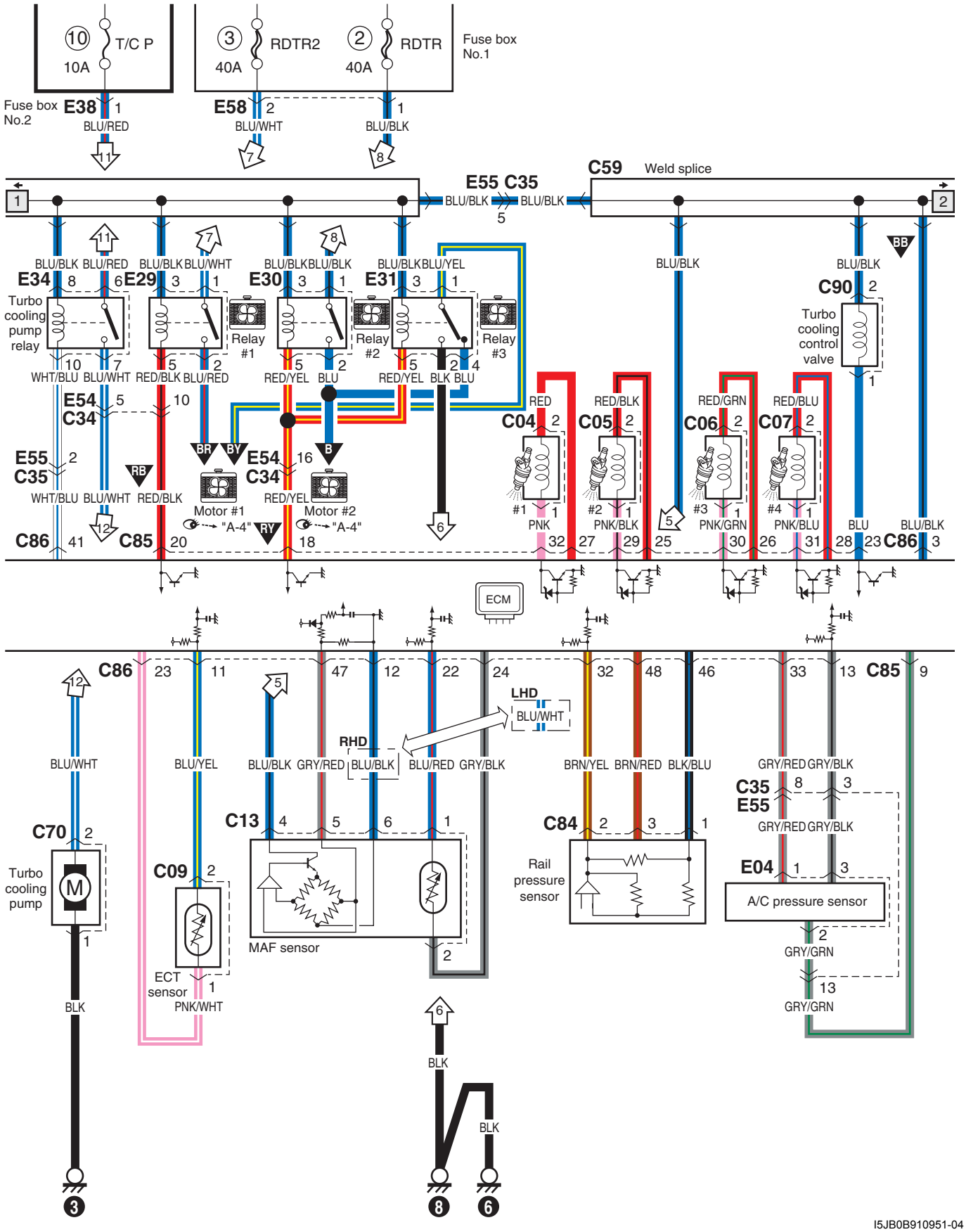
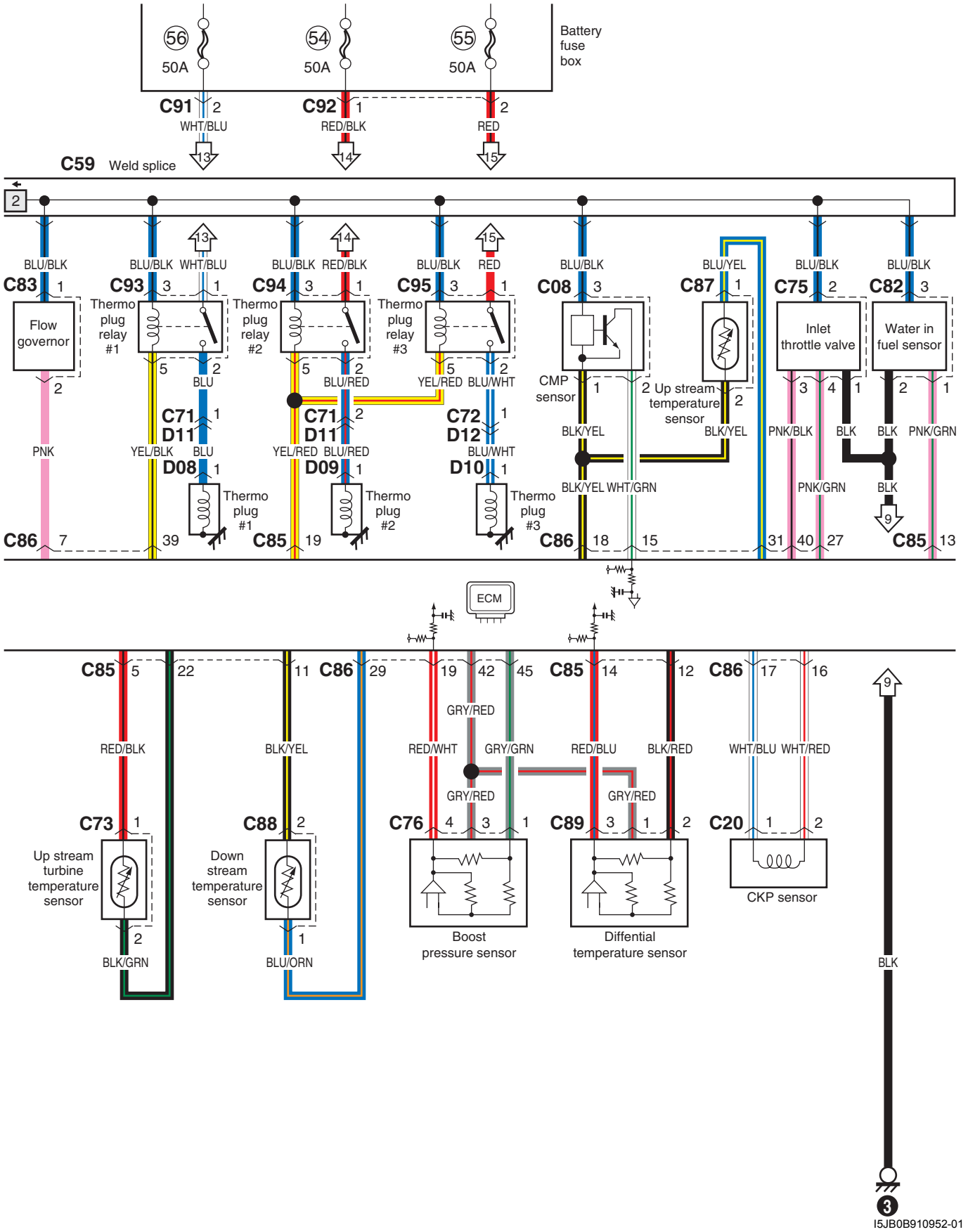
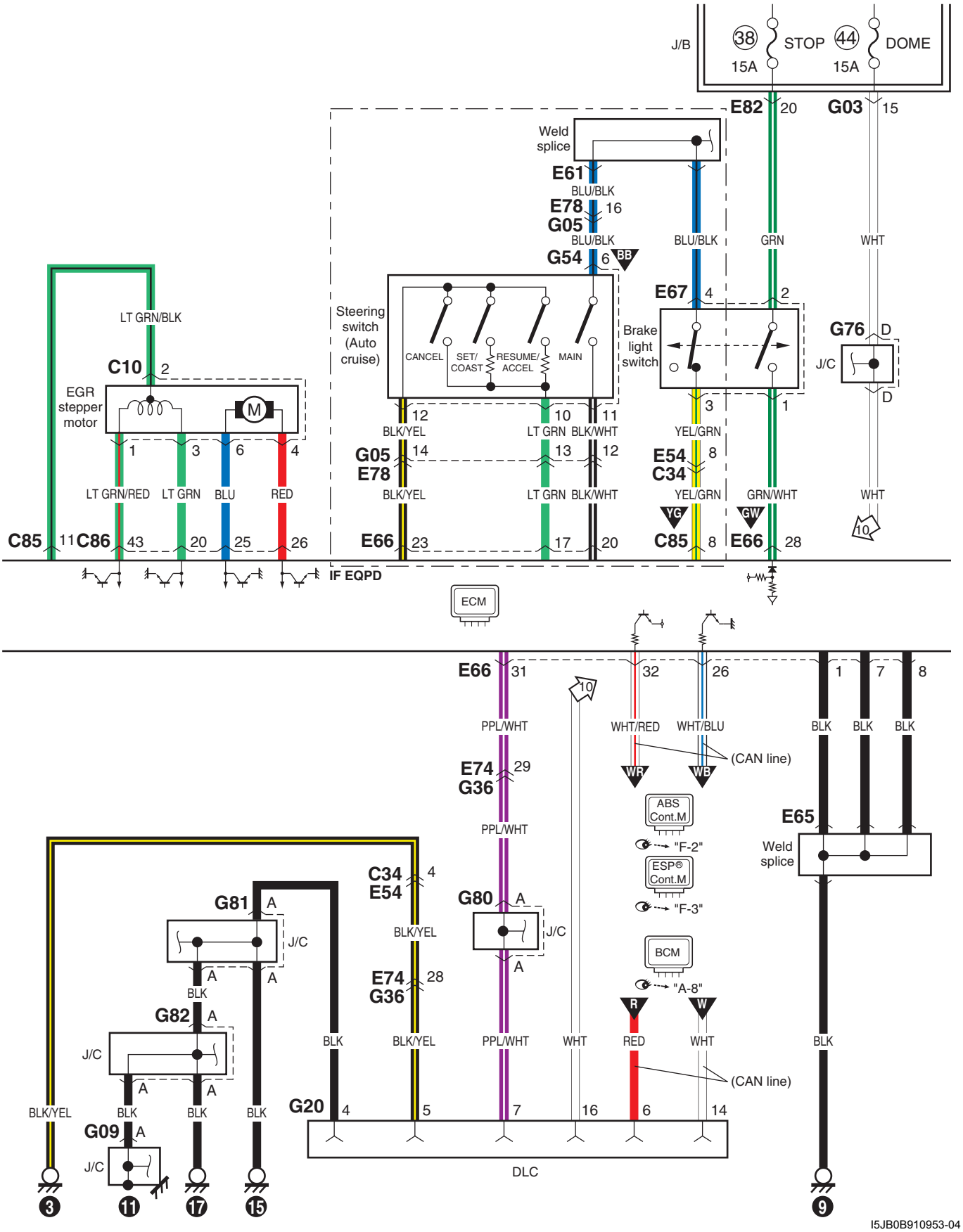
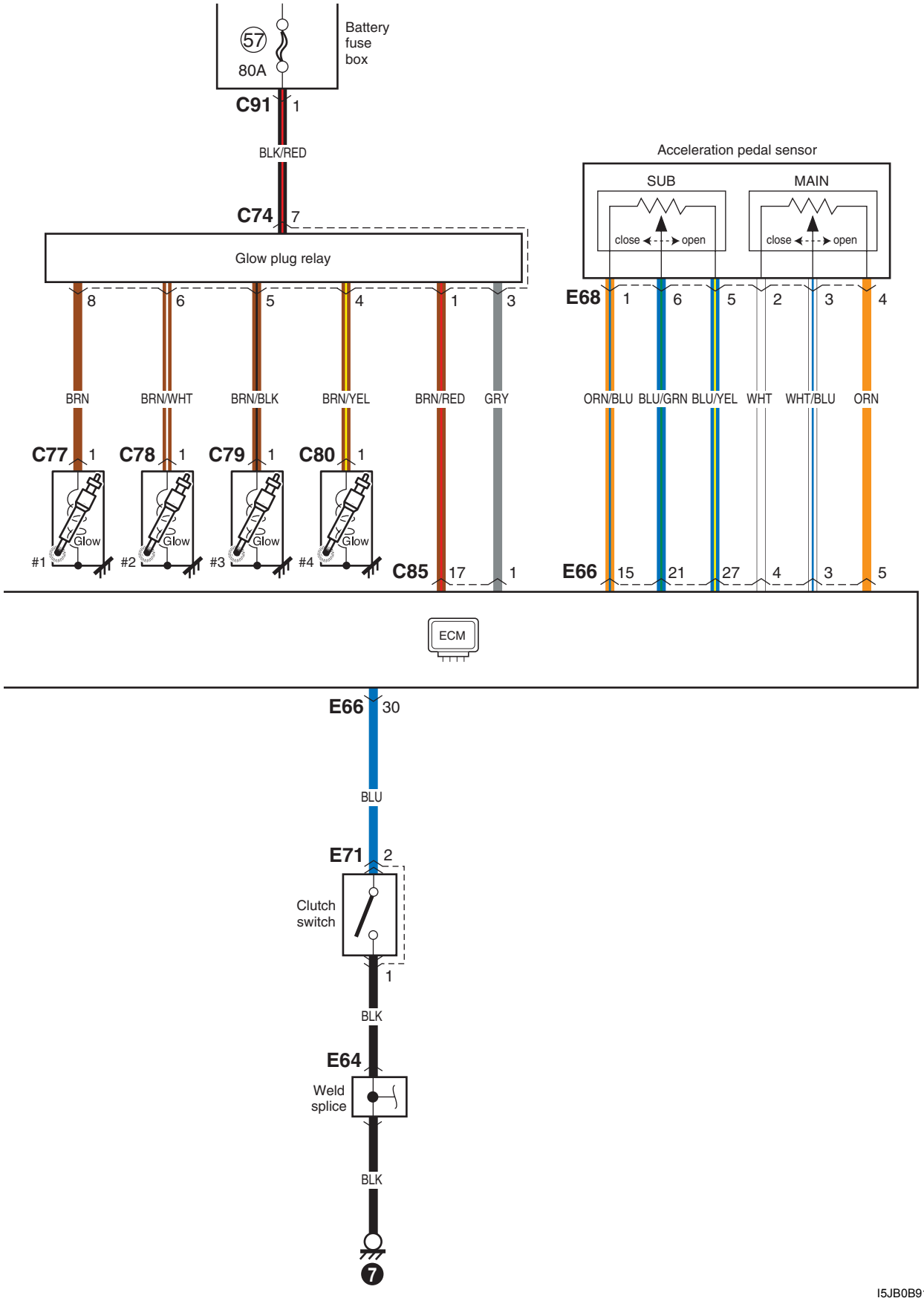


I5JB0B910951-04


56
50A
54
50A
55
50A
Battery fuse box
C91 2
WHT/BLU
13
C92 1
RED/BLK
14
2
RED
15
C59 Weld splice
2
BLU/BLK
C83 1
Flow governor
2
PNK
C86 7
BLU/BLK
C93 3
1
WHT/BLU
Thermo plug relay #1
5
2
BLU
C71 1
D11
YEL/BLK
BLU
D08 1
Thermo plug #1
39
BLU/BLK
C94 3
1
RED/BLK
Thermo plug relay #2
5
2
BLU/RED
C71 2
D11
YEL/RED
BLU/RED
D09 1
Thermo plug #2
C85 19
BLU/BLK
C95 3
1
RED
Thermo plug relay #3
5
2
YEL/RED
BLU/WHT
C72 1
D12
BLU/WHT
D10 1
Thermo plug #3
BLU/BLK
C08 3
CMP sensor
1
2
BLK/YEL
BLK/YEL WHT/GRN
C86 18
15
BLU/YEL
C87 1
Up stream temperature sensor
2
BLK/YEL
31
BLU/BLK
C75 2
Inlet throttle valve
3
4
1
PNK/BLK
BLK
PNK/GRN
40
27
BLU/BLK
C82 3
Water in fuel sensor
2
1
BLK
9
C85 13
ECM
C85 5
22
RED/BLK
C73 1
Up stream turbine temperature sensor
2
BLK/GRN
11
BLK/YEL
C88 2
Down stream temperature sensor
1
BLU/ORN
C86 29
19
42
45
GRY/RED
RED/WHT
GRY/GRN
GRY/RED
C76 4
3
1
Boost pressure sensor
C85 14
12
RED/BLU
BLK/RED
GRY/RED
C89 3
1
2
Diffential temperature sensor
C86 17
16
WHT/BLU
WHT/RED
C20 1
2
CKP sensor
9
BLK
3
I5JB0B910952-01



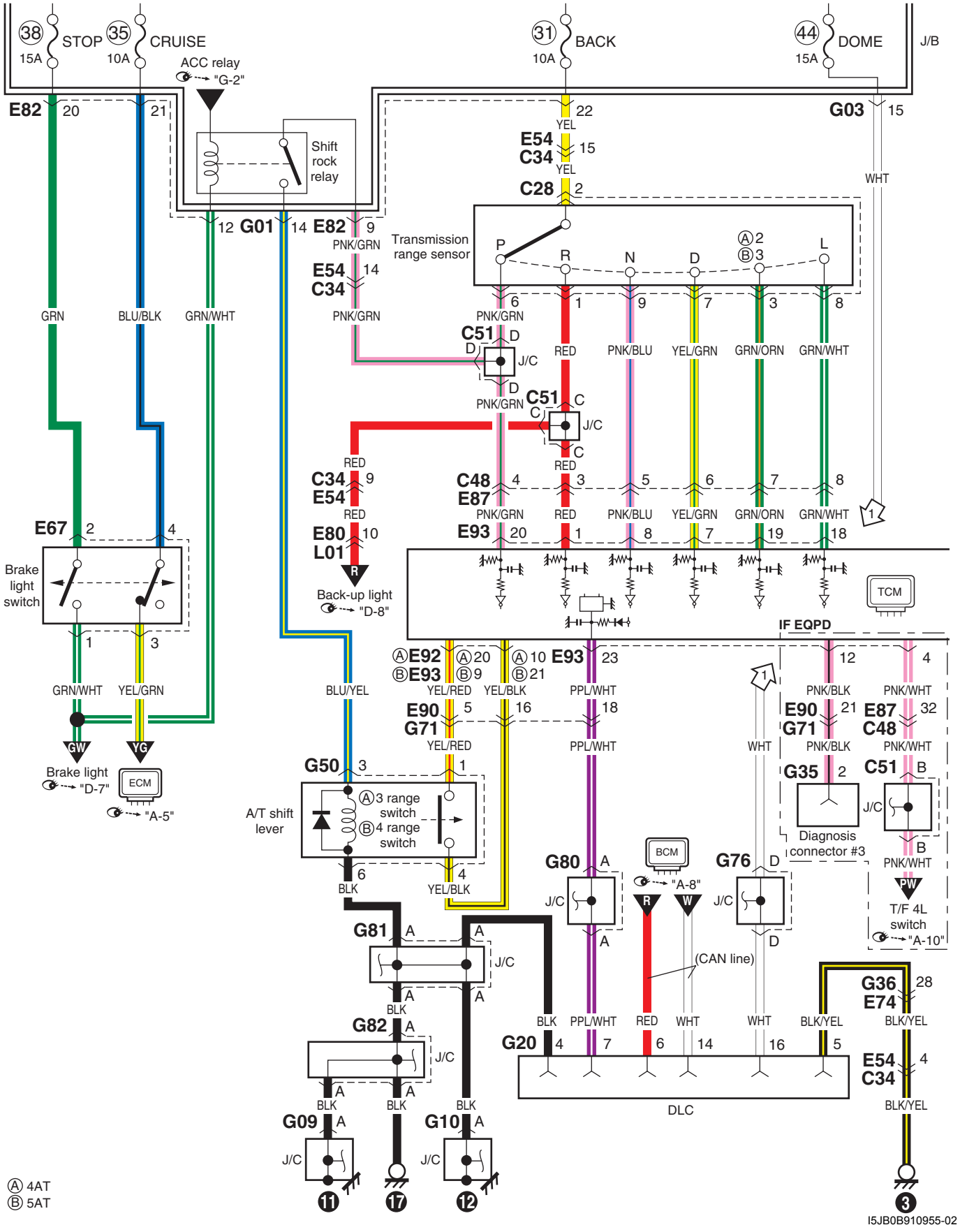
I5JB0B910953-04



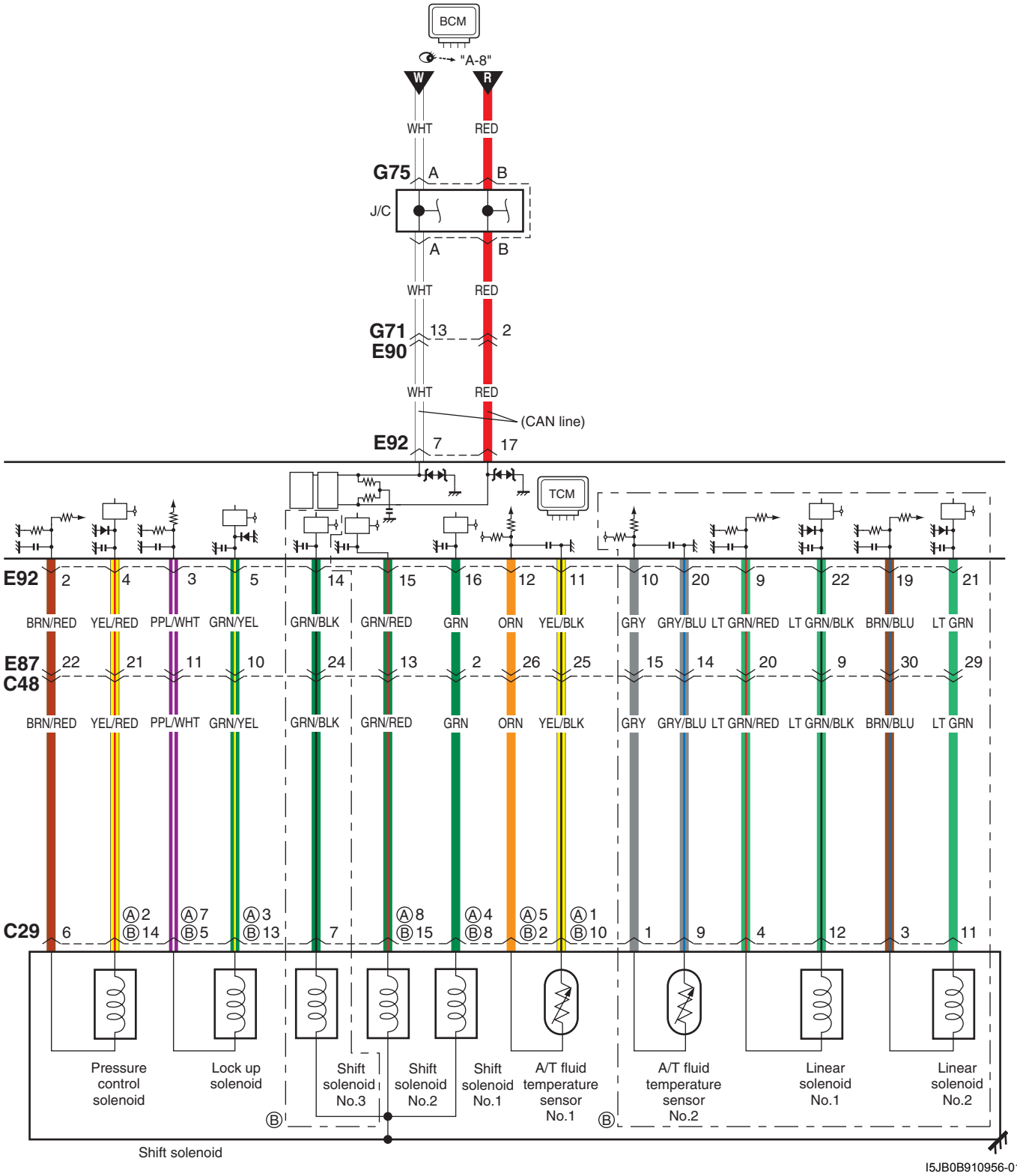
I5JB0B910954-01

A-6 A/T Control System Circuit Diagram

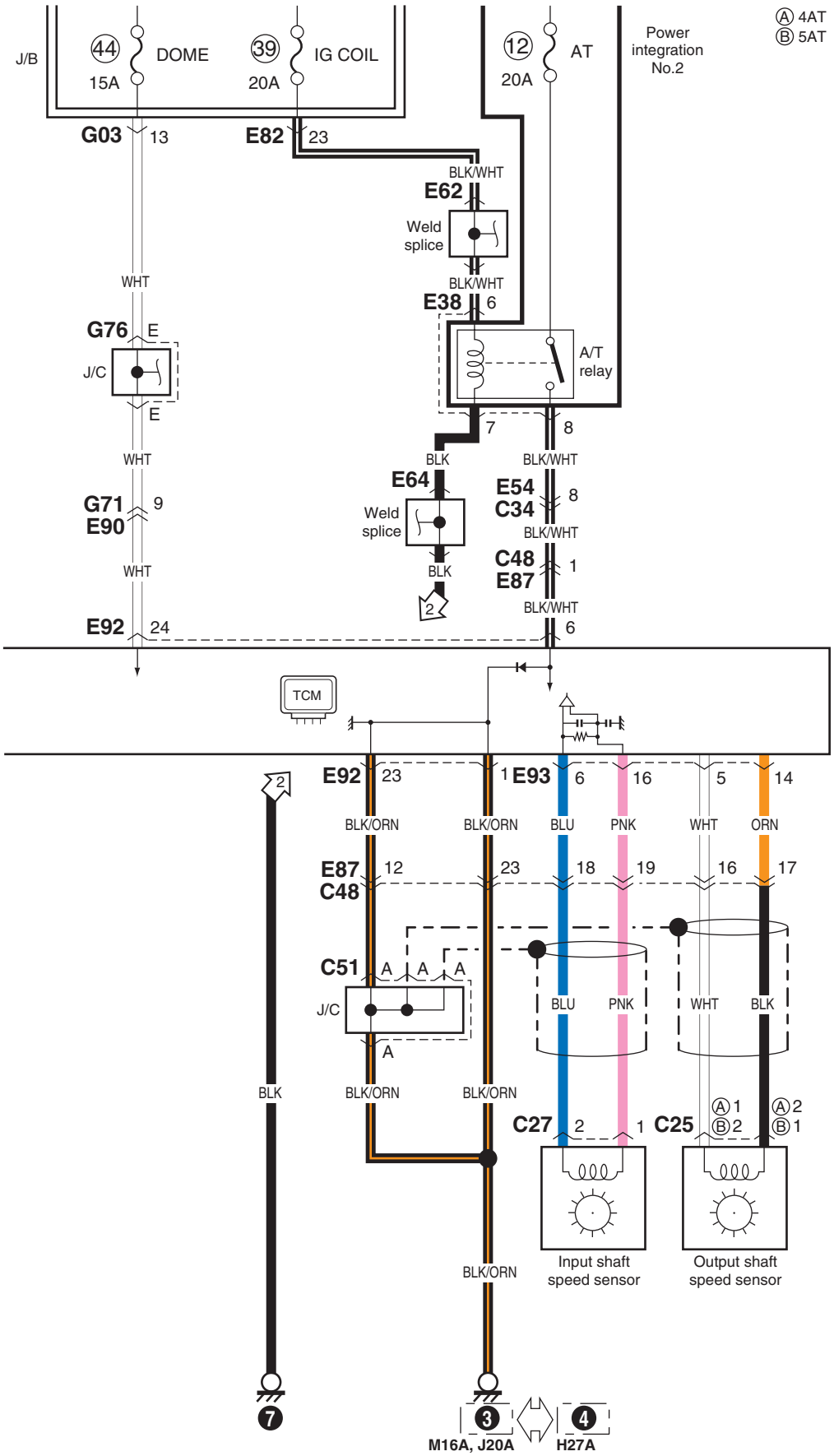
S5JB0B910E009



Ⓐ 4AT
Ⓑ 5AT



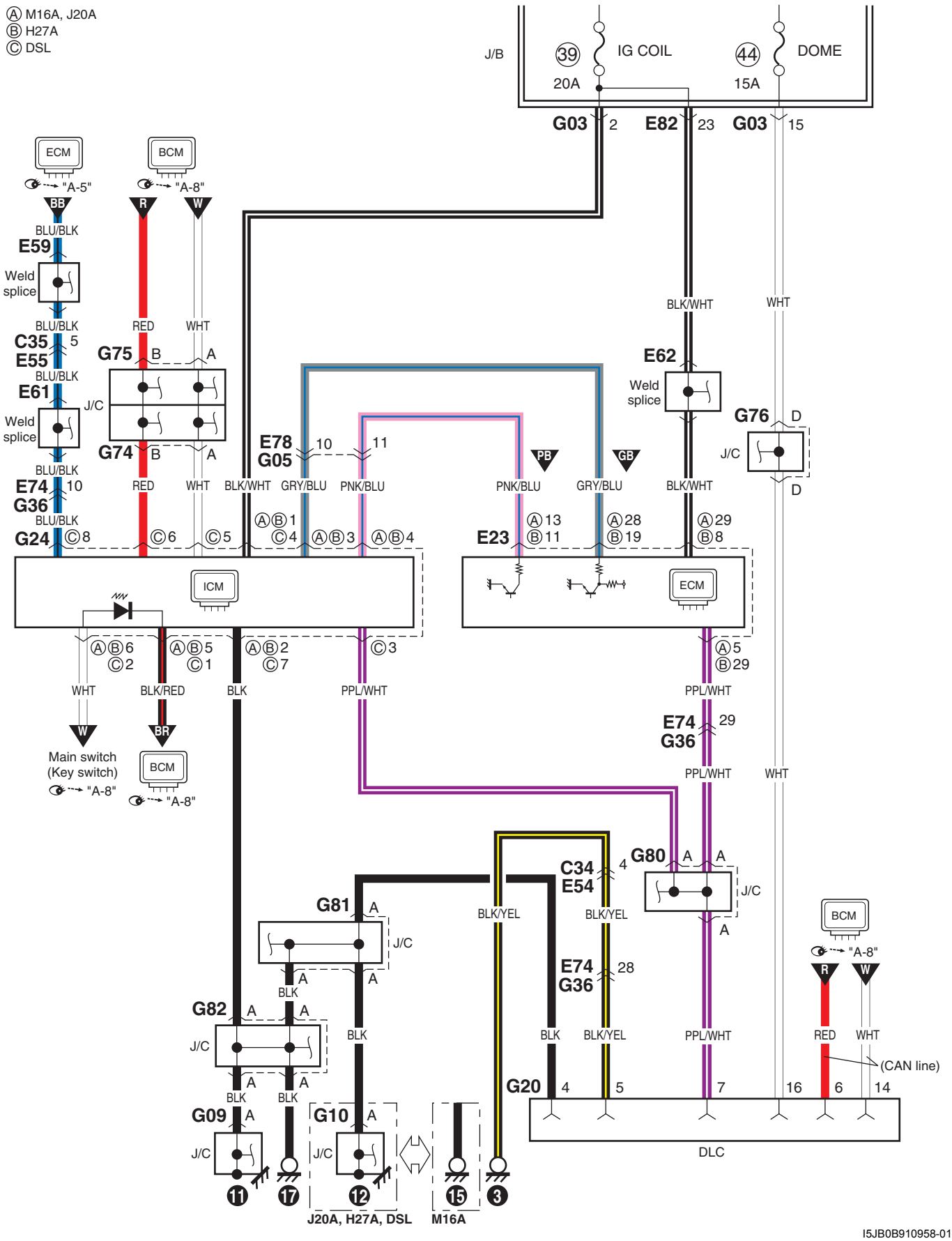
I5JB0B910956-01



I5JB0B910957-03

A-7 Immobilizer System Circuit Diagram

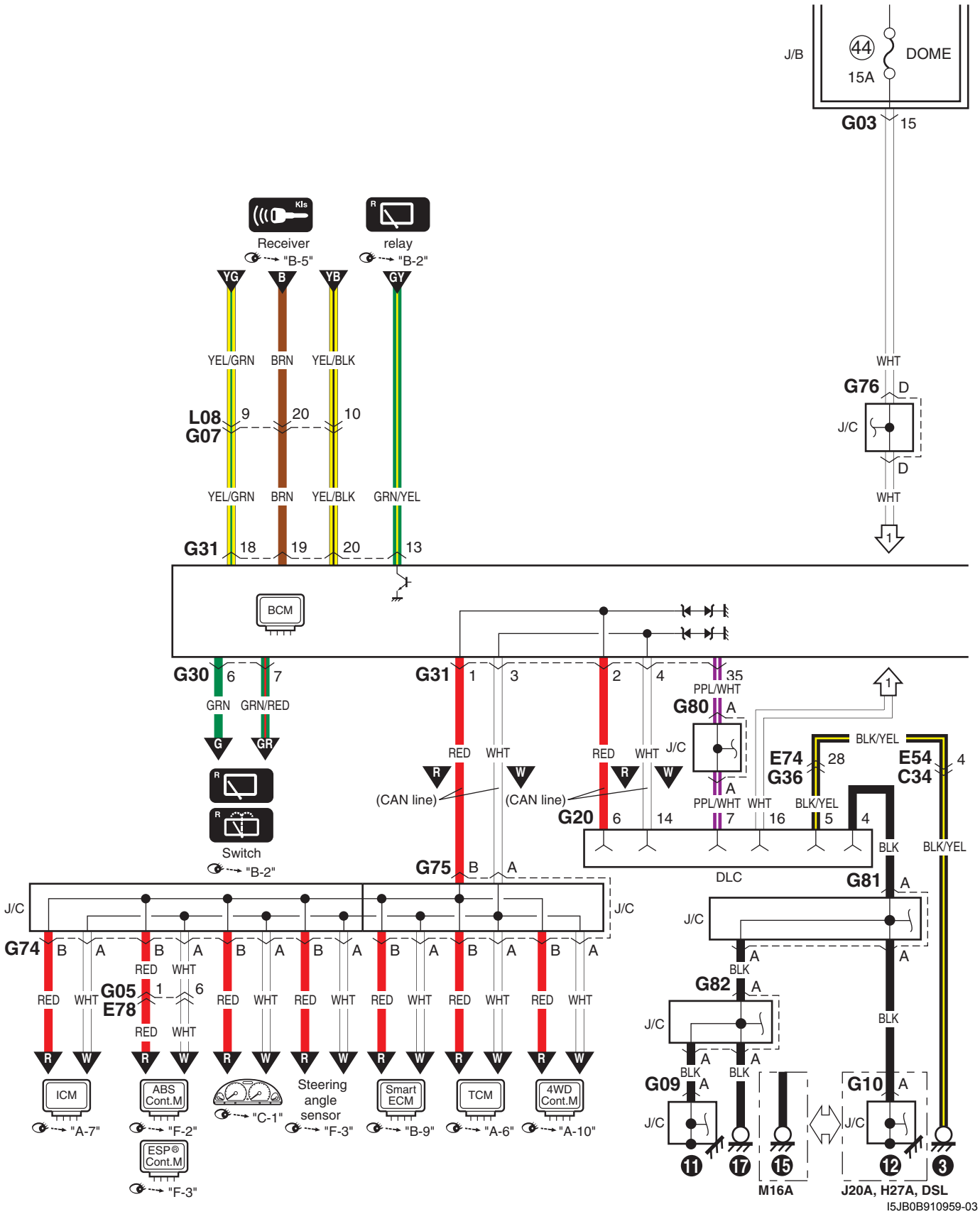
S5JB0B910E010



I5JB0B910958-01

A-8 Body Control System Circuit Diagram

S5JB0B910E011



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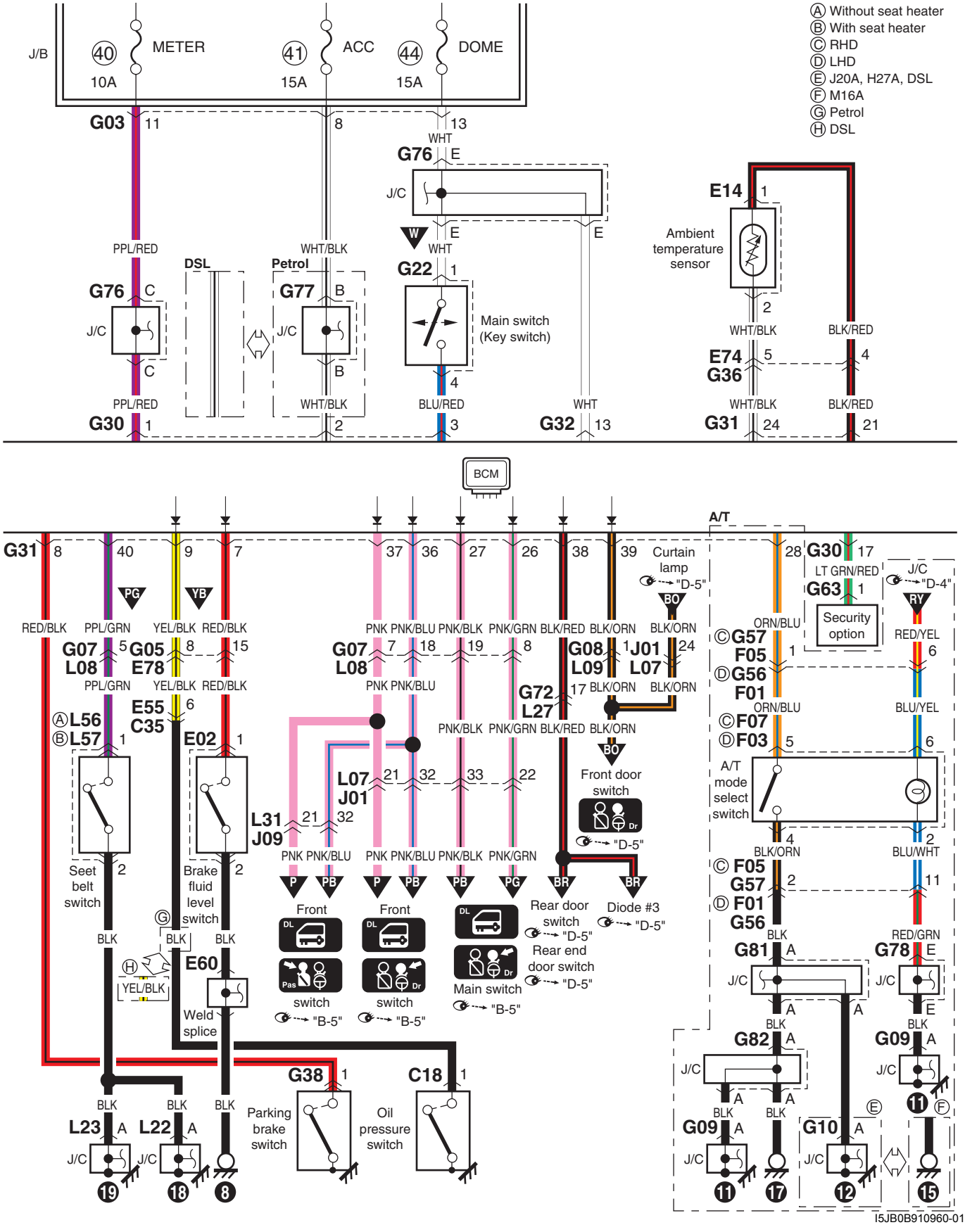
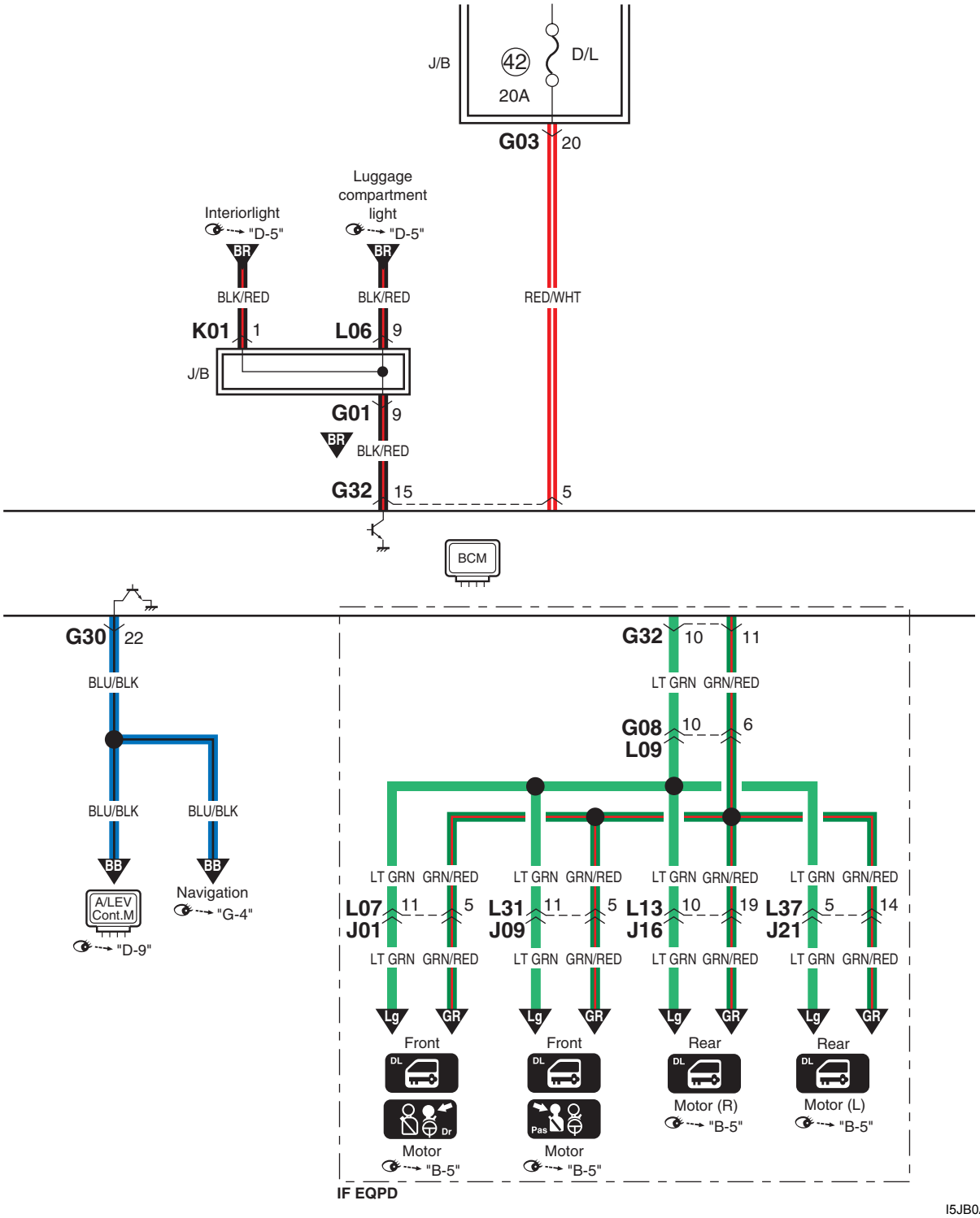
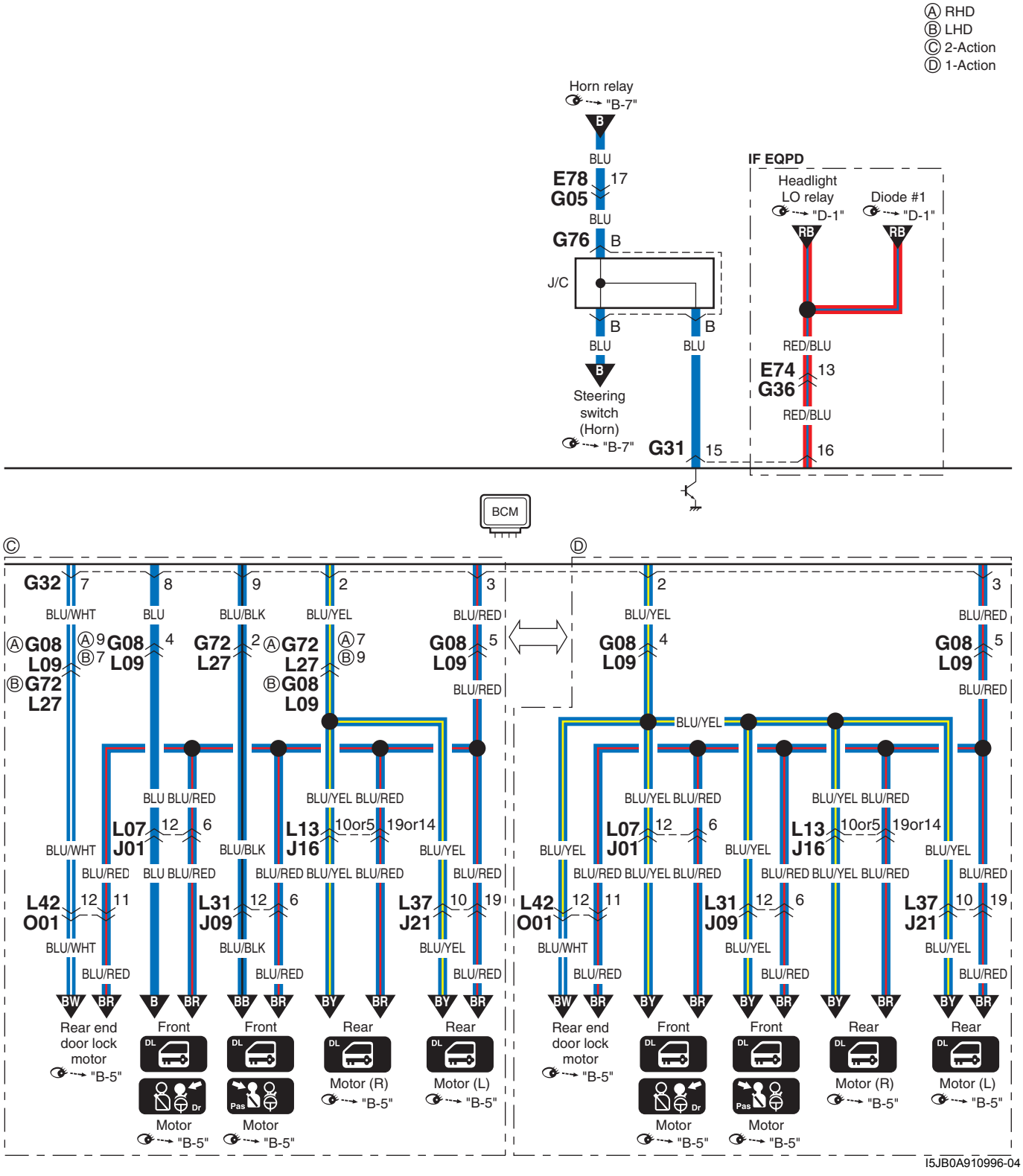
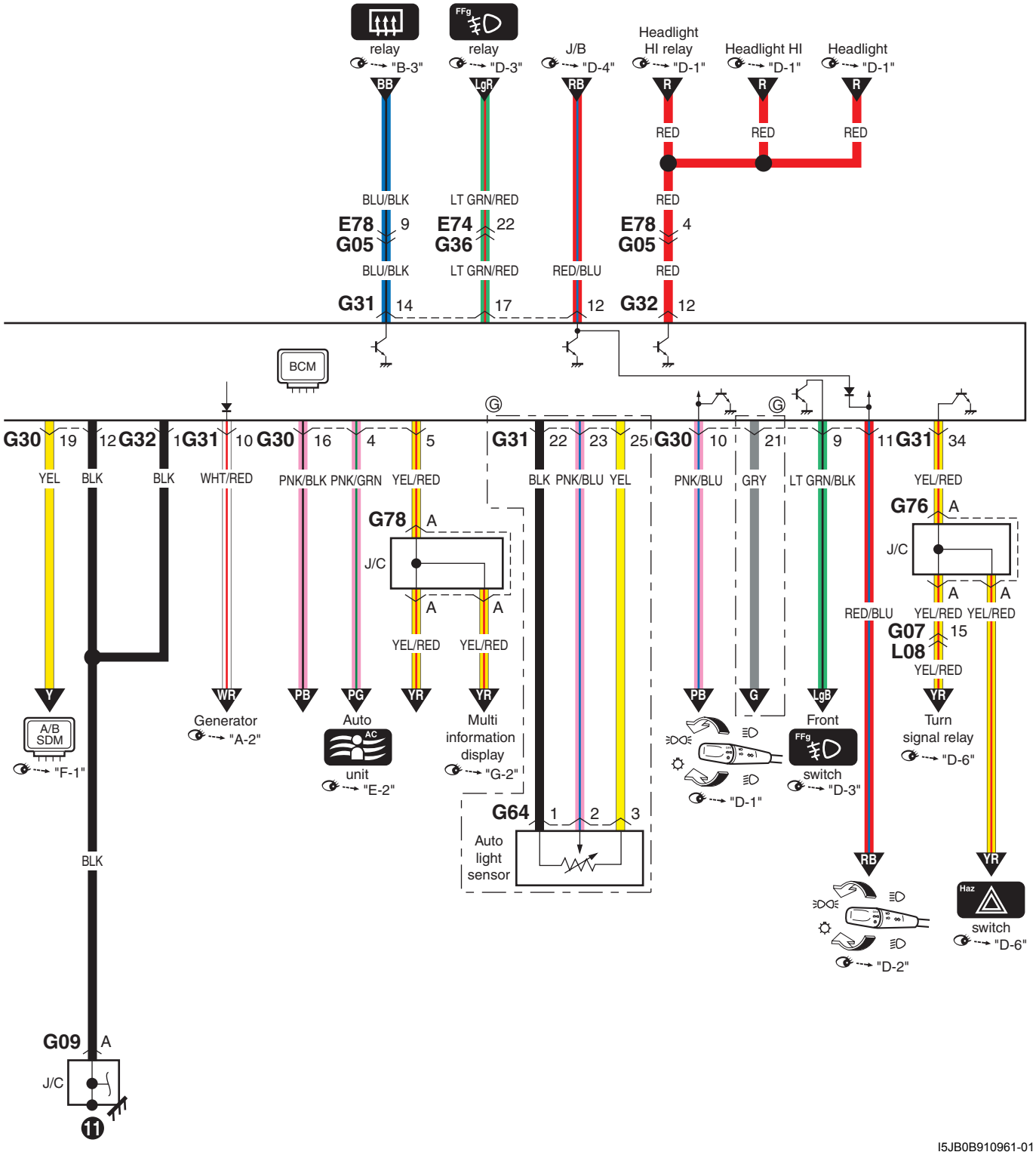

Ⓐ Without seat heater
Ⓑ With seat heater
Ⓒ RHD
Ⓓ LHD
Ⓔ J20A, H27A, DSL
Ⓕ M16A
Ⓖ Petrol
Ⓗ DSL
J/B
40 METER 10A
41 ACC 15A
44 DOME 15A
G03
G76
G22
G30
G32
G31
E14
E74
G36
Ambient temperature sensor
Main switch (Key switch)
DSL
Petrol
G77
PPL/RED
WHT/BLK
BLU/RED
WHT
BLK/RED
BCM
A/T
Curtain lamp
Front door switch
Rear door switch
Rear end door switch
Main switch
Diode #3
Front
Seet belt switch
Brake fluid level switch
Weld splice
Parking brake switch
Oil pressure switch
Security option
A/T mode select switch
G07
G05
G08
J01
L08
E78
L09
L07
E55
C35
E02
L56
L57
L31
J09
L27
G72
F05
G57
F01
G56
F07
F03
G81
G78
G82
G09
G10
C18
L23
L22
E60
PPL/GRN
YEL/BLK
RED/BLK
PNK
PNK/BLU
PNK/BLK
PNK/GRN
BLK/RED
BLK/ORN
ORN/BLU
BLU/YEL
BLU/WHT
RED/YEL
LT GRN/RED
RED/GRN
BLK
YEL/BLK
J/C
"B-5"
"D-4"
"D-5"
I5JB0B910960-01



I5JB0A910949-06


Ⓐ RHD
Ⓑ LHD
Ⓒ 2-Action
Ⓓ 1-Action
Horn relay
"B-7"
BLU
E78 17
G05
BLU
G76 B
J/C
B B
BLU BLU
Steering switch (Horn)
"B-7"
G31 15
IF EQPD
Headlight LO relay
"D-1"
Diode #1
"D-1"
RB RB
RED/BLU
E74 13
G36
RED/BLU
16
BCM
Ⓒ
Ⓓ
G32 7
BLU/WHT
8 BLU
9 BLU/BLK
2 BLU/YEL
3 BLU/RED
Ⓐ G08 L09 Ⓑ G72 L27
Ⓐ 9 Ⓑ 7 G08 L09 4
G72 L27 2
Ⓐ G72 L27 Ⓑ G08 L09
Ⓐ 7 Ⓑ 9
G08 L09 5
BLU/RED
BLU/YEL
BLU BLU/RED
BLU/YEL BLU/RED
L07 J01 12 6
L13 J16 10or5 19or14
L42 O01 12 11
L31 J09 12 6
L37 J21 10 19
BW BR
B BR
BB BR
BY BR
BY BR
Rear end door lock motor
"B-5"
Front
Front
Rear
Rear
Motor (R)
"B-5"
Motor (L)
"B-5"
Motor
"B-5"
Motor
"B-5"
I5JB0A910996-04

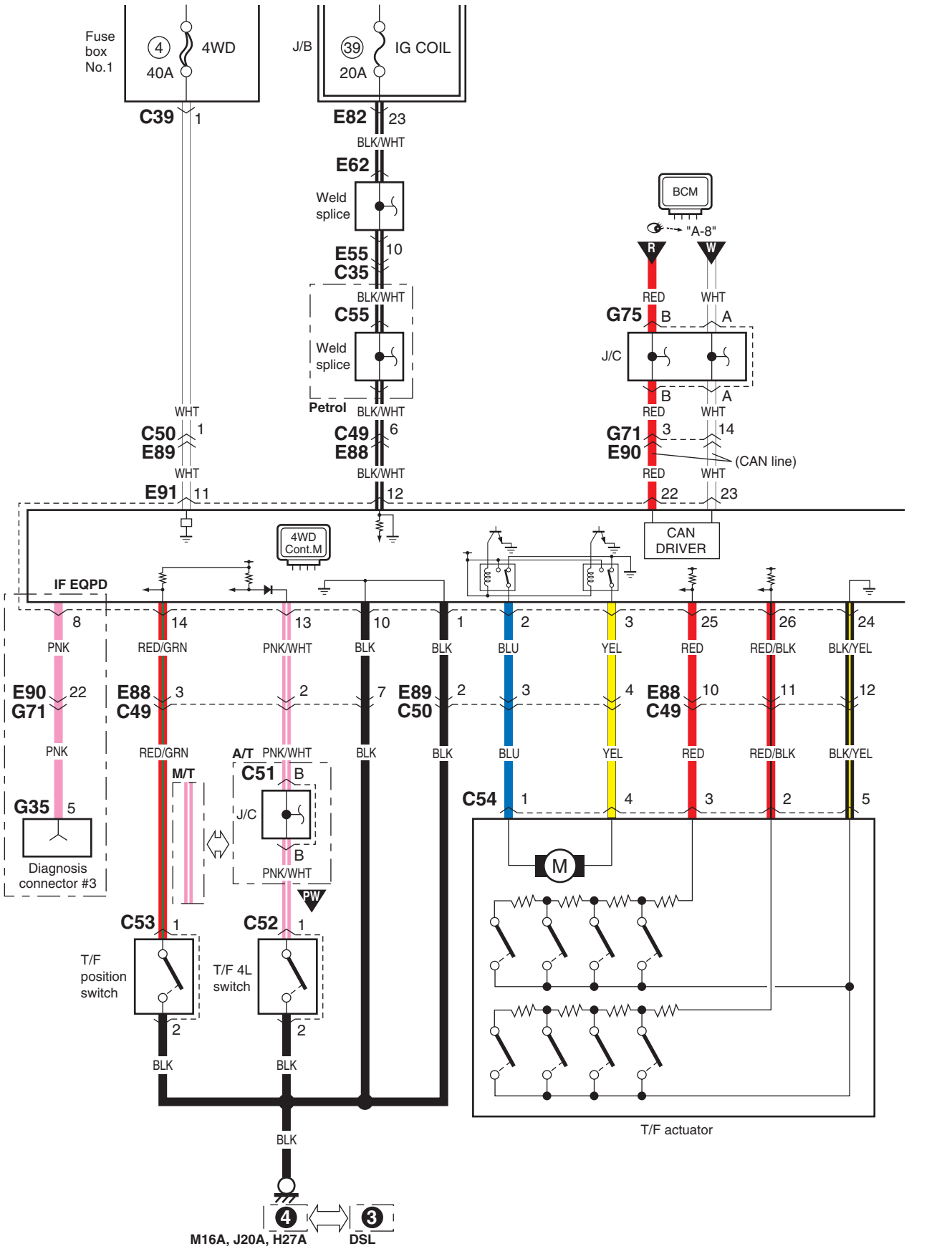
Ⓐ Without seat heater
Ⓑ With seat heater
Ⓒ RHD
Ⓓ LHD
Ⓔ J20A, H27A, DSL
Ⓕ M16A
Ⓖ LHD without Rear fog light



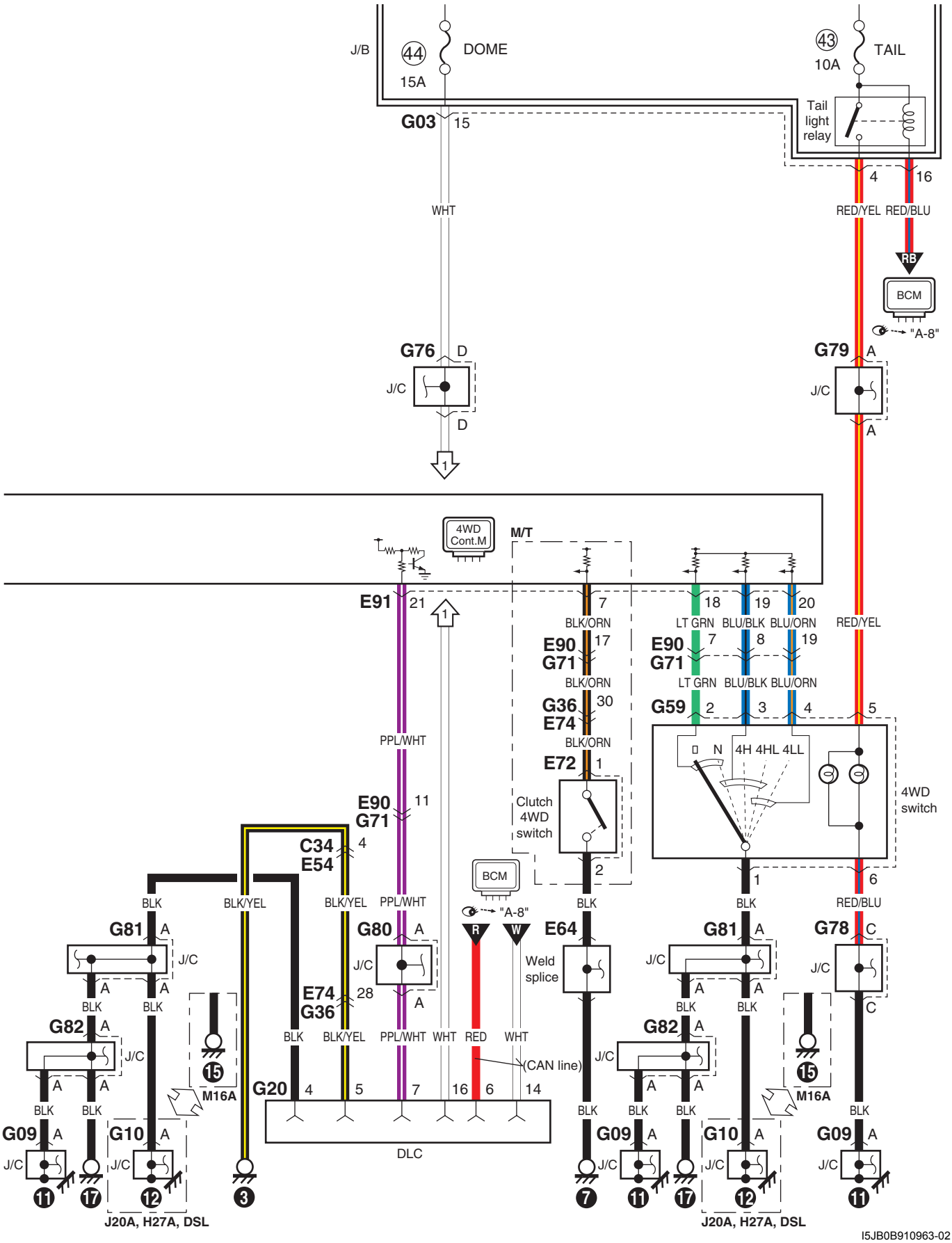
I5JB0B910961-01

A-10 4WD Control System Circuit Diagram

S5JB0B910E012



I5JB0B910962-05

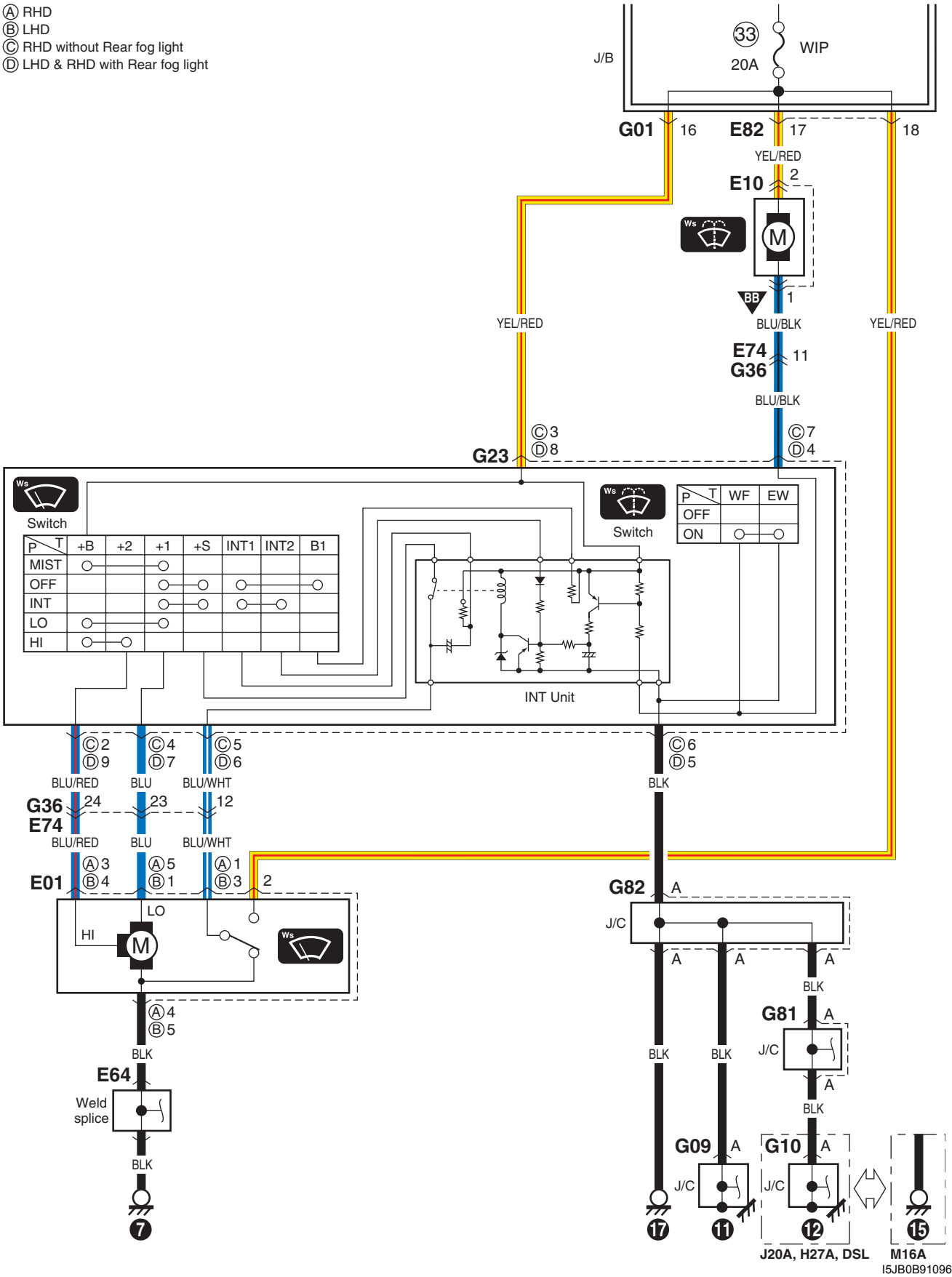


I5JB0B910963-02

B-1 Windshield Wiper and Washer Circuit Diagram

S5JB0B910E013

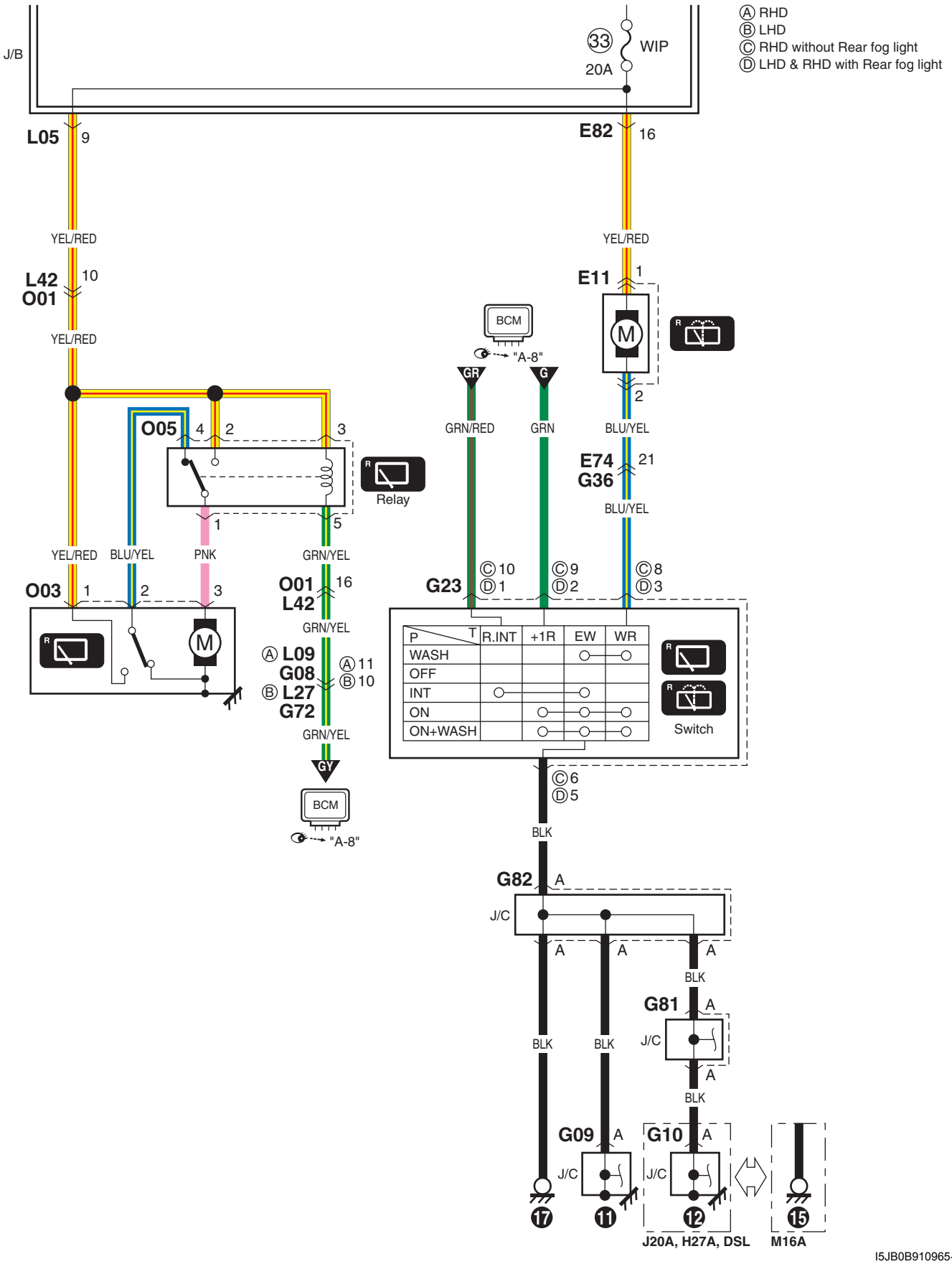
Ⓐ RHD
Ⓑ LHD
Ⓒ RHD without Rear fog light
Ⓓ LHD & RHD with Rear fog light



I5JB0B910964-02

B-2 Rear Wiper and Washer Circuit Diagram

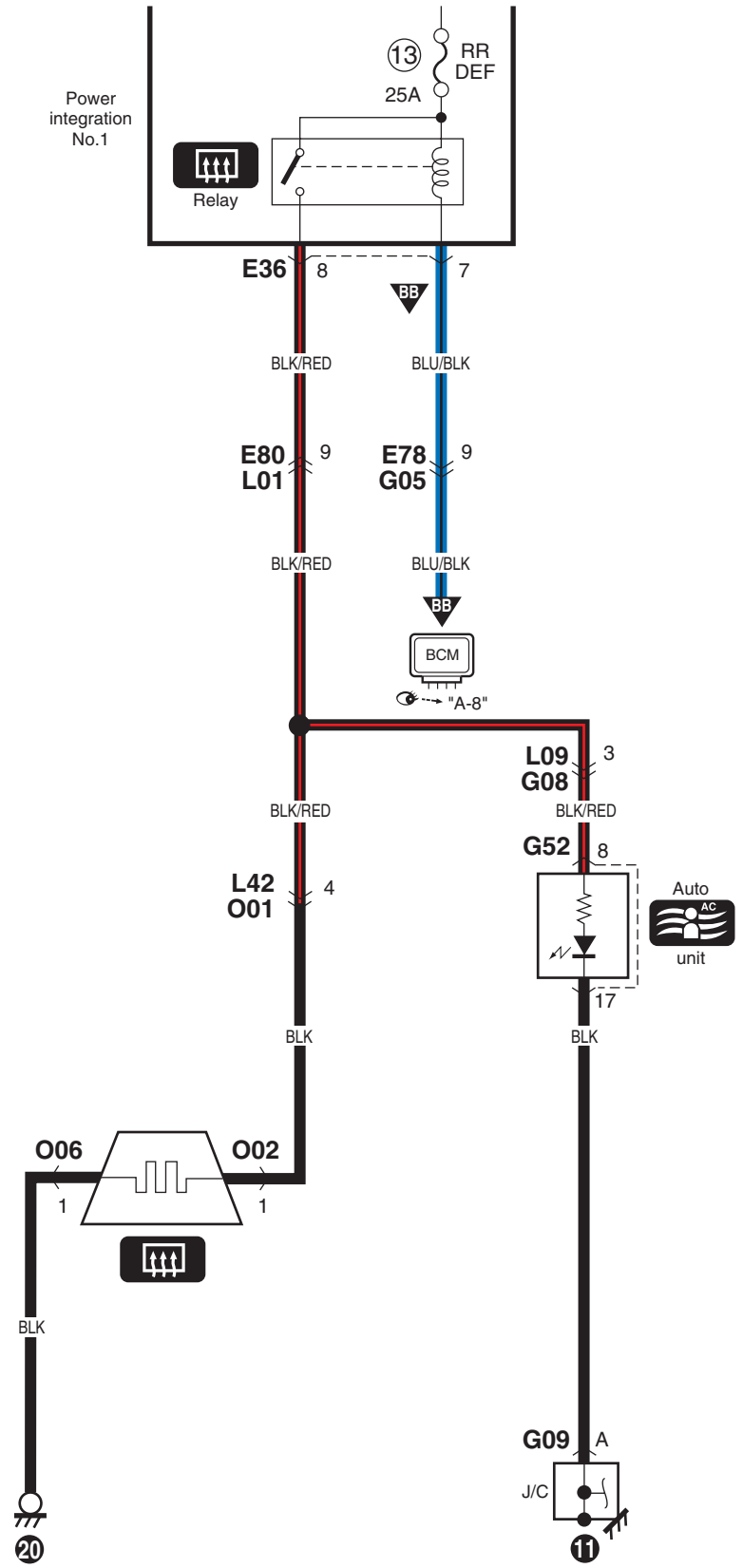
S5JB0B910E014



I5JB0B910965-01

B-3 Rear Defogger Circuit Diagram

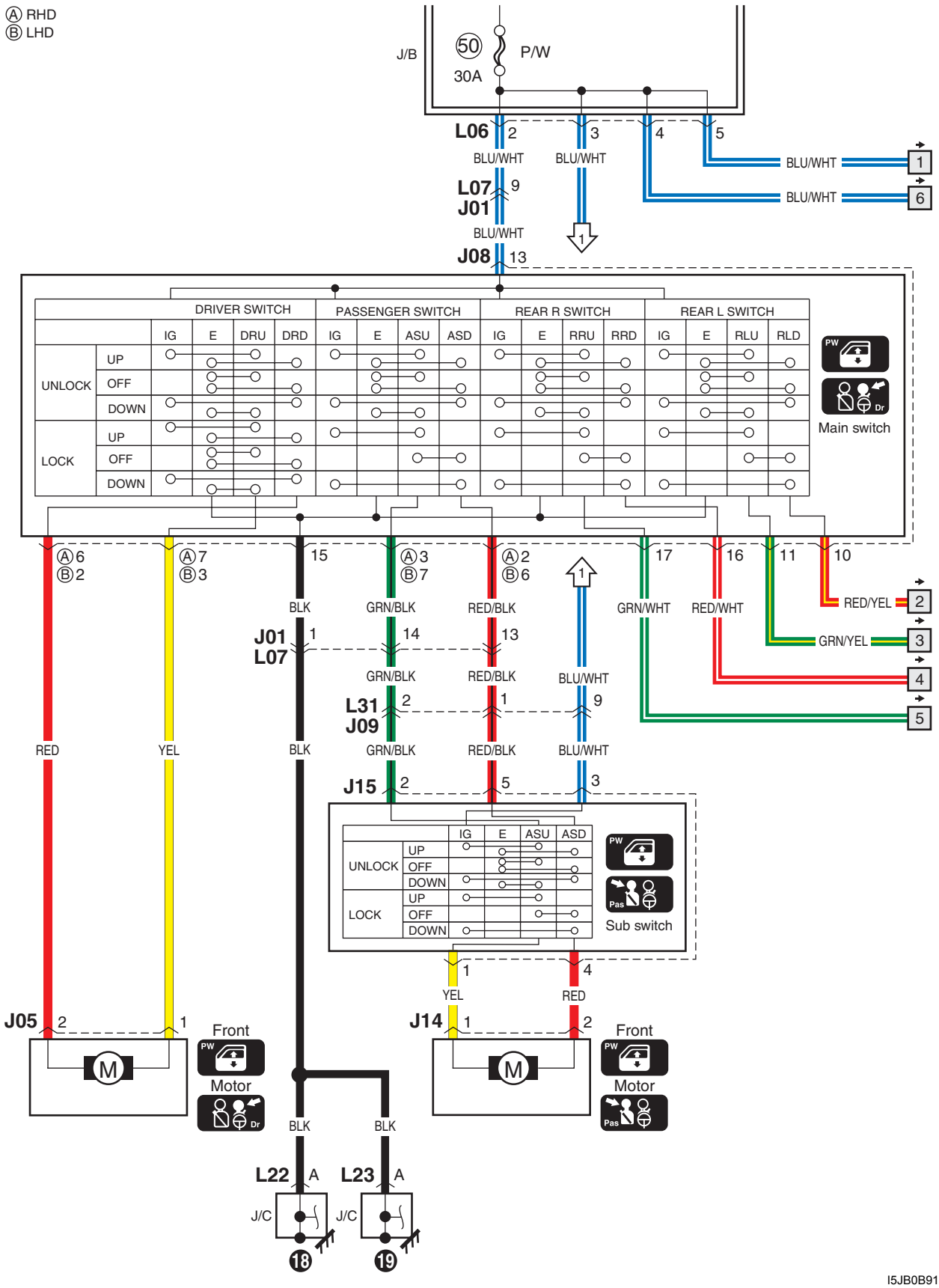
S5JB0B910E015



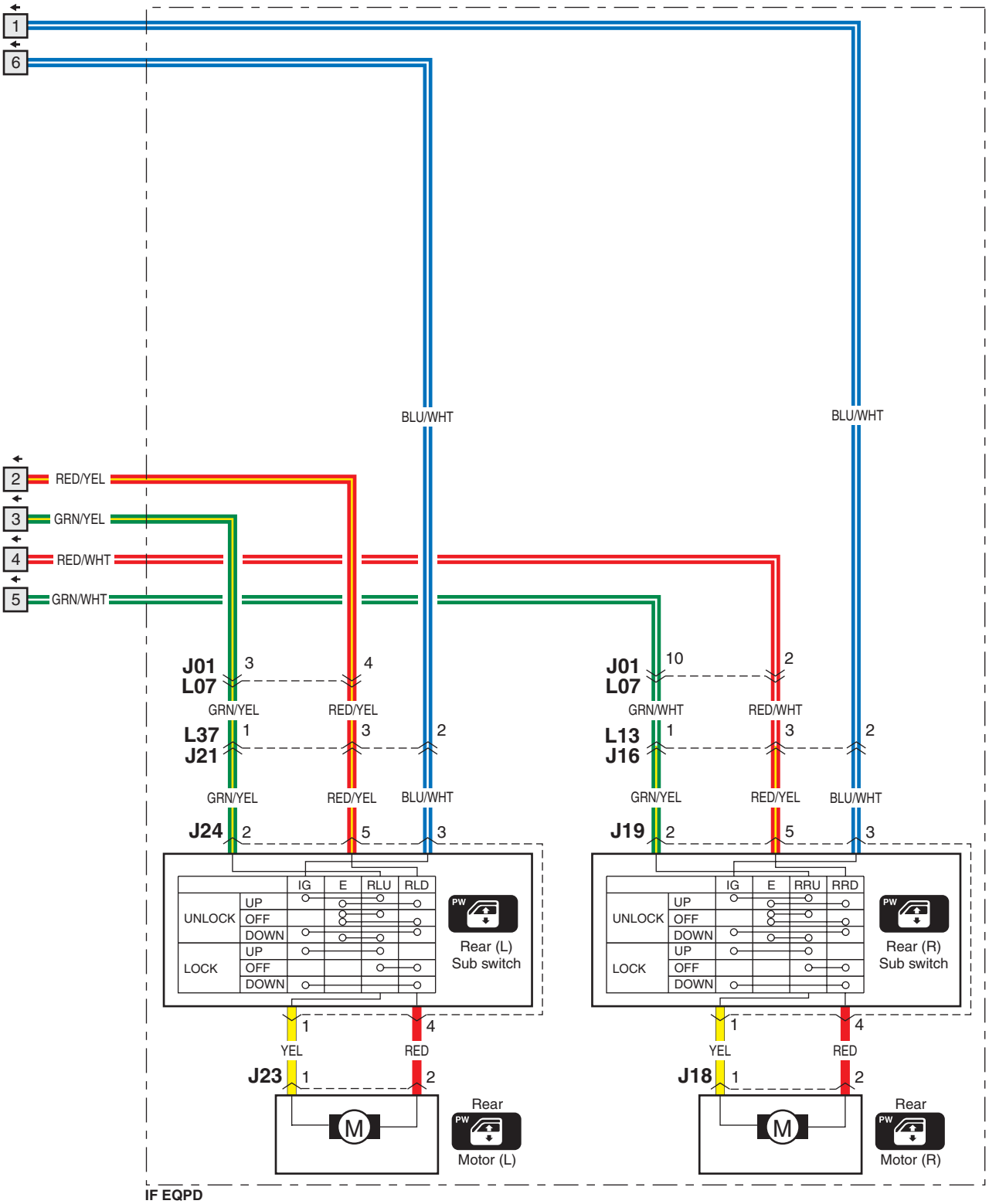
I5JB0A910955-05

B-4 Power Window Circuit Diagram

S5JB0B910E016



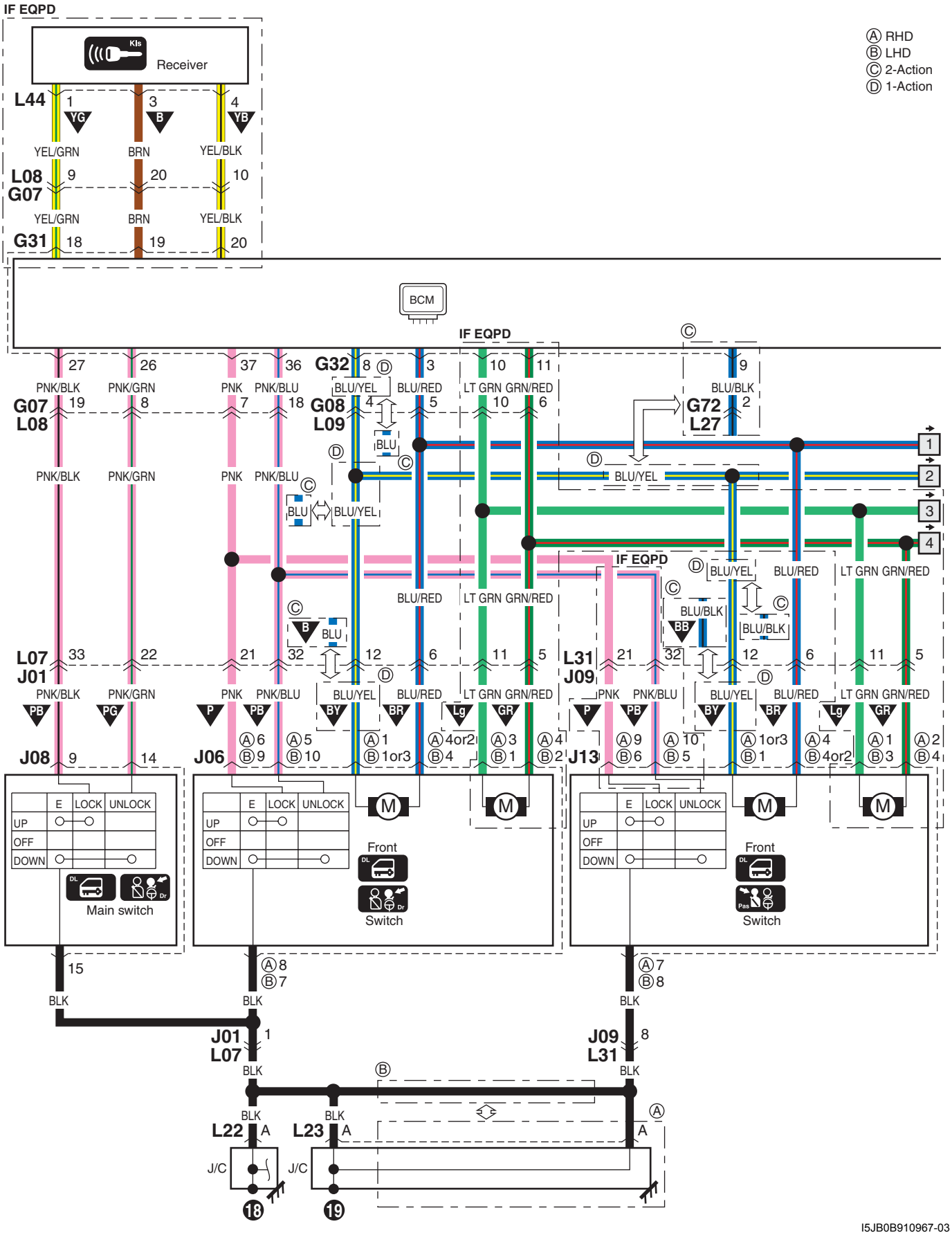
I5JB0B910966-01



I5JB0A910957-03

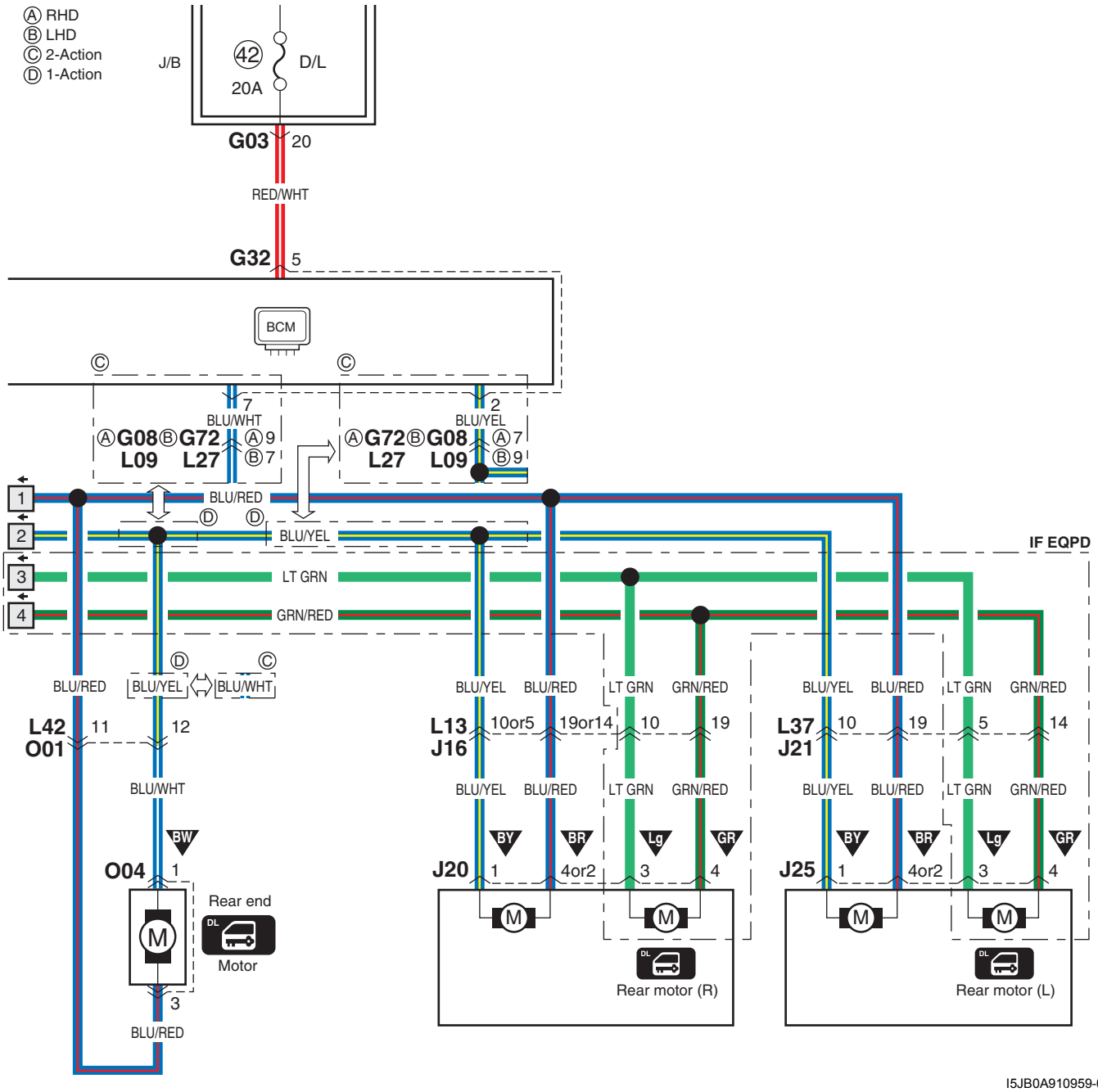
B-5 Power Door Lock Circuit Diagram

S5JB0B910E017



Ⓐ RHD
Ⓑ LHD
Ⓒ 2-Action
Ⓓ 1-Action

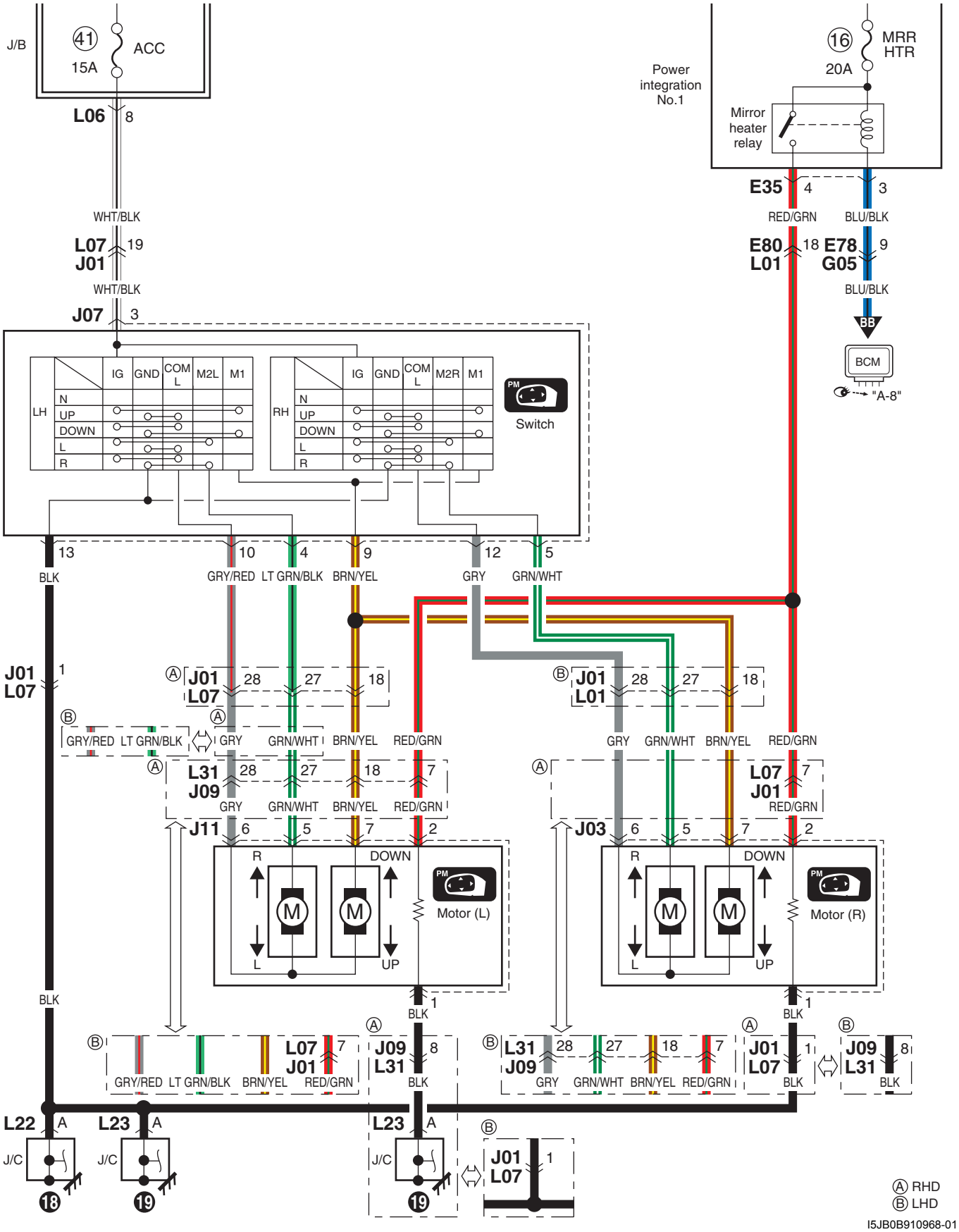
I5JB0B910967-03



I5JB0A910959-03

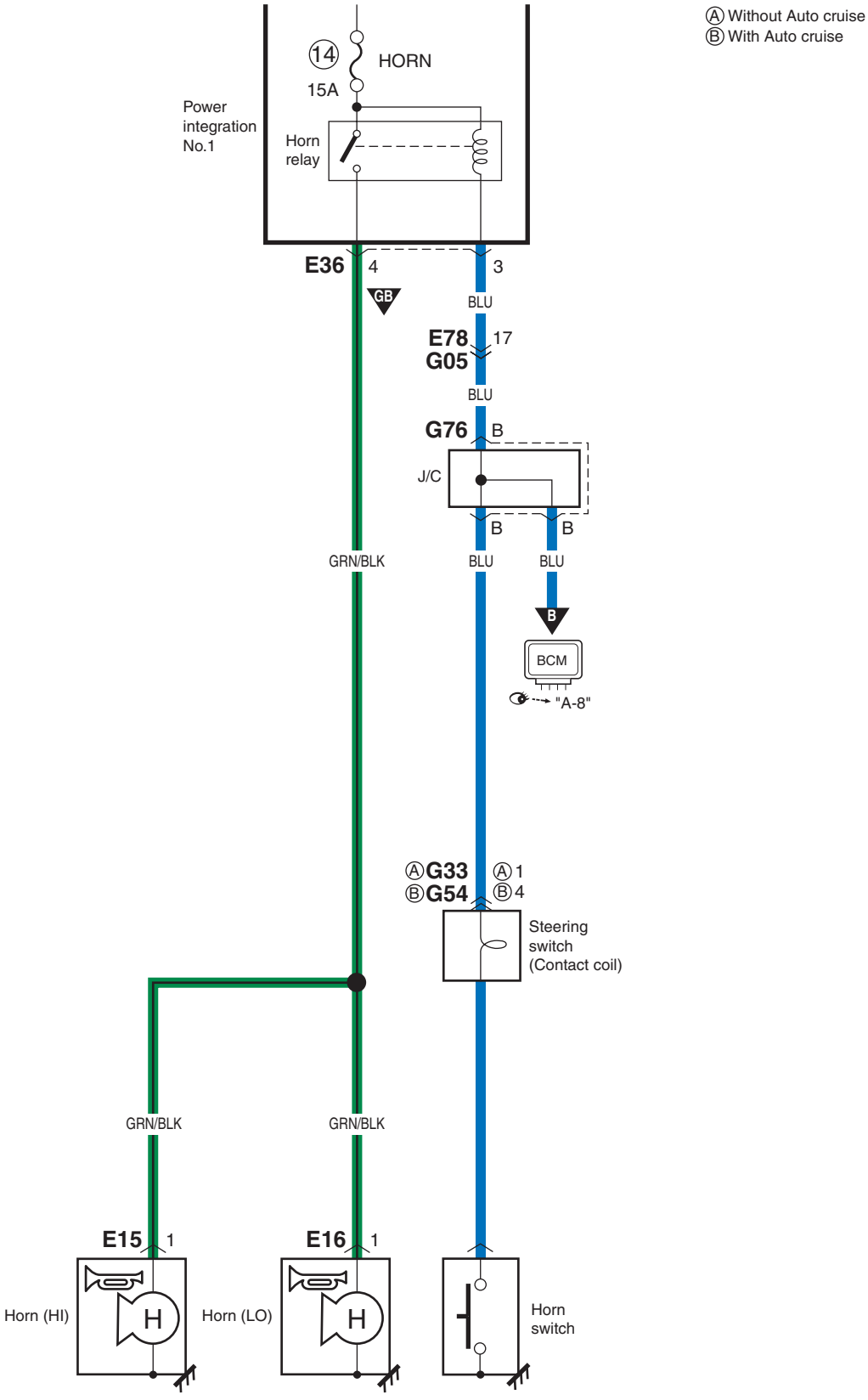
B-6 Power Mirror Circuit Diagram

S5JB0B910E018



B-7 Horn Circuit Diagram

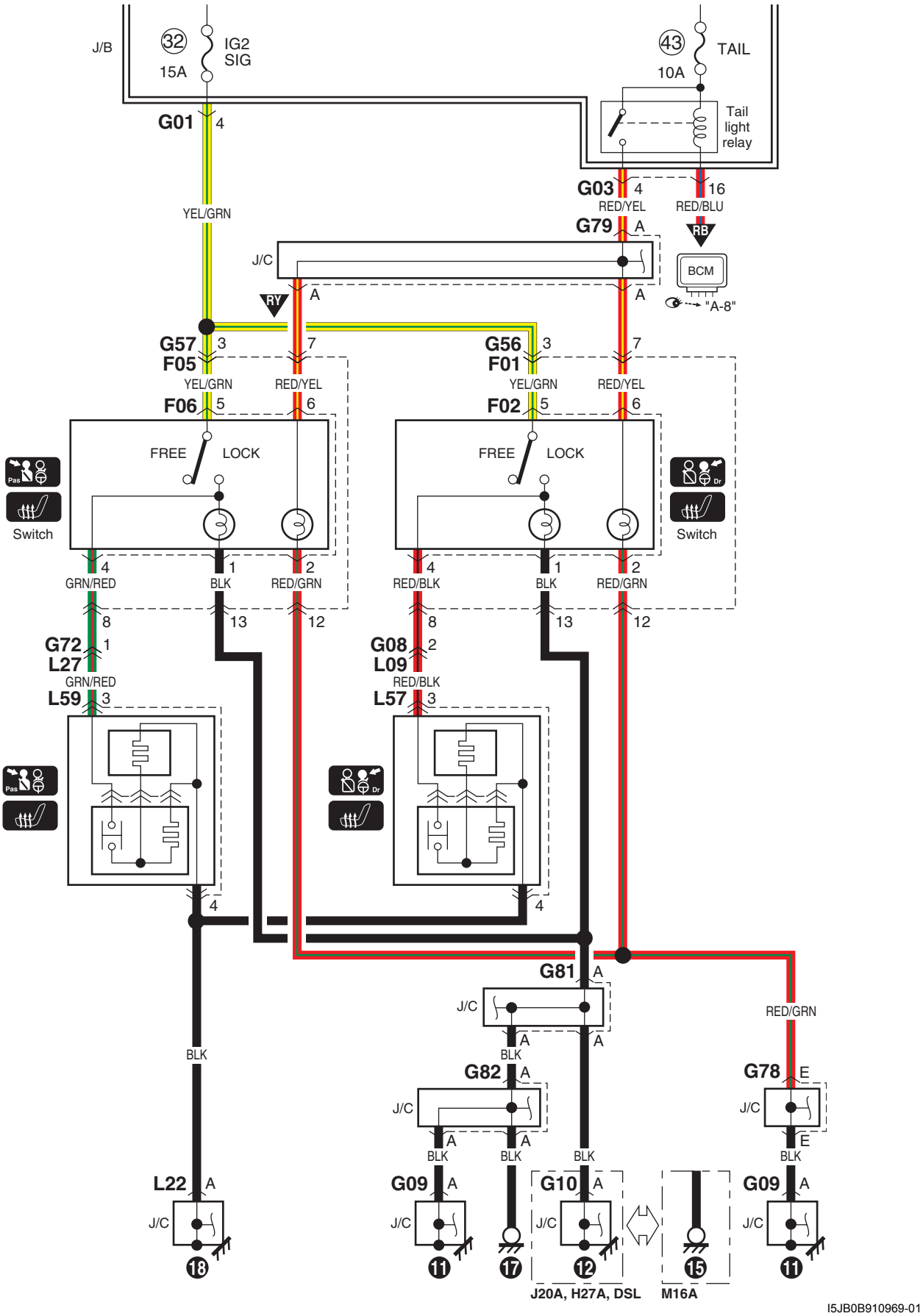
S5JB0B910E019



I5JB0B910996-01

B-8 Seat Heater Circuit Diagram

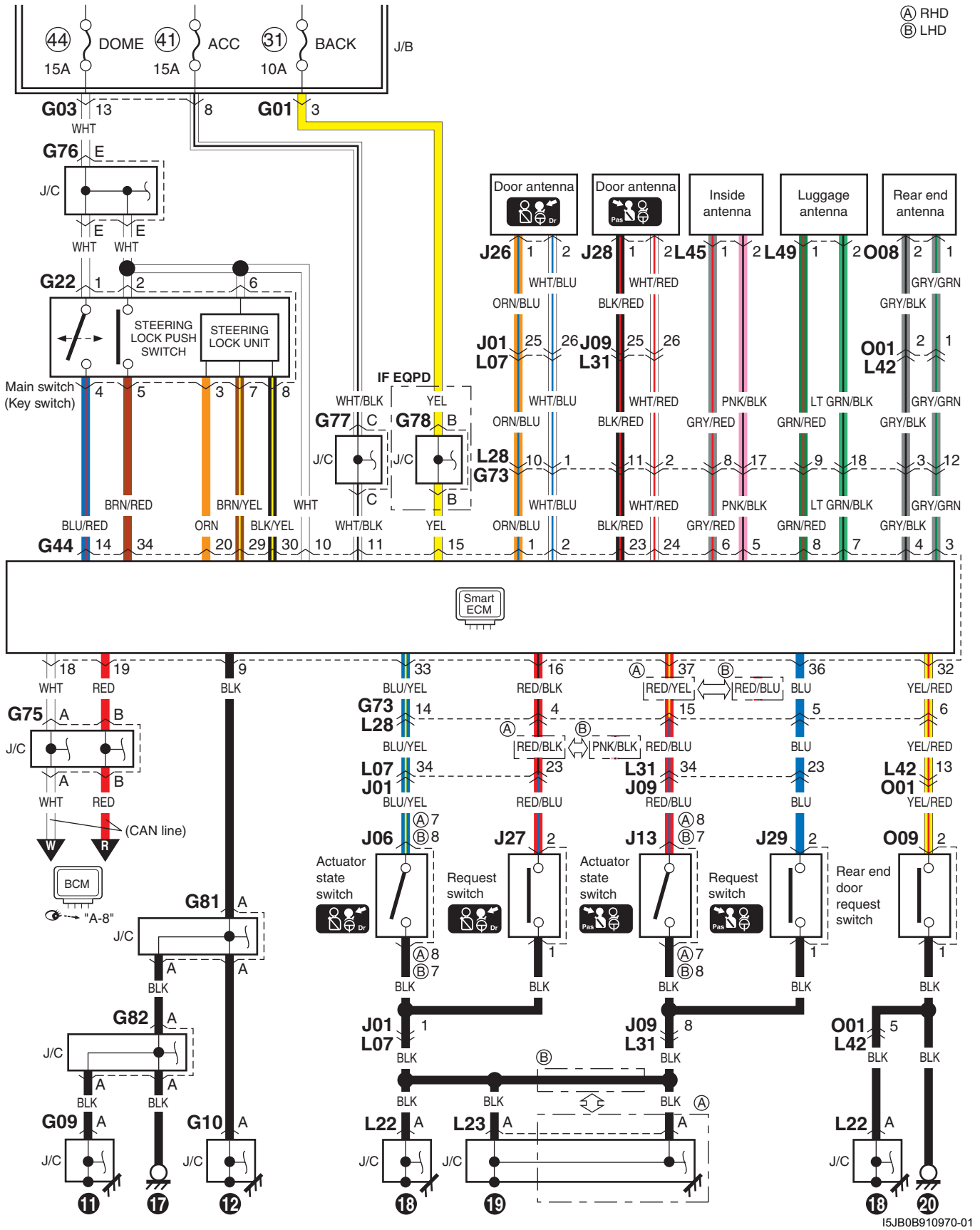
S5JB0B910E020



I5JB0B910969-01

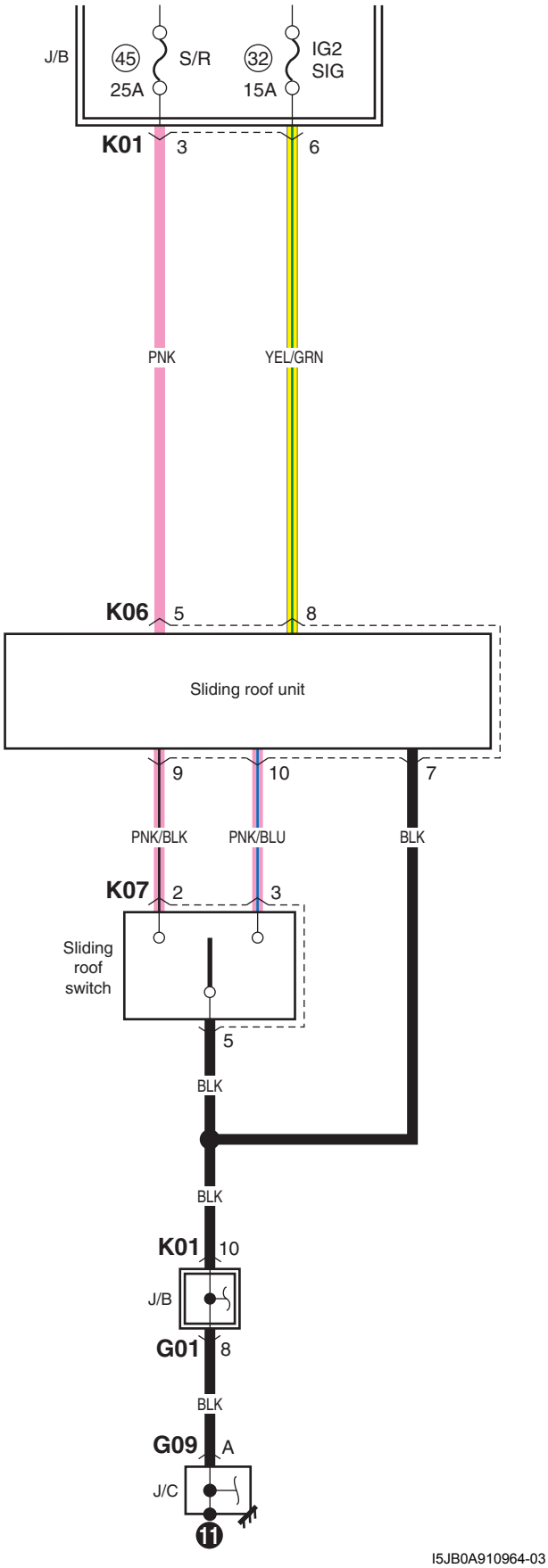
B-9 Smart Key System Circuit Diagram

S5JB0B910E021



B-10 Sliding Roof Circuit Diagram

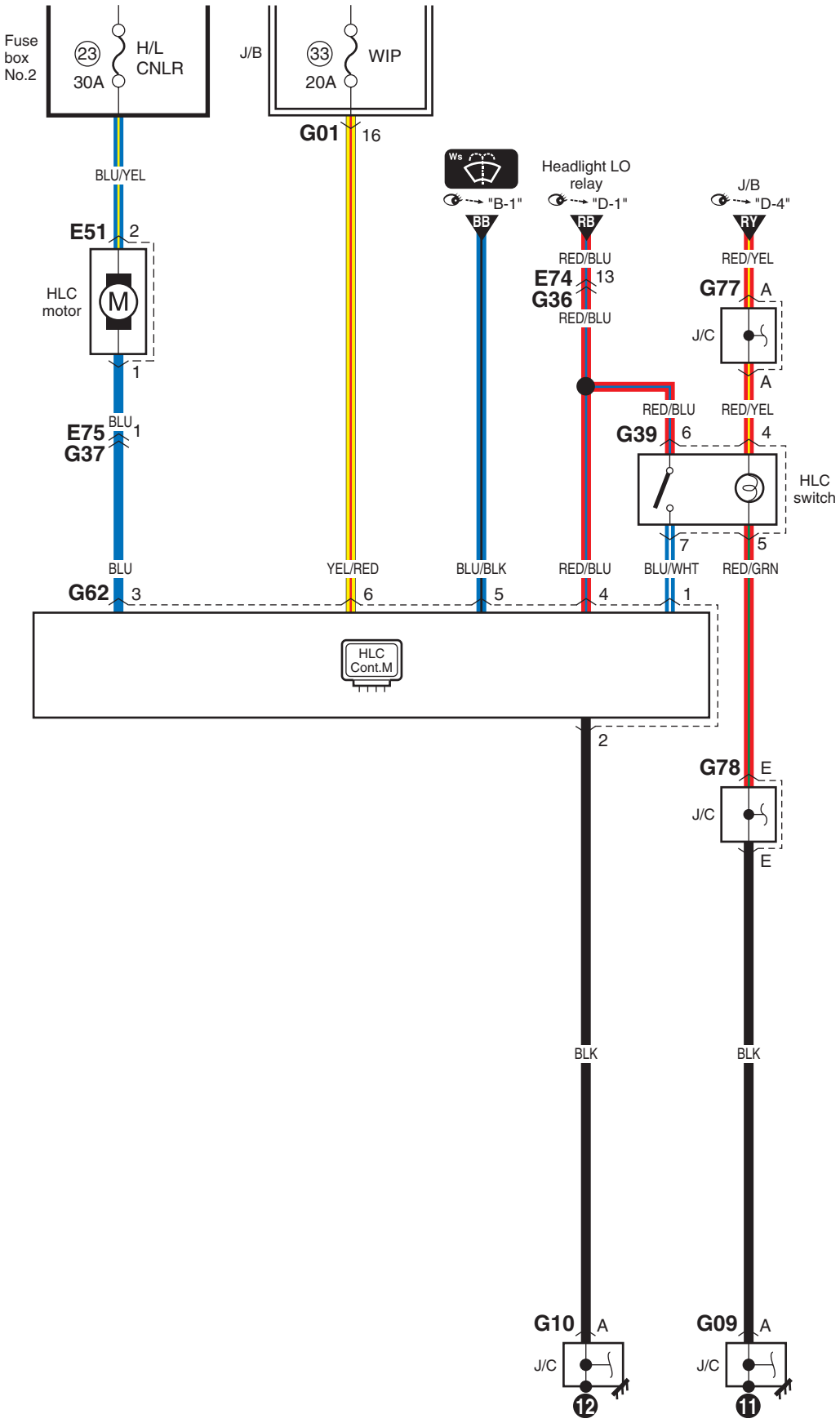
S5JB0B910E022



I5JB0A910964-03

B-11 Headlight Cleaner Circuit Diagram

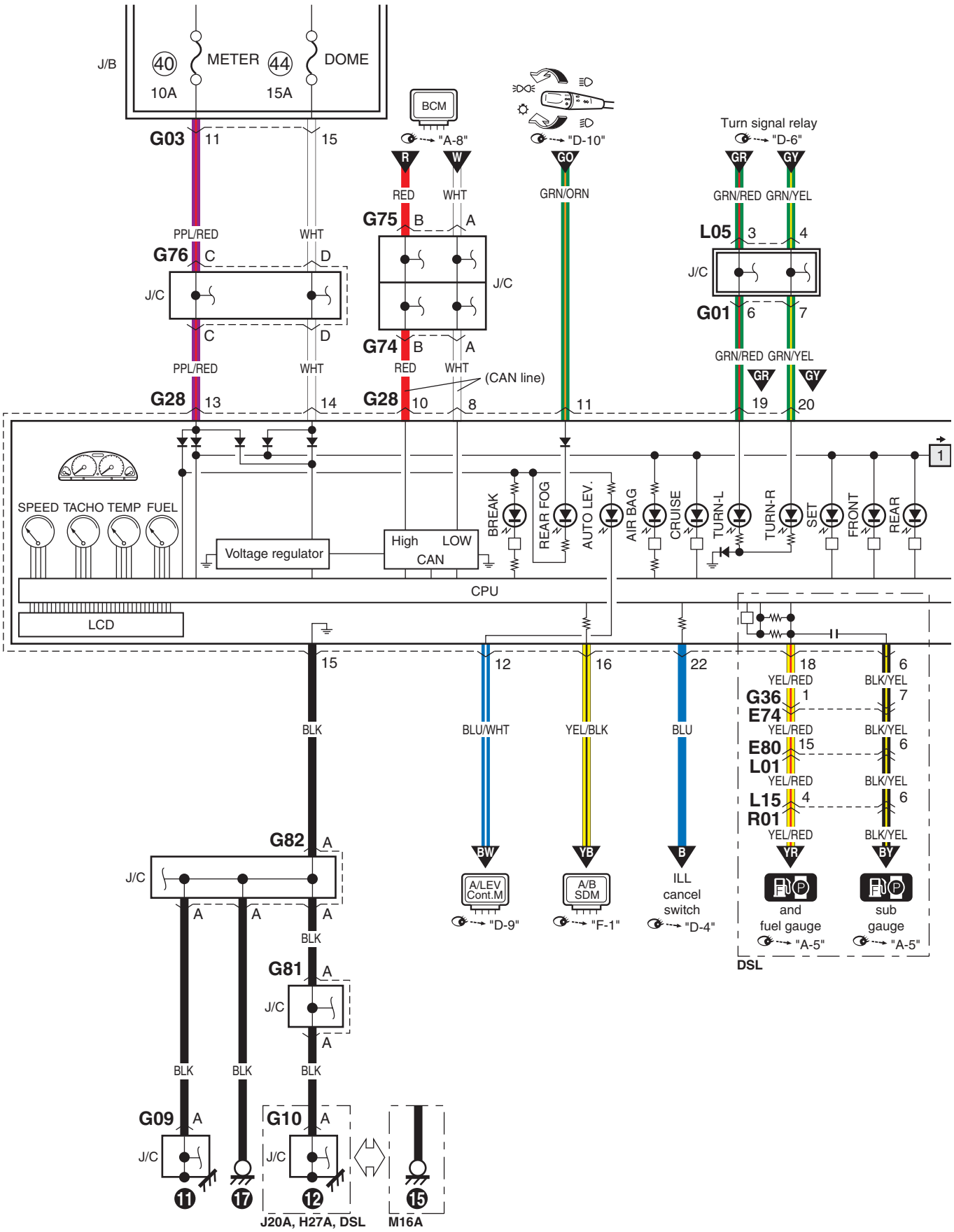
S5JB0B910E023



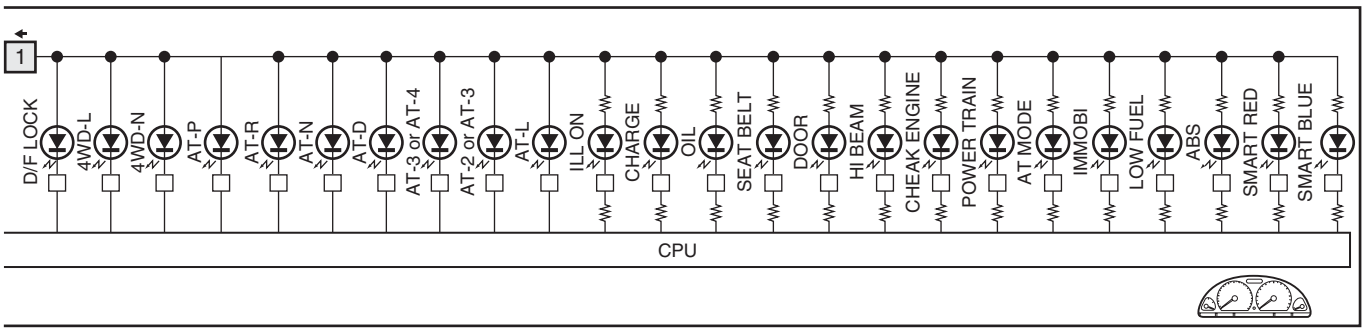
I5JB0A910965-08

C-1 Combination Meter Circuit Diagram

S5JB0B910E024

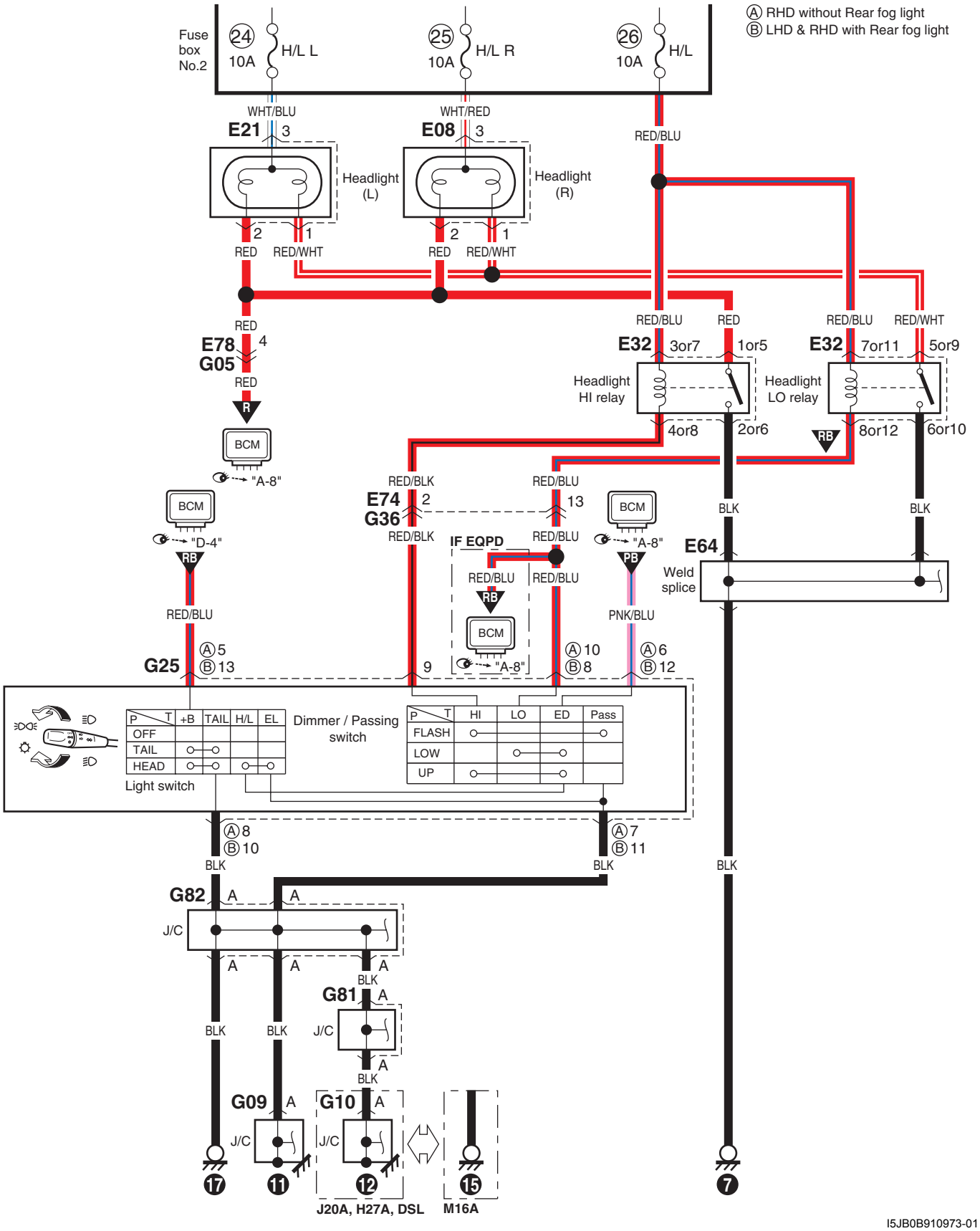


I5JB0B910971-04


1
D/F LOCK
4WD-L
4WD-N
AT-P
AT-R
AT-N
AT-D
AT-3 or AT-4
AT-2 or AT-3
AT-L
ILL ON
CHARGE
OIL
SEAT BELT
DOOR
HI BEAM
CHEAK ENGINE
POWER TRAIN
AT MODE
IMMOBI
LOW FUEL
ABS
SMART RED
SMART BLUE
CPU

D-1 Headlight System Circuit Diagram (One bulb type)

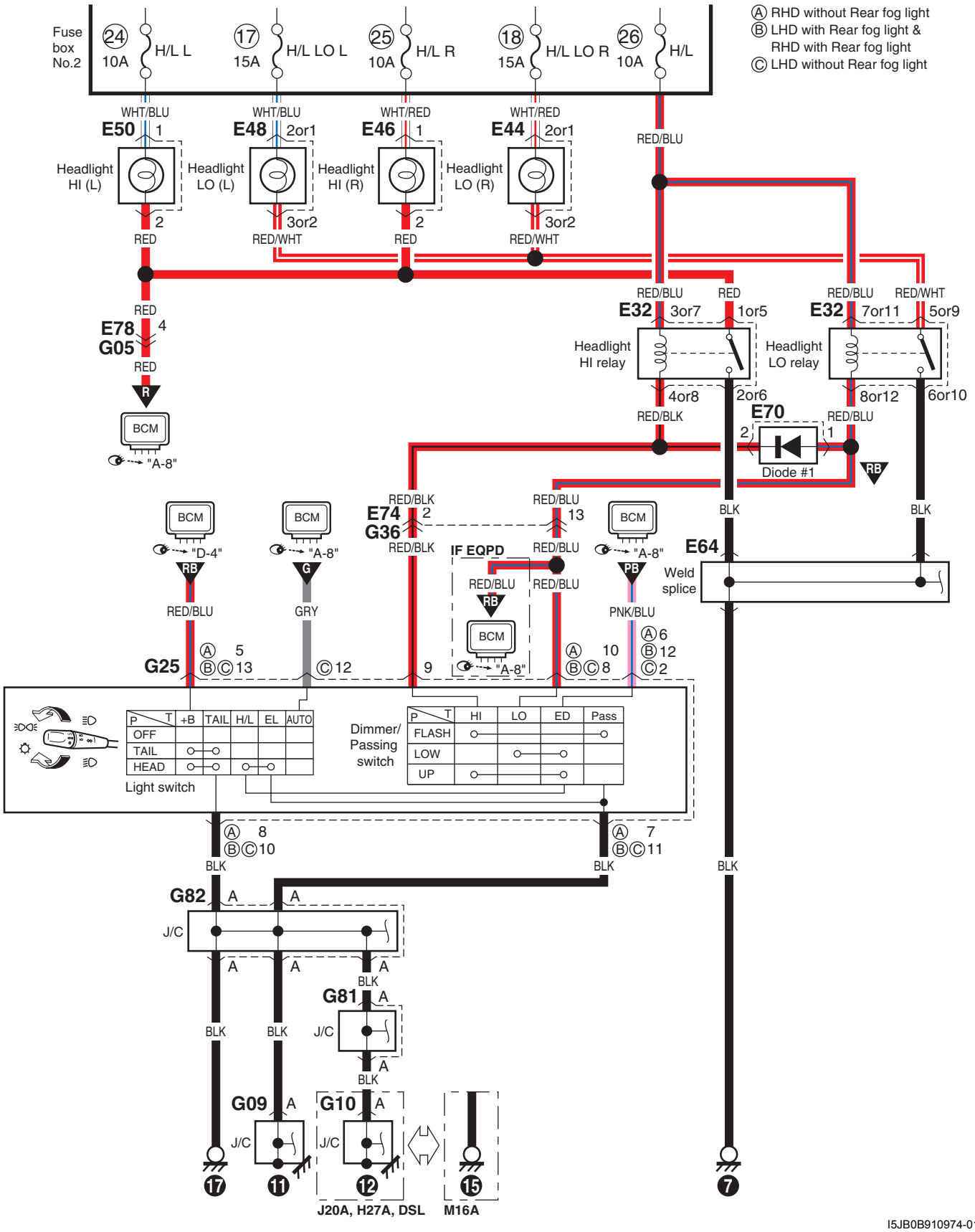
S5JB0B910E025



I5JB0B910973-01

D-1 Headlight System Circuit Diagram (With Projector light)

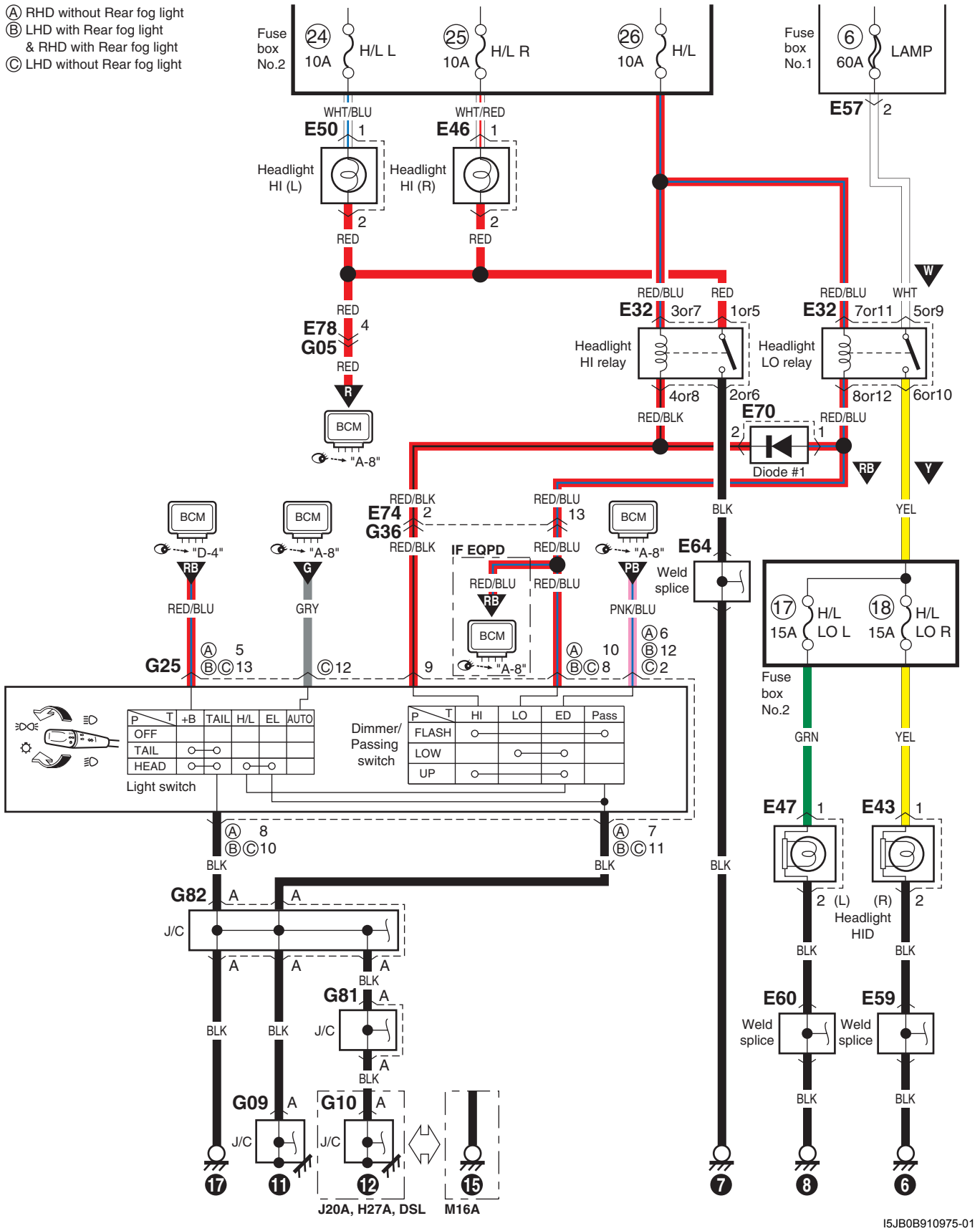
S5JB0B910E026



I5JB0B910974-01

D-1 Headlight System Circuit Diagram (With Discharge bulb)

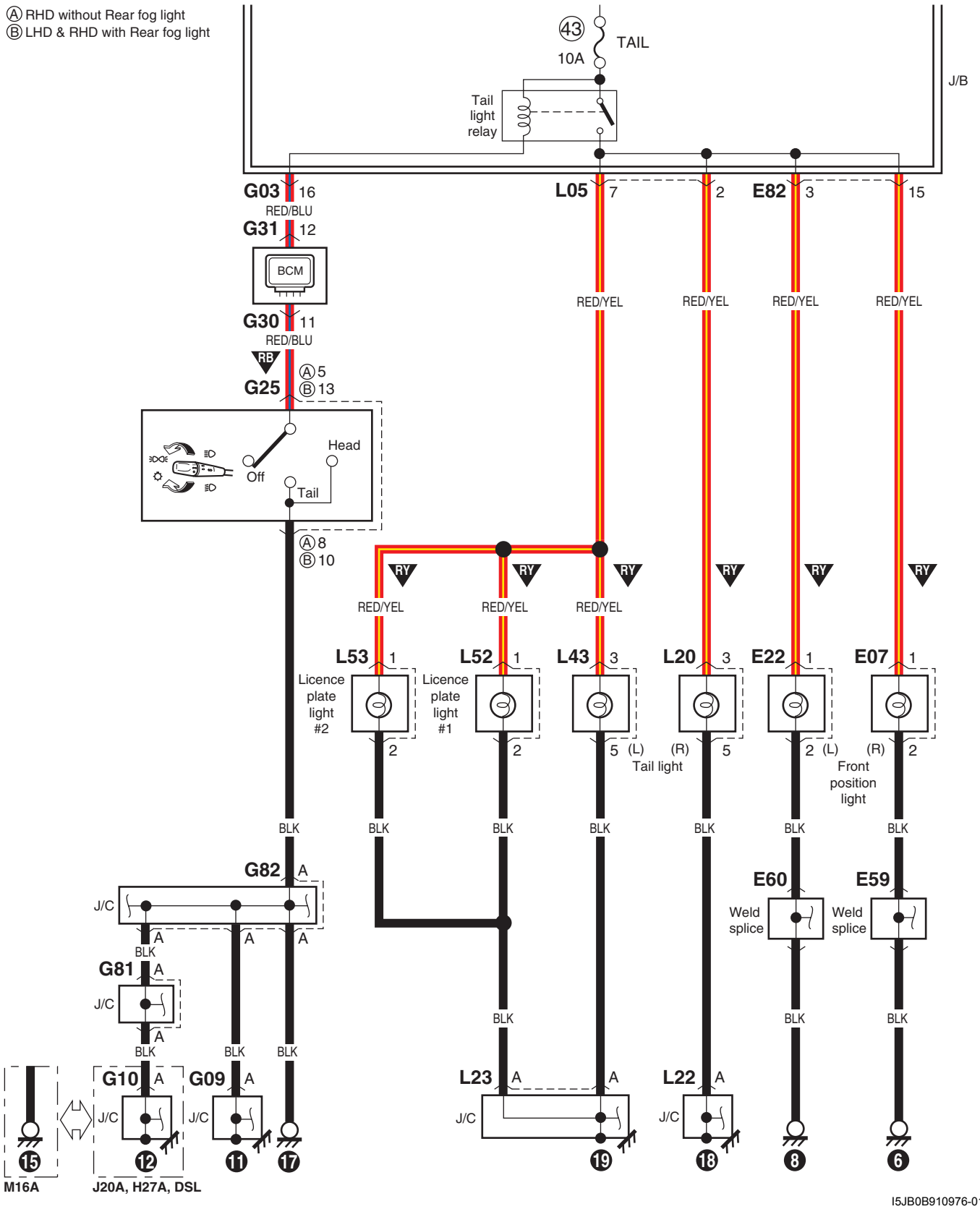
S5JB0B910E027



I5JB0B910975-01

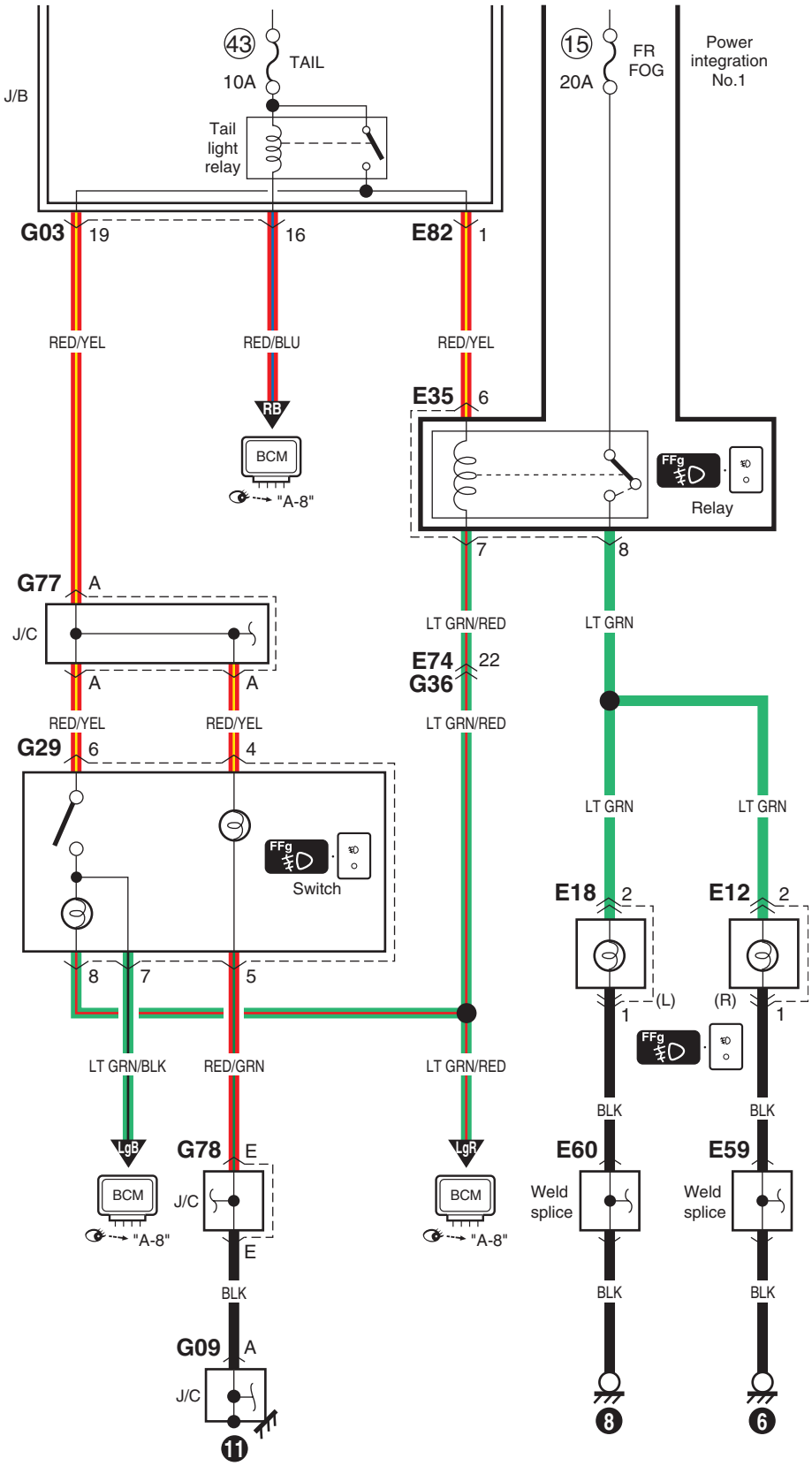
D-2 Position, Tail and Licence Plate Light System Circuit Diagram

S5JB0B910E028



D-3 Front Fog Light System Circuit Diagram

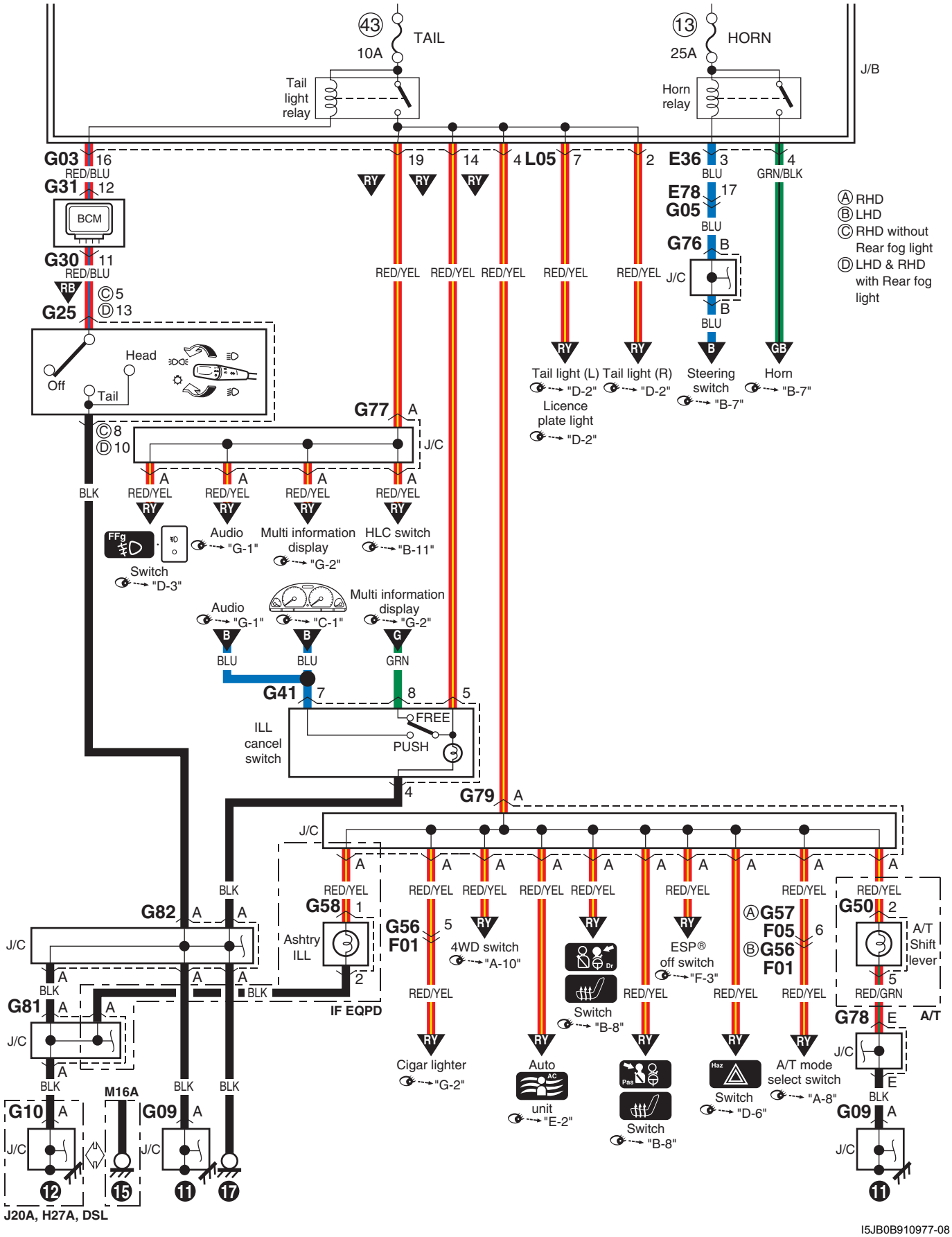
S5JB0B910E029



I5JB0A910972-07

D-4 Illumination Light System Circuit Diagram

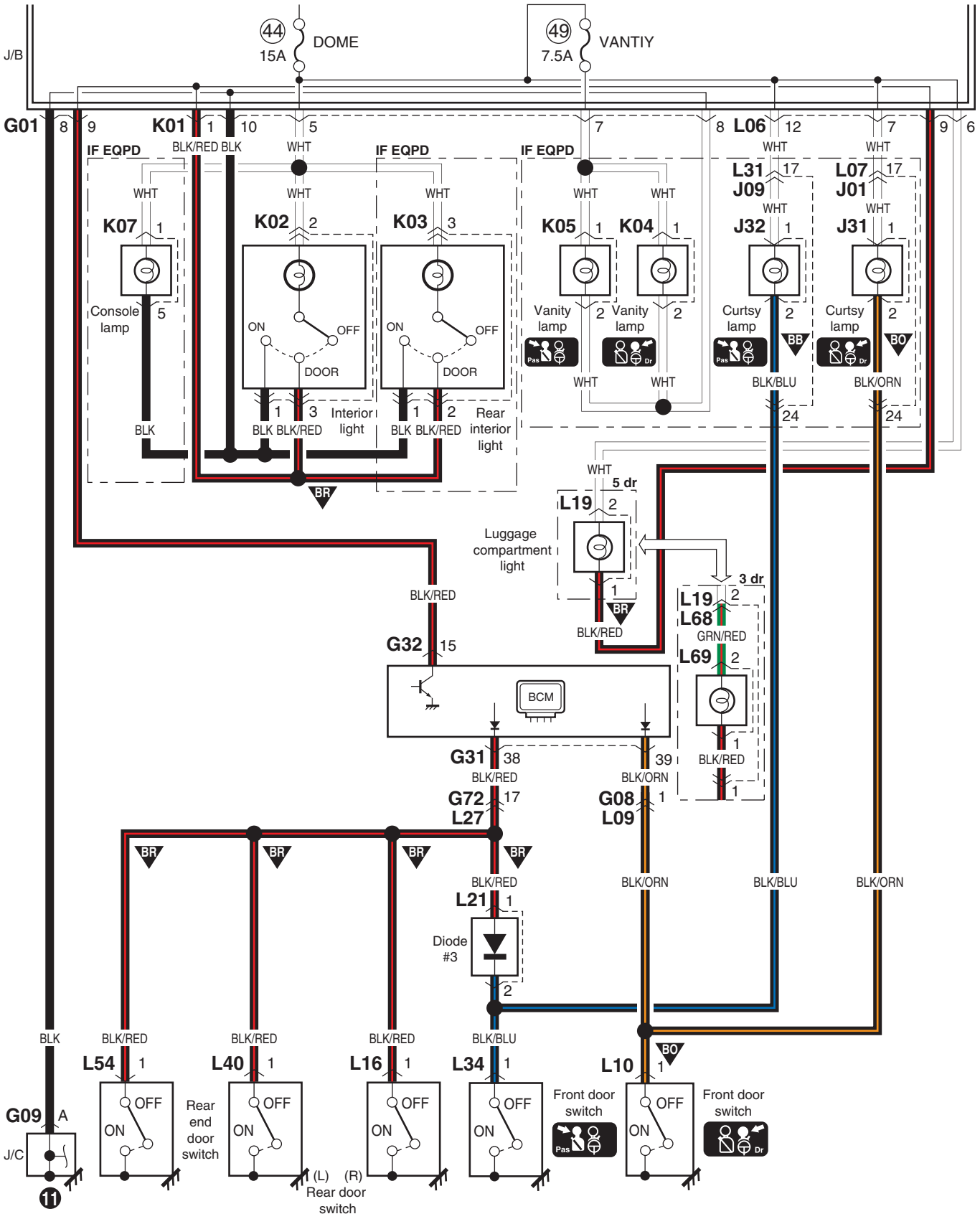
S5JB0B910E030



I5JB0B910977-08

D-5 Interior Light System Circuit Diagram

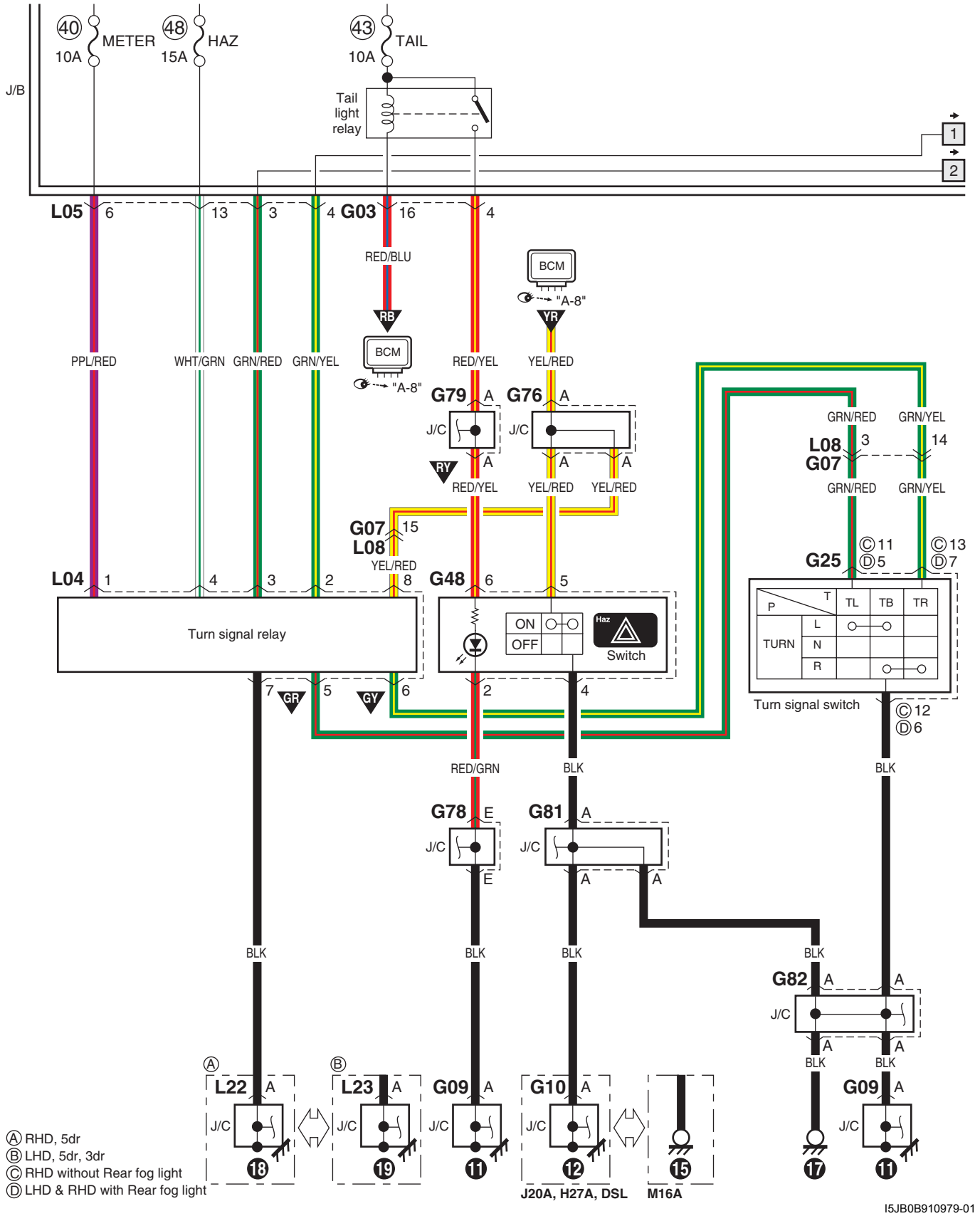
S5JB0B910E031



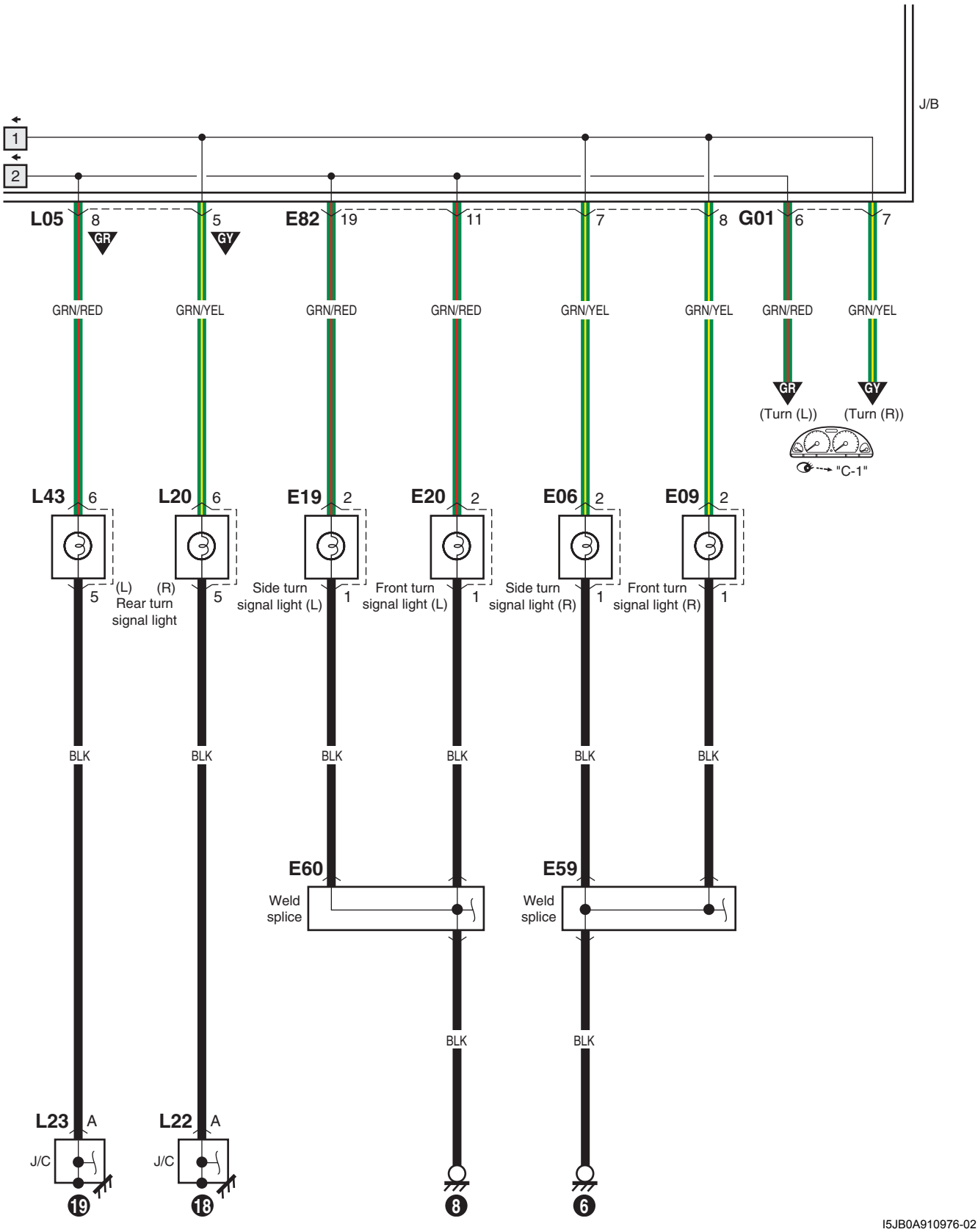
I5JB0B910978-01

D-6 Turn Signal and Hazard Warning Light System Circuit Diagram

S5JB0B910E032



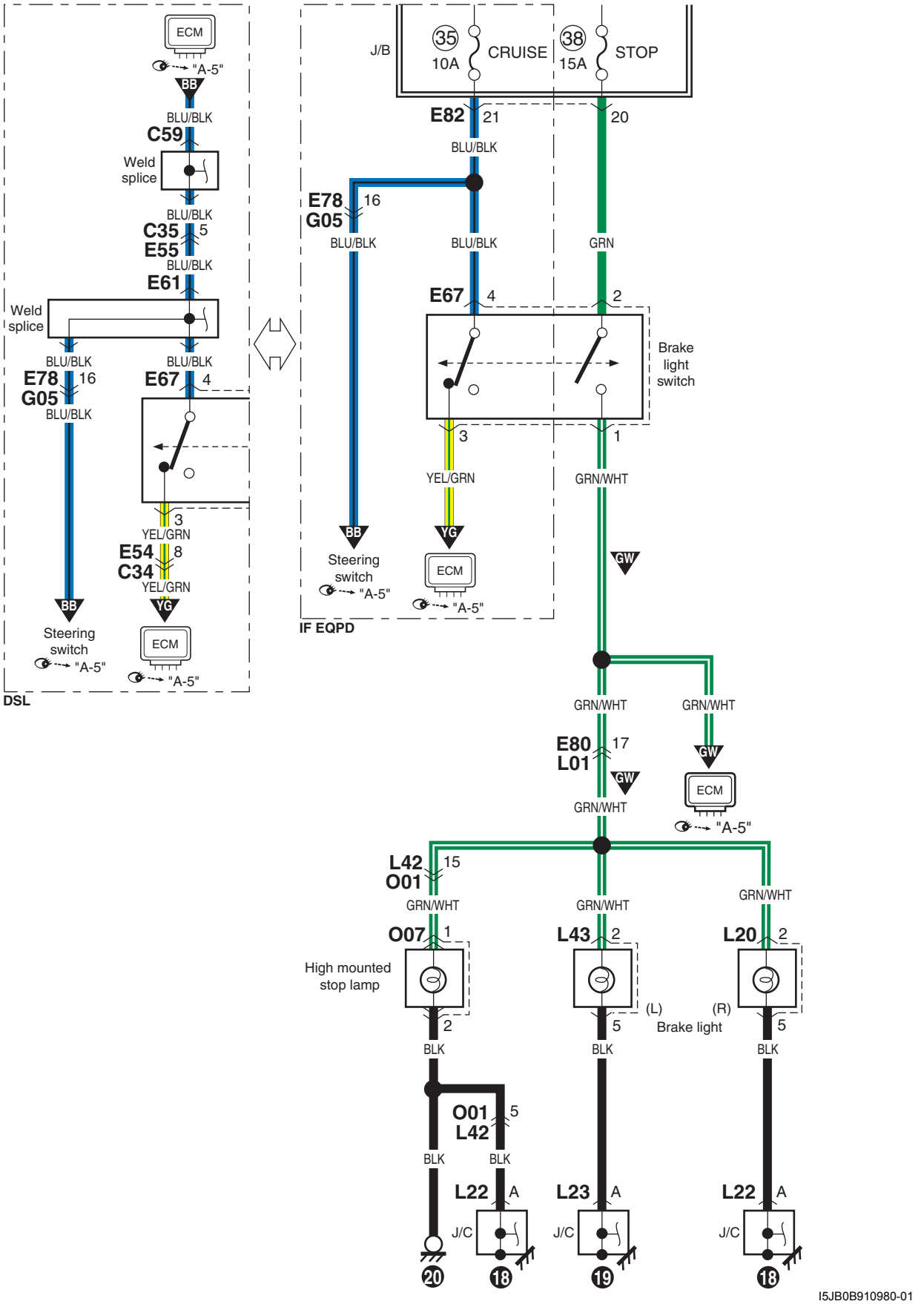
I5JB0B910979-01



I5JB0A910976-02

D-7 Brake Light System Circuit Diagram

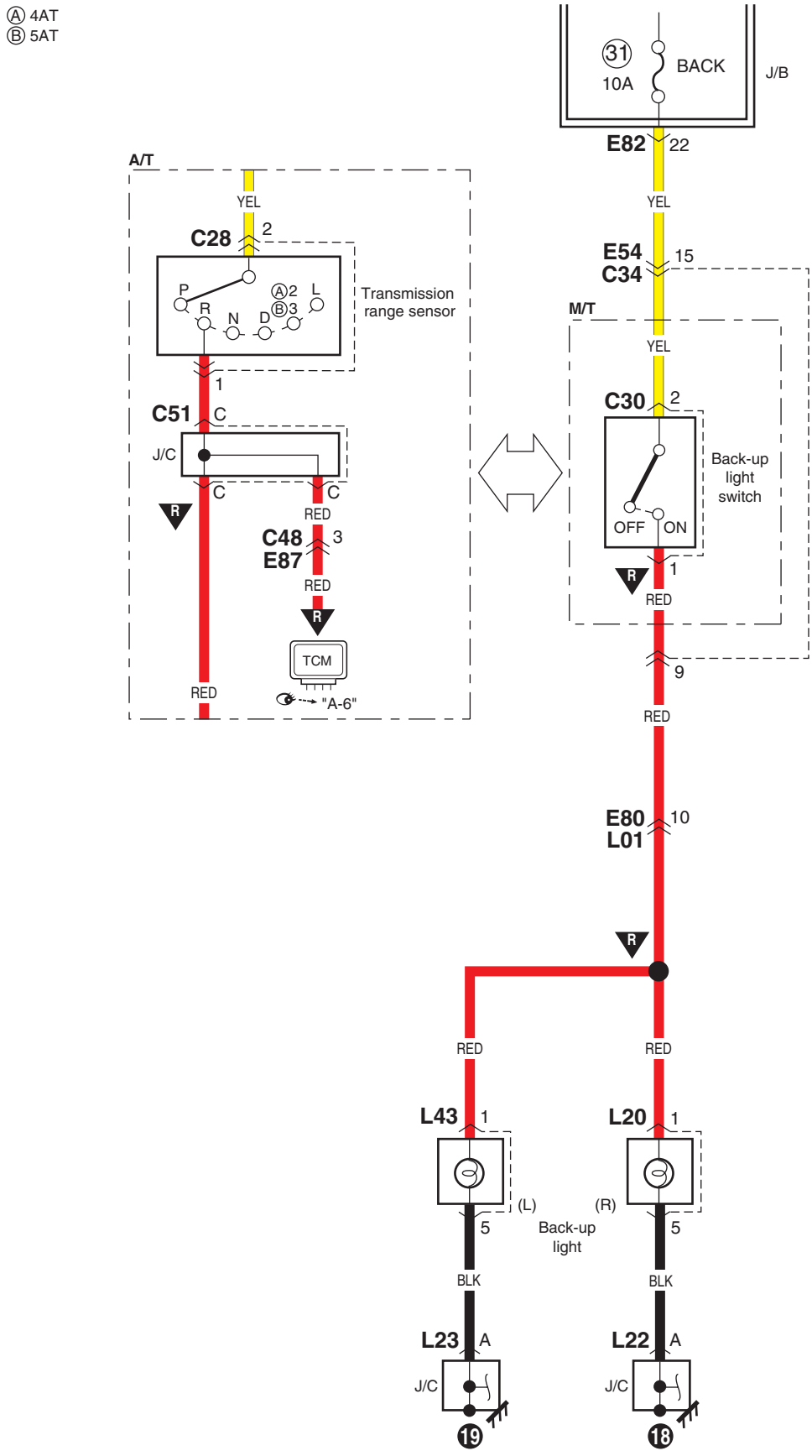
S5JB0B910E033



I5JB0B910980-01

D-8 Back-Up Light System Circuit Diagram

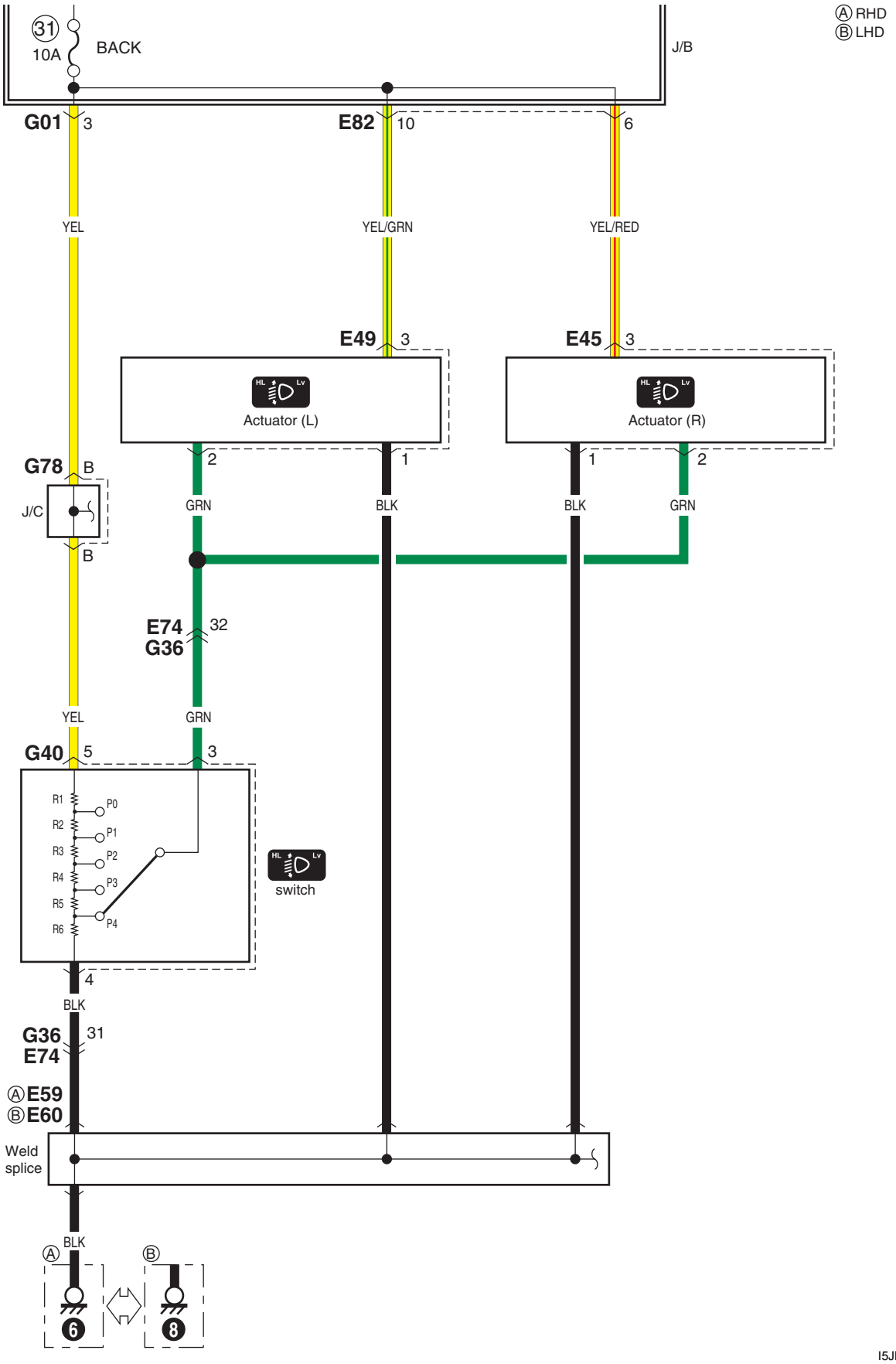
S5JB0B910E034



I5JB0B910981-01

D-9 Headlight Beam Leveling System Circuit Diagram (Manual Leveling)

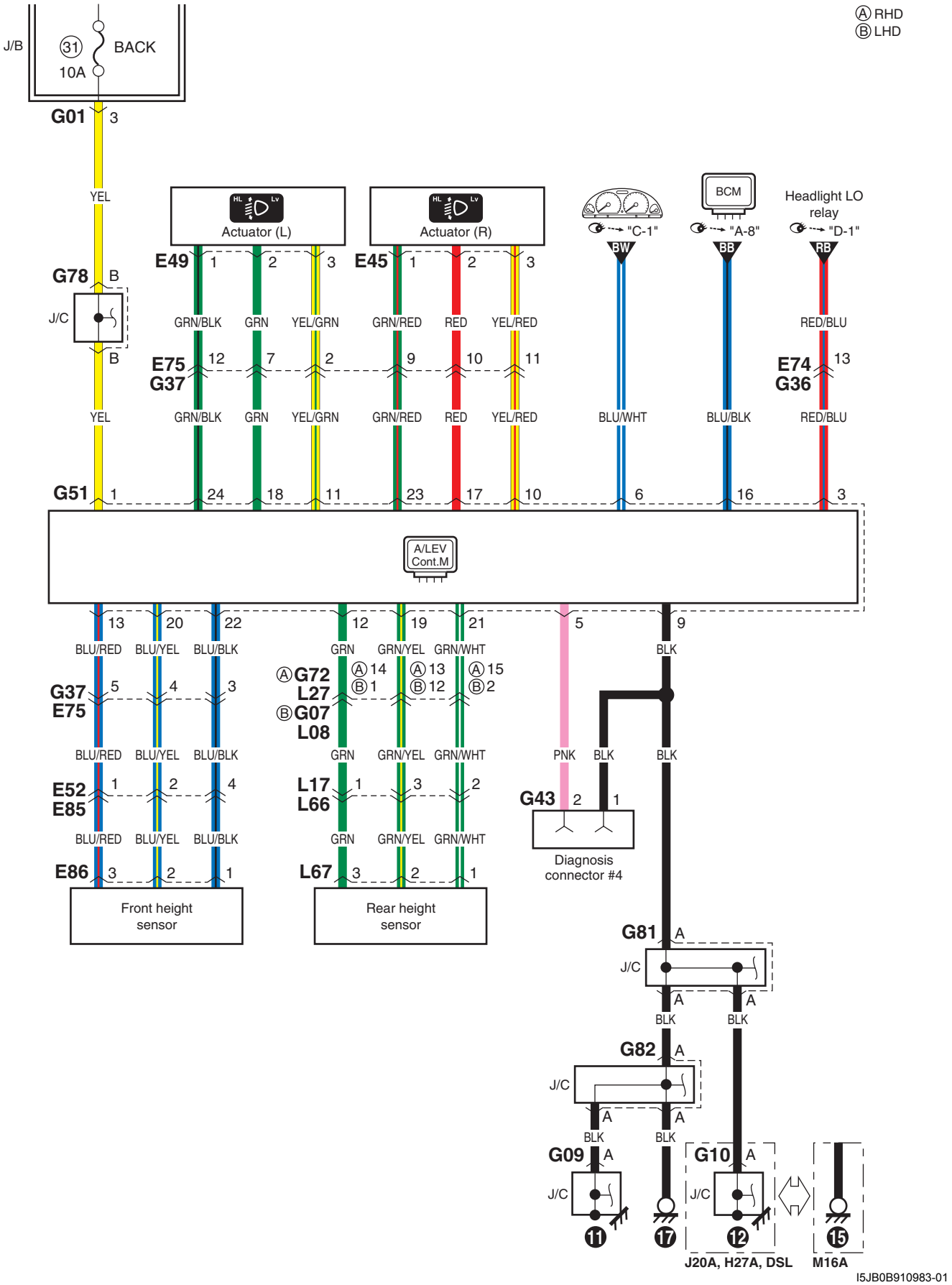
S5JB0B910E035



I5JB0B910982-01

D-9 Headlight Beam Leveling System Circuit Diagram (Auto Leveling)

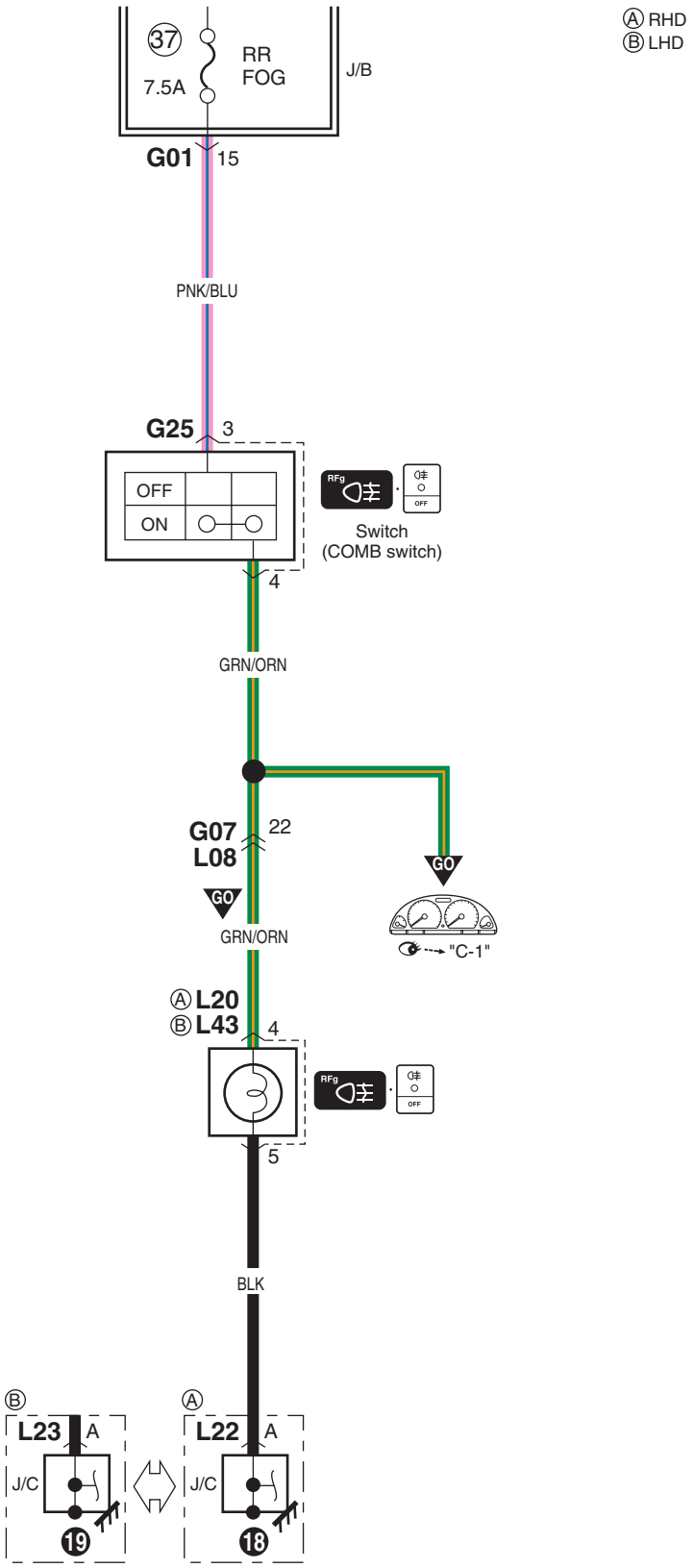
S5JB0B910E036



I5JB0B910983-01

D-10 Rear Fog Light Circuit Diagram

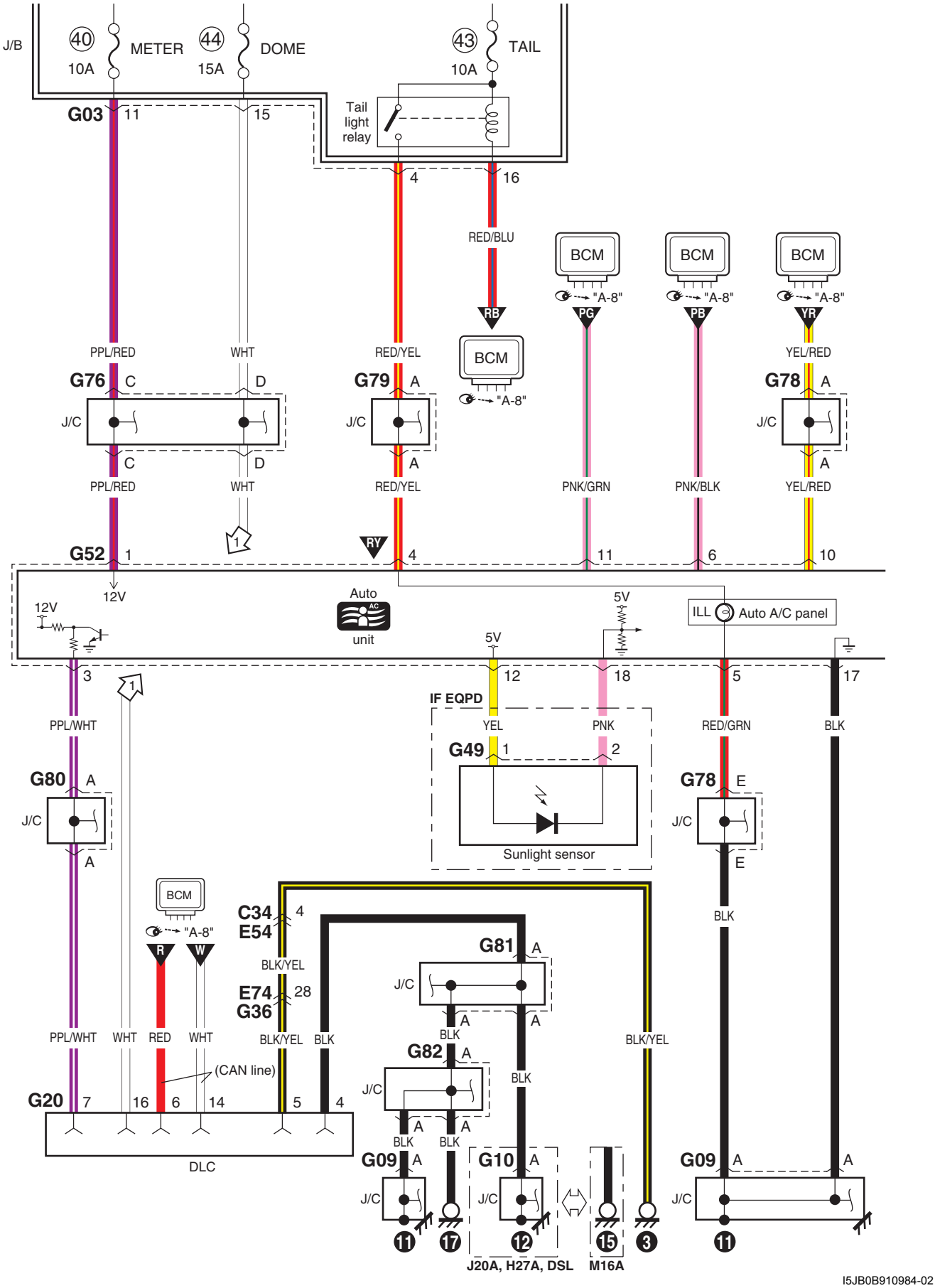
S5JB0B910E037



I5JB0B910997-01

E-2 Auto A/C System Circuit Diagram

S5JB0B910E038



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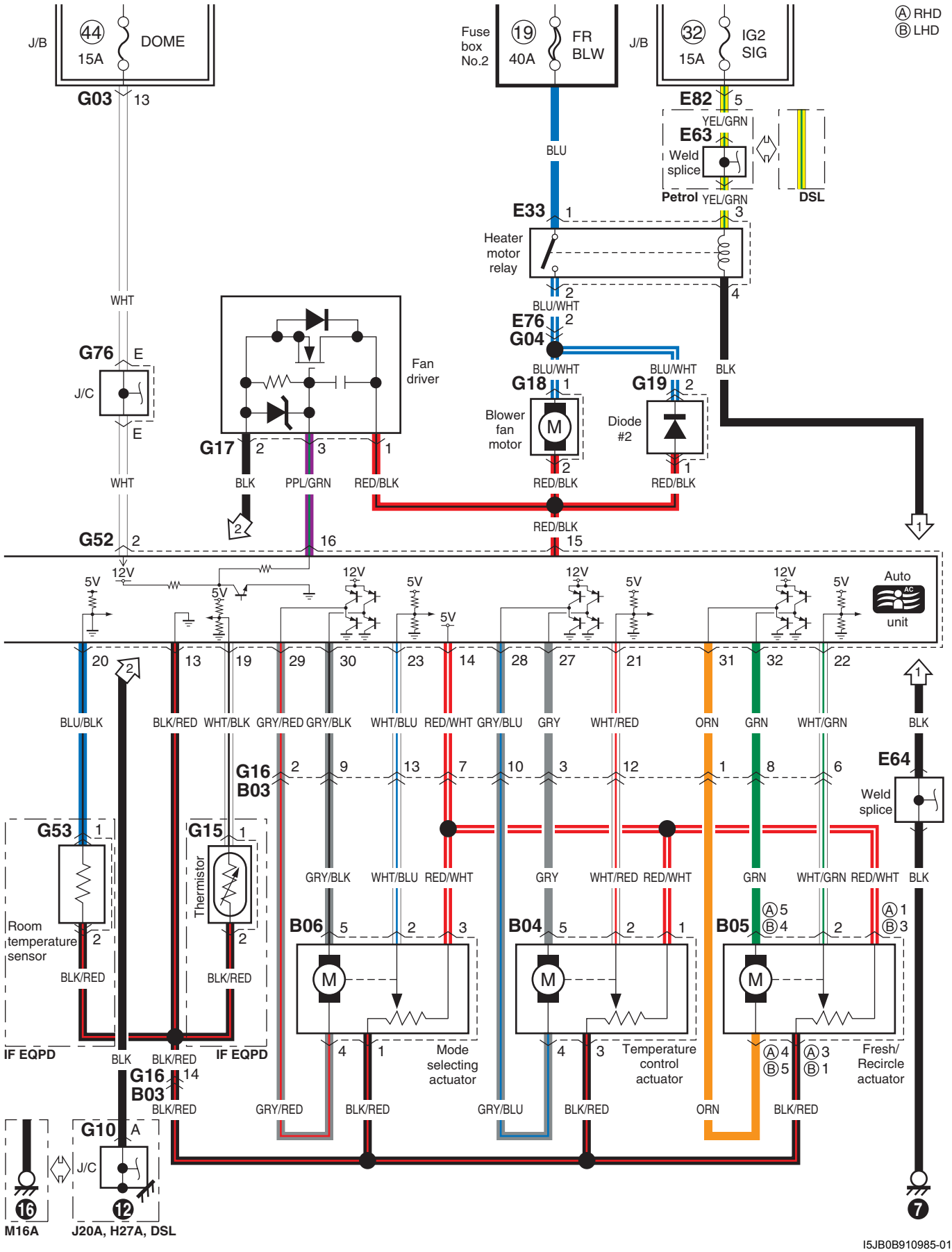
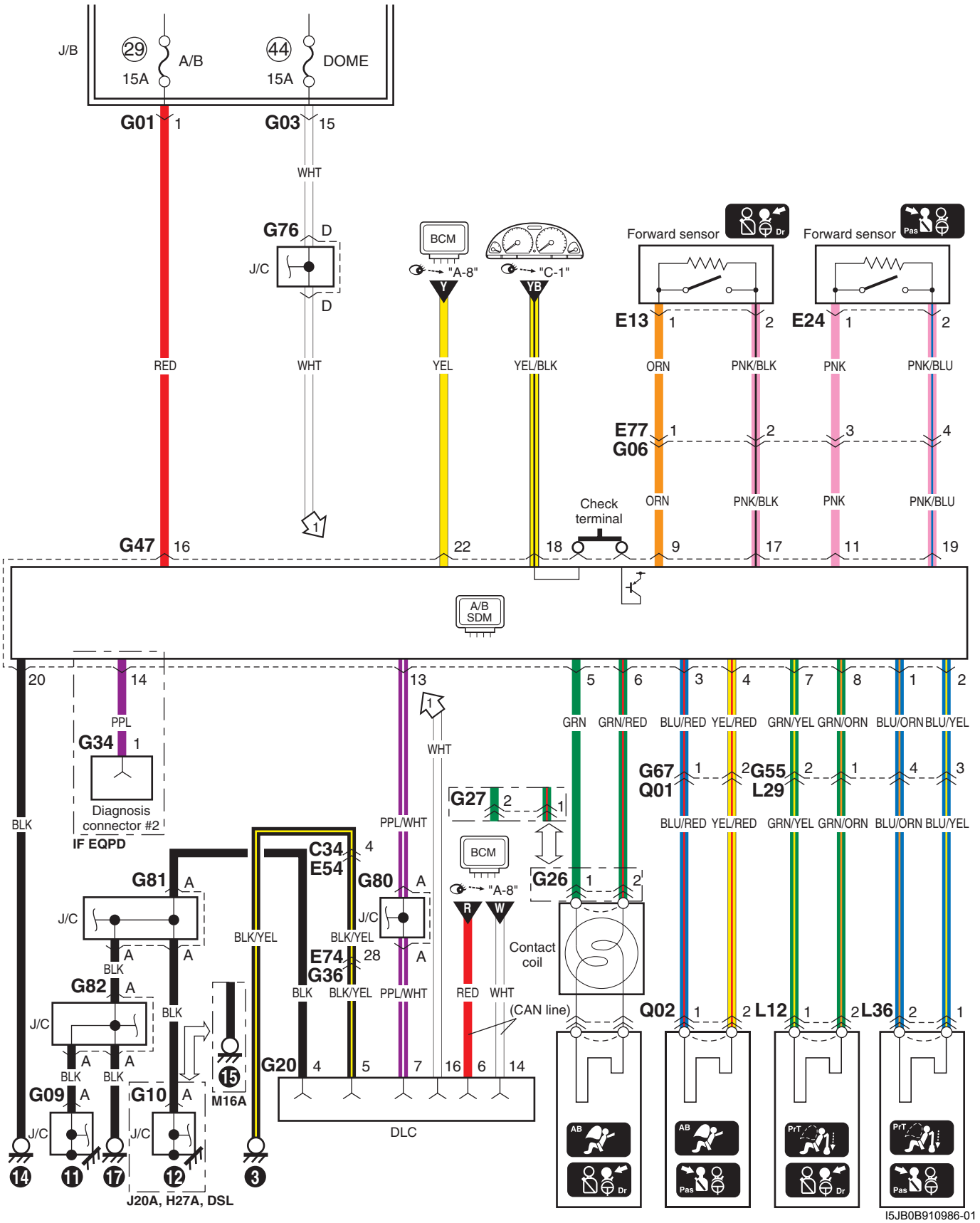


I5JB0B910985-01

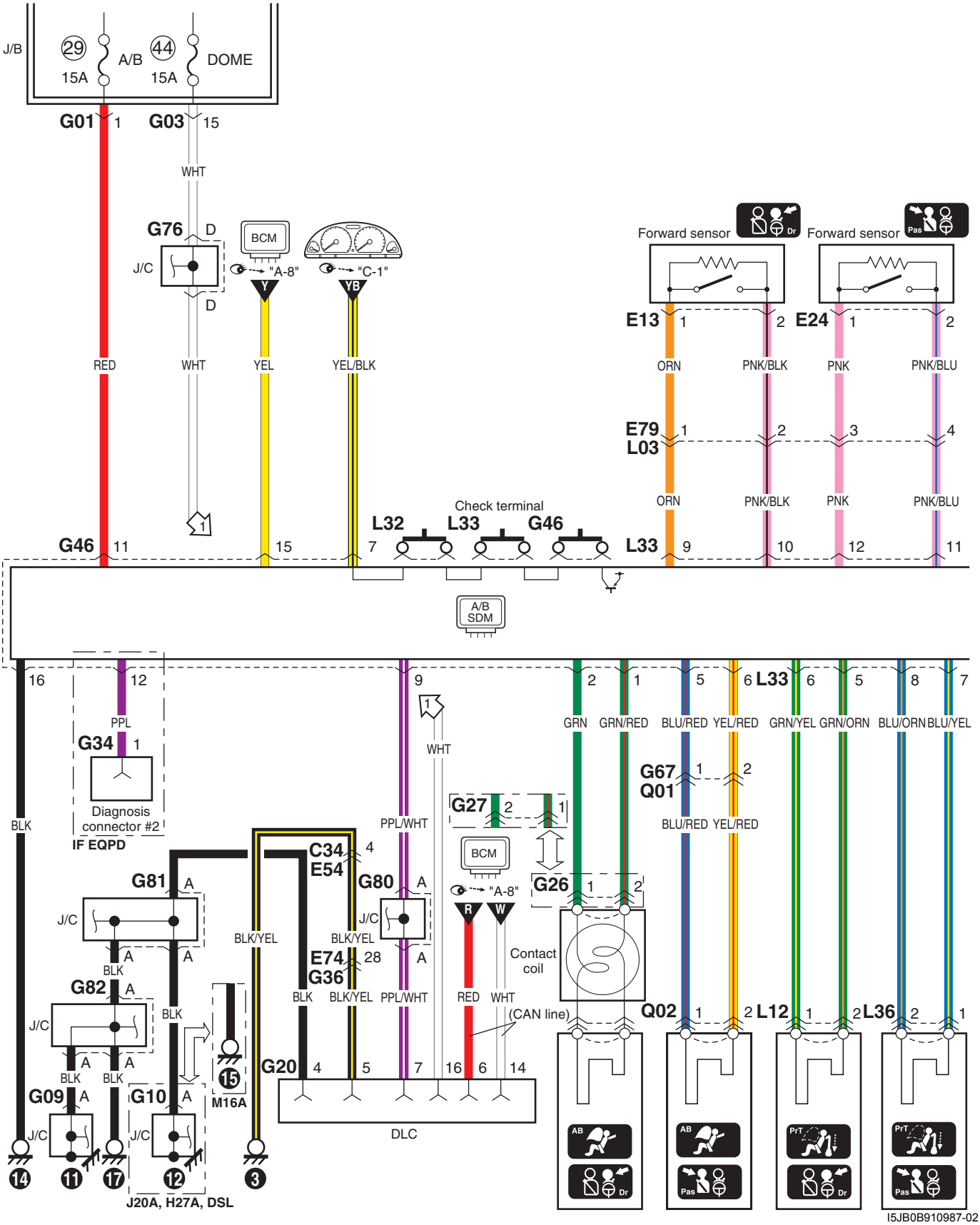
F-1 Air-Bag System Circuit Diagram (4ch)

S5JB0B910E039

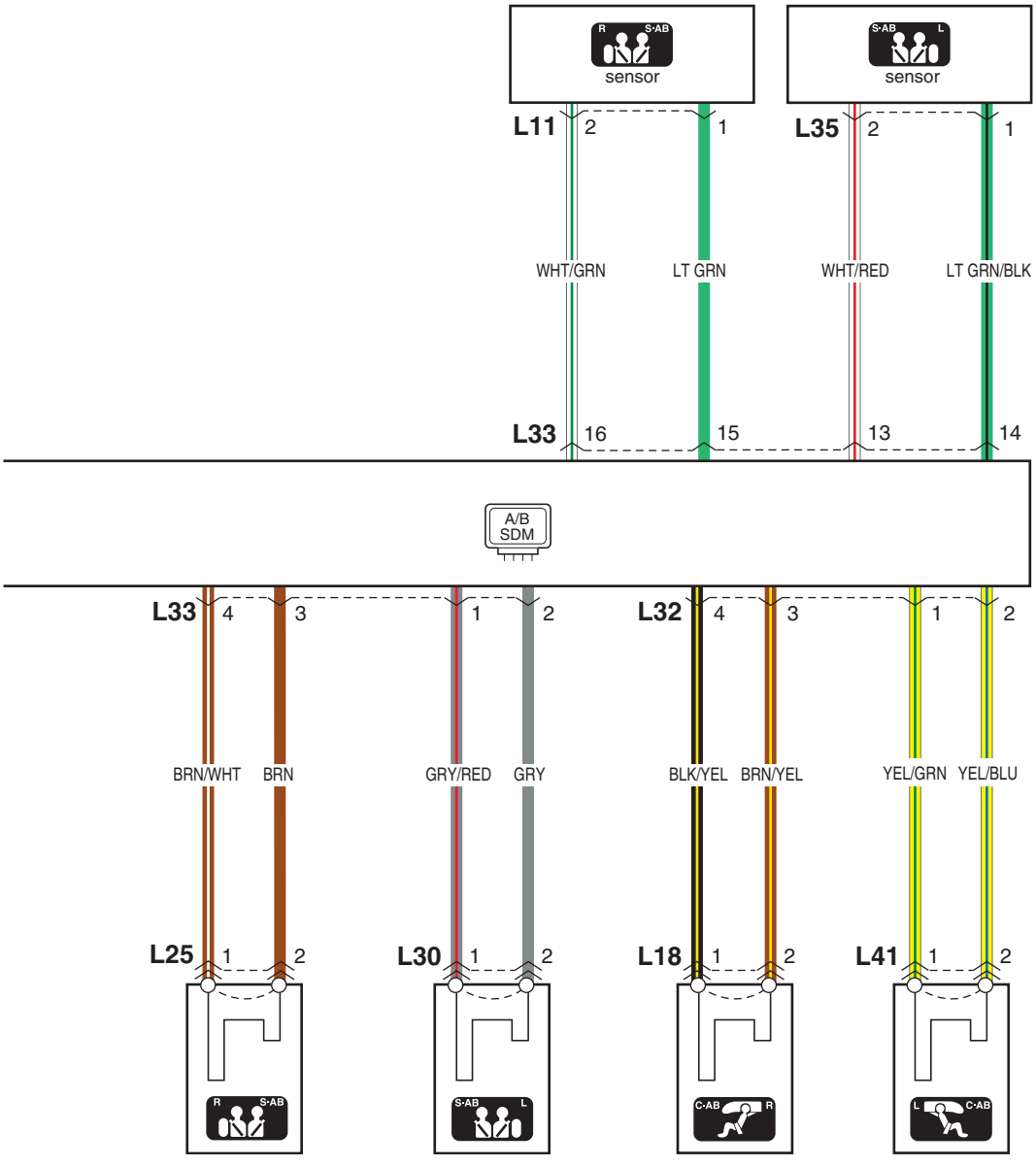


F-1 Air-Bag System Circuit Diagram (8ch)

S5JB0B910E040



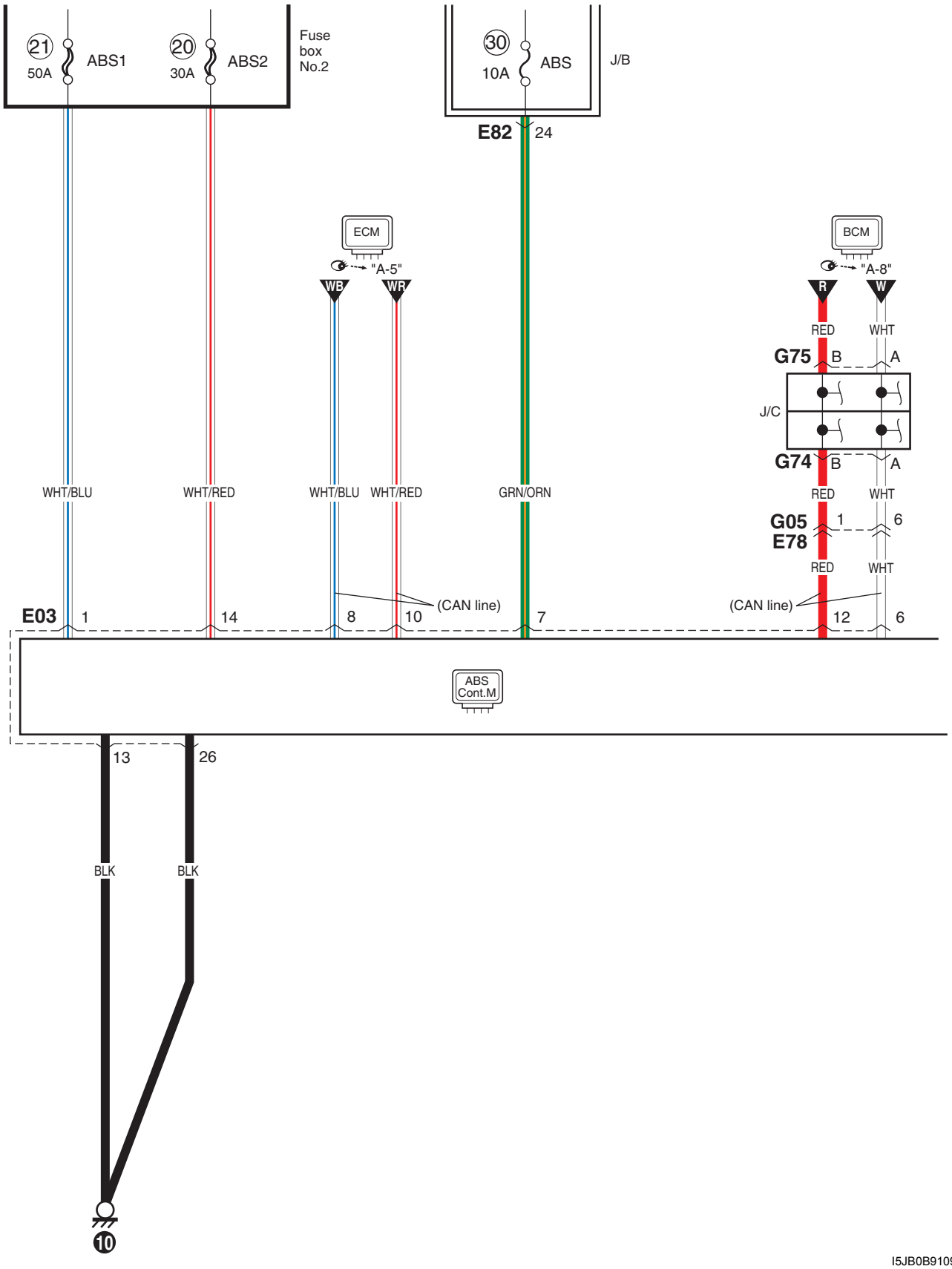
I5JB0B910987-02



I5JB0A910986-06

F-2 Anti-Lock Brake System Circuit Diagram

S5JB0B910E041



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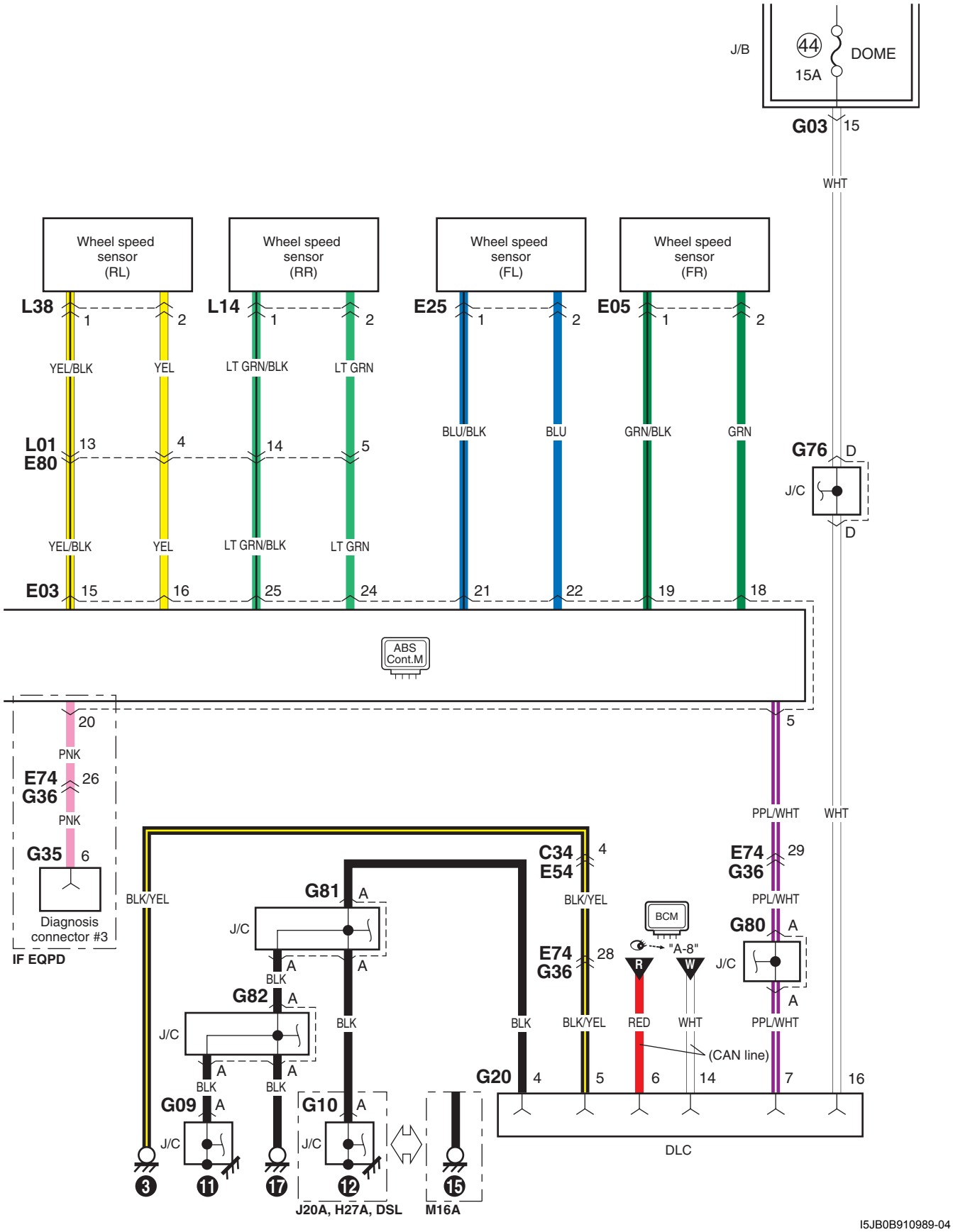
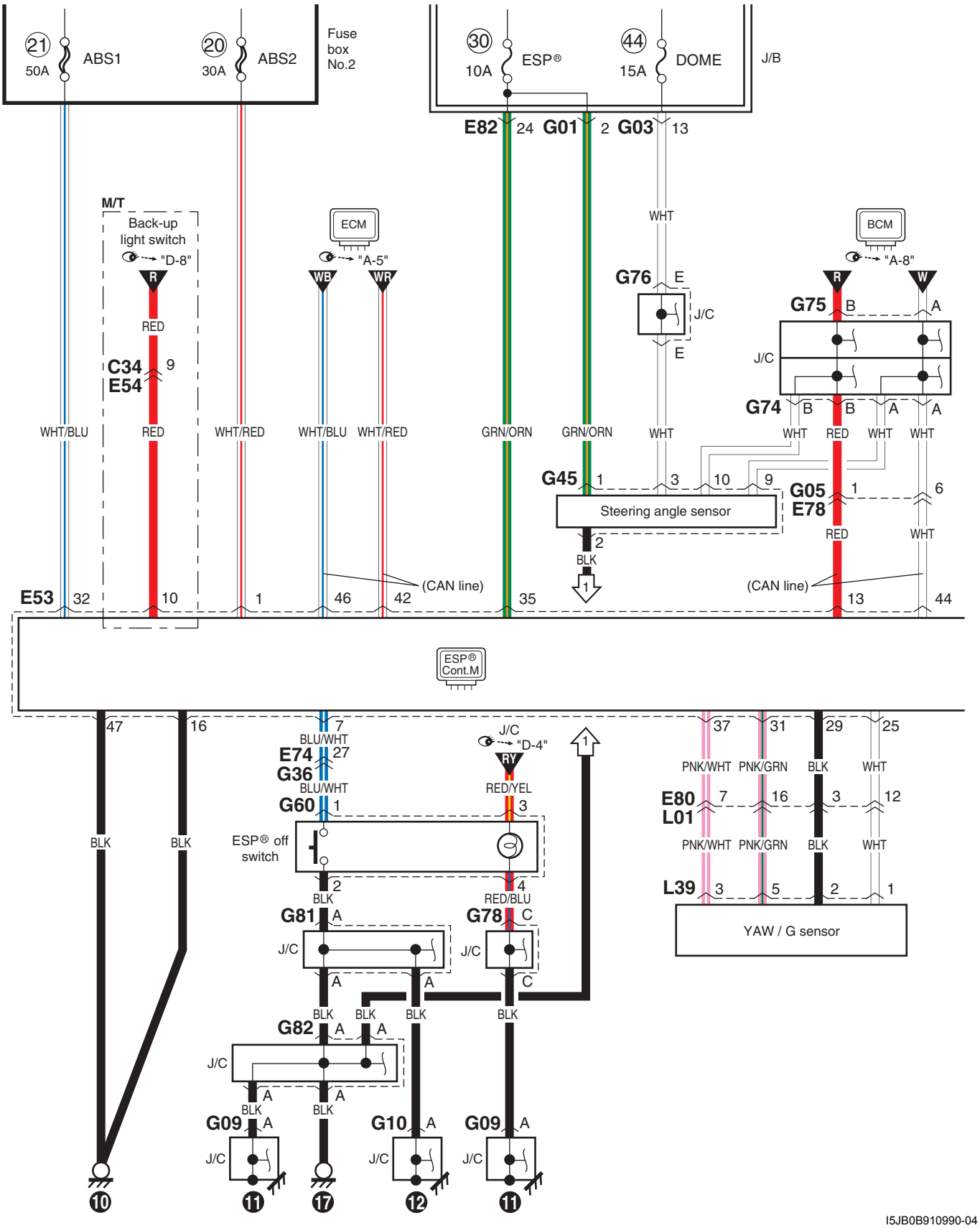


I5JB0B910989-04

F-3 Electronic Stability Program System Circuit Diagram

S5JB0B910E049



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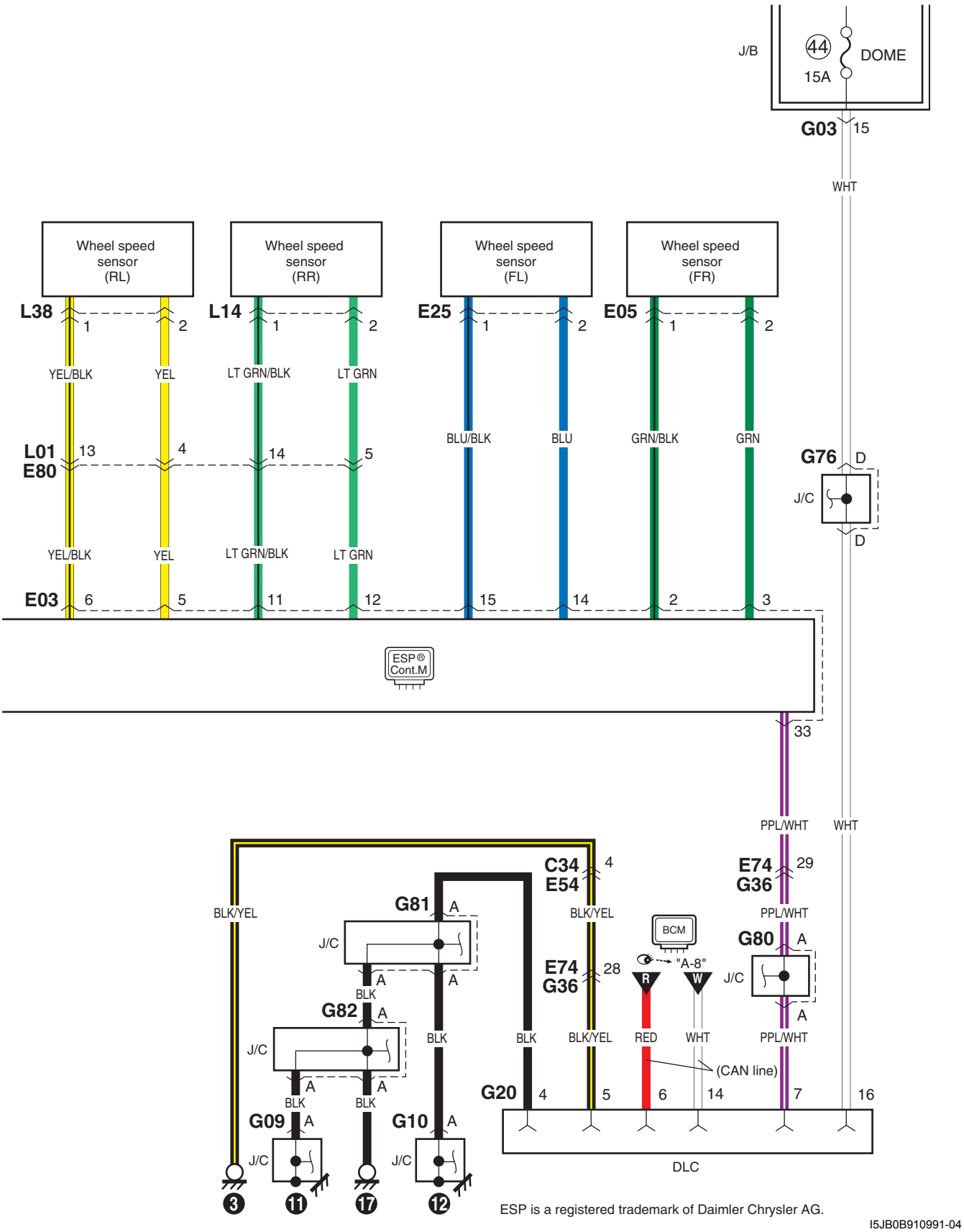

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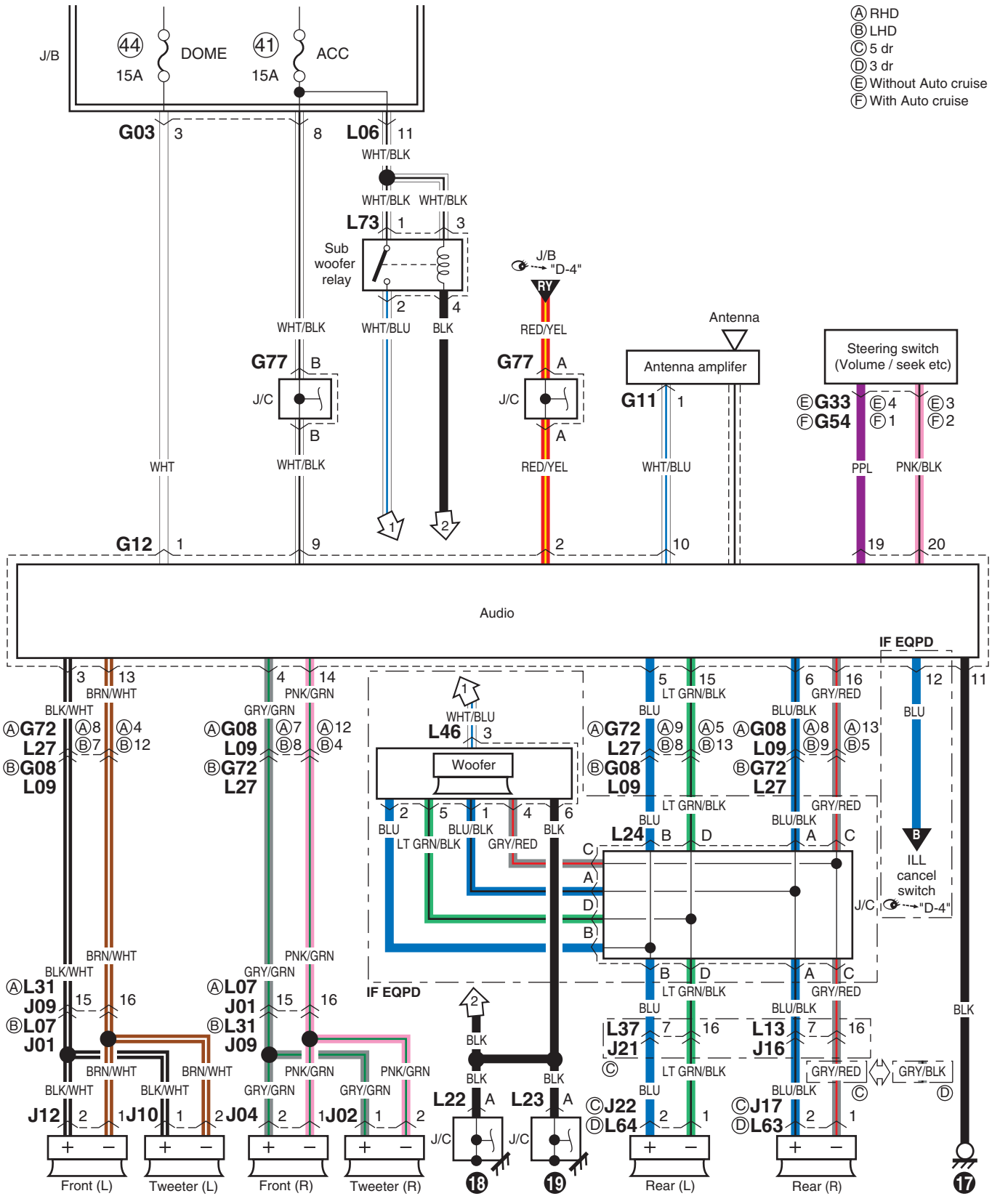
I5JB0B910991-04

G-1 Audio System Circuit Diagram

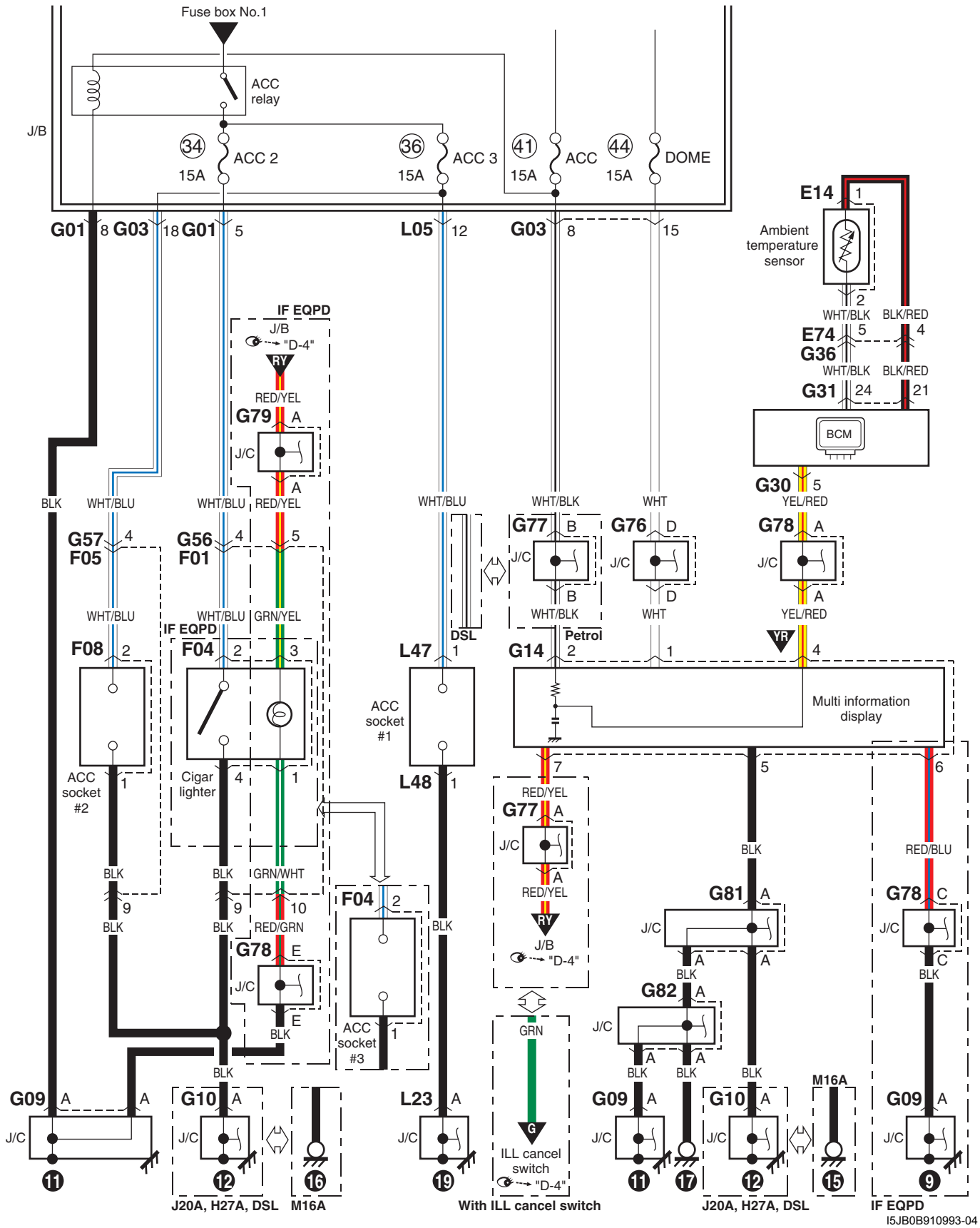
S5JB0B910E042



I5JB0B910992-04

G-2 Multi Information Display / Accessory Socket System Circuit Diagram

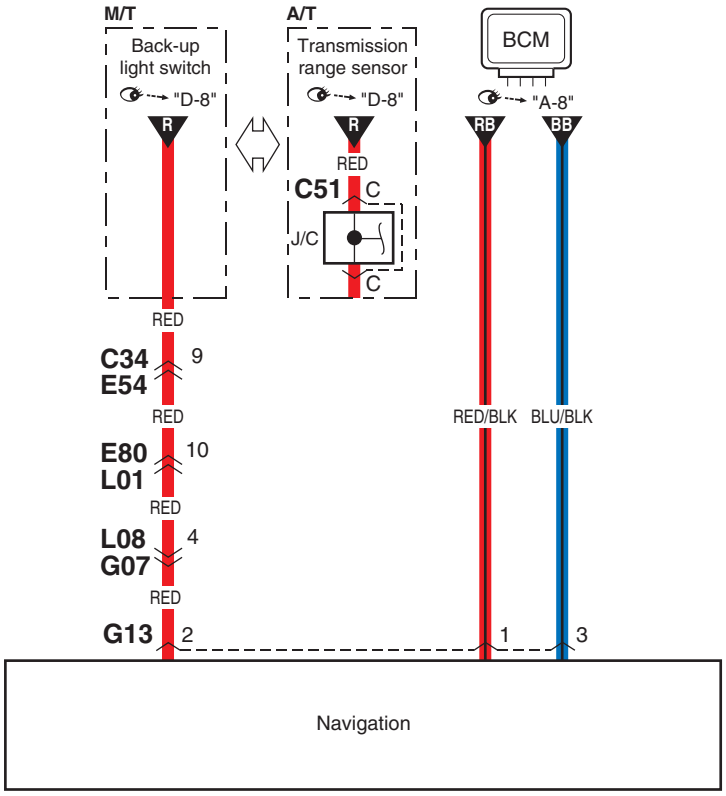
S5JB0B910E043



I5JB0B910993-04

G-4 Navigation System Circuit Diagram

S5JB0B910E044



I5JB0A910991-05

List of Connectors

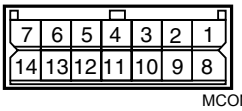
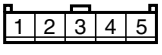
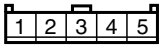
List of Connectors

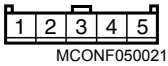
S5JB0B910F001

Refer to “B Connector: ”.
Refer to “C Connector: ”.
Refer to “E Connector: ”.
Refer to “F Connector: ”.
Refer to “G Connector: ”.
Refer to “J Connector: ”.
Refer to “K Connector: ”.
Refer to “L Connector: ”.
Refer to “O Connector: ”.
Refer to “Q Connector: ”.
Refer to “R Connector: ”.

B Connector

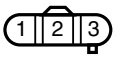
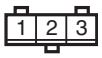
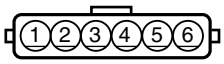
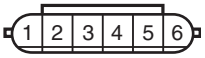
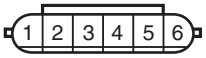
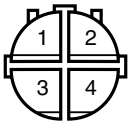
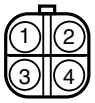
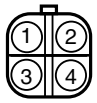
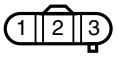
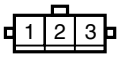
S5JB0B910F002

B01 (TO E17)	B02	B03 (TO G16)	B04	B05
MCONM010033-01 J20A	MCONF010076-01 J20A	 MCONM140005-02	 MCONF050021-01	 MCONF050021-01

B06
 MCONF050021-01

C Connector

S5JB0B910F003

C01 MCONF010070-02	C02 MCONF010083-01 Petrol	C02 MCONF010071-01 DSL	C03 MCONF010084-01	C04 MCONF020065-01 Petrol	C04 MCONF020238-01 DSL
C05 MCONF020065-01 Petrol	C05 MCONF020238-01 DSL	C06 MCONF020065-01 Petrol	C06 MCONF020238-01 DSL	C07 MCONF020065-01 Petrol	C07 MCONF020238-01 DSL
C08  MCONF030053-01 Petrol	C08  MCONF030115-01 DSL	C09 MCONF020042-01 Petrol	C09 MCONF040111-01 DSL	C10 MCONF060018-01 Petrol	C10 MCONF060074-01 DSL
C11  MCONF060068-01 M16A, J20A	C11  MCONF060073-01 H27A	C12 MCONF030030-01 Petrol	C13 MCONF050025-01 M16A, J20A	C13  MCONF060073-01 H27A, DSL	
C14 MCONF020042-01 M16A, J20A	C14 MCONF020064-01 H27A	C15  MCONF040008-01 M16A, J20A	C15  MCONF040024-01 H27A	C16  MCONF040024-01 H27A	C17 MCONF010076-01 M16A, H27A, DSL
C18 MCONF010030-01 Petrol	C18 MCONF010088-01 DSL	C19 MCONM020016-01 M16A	C20  MCONF030053-01 M16A, H27A	C20  MCONF030038-01 J20A	C20 MCONF020243-01 DSL
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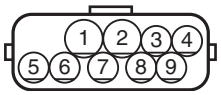
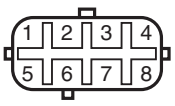
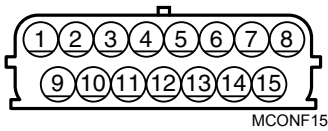
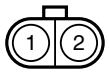
C24 MCONF010078-01	C25 MCONF020150-01 A/T	C26 MCONF010054-01 Petrol	C27 MCONF020150-01 A/T	C28  MCONF090017-01 A/T	
C29  MCONF080039-01 J20A A/T	C29  MCONF150003-01 H27A A/T		C30 MCONF020042-01 Petrol	C30  MCONF020079-01 DSL	C31 MCONF010078-01

C32

MCONF010085-01

M16A, J20A

C32

MCONF010090-01

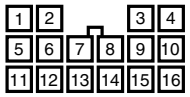
H27A, DSL

C33

MCONF010001-01

Petrol

C34 (TO E54)



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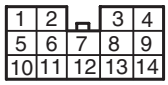
C35 (TO E55)



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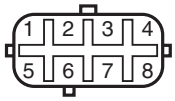

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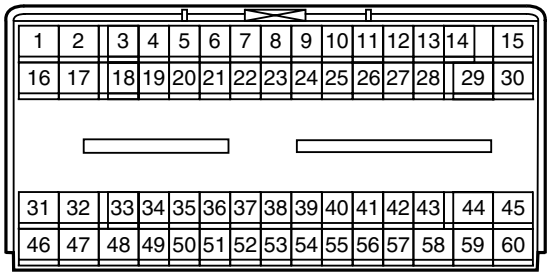
Petrol

C37



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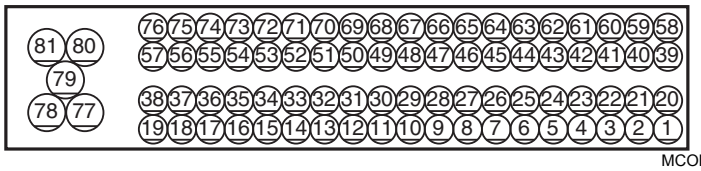
M16A, J20A

C37



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H27A

C38

MCONF030056-01

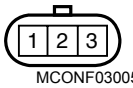
J20A

C39

MCONF010081-01

Other than M16A

C40



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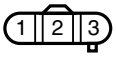
M16A

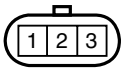
C40



MCONF030053-01

J20A, H27A

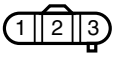
C41



MCONF030055-01

M16A

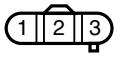
C41



MCONF030053-01

J20A, H27A

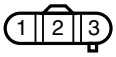
C42



MCONF030053-01

J20A, H27A

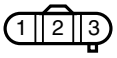
C43



MCONF030053-01

J20A, H27A

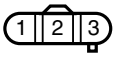
C44



MCONF030053-01

H27A

C45



MCONF030053-01

H27A

C46

MCONF020063-01

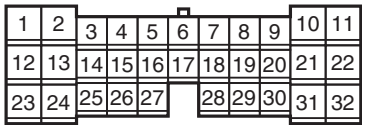
J20A

C47

MCONF020066-01

Petrol

C48 (TO E87)



MCONF320006-01

J20A, H27A

C49 (TO E88)

MCONF140008-01

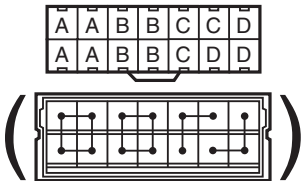
Other than M16A

C50 (TO E89)

MCONF040112-01

Other than M16A

C51



MCONF140021-01

J20A, H27A

C52

MCONF020231-01

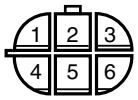
Other than M16A

C53

MCONF020231-01

Other than M16A

C54



MCONF060061-01

Other than M16A

C55

MCONN000002-01

Petrol

C56

MCONN000002-01

Petrol

C57

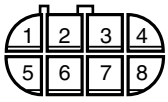
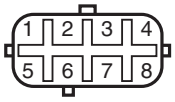
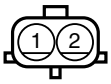
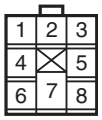
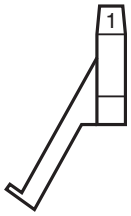
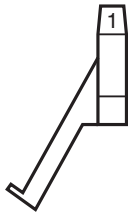
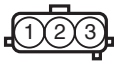
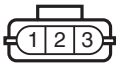
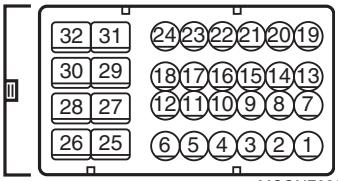
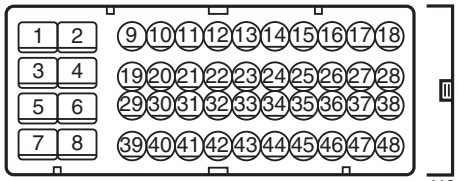
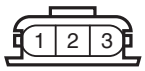
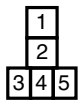
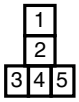
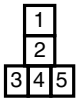
MCONN000002-01

H27A

C58

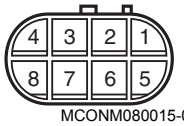
MCONN000002-01

H27A

C59	C60 (TO D07)	C61	C70	C71 (TO D11)	C72 (TO D12)
MCONN000002-01	 MCONF080028-02	 MCONF080039-01	MCONF020239-01	MCONF020240-01	MCONM010035-01
H27A, DSL	H27A	H27A	DSL	DSL	DSL
C73	C74	C75	C76	C77	C78
 MCONF020167-01	 MCONF080042-01	MCONF040072-01	MCONF040110-01	 MCONF010093-01	 MCONF010093-01
DSL	DSL	DSL	DSL	DSL	DSL
C79	C80	C81	C82	C83	C84
MCONF010093-01	MCONF010093-01	MCONF020241-01	 MCONF030112-01	MCONF020238-01	 MCONF030113-01
DSL	DSL	DSL	DSL	DSL	DSL
C85		C86			C87
 MCONF320010-01		 MCONF480003-01		MCONF020242-01
DSL		DSL			DSL
C88	C89	C90	C91	C92	C93
MCONF020227-01	 MCONF030114-01	MCONF020217-02	MCONF020170-01	MCONF020169-01	 MCONF050031-01
DSL	DSL	DSL	DSL	DSL	DSL
C94	C95				
 MCONF050031-01	 MCONF050031-01				
DSL	DSL				

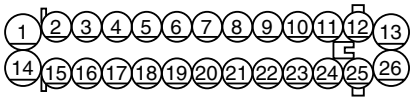
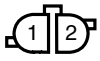
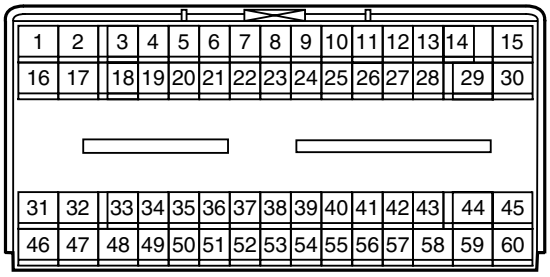
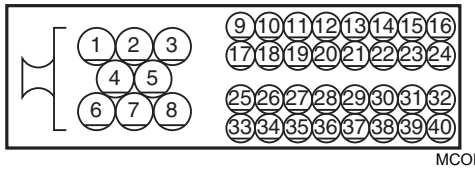
D Connector

S5JB0B910F013

D01 MCONF020065-01 H27A	D02 MCONF020065-01 H27A	D03 MCONF020065-01 H27A	D04 MCONF020065-01 H27A	D05 MCONF020065-01 H27A	D06 MCONF020065-01 H27A
D07 (TO C60)  MCONM080015-01 H27A	D08 MCONF010092-01 DSL	D09 MCONF010092-01 DSL	D10 MCONF010092-01 DSL	D11 (TO C71) MCONM020050-01 DSL	D12 (TO C72) MCONF010091-01 DSL

E Connector

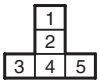
S5JB0B910F004

E01 MCONF050027-01	E02 MCONF020115-01	E03  MCONF260011-01			
E04 MCONF030062-01 Petrol	E04 MCONF030097-01 DSL	E05 MCONM020027-01	E06 MCONF020196-01	E07 MCONF020013-01	E08 MCONF030101-01
E09  MCONF020110-01	E10 MCONF020008-01	E11 MCONF020013-01	E12 MCONF020198-01	E13 MCONF020022-01	E14 MCONF020200-01
E15 MCONF010079-01	E16 MCONF010079-01	E17 (TO B01) MCONF010076-01 J20A	E18 MCONF020198-01	E19 MCONF020196-01	E20 MCONF020110-01
E21 MCONF030101-01	E22 MCONF020013-01	E23  MCONF600003-01 M16A, J20A			
E23  MCONF400003-01 H27A		E24 MCONF020022-01	E25 MCONM020027-01	E26 MCONF020183-01	

E27

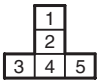
MCONF020183-01

E28



MCONF050015-01

E29



MCONF050015-01

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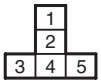
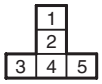


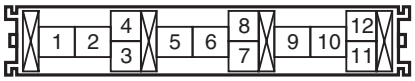
MCONF050015-01

E31



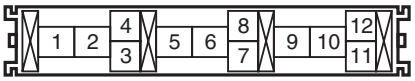
MCONF050015-01

E32



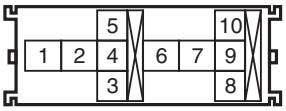
MCONF120030-01

E33



MCONF120030-01

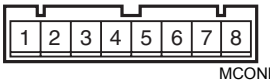
E34



MCONF100032-01

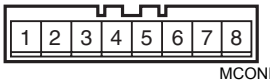
M16A

E35



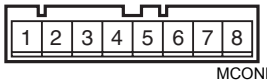
MCONF080019-01

E36



MCONF080036-01

E37



MCONF080037-01

J20A, H27A

E38

MCONF080038-01

J20A, H27A

E40

MCONF010081-01

E41

MCONF010081-01

J20A, H27A

E42

MCONF010086-01

E43

MCONF020044-01

Petrol

E44

MCONF030101-01

Petrol

E44

MCONF020229-01

DSL

E45

MCONF030111-01

E46

MCONF020230-01

E47

MCONF020044-01

Petrol

E48

MCONF030101-01

Petrol

E48

MCONF020229-01

DSL

E49

MCONF030111-01

E50

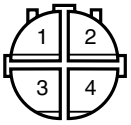
MCONF020230-01

E51

MCONF020231-01

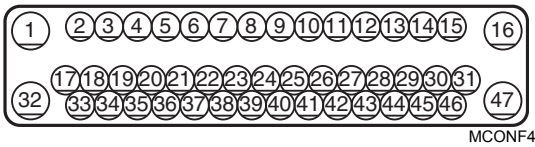
Petrol

E52 (TO E85)



MCONF040008-01

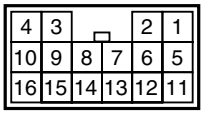
E53



MCONF470001-01

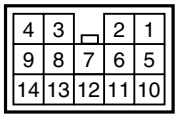
IF EQPD

E54 (TO C34)



MCONM160004-01

E55 (TO C35)



MCONM140003-01

E56

MCONF020201-01

E57

MCONF020202-01

E58

MCONF020148-01

E59

MCONN000002-01

E60

MCONN000002-01

E61

MCONN000002-01

E62

MCONN000002-01

E63

MCONN000002-01

Petrol

E64

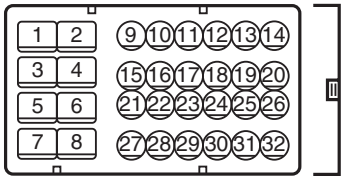
MCONN000002-01

E65

MCONN000002-01

DSL

E66



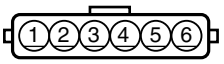
MCONF320011-01

DSL

E67

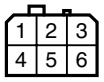
MCONF040045-01

E68



MCONF060068-01

E69



MCONF060044-01

IF EQPD

E70

MCONF020232-01

E71

MCONF020151-01

Petrol

E71

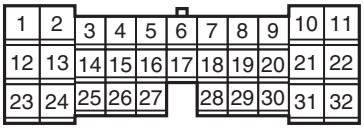
MCONF020008-01

DSL

E72

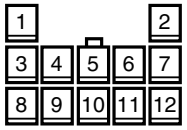
MCONF020157-01

E74 (TO G36)



MCONF320006-01

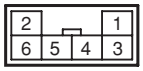
E75 (TO G37)



MCONF120015-01

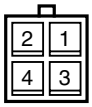
Petrol

E76 (TO G04)



MCONM060008-01

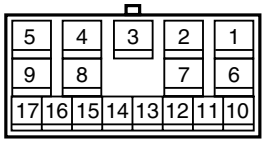
E77 (TO G06)



MCONM040022-01

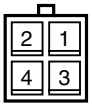
Petrol

E78 (TO G05)



MCONM170001-01

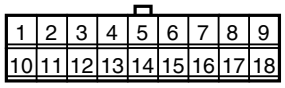
E79 (TO L03)



MCONM040022-01

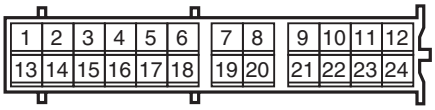
IF EQPD

E80 (TO L01)



MCONF180010-01

E82

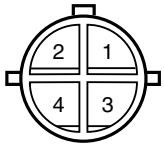


MCONF240013-01

E83

MCONF010081-01

E85 (TO E52)

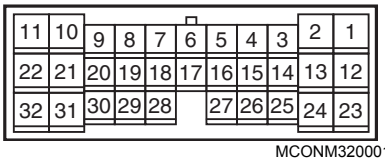


MCONM040021-01

E86

MCONF030110-01

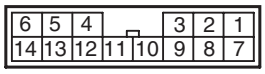
E87 (TO C48)



MCONM320001-01

J20A, H27A

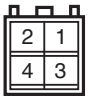
E88 (TO C49)



MCONM140002-01

Other than M16A

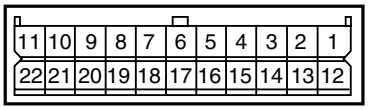
E89 (TO C50)



MCONM040011-01

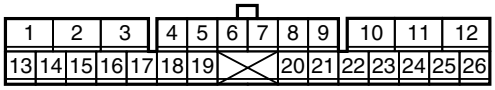
Other than M16A

E90 (TO G71)



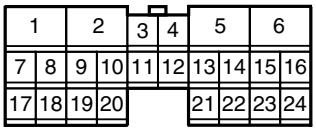
MCONM220003-01

E91



MCONF260010-01

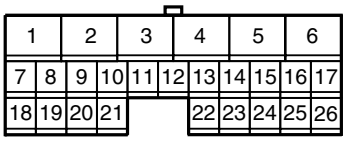
E92



MCONF240011-01

A/T

E93

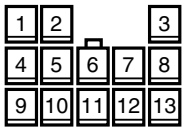
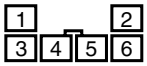
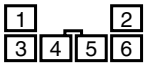
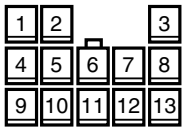
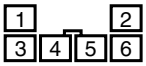
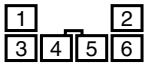
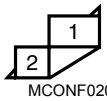


MCONF260014-01

A/T

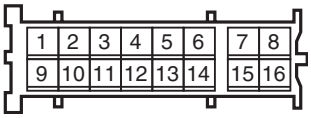
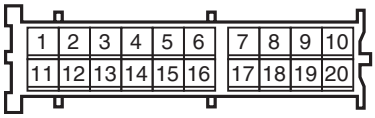
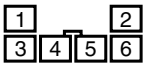
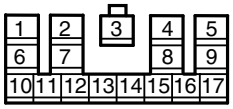
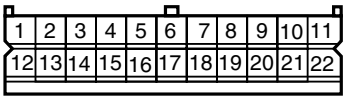
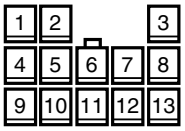
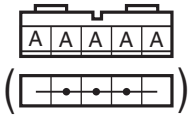
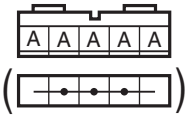
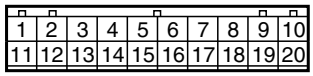
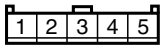
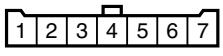
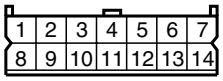
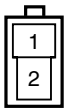
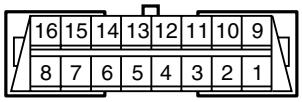
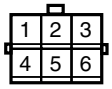
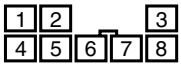
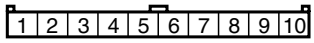
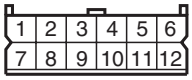
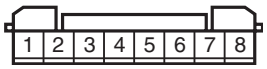
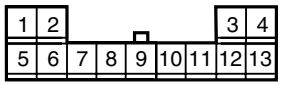
F Connector

S5JB0B910F005

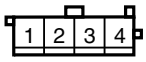
F01 (TO G56)  MCONF130006-01	F02  MCONF060046-01	F03  MCONF060046-01 LHD A/T	F04 MCONF040095-01	F05 (TO G57)  MCONF130006-01	F06  MCONF060046-01
F07  MCONF060046-01 RHD A/T	F08  MCONF020116-01				

G Connector

S5JB0B910F006

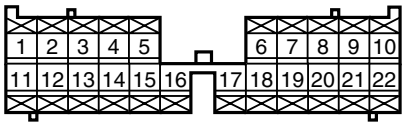
G01  MCONF160037-01	G02 MCONF040046-01	G03  MCONF200024-01	G04 (TO E76)  MCONF060046-01		
G05 (TO E78)  MCONF170005-01	G06 (TO E77) MCONF040093-01	G07 (TO L08)  MCONF220010-01	G08 (TO L09)  MCONF130006-01		
G09  MCONF050038-01	G10  MCONF050038-01	G11 MCONM010017-01	G12  MCONF200014-01	G13  MCONF050021-01	
G14  MCONF070012-01	G15 MCONF020008-01	G16 (TO B03)  MCONF140012-01	G17 MCONF040046-01	G18  MCONM020001-01	G19 MCONF020232-01
G20  MCONM160003-01	G21  MCONF060063-01	G22  MCONF080014-01	G23  MCONF100038-01		
G24  MCONF120022-02 Petrol	G24  MCONF080040-01 DSL	G25  MCONF130010-01	G26 MCONF020212-01		

G27



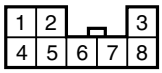
MCONF040099-01

G28



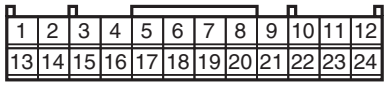
MCONF220006-01

G29



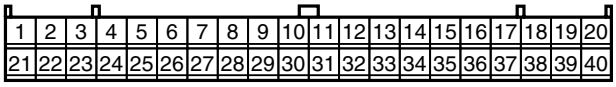
MCONF080002-01

G30



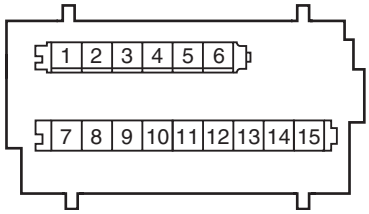
MCONF240014-01

G31



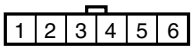
MCONF400001-01

G32



MCONF150005-01

G33



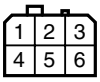
MCONF060053-01

G34

MCONF020084-01

IF EQPD

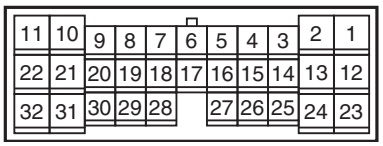
G35



MCONF060044-01

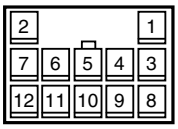
IF EQPD

G36 (TO E74)



MCONM320001-01

G37 (TO E75)

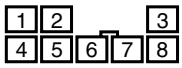


MCONM120004-01

G38

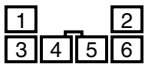
MCONF010087-01

G39



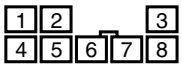
MCONF080014-01

G40



MCONF060046-01

G41

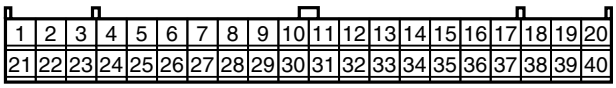


MCONF080014-01

G43

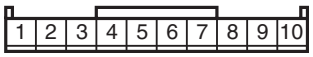
MCONF020151-01

G44



MCONF400001-01

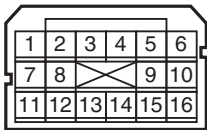
G45



MCONF100064-01

IF EQPD

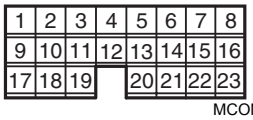
G46



MCONF160038-01

IF EQPD

G47



MCONF230001-01

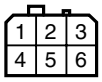
G48

MCONF060046-01

G49

MCONF020084-01

G50



MCONF060044-01

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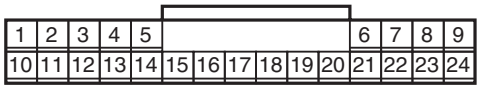
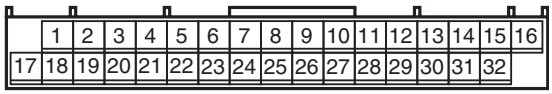


MCONF240015-01

G52

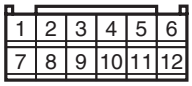


MCONF320007-01

G53

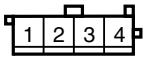
MCONF020151-01

G54



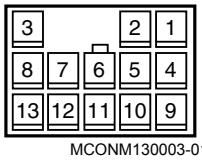
MCONF120034-01

G55 (TO L29)



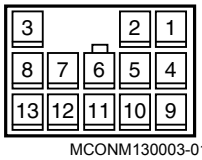
MCONF040099-01

G56 (TO F01)



MCONM130003-01

G57 (TO F05)

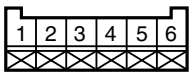


MCONM130003-01

G58

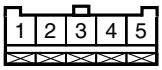
MCONF020140-01

G59



MCONF060040-01

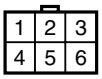
G60



MCONF050024-01

IF EQPD

G62

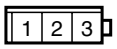


MCONF060003-01

G63

MCONF010010-01

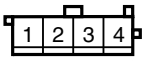
G64



MCONF030078-01

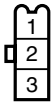
IF EQPD

G67 (TO Q01)



MCONF040099-01

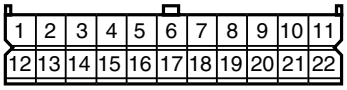
G69



MCONF030087-01

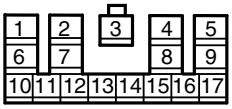
IF EQPD

G71 (TO E90)



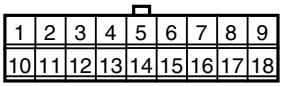
MCONF220009-01

G72 (TO L27)



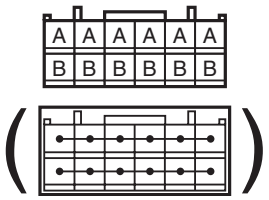
MCONF170005-01

G73 (TO L28)



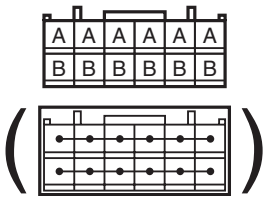
MCONF180010-01

G74



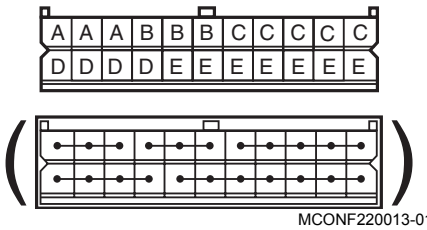
MCONF120031-01

G75



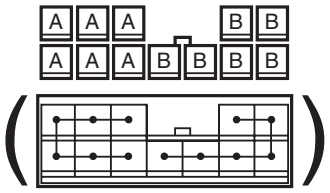
MCONF120031-01

G76



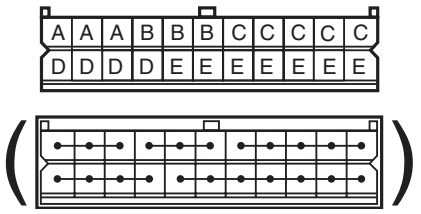
MCONF220013-01

G77



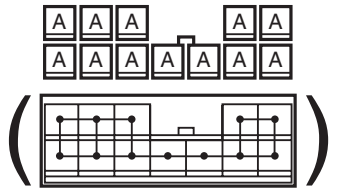
MCONF120032-01

G78



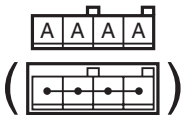
MCONF220013-01

G79



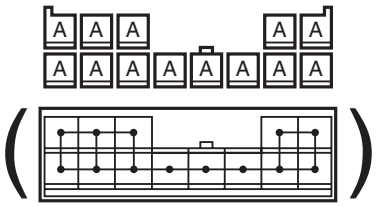
MCONF120033-01

G80



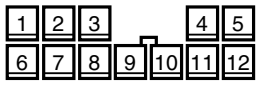
MCONF040071-01

G81



MCONF130012-01

G82

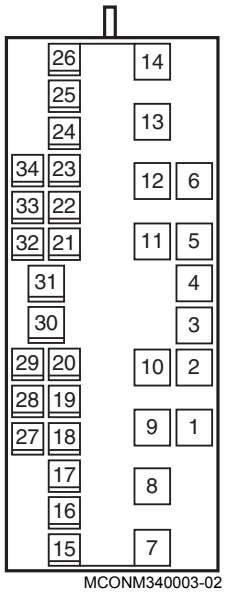


MCONF120016-01

J Connector

S5JB0B910F007

J01 (TO L07)

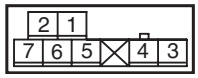


MCONM340003-02

J02

MCONF020159-01

J03



MCONM070004-01

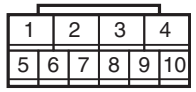
J04

MCONF020008-01

J05

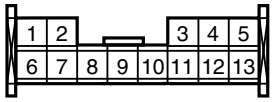
MCONF020236-01

J06



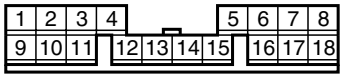
MCONF100061-01

J07



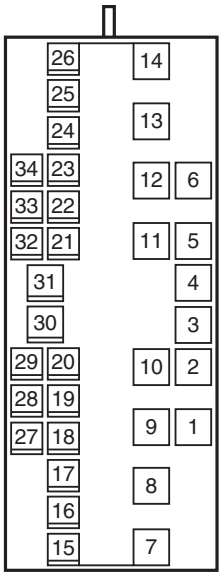
MCONF130011-01

J08



MCONF180006-01

J09 (TO L31)

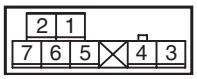


MCONM340003-02

J10

MCONF020159-01

J11

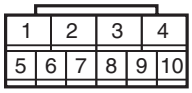


MCONM070004-01

J12

MCONF020008-01

J13

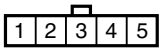


MCONF100061-01

J14

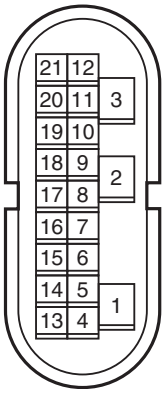
MCONF020236-01

J15

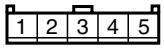
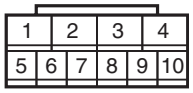
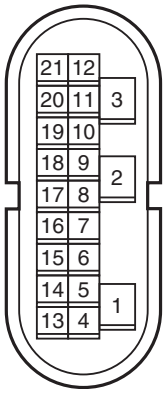
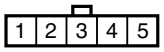
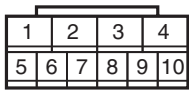
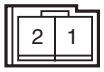
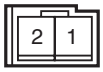


MCONF050001-01

J16 (TO L13)

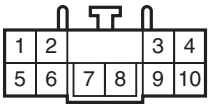
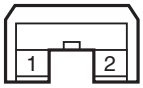
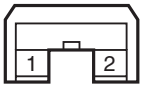
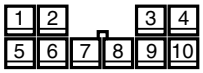


MCONM210001-01

J17	J18	J19	J20	J21 (TO L37)	J22
MCONF020008-01	MCONF020236-01	 MCONF050021-01	 MCONF100061-01	 MCONM210001-01	MCONF020008-01
J23	J24	J25	J26	J27	J28
MCONF020236-01	 MCONF050001-01	 MCONF100061-01	MCONM020018-01	MCONM020016-01	MCONM020018-01
J29	J31	J32			
MCONM020016-01	 MCONM020051-01	 MCONM020051-01			

K Connector

S5JB0B910F008

K01	K02	K03	K04	K05	K06
 MCONF100062-01	MCONF030102-01	MCONF030102-01	 MCONF020233-01	 MCONF020233-01	 MCONF100054-01
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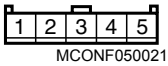
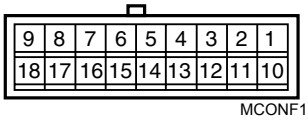
 MCONF050021-01					

L Connector

S5JB0B910F009

L01 (TO E80)



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L03 (TO E79)

MCONF040095-01

IF EQPD

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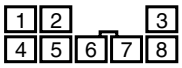

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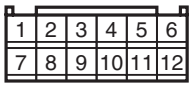
L05

MCONF130013-01

L06



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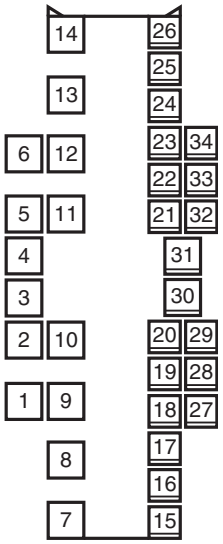
L07 (TO J01)



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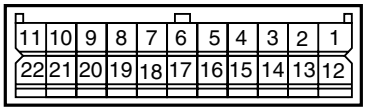
L08 (TO G07)



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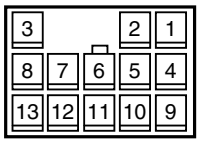
L09 (TO G08)



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L11

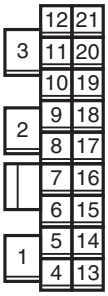
MCONF020022-01

IF EQPD

L12

MCONF020209-01

L13 (TO J16)



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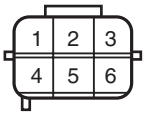
L14

MCONM020027-01

L15 (TO R01)



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L16

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L17 (TO L66)

MCONM030009-01

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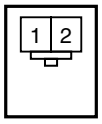


MCONF020207-01

IF EQPD

L19 (TO L68)

MCONF020151-01

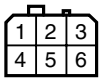
3 dr

L19

MCONF020211-01

5 dr

L20



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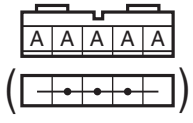

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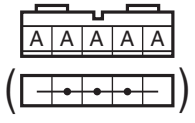

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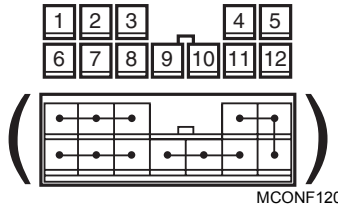

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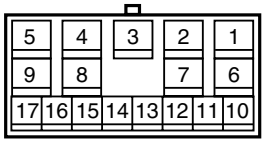
IF EQPD

L25

MCONF020212-01

IF EQPD

L27 (TO G72)



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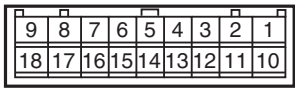
L28 (TO G73)



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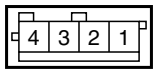
L29 (TO G55)



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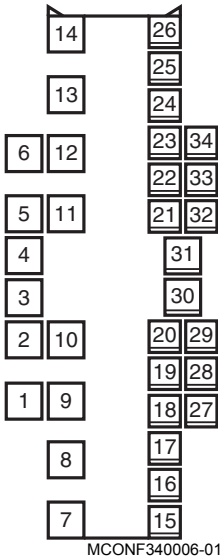
MCONF020212-01

IF EQPD

L31 (TO J09)



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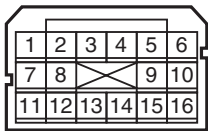

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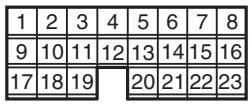

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L34

MCONF010060-01

L35

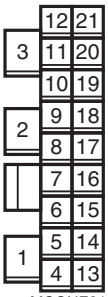
MCONF020022-01

IF EQPD

L36

MCONF020209-01

L37 (TO J27)



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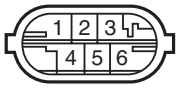
L38

MCONM020027-01

L39



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L40

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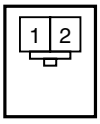
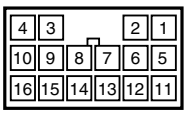
L41



MCONF020207-01

IF EQPD

L42 (TO O01)



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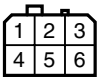

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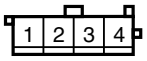

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L45

MCONF020228-01

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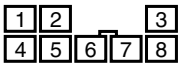
L46



MCONF080014-01

IF EQPD

L47

MCONF010001-01

L48

MCONF010030-01

L49

MCONF020228-01

5 dr

L52

MCONF020013-01

L53

MCONF020013-01

L54

MCONM010017-01

L56

MCONF020151-01

L57

MCONF040095-01

L59

MCONF040095-01

L63

MCONF020008-01

3 dr

L64

MCONF020008-01

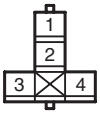
3 dr

L66 (TO L17)

MCONF030069-01

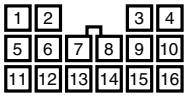
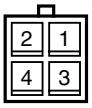
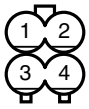
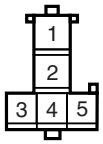
L67

MCONF030110-01

L68 (TO L19)	L69	L73	
MCONM020005-01 3 dr	MCONF020211-01 3 dr	 MCONF040054-01 IF EQPD	

O Connector

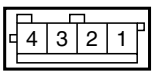
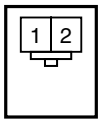
S5JB0B910F010

O01 (TO L42)	O02	O03	O04	O05	O06
 MCONF160010-01	MCONM010034-01	 MCONM040022-01	 MCONF040069-01	 MCONF050037-02	MCONM010034-01

O07	O08	O09	
MCONF020026-01	MCONM020018-01	MCONM020016-01	

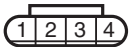
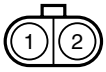
Q Connector

S5JB0B910F011

Q01 (TO G67)	Q02
 MCONM040015-01	 MCONF020207-01

R Connector

S5JB0B910F012

R01 (TO L15)	R02	R02	R03
MCONM060034-01	MCONF040048-01 Petrol	 MCONF040113-01 DSL	 MCONF020079-01

Instrumentation / Driver Info. / Horn

Precautions

Precautions in Diagnosing Troubles for Combination Meter

S5JB0B9300001

Combination meter uses signals (information) from each control module by CAN communication to control speedometer, tachometer, engine coolant temp meter, warning light and indicator light (other than air bag warning light, headlight leveling warning light, rear fog light and turn signal indicator lamp). Therefore, check that no DTC is detected in each module before performing combination meter symptom diagnosis. If any DTC is detected, correct trouble indicated by that DTC troubleshooting first.

General Description

CAN Communication Data of Combination Meter

S5JB0B9301001

Combination meter communicates with each control module about the following information. For details of CAN communication, refer to “CAN Communication System Description: in Section 1A”.

Combination Meter Reception Data

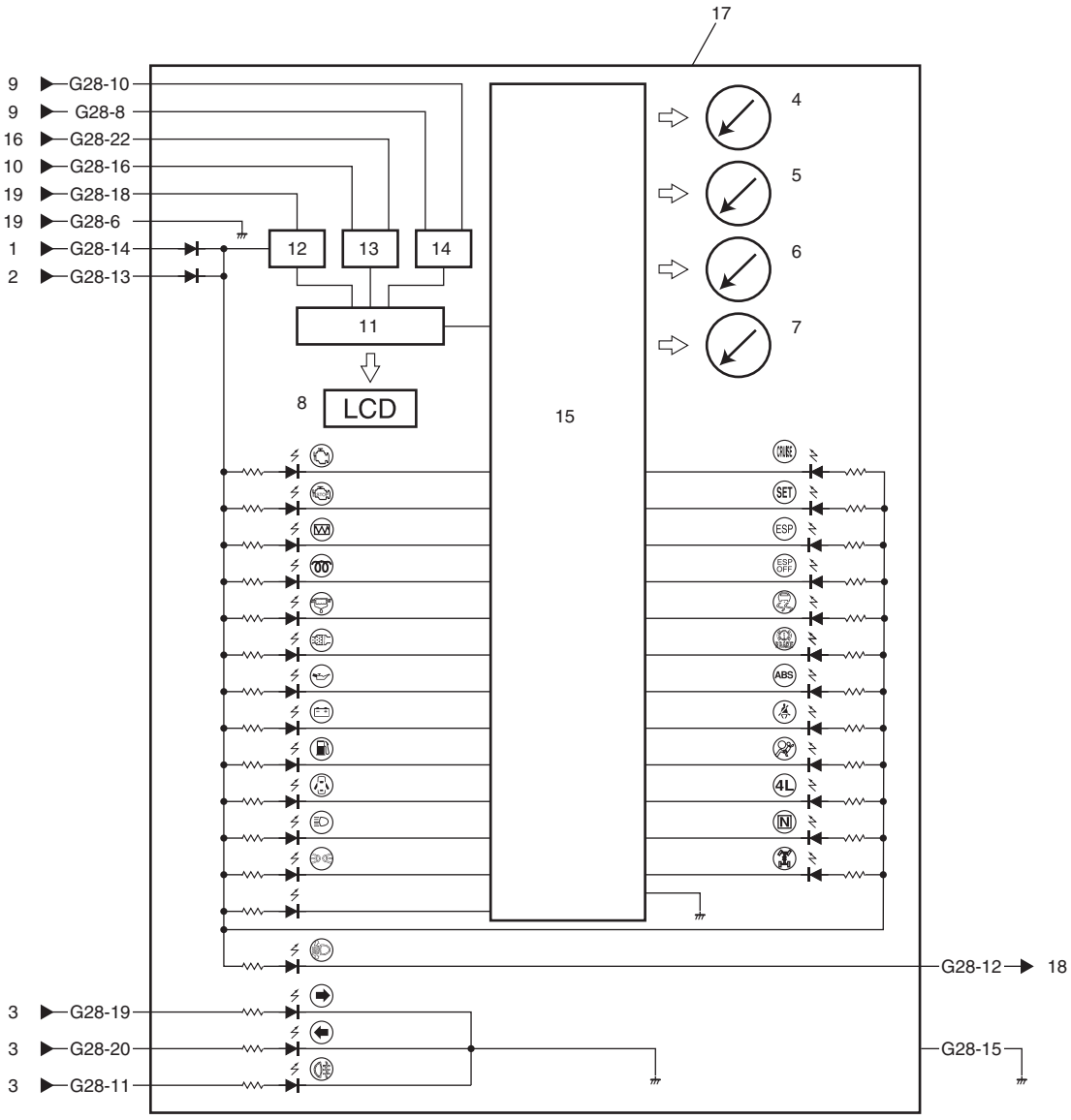
			ECM	BCM	4WD control module (if equipped)	ABS control module (vehicle not equipped with ESP®)	ESP® control module (vehicle equipped with ESP®)
Combination meter	DATA Receive	Engine revolution speed signal	○				
		Engine coolant temperature signal	○				
		Vehicle speed signal	○				
		Malfunction indicator light (MIL) control signal	○				
		Diesel particulate filter warning light control signal	○				
		Injection warning light control signal	○				
		Red stop warning light control signal	○				
		Glow ingicator light control signal	○				
		Fuel filter warning light control signal	○				
		“CRUSE” and “SET” indicator light control signal (if equipped)	○				
		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 reminder light control signal)		○			
		Charging system warning light signal (charge warning light control signal)		○			
		Engine oil pressure switch signal (oil pressure warning light control signal)		○			
		Lighting switch signal (illumination indicator light control signal)		○			
		Door switch signal (door ajar warning light)		○			
		HI beam indicator control signal		○			
		DRL indicator control signal		○			
		Diagnostic trouble code (DTC)		○	○	○	○
		4WD shift position indicator light control signal			○		
		ABS warning light control signal				○	○
		EBD warning light control signal (brake warnng light control signal)				○	○
		ESP® status signal					○

I5JB0B930001-03

Schematic and Routing Diagram

Combination Meter Circuit Diagram

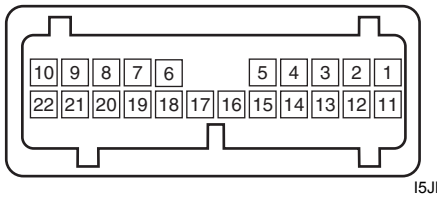
S5JB0B9302001



I5JB0B930002-01

1. Main fuse	6. Fuel meter	11. CPU	16. Illumination cancel switch (if equipped)
2. METER fuse	7. ECT meter	12. Power supply	17. Combination meter
3. Combination switch	8. ODO-TRIP	13. Interface circuit	18. Headlight auto leveling control module (if equipped)
4. Tacho meter	9. Junction connector	14. CAN driver	19. Fuel level sensor
5. Speedometer	10. SDM	15. Stepper motor and LED output driver	

Terminal arrangement of coupler viewed from harness side



I5JB0A930002-01

Terminal	Circuit	Terminal	Circuit
G28-1	—	G28-12	To headlight auto leveling control module
G28-2	—	G28-13	Power source
G28-3	—	G28-14	Backup power source
G28-4	—	G28-15	GND
G28-5	—	G28-16	To SDM (Air bag warning lamp signal)
G28-6	Fuel level sensor ground	G28-17	—
G28-7	—	G28-18	To fuel level sensor
G28-8	CAN communication line (Active Low Signal)	G28-19	To turn signal light switch (turn L)
G28-9	—	G28-20	To turn signal light switch (turn R)
G28-10	CAN communication line (Active High Signal)	G28-21	—
G28-11	To rear fog light switch	G28-22	To illumination cancel switch

Diagnostic Information and Procedures

Fuel Meter Symptom Diagnosis

S5JB0B9304004

Condition	Possible cause	Correction / Reference Item
Fuel meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Low Fuel Warning Light Symptom Diagnosis

S5JB0B9304005

NOTE

Confirm that fuel meter is in good condition before referring to the following possible causes.

- **When fuel level sensor signal circuit is open or short circuit, fuel level meter indicates empty even if fuel tank does not empty.**
- **The low fuel warning light comes ON when fuel level is lower than specification below.**

Low fuel warning light operation:

Low fuel warning light operation:	Fuel amount:	Resistance of fuel level sensor:
ON	**Approx. 8.3 liter (3 door model) Approx. 9.9 liter (5 door model)**	**250.8 – 255.8 Ω**

Condition	Possible cause	Correction / Reference Item
Low fuel warning light does not come ON when fuel level is lower than specification	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Low fuel warning light comes ON steady	Low fuel	*Refill fuel.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Combination meter faulty	*Replace combination meter.*

Repair Instructions

Fuel Level Sensor Inspection

S5JB0B9306005

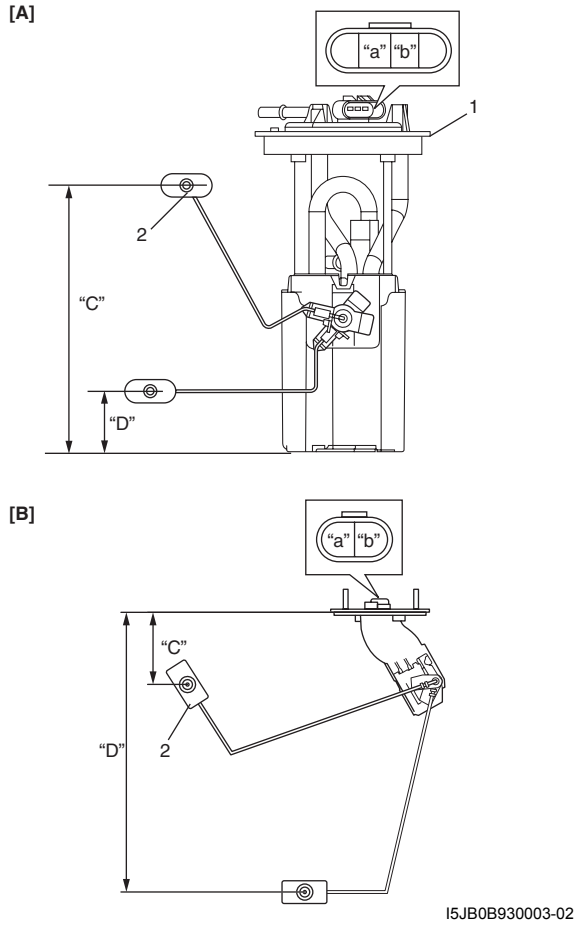
- Check that resistance between terminals “a” and “b” of fuel level sensor changes with change of float position.
- Check resistance between terminals “a” and “b” at each float position in the following.
  If the measured value is out of specification, replace.

Main fuel level sensor [A] specifications

	Float position		Resistance (Ω)
3 door model	Full Upper “C”	193.7 mm (7.626 in.)	19.0 – 21.0
	Full Lower “D”	42.2 mm (1.661 in.)	111.9 – 115.3
5 door model	Full Upper “C”	196.8 mm (7.748 in.)	19.0 – 21.0
	Full Lower “D”	34.9 mm (1.374 in.)	129.0 – 132.4

Sub fuel level sensor [B] specifications

	Float position		Resistance (Ω)
3 door model	Full Upper “C”	48.1 mm (1.894 in.)	19.0 – 21.0
	Full Lower “D”	252.8 mm (9.953 in.)	164.7 – 168.1
5 door model	Full Upper “C”	64.1 mm (2.524 in.)	19.0 – 21.0
	Full Lower “D”	244.8 mm (9.638 in.)	147.6 – 151.0



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1. Fuel pump	2. Float

Oil Pressure Switch Removal and Installation

S5JB0B9306006

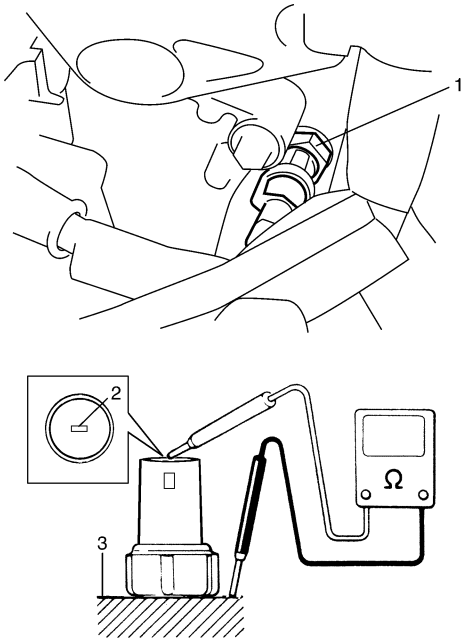
For removal and installation, refer to “Oil Pressure Check: in Section 1E”.

Oil Pressure Switch Inspection

S5JB0B9306007

1) Disconnect connector from oil pressure switch (1).
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



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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 manual.

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Cruise Control System

General Description

Cruise Control System Construction

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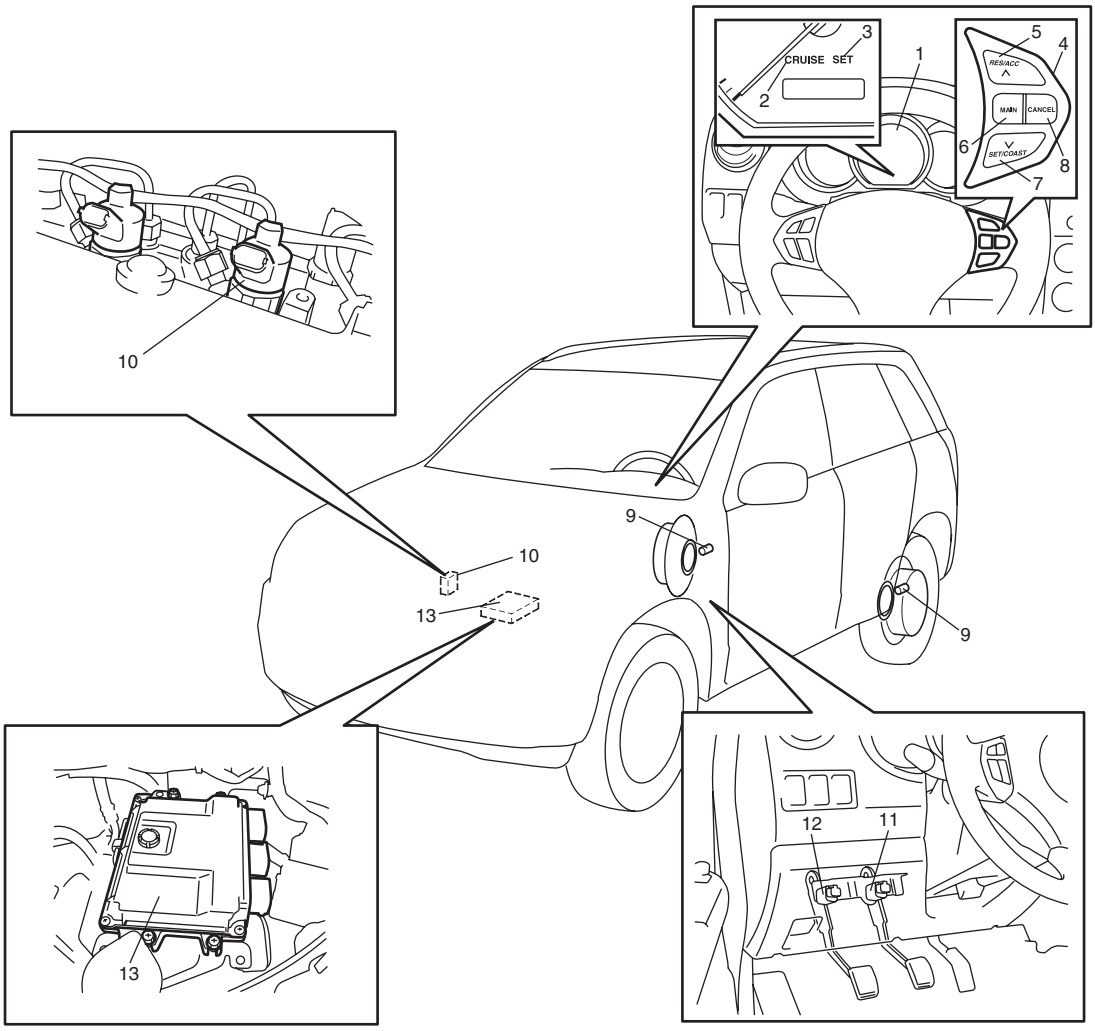
The cruise control system is a device which maintains a preset vehicle speed while driving at a high speed, e.g., on a highway. It allows the driver to drive his vehicle at a constant speed of 40 km/h (25 mile/h) or higher without depressing the accelerator pedal. The system also has such functions as to change the vehicle speed without operating the accelerator pedal (but using SET/COAST and RES/ACC switches), cancel cruise control (CANCEL switch) and resume the speed in memory automatically after cruise control is cancelled (RES/ACC switch). The system mainly consists of fuel injectors, ECM, cruise control switch (MAIN switch, SET/COAST switch, RES/ACC switch and CANCEL switch), etc.



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1. Combination meter	6. MAIN switch	11. Brake light switch with brake pedal position switch
2. “CRUISE” indicator lamp	7. SET/COAST switch	12. Clutch pedal position switch (M/T vehicle only)
3. “SET” indicator lamp	8. CANCEL switch	13. ECM
4. Cruise control switch assembly	9. Wheel speed sensor (vehicle speed signal)	
5. RES/ACC switch	10. Fuel injectors	

Components and Functions of Cruise Control System

S5JB0BA101002

Component	Function
ECM and fuel injectors	ECM executes centralized control over all functions including setting a constant speed, resuming it, setting coast, cancelling cruise control limiting minimum speed. ECM controls fuel injector to keep actual vehicle speed at set (target) speed.
MAIN switch	This switch has a momentary contact type button to press cruise control system ON and OFF.
SET/COAST switch	When this switch is pressed (ON) and then released (OFF) while vehicle is running at a speed 40 km/h (25 mile/h) or higher, vehicle speed at that OFF moment is stored in memory and it is maintained (constant cruising). Pressing this switch (ON) continuously during constant cruising keeps slowing down vehicle speed as long as it is ON. When it is released (OFF), vehicle speed at that moment is stored in memory and vehicle starts constant cruising.
RES/ACC switch	When this switch is pressed (ON) during constant cruising, vehicle speed keeps increasing as long as it is ON. When it is released (OFF), vehicle speed at that moment is stored in memory and vehicle starts constant cruising. If vehicle speed is higher than 40 km/h (25 mile/h) after cruise control is cancelled, pressing this switch ON momentarily will resume the speed at which vehicle was running before cancellation.
CANCEL switch	When this switch is pressed (ON), cruise control is cancelled.
Wheel speed vehicle (sensor speed signal)	ECM receives speed sensor signal from ABS or ESP® control module through CAN communication and calculates vehicle speed using that signal.
Brake light switch	Brake light switch has 2 contact points. One contact point closes when brake pedal is depressed to light brake light and provides a voltage signal to the ECM. The other contact point (brake pedal position switch) opens when brake pedal is depressed, to shut off power to cruise control of ECM, thereby cancelling cruise control. This switch is installed to cancel cruise control (constant cruising).
Clutch pedal position switch	When clutch pedal is depressed, clutch pedal position switch closes and provides a ground signal to ECM. ECM cancels cruise control when this signal is inputted.
“CRUISE” indicator lamp	In the state with ignition switch ON and cruise control system OFF, pressing MAIN switch once and releasing it will activate the cruise control system and ECM will cause indicator lamp to light up.
“SET” indicator lamp	It lights up when cruise control is functioning.

Cancel Conditions of Cruise Control System

S5JB0BA101003

Constant cruising is cancelled under the following conditions.

- *Ignition switch is turned OFF.
- MAIN switch is turned OFF.
- Vehicle speed becomes lower than minimum operating speed (40 km/h (25 mile/h)).
- *Vehicle speed varies beyond cancel speed range (–10 km/h (–6 mile/h)) from preset speed.
- *Brake pedal is depressed. (Brake light switch is turned ON).
- *Clutch pedal is depressed (Clutch pedal position switch is turned ON) (For M/T vehicle).
- *CANCEL switch is turned ON.
- *ESP® is operating (if equipped).

NOTE

When constant cruising is cancelled under any condition with * (asterisk), vehicle speed before cancellation can be resumed by operating RES/ACC switch, provided that vehicle speed is higher than 40 km/h (25 mile/h).

Input / Output Diagram

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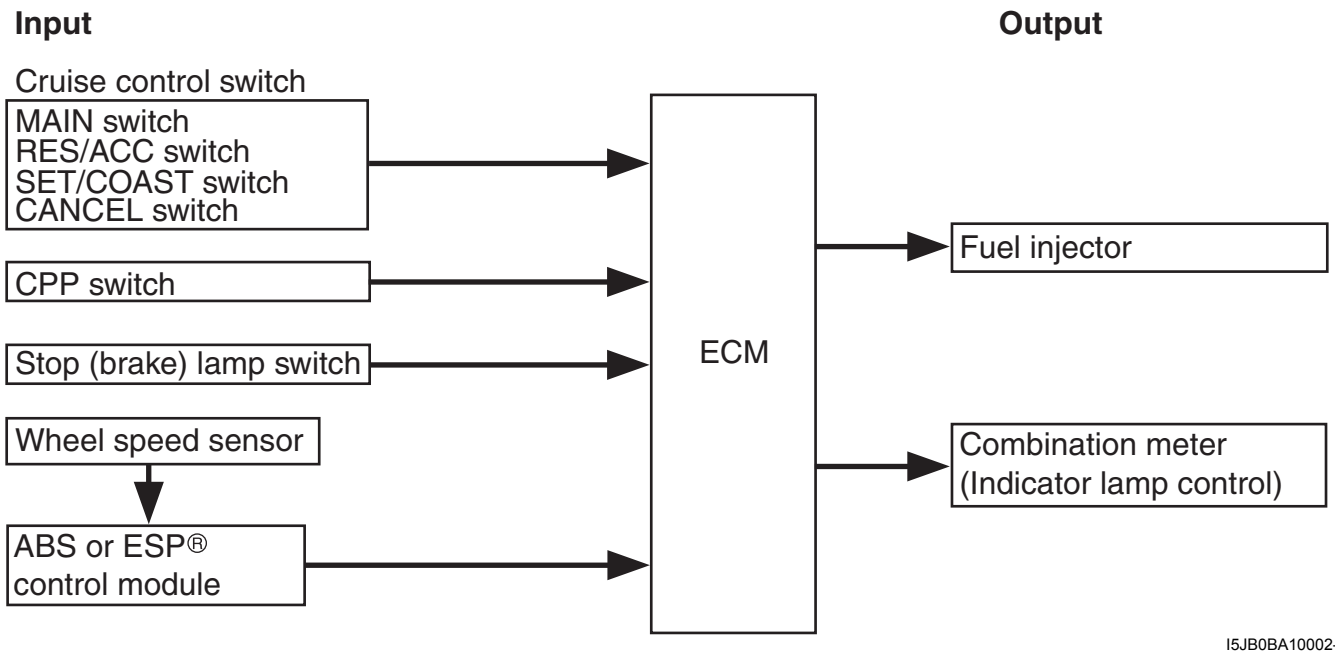

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Schematic and Routing Diagram

Cruise Control System Wiring Diagram

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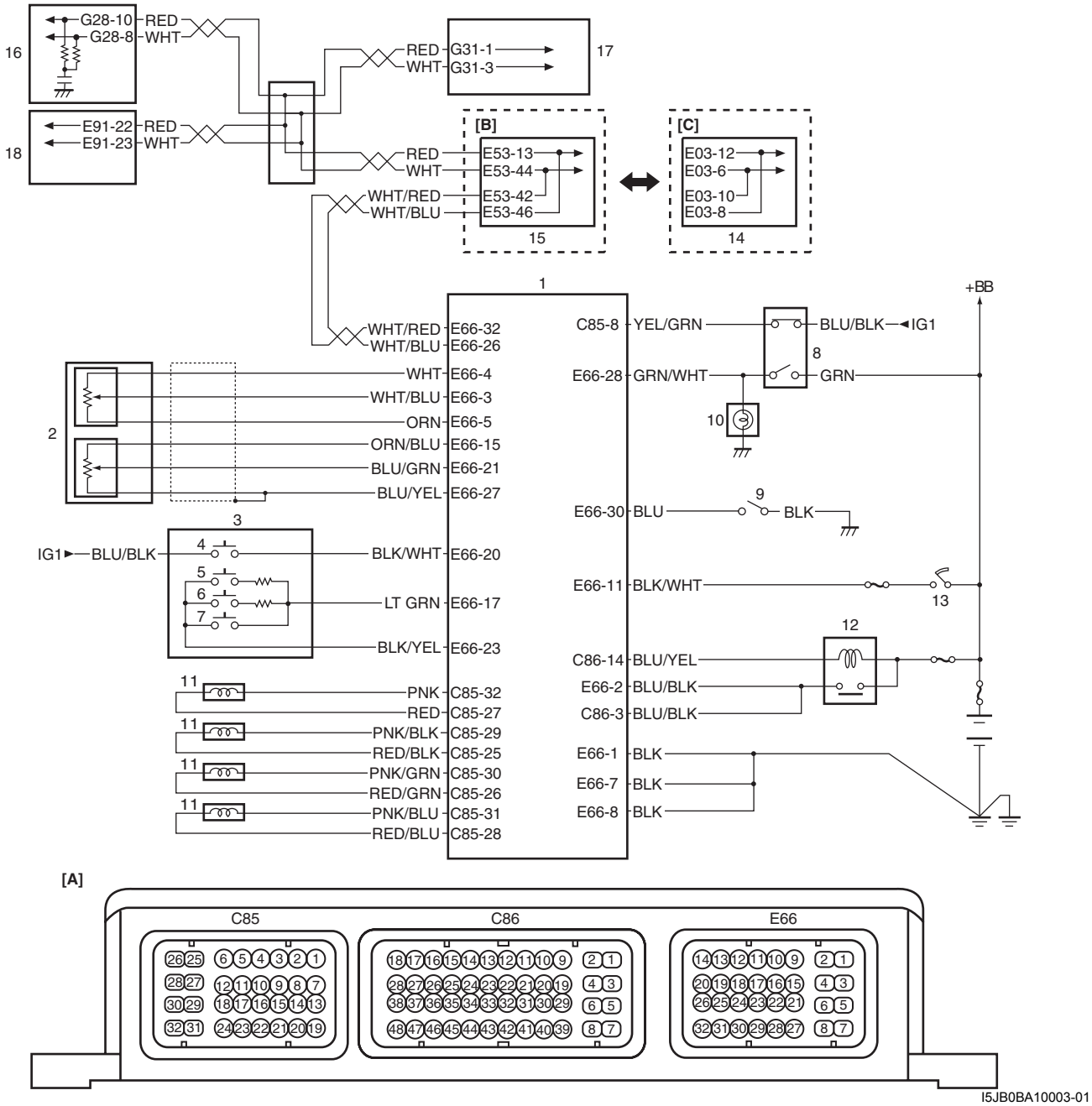

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[A]: ECM connector (viewed from harness side)	5. RES/ACC switch	12. Main relay
[B]: Vehicle equipped with ESP®	6. SET/COAST switch	13. Ignition switch
[C]: Vehicle not equipped with ESP®	7. CANCEL switch	14. ABS control module
1. ECM	8. Stop (brake) lamp switch	15. ESP® control module
2. Accelerator pedal position sensor	9. CPP switch	16. Combination meter
3. Cruise control switch assembly	10. Brake lamp	17. BCM
4. MAIN switch	11. Fuel injector	18. 4WD control module (if equipped)

Diagnostic Information and Procedures

Cruise Control System Symptom Diagnosis

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NOTE

- **ECM uses ABS or ESP® control module and CAN communication to transmit and receive data for cruise control. Therefore, check that no DTC is detected in ECM and ABS or ESP® control module before performing this Cruise Control System Symptom Diagnosis. If DTC is detected, correct trouble indicated by that DTC first.**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
CRUISE or SET indicator lamp does not turn ON or OFF	MAIN switch faulty	*Check MAIN switch for function referring to "Cruise Control Switch Inspection: in related manual".*
	SET/COAST switch faulty	*Check SET/COAST switch for function referring to "Cruise Control Switch Inspection: in related manual".*
	Wiring or grounding faulty	*Repair.*
	Combination meter faulty	*Replace.*
	ECM faulty	*Replace after making sure that none of above parts is faulty.*
Vehicle speed can not be set	MAIN switch faulty	*Check MAIN switch for function referring to "Cruise Control Switch Inspection: in related manual".*
	SET/COAST switch faulty	*Check SET/COAST switch for function referring to "Cruise Control Switch Inspection: in related manual".*
	Brake (stop) Lamp switch faulty	*Check brake (stop) lamp switch for function referring to "Stop (Brake) Lamp Switch Inspection: in related manual".*
	CPP switch faulty (M/T model)	*Check CPP switch for function referring to "Clutch Pedal Position (CPP) Switch (for Cruise Control) Inspection and Adjustment: in related manual".*
	Wiring or grounding faulty	*Repair.*
	ECM faulty	*Replace after making sure that none of above parts is faulty.*
Acceleration or deceleration is not available by using RES/ ACC or SET/COAST switch	RES/ACC or SET/COAST switch faulty	*Check RES/ACC or SET/COAST switch for function referring to "Cruise Control Switch Inspection: in related manual".*
	Wiring or grounding faulty	*Repair.*
	ECM faulty	*Replace after making sure that none of above parts is faulty.*
Cruise control cannot be cancelled	CANCEL switch faulty	*Check CANCEL switch for function referring to "Cruise Control Switch Inspection: in related manual".*
	Stop (brake) lamp switch faulty	*Check brake (stop) lamp switch for function referring to "Stop (Brake) Lamp Switch Inspection: in related manual".*
	CPP switch faulty	*Check CPP switch for function referring to "Clutch Pedal Position (CPP) Switch (for Cruise Control) Inspection and Adjustment: in related manual".*
	Wiring or grounding faulty	*Repair.*
	ECM faulty	*Replace after making sure that none of above parts is faulty.*

Condition	Possible cause	Correction / Reference Item
Cruise control at vehicle speed stored in memory cannot be resumed after cruise control was cancelled by means other than MAIN switch	RES/ACC switch faulty	*Check RES/ACC switch for function referring to "Cruise Control Switch Inspection: in related manual".*
	Wiring or grounding faulty	*Repair.*
	ECM faulty	*Replace after making sure that none of above parts is faulty.*

Inspection of Cruise Control System Circuit

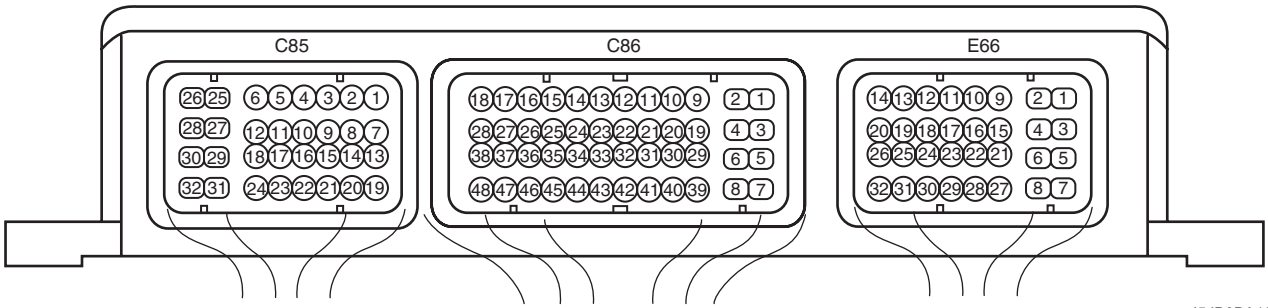
S5JB0BA104012

Cruise control system is controlled by ECM. Each switch and circuit can be checked by taking measurement of terminal voltage.

Voltage Check

Check voltage between the following terminals with ECM connector connected.

Terminal arrangement of ECM connector viewed from harness side



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Terminals	Circuit	Normal Voltage	Condition
E66-17 – ground	Cruise control command switch (SET/COAST, ACC/RES and CANCEL switch) circuit	0 – 0.1 V	Ignition switch is at ON position and cruise control cancel switch is kept in push.
		1.5 – 1.9 V	Ignition switch is at ON position and SET/ COAST switch of cruise control is kept in push.
		3.2 – 3.7 V	Ignition switch is at ON position and ACC/RES switch of cruise control is kept in push.
		4.5 – 5.5 V	Ignition switch is at ON position and cruise control command switches are not pushed.
E66-20 – ground	Cruise control main switch circuit	0 – 1 V	Ignition switch is at ON position and cruise control MAIN switch is not pushed.
		10 – 14 V	Ignition switch is at ON position and cruise control MAIN switch is kept in push.
E66-23 – ground	Ground circuit for cruise control command switch	Below 1.3 V	Ignition switch is at ON position.
E66-28 – ground	Stop lamp switch circuit	0 V	Ignition switch is at ON position and brake pedal is not depressed.
		10 – 14 V	Ignition switch is at ON position and brake pedal is depressed.
E66-30 – ground	CPP switch circuit	10 – 14 V	Ignition switch is at ON position and clutch pedal is not depressed.
		0 V	Ignition switch is at ON position and clutch pedal is depressed.
C85-8 – ground	Brake pedal position switch circuit	10 – 14 V	Ignition switch is at ON position and brake pedal is not depressed.
		0 V	Ignition switch is at ON position and brake pedal is depressed.

Body Electrical Control System

Precautions

Precautions in Diagnosing Trouble

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- Diagnostic information stored in BCM 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 in related manual" before inspection and observe what is written there.
- Communication of ECM, BCM, ABS or ESP® control module, 4WD control module (if equipped), steering angle sensor (if equipped) and combination meter is established by CAN (Controller Area Network). Therefore, be sure to read "Precaution for CAN Communication System: in Section 00 in related manual" before inspection and handle CAN communication line.

General Description

CAN Communication for BCM

S5JB0BA201002

BCM communicates with each of ECM, ESP® control module (if equipped), 4WD control module (if equipped) and combination meter about the following data. For details of CAN communication, refer to "CAN Communication System Description: in Section 1A".

BCM Transmission Data

				ECM	ESP® Control Module (if equipped)	Combination Meter
BCM	Transmit	DATA	A/C switch ON signal	○		
			Brake fluid level switch signal		○	○
			Parking brake switch signal		○	○
			Seat belt buckle switch signal			○
			Charging system signal			○
			Engine oil pressure switch signal			○
			Illumination ON signal			○
			Lighting switch signal			○
			DRL operation signal			○
			Door switch status			○
			Diagnostic trouble code (DTC)			○

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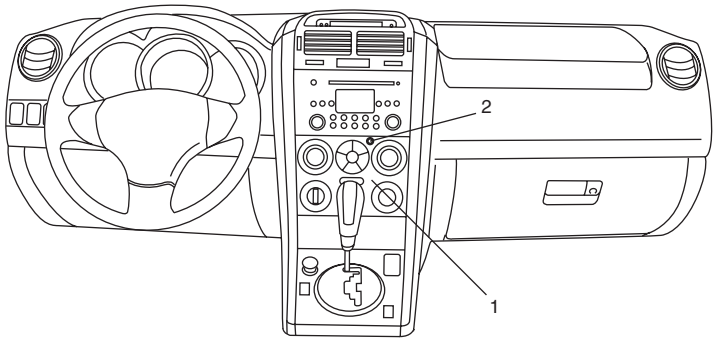
BCM Reception Data

				ECM	4WD Control Module (if equipped)
BCM	Receive	DATA	Engine speed signal	○	
			Engine coolant temp. signal	○	
			Vehicle speed signal	○	
			Stop (brake) lamp switch signal	○	
			Magnet clutch signal	○	
			A/C refrigerant pressure signal	○	
			Distance kilometers per liter of fuel signal	○	
			Additional heater relay signal	○	
			Radiator cooling fan relay signal	○	
			Buzzer request signal		○

I5JB0BA20002-01

Theft Deterrent Light

Theft deterrent light (2) is installed on the HVAC control module (1) for the theft preventive purpose.
The BCM makes the theft deterrent light flash at certain intervals after the ignition switch is turned off until it is turned on again. Also, DTCs stored in BCM can be checked by reading the flashing patterns of the theft deterrent light when diagnosing troubles.



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Schematic and Routing Diagram

Body Electrical Control System Wiring Circuit Diagram

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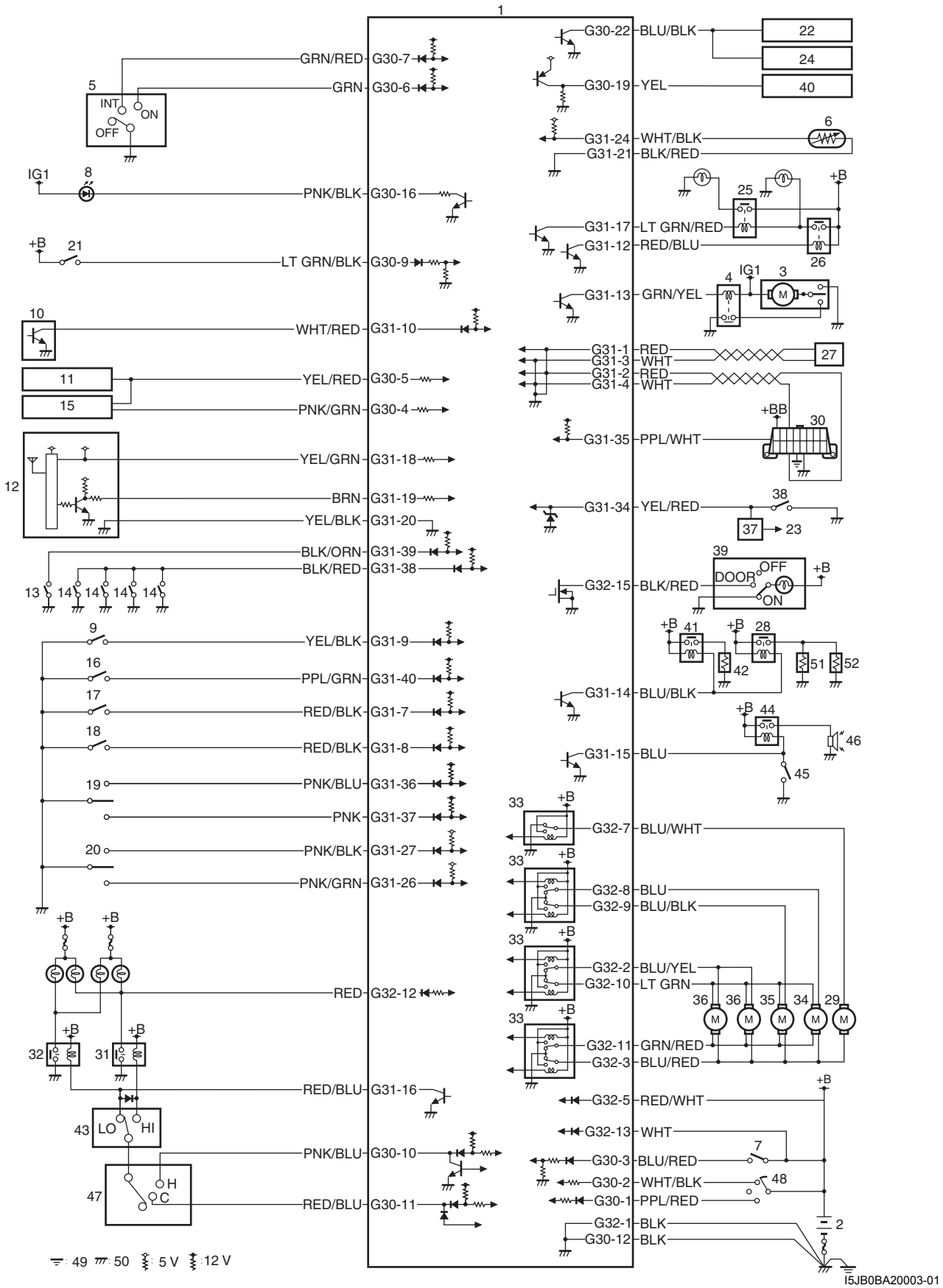

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1. BCM	22. Navigation (if equipped)	43. Dimmer and passing switch
2. Battery	23. To turn signal light	44. Horn relay
3. Rear wiper motor	24. Headlight auto leveling control module (if equipped)	45. Horn switch
4. Rear wiper relay	25. Front fog light relay (if equipped)	46. Horn
5. Rear wiper and washer switch	26. Tail light relay	47. Lighting switch
6. Outside air temperature sensor	27. Junction connector	48. Ignition switch
7. Ignition key switch	28. Door mirror heater relay (if equipped)	49. Body ground
8. Theft deterrent light	29. Rear end door lock actuator	50. Engine ground
9. Oil pressure switch	30. Data link connector (DLC)	51. Right side door mirror heater (if equipped)
10. Generator	31. Headlight high beam relay	52. Left side door mirror heater (if equipped)
11. Information display	32. Headlight low beam relay	INT: Intermittent position
12. Keyless entry receiver (if equipped)	33. Door lock motor relay	ON: Rear wiper ON position
13. Driver side door switch	34. Driver side door lock actuator	LO: Low beam position
14. Other than driver side door switch	35. Passenger side door lock actuator	HI: High beam position
15. HVAC control module	36. Rear door lock actuator	C: Clearance position
16. Driver side seat belt switch	37. Turn signal and hazard warning relay	H: Head position
17. Brake fluid level switch	38. Hazard warning switch	
18. Parking brake switch	39. Interior light	
19. Door key cylinder switch (included in door lock actuator)	40. Air bag control module	
20. Manual door lock switch	41. Rear window defogger relay	
21. Front fog light switch (if equipped)	42. Rear window defogger	

Component Location

BCM and Related System Component Location

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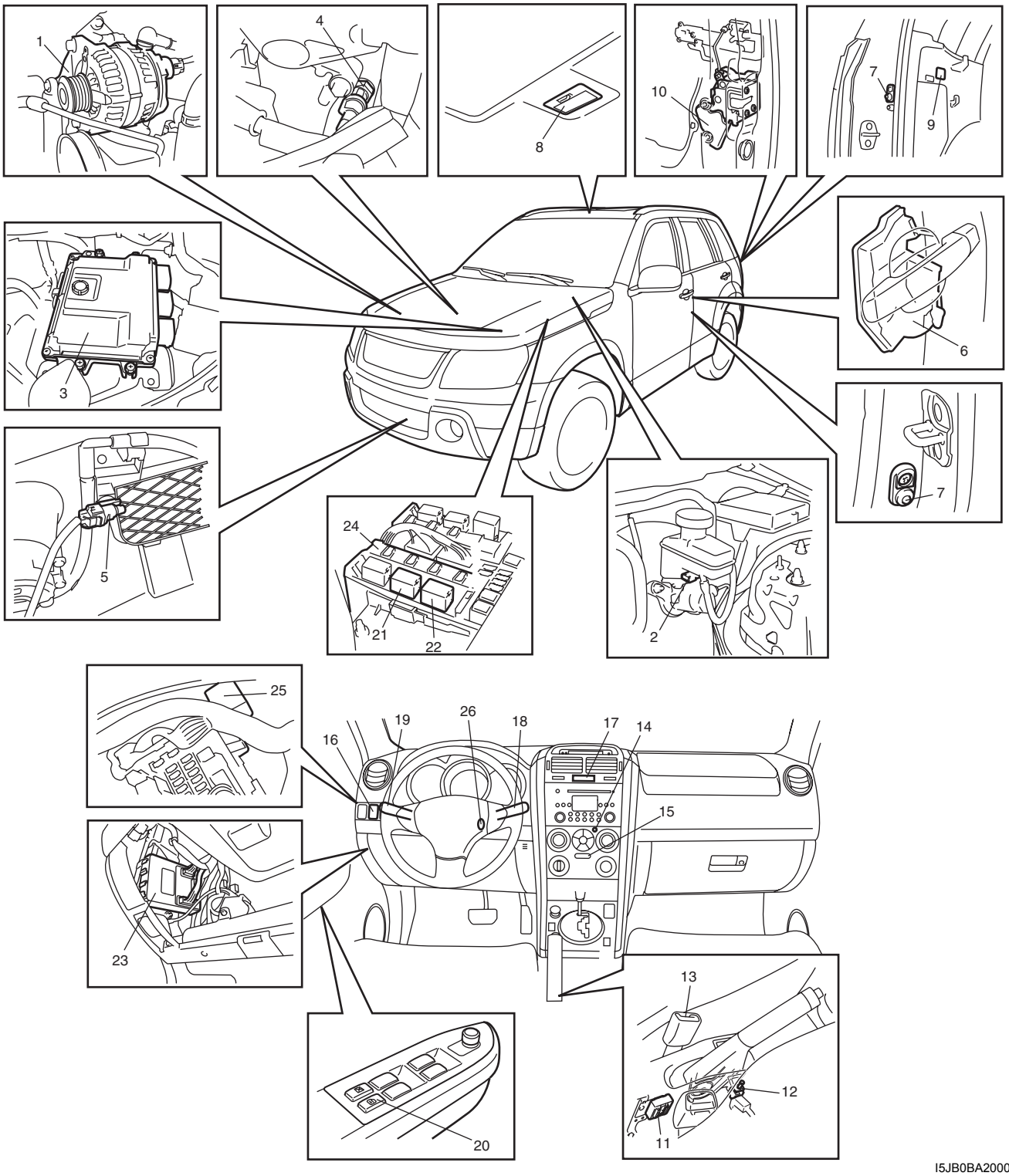

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1. Generator	10. Rear end door lock actuator (incorporated in door switch)	19. Lighting switch
2. Brake fluid level switch	11. Keyless entry receiver (if equipped)	20. Manual door lock switch
3. ECM	12. Parking brake switch	21. Headlight high beam relay
4. Oil pressure switch	13. Seat belt buckle switch	22. Headlight low beam relay
5. Outside air temperature sensor	14. Theft deterrent light	23. BCM
6. Door lock actuator (incorporated in key cylinder switch)	15. Rear end door window defogger switch	24. Rear end window defogger, mirror heater, rear wiper and front fog light relays (included in integration relay)

7. Door switch	16. Front fog light switch (if equipped)	25. Turn signal and hazard warning relay
8. Interior light	17. Hazard warning switch	26. Key reminder switch (included in ignition switch)
9. Luggage room light	18. Rear wiper switch	

Diagnostic Information and Procedures

Scan Tool Data

S5JB0BA204003

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
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 Seat belt Sw	Driver side seat belt fastened	Fasten
	Driver side seat belt unfastened	Unfasten
Charge Lamp	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
Oil pressure switch	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
A/C Switch	A/C and ignition switch turned ON	ON
	A/C switch turned OFF	OFF
Rear Wiper Sw	Rear wiper switch at ON position	ON
	Rear wiper switch at INT position	INT
	Rear wiper switch at OFF position	OFF
Front Fog Light Sw	Lighting switch at HEAD or CLEARANCE position and front fog light switch at ON position	ON
	Lighting switch at HEAD or CLEARANCE position and front fog light switch at OFF position	OFF
Headlight Sw	Lighting switch at HEAD position	ON
	Lighting switch at OFF position	OFF

Scan Tool Data Definitions

Vehicle Speed (km/h, mph): This parameter indicates the vehicle speed computed by ECM.

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): This parameter indicates the engine coolant temperature computed by ECM.

Engine Speed (RPM): This parameter indicates the engine speed computed by ECM.

Fuel Consumption (km/l): This parameter indicates the fuel consumption computed by ECM.

Key Reminder Sw (Key reminder switch) (Pulled / Key in): This parameter indicates the state of the key reminder 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 Seat belt Sw (Driver seat belt switch) (Fasten / Unfasten): This parameter indicates the state of the driver side seat belt buckle switch.

Charge lamp (ON / OFF): This parameter indicates the state of the charge system monitor switch.

Oil pressure switch (ON / OFF): This parameter indicates the state of the oil pressure switch.

A/C Switch (ON / OFF): This parameter indicates the state of the air conditioning switch.

Rear Wiper Sw (Rear wiper switch) (ON / INT / OFF): This parameter indicates the state of the rear wiper switch.

Front Fog Light Sw (Front fog light switch) (ON / OFF): This parameter indicates the state of the front fog light switch.

Headlight Sw (Headlight switch) (ON / OFF): This parameter indicates the state of the lighting 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 Test 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)
Parking/Tail Light	Tail light relay
Front Fog Light	Front fog light relay (when lighting switch is at CLEARANCE position)
Rear defogger	Rear defogger and mirror heater relays
D.R.L.	Headlight low beam relay
Auto on headlight	Headlight low beam and tail light relays
Door	Each door lock actuator
Dead lock	Each door lock actuator
Warning buzzer	Warning buzzer (in BCM)
Rear wiper	Rear wiper relay
Alarm indicator	Theft deterrent light (in HVAC control module)

DTC Table

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DTC (displayed on SUZUKI scan tool)	DTC (indicated by theft deterrent light)	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
☞ 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
☞ 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 U1073 (No. 1073): Control Module Communication Bus Off

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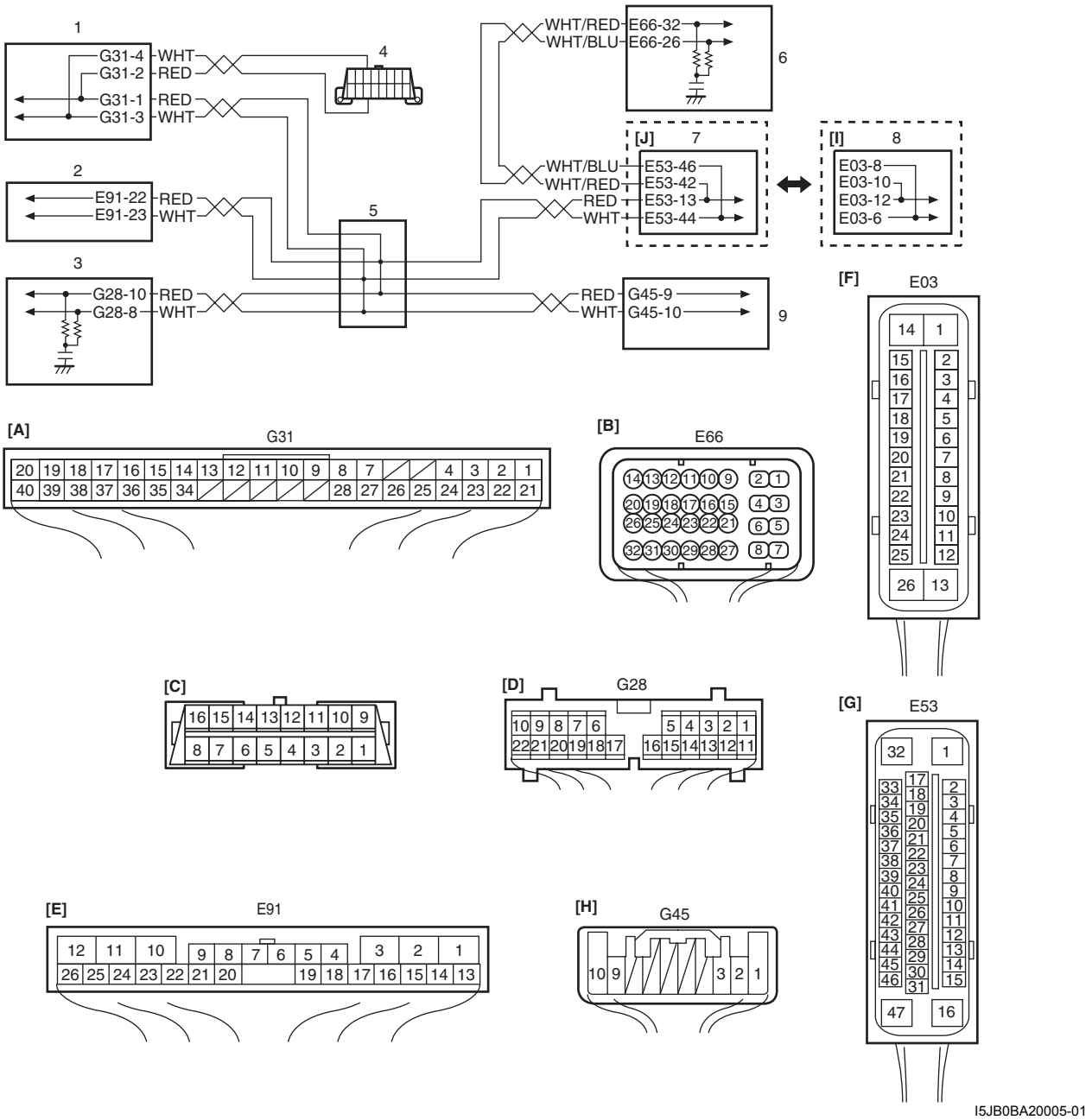
Wiring Diagram



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[A]: BCM connector (viewed from harness side)	1. BCM
[B]: ECM connector (viewed from harness side)	2. 4WD control module (if equipped)
[C]: DLC (viewed from harness side)	3. Combination meter
[D]: Combination meter connector (viewed from harness side)	4. DLC
[E]: 4WD control module connector (viewed from harness side)	5. Junction connector
[F]: ABS control module connector (viewed from terminal side)	6. ECM
[G]: ESP® control module connector (viewed from terminal side)	7. ESP® control module
[H]: Steering angle sensor connector (viewed from harness side)	8. ABS control module
[I]: Vehicle not equipped with ESP®	9. Steering angle sensor
[J]: Vehicle equipped with ESP®	

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 • 4WD control module (if equipped) • ABS or ESP® control module • 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 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 and reconnect securely. 2) Recheck DTC and reconnect securely. *Is DTC U1073 detected?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”.
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. *Is each CAN communication circuit in good condition?*	Go to Step 3.	Repair circuit.
3	**Check DTC in BCM** 1) Turn ignition switch to OFF position. 2) Connect connectors of disconnected control modules communicating by means of CAN. 3) Disconnect connector from any one of control modules other than BCM. 4) Recheck DTC for BCM. *Is DTC U1073 detected?*	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 3) one by one and check that DTC U1073 is detected by BCM each time connector is disconnected. When DTC U1073 is not detected by BCM while checking in this way, go to description under “NO” below. If DTC U1073 is detected by BCM even when connectors of all control modules that use CAN communication with BCM are disconnected, substitute a known-good BCM and recheck.	Check power and ground circuit of control module disconnect in Step 3). If circuit is OK, substitute a known-good control module disconnected in Step 3) and recheck.

DTC U1100 (No. 1100): Lost Communication with ECM

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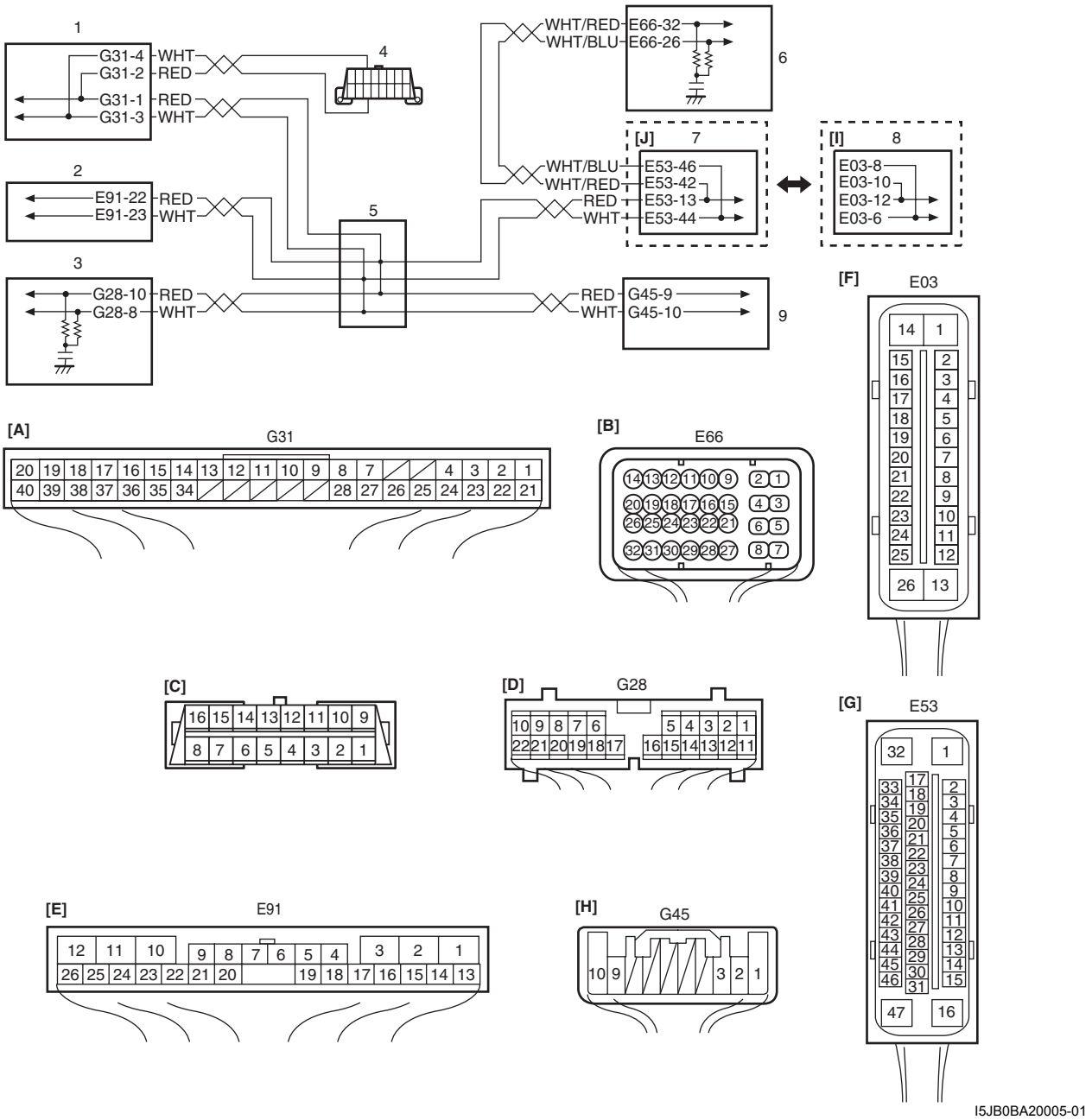
Wiring Diagram



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[A]: BCM connector (viewed from harness side)	1. BCM
[B]: ECM connector (viewed from harness side)	2. 4WD control module (if equipped)
[C]: DLC (viewed from harness side)	3. Combination meter
[D]: Combination meter connector (viewed from harness side)	4. DLC
[E]: 4WD control module connector (viewed from harness side)	5. Junction connector
[F]: ABS control module connector (viewed from terminal side)	6. ECM
[G]: ESP® control module connector (viewed from terminal side)	7. ESP® control module
[H]: Steering angle sensor connector (viewed from harness side)	8. ABS control module
[I]: Vehicle not equipped with ESP®	9. Steering angle sensor
[J]: Vehicle equipped with ESP®	

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 • 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** *Is DTC U1100 (No. 1100) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	**Check DTC in ABS or ESP® control module** *Is DTC U1073 detected?*	Go to "DTC U1073: Control Module Communication Bus Off: in Section 4E".	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. *Is DTC U1100 (No. 1100) detected?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00 in related manual".
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from BCM, ECM and ABS or ESP® control module. 3) Check CAN communication circuit for open, short and high resistance. • Between ECM and ABS or ESP® control module • Between BCM and ABS or ESP® control module *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.
5	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 4 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 6.	Repair circuit.

Step	Action	Yes	No
6	**Check DTC in BCM** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect connector from any one of control modules other than BCM. 3) Recheck DTC for BCM. *Is DTC U1100 detected?*	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 2) one by one and check that DTC U1100 is detected by BCM each time connector is disconnected. When DTC U1100 is not detected by BCM while checking in this way, go to description under "NO" below. If DTC U1100 is detected by BCM even when connectors of all control modules that use CAN communication with BCM are disconnected, substitute a known-good BCM and recheck.	Check power and ground circuit of control module disconnect in Step 2). If circuit is OK, substitute a known-good control module disconnected in Step 2) and recheck.

Inspection of BCM and its Circuits

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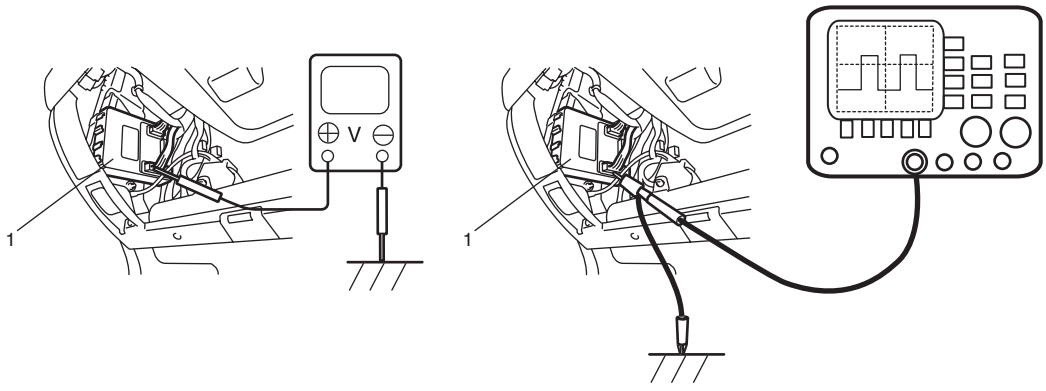
BCM and its circuits can be checked at BCM wiring couplers by measuring voltage and resistance.

⚠ 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 steering column hole cover from instrument panel.
3) Check voltage at each terminal number of couplers connected.
   For connector and terminal number, refer to "Connector Layout Diagram of BCM: in related manual".



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1. BCM

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 "G30"

Terminal	Circuit	Normal voltage	Condition
G30-1	Power source (IG)	10 – 14 V	Ignition switch is at ON position
		0 V	Ignition switch is at any position other than ON position
G30-2	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
G30-3	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
G30-4	Serial communication line for HVAC control module	*0 – 1 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 1: "
G30-5	Serial communication line for information display and HVAC control module	*0 – 1V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 2: "
G30-6	Rear wiper switch	*0 – 1 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 3: "
		0 V	Ignition switch is at ON position and rear wiper switch is at ON position
G30-7	Rear wiper INT switch	0 – 1 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 3: "
		0 V	Ignition switch is at ON position and rear wiper switch is at INT position
G30-8	—	—	—
G30-9	Front fog light switch (if equipped)	10 – 14 V	Lighting switch is at CLEARANCE position and front fog light switch is at ON position
		0 V	Lighting switch is at CLEARANCE position and front fog light switch is at OFF position
G30-10	Lighting switch (HEAD)	10 – 14 V	Lighting switch is at any position other than HEAD position
		0 V	Lighting switch is at HEAD position
G30-11	Lighting switch (CLEARANCE)	10 – 14 V	Lighting switch is at OFF position
		0 V	Lighting switch is at any position other than OFF position
G30-12	Ground for body electrical controller	0 V	Ignition switch is at each position
G30-13	—	—	—
G30-14	—	—	—
G30-15	—	—	—
G30-16	Theft deterrent light	10 – 14 V	Theft deterrent light is not lit up
		0 V	Theft deterrent light is lit up
G30-17	—	—	—
G30-18	—	—	—
G30-19	Serial communication line of SDM	*0 – 1 V ↑↓ 4 – 6 V	Refer to "Reference waveform No. 4: "
G30-20	—	—	—
G30-21	—	—	—

Terminal	Circuit	Normal voltage	Condition
G30-22	Vehicle speed signal output (if equipped)	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 5: ”
G30-23	—	—	—
G30-24	—	—	—

BCM connector “G31”

Terminal	Circuit	Normal voltage	Condition
G31-1	CAN communication line (high) for each control module	*2.5 – 3.6 V	Refer to “Reference waveform No. 6: ”
G31-2	CAN communication line (high) for DLC	*2.5 – 3.6 V	
G31-3	CAN communication line (low) for each control module	*1.6 – 2.5 V	
G31-4	CAN communication line (low) for DLC	*1.6 – 2.5 V	
G31-5	—	—	—
G31-6	—	—	—
G31-7	Brake fluid level switch	*5 – 12 V	Refer to “Reference waveform No. 7: ”
		0 V	Ignition switch is at ON position and brake fluid level is lower than MIN level
G31-8	Parking brake switch	*5 – 12 V	Refer to “Reference waveform No. 7: ”
		0 V	Ignition switch is at ON position and parking brake lever is pulled up
G31-9	Oil pressure switch	*6 – 14 V	Refer to “Reference waveform No. 8: ”
		0 V	Ignition switch is at ON position and engine is at stop
G31-10	Generator “L” terminal	10 – 14 V	Engine is running
		0 V	Ignition switch is at ON position
G31-11	—	—	—
G31-12	Tail light relay control	10 – 14 V	Lighting switch is at OFF position
		0 V	Lighting switch is at any position other than OFF position
G31-13	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
G31-14	Rear end door window defogger control	10 – 14 V	Engine is running and rear end door window defogger is not in operation
		0 V	Engine is running and rear end door window defogger is in operation
G31-15	Horn control	10 – 14 V	Horn is not in operation
		0 V	Horn is in operation
G31-16	DRL control (if equipped)	10 – 14 V	Engine is running and lighting switch is at CLEARANCE or OFF position
		0 V	Engine is running and lighting switch is at HEAD position
G31-17	Front fog light control (if equipped)	10 – 14 V	Lighting switch is at CLEARANCE position and front fog light switch is at OFF position
		0 V	Lighting switch is at CLEARANCE position and front fog light switch is at ON position
G31-18	Power supply for keyless receiver (if equipped)	4 – 6 V	Ignition switch is at ON position
G31-19	Signal for keyless receiver (if equipped)	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 9: ”
G31-20	Ground for keyless receiver (if equipped)	0 V	Ignition switch is at each position

Terminal	Circuit	Normal voltage	Condition
G31-21	Sensor ground for outside air temperature sensor	0 V	Ignition switch is at each position
G31-22	—	—	—
G31-23	—	—	—
G31-24	Outside air temperature sensor	About 1.5 V	Ignition switch is at ON position and outside air temperature approx. 20 °C (68 °F)
G31-25	—	—	—
G31-26	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
G31-27	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.
G31-28	—	—	—
G31-29	—	—	—
G31-30	—	—	—
G31-31	—	—	—
G31-32	—	—	—
G31-33	—	—	—
G31-34	Turn signal / hazard warning relay control	0 V	Hazard warning switch is at ON position
		10 – 14 V	Hazard warning switch is at OFF position
G31-35	Serial communication line of data link connector	7 – 14 V	Ignition switch is at ON position
G31-36	Driver side door key cylinder switch (Unlock)	10 – 14 V	Driver side key cylinder switch is at any position other than unlock position
		0 V	Driver side key cylinder switch is at unlock position
G31-37	Driver side door key cylinder switch (lock)	10 – 14 V	Driver side key cylinder switch is at any position other than lock position
		0 V	Driver side key cylinder switch is at lock position
G31-38	Door switch (rear end door and other than driver side door)	10 – 14 V	Rear right and left side door, passenger side door and rear end door are closed
		0 V	Any one of the door is opened (except driver side door)
G31-39	Driver side door switch	10 – 14 V	Driver side door is closed
		0 V	Driver side door is opened
G31-40	Driver seat belt switch	*5 – 12 V	Refer to “Reference waveform No. 7: ”
		0 V	Ignition switch is at ON position and driver seat belt is unfastened

BCM connector “G32”

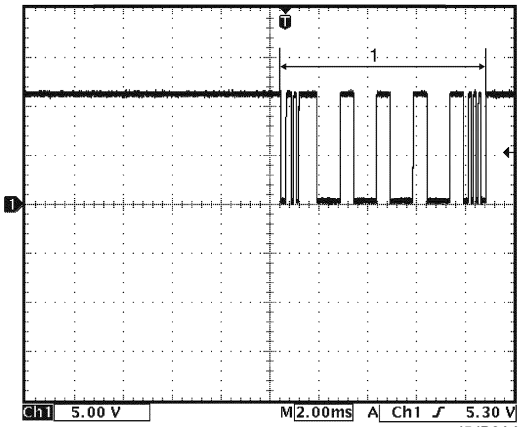
Terminal	Circuit	Normal voltage	Condition
G32-1	Ground for door lock motor	0 V	Ignition switch is at each position
G32-2	Rear door lock actuator motor control (Unlock)	10 – 14 V	Unlock signal is output for rear door lock actuators
		0 V	Unlock signal is not output for rear door lock actuators
G32-3	Door lock actuator motor control (Lock)	10 – 14 V	Lock signal is output for all door lock actuators
		0 V	Lock signal is not output for all door lock actuators
G32-4	—	—	—
G32-5	Power supply for door lock actuator motor	10 – 14 V	Ignition switch is at each position
G32-6	—	—	—
G32-7	Rear end door lock actuator motor control (Unlock)	10 – 14 V	Unlock signal is output for rear end door lock actuator
		0 V	Unlock signal is not output for rear end door lock actuator
G32-8	Driver side door lock actuator motor control (Unlock)	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

Terminal	Circuit	Normal voltage	Condition
G32-9	Passenger side door lock actuator motor control (Unlock)	10 – 14 V	Unlock signal is output for passenger side door lock actuator
		0 V	Unlock signal is not output for passenger side door lock actuator
G32-10	Door lock actuator motor control (Dead lock cancel) (if equipped)	10 – 14 V	Driver side key cylinder is turned to unlock position
		0 V	Driver side key cylinder is at any position other than unlock position
G32-11	Door lock actuator motor control (Dead lock set) (if equipped)	10 – 14 V	Driver side key cylinder is turned to lock twice within 3 seconds
		0 V	Driver side key cylinder is at any position other than lock position
G32-12	Headlight high beam monitor signal	10 – 14 V	Lighting switch is at HEAD position and dimmer switch is at low beam position
		0 V	Lighting switch is at HEAD position and dimmer switch is at high beam position
G32-13	Power supply for interior light	10 – 14 V	Ignition switch is at each position
G32-14	—	—	—
G32-15	Interior light control	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

Reference waveform No. 1

HVAC control module serial communication signal (1)

Measurement terminal	CH1: “G30-4” to “G30-12”
Oscilloscope setting	CH1: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position



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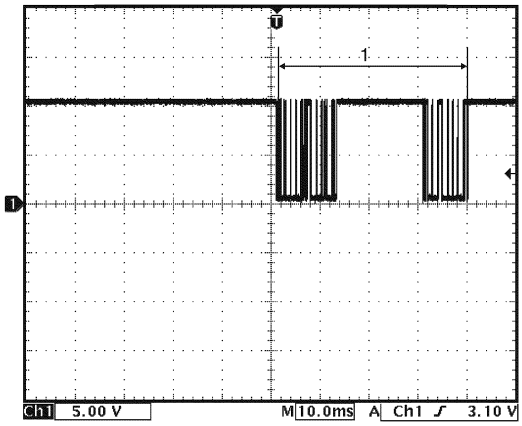
Reference waveform No. 2

HVAC control module and information display serial communication signal (1)

Measurement terminal	CH2: “G30-5” to “G30-12”
Oscilloscope setting	CH1: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	Ignition switch is at ON position



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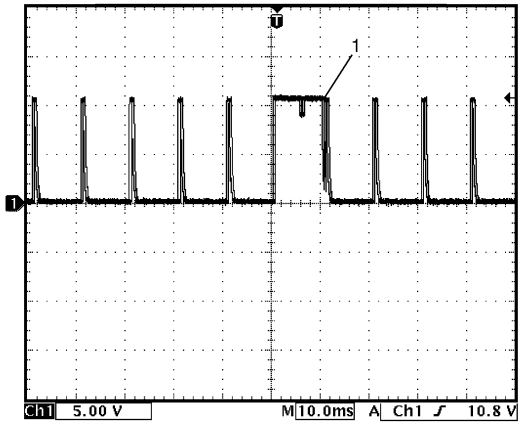
Reference waveform No. 3
Rear wiper LOW or INT signal (1)

Measurement terminal	Rear wiper LOW signal: CH1: “G30-6” to “G30-12” Rear wiper INT signal: CH1: “G30-7” to “G30-12”
Oscilloscope setting	CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	Rear wiper LOW signal: • Ignition switch is at ON position, rear wiper switch is at any position other than LOW position Rear wiper INT signal: • Ignition switch is at ON position, rear wiper switch is at any position other than INT position



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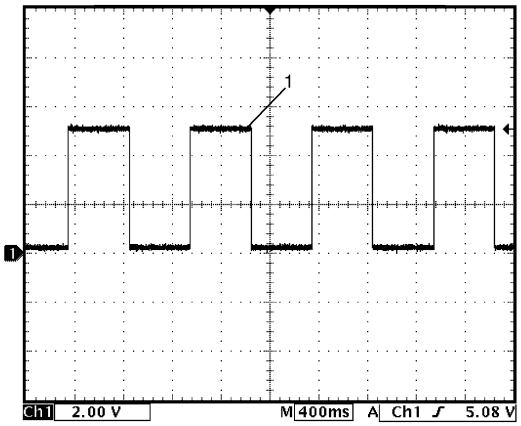
Reference waveform No. 4
SDM communication signal (1)

Measurement terminal	CH1: “G30-19” to “G30-12”
Oscilloscope setting	CH1: 2 V/DIV TIME: 400 ms/ DIV
Measurement condition	Ignition switch is at ON position



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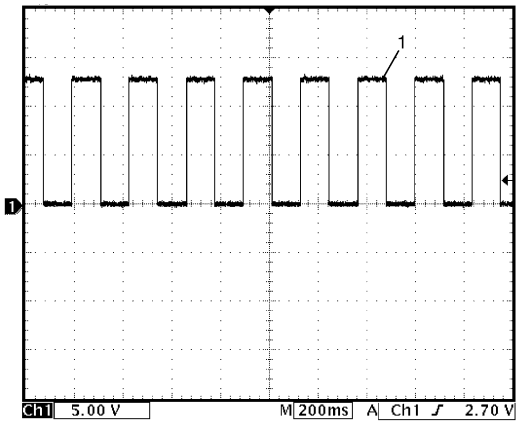
Reference waveform No. 5
Vehicle speed pulse output signal (1)

Measurement terminal	CH1: “G30-22” to “G30-12”
Oscilloscope setting	CH1: 5 V / DIV TIME: 200 ms / DIV
Measurement condition	Vehicle speed at 10 km/h (6 mph)



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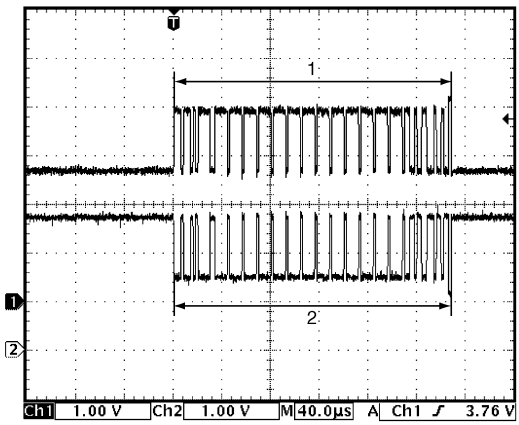
Reference waveform No. 6
CAN communication signal

Measurement terminal	CAN communication signal for each control module CH1: “G31-1” to “G30-12” CH2: “G31-3” to “G30-12” CAN communication signal for DLC CH1: “G31-2” to “G30-12” CH2: “G31-4” to “G30-12”
Oscilloscope setting	CH1: 1 V / DIV CH2: 1 V / DIV TIME: 40 μs / DIV
Measurement condition	Ignition switch is at ON position



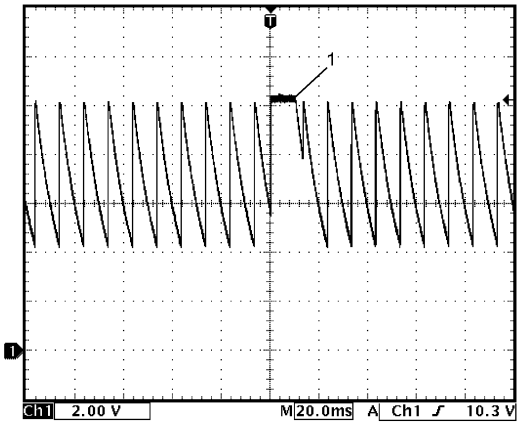
I5JB0BA20006-01

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No. 7

Brake fluid level, parking brake or driver seat belt switch signal (1)

Measurement terminal	Brake fluid level switch signal: CH1: “G31-7” to “G30-12” Parking brake switch signal: CH1: “G31-8” to “G30-12” Driver side seat belt switch signal: CH1: “G31-40” to “G30-12”
Oscilloscope setting	CH1: 2 V / DIV TIME: 20 ms / DIV
Measurement condition	Brake fluid level switch: • Ignition switch is at ON position and brake fluid level is at specified level Parking brake switch: • Ignition switch is at ON position and parking brake lever is released. Driver side seat belt switch: • Ignition switch is at ON position and driver seat belt is fastened

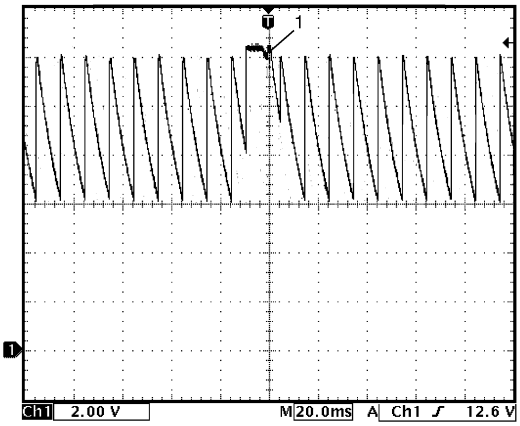


I5JB0AA20019-01

Reference waveform No. 8

Oil pressure switch signal (1)

Measurement terminal	CH1: “G31-9” to “G30-12”
Oscilloscope setting	CH1: 2 V / DIV TIME: 20 ms / DIV
Measurement condition	Engine is running and oil pressure is in normal condition

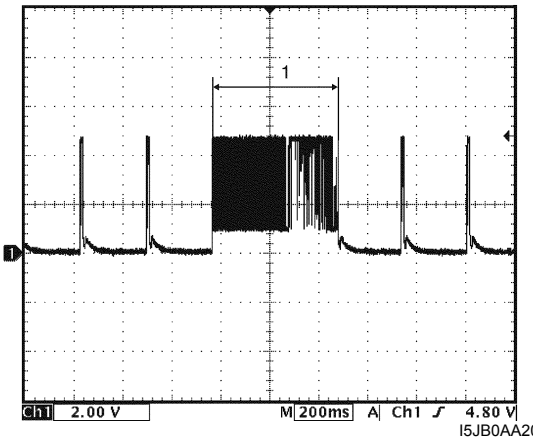


I5JB0AA20020-01

Reference waveform No. 9

Keyless entry receiver signal (1)

Measurement terminal	CH2: “G31-19” to “G30-12”
Oscilloscope setting	CH2: 2 V / DIV TIME: 200 ms / DIV
Measurement condition	Lock or unlock button of key less entry transmitter is pushed



I5JB0AA20021-01

Immobilizer Control System

Precautions

Precautions in Diagnosing Troubles

S5JB0BA300001

- Before confirming the diagnostic trouble code (DTC), do not disconnect connector from immobilizer control module (ICM), battery cable from battery, ground wire harness, or main fuse. Such disconnection will erase DTC stored in ICM.
- DTC stored in ICM memory can be checked as well as cleared by using SUZUKI scan tool. Before using SUZUKI scan tool, read its operator's manual carefully to know how to use it and what functions are available.
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00 in related manual" before inspection.
- Communication of ECM, BCM, combination meter, ABS/ESP® control module, immobilizer control module, 4WD control module and steering angle sensor (if equipped) is established by CAN (Computer Area Network). (For more detail of CAN communication, refer to "CAN Communication System Description: in Section 1A") Therefore, handle CAN communication lines with care referring to "Precaution for CAN Communication System: in Section 00 in related manual".

Precaution in Replacing Immobilizer Control Module (ICM)

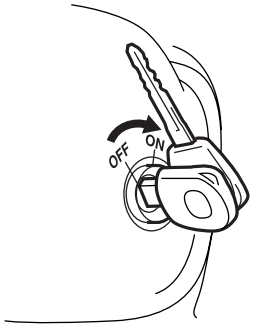
S5JB0BA300004

- If ICM is replaced with new or used one without the functionality for the immobilizer control system, the engine will not be started. In case of the above, check if the newly ICM has the functionality for the immobilizer control system referring to its part number.
- After ICM is replaced with a new one or a used one, the engine cannot be started unless the transponder code in the transponder which is built in the ignition key is registered in ICM and the key verification code stored in ICM is registered in the immobilizer control system. For the registration procedure, refer to "Procedure after Immobilizer Control Module (ICM) Replacement: ".

Precautions in Handling Immobilizer Control System

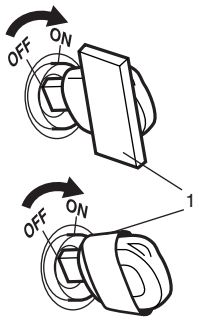
S5JB0BA300003

- 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.



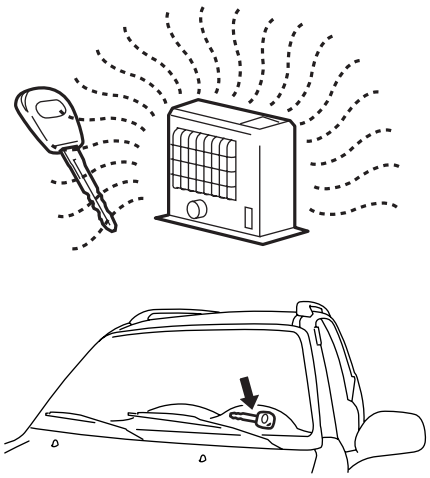
I3RH0AA30001-01

- 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.



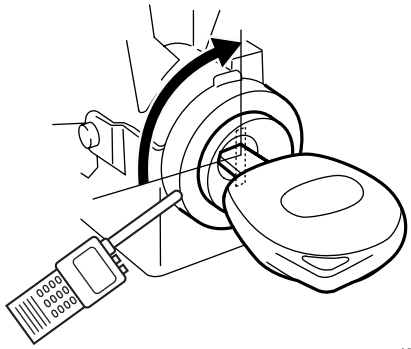
I3RH0AA30002-01

- 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 Introduction

S5JB0BA301001

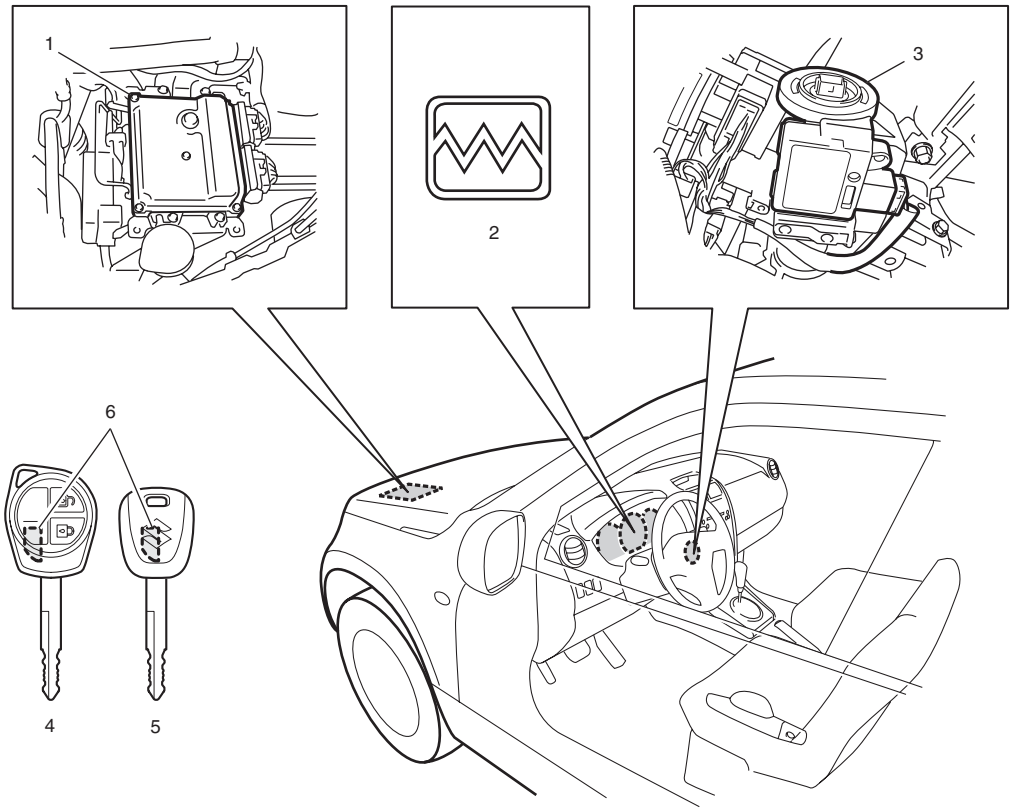
The immobilizer control system is an anti-theft device that immobilizes the vehicle. It stops the engine from working and prevents the vehicle from being stolen. It mainly consists of the following components.

- Engine Control Module (ECM)
- Immobilizer control module (ICM) with the built-in coil antenna
- Ignition key with the built-in transponder

A code called the transponder code is memorized in the transponder. And, the code is registered with ECM. Basically, when the ignition switch is turned ON, ECM reads the code by the coil antenna. When that code agrees with the ICM registered code, ICM compares the secret code with ECM. When their secret codes agree, the engine can be started.If there is no agreement between transponder codes of ICM and ignition key or between secret codes of ICM and ECM, ECM stops fuel injection to prevent the engine from starting and turn the injection warning light ON and OFF using CAN communication line.

Immobilizer Control System Components Location

S5JB0BA301002



I5JB0BA30001-02

1. ECM	4. Ignition key with keyless entry system
2. Injection warning light (gravity 1 warning light)	5. Ignition key without keyless entry system
3. Immobilizer control module (ICM)	6. Transponder

On-Board Diagnostic System Description (Self-diagnosis Function)

S5JB0BA301003

ICM and ECM diagnoses if there is any trouble with the immobilizer control system. The diagnostic information is stored as the diagnostic trouble code (DTC) in ICM. To read the diagnostic information, use SUZUKI scan tool referring to “Diagnostic Trouble Code (DTC) Check: ”.
With the ignition switch turned ON (but the engine at stop) regardless of the condition of the engine and emission control system, ECM indicates whether there is any trouble with the immobilizer control system or not by either lighting ON or flashing ON and OFF the injection warning light.

Injection warning light lights ON:
No trouble exists in the immobilizer control system. (After starting up the engine, the lamp turns OFF.)

Injection warning light flashes ON and OFF:
There is some trouble in the immobilizer control system or in the keyless start system. Its diagnostic information is stored in ICM.

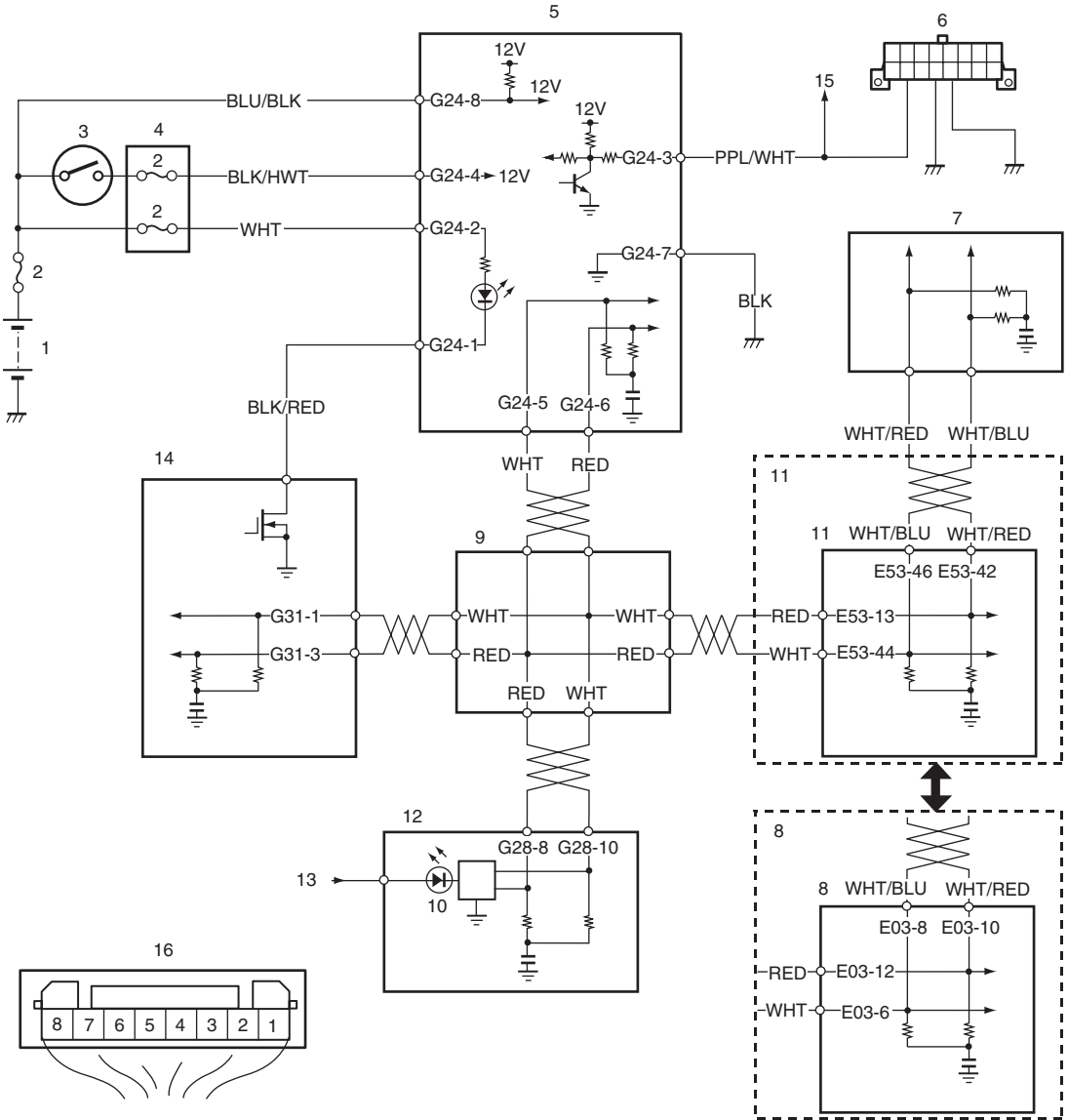
Schematic and Routing Diagram

Immobilizer Control System Wiring Circuit Diagram

S5JB0BA302001

NOTE

For more details about power supply and ground wire circuits for ECM, BCM, ABS control module, ESP® control module and combination meter, refer to "System Circuit Diagram: in Section 9A".



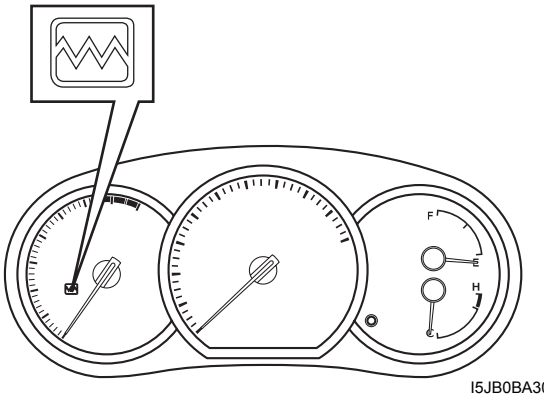
I5JB0BA30003-02

1. Battery	7. ECM	13. From fuse
2. Fuse	8. ABS control module (Vehicle not equipped with ESP® system)	14. BCM
3. Ignition switch	9. Junction connector	15. To ECM, TCM, BCM, ABS control module or ESP® control module, SDM and 4WD control module.
4. Junction block assembly	10. Injection warning light	16. Immobilizer control module (ICM) connector (harness side view)
5. Immobilizer control module (ICM)	11. ESP® control module (vehicle equipped with ESP® system)	
6. Data link connector (DLC)	12. Combination meter	

Diagnostic Information and Procedures

Immobilizer Control System Check

S5JB0BA304001

Step	Action	Yes	No
1	**Injection warning light ON check** 1) Turn ignition switch to ON position.  I5JB0BA30002-02 *Does injection warning light (1) come on?*	Go to Step 2.	Go to “Injection Warning Light Does Not Come ON with Ignition Switch ON and Engine Stop: ”.
2	**Injection warning light flash check** *Does injection warning light flash on and off continuously in Step 1?*	Go to Step 3.	Go to Step 5.
3	**ICM communication check** 1) Connect SUZUKI scan tool with turn ignition switch to OFF position. 2) Check ICM for DTC referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is communication between ICM and SUZUKI scan tool available?*	Go to applicable DTC diag. flow.	Go to step 4.
4	**ICM connector terminal voltage check** 1) Check the following terminal voltage on ICM connector referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. • Power circuit • Ground circuit • Serial communication line of data link connector *Is each terminal voltage normal?*	Substitute a known-good ICM and recheck.	Repair circuit.
5	**Injection warning light remain ON check** 1) Check if injection warning light remains ON after engine start. *Does injection warning light remain ON after engine start?*	Go to “Injection Warning Light Remains ON after Engine Start: ”.	Immobilizer control system is in good condition.

Diagnostic Trouble Code (DTC) Check

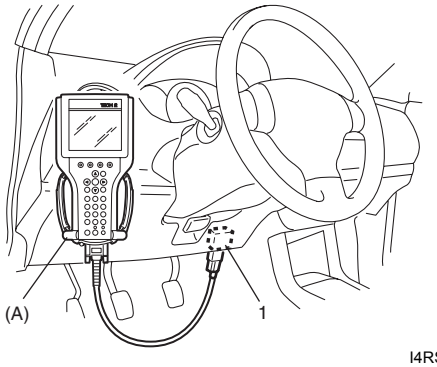
S5JB0BA304002

NOTE

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

1) Turn the ignition switch to OFF position.
2) 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



I4RS0BA30003-03

3) Turn the ignition switch to ON position.
4) Check if any DTC is stored in ICM according to the instructions displayed on SUZUKI scan tool.
5) After completing the check, turn ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Diagnostic Trouble Code (DTC) Clearance

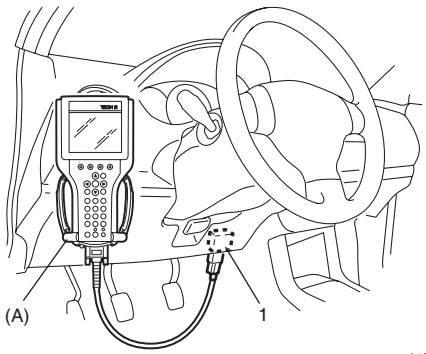
S5JB0BA304003

NOTE

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

1) Turn the ignition switch to OFF position,
2) 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



I4RS0BA30003-03

1) Turn the ignition switch to ON position.
2) Clear DTC(s) according to the instructions displayed on SUZUKI scan tool.
3) After completing the clearance, turn the ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Diagnostic Trouble Code (DTC) Table

S5JB0BA304004

Immobilizer control module (ICM)

DTC No.	Detecting item	Detecting condition
B1701	Transponder Code Error 1	Inconsistent transponder data from transponder while registering ignition key
B1702	ECM Communication Error 1	Communication error between ICM and ECM and/or battery voltage is lower than specified value
B1703	Unregistered Transponder	Transponder code unregistered
B1704	Transponder Code Error 2	Inconsistent transponder data from transponder
B1705	Transponder Response Error	Cannot receive transponder data from transponder
B1706	Immobilizer Antenna Error	Immobilizer antenna faulty
B1707	IMM EEPROM Error	EEPROM in ICM faulty
B1708	ECM Code Error	Verification error between ICM and ECM
B1709	ECM Communication Error 2	Communication error for OBD between ICM and ECM
B1710	Transponder Code Error 3	Inconsistent transponder data from transponder while registering ignition key
B1711*	ECM EEPROM Error	EEPROM in ECM faulty
B1712*	Immobilizer Communication Error	Communication error between ICM and ECM
B1713*	Immobilizer Code Error	Verification error between ICM and ECM
B1714*	Unregistered Code	ECM code unregistered

NOTE

DTC marked with (*) is detected by ECM, transmitted through CAN to ICM and indicated by ICM. ECM does not indicate (*) marked DTC.

Scan Tool Data

S5JB0BA304005

Scan Tool Data	Vehicle Condition	Normal Data
NUMBER OF LEARNT KEY	Ignition switch at ON position	0 – 4
INPUT YEAR	Ignition switch at ON position	2005 or later
INPUT MONTH	Ignition switch at ON position	1 – 12

Scan Tool Data Definitions

NUMBER OF LEARNT KEY

0 – 4 PCS: The number of the transponder code in the transponder built in the ignition key that is registered with immobilizer control system

NOTE

A maximum of four transponder codes can be registered with immobilizer control system. Therefore, the maximal value should be 4.

INPUT YEAR

20:** The year in which the transponder code in the transponder built in the ignition key is registered with immobilizer control system

INPUT MONTH

1 – 12: The month in which the transponder code in the transponder built in the ignition key is registered with immobilizer control system

Injection Warning Light Does Not Come ON with Ignition Switch ON and Engine Stop

S5JB0BA304006

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Circuit Description

When the ignition switch is turned ON, ECM transmits the indication ON signal to the combination meter to turn ON the injection warning light in case that there is not any problem with the immobilizer control system. Then, the combination meter turns ON the lamp. When the engine is started up, ECM transmits the indication OFF signal to the combination meter to turn OFF the lamp. Then, the combination meter turns OFF the injection warning light. However, in case that there is some trouble with the immobilizer control system, the injection warning light flashes ON and OFF when the ignition switch is turned ON.

Troubleshooting

Step	Action	Yes	No
1	**Injection warning light power supply check** 1) Turn the ignition switch to ON position. *Do other warning lights come ON?*	Go to Step 2.	Go to Step 3.
2	**Diagnostic Trouble Code (DTC) check** 1) Check ECM for DTC referring to “DTC Check: in Section 1A”. 2) Check ABS control module or ESP® control module for DTC. For vehicle equipped with ESP® system, refer to “DTC Check: in Section 4F”. For vehicle not equipped with ESP® system, refer to “DTC Check: in Section 4E”. 3) Check BCM for DTC referring to “DTC Check: in Section 10B in related manual”. *Is any DTC(s) detected?*	Go to applicable DTC diag. flow.	Replace combination meter with a known-good one and recheck. If the injection warning light still remains OFF, replace ECM with a known-good one and recheck.
3	**Fuse check** 1) Turn the ignition switch to OFF position. 2) Check if any related fuse is blown. *Is any fuse blown?*	Replace blown fuse, and then check for short.	Go to Step 4.
4	**Combination meter power supply wire circuit check** 1) Remove combination meter referring to “Combination Meter Removal and Installation: in Section 9C in related manual”. 2) Check for proper connection at “G28-13” and “G28-15” wire terminals of combination meter connector. 3) If OK, turn the ignition switch to ON position and measure voltage between “G28-13” wire terminal of combination meter and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 5.	Repair open in power supply wire circuit.
5	**Combination meter ground wire circuit check** 1) Turn ignition switch OFF position. 2) Measure resistance between “G28-15” terminal of combination meter connector and vehicle body ground. *Is resistance 1 Ω or less?*	Replace combination meter with a know-good one and recheck. If the injection warning light still remains OFF, replace ECM with a known-good one and recheck.	Repair open or high resistance in ground wire circuit.

Injection Warning Light Remains ON after Engine Start

S5JB0BA304007

Wiring Diagram
Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Circuit Description
When ECM has any DTC(s), injection warning light remains ON after engine starts.

Troubleshooting
Check ECM for DTC(s) referring to “DTC Check: in Section 1A” and then, go to applicable DTC diag. flow.

DTC B1701: Transponder Code Error 1/DTC B1710: Transponder Code Error 3

S5JB0BA304008

Wiring Diagram
Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Inconsistent transponder data from transponder while registering ignition key.	• Transponder in ignition key faulty • ICM faulty

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) Check** 1) Check ICM for DTC referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is any DTC other than B1701 and B1710 detected?*	Go to corresponding flowchart for DTC other than B1701 and B1710.	Go to Step 2.
2	**Registration of the spare ignition key** 1) Register the spare ignition key referring to “Registration of the Ignition Key: ”. *Is ignition key registered?*	Replace ignition key which cannot be registered.	Substitute a known-good ICM and recheck.

DTC B1702: ECM Communication Error 1

S5JB0BA304019

Wiring Diagram
Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Communication error between ICM and ECM or battery voltage is lower than specified value	• Battery voltage is low • Related fuse(s) blown • ICM power and ground circuit faulty • ECM power and ground circuit faulty • CAN communication circuit faulty • ICM faulty • ECM faulty

NOTE

- **When ICM detects DTC B1702 although engine has started, battery may be defective. In such case, check battery, referring to “Battery Inspection: in Section 1J”. Also, recharge or replace battery if necessary. After that, recheck DTC.**
- **When DTC B1702 and B1709 are detected at the same time, CAN communication circuit may be faulty. Check if DTC related to CAN failure is detected by ECM, BCM, ABS control module and/or ESP® control module. If it is detected, perform applicable DTC diag. flow.**

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) Check** 1) Check ECM for DTC referring to “DTC Check: in Section 1A”. 2) Check ABS control module or ESP® control module for DTC. For vehicle equipped with ESP® system, refer to “DTC Check: in Section 4F”. For vehicle not equipped with ESP® system, refer to “DTC Check: in Section 4E”. 3) Check BCM for DTC referring to “DTC Check: in Section 10B in related manual”. *Is any DTC(s) detected?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**Fuse check** 1) Check if any fuse is blown. *Is any fuse blown?*	Replace blown fuse(s).	Go to Step 3.
3	**ICM connector check** 1) With the ignition key at OFF position, disconnect ICM connector. 2) Check for proper connection at terminals and wires of connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 4.	Repair poor connection(s).
4	**ECM connector check** 1) With the ignition key at OFF position, disconnect ECM connectors. 2) Check for proper connection at terminals and wires of ECM connectors. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 5.	Repair poor connection(s).
5	**CAN communication circuit check** 1) Check CAN communication circuit between ICM and ECM for open, short and high resistance. Refer to “Electrical Circuit Inspection Procedure: in Section 00 in related manual”. *Is each CAN communication circuit in good condition?*	Go to step 6.	Repair circuit.
6	**ICM power and ground circuit check** 1) Check power and ground circuit of ICM referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. *Is power and ground circuit of ICM normal?*	Substitute a known-good ICM and recheck. If DTC B1702 is still detected, substitute a known-good ECM and recheck.	Repair power and ground circuit.

DTC B1703: Unregistered Transponder

S5JB0BA304020

Detecting Condition and Trouble Area

Detecting Condition
Transponder code does not register in ICM

NOTE

Troubleshoot DTC B1703 first if both B1703 and B1712 are detected at the same time.

Troubleshooting

Perform “Registration of the Ignition Key: ” and recheck DTC.

DTC B1704: Transponder Code Error 2

S5JB0BA304021

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Inconsistent transponder data from transponder	• Use of the unregistered ignition key • Corruption of the transponder in the ignition key • Transponder faulty • ICM faulty

NOTE

Troubleshoot DTC B1704 first if both B1704 and B1713 are detected at the same time.

Troubleshooting

Step	Action	Yes	No
1	**Registration of the ignition key in use with ICM** 1) Register the ignition key in use with ICM referring to “Registration of the Ignition Key: ”. *Is ignition key in use registered?*	Check that engine can be started and recheck DTC.	Go to step 2.
2	**Registration of the spare ignition key with ICM** 1) Register the spare ignition key with ICM referring to “Registration of the Ignition Key: ”. *Is spare ignition key registered?*	Check that engine can be started and replace ignition key which cannot be registered.	Go to step 3.
3	**ICM connector check** 1) With the ignition key at OFF position, disconnect ICM connector. 2) Check for proper connection at terminals of ICM connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 4.	Repair poor connection(s).
4	**ICM check** 1) Check power and ground circuit of ICM referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. *Is power and ground circuit of ICM normal?*	Substitute a known-good ICM and recheck.	Repair power and ground circuit.

DTC B1705: Transponder Response Error

S5JB0BA304022

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Cannot receive transponder data from transponder	• Use of the ignition key without the transponder • Use of the unregistered ignition key • Corruption of the transponder in the ignition key • ICM faulty

Troubleshooting

Step	Action	Yes	No
1	**DTC check** *Is DTC B1706 detected other than B1705?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**Registration of the ignition key in use with ICM** 1) Register ignition key in use with referring to “Registration of the Ignition Key: ”. *Is ignition key in use registered?*	Check that engine can be started and recheck DTC.	Go to step 3.
3	**Registration of the spare ignition key with ICM** 1) Register spare ignition key with ICM referring to “Registration of the Ignition Key: ”. *Is spare ignition key registered?*	Check that engine can be started and replace ignition key which cannot be registered.	Go to Step 4.
4	**ICM connector check** 1) With the ignition key at OFF position, disconnect ICM connector. 2) Check for proper connection at all terminals and wires of ICM connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 5.	Repair poor connection(s).
5	**ICM check** 1) Check power and ground circuit of ICM referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. *Is power and ground circuit of ICM normal?*	Substitute a known-good ICM and recheck.	Repair power and ground circuit.

DTC B1706: Immobilizer Antenna Error

S5JB0BA304023

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Immobilizer antenna faulty	ICM faulty

Troubleshooting

Step	Action	Yes	No
1	**ICM check** 1) Check power and ground circuit of ICM referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. *Is power and ground circuit of ICM normal?*	Substitute a known-good ICM and recheck.	Repair power and ground circuit.

DTC B1707: IMM EEPROM Error

S5JB0BA304024

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
EEPROM in ICM faulty	Internal failure (EEPROM corruption) of ICM

Troubleshooting

1) Clear DTC(s) referring to “Diagnostic Trouble Code (DTC) Clearance: ”.
2) Turn the ignition switch to OFF position.
3) Check if DTC B1707 is still detected referring to “Diagnostic Trouble Code (DTC) Check: ”. If still detected, go to the next step. If not, the troubleshooting is completed.
4) Substitute a known-good ICM and recheck.

DTC B1708: ECM Code Error

S5JB0BA304025

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Verification error between ICM and ECM	• ECM does not registered with immobilizer control system • ICM faulty • ECM faulty

Troubleshooting

Step	Action	Yes	No
1	**ECM check** *Was DTC B1708 detected immediately after replace of ECM?*	Go to Step 2.	Go to Step 3.
2	**Register ECM** 1) Register ECM referring to “Procedure after ECM Replacement: ”. 2) Recheck DTC. *Is DTC B1707 detected?*	Go to Step 3.	Check that engine can be started and recheck DTC.
3	**Diagnostic Trouble Code (DTC) check** 1) Check ECM for DTC referring to “DTC Check: in Section 1A”. 2) Check ABS control module or ESP® control module for DTC. For vehicle equipped with ESP® system, refer to “DTC Check: in Section 4F”. For vehicle not equipped with ESP® system, refer to “DTC Check: in Section 4E”. 3) Check BCM for DTC referring to “DTC Check: in Section 10B in related manual”. *Is any DTC(s) detected?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	**ICM connector check** 1) With the ignition key at OFF position, disconnect ICM connector. 2) Check for proper connection at terminals and wires of ICM connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 5.	Repair poor connection(s).

Step	Action	Yes	No
5	**ECM connector check** 1) With the ignition key at OFF position, disconnect ECM connectors. 2) Check for proper connection at terminals and wires of ECM connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 6.	Repair poor connection(s).
6	**ICM power and ground circuit check** 1) Check power and ground circuit of ICM referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. *Is power and ground circuit of ICM normal?*	Substitute a known-good ICM and recheck. If DTC B1708 is still detected, substitute a known-good ECM and recheck.	Repair power and ground circuit.

DTC B1709: ECM Communication Error 2

S5JB0BA304026

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Communication error for OBD between ICM and ECM	• CAN communication circuit faulty • ICM faulty • ECM faulty

NOTE

When DTC B1702 and B1709 are detected at the same time, CAN communication circuit may be faulty. Check if DTC related to CAN failure is detected by ECM, BCM, ABS control module and/or ESP® control module. If it is detected, perform applicable DTC diag. flow.

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) Check** 1) Check ECM for DTC referring to “DTC Check: in Section 1A”. 2) Check ABS control module or ESP® control module for DTC. For vehicle equipped with ESP® system, refer to “DTC Check: in Section 4F”. For vehicle not equipped with ESP® system, refer to “DTC Check: in Section 4E”. 3) Check BCM for DTC referring to “DTC Check: in Section 10B in related manual”. *Is any DTC(s) detected?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**Fuse check** 1) Check if any fuse is blown. *Is any fuse blown?*	Replace blown fuse(s).	Go to Step 3.
3	**ICM connector check** 1) With the ignition key at OFF position, disconnect ICM connector. 2) Check for proper connection at terminals and wires of ICM connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 4.	Repair poor connection(s).

Step	Action	Yes	No
4	**ECM poor connection check** 1) With the ignition key at OFF position, disconnect ECM connectors. 2) Check for proper connection at terminals and wires of ECM connectors. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 5.	Repair poor connection(s).
5	**CAN communication circuit check** 1) Check CAN communication circuit between ICM and ECM for open, short and high resistance. Refer to “Electrical Circuit Inspection Procedure: in Section 00 in related manual”. *Is each CAN communication circuit in good condition?*	Go to step 6.	Repair circuit.
6	**ICM check** 1) Check power and ground circuit of ICM referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. *Is power and ground circuit of ICM normal?*	Substitute a known-good ICM and recheck. If DTC B1709 is still detected, substitute a known-good ECM and recheck.	Repair power and ground circuit of ICM.

DTC B1711: ECM EEPROM Error

S5JB0BA304027

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
EEPROM in ECM faulty	Internal failure (EEPROM corruption) of ECM

Troubleshooting

1) Clear DTC(s) referring to “Diagnostic Trouble Code (DTC) Clearance: ”.
2) Turn the ignition switch to OFF position.
3) Check if DTC B1711 is still detected referring to “Diagnostic Trouble Code (DTC) Check: ”. If still detected, go to the next step. If not, the troubleshooting is completed.
4) Substitute a known-good ECM and recheck.

DTC B1712: Immobilizer Communication Error

S5JB0BA304028

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: ”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Communication error between ICM and ECM	• Related fuse(s) blown • ICM power and ground circuit faulty • ECM power and ground circuit faulty • CAN communication circuit faulty • ICM faulty • ECM faulty

NOTE

Troubleshoot DTC B1703 first if both B1703 and B1712 are detected at the same time.

Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check ICM for DTC referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is any DTC detected other than B1712?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**Diagnostic Trouble Code (DTC) Check** 1) Check ECM for DTC referring to “DTC Check: in Section 1A”. 2) Check ABS control module or ESP® control module for DTC. For vehicle equipped with ESP® system, refer to “DTC Check: in Section 4F”. For vehicle not equipped with ESP® system, refer to “DTC Check: in Section 4E”. 3) Check BCM for DTC referring to “DTC Check: in Section 10B in related manual”. *Is any DTC(s) detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Fuse check** 1) Check if any fuse is blown. *Is any fuse blown?*	Replace blown fuse(s).	Go to Step 4.
4	**ICM connector check** 1) With the ignition key at OFF position, disconnect ICM connector. 2) Check for proper connection at terminals and wires of ICM connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 5.	Repair poor connection(s).
5	**ECM connector check** 1) With the ignition key at OFF position, disconnect ECM connectors. 2) Check for proper connection at terminals and wires of ECM connectors. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 6.	Repair poor connection(s).
6	**CAN communication circuit check** 1) Check CAN communication circuit between ICM and ECM for open, short and high resistance. Refer to “Electrical Circuit Inspection Procedure: in Section 00 in related manual”. *Is each CAN communication circuit in good condition?*	Go to Step 7.	Repair circuit.
7	**ICM power and ground circuit check** 1) Check power and ground circuit of ICM referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. *Is power and ground circuit of ICM normal?*	Substitute a known-good ICM and recheck. If DTC B1702 is still detected, substitute a known-good ECM and recheck.	Repair power and ground circuit.

DTC B1713: Immobilizer Code Error

S5JB0BA304029

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Verification error between ICM and ECM	• ICM faulty • ECM faulty

NOTE

Troubleshoot DTC B1704 first if both B1704 and B1713 are detected at the same time.

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) check** 1) Check ECM for DTC referring to “DTC Check: in Section 1A”. 2) Check ABS control module or ESP® control module for DTC. For vehicle equipped with ESP® system, refer to “DTC Check: in Section 4F”. For vehicle not equipped with ESP® system, refer to “DTC Check: in Section 4E”. 3) Check BCM for DTC referring to “DTC Check: in Section 10B in related manual”. *Is any DTC(s) detected?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**ICM connector check** 1) With the ignition key at OFF position, disconnect ICM connector. 2) Check for proper connection at terminals and wires of ICM connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 3.	Repair poor connection(s).
3	**ECM connector check** 1) With the ignition key at OFF position, disconnect ECM connectors. 2) Check for proper connection at terminals and wires of ECM connector. Refer to “Intermittent and Poor Connection Inspection: in Section 00 in related manual”. *Is each terminal and wire connection normal?*	Go to Step 4.	Repair poor connection(s).
4	**ICM power and ground circuit check** 1) Check power and ground circuit of ICM referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: ”. *Is power and ground circuit of ICM normal?*	Substitute a known-good ICM and recheck. If DTC B1702 is still detected, substitute a known-good ECM and recheck.	Repair power and ground circuit.

DTC B1714: Unregistered Code

S5JB0BA304030

Detecting Condition and Trouble Area

Detecting Condition
ECM have never been registered with immobilizer control system

Troubleshooting

ECM does not registered with immobilizer control system. Perform “Procedure after ECM Replacement: ”.

Inspection of Immobilizer Control Module (ICM) and Its Circuit

S5JB0BA304018

ICM and its circuit can be checked at ICM wiring connector by measuring voltage.

⚠ CAUTION

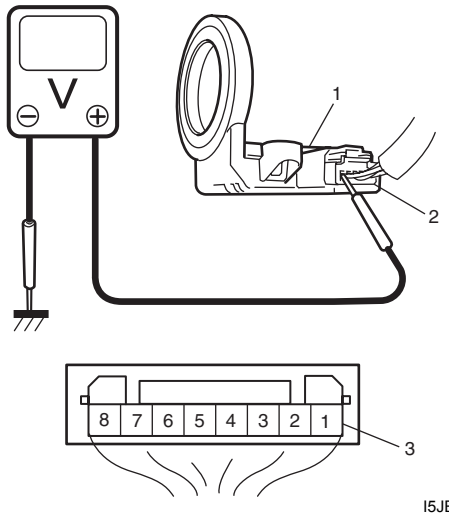
ICM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ICM with connector disconnected from it.

Voltage Check

1) Remove ICM (1) from steering lock assembly or steering lock unit referring to “Immobilizer Control Module (ICM) Removal and Installation: ”.
2) Connect ICM connector (2) to ICM.
3) Check voltage at each terminal.

NOTE

As each terminal voltage is affected by the battery voltage, confirm that it is 12 V or more when the ignition switch is turned to ON position.



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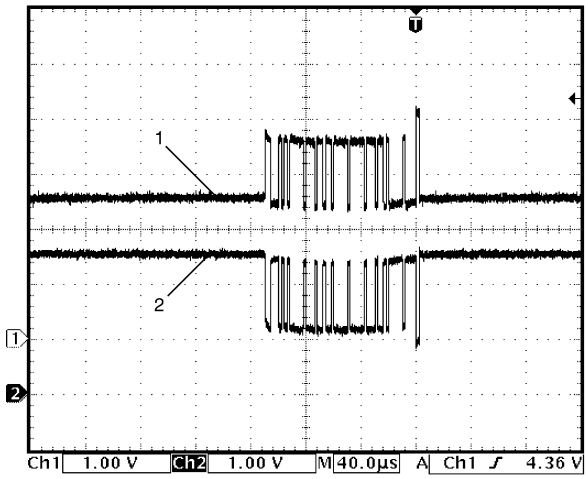
3. ICM connector (harness side view)

Connector	Terminal		Circuit	Normal Voltage	Condition
G24	1	BLK/ RED	Illumination ring ground	0 V	• Ignition key not inserted to the key cylinder • Door opened
				0 V→12 V	• Ignition switch at OFF position • From the time door is closed to the time interior light faded out completely (As the interior light fades out, the voltage increases)
				0 V→12 V	• Door closed • From the ignition switch is turned ON to the time interior light completely faded out (As the interior light fades out, the voltage increases)
	2	WHT	Illumination ring power supply	About 12 V	Ignition switch at ON position
				About 12 V	Ignition switch at OFF position
	3	PPL/ WHT	Serial communication line of data link connector	About 6 V	Ignition switch at ON position, scan tool connected
				About 7 V	Ignition switch at ON position, scan tool disconnected
	4	BLK/ WHT	Ignition switch signal	About 12 V	Ignition switch at ON position
				About 0 V	Ignition switch at OFF position
	5	WHT	CAN communication line (low) for each control module	See the reference waveform	—
	6	RED	CAN communication line (high) for each control module	See the reference waveform	—
	7	BLK	Ground for ICM	About 0 V	Constantly
	8	BLU/ BLK	Power source	About 12 V	Constantly

Reference Waveform



I5JB0BA30006-01

1. CAN communication line signal (High)
2. CAN communication line signal (Low)

NOTE

CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on vehicle condition.

Measurement terminals	CH1: G24-5 to G24-7 CH2: G24-6 to G24-7
Oscilloscope settings	CH1: 1 V/DIV CH2: 1 V/DIV TIME: 40 µs/DIV
Measurement condition	Ignition switch at ON position.

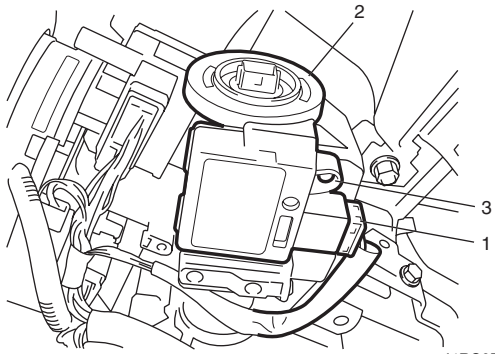
Repair Instructions

Immobilizer Control Module (ICM) Removal and Installation

S5JB0BA306001

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B in related manual”.
3) Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B in related manual”.
4) Remove steering wheel referring to “Steering Wheel Removal and Installation: in Section 6B in related manual”.
5) Remove steering column lower and upper covers.
6) Disconnect connector (1) from ICM (2).
7) Remove a screw (3) from ICM.



I4RS0BA30007-03

8) Remove ICM from steering lock assembly.

NOTE

The antenna part of ICM is fragile. Therefore, do not add strong power to the part or twist the part.

Installation

Reverse the removal procedure.

Registration of the Ignition Key

S5JB0BA306002

To finish the registration of the ignition key, the transponder code memorized in the transponder built in the ignition key has to be registered with ICM. To register the transponder code with ICM, perform “Register Ig Key” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator’s Manual”.

NOTE

- **A maximum of four transponder codes can be registered with ICM.**
- **At an early part of the registration process, all transponder codes of the ignition keys in use already registered with ICM are cleared. Therefore, before starting the registration, prepare all ignition keys in use in addition to the new ignition key(s) to be registered with ICM.**

Procedure after ECM Replacement

S5JB0BA306003

After ECM is replaced with new one or used one, the key verification code stored in the ECM has to be registered with immobilizer control system. To register key verification code stored in the ECM with immobilizer control system, perform “Replace ECM” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator’s Manual”.

Procedure after Immobilizer Control Module (ICM) Replacement

S5JB0BA306004

After ICM replaced with new one or used one, transponder code memorized in the transponder built in the ignition key in use has to be registered with ICM and then, key verification code stored in the ICM has to be registered with immobilizer control system. To register ignition key in use with ICM and to register verification code stored in the ICM with immobilizer control system, perform “Replace Immobilizer Module” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator's Manual”.

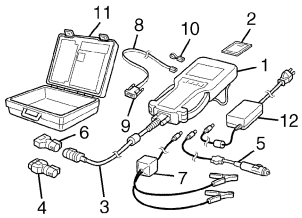
NOTE

- **A maximum of four transponder codes can be registered with ICM.**
- **At an early part of the registration process, all transponder codes of the ignition keys in use already registered with ICM are cleared. Therefore, before starting the registration, prepare all ignition keys in use in addition to the new ignition key(s) to be registered with ICM.**

Special Tools and Equipment

Special Tool

S5JB0BA308001

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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