

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.

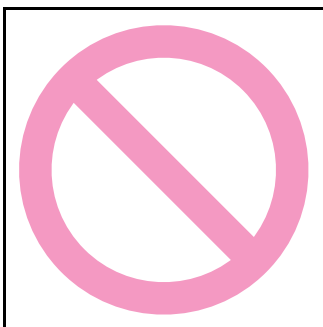
Improper repair may result in injury to the technician and may render the vehicle unsafe for the driver and passengers.

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



FOREWORD

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

Applicable model:

SWIFT (RS413/RS415/RS416/RS413D) on and after the following vehicle identification numbers (VINs).

M13A engine model

ZA11S-300001 ~ ⓧTSMMZA11S00300001 ⓧ~

ZC11S-300001 ~ ⓧTSMMZC11S00300001 ⓧ~

M15A engine model

ZA21S-300001 ~ ⓧTSMMZA21S00300001 ⓧ~

ZC21S-300001 ~ ⓧTSMMZC21S00300001 ⓧ~

M16A engine model

ZA31S-300001 ~ ⓧTSMMZA31S00300001 ⓧ~

Z13DT engine model

ZA91S-300001 ~ ⓧTSMMZA91S00300001 ⓧ~

ZC91S-300001 ~ ⓧTSMMZC91S00300001 ⓧ~

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

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

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

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

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

Related Manuals:

Manual Name	Manual No.
SWIFT (RS413/RS415) SERVICE MANUAL	99500U62J00-01E
SWIFT (RS413D) SUPPLEMENTARY SERVICE MANUAL	99501U62J00-01E

MAGYAR SUZUKI CORPORATION LTD.

RECOMMENDATION OF GENUINE SUZUKI PARTS AND ACCESSORIES USE

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

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

Non-Genuine SUZUKI Parts and Accessories

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

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

Re-use of Genuine SUZUKI Parts and Accessories

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

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

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

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

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Section 00

00

Precautions

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NOTE

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Precautions

Precautions

Precaution for Vehicle Equipped with ESP® System

S6RS0B0000014

- 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.

Brake Caution

S6RS0B0000013

CAUTION

All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

NOTE

Before inspecting and servicing brakes for vehicle equipped with ABS (ESP®), make sure that ABS (ESP®) is in good condition.

Section 0

General Information

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NOTE

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General Information

General Description

Abbreviations

S6RS0B0101001

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
APP sensor: Accelerator Pedal Position Sensor
A/T: Automatic Transmission, Automatic Transaxle
ATDC: After Top Dead Center
ATF: Automatic Transmission Fluid, Automatic Transaxle Fluid

B:

B+: Battery Positive Voltage
BBDC: Before Bottom Dead Center
BCM: Body Electrical Control Module
BTDC: Before Top Dead Center

C:

CAN: Controller Area Network
CKT: Circuit
CKP Sensor: Crankshaft Position Sensor
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)
EPS: Electronic Power Steering
ESP®: Electronic Stability Program
EVAP: Evaporative Emission
EVAP Canister: Evaporative Emission Canister (Charcoal Canister)

F:

4WD: 4 Wheel Drive

G:

GEN: Generator
GND: Ground
GPS: Global Positioning System

0A-2 General Information:

H:
HAVC: Heating, Ventilating and Air Conditioning
HC: Hydrocarbons
HO2S: Heated Oxygen Sensor

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
ISC Actuator: Idle Speed Control Actuator

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)
Min: Minimum
MIL: Malfunction Indicator Lamp ("SERVICE ENGINE SOON" Light)
M/T: Manual Transmission, Manual Transaxle

N:
NOx: Nitrogen Oxides

O:
OBD: On-Board Diagnostic System (Self-Diagnosis Function)
O/D: Overdrive
OHC: Over Head Camshaft
O2S: Oxygen Sensor

P:
PCM: Powertrain Control Module
PCV: Positive Crankcase Ventilation
PNP: Park / Neutral Position
P/S: Power Steering
PSP Switch: Power Steering Pressure Switch (P/S Pressure Switch)

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)
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

Maintenance and Lubrication

Scheduled Maintenance

Maintenance Schedule under Normal Driving Conditions (Petrol Engine Model)

S6RS0B0205001

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										
Accessory drive belt (I: ⚙, R: ⚙)					—	—	I	—	—	R
Valve lash (clearance) (I: ⚙)					—	I	—	I	—	I
Engine oil and oil filter (R: ⚙)					R	R	R	R	R	R
Engine coolant (R: ⚙)					—	—	R	—	—	R
Exhaust system (I: ⚙)					—	I	—	I	—	I
Ignition system										
Spark plugs (R: ⚙)	When unleaded fuel is used	Vehicle with O2S	Nickel Plug		—	—	R	—	—	R
			(Highly recommended) Iridium Plug	M13A / M15A engines	Replace every 105,000 km (63,000 miles) or 84 months					
		Vehicle without O2S	M16A engine		—	—	—	R	—	—
			Nickel Plug		—	R	—	R	—	R
	Iridium Plug		—	—	—	R	—	—		
	When leaded fuel is used, refer to “Maintenance Recommended under Severe Driving Conditions (Petrol Engine Model) in related manual”.									
Fuel system										
Air cleaner filter (R: ⚙, I: ⚙)			Paved-road		I	I	R	I	I	R
			Dusty conditions		Refer to “Maintenance Recommended under Severe Driving Conditions (Petrol Engine Model) in related manual”.					
Fuel lines and connections (I: ⚙)					—	I	—	I	—	I
Fuel tank (I: ⚙)					—	—	I	—	—	I
Emission control system										
PCV valve (I: ⚙)		Vehicle with O2S			—	—	—	—	—	I
		Vehicle without O2S			—	—	I	—	—	I
Fuel evaporative emission control system (I: ⚙)					—	—	—	—	—	I
Brake										
Brake discs and pads (thickness, wear, damage) (I: ⚙)					I	I	I	I	I	I
Brake drums and shoes (if equipped) (wear, damage) (I: ⚙)					—	I	—	I	—	I
Brake hoses and pipes (leakage, damage, clamp) (I: ⚙)					—	I	—	I	—	I
Brake fluid (R: ⚙)					—	R	—	R	—	R
Brake lever and cable (damage, stroke, operation) (I: ⚙)					Inspect at first 15,000 km (9,000 miles only)					
Chassis and body										
Clutch (fluid leakage, level) (I: ⚙)					—	I	—	I	—	I
Tires (wear, damage, rotation) / wheels (damage) (I: ⚙ / ⚙)					I	I	I	I	I	I
Suspension system (tightness, damage, rattle, breakage) (I: ⚙)					—	I	—	I	—	I
Steering system (tightness, damage, breakage, rattle) (I: ⚙)					—	I	—	I	—	I
Drive shaft (axle) boots (I: ⚙)					—	—	I	—	—	I
Manual transaxle oil (leakage, level) (I: ⚙ 1st 15,000 km only) (R: ⚙)					I	—	R	—	—	R

0B-2 Maintenance and Lubrication:

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
Automatic transaxle fluid	Fluid level (I: ⚙)	—	I	—	I	—	I
	Fluid change (R: ⚙)	Replace every 165,000 km (99,000 miles)					
	Fluid hose (I: ⚙)	—	—	—	I	—	—
All latches, hinges and locks (I: ⚙)		—	I	—	I	—	I
Air conditioning filter (if equipped) (I: ⚙) (R: ⚙)		—	I	R	—	I	R

NOTE

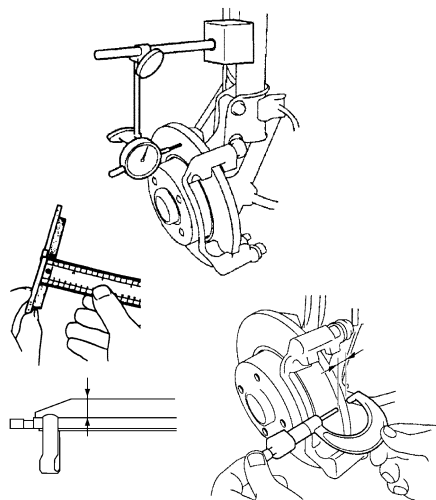
- “R”: Replace or change
- “I”: Inspect and correct, replace or lubricate if necessary
- For spark plugs, replace every 50,000 km if the local law requires.
- Nickel spark plug: BKR6E-11 (NGK) or K20PR-U11 (DENSO)
- Iridium spark plug: IFR6J11 (NGK)

Repair Instructions

Brake Discs and Pads Inspection

S6RS0B0206014

- 1) Remove wheel and caliper but don't disconnect brake hose from caliper.
- 2) Check disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For details, refer to “Front Disc Brake Pad Inspection in Section 4B in related manual”, “Front Brake Disc Inspection in Section 4B in related manual”, “Rear Disc Brake Pad Inspection: Disc Brake Type in Section 4C” and / or “Rear Brake Disc Inspection: Disc Brake Type in Section 4C”.
Be sure to torque caliper pin bolts to specification.



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Special Tools and Equipment

Recommended Fluids and Lubricants (Petrol Engine Model)

S6RS0B0208002

Engine oil	SG, SH, SJ, SL or SM grade (Refer to “Engine Oil and Filter Change (Petrol Engine) in related manual” for engine oil viscosity.)
Engine coolant (Ethylene glycol base coolant)	“Antifreeze/Anticorrosion coolant”
Brake fluid	DOT 4 or SAE J1704
Manual transaxle oil	Refer to “Manual Transaxle Oil Change: For M13 Engine Model in Section 5B in related manual” or “Manual Transaxle Oil Change: For M15 and M16 Engines Model in Section 5B in related manual”.
Automatic transaxle fluid	Refer to “A/T Fluid Change in Section 5A in related manual”.
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	Engine oil or water resistance chassis grease
Key lock cylinder	Spray lubricant

Section 1

Engine

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Precautions

For M13, M15 and M16 Engines

Precautions

Precautions for Engine

S6RS0B1010001

Air Bag Warning

Refer to “Air Bag Warning in Section 00 in related manual”.

Precautions on Engine Service

Refer to “Precautions on Engine Service: For M13, M15 and M16 Engines in Section 1A in related manual”.

Precautions in Diagnosing Trouble

Refer to “Precautions in Diagnosing Trouble: For M13, M15 and M16 Engines in Section 1A in related manual”.

Precautions of ECM Circuit Inspection

Refer to “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in Section 1A in related manual”.

Precautions on Fuel System Service

Refer to “Precautions on Fuel System Service: For M13, M15 and M16 Engines in Section 1G in related manual”.

Precaution for CAN Communication System

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

Precautions for Catalytic Converter

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

Precautions for Electrical Circuit Service

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

For Z13DT Engine

Precautions

Precautions for Engine

S6RS0B1020001

Air Bag Warning

Refer to "Air Bag Warning in Section 00 in related manual".

Precautions on Engine Service

Refer to "Precautions on Engine Service: For Z13DT Engine in Section 1A in related manual".

Precautions in Diagnosing Trouble

Refer to "Precautions in Diagnosing Trouble: For Z13DT Engine in Section 1A in related manual".

Precautions on Fuel System Service

Refer to "Precautions on Fuel System Service: For Z13DT Engine in Section 1G in related manual".

Precaution for CAN Communication System

Refer to "Precaution for CAN Communication System in Section 00 in related manual".

Precautions for Catalytic Converter

Refer to "Precautions for Catalytic Converter in Section 00 in related manual".

Precautions for Electrical Circuit Service

Refer to "Precautions for Electrical Circuit Service in Section 00 in related manual".

Engine General Information and Diagnosis

For M13, M15 and M16 Engines

Precautions

Precautions of Electric Throttle Body System Calibration (Electric Throttle Body Model)

S6RS0B1110004

After performing one of works described below, it is necessary to re-register the completely closed throttle valve reference position stored in memory of ECM. (For detailed information, refer to “Description of Electric Throttle Body System Calibration (Electric Throttle Body Model): For M13, M15 and M16 Engines in related manual”.) For the procedure to register such data in ECM, refer to “Electric Throttle Body System Calibration (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual”.

- To shut off backup power of ECM for such purposes of battery replacement and “RADIO” fuse removal
- To erase DTCs P0607, P0122, P0123, P0222, P0223, P2101, P2102, P2103, P2111, P2112, P2119, P2122, P2123, P2127, P2128, P2135 and/or P2138
- To replace ECM
- To replace throttle body and/or accelerator pedal position (APP) sensor assembly

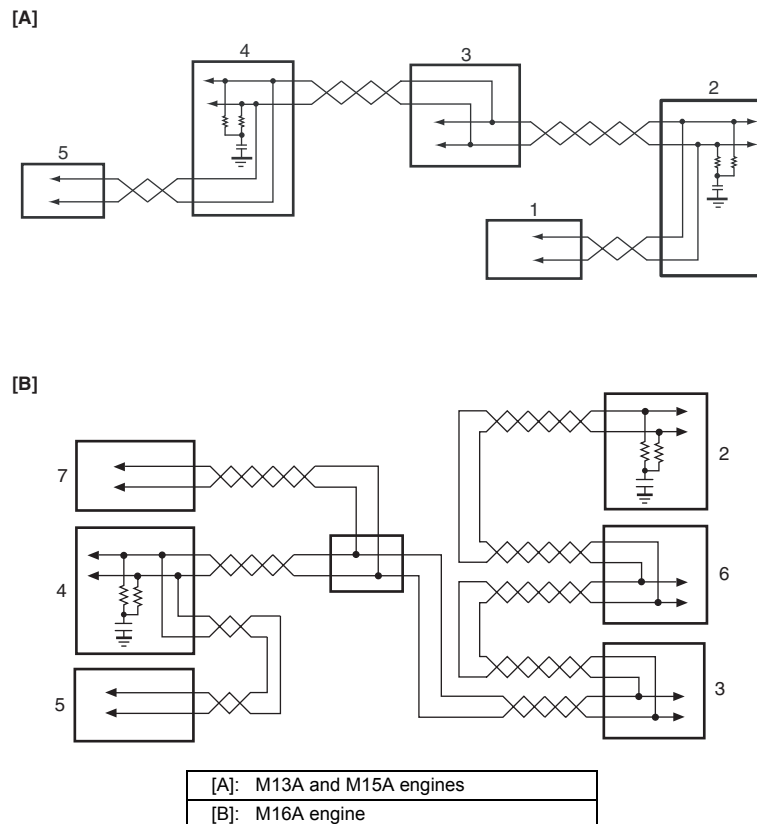
General Description

CAN Communication System Description

S6RS0B1111005

ECM (2), TCM (A/T or Automated Manual Transaxle model) (1), BCM (3), ESP® control module (ESP® model) (6), steering angle sensor (ESP® model) (7), combination meter (4) and keyless start control module (keyless start model) (5) of this vehicle communicate control data between each control module.

Communication of each control module is established by CAN (Controller Area Network) communication system.



I6RS0B111001-03

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.

1A-3 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

ECM Transmission Data

[A]

				TCM (A/T model)	TCM (Automated Manual Transaxle model)	BCM	Combination Meter	Keyless Start Control Module (keyless start model)
ECM		DATA	Engine torque driver requested	☐				
			Engine speed	☐	☐		☐	
			Top gear inhibit	☐				
			Torque converter clutch control inhibit	☐				
			Lock up / slip control inhibit signal	☐				
			Throttle position	☐	☐			
			Immobilizer indication				☐	
			Engine emissions related malfunction				☐	
			Vehicle speed		☐	☐	☐	☐
			Engine coolant temperature	☐	☐	☐	☐	
			Brake pedal switch active	☐				
			A/C refrigerant pressure (A/C model)			☐		
			Distance kilometers per liter of fuel			☐		
			Stand by to engage air conditioning compressor clutch	☐				
			Accelerator pedal position		☐			
			Intake air temperature		☐			

[B]

				ESP® Control Module	BCM	Combination Meter	Keyless Start Control Module
ECM		DATA	Engine torque driver requested	☐			
			Engine speed	☐	☐	☐	
			Immobilizer indication			☐	
			Engine emissions related malfunction			☐	
			Vehicle speed		☐	☐	☐
			Engine coolant temperature		☐	☐	
			Brake pedal switch active	☐			
			A/C refrigerant pressure (A/C model)		☐		
			Distance kilometers per liter of fuel		☐		
			Accelerator pedal position	☐			

I6RS0B111002-03

[A]: M13A and M15A engines

[B]: M16A engine

NOTE

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

ECM Reception Data

[A]

				TCM (A/T model)	TCM (Automated Manual Transaxle model)	BCM	Keyless Start Control Module (keyless start model)
ECM		DATA	Torque down ignition delay request	○			
			Coast slip control signal	○			
			Vehicle speed pulse	○			
			TCM data validity	○			
			Transmission gear selector position	○			
			Transmission actual gear	○			
			A/C switch ON (A/C model)			○	
			Electric load active (clearance light)			○	
			Electric load active (rear defogger)			○	
			Ignition key switch ON			○	
			Actual gear position		○		
			ECO mode		○		
			Clutch engaging flag		○		
			ID code				○

[B]

				ESP® Control Module	BCM
ECM		DATA	A/C switch ON (A/C model)		○
			Electric load active (tail light)		○
			Electric load active (front deicer)		○
			Ignition key switch ON		○
			Torque reduction request	○	
			Torque request rolling count	○	
			Wheel speed pulse (Front)	○	
			Wheel speed pulse (rear right)	○	
			Wheel speed pulse (rear left)	○	
			Antilock brake system active	○	
			Electronic stability program system active	○	
			Electronic stability program system OFF	○	

I6RS0B111003-04

[A]: M13A and M15A engines

[B]: M16A engine

Description of Electric Throttle Body System (Electric Throttle Body Model)

S6RS0B1111007

The Electric Throttle Body System consists of electric throttle body assembly, accelerator position (APP) sensor assembly, ECM and throttle actuator control relay.

Among them, assembly components are as follows.

- Electric throttle body assembly: throttle valve, throttle actuator, 2 throttle position sensors
- Accelerator pedal position (APP) sensor assembly: Accelerator pedal, 2 accelerator position sensors

Operation Description

ECM (5) detects opening (depressed extent of pedal) of the accelerator pedal based on signal voltage of the accelerator pedal position (APP) sensor (1) and using that data and engine operation condition, it calculates the optimum throttle valve opening. On the other hand, it detects the throttle valve opening based on the signal voltage of the throttle position sensor (3) included in the throttle body (2) and compares it with the above calculated optimum throttle valve opening. When there is a difference between them, ECM controls the duty ratio (100% – 0%) according to this difference to drive the throttle actuator (motor) (4) included in the throttle body. When there is no difference, ECM controls the duty ratio to about 15% to maintain the throttle valve opening. In this way, the throttle valve (17) is opened and closed to achieve the optimum throttle valve opening.

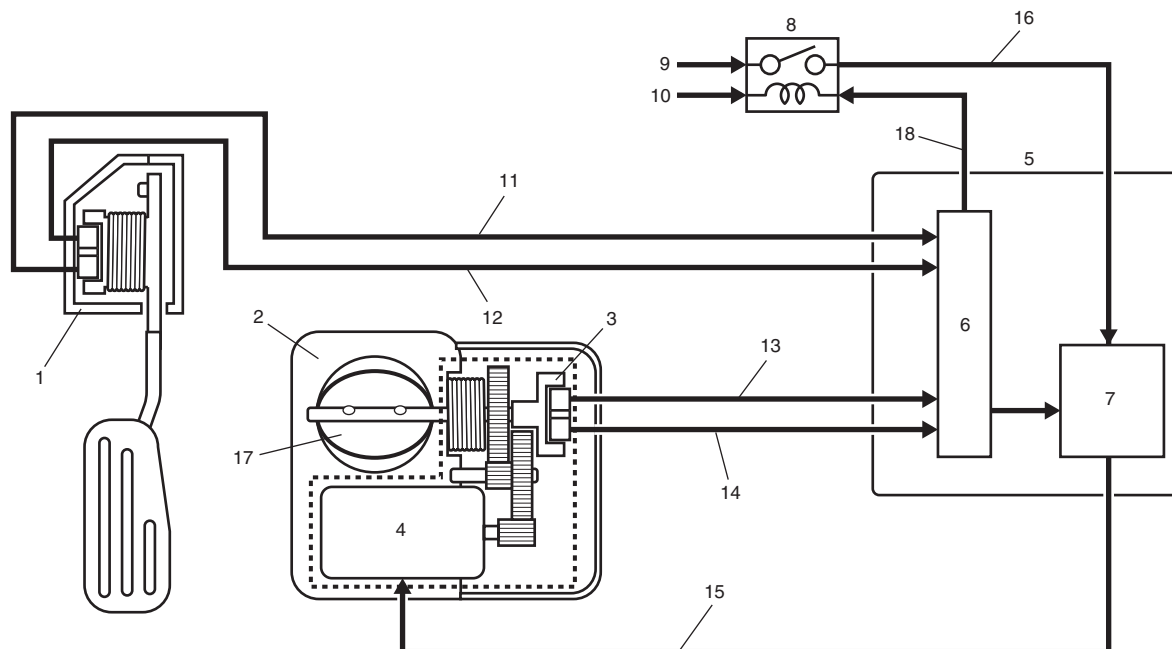
In this system, as the throttle position sensor and accelerator pedal position (APP) sensor have 2 sensors (main and sub) each, highly accurate and highly reliable control and abnormality detection are assured. Also, when ECM detects an abnormality in the system, it turns off the throttle actuator control relay (8) to stop controlling the throttle actuator. When the throttle actuator control relay is turned off, the throttle valve is fixed at the specified opening below from its completely closed position (default opening) by the force of the return spring and open spring included in the throttle body.

This throttle body is not equipped with IAC valve for idle speed control. Idle speed control is done by the throttle actuator which opens/closes the throttle valve.

Throttle valve opening when throttle actuator control is OFF

Automated manual transaxle model: Approx. 8°

M16A engine: Approx. 6°



I4RS0B110007-02

6. CPU	11. Accelerator pedal position (APP) sensor (main) signal	15. Drive signal of throttle actuator
7. Drive circuit of throttle actuator	12. Accelerator pedal position (APP) sensor (sub) signal	16. Power supply of throttle actuator
9. From "TH MOT" fuse	13. Throttle position sensor (main) signal	18. Control signal of throttle actuator control relay
10. From main relay	14. Throttle position sensor (sub) signal	

Fuel Cut Control Description (M16A Engine)

S6RS0B1111012

For M16A engine, the fuel cut control in the vehicle stop is added as follows in order to prevent the over-rev.

Fuel Cut Control Table (M16A Engine)

Vehicle Condition	Operative Condition
Stop	- Engine r/min > 6,000 - Engine r/min > 4,000 for 180 seconds
Run	Engine r/min > 7,000

Generator Control System Description (M16A Engine)

S6RS0B1111011

Generator Control System consists of a generator (1) and ECM (4).

ECM controls generated electricity (adjusting voltage of IC regulator (2)) so that it is suitable for the engine and electric load conditions. When the electric load increases quickly, generation load of the generator increases quickly and causes idling to change. To prevent this, ECM makes generated electricity volume vary gradually to stabilize idling. Also, it reduces the engine load caused by temporary increase in electricity generation to cope with the engine condition (such as when accelerating).

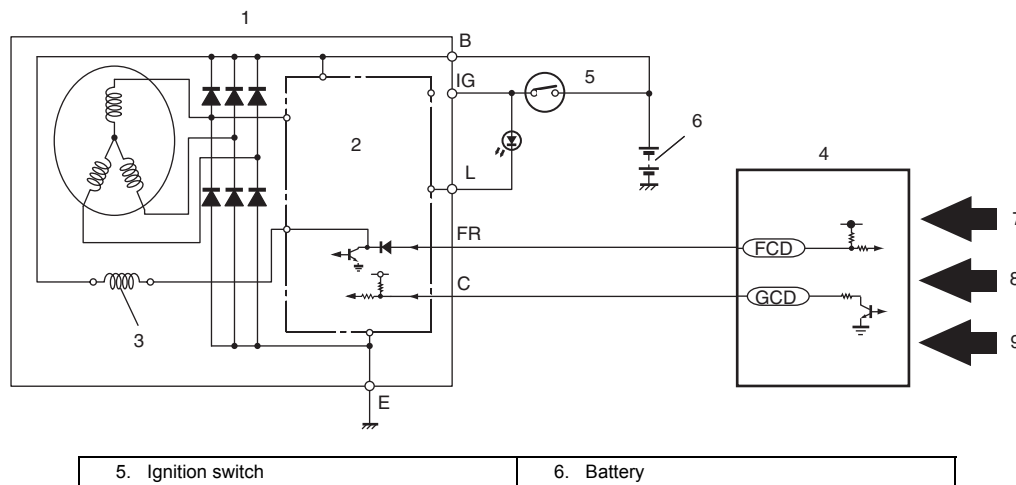
Operation

ECM controls the generated voltage of the generator using "C" terminal (generator control terminal) duty, based on following information.

- Engine condition (ECT, vehicle speed, engine speed, TP, etc.) (7)
- Battery voltage (ECM backup power voltage) (8)
- Electric load condition (blower motor, rear defogger, head lights, radiator fan, A/C, etc.) (9)
- "FR" terminal output (field coil (3) control duty) which indicates the operation rate (electricity generation condition) of the generator.

Then the generator uses "C" terminal duty to regulate the adjusting voltage of the IC regulator with the field coil control duty so as to control its generated voltage ("B" terminal output voltage).

(For more information of the generated voltage, refer to Charging System in Section 1J.)



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Electronic Control System Description

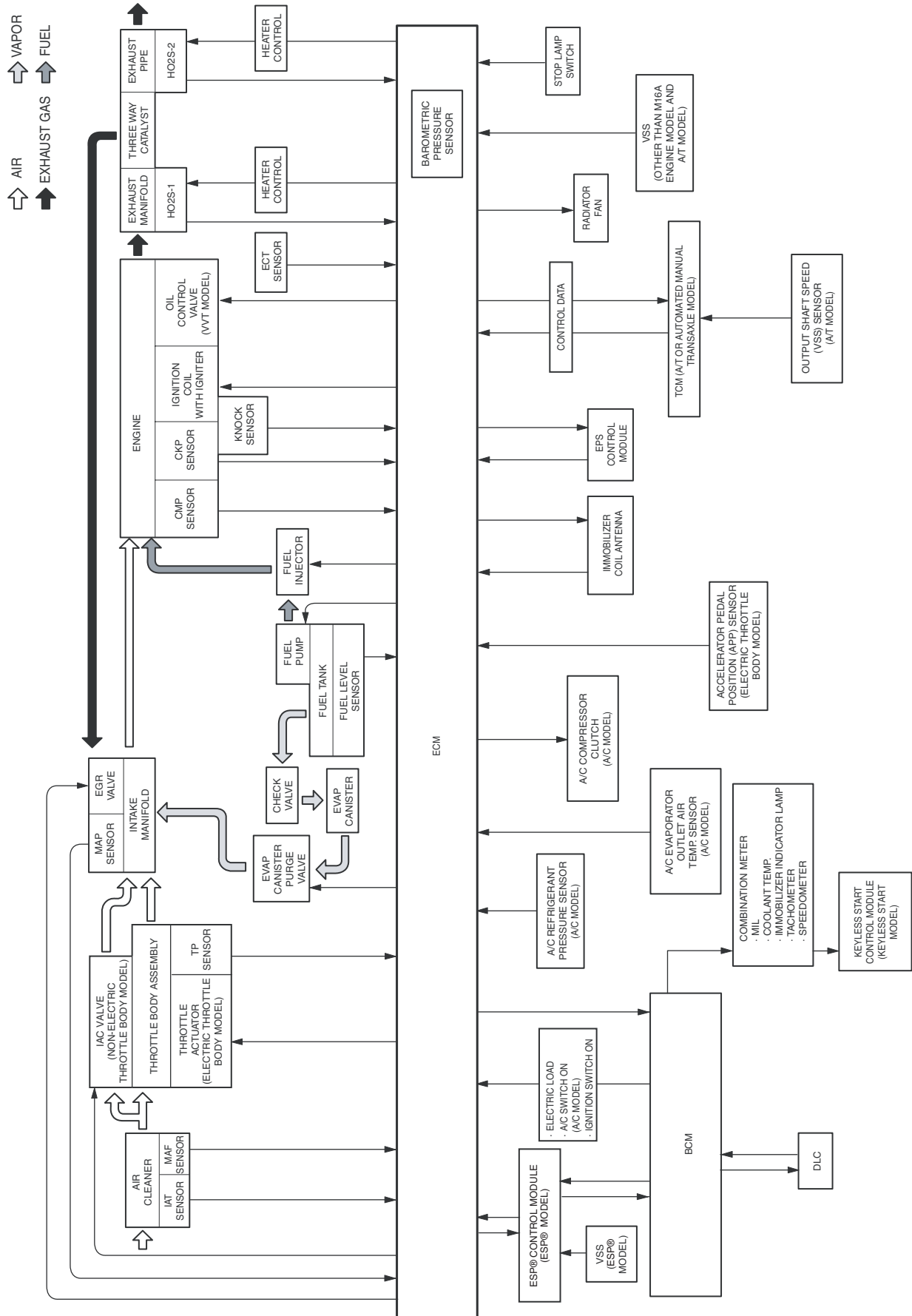
S6RS0B1111009

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices. Functionally, it is divided into the following sub systems:

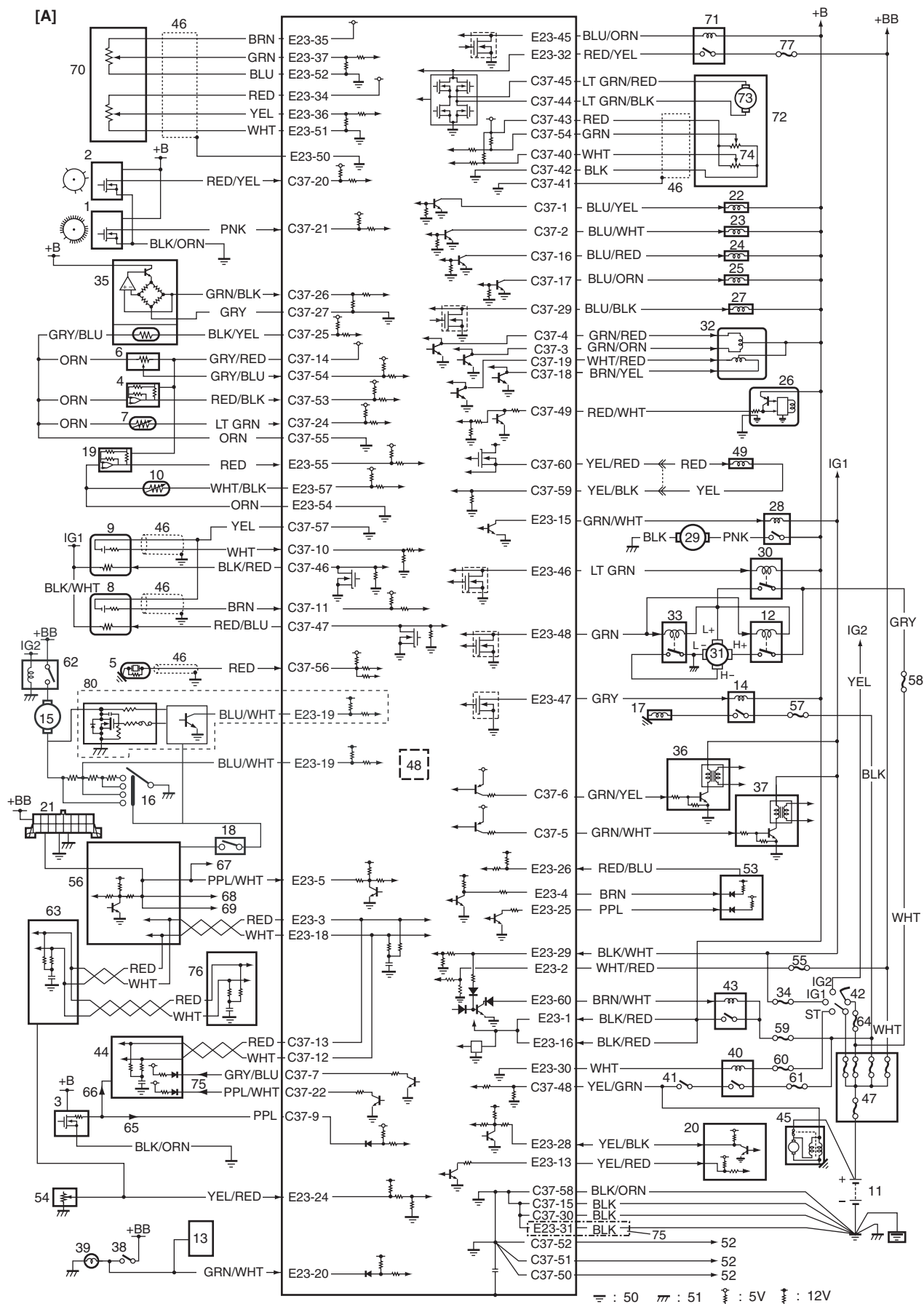
- Fuel injection control system
- Ignition control system
- Idle speed control system (non-electric throttle body model)
- Electric Throttle Body Control System (electric throttle body model)
- Fuel pump control system
- Radiator cooling fan control system
- Evaporative emission control system
- EGR system
- Oxygen sensor heater control system
- A/C control system (A/C model)
- Camshaft position control system
- Immobilizer control system
- Controller (computer) communication system

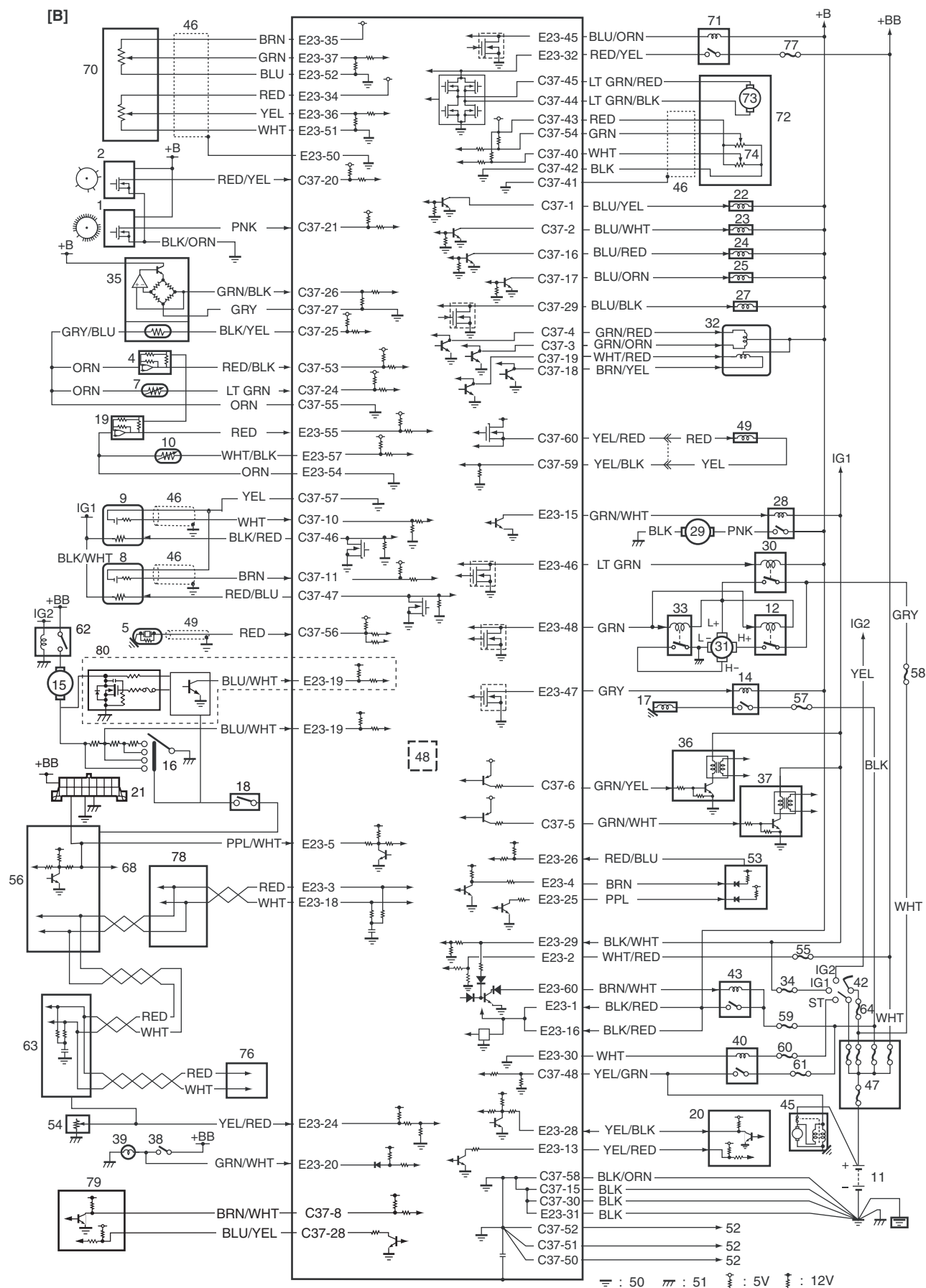
Especially, ECM (Engine Control Module), BCM (Body electrical Control Module), ESP® control module (ESP® model), combination meter, TCM (Transmission Control Module (A/T or Automated Manual Transaxle model)) and keyless start control module (keyless start model) intercommunicate by means of CAN (Controller Area Network) communication.

Engine and Emission Control System Flow Diagram



ECM Input / Output Circuit Diagram





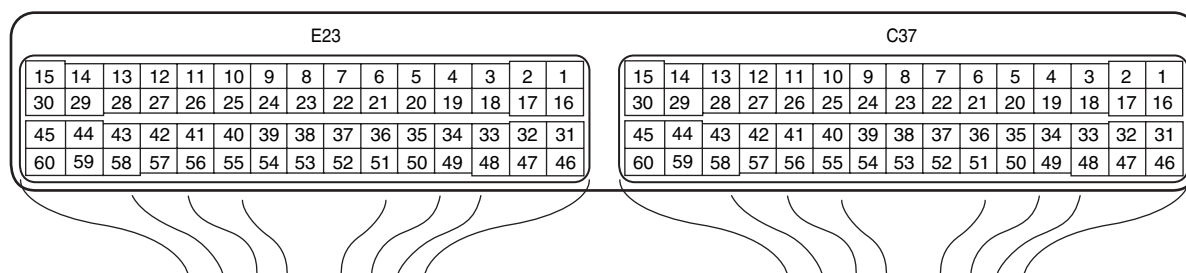
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[A]: M13A and M15A engines	27. EVAP canister purge valve	55. "RADIO" fuse
[B]: M16A engine	28. Fuel pump relay	56. BCM

1A-11 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

1. CKP sensor	29. Fuel pump	57. "A/C COMP" fuse
2. CMP sensor	30. Radiator cooling fan relay No.1	58. "RDTR FAN" fuse
3. VSS	31. Radiator cooling fan motor	59. "FI" fuse
4. MAP sensor	32. EGR valve	60. "ST SIG" fuse
5. Knock sensor	33. Radiator cooling fan relay No.3	61. "ST MOT" fuse
6. TP sensor (Non-electric throttle body model)	34. "IG COIL" fuse	62. Blower motor relay
7. ECT sensor	35. MAF and IAT sensor	63. Combination meter
8. Heated oxygen sensor-2	36. Ignition coil assembly (for No.1 and No.4 spark plugs)	64. "IG ACC" fuse
9. Heated oxygen sensor-1	37. Ignition coil assembly (for No.2 and No.3 spark plugs)	65. Only for M/T and Automated Manual Transaxle models
10. A/C evaporator outlet air temp. sensor	38. Stop lamp switch	66. Only for A/T model
11. Battery	39. Stop lamp	67. To TCM
12. Radiator cooling fan relay No.2	40. Starting motor control relay	68. To SDM
13. ABS control module	41. Transmission range switch (A/T model)	69. To EPS control module
14. A/C compressor relay	42. Ignition switch	70. Accelerator pedal position (APP) sensor assembly (Electric throttle body model)
15. Blower motor	43. Main relay	71. Throttle actuator control relay (Electric throttle body model)
16. Blower speed selector (Non-auto A/C model)	44. TCM (A/T or Automated Manual Transaxle model)	72. Electric throttle body assembly
17. Magnet clutch of A/C compressor	45. Starting motor	73. Throttle actuator (Electric throttle body model)
18. A/C switch	46. Shield wire	74. Throttle position sensor (Electric throttle body model)
19. A/C refrigerant pressure sensor	47. Main fuse box	75. Only for electric throttle body model
20. Immobilizer coil antenna	48. Barometric pressure sensor	76. Keyless start control module
21. Data link connector	49. Oil control valve (Camshaft position control) (VVT model)	77. "TH MOT" fuse
22. Injector No.1	50. Engine ground	78. ESP® control module
23. Injector No.2	51. Body ground	79. Generator (M16A engine)
24. Injector No.3	52. Shield ground	80. Blower selector speed (Auto A/C model)
25. Injector No.4	53. EPS control module	
26. IAC valve (Non-electric throttle body model)	54. Fuel level sensor	

Terminal Arrangement of ECM Coupler (Viewed from Harness Side)



I4RS0A110008-01

Connector: C37

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLU/YEL	Fuel injector No.1 output	31	—	—
2	BLU/WHT	Fuel injector No.2 output	32	—	—
3	GRN/ORN	EGR valve (stepper motor coil 2) output	33	—	—
4	GRN/RED	EGR valve (stepper motor coil 1) output	34	—	—
5	GRN/WHT	Ignition coil No.2 and No.3 output	35	—	—
6	GRN/YEL	Ignition coil No.1 and No.4 output	36	—	—
7	GRY/BLU	Engine revolution signal output for TCM (Automated Manual Transaxle model)	37	—	—
8	BRN/WHT	Generator field coil monitor signal (M16A engine)	38	—	—

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
9	PPL	Vehicle speed sensor signal (M/T and Automated Manual Transaxle models)	39	—	—
10	WHT	Oxygen signal of heated oxygen sensor-1	40	WHT	Throttle position sensor (sub) signal (Electric throttle body model)
11	BRN	Oxygen signal of heated oxygen sensor-2	41	—	Ground for shield wire of TP sensor circuit (Electric throttle body model)
12	WHT	CAN (low) communication line (active low signal) to TCM (A/T and Automated Manual Transaxle models)	42	BLK	Ground for throttle position sensor (Electric throttle body model)
13	RED	CAN (high) communication line (active high signal) to TCM (A/T and Automated Manual Transaxle models)	43	RED	Output for 5 V power source of throttle position sensor (Electric throttle body model)
14	GRY/RED	Output of 5 V power source for TP sensor (Non-electric throttle body model), MAP sensor, A/C refrigerant pressure sensor (A/C model)	44	LT GRN/BLK	Output of throttle actuator (Electric throttle body model)
15	BLK	Ground for ECM	45	LT GRN/RED	Output of throttle actuator (Electric throttle body model)
16	BLU/RED	Fuel injector No.3 output	46	BLK/RED	Heater output of heated oxygen sensor-1
17	BLU/ORN	Fuel injector No.4 output	47	RED/BLU	Heater output of heated oxygen sensor-2
18	BRN/YEL	EGR valve (stepper motor coil 4) output	48	YEL/GRN	Starting motor signal
19	WHT/RED	EGR valve (stepper motor coil 3) output	49	RED/WHT	IAC valve output (Non-electric throttle body model)
20	RED/YEL	CMP sensor signal	50	—	Ground of ECM for shield wire
21	PNK	CKP sensor signal	51	—	Ground of ECM for shield wire
22	PPL/WHT	Vehicle speed signal output for TCM (Automated Manual Transaxle model)	52	—	Ground of ECM for shield wire
23	—	—	53	RED/BLK	Manifold absolute pressure (MAP) sensor signal
24	LT GRN	Engine coolant temp. (ECT) sensor signal	54	GRY/BLU	Throttle position (TP) sensor signal (Non-electric throttle body model)
				GRN	Throttle position sensor (main) signal (Electric throttle body model)
25	BLK/YEL	Intake air temp. (IAT) sensor signal	55	ORN	Ground for sensors
26	GRN/BLK	Mass air flow (MAF) sensor signal	56	RED	Knock sensor signal
27	GRY	Ground for MAF sensor	57	YEL	Ground for sensors
28	BLU/YEL	Generator control signal output (M16A engine)	58	BLK/ORN	Ground for ECM
29	BLU/BLK	EVAP canister purge valve output	59	YEL/BLK	Oil control valve ground (VVT model)
30	BLK	Ground for ECM	60	YEL/RED	Oil control valve output (VVT model)

Connector: E23

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLK/RED	Main power supply	31	BLK	Ground for ECM (Electric throttle body model)
2	WHT/RED	Power source for ECM internal memory	32	RED/YEL	Power supply of throttle actuator drive circuit. (Electric throttle body model)
3	RED	CAN communication line (active high signal) for BCM, combination meter	33	—	—
4	BRN	Engine revolution signal output for EPS control module	34	RED	Output for 5 V power source of accelerator pedal position (APP) sensor (sub) (Electric throttle body model)
5	PPL/WHT	12 V serial communication line of data link connector	35	BRN	Output for 5 V power source of accelerator pedal position (APP) sensor (main) (Electric throttle body model)
6	—	—	36	YEL	Accelerator pedal position (APP) sensor (sub) signal (Electric throttle body model)
7	—	—	37	GRN	Accelerator pedal position (APP) sensor (main) signal (Electric throttle body model)
8	—	—	38	—	—
9	—	—	39	—	—
10	—	—	40	—	—
11	—	—	41	—	—
12	—	—	42	—	—
13	YEL/RED	Clock signal for immobilizer coil antenna	43	—	—
14	—	—	44	—	—
15	GRN/WHT	Fuel pump relay output	45	BLU/ORN	Throttle actuator control relay output (Electric throttle body model)
16	BLK/RED	Main power supply	46	LT GRN	Radiator cooling fan relay No.1 output
17	—	—	47	GRY	A/C compressor relay output (A/C model)
18	WHT	CAN communication line (active low signal) for BCM, combination meter	48	GRN	Radiator cooling fan relay No.2 and No.3 output
19	BLU/WHT	Electric load signal for heater blower motor	49	—	—
20	GRN/WHT	Stop lamp switch signal	50	—	Ground for shield wire of accelerator pedal position (APP) sensor (Electric throttle body model)
21	—	—	51	WHT	Ground for accelerator pedal position (APP) sensor (sub) signal (Electric throttle body model)
22	—	—	52	BLU	Ground for accelerator pedal position (APP) sensor (main) signal (Electric throttle body model)
23	—	—	53	—	—
24	YEL/RED	Fuel level sensor signal	54	ORN	Ground for sensors

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
25	PPL	Vehicle speed signal output for EPS control module	55	RED	A/C refrigerant pressure sensor signal (A/C model)
26	RED/BLU	EPS signal	56	—	—
27	—	—	57	WHT/BLK	A/C evaporator outlet air temp. sensor signal (A/C model)
28	YEL/BLK	Serial communication line for immobilizer coil antenna	58	—	—
29	BLK/WHT	Ignition switch signal	59	—	—
30	WHT	Starting motor control relay output	60	BRN/WHT	Main power supply relay output

Engine and Emission Control Input / Output Table

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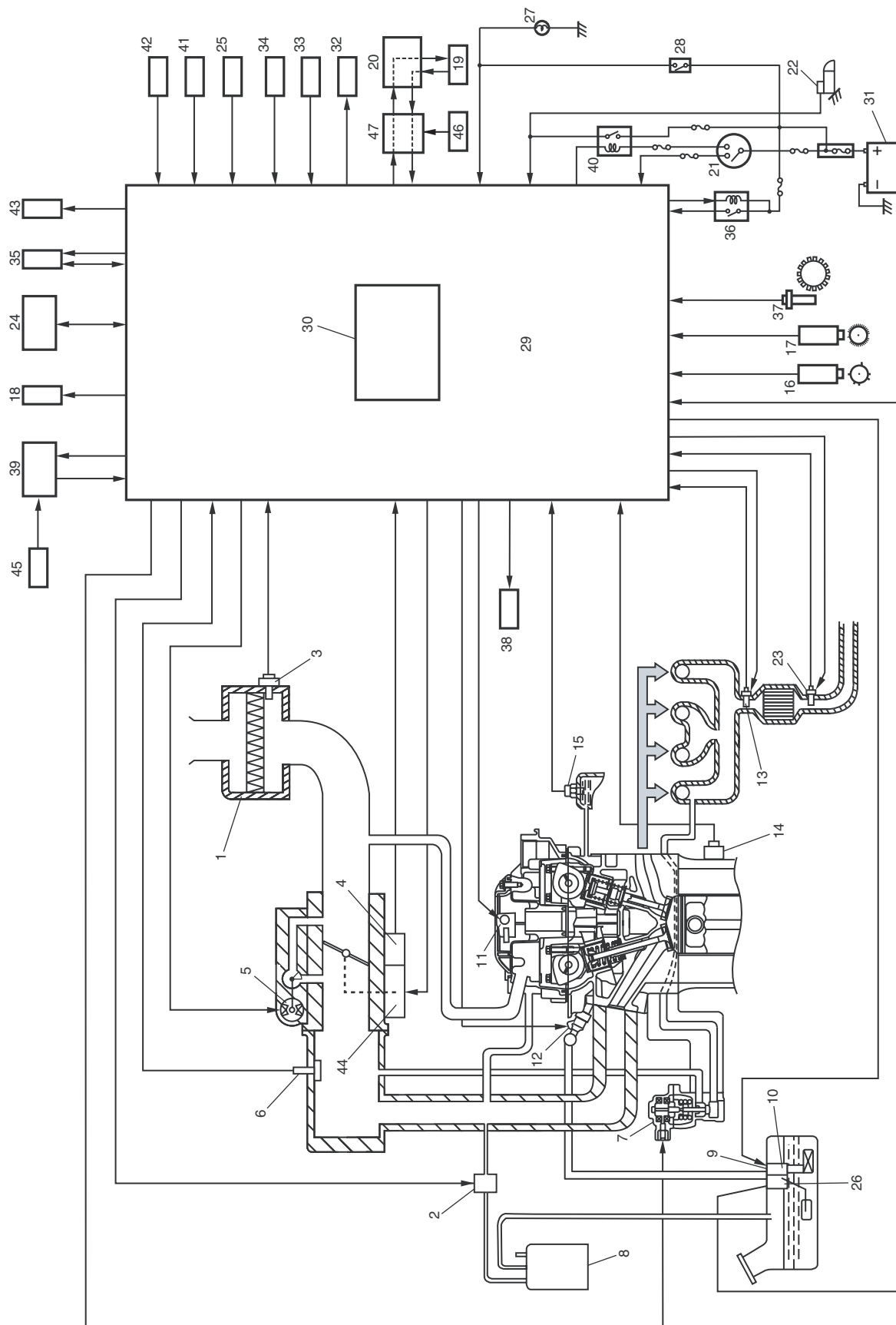
INPUT OUTPUT		ELECTRIC CONTROL DEVICE													
		FUEL PUMP RELAY	FUEL INJECTOR	HO2S HEATER	IAC VALVE (Non-electric throttle body model)	THROTTLE ACTUATOR (Electric throttle body model)	IGNITION COIL WITH IGNITER	EGR VALVE	EVAP CANISTER PURGE VALVE	A/C COMPRESSOR RELAY (A/C model)	RADIATOR FAN RELAY	MIL	MAIN RELAY	OIL CONTROL VALVE (VVT model)	THROTTLE ACTUATOR CONTROL RELAY (Electric throttle body model)
SIGNAL FROM SENSOR, SWITCH AND CONTROL MODULE	FUEL LEVEL SENSOR	For detecting fuel level													
	BAROMETRIC PRESSURE SENSOR		☐		☐	☐	☐	☐	☐			☐			
	STOP LAMP SWITCH		☐		☐	☐									
	START SWITCH	☐	☐		☐	☐	☐			☐					
	IGNITION SWITCH	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	A/C REFRIGERANT PRESSURE SENSOR (A/C model)		☐		☐	☐				☐	☐				
	BLOWER SWITCH				☐	☐				☐					
	A/C SWITCH (A/C model)		☐		☐	☐			☐	☐	☐				
	A/C EVAP OUTLET AIR TEMP. SENSOR (A/C model)		☐		☐	☐				☐	☐				
	VSS		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	
	HEATED OXYGEN SENSOR-1		☐						☐			☐			
	HEATED OXYGEN SENSOR-2		☐									☐			
	MAF SENSOR OF MAF AND IAT SENSOR		☐	☐	☐	☐	☐	☐	☐			☐		☐	
	IAT SENSOR OF MAF AND IAT SENSOR		☐		☐	☐	☐	☐	☐			☐		☐	
	ECT SENSOR		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	
	TP SENSOR (Non-electric throttle body model)		☐	☐	☐		☐	☐	☐	☐		☐		☐	
	TP SENSOR (Electric throttle body model)		☐	☐		☐	☐	☐	☐	☐		☐			☐
	ACCELERATOR PEDAL POSITION (APP) SENSOR (Electric throttle body model)					☐						☐			☐
	MAP SENSOR		☐				☐	☐				☐			
	CMP SENSOR		☐				☐					☐		☐	
	CKP SENSOR	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐		☐	
	KNOCK SENSOR						☐					☐			
	ABS / ESP® CONTROL MODULE				☐	☐									
	IMMOBILIZER CONTROL MODULE (in ECM)	☐	☐				☐					☐			
	TCM (Automated Manual Transaxle model)					☐									

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Schematic and Routing Diagram

Engine and Emission Control System Diagram

S6RS0B1112001



I6RS0B111008-02

1A-17 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

1. Air cleaner	17. CKP sensor	33. A/C switch (A/C model)
2. EVAP canister purge valve	18. Radiator cooling fan	34. A/C evaporator outlet air temp. sensor (A/C model)
3. MAF and IAT sensor	19. Combination meter	35. Immobilizer coil antenna
4. TP sensor	20. BCM	36. Main relay
5. IAC valve (Non-electric throttle body model)	21. Ignition switch	37. VSS (other than M16A engine and A/T model)
6. MAP sensor	22. Starter magnetic switch	38. Oil control valve (VVT model)
7. EGR valve	23. Heated oxygen sensor (HO2S)-2	39. TCM (A/T or Automated Manual Transaxle model)
8. EVAP canister	24. DLC	40. Starting motor control relay
9. Tank pressure control valve (built-in fuel pump)	25. Electric load	41. A/C refrigerant pressure sensor (A/C model)
10. Fuel pump (with pressure regulator)	26. Fuel level sensor	42. Accelerator pedal position (APP) sensor (Electric throttle body model)
11. Ignition coil assembly	27. Stop lamp	43. Throttle actuator control relay (Electric throttle body model)
12. Fuel injector	28. Stop lamp switch	44. Throttle actuator (Electric throttle body model)
13. Heated oxygen sensor (HO2S)-1	29. ECM	45. Output shaft speed (VSS) sensor (A/T model)
14. Knock sensor	30. Barometric pressure sensor	46. Wheel speed sensor (ESP® model)
15. ECT sensor	31. Battery	47. ESP® control module (ESP® model)
16. CMP sensor	32. A/C compressor relay (A/C model)	

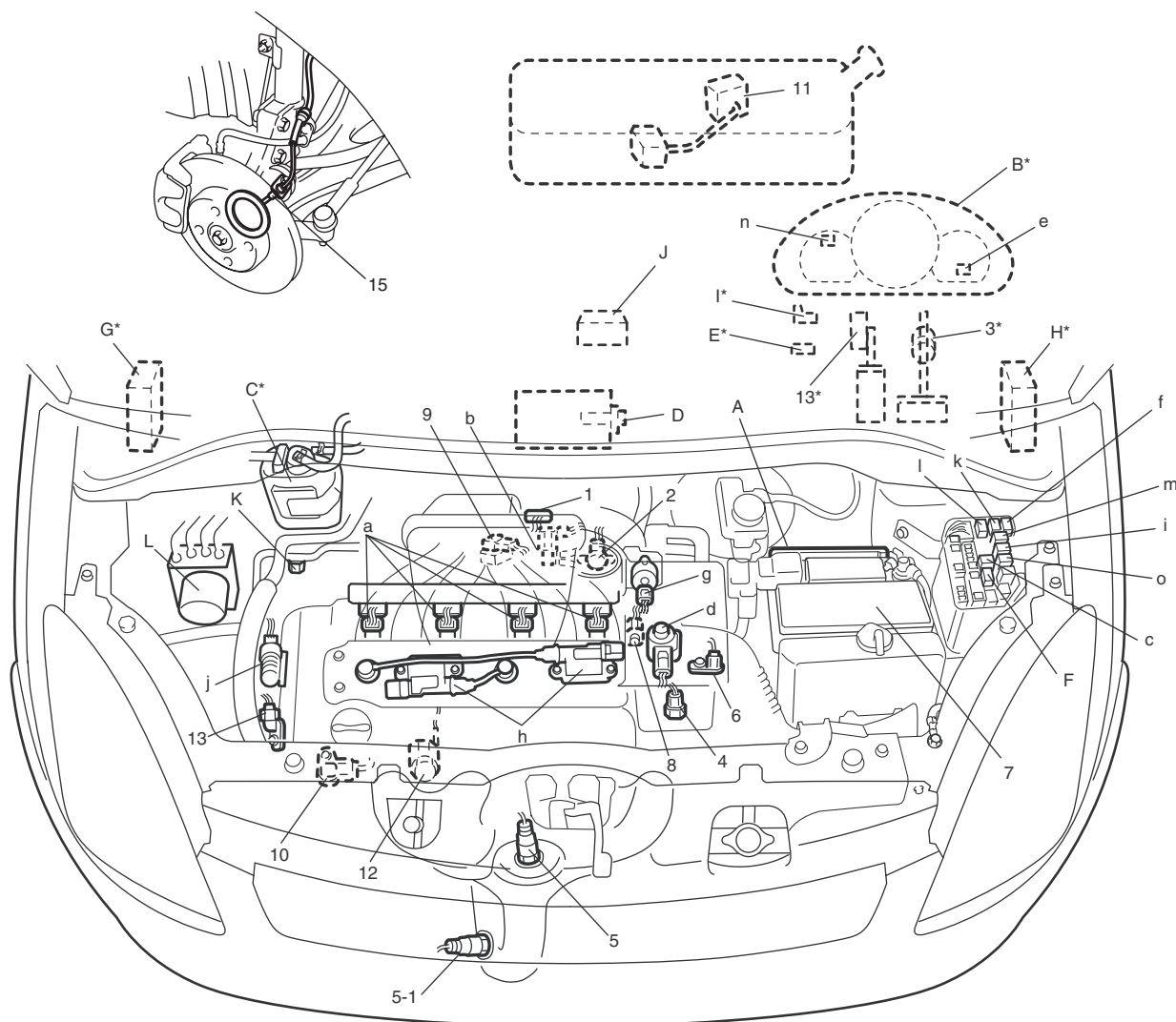
Component Location

Electronic Control System Components Location

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NOTE

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



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Information sensors	Control devices	Others
1. MAF and IAT sensor	a: Fuel injector	A: ECM
2. TP sensor (Non-electric throttle body model) or electric throttle body assembly (built-in throttle position sensor and throttle actuator) (Electric throttle body model)	b: EVAP canister purge valve	B: Combination meter
3. Stop lamp switch	c: Fuel pump relay	C: EVAP canister
4. ECT sensor	d: EGR valve	D: A/C evaporator outlet air temp. sensor (A/C model)
5. Heated oxygen sensor-1	e: Malfunction indicator lamp	E: Data link connector
5-1. Heated oxygen sensor-2	f: Radiator cooling fan relay No.1	F: A/C compressor relay (A/C model)
6. VSS	g: IAC valve (Non-electric throttle body model)	G: TCM (A/T or Automated Manual Transaxle model)
7. Battery	h: Ignition coil assembly (with ignitor)	H: BCM (included in junction block assembly)
8. CMP sensor (VVT model)	i: Main relay	I: Immobilizer coil antenna
9. MAP sensor	j: Oil control valve (VVT model)	J: EPS control module
10. CKP sensor	k: Radiator cooling fan relay No.2	K: A/C refrigerant pressure sensor (A/C model)
11. Fuel level sensor	l: Radiator cooling fan relay No.3	L: ABS / ESP® control module
12. Knock sensor	m: Starting motor control relay	
13. CMP sensor (Non-VVT model)	n: Immobilizer indicator lamp	

Information sensors	Control devices	Others
14. Accelerator pedal position (APP) sensor (Electric throttle body model)	o: Throttle actuator control relay (Electric throttle body model)	
15. Wheel speed sensor		

Diagnostic Information and Procedures

DTC Table

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NOTE

- With the generic scan tool, only star (*) marked DTC No. in the following table can be read.
- 1 driving cycle: MIL lights up when DTC is detected during 1 driving cycle.
- 2 driving cycles: MIL lights up when the same DTC is detected also in the next driving cycle after DTC is detected and stored temporarily in the first driving cycle.
- *2 driving cycles:
MIL blinks or lights up. Refer to “DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected: For M13, M15 and M16 Engines in related manual” for details.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
*P0010	Camshaft position actuator circuit (VVT model)	Oil control valve circuit open or short.	1 driving cycle
*P0011	Camshaft position – timing over-advanced or system performance (VVT model)	Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding.	2 driving cycles
*P0012	Camshaft position – timing over-retarded (VVT model)		2 driving cycles
*P0031	HO2S heater control circuit low (Sensor-1)	Heater current is less than specification while heater ON.	2 driving cycles
*P0032	HO2S heater control circuit high (Sensor-1)	Heater current is more than specification while heater ON.	2 driving cycles
*P0037	HO2S heater control circuit low (Sensor-2)	Heater current is less than specification while heater ON.	2 driving cycles
*P0038	HO2S heater control circuit high (Sensor-2)	Heater current is more than specification while heater ON.	2 driving cycles
*P0101	Mass air flow circuit range/performance	MAF sensor volume is more than specification or less than specification.	2 driving cycles
*P0102	Mass air flow circuit low input	Output voltage of MAF sensor is less than specification.	1 driving cycle
*P0103	Mass air flow circuit high input	Output voltage of MAF sensor is more than specification.	1 driving cycle
*P0106	Manifold absolute pressure circuit range/performance	Difference between Max. manifold absolute pressure value and Min. manifold pressure value is less than specification or difference between barometric pressure value and manifold pressure value is less than specification	2 driving cycles
*P0107	Manifold absolute pressure circuit low input	Output voltage of MAP sensor is less than specification.	1 driving cycle
*P0108	Manifold absolute pressure circuit high input	Output voltage of MAP sensor is more than specification.	1 driving cycle
*P0111	Intake air temperature sensor circuit range/performance	Variation of intake air temperature from engine start is less than specification.	2 driving cycles
*P0112	Intake air temperature sensor circuit low	Circuit voltage of IAT sensor is less than specification.	1 driving cycle
*P0113	Intake air temperature sensor circuit high	Circuit voltage of IAT sensor is more than specification.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0116	Engine coolant temperature circuit range/performance	Engine coolant temperature is less than specified temperature for specified time from engine start.	2 driving cycles
☞ *P0117	Engine coolant temperature circuit low	Circuit voltage of ECT sensor is less than specification.	1 driving cycle
☞ *P0118	Engine coolant temperature circuit high	Circuit voltage of ECT sensor is more than specification.	1 driving cycle
☞ *P0121	Throttle position sensor circuit range/performance (Non-electric throttle body model)	Difference between actual throttle opening and opening calculated by ECM is out of specification.	2 driving cycles
☞ *P0122	Throttle position sensor circuit low (Non-electric throttle body model)	Output voltage of TP sensor is less than specification.	1 driving cycle
☞ *P0122	Throttle position sensor (main) circuit low (Electric throttle body model)	Output voltage of throttle position sensor (main) is lower than specification.	1 driving cycle
☞ *P0123	Throttle position sensor circuit high (Non-electric throttle body model)	Output voltage of TP sensor is more than specification.	1 driving cycle
☞ *P0123	Throttle position sensor (main) circuit high (Electric throttle body model)	Output voltage of throttle position sensor (main) is higher than specification.	1 driving cycle
☞ *P0131	O2 sensor (HO2S) circuit low voltage (Sensor-1)	Max. output voltage of HO2S-1 is less than specification.	2 driving cycles
☞ *P0132	O2 sensor (HO2S) circuit high voltage (Sensor-1)	Min. output voltage of HO2S-1 is more than specification.	2 driving cycles
☞ *P0133	O2 sensor (HO2S) circuit slow response (Sensor-1)	Response time of HO2S-1 output voltage between rich and lean is longer than specification.	2 driving cycles
☞ *P0134	O2 sensor (HO2S) circuit no activity detected (Sensor-1)	Output voltage of HO2S-1 is more than specification or less than specification. (or HO2S-1 circuit open or short)	2 driving cycles
☞ *P0137	O2 sensor (HO2S) circuit low voltage (Sensor-2)	Output voltage of HO2S-2 is less than specification while engine is idling after driving with high engine load and Max. output voltage of HO2S-2 minus Min. output voltage of HO2S-2 is less than specification.	2 driving cycles
☞ *P0138	O2 sensor (HO2S) circuit high voltage (Sensor-2)	Output voltage of HO2S-2 is more than specification while engine is idling after driving with high engine load and Max. output voltage of HO2S-2 minus Min. output voltage of HO2S-2 is less than specification.	2 driving cycles
☞ *P0140	O2 sensor (HO2S) circuit no activity detected (Sensor-2)	Output voltage of HO2S-2 is more than specification after warming up engine.	2 driving cycles
☞ *P0171	System too lean	Total fuel trim is larger than specification for specified time or longer. (Fuel trim toward rich side is large.)	2 driving cycles
☞ *P0172	System too rich	Total fuel trim is smaller than specification for specified time or longer. (Fuel trim toward lean side is large.)	2 driving cycles
☞ *P0222	Throttle position sensor (sub) circuit low (Electric throttle body model)	Output voltage of throttle position sensor (sub) is lower than specification.	1 driving cycle
☞ *P0223	Throttle position sensor (sub) circuit high (Electric throttle body model)	Output voltage of throttle position sensor (sub) is higher than specification.	1 driving cycle
☞ *P0300	Random misfire detected	Misfire of such level as to cause damage to three way catalyst.	*2 driving cycles
☞ *P0301 / *P0302 / *P0303 / *P0304	Cylinder 1 misfire detected Cylinder 2 misfire detected Cylinder 3 misfire detected Cylinder 4 misfire detected	Misfire of such level as to deteriorate emission but not to cause damage to three way catalyst.	*2 driving cycles
☞ *P0327	Knock sensor circuit low	Output voltage of knock sensor is less than specification.	1 driving cycle

1A-21 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
✎ *P0328	Knock sensor circuit high	Output voltage of knock sensor is more than specification.	1 driving cycle
✎ *P0335	Crankshaft position sensor circuit	No signal of CKP sensor for specified time even if starting motor signal is input.	1 driving cycle
✎ *P0340	Camshaft position sensor circuit	CMP sensor pulse is out of specification.	1 driving cycle
✎ *P0401	Exhaust gas recirculation flow detected as insufficient	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is less than specification.	2 driving cycles
✎ *P0402	Exhaust gas recirculation flow detected as excessive	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is more than specification.	2 driving cycles
✎ *P0403	Exhaust gas recirculation control circuit	Output voltage is different from output command with more than one pole out of 4 poles.	1 driving cycle
✎ *P0420	Catalyst system efficiency below threshold	Output waveforms of HO2S-1 and HO2S-2 are similar.	2 driving cycles
✎ *P0443	Evaporative emission system purge control valve circuit	Monitor signal of EVAP canister purge valve is different from command signal. (circuit open or shorted to ground)	2 driving cycles
✎ P0462	Fuel level sensor circuit low	Circuit voltage of fuel level sensor is less than specification.	—
✎ P0463	Fuel level sensor circuit high	Circuit voltage of fuel level sensor is more than specification.	—
✎ *P0480	Fan 1 (Radiator cooling fan) control circuit	Monitor signal of radiator cooling fan relay is different from command signal.	1 driving cycle
✎ *P0500	Vehicle speed sensor (VSS) malfunction	No VSS signal during fuel cut for specified time or longer, or VSS signal is not input even if vehicle is driving with more than specified engine speed and D-range (A/T model).	2 driving cycles
✎ *P0505	Idle air control system (Non-electric throttle body model)	IAC control duty pulse is not detected in its monitor signal.	2 driving cycles
✎ P0532	A/C refrigerant pressure sensor circuit low	Output voltage of A/C refrigerant pressure sensor is less than specification.	—
✎ P0533	A/C refrigerant pressure sensor circuit high	Output voltage of A/C refrigerant pressure sensor is more than specification.	—
✎ *P0601	Internal control module memory check sum error	Data write error or check sum error.	1 driving cycle
✎ P0602	Control module programming error	Data programming error.	1 driving cycle
✎ *P0607	Control module performance (Electric throttle body model)	Data programming error.	1 driving cycle
✎ *P0616	Starter relay circuit low	Starter signal is low voltage even though engine is started with vehicle at stop.	2 driving cycles
✎ *P0617	Starter relay circuit high	Starter signal is high voltage for specified time while engine is running.	2 driving cycles
✎ P0620	Generator control circuit	Battery voltage is higher than specification even through generator control is maximum regulation, or battery voltage is lower than specification even through generator control is minimum regulation and electric load is less than 15 A.	—
✎ P0625	Generator field terminal circuit low	Generator field coil duty is 0% (high voltage) for more than specified time even through generator control is minimum regulation	—
✎ P0626	Generator field terminal circuit high	Generator field coil duty is 100% (low voltage) for more than specified time even through generator control is maximum regulation, or generator field coil duty is 100% (low voltage) when engine is starting.	—
✎ *P1510	ECM backup power supply malfunction	Backup power voltage is out of specification after starting engine.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P1603	TCM trouble code detected	When ECM receives a trouble code from TCM, which indicates that some problem occurred in sensor circuits and its calculated values used for operations such as idle speed control, engine power control and so on by TCM, this DTC is detected by ECM.	1 driving cycle
☞ *P1674	CAN communication (buss off error)	Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	1 driving cycle
☞ *P1675	CAN communication (transmission error)	Transmission error of communication data for ECM is detected for longer than specified time continuously.	1 driving cycle
☞ *P1676	CAN communication (reception error for TCM)	Reception error of communication data for TCM is detected for longer than specified time continuously.	1 driving cycle
☞ P1678	CAN communication (reception error for BCM)	Reception error of communication data for BCM is detected for longer than specified time continuously.	—
☞ *P1685	CAN communication (reception error for ESP® control module)	Reception error of communication data for ESP® control module is detected for longer than specified time continuously.	1 driving cycle
☞ *P2101	Throttle actuator control motor circuit range/performance (Electric throttle body model)	Monitor signal of throttle actuator output (duty output) is inconsistent with throttle actuator control command.	1 driving cycle
☞ *P2102	Throttle actuator control motor circuit low (Electric throttle body model)	Power supply voltage of throttle actuator control circuit is lower than specification even if throttle actuator control relay turned on.	1 driving cycle
☞ *P2103	Throttle actuator control motor circuit high (Electric throttle body model)	Power supply voltage of throttle actuator control circuit is higher than specification even if throttle actuator control relay turned off.	1 driving cycle
☞ *P2111	Throttle actuator control system – stuck open (Electric throttle body model)	Throttle valve default opening is greater than specified value from complementary closed position when diagnosing throttle valve at ignition switch turned OFF.	1 driving cycle
☞ *P2112	Throttle actuator control system – stuck closed (Electric throttle body model)	Throttle valve default opening is smaller than specified value from complementary closed position when diagnosing throttle valve at ignition switch turned OFF.	1 driving cycle
☞ *P2119	Throttle actuator control throttle body range/performance (Electric throttle body model)	Difference between actual throttle valve opening angle and opening angle calculated by ECM is more than specification.	1 driving cycle
☞ *P2122	Pedal position sensor (main) circuit low input (Electric throttle body model)	Output voltage of pedal position sensor (main) is lower than specification.	1 driving cycle
☞ *P2123	Pedal position sensor (main) circuit high input (Electric throttle body model)	Output voltage of pedal position sensor (main) is higher than specification.	1 driving cycle
☞ *P2127	Pedal position sensor (sub) circuit low input (Electric throttle body model)	Output voltage of pedal position sensor (sub) is lower than specification.	1 driving cycle
☞ *P2128	Pedal position sensor (sub) circuit high input (Electric throttle body model)	Output voltage of pedal position sensor (sub) is higher than specification.	1 driving cycle
☞ *P2135	Throttle position sensor (main / sub) voltage correlation (Electric throttle body model)	Difference between the opening angle based on throttle position sensor (main) and the opening angle based on throttle position sensor (sub) is more than specification.	1 driving cycle
☞ *P2138	Pedal position sensor (main / sub) voltage correlation (Electric throttle body model)	Difference between the opening angle based on accelerator pedal position sensor (main) and the opening angle based on accelerator pedal position sensor (sub) is more than specification.	1 driving cycle
☞ *P2227	Barometric pressure circuit range/performance	Difference of barometric pressure value and intake manifold pressure value is more than specification at engine start.	2 driving cycles

1A-23 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
✎ *P2228	Barometric pressure circuit low	Barometric pressure sensor voltage is less than specification.	1 driving cycle
✎ *P2229	Barometric pressure circuit high	Barometric pressure sensor voltage is more than specification.	1 driving cycle
P1614	Transponder response error	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
*P1615	ID code does not registered (keyless start model)	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
*P1616	Different registration ID codes (keyless start model)	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
*P1618	CAN communication error (reception error for keyless start control module) (keyless start model)	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
P1621	Immobilizer communication line error	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
P1622	EEPROM error	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
P1623	Unregistered transponder	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
P1625	Immobilizer antenna error	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
P1636	Immobilizer information registration failure	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle
P1638	Immobilizer information mismatched	Refer to "Diagnostic Trouble Code (DTC) Table: For Petrol Engine Model in Section 10C".	1 driving cycle

For A/T Model

When using OBD generic scan tool, not only the previous star (*) marked ECM DTC(s) but also the following DTC(s) is displayed on OBD generic scan tool simultaneously.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)
*P0705	Transmission range sensor circuit malfunction (PRNDL input)	Refer to "DTC Table in Section 5A in related manual".
*P0707	Transmission range sensor circuit low	
*P0712	Transmission fluid temperature sensor circuit low	
*P0713	Transmission fluid temperature sensor circuit high	
*P0717	Input / Turbine speed sensor circuit no signal	
*P0722	Output speed sensor circuit no signal	
*P0741	Torque converter clutch circuit performance or stuck off	
*P0742	Torque converter clutch circuit stuck on	
*P0751	Shift solenoid-A (No.1) performance or stuck off	
*P0752	Shift solenoid-A (No.1) stuck on	
*P0756	Shift solenoid-B (No.2) performance or stuck off	
*P0757	Shift solenoid-B (No.2) stuck on	
*P0787	Shift / Timing solenoid control circuit low	
*P0788	Shift / Timing solenoid control circuit high	
*P0962	Pressure control solenoid control circuit low	
*P0963	Pressure control solenoid control circuit high	
*P0973	Shift solenoid-A (No.1) control circuit low	
*P0974	Shift solenoid-A (No.1) control circuit high	
*P0976	Shift solenoid-B (No.2) control circuit low	
*P0977	Shift solenoid-B (No.2) control circuit high	
*P1702	Internal control module memory check sum error	
*P1774	Control module communication bus off	
*P1775	High speed can communication bus (Transmission error)	
*P1777	TCM lost communication with ECM (Reception error)	
*P2763	Torque converter clutch pressure control solenoid control circuit high	
*P2764	Torque converter clutch pressure control solenoid control circuit low	

For Automated Manual Transaxle Model

When using OBD generic scan tool, not only the previous star (*) marked ECM DTC(s) but also the following DTC(s) is displayed on OBD generic scan tool simultaneously.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)
*P0807	Clutch position sensor circuit low	Refer to "DTC Table in Section 5D in related manual".
*P0808	Clutch position sensor circuit high	
*P0906	Gate select position circuit low	
*P0907	Gate select position circuit high	
*P0916	Gate shift position circuit low	
*P0917	Gate shift position circuit high	
*P1774	Control module communication bus off	
*P1777	TCM (Automated Manual Transaxle) lost communication with ECM	
*P1840	TCM (Automated Manual Transaxle) system voltage	
*P1856	Clutch position sensor "B" circuit low	
*P1857	Clutch position sensor "B" circuit high	
*P1858	Gate select position "B" circuit low	
*P1859	Gate select position "B" circuit high	
*P1882	Gate shift position circuit "B" low	
*P1883	Gate shift position circuit "B" high	

Fail-Safe Table

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When any of the following DTCs is detected, ECM enters fail-safe mode as long as malfunction continues to exist but that mode is canceled when ECM detects normal condition after that.

DTC No.	Detected item	Fail-safe operation
 P0102	Mass air flow circuit low input	- ECM controls injector drive time (fuel injection volume) according to throttle valve opening (closed throttle position or not). - ECM stops EGR control.
 P0103	Mass air flow circuit high input	
 P0112	Intake air temperature sensor circuit low	ECM controls actuators assuming that intake air temperature is 20 °C (68 °F).
 P0113	Intake air temperature sensor circuit high	
 P0117	Engine coolant temperature circuit low	- ECM controls actuators assuming that engine coolant temperature is 80 °C (176 °F). - ECM operates radiator cooling fan.
 P0118	Engine coolant temperature circuit high	
 P0122 (Non-electric throttle body model)	Throttle position sensor circuit low (Non-electric throttle body model)	ECM controls actuators assuming that throttle opening is about 20°.
 P0122 (Electric throttle body model)	Throttle position sensor (main) circuit low (Electric throttle body model)	- ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to "Description of Electric Throttle Body System (Electric Throttle Body Model): For M13, M15 and M16 Engines". - ECM controls fuel cut at specified engine speed. - ECM stops air/fuel ratio control.
 P0123 (Non-electric throttle body model)	Throttle position sensor circuit high (Non-electric throttle body model)	ECM controls actuators assuming that throttle opening is about 20°.

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DTC No.	Detected item	Fail-safe operation
P0123 (Electric throttle body model)	Throttle position sensor (main) circuit high (Electric throttle body model)	- ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Description of Electric Throttle Body System (Electric Throttle Body Model): For M13, M15 and M16 Engines”. - ECM controls fuel cut at specified engine speed. - ECM stops air/fuel ratio control.
P0222 (Electric throttle body model)	Throttle position sensor (sub) circuit low (Electric throttle body model)	
P0223 (Electric throttle body model)	Throttle position sensor (sub) circuit high (Electric throttle body model)	
P0335	Crankshaft position sensor circuit	- Ignition timing is fixed. - ECM changes injection control system from sequential injection to simultaneous one.
P0340	Camshaft position sensor circuit	ECM changes injection control system from sequential injection to simultaneous one.
P0500	Vehicle speed sensor	- ECM controls actuators assuming that vehicle speed is 0 km/h (0 mile/h). - ECM stops IAC feedback control.
P2101 (Electric throttle body model)	Throttle actuator control motor circuit range / performance (Electric throttle body model)	- ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Description of Electric Throttle Body System (Electric Throttle Body Model): For M13, M15 and M16 Engines”. - ECM controls fuel cut at specified engine speed. - ECM stops air/fuel ratio control.
P2102 (Electric throttle body model)	Throttle actuator control motor circuit low (Electric throttle body model)	
P2103 (Electric throttle body model)	Throttle actuator control motor circuit high (Electric throttle body model)	
P2111 (Electric throttle body model)	Throttle actuator control system – stuck open (Electric throttle body model)	- ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Description of Electric Throttle Body System (Electric Throttle Body Model): For M13, M15 and M16 Engines”. - ECM controls fuel cut at specified engine speed. - ECM stops air/fuel ratio control.
P2112 (Electric throttle body model)	Throttle actuator control system – stuck closed (Electric throttle body model)	
P2119 (Electric throttle body model)	Throttle actuator control throttle body range / performance (Electric throttle body model)	- ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Description of Electric Throttle Body System (Electric Throttle Body Model): For M13, M15 and M16 Engines”. - ECM controls fuel cut at specified engine speed.

DTC No.	Detected item	Fail-safe operation
P2122 (Electric throttle body model)	Pedal position sensor (main) circuit low input (Electric throttle body model)	- ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Description of Electric Throttle Body System (Electric Throttle Body Model): For M13, M15 and M16 Engines”. - ECM controls fuel cut at specified engine speed. - ECM stops air/fuel ratio control.
P2123 (Electric throttle body model)	Pedal position sensor (main) circuit high input (Electric throttle body model)	
P2127 (Electric throttle body model)	Pedal position sensor (sub) circuit low input (Electric throttle body model)	
P2128 (Electric throttle body model)	Pedal position sensor (sub) circuit high input (Electric throttle body model)	
P2135 (Electric throttle body model)	Throttle position sensor (main) / (sub) voltage correlation (Electric throttle body model)	
P2138 (Electric throttle body model)	Pedal position sensor (main) / (sub) voltage correlation (Electric throttle body model)	
P2227	Barometric pressure sensor performance problem	ECM controls actuators assuming that barometric pressure is 101.33 kPa (762 mmHg).

Scan Tool Data

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

Also, conditions that can be checked by the scan tool are those detected by ECM and output from ECM as commands and there may be cases where the engine or actuator is not operating (in the condition) as indicated by the scan tool. Be sure to use the timing light to check the ignition timing.

NOTE

- With the generic scan tool, only star (*) marked data in the following table can be read.
- When checking the data with the engine running at idle or racing, be sure to shift M/T or Automated Manual Transaxle gear to the neutral gear position and A/T gear to the “Park” position and pull the parking brake fully. Also, if nothing or “no load” is indicated, turn OFF A/C (if equipped with A/C), all electric loads, P/S and all the other necessary switches.

	Scan tool data	Vehicle condition	Normal condition / reference values
*	COOLANT TEMP (ENGINE COOLANT TEMP.)	At specified idle speed after warming up	80 – 100 °C, 176 – 212 °F
*	INTAKE AIR TEMP.	At specified idle speed after warming up	–5 °C (23 °F) + environmental temp. to 40 °C (104 °F) + environmental temp.
*	ENGINE SPEED	It idling with no load after warming up	Desired idle speed ± 50 rpm
	INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH)	At specified idle speed with no load after warming up	2.0 – 4.0 msec.
		At 2500 r/min. with no load after warming up	2.0 – 3.6 msec.
	TP SENSOR VOLT (THROTTLE POSITION SENSOR OUTPUT VOLTAGE)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released 3.3 – 4.8 V
		Accelerator pedal depressed fully	More than 4.8 V

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	Scan tool data	Vehicle condition		Normal condition / reference values
	DESIRED IDLE (DESIRED IDLE SPEED)	It idling with radiator cooling fan stopped and all electrical parts turned OFF after warming up, M/T at neutral		700 rpm
	IAC FLOW DUTY (IDLE AIR CONTROL FLOW DUTY) (Non-electric throttle body model)	It idling with no load after warming up		5 – 55%
	IAC THROTTLE OPENING (IDLE AIR CONTROL THROTTLE VALVE OPENING) (Electric throttle body model)	It idling with no load after warming up		5 – 55%
*	SHORT FT B1 (SHORT TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
*	LONG FT B1 (LONG TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
	TOTAL FUEL TRIM B1	At specified idle speed after warming up		–35 – +35%
*	MAF (MASS AIR FLOW RATE)	At specified idle speed with no load after warming up		1.0 – 4.0 g/s 0.14 – 0.52 lb/min.
		At 2500 r/min. with no load after warming up		4.0 – 12.0 g/s 0.53 – 1.58 lb/min.
*	CALC LOAD (CALCULATED LOAD VALUE) (M13A and M15A engines)	At specified idle speed with no load after warming up		0 – 10%
		At 2500 r/min. with no load after warming up		0 – 10%
	CALC LOAD (CALCULATED LOAD VALUE) (M16A engine)	At specified idle speed with no load after warming up		18 – 28%
		At 2500 r/min. with no load after warming up		13 – 23%
*	THROTTLE POSITION (ABSOLUTE THROTTLE POSITION)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released	0 – 5%
			Accelerator pedal depressed fully	90 – 100%
*	O2S B1 S1 (HEATED OXYGEN SENSOR-1)	At specified idle speed after warming up		0.1 – 0.95 V
	O2S B1 S1 ACT	At specified idle speed after warming up		ACTIVE
*	O2S B1 S2 (HEATED OXYGEN SENSOR-2)	At 2000 r/min. for 3 min. or longer after warming up.		0.1 – 0.95 V
	O2S B1 S2 ACT	At specified idle speed after warming up		ACTIVE
*	FUEL SYSTEM B1 (FUEL SYSTEM STATUS)	At specified idle speed after warming up		CLSD (closed loop)
*	MAP (INTAKE MANIFOLD ABSOLUTE PRESSURE)	At specified idle speed with no load after warming up		24 – 38 kPa, 7.1 – 11.2 in.Hg
	BAROMETRIC PRES	—		Barometric pressure is displayed
	STEP EGR FLOW DUTY	At specified idle speed after warming up		0%
	FUEL CUT	Engine at fuel cut condition		ON
		Engine at other than fuel cut condition		OFF
	A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE)	Engine running	A/C ON (A/C is operating) at ambient temperature: 30 °C (86 °F) and humidity: 50%	1350 – 1650 kPa For more details, refer to pressure of high pressure gage under “A/C System Performance Inspection: Manual Type in Section 7B in related manual”.
			A/C OFF (A/C is not operating) at ambient temperature: 30 °C (86 °F) and engine coolant temperature: 90 – 100 °C (194 – 212 °F)	600 – 1000 kPa After longer than 10 min from A/C switch turned off

	Scan tool data	Vehicle condition		Normal condition / reference values
	☞ CLOSED THROTTLE POS (CLOSED THROTTLE POSITION)	Throttle valve at idle position		ON
		Throttle valve opens larger than idle position		OFF
	☞ CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY)	At specified idle speed after warming up		0%
*	☞ IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER)	At specified idle speed with no load after warming up		5 – 15° BTDC (Non-VVT model), 3 – 13° BTDC (VVT model)
	☞ BATTERY VOLTAGE	Ignition switch ON / engine at stop		10 – 14 V
	☞ FUEL PUMP	Within 2 seconds after ignition switch ON or engine running		ON
		Engine at stop with ignition switch ON		OFF
	☞ ELECTRIC LOAD	Ignition switch ON / Headlight, small light, all turned OFF		OFF
		Ignition switch ON / Headlight, small light, turned ON		ON
	☞ BRAKE SWITCH	Ignition switch ON	Brake pedal is released	OFF (Other than Automated Manual Transmission model), CANCEL (Automated Manual Transmission model)
			Brake pedal is depressed	ON (Other than Automated Manual Transmission model), SET (Automated Manual Transmission model)
	☞ RADIATOR FAN (RADIATOR COOLING FAN CONTROL RELAY)	Ignition switch ON	Engine coolant temp.: Lower than 95 °C (203 °F)	OFF
			Engine coolant temp.: 97.5 °C (208 °F) or higher	ON
	☞ BLOWER FAN	Ignition switch ON	Blower fan switch: 2nd speed position or more	ON
			Blower fan switch: under 1st speed position	OFF
	☞ A/C SWITCH	Engine running after warming up, A/C not operating		OFF
		Engine running after warming up, A/C operating		ON
	☞ A/C COMP RELAY	Engine running	A/C switch and blower motor switch turned ON	ON
			A/C switch and blower motor switch turned OFF	OFF
*	☞ VEHICLE SPEED	At stop		0 km/h (0 mph)
	☞ VVT GAP (TARGET-ACTUAL POSITION) (VVT model)	At specified idle speed after warming up		0 – 3°
	☞ TP SENSOR 1 VOLT (THROTTLE POSITION SENSOR (MAIN) OUTPUT VOLTAGE) (Electric throttle body model)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.6 – 1.0 V
			Accelerator pedal depressed fully	3.37 – 4.55 V
	☞ TP SENSOR 2 VOLT (THROTTLE POSITION SENSOR (SUB) OUTPUT VOLTAGE) (Electric throttle body model)	Ignition switch ON after warmed up engine	Accelerator pedal released	1.4 – 1.8 V
			Accelerator pedal depressed fully	3.58 – 4.76 V

Scan tool data	Vehicle condition		Normal condition / reference values
APP SENSOR 1 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (MAIN) OUTPUT VOLTAGE) (Electric throttle body model)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.5 – 0.9 V
		Accelerator pedal depressed fully	3.277 – 3.915 V
APP SENSOR 2 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (SUB) OUTPUT VOLTAGE) (Electric throttle body model)	Ignition switch ON after warmed up engine	Accelerator pedal released	1.3 – 1.7 V
		Accelerator pedal depressed fully	4.077 – 4.715 V
ACCEL POSITION (ABSOLUTE ACCELERATOR PEDAL POSITION) (Electric throttle body model)	Ignition switch ON after warmed up engine	Accelerator pedal released	0 – 5%
		Accelerator pedal depressed fully	90 – 100%
THROTTLE TARGET POSI (TARGET THROTTLE VALVE POSITION) (Electric throttle body model)	Ignition switch ON after warmed up engine	Accelerator pedal released	0 – 5%
		Accelerator pedal depressed fully	90 – 100%

Scan Tool Data Definitions

COOLANT TEMP (ENGINE COOLANT TEMPERATURE, °C, °F)

It is detected by engine coolant temp. sensor.

INTAKE AIR TEMP. (°C, °F)

It is detected by intake air temp. sensor.

ENGINE SPEED (rpm)

It is computed by reference pulses from the camshaft position sensor.

INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH, msec.)

This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM (but injector drive time of NO.1 cylinder for multiport fuel injection).

TP SENSOR VOLT (THROTTLE POSITION SENSOR OUTPUT VOLTAGE, V) (Non-electric throttle body model)

The Throttle Position Sensor reading provides throttle valve opening information in the form of voltage.

DESIRED IDLE (DESIRED IDLE SPEED, rpm)

The Desired Idle Speed is an ECM internal parameter which indicates the ECM requested idle. If the engine is not running, this number is not valid.

IAC FLOW DUTY (IDLE AIR (SPEED) CONTROL DUTY, %) (Non-electric throttle body model)

This parameter indicates current flow time rate within a certain set cycle of IAC valve (valve opening rate) which controls the amount of bypass air (idle speed).

IAC THROTTLE OPENING (IDLE AIR (SPEED)

CONTROL THROTTLE VALVE OPENING, %) (Electric throttle body model)

This parameter indicates throttle valve opening of idle air control in %.

(100% indicates the maximum idle air flow.)

SHORT FT B1 (SHORT TERM FUEL TRIM, %)

Short term fuel trim value represents short term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

LONG FT B1 (LONG TERM FUEL TRIM, %)

Long term fuel trim value represents long term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

TOTAL FUEL TRIM B1 (%)

The value of Total Fuel Trim is obtained by calculating based on values of Short Term Fuel Trim and Long Term Fuel Trim. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

MAF (MASS AIR FLOW RATE, g/s, lb/min.)

It represents total mass of air entering intake manifold which is measured by mass air flow sensor.

CALC LOAD (CALCULATED LOAD VALUE, %)

Engine load displayed as a percentage of maximum possible load. Value is calculated mathematically using the formula: actual (current) intake air volume ÷ maximum possible intake air volume × 100%

THROTTLE POS (ABSOLUTE THROTTLE POSITION, %) (A/T and M/T models)

When throttle position sensor is at fully closed position, throttle opening is indicated as 0 – 5% and 90 – 100% full open position.

O2S SENSOR B1 S1 (HEATED OXYGEN SENSOR-1, V)

It indicates output voltage of HO2S-1 installed on exhaust manifold (pre-catalyst).

O2S B1 S1 ACT (HEATED OXYGEN SENSOR-1, ACTIVE / INACTIVE)

This parameter indicates activation condition of HO2S-1

ACTIVE: Activating

INACTIVE: warming up or at stop

O2S SENSOR B1 S2 (HEATED OXYGEN SENSOR-2, V)

It indicates output voltage of HO2S-2 installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

O2S B1 S2 ACT (HEATED OXYGEN SENSOR-2, ACTIVE / INACTIVE)

This parameter indicates activation condition of HO2S-2

ACTIVE: Activating

INACTIVE: warming up or at stop

FUEL SYSTEM (FUEL SYSTEM STATUS)

Air/fuel ratio feedback loop status displayed as one of the followings.

OPEN: Open-loop has not yet satisfied conditions to go closed loop.

CLOSED: Closed-loop using oxygen sensor(s) as feedback for fuel control.

OPEN-DRIVE COND: Open-loop due to driving conditions (Power enrichment, etc.).

OPEN SYS FAULT: Open-loop due to detected system fault.

MAP (MANIFOLD ABSOLUTE PRESSURE, in.Hg, kPa)

This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

It is detected by manifold absolute pressure sensor.

BAROMETRIC PRESS (kPa, in.Hg)

This parameter represents a measurement of barometric air pressure and is used for altitude correction of the fuel injection quantity and IAC valve control.

STEP EGR FLOW DUTY (%)

This parameter indicates opening rate of EGR valve which controls the amount of EGR flow.

FUEL CUT (ON/OFF)

ON: Fuel being cut (output signal to injector is stopped)

OFF: Fuel not being cut

A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE, kPa)

This parameter indicates A/C refrigerant absolute pressure calculated by ECM.

CLOSED THROTTLE POS (CLOSED THROTTLE POSITION, ON/OFF)

This parameter reads ON when throttle valve is fully closed, or OFF when it is not fully closed.

CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY, %)

This parameter indicates valve ON (valve open) time rate within a certain set cycle of EVAP canister purge valve which controls the amount of EVAP purge.

IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER, °)

Ignition timing of No.1 cylinder is commanded by ECM. The actual ignition timing should be checked by using the timing light.

BATTERY VOLTAGE (V)

This parameter indicates battery positive voltage inputted from main relay to ECM.

FUEL PUMP (ON/OFF)

ON is displayed when ECM activates the fuel pump via the fuel pump relay switch.

ELECTRIC LOAD (ON/OFF)

ON: Headlight or small light ON signal inputted.

OFF: Above electric loads all turned OFF.

BRAKE SW (ON/OFF: Other than Automated Manual Transmission model, CANCEL / SET: Automated Manual Transmission model)

This parameter indicates the state of the brake switch.

RADIATOR COOLING FAN (RADIATOR COOLING FAN CONTROL RELAY, ON/OFF)

ON: Command for radiator cooling fan control relay operation being output.

OFF: Command for relay operation not being output.

BLOWER FAN (ON/OFF)

This parameter indicates the state of the blower fan motor switch.

A/C SWITCH (ON/OFF)

This parameter indicates the state of the A/C switch.

A/C COMP RELAY (A/C COMPRESSOR RELAY, ON/OFF)

ON: Command for A/C operation being output from ECM to HVAC.

OFF: Command for A/C operation not being output.

VEHICLE SPEED (km/h, mph)

It is computed based on pulse signals from vehicle speed sensor.

VVT GAP (TARGET-ACTUAL POSITION, °) (VVT model)

It is calculated using the formula: target valve timing advance – actual valve timing advance.

TP SENSOR 1 VOLT (THROTTLE POSITION SENSOR (MAIN) OUTPUT VOLTAGE, V) (Electric throttle body model)

The Throttle Position Sensor (Main) reading provides throttle valve opening information in the form of voltage.

TP SENSOR 2 VOLT (THROTTLE POSITION SENSOR (SUB) OUTPUT VOLTAGE, V) (Electric throttle body model)

The Throttle Position Sensor (Sub) reading provides throttle valve opening information in the form of voltage.

APP SENSOR 1 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (MAIN) OUTPUT VOLTAGE, V) (Electric throttle body model)

The Accelerator Pedal Position (APP) Sensor (Main) reading provides accelerator pedal opening information in the form of voltage.

APP SENSOR 2 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (SUB) OUTPUT VOLTAGE, V) (Electric throttle body model)

The Accelerator Pedal Position (APP) Sensor (Sub) reading provides accelerator pedal opening information in the form of voltage.

ACCEL POSITION (ABSOLUTE ACCELERATOR PEDAL POSITION, %) (Electric throttle body model)

When accelerator pedal is at fully released position, accelerator pedal is indicated as 0 – 5% and 90 – 100% fully depressed position.

THROTTLE TARGET POSI (TARGET THROTTLE VALVE POSITION, %) (Electric throttle body model)

Target Throttle Valve Position is ECM internal parameter which indicates the ECM requested throttle valve position.

Engine Symptom Diagnosis

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Perform troubleshooting referring to the followings when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: For M13, M15 and M16 Engines in related manual” and “Engine Basic Inspection: For M13, M15 and M16 Engines in related manual”.

Condition	Possible cause	Correction / Reference Item
Hard starting (Engine cranks OK)	Faulty spark plug	“Spark Plug Inspection: For M13, M15 and M16 Engines in Section 1H”
	Leaky high-tension cord	“High-Tension Cord Inspection: For M13, M15 and M16 Engines in Section 1H in related manual”
	Loose connection or disconnection of high-tension cord(s) or lead wire(s)	“High-Tension Cord Removal and Installation: For M13, M15 and M16 Engines in Section 1H in related manual”
	Faulty ignition coil	“Ignition Coil Assembly (Including ignitor) Inspection: For M13, M15 and M16 Engines in Section 1H in related manual”
	Dirty or clogged fuel hose or pipe	“Fuel Pressure Check: For M13, M15 and M16 Engines in related manual”
	Malfunctioning fuel pump	“Fuel Pressure Check: For M13, M15 and M16 Engines in related manual”
	Air drawn in through intake manifold gasket or throttle body gasket	
	Faulty idle air control system	“Idle Air Control System Check (Non-electric Throttle Body Model): For M13, M15 and M16 Engines in related manual”
	Faulty electric throttle body assembly (Electric throttle body model)	“Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C”
	Faulty accelerator pedal position (APP) sensor assembly (Electric throttle body model)	“Accelerator Pedal Position (APP) Sensor Assembly Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual”

Condition	Possible cause	Correction / Reference Item
	Faulty ECT sensor or MAF sensor	<i>“Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual” or “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual”</i>
	Faulty ECM	
	Low compression	<i>“Compression Check: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Poor spark plug tightening or faulty gasket	<i>“Spark Plug Removal and Installation: For M13, M15 and M16 Engines in Section 1H in related manual”</i>
	Compression leak from valve seat	<i>“Valves and Valve Guides Inspection: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Sticky valve stem	<i>“Valves and Valve Guides Inspection: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Weak or damaged valve springs	<i>“Valve Spring Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Compression leak at cylinder head gasket	<i>“Cylinder Head Inspection: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Sticking or damaged piston ring	<i>“Cylinders, Pistons and Piston Rings Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Worn piston, ring or cylinder	<i>“Cylinders, Pistons and Piston Rings Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Malfunctioning PCV valve	<i>“PCV Valve Inspection: For M13, M15 and M16 Engines in Section 1B in related manual”</i>
	Camshaft position control (VVT) system out of order (VVT model)	<i>“Oil Control Valve Inspection (For Engine with VVT): For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Faulty EGR system	<i>“EGR System Inspection: For M13, M15 and M16 Engines in Section 1B in related manual”</i>
Low oil pressure	Improper oil viscosity	<i>“Engine Oil and Filter Change (Petrol Engine) in Section 0B in related manual”</i>
	Malfunctioning oil pressure switch	<i>“Oil Pressure Switch Inspection in Section 9C in related manual”</i>
	Clogged oil strainer	<i>“Oil Pan and Oil Pump Strainer Cleaning: For M13, M15 and M16 Engines in Section 1E in related manual”</i>
	Functional deterioration of oil pump	<i>“Oil Pump Inspection: For M13, M15 and M16 Engines in Section 1E in related manual”</i>
	Worn oil pump relief valve	<i>“Oil Pump Inspection: For M13, M15 and M16 Engines in Section 1E in related manual”</i>
	Excessive clearance in various sliding parts	
Engine noise – Valve noise NOTE Before checking mechanical noise, make sure that: • Specified spark plug is used. • Specified fuel is used.	Improper valve lash	<i>“Camshaft, Tappet and Shim Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Worn valve stem and guide	<i>“Valves and Valve Guides Inspection: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Weak or broken valve spring	<i>“Valve Spring Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Warped or bent valve	<i>“Valves and Valve Guides Inspection: For M13, M15 and M16 Engines in Section 1D in related manual”</i>

Condition	Possible cause	Correction / Reference Item
Engine noise – Piston, ring and cylinder noise NOTE Before checking mechanical noise, make sure that: - Specified spark plug is used. - Specified fuel is used.	Worn piston, ring and cylinder bore	<i>"Cylinders, Pistons and Piston Rings Inspection: For M13, M15 and M16 Engines in Section 1D"</i>
Engine noise – Connecting rod noise NOTE Before checking mechanical noise, make sure that: - Specified spark plug is used. - Specified fuel is used.	Worn piston, ring and cylinder bore	<i>"Cylinders, Pistons and Piston Rings Inspection: For M13, M15 and M16 Engines in Section 1D"</i>
	Worn rod bearing	<i>"Crank Pin and Connecting Rod Bearings Inspection: For M13, M15 and M16 Engines in Section 1D"</i>
	Worn crank pin	<i>"Crank Pin and Connecting Rod Bearings Inspection: For M13, M15 and M16 Engines in Section 1D"</i>
	Loose connecting rod nuts	<i>"Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: For M13, M15 and M16 Engines in Section 1D"</i>
	Low oil pressure	<i>Condition "Low oil pressure"</i>
Engine noise – Crankshaft noise NOTE Before checking mechanical noise, make sure that: - Specified spark plug is used. - Specified fuel is used.	Low oil pressure	<i>Condition "Low oil pressure"</i>
	Worn bearing	<i>"Main Bearings Inspection: For M13, M15 and M16 Engines in Section 1D"</i>
	Worn crankshaft journal	<i>"Crankshaft Inspection: For M13, M15 and M16 Engines in Section 1D"</i>
	Loose bearing cap bolts	<i>"Main Bearings, Crankshaft and Cylinder Block Removal and Installation: For M13, M15 and M16 Engines in Section 1D"</i>
	Excessive crankshaft thrust play	<i>"Crankshaft Inspection: For M13, M15 and M16 Engines in Section 1D"</i>

Condition	Possible cause	Correction / Reference Item
Engine overheating	Inoperative thermostat	<i>“Thermostat Inspection: For M13, M15 and M16 Engines in Section 1F in related manual”</i>
	Poor water pump performance	<i>“Water Pump Inspection: For M13, M15 and M16 Engines in Section 1F in related manual”</i>
	Clogged or leaky radiator	<i>“Radiator On-Vehicle Inspection and Cleaning: For M13, M15 and M16 Engines in Section 1F in related manual”</i>
	Improper engine oil grade	<i>“Engine Oil and Filter Change (Petrol Engine) in Section 0B in related manual”</i>
	Clogged oil filter or oil strainer	<i>“Oil Pressure Check: For M13, M15 and M16 Engines in Section 1E in related manual”</i>
	Poor oil pump performance	<i>“Oil Pressure Check: For M13, M15 and M16 Engines in Section 1E in related manual”</i>
	Faulty radiator cooling fan control system	<i>“Radiator cooling fan Low Speed Control System Check: For M13, M15 and M16 Engines in related manual” or “Radiator cooling fan High Speed Control System Check: For M13, M15 and M16 Engines in related manual”</i>
	Dragging brakes	<i>Condition “Dragging brakes” in “Brakes Symptom Diagnosis in Section 4A”</i>
	Slipping clutch	<i>Condition “Slipping clutch” in “Clutch System Symptom Diagnosis in Section 5C in related manual” for M/T model or “Slipping clutch” in “Automated Manual Transaxle Symptom Diagnosis in Section 5D in related manual” for Automated Manual Transaxle model.</i>
	Blown cylinder head gasket	<i>“Cylinder Head Inspection: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Air mixed in cooling system	

1A-35 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

Condition	Possible cause	Correction / Reference Item
Poor gasoline mileage	Leaks or loose connection of high-tension cord	<i>"High-Tension Cord Removal and Installation: For M13, M15 and M16 Engines in Section 1H in related manual"</i>
	Faulty spark plug (improper gap, heavy deposits and burned electrodes, etc.)	<i>"Spark Plug Inspection: For M13, M15 and M16 Engines in Section 1H"</i>
	Malfunctioning EGR valve	<i>"EGR Valve Inspection: For M13, M15 and M16 Engines in Section 1B in related manual"</i>
	High idle speed	<i>Condition "Improper engine idling or engine fails to idle"</i>
	Poor performance of ECT sensor, TP sensor (Non-electric throttle body model) or MAF sensor	<i>"Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual", "Throttle Position (TP) Sensor On-Vehicle Inspection (Non-Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual"</i>
	Faulty electric throttle body assembly (Electric throttle body model)	<i>"Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C"</i>
	Faulty accelerator pedal position (APP) sensor assembly (Electric throttle body model)	<i>"Accelerator Pedal Position (APP) Sensor Assembly Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual"</i>
	Faulty fuel injector(s)	<i>"Fuel Injector Circuit Check: For M13, M15 and M16 Engines in related manual"</i>
	Faulty ECM	
	Low compression	<i>"Compression Check: For M13, M15 and M16 Engines in Section 1D in related manual"</i>
	Poor valve seating	<i>"Valves and Valve Guides Inspection: For M13, M15 and M16 Engines in Section 1D in related manual"</i>
	Dragging brakes	<i>Condition "Dragging brakes" in "Brakes Symptom Diagnosis in Section 4A"</i>
	Slipping clutch	<i>Condition "Slipping clutch" in "Clutch System Symptom Diagnosis in Section 5C in related manual" (M/T model) or "Slipping clutch" in "Automated Manual Transaxle Symptom Diagnosis in Section 5D in related manual" (Automated Manual Transaxle model)</i>
	Thermostat out of order	<i>"Thermostat Inspection: For M13, M15 and M16 Engines in Section 1F in related manual"</i>
	Improper tire pressure	<i>"Tires Description in Section 2D in related manual"</i>
	Camshaft position control (VVT) system out of order (VVT model)	<i>"Oil Control Valve Inspection (For Engine with VVT): For M13, M15 and M16 Engines in Section 1D in related manual"</i>
Excessive engine oil consumption – Oil leakage	Blown cylinder head gasket	<i>"Cylinder Head Inspection: For M13, M15 and M16 Engines in Section 1D in related manual"</i>
	Leaky camshaft oil seals	<i>"Camshaft, Tappet and Shim Inspection: For M13, M15 and M16 Engines in Section 1D"</i>

Condition	Possible cause	Correction / Reference Item
Excessive engine oil consumption – Oil entering combustion chamber	Sticky piston ring	<i>“Cylinders, Pistons and Piston Rings Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Worn piston and cylinder	<i>“Cylinders, Pistons and Piston Rings Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Worn piston ring groove and ring	<i>“Cylinders, Pistons and Piston Rings Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Improper location of piston ring gap	<i>“Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly: For M13, M15 and M16 Engines in Section 1D”</i>
	Worn or damaged valve stem seal	<i>“Valves and Valve Guides Inspection: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Worn valve stem	<i>“Valves and Valve Guides Inspection: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
Engine hesitates – Momentary lack of response as accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop sign.	Spark plug faulty or plug gap out of adjustment	<i>“Spark Plug Inspection: For M13, M15 and M16 Engines in Section 1H”</i>
	Leaky high-tension cord	<i>“High-Tension Cord Inspection: For M13, M15 and M16 Engines in Section 1H in related manual”</i>
	Fuel pressure out of specification	<i>“Fuel Pressure Check: For M13, M15 and M16 Engines in related manual”</i>
	Malfunctioning EGR valve	<i>“EGR Valve Inspection: For M13, M15 and M16 Engines in Section 1B in related manual”</i>
	Poor performance of TP sensor (Non-electric throttle body model), ECT sensor or MAF sensor	<i>“Throttle Position (TP) Sensor On-Vehicle Inspection (Non-Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual”, “Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual” or “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual”</i>
	Faulty electric throttle body assembly (Electric throttle body model)	<i>“Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C”</i>
	Faulty accelerator pedal position (APP) sensor assembly (Electric throttle body model)	<i>“Accelerator Pedal Position (APP) Sensor Assembly Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual”</i>
	Faulty fuel injector	<i>“Fuel Injector Circuit Check: For M13, M15 and M16 Engines in related manual”</i>
	Faulty ECM	
	Engine overheating	<i>Condition “Engine overheating”</i>
	Low compression	<i>“Compression Check: For M13, M15 and M16 Engines in Section 1D in related manual”</i>
	Camshaft position control (VVT) system out of order (VVT model)	<i>“Oil Control Valve Inspection (For Engine with VVT): For M13, M15 and M16 Engines in Section 1D in related manual”</i>

1A-37 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

Condition	Possible cause	Correction / Reference Item
Surge – Engine power variation under steady throttle or cruise. Feels like vehicle speeds up and down with no change in accelerator pedal.	Leaky or loosely connected high-tension cord	<i>“High-Tension Cord Removal and Installation: For M13, M15 and M16 Engines in Section 1H in related manual”</i>
	Faulty spark plug (excess carbon deposits, improper gap, burned electrodes, etc.)	<i>“Spark Plug Inspection: For M13, M15 and M16 Engines in Section 1H”</i>
	Variable fuel pressure	<i>“Fuel Pressure Check: For M13, M15 and M16 Engines in related manual”</i>
	Kinky or damaged fuel hose and lines	
	Faulty fuel pump (clogged fuel filter)	
	Malfunctioning EGR valve	<i>“EGR Valve Inspection: For M13, M15 and M16 Engines in Section 1B in related manual”</i>
	Poor performance of MAF sensor	<i>“Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual”</i>
	Faulty fuel injector	<i>“Fuel Injector Circuit Check: For M13, M15 and M16 Engines in related manual”</i>
	Faulty ECM	
	Faulty electric throttle body assembly (Electric throttle body model)	<i>“Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C”</i>
	Faulty accelerator pedal position (APP) sensor assembly (Electric throttle body model)	<i>“Accelerator Pedal Position (APP) Sensor Assembly Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual”</i>

Condition	Possible cause	Correction / Reference Item
Excessive detonation – Engine makes continuously sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.	Faulty spark plug	<i>“Spark Plug Inspection: For M13, M15 and M16 Engines in Section 1H”</i>
	Loose connection of high-tension cord	<i>“High-Tension Cord Removal and Installation: For M13, M15 and M16 Engines in Section 1H in related manual”</i>
	Engine overheating	<i>Condition “Engine overheating”</i>
	Clogged fuel filter (faulty fuel pump) or fuel lines	<i>“Fuel Pressure Check: For M13, M15 and M16 Engines in related manual” or “Fuel Pump and Its Circuit Check: For M13, M15 and M16 Engines in related manual”</i>
	Air drawn in through intake manifold or throttle body gasket	
	Malfunctioning EGR valve	<i>“EGR Valve Inspection: For M13, M15 and M16 Engines in Section 1B in related manual”</i>
	Poor performance of knock sensor, ECT sensor or MAF sensor	<i>“DTC P0327 / P0328: Knock Sensor Circuit Low / High: For M13, M15 and M16 Engines in related manual”, “Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual” or “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual”</i>
	Faulty fuel injector(s)	<i>“Fuel Injector Circuit Check: For M13, M15 and M16 Engines in related manual”</i>
	Faulty ECM	
	Excessive combustion chamber deposits	<i>“Cylinders, Pistons and Piston Rings Inspection: For M13, M15 and M16 Engines in Section 1D” and/or “Piston Pins and Connecting Rods Inspection: For M13, M15 and M16 Engines in Section 1D”</i>
	Camshaft position control (VVT) system out of order (VVT model)	<i>“Oil Control Valve Inspection (For Engine with VVT): For M13, M15 and M16 Engines in Section 1D in related manual”</i>

Condition	Possible cause	Correction / Reference Item
Engine has no power	Faulty spark plug	"Spark Plug Inspection: For M13, M15 and M16 Engines in Section 1H"
	Faulty ignition coil with ignitor	"Ignition Coil Assembly (Including ignitor) Inspection: For M13, M15 and M16 Engines in Section 1H in related manual"
	Leaks, loose connection or disconnection of high-tension cord	"High-Tension Cord Removal and Installation: For M13, M15 and M16 Engines in Section 1H in related manual"
	Faulty knock sensor	"DTC P0327 / P0328: Knock Sensor Circuit Low / High: For M13, M15 and M16 Engines in related manual"
	Clogged fuel hose or pipe	"Fuel Pressure Check: For M13, M15 and M16 Engines in related manual"
	Malfunctioning fuel pump	"Fuel Pump and Its Circuit Check: For M13, M15 and M16 Engines in related manual"
	Air drawn in through intake manifold gasket or throttle body gasket	
	Engine overheating	Condition "Engine overheating"
	Malfunctioning EGR valve	"EGR Valve Inspection: For M13, M15 and M16 Engines in Section 1B in related manual"
	Maladjusted accelerator cable play (Non-electric throttle body model)	"Accelerator Cable Adjustment (For Other Than Electric Throttle Body): For M13, M15 and M16 Engines in Section 1D in related manual"
	Poor performance of TP sensor (Non-electric throttle body model), ECT sensor or MAF sensor	"Throttle Position (TP) Sensor On-Vehicle Inspection (Non-Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual", "Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual"
	Faulty electric throttle body assembly (Electric throttle body model)	"Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C"
	Faulty accelerator pedal position (APP) sensor assembly (Electric throttle body model)	"Accelerator Pedal Position (APP) Sensor Assembly Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual"
	Faulty fuel injector(s)	"Fuel Injector Circuit Check: For M13, M15 and M16 Engines in related manual"
	Faulty ECM	
	Dragging brakes	Condition "Dragging brakes" in "Brakes Symptom Diagnosis in Section 4A"
	Slipping clutch	Condition "Slipping clutch" in "Clutch System Symptom Diagnosis in Section 5C in related manual" for M/T model or "Slipping clutch" in "Automated Manual Transaxle Symptom Diagnosis in Section 5D in related manual" for Automated Manual Transaxle model
	Low compression	"Compression Check: For M13, M15 and M16 Engines in Section 1D in related manual"
	Camshaft position control (VVT) system out of order (VVT model)	"Oil Control Valve Inspection (For Engine with VVT): For M13, M15 and M16 Engines in Section 1D in related manual"

Condition	Possible cause	Correction / Reference Item
Improper engine idling or engine fails to idle	Faulty spark plug	"Spark Plug Inspection: For M13, M15 and M16 Engines in Section 1H"
	Leaky or disconnected high-tension cord	"High-Tension Cord Removal and Installation: For M13, M15 and M16 Engines in Section 1H in related manual"
	Faulty ignition coil with ignitor	"Ignition Coil Assembly (Including ignitor) Inspection: For M13, M15 and M16 Engines in Section 1H in related manual"
	Fuel pressure out of specification	"Fuel Pressure Check: For M13, M15 and M16 Engines in related manual"
	Leaky manifold, throttle body, or cylinder head gasket	
	Malfunctioning EGR valve	"EGR Valve Inspection: For M13, M15 and M16 Engines in Section 1B in related manual"
	Faulty idle air control system	"Idle Air Control System Check (Non-electric Throttle Body Model): For M13, M15 and M16 Engines in related manual"
	Faulty evaporative emission control system	"EVAP Canister Purge Inspection: For M13, M15 and M16 Engines in Section 1B in related manual"
	Faulty EGR system	"EGR System Inspection: For M13, M15 and M16 Engines in Section 1B in related manual"
	Faulty fuel injector(s)	"Fuel Injector Circuit Check: For M13, M15 and M16 Engines in related manual"
	Poor performance of ECT sensor, TP sensor (Non-electric throttle body model) or MAF sensor	"Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual", "Throttle Position (TP) Sensor On-Vehicle Inspection (Non-Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual"
	Faulty electric throttle body assembly (Electric throttle body model)	"Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C"
	Faulty accelerator pedal position (APP) sensor assembly (Electric throttle body model)	"Accelerator Pedal Position (APP) Sensor Assembly Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual"
	Faulty ECM	
	Loose connection or disconnection of vacuum hoses	
	Malfunctioning PCV valve	"PCV Valve Inspection: For M13, M15 and M16 Engines in Section 1B in related manual"
	Engine overheating	Condition "Engine overheating"
	Low compression	"Compression Check: For M13, M15 and M16 Engines in Section 1D in related manual"
	Camshaft position control (VVT) system out of order (VVT model)	"Oil Control Valve Inspection (For Engine with VVT): For M13, M15 and M16 Engines in Section 1D in related manual"

1A-41 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

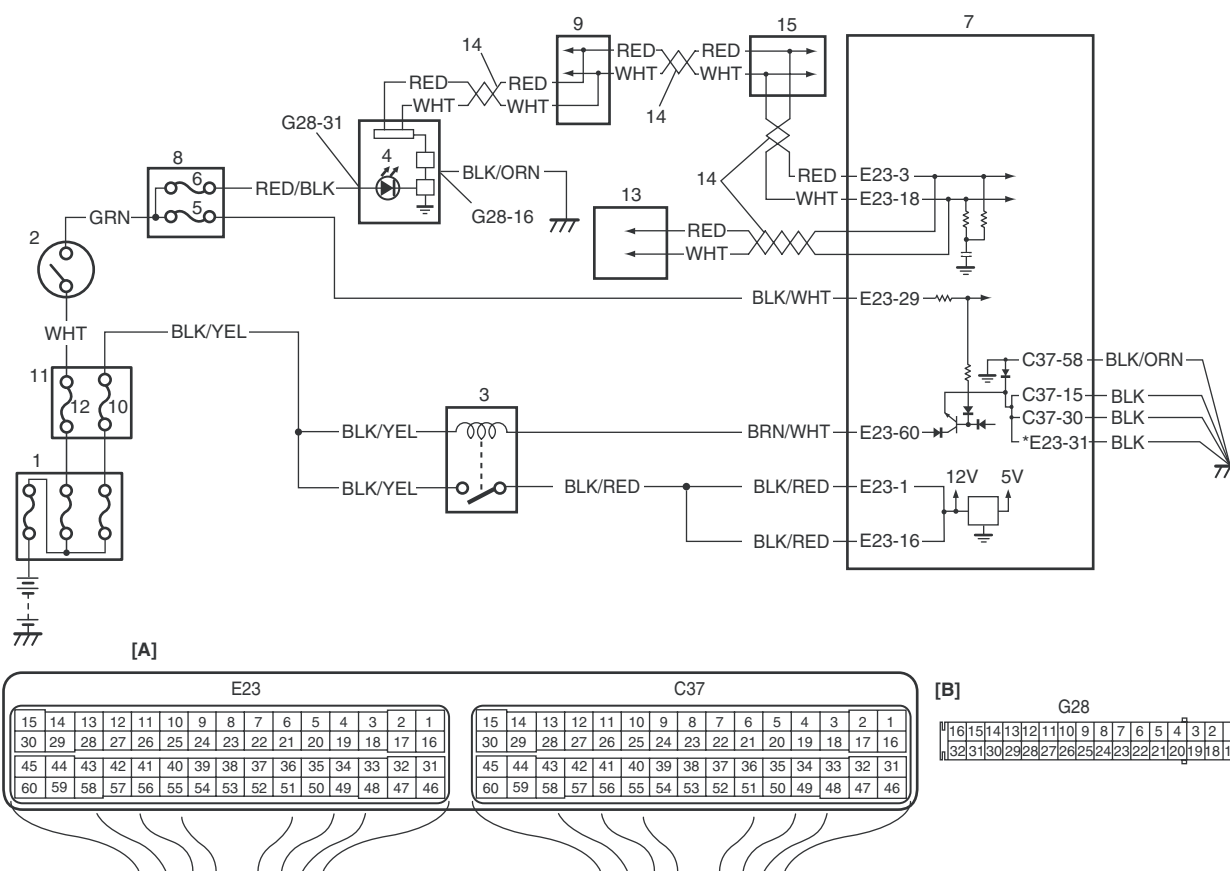
Condition	Possible cause	Correction / Reference Item
Excessive hydrocarbon (HC) emission or carbon monoxide (CO)	Faulty spark plug	"Spark Plug Inspection: For M13, M15 and M16 Engines in Section 1H"
	Leaky or disconnected high-tension cord	"High-Tension Cord Removal and Installation: For M13, M15 and M16 Engines in Section 1H in related manual"
	Faulty ignition coil with ignitor	"Ignition Coil Assembly (Including ignitor) Inspection: For M13, M15 and M16 Engines in Section 1H in related manual"
	Low compression	"Compression Check: For M13, M15 and M16 Engines in Section 1D in related manual"
	Lead contamination of three way catalytic converter	Check for absence of filler neck restrictor.
	Faulty evaporative emission control system	"EVAP Canister Purge Inspection: For M13, M15 and M16 Engines in Section 1B in related manual"
	Fuel pressure out of specification	"Fuel Pressure Check: For M13, M15 and M16 Engines in related manual"
	Closed loop system (A/F feedback compensation) fails (Faulty TP sensor, Poor performance of ECT sensor or MAF sensor)	"Throttle Position (TP) Sensor On-Vehicle Inspection (Non-Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual", "Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual"
	Faulty electric throttle body assembly (Electric throttle body model)	"Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C"
	Faulty accelerator pedal position (APP) sensor assembly (Electric throttle body model)	"Accelerator Pedal Position (APP) Sensor Assembly Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual"
	Faulty injector(s)	"Fuel Injector Circuit Check: For M13, M15 and M16 Engines in related manual"
	Faulty ECM	
	Engine not at normal operating temperature	
	Clogged air cleaner	"Air Cleaner Element Inspection and Cleaning: For M13, M15 and M16 Engines in Section 1D in related manual"
	Vacuum leaks	"Engine Vacuum Check: For M13, M15 and M16 Engines in Section 1D in related manual"
	Camshaft position control (VVT) system out of order (VVT model)	"Oil Control Valve Inspection (For Engine with VVT): For M13, M15 and M16 Engines in Section 1D in related manual"

Condition	Possible cause	Correction / Reference Item
Excessive nitrogen oxides (NOx) emission	Improper ignition timing	<i>"Ignition Timing Inspection: For M13, M15 and M16 Engines in Section 1H"</i>
	Lead contamination of catalytic converter	<i>Check for absence of filler neck restrictor.</i>
	Faulty EGR system	<i>"EGR System Inspection: For M13, M15 and M16 Engines in Section 1B in related manual"</i>
	Fuel pressure out of specification	<i>"Fuel Pressure Check: For M13, M15 and M16 Engines in related manual"</i>
	Closed loop system (A/F feedback compensation) fails (Faulty TP sensor, Poor performance of ECT sensor or MAF sensor)	<i>"Throttle Position (TP) Sensor On-Vehicle Inspection (Non-Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual", "Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual"</i>
	Faulty electric throttle body assembly (Electric throttle body model)	<i>"Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C"</i>
	Faulty accelerator pedal position (APP) sensor assembly (Electric throttle body model)	<i>"Accelerator Pedal Position (APP) Sensor Assembly Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual"</i>
	Faulty injector(s)	<i>"Fuel Injector Circuit Check: For M13, M15 and M16 Engines in related manual"</i>
	Faulty ECM	
	Camshaft position control (VVT) system out of order (VVT model)	<i>"Oil Control Valve Inspection (For Engine with VVT): For M13, M15 and M16 Engines in Section 1D in related manual"</i>

Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started)

S6RS0B1114011

Wiring Diagram



I6RS0B111010-01

[A]: ECM connector (viewed from harness side)	5. "IG COIL" fuse	11. Individual circuit fuse box No.1
[B]: Combination meter connector (viewed from harness side)	6. "METER" fuse	12. "IG ACC" fuse
1. Main fuse box	7. ECM	13. TCM (A/T or Automated Manual Transaxle model)
2. Ignition switch	8. Junction block assembly	14. CAN communication line
3. Main relay	9. BCM	15. ESP® control module (ESP® model)
4. Malfunction indicator lamp in combination meter	10. "FI" fuse	*: Automated Manual Transaxle model

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of malfunction indicator lamp (MIL) to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE

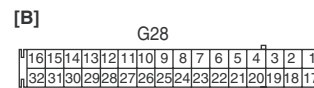
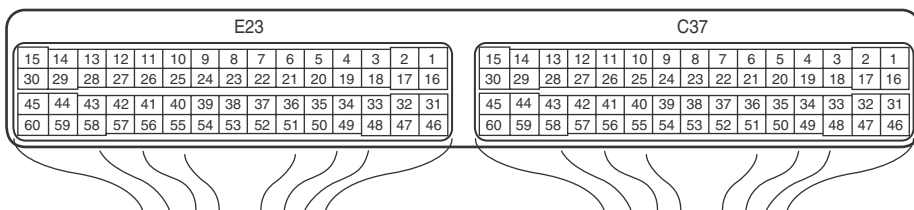
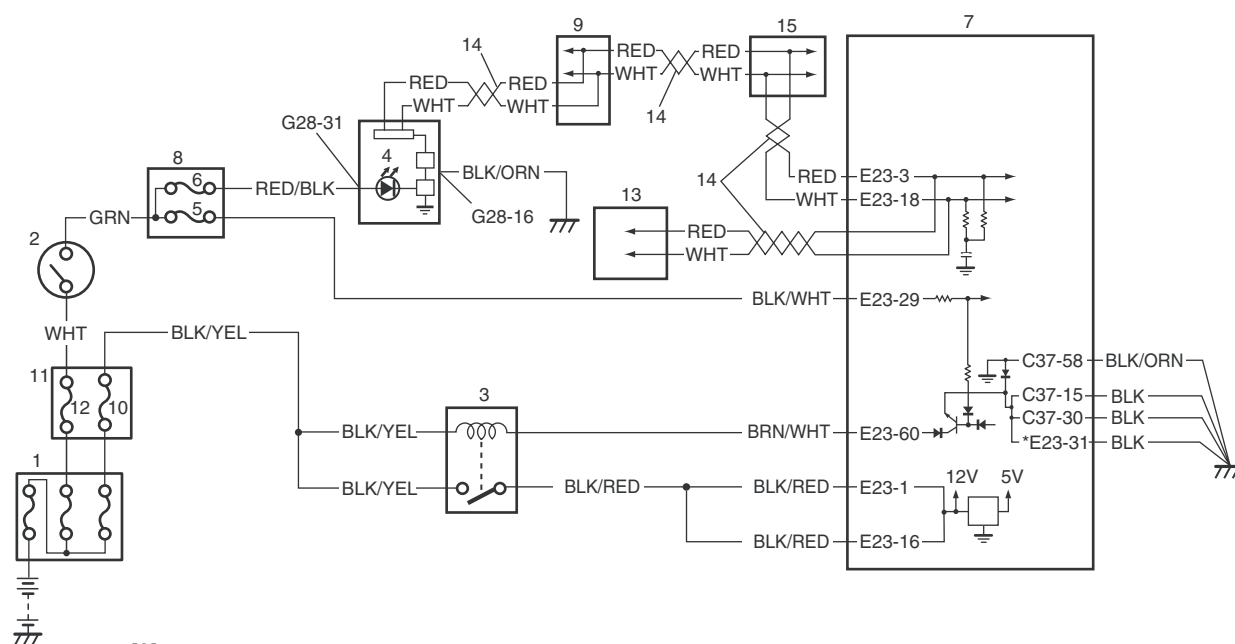
- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.

Step	Action	Yes	No
1	MIL power supply check 1) Turn ignition switch to ON position. <i>Do other warning lights come ON?</i>	Go to Step 2.	Go to Step 3.
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. <i>Is there DTC(s) P1674, P1675 and/or P1678?</i>	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.
3	CAN communication line circuit check 1) Check CAN communication circuit between combination meter and ECM, TCM (A/T or Automated Manual Transaxle model) referring to Step 10 to 15 under M13A and M15A engines of “DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines” (M13A and M15A engines) or Step 13 to 17 under M16A engine of “DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines” (M16A engine). <i>Is circuit in good condition?</i>	Go to Step 4.	Repair or replace.
4	“METER” fuse check 1) Turn ignition switch to OFF position. 2) Check for fuse blown at “METER” fuse in junction block assembly. <i>Is “METER” fuse in good condition?</i>	Go to Step 5.	Replace “METER” fuse and check for short.
5	Combination meter power supply check 1) Remove combination meter referring to “Combination Meter Removal and Installation in Section 9C in related manual”. 2) Check for proper connection to combination meter connector at “G28-31” and “G28-16” terminals. 3) If OK, then turn ignition switch to ON position and measure voltage between combination meter connector at “G28-31” terminal and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 6.	“RED/BLK” wire is open circuit.
6	Combination meter circuit check 1) Turn ignition switch to OFF position. 2) Measure resistance between “G28-16” terminal of combination meter connector and vehicle body ground. <i>Is resistance 1 Ω or less?</i>	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	“BLK/ORN” wire is open or high resistance circuit.

Malfunction Indicator Lamp Remains ON after Engine Starts

S6RS0B1114012

Wiring Diagram



I6RS0B111010-01

[A]: ECM connector (viewed from harness side)	5. "IG COIL" fuse	11. Individual circuit fuse box No.1
[B]: Combination meter connector (viewed from harness side)	6. "METER" fuse	12. "IG ACC" fuse
1. Main fuse box	7. ECM	13. TCM (A/T or Automated Manual Transaxle model)
2. Ignition switch	8. Junction block assembly	14. CAN communication line
3. Main relay	9. BCM	15. ESP® control module (ESP® model)
4. Malfunction indicator lamp in combination meter	10. "FI" fuse	*: Electric throttle body model

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of malfunction indicator lamp (MIL) to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting**NOTE**

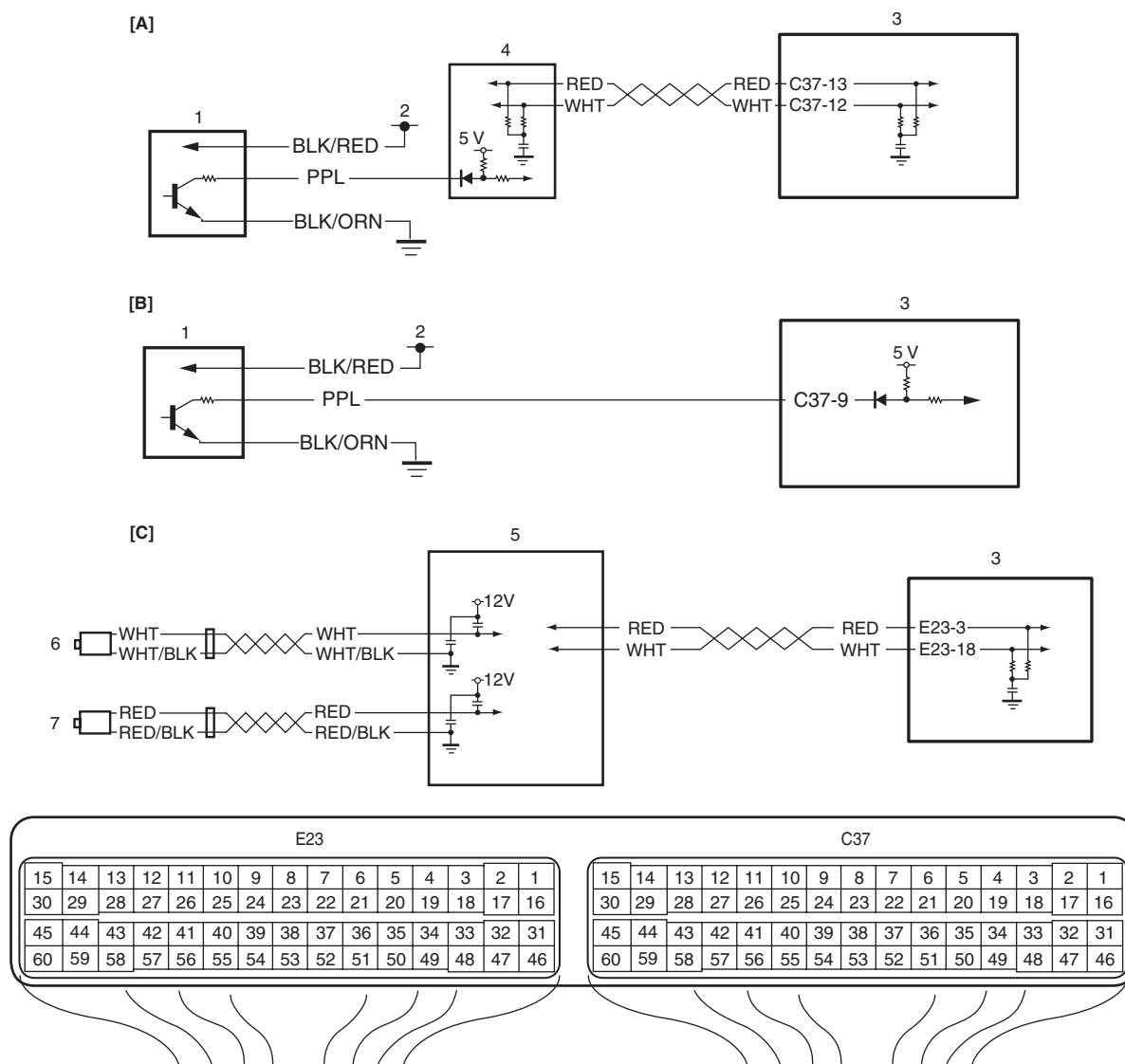
- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.

Step	Action	Yes	No
1	DTC check 1) Start engine and recheck DTC of ECM and TCM (A/T or Automated Manual Transaxle model) while engine running. <i>Is there any DTC(s)?</i>	Go to Step 2 of “Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual”, Step 2 of “A/T System Check in Section 5A in related manual” or “Automated Manual Transaxle System Check in Section 5D in related manual”.	Go to Step 2.
2	CAN communication line circuit check 1) Check CAN communication line circuit between combination meter and ECM, TCM (A/T or Automated Manual Transaxle model) referring to Step 9 to 15 “DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines”. <i>Is circuit in good condition?</i>	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	Repair or replace CAN communication circuit.

DTC P0500: Vehicle Speed Sensor (VSS) Malfunction

S6RS0B1114052

Wiring Diagram



I6RS0B111013-01

[A]: For A/T with M13A / M15A engines	2. To main relay	6. Front left side wheel speed sensor
[B]: For M/T or Automated Manual Transaxle with M13A / M15A engines	3. ECM	7. Front right side wheel speed sensor
[C]: For M16A engine	4. TCM	
1. VSS	5. ESP® control module	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
- Vehicle speed signal is not input while fuel is cut at deceleration for 4 seconds continuously at 3600 rpm or less. - Vehicle speed signal is not input even if engine is running with more than 3000 rpm at D-Range for 4 sec. (A/T model). (2 driving cycle detection logic)	- VSS circuit - Wheel speed sensor circuit (ESP® model) - VSS malfunction - ESP® control module (ESP® model) - TCM malfunction - ECM malfunction

DTC Confirmation Procedure**⚠ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out by 2 persons, a driver and a tester.

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Warm up engine to normal operating temperature.
- 4) Drive vehicle at 4000 rpm (engine speed) with 3rd gear (M/T and Automated Manual Transaxle model) or "3" range (A/T model).
- 5) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 6 sec. or more (fuel cut condition for 5 sec. or more) and stop vehicle.
- 6) For A/T model, drive vehicle at more than 3000 rpm for 10 sec.
- 7) Check pending DTC and DTC.

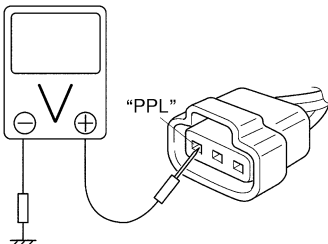
DTC Troubleshooting**NOTE**

- Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual".
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines".
- Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.

M13A and M15A engines

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual".
2	Vehicle speed signal check <i>Is vehicle speed displayed on scan tool in Step 4) and 5) of "DTC Confirmation Procedure"?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	Vehicle spec check <i>Is vehicle equipped with A/T?</i>	Go to Step 4.	Go to Step 5.
4	DTC check in TCM 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check TCM for DTC. <i>Is there DTC P0722 in TCM?</i>	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.

1A-49 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

Step	Action	Yes	No
5	Power supply circuit check 1) With ignition switch turned OFF, disconnect connector from VSS. 2) Check for proper connection to "BLK/RED", "PPL" and "BLK/ORN" wire terminals of VSS connector. 3) If wires are OK, turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of VSS connector. <i>Is voltage 10 – 14 V?</i>	Go to Step 6.	"BLK/RED" wire is open circuit.
6	Ground circuit check 1) Measure resistance between engine ground and "BLK/ORN" wire terminal of VSS connector with ignition switch turned OFF. <i>Is resistance below 5 Ω?</i>	Go to Step 7.	"BLK/ORN" wire is open or high resistance circuit.
7	Wire circuit check 1) Turn ON ignition switch, measure voltage between engine ground and "PPL" wire terminal of VSS connector.  I4RS0B110040-01 <i>Is measured voltage 4 – 5 V?</i>	Go to Step 11.	Go to Step 8.
8	ECM voltage check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Turn ON ignition switch, measure voltage between vehicle body ground and "C37-9" terminal of ECM connector. <i>Is measured voltage 4 – 5 V?</i>	"PPL" wire is open circuit.	Go to Step 9.
9	Short circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "C37-9" terminal of ECM connector. <i>Is measured voltage 0 V?</i>	Go to Step 10.	"PPL" wire is shorted to power supply circuit.
10	Short circuit check 1) Measure resistance between engine ground and "C37-9" terminal of ECM connector with ignition switch turned OFF. <i>Is resistance infinity?</i>	Go to Step 11.	"PPL" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.

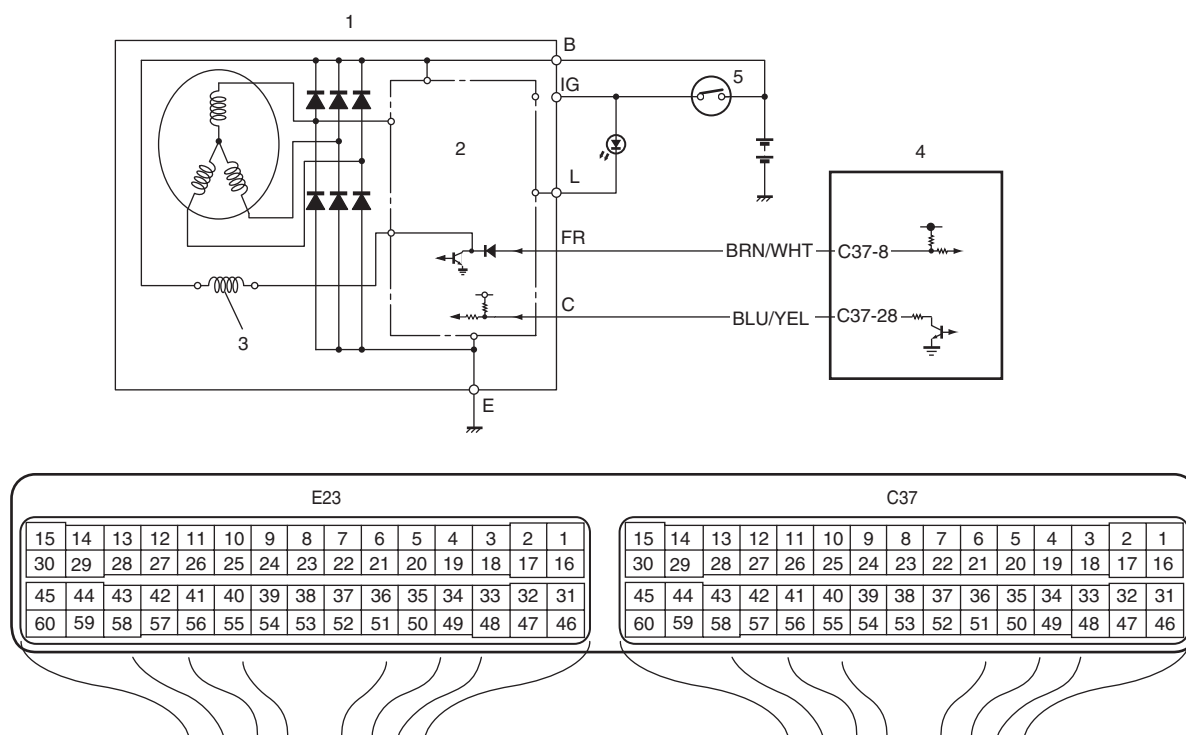
Step	Action	Yes	No
11	VSS check 1) Check VSS and signal rotor tooth referring to "Vehicle Speed Sensor (VSS) Inspection (If Equipped): For M13, M15 and M16 Engines in Section 1C". <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Replace VSS or signal rotor.

M16A engine

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual".
2	Vehicle speed signal check <i>Is vehicle speed displayed on scan tool in Step 4) and 5) of "DTC Confirmation Procedure"?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	DTC check in ESP® control module 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ESP® control module for DTC. <i>Is there any DTC(s) in ESP® control module?</i>	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.

DTC P0620: Generator Control Circuit

S6RS0B1114088

System and Wiring Diagram

I6RS0B111015-01

1. Generator	3. Field coil	5. Ignition switch
2. IC regulator	4. ECM	6. Charge lamp

Generator Control System Description

Refer to "Generator Control System Description (M16A Engine): For M13, M15 and M16 Engines".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
- Battery voltage is higher than specification even through generator control is maximum regulation (duty 100%). - Battery voltage is lower than specification even through generator control is minimum regulation (duty 0%) and electric load is less than 15 A.	- Generator and/or its circuit - Electric load current sensor - ECM - Generator drive belt

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool to DLC
- 2) Turn ON ignition switch and clear DTC.
- 3) Make sure that all accessory switches are tuned OFF.
- 4) Start engine and warm it up to normal operating temperature (ECT approx. 90 – 95 °C, 193 – 203 °F).
- 5) Turn ON the following accessory switches.
 - Head light switch.
 - Blower motor switch (max position).
 - Rear defogger switch.
- 6) Increase engine speed to 4000 rpm and keep it for 10 sec or more.
- 7) Decrease engine speed to idle.
- 8) Check DTC and pending DTC.

DTC Troubleshooting

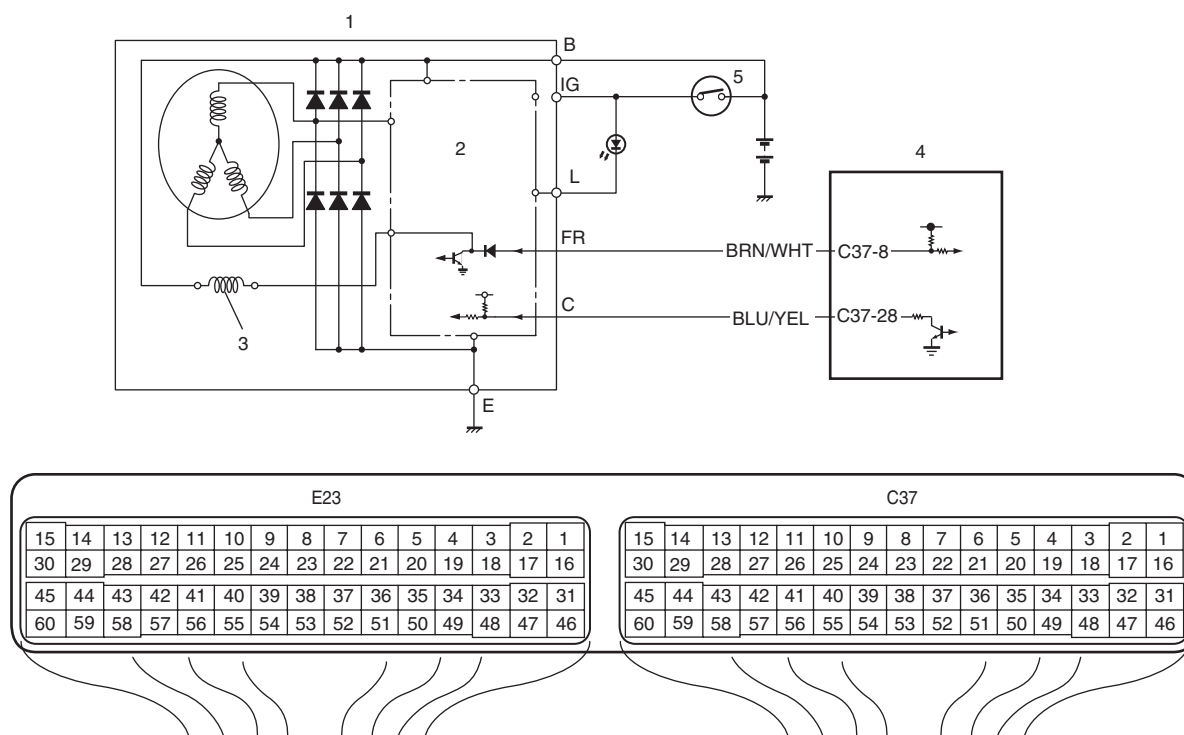
NOTE

- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.
- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual”.
2	Generator drive belt check 1) Check generator drive belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: For M13, M15 and M16 Engines in Section 1F”. <i>Is check result satisfactory?</i>	Go to Step 3.	Adjust or replace generator drive belt.
3	Generator control circuit check 1) Disconnect connector from generator and ECM with ignition switch turned OFF. 2) Check for proper connection of wire terminal to generator connector and to ECM connector. 3) If connections are OK, check generator control circuit for the following. • Resistance of generator control circuit wire between generator connector and ECM connector is less than 1 Ω (continuity check) • Resistance between generator control circuit wire of generator connector and vehicle body ground is infinity (ground circuit short check) • Voltage between generator control circuit wire of generator connector and vehicle body ground is 0 V with ignition switch turned ON (power circuit short check) <i>Are they in good condition?</i>	Go to Step 3.	Repair or replace defective wire.
4	Generator check 1) Check for generator output referring to “Generator Test (Undercharged Battery Check) (For 75A Type): For M13, M15 and M16 Engines in Section 1J in related manual”. <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Repair or replace generator.

DTC P0625 / P0626: Generator Field Terminal Circuit Low / High

S6RS0B1114089

System and Wiring Diagram

I6RS0B111015-01

1. Generator	3. Field coil	5. Ignition switch
2. IC regulator	4. ECM	6. Charge lamp

Generator Control System Description

Refer to "Generator Control System Description (M16A Engine): For M13, M15 and M16 Engines".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0625: Generator field coil duty is 0% (high voltage) for more than specified time even through generator control is minimum regulation (control duty 0%). P0626: Generator field coil duty is 100% (low voltage) for more than specified time even through generator control is maximum regulation (control duty 100%) or Generator field coil duty is 100% (low voltage) when engine is starting.	- Generator and/or its circuit - ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Make sure that all accessory switch is tuned OFF.
- 4) Start engine and warm it up to normal operating temperature (ECT approx. 90 – 95 °C, 193 – 203 °F).
- 5) Turn ON following accessory switch.
 - Head lights switch.
 - Blower motor switch (max position).
 - Rear defogger switch.
- 6) Increase engine speed to 4000 rpm and keep it for 10 sec. or more.
- 7) Decrease engine speed to idle.
- 8) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.
- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.

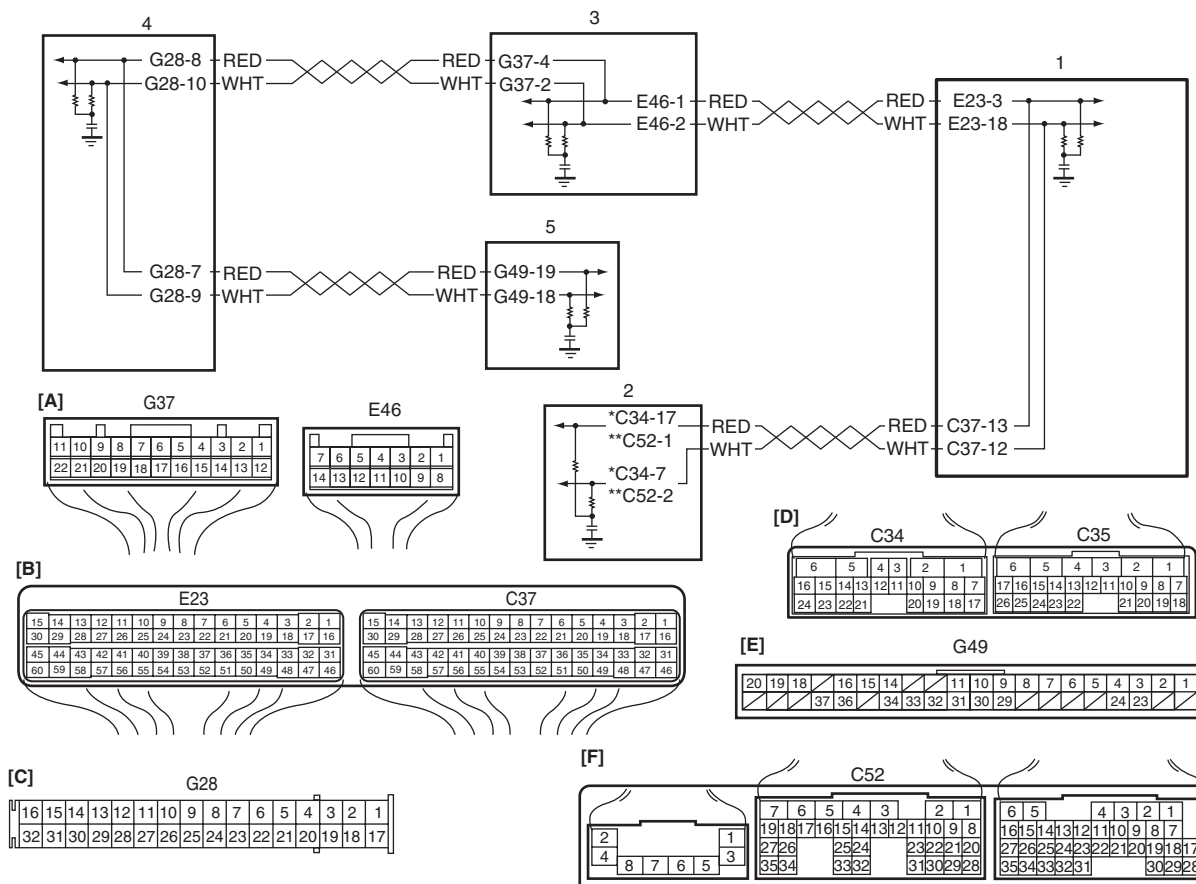
Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual”.
2	Generator control circuit check 1) Disconnect connector from generator and ECM with ignition switch turned OFF. 2) Check for proper connection of wire terminal to generator connector and to ECM connector. 3) If connections are OK, check generator control (generator “C” terminal) circuit and field coil monitor (generator “FR” terminal) circuit for the following. • Resistance of each generator control wire and field coil monitor wire between generator connector and ECM connector is less than 1 Ω (continuity check) • Resistance between generator control wire and field coil monitor wire of generator connector is infinity (insulation check) • Resistance between each generator control wire and field coil monitor wire of generator connector and vehicle body ground is infinity (ground circuit short check) • Voltage between each generator control wire and field coil monitor wire of generator connector and vehicle body ground is 0 V with ignition switch turned ON (power circuit short check) Are they in good condition?	Go to Step 3.	Repair or replace defective wire.
3	Generator check 1) Check for generator output referring to “Generator Test (Undercharged Battery Check) (For 75A Type): For M13, M15 and M16 Engines in Section 1J in related manual” and “Generator Inspection: For M13, M15 and M16 Engines in Section 1J”. Is check result satisfactory?	Substitute a known good ECM and recheck.	Repair or replace generator.

DTC P1674: CAN Communication (Bus Off Error)

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Wiring Diagram

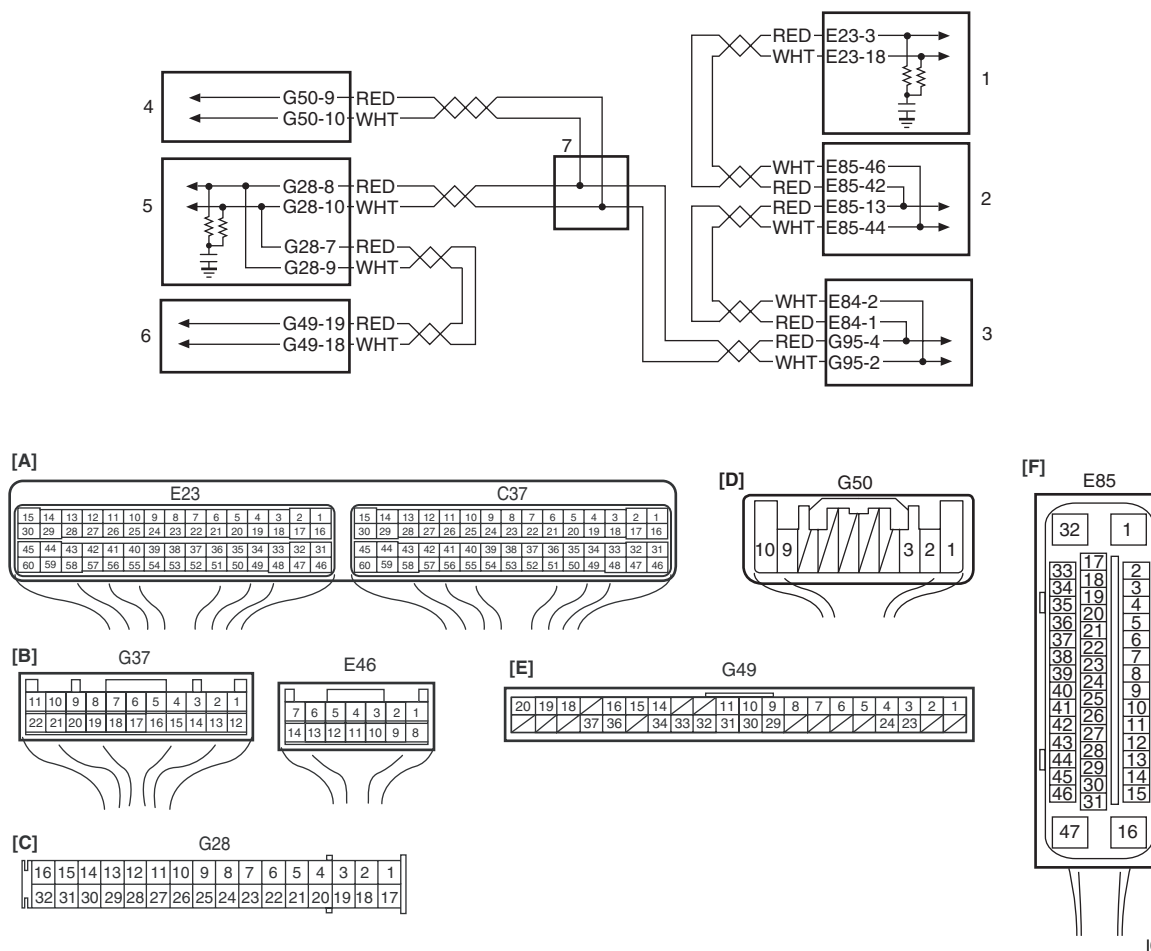
For M13A and M15A engines



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[A]: BCM connector (viewed from harness side)	[F]: TCM connector (Automated Manual Transaxle model) (viewed from harness side)	5. Keyless start control module (keyless start model)
[B]: ECM connector (viewed from harness side)	1. ECM	*: A/T vehicle
[C]: Combination meter connector (viewed from harness side)	2. TCM (A/T or Automated Manual Transaxle model)	** : Automated Manual Transaxle vehicle
[D]: TCM connector (A/T model) (viewed from harness side)	3. BCM	
[E]: Keyless start control module connector (keyless start model) (viewed from harness side)	4. Combination meter	

For M16A engine



I6RS0B111016-01

[A]: ECM connector (viewed from harness side)	[F]: ESP® control module connector (ESP® model) (viewed from harness side)	5. Combination meter
[B]: BCM connector (viewed from harness side)	1. ECM	6. Keyless start control module (keyless start model)
[C]: Combination meter connector (viewed from harness side)	2. ESP® control module (ESP® model)	7. CAN junction connector
[D]: Steering angle sensor connector (ESP® model) (viewed from harness side)	3. BCM	
[E]: Keyless start control module connector (keyless start model) (viewed from harness side)	4. Steering angle sensor (ESP® model)	

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)	- ECM - BCM - TCM (A/T or Automated Manual Transaxle model) - ESP® control module (ESP® model) - Steering angle sensor (ESP® model) - Keyless start control module (keyless start model) - Combination meter - CAN communication line circuit

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

NOTE

- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.
- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.

For M13A and M15A engine

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual”.
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (A/T or Automated Manual Transaxle model) and BCM for DTC. <i>Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (A/T or Automated Manual Transaxle model), DTC U1073, U1001, U1100, U1101 in BCM and DTC No.31 / 33 in keyless start control module (keyless start model))?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	ECM, TCM (A/T or Automated Manual Transaxle model), BCM, combination meter and keyless start control module (keyless start model) connectors check 1) Check for proper connection at each ECM, TCM (A/T or Automated Manual Transaxle model), BCM, combination meter and keyless start control module (keyless start model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. <i>Is there DTC P1674?</i>	Go to Step 4.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual”.
4	ECM power and ground circuit check 1) Check ECM power and ground circuit referring to “ECM Power and Ground Circuit Check: For M13, M15 and M16 Engines in related manual”. <i>Are they in good condition?</i>	Go to Step 5.	Repair ECM power and/or ground circuits.
5	DTC check in BCM, TCM (A/T or Automated Manual Transaxle model) and keyless start control module (keyless start model) (bus off) 1) Check DTC(s) in TCM (A/T or Automated Manual Transaxle model) and BCM. <i>Is there DTC(s) P1774 in TCM (A/T or Automated Manual Transaxle model), U1073 in BCM and/or DTC No.33 in keyless start control module (keyless start model)?</i>	Go to Step 6.	Go to Step 7.

Step	Action	Yes	No
6	DTC check in ECM (bus off) 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check TCM (A/T or Automated Manual Transaxle model) and BCM for DTC(s). <i>Is there DTC(s) P1774 in TCM (A/T or Automated Manual Transaxle model), U1073 in BCM and/or DTC No.33 in keyless start control module (keyless start model)?</i>	Go to Step 7.	"E23-3", "E23-18", "C37-13" or "C37-12" circuit wire between ECM and BCM or TCM is open or high resistance. If wires are OK, substitute a known- good ECM and recheck.
7	DTC check in ECM 1) Connect connectors to ECM and disconnect connectors from TCM (A/T or Automated Manual Transaxle model) with ignition switch turned OFF. 2) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to Step 8.	"C37-13" or "C37-12" circuit wire between ECM and TCM is open or high resistance. If wires are OK, substitute a known-good TCM (A/ T or Automated Manual Transaxle model) and recheck.
8	DTC check in ECM 1) Disconnect connector from keyless start control module (keyless start model) with ignition switch turned OFF. 2) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to Step 9.	"G49-18" or "G49-19" circuit wire between combination meter and keyless start control module (keyless start model) is open or high resistance. If wires are OK, substitute a known- good keyless start control module and recheck.
9	DTC check in ECM 1) Disconnect connector from combination meter with ignition switch turned OFF. 2) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to Step 10.	"G28-8" or "G28-10" circuit wire between BCM and combination meter is open or high resistance. If wires are OK, substitute a known- good combination meter or keyless start control module (keyless start model) and recheck.
10	CAN communication line circuit insulation check 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance between "G37-2" and "G37-4" terminals of BCM connector. <i>Is resistance infinity?</i>	Go to Step 11.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
11	CAN communication line circuit insulation check (keyless start model) 1) Disconnect connector from keyless start control module with ignition switch turned OFF. 2) Measure resistance between "G49-18" and "G49-19" terminals of keyless start control module connector. <i>Is resistance infinity?</i>	Go to Step 12.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

Step	Action	Yes	No
12	CAN communication line circuit insulation check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "E23-3" and "E23-18" terminals of ECM connector. <i>Is resistance infinity?</i>	Go to Step 13.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
13	CAN communication line circuit insulation check (A/T or Automated Manual Transaxle model) 1) Measure resistance between "C37-13" and "C37-12" terminals of ECM connector. <i>Is resistance infinity?</i>	Go to Step 14.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
14	CAN communication line circuit continuity check 1) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and "E46-1" terminal of BCM connector - Between "E23-18" terminal of ECM connector and "E46-2" terminal of BCM connector - Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM (A/T) connector (A/T model) or "C52-1" terminal of TCM (Automated Manual Transaxle) connector (Automated Manual Transaxle model) - Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM (A/T) connector (A/T model) or "C52-2" terminal of TCM (Automated Manual Transaxle) connector (Automated Manual Transaxle model) - Between "G37-4" terminal of BCM connector and "G28-8" terminal of combination meter connector - Between "G37-2" terminal of BCM connector and "G28-10" terminal of combination meter connector - Between "G28-7" terminal of combination meter connector and "G49-19" terminal of keyless start control module connector (keyless start model) - Between "G28-9" terminal of combination meter connector and "G49-18" terminal of keyless start control module connector (keyless start model) <i>Is each resistance below 1 Ω?</i>	Go to Step 15.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

Step	Action	Yes	No
15	CAN communication line circuit ground short check 1) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "C37-13" terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) - Between "C37-12" terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) - Between "G37-4" terminal of BCM connector and vehicle body ground - Between "G37-2" terminal of BCM connector and vehicle body ground - Between "G49-19" terminal of keyless start control module connector and vehicle body ground (keyless start model) - Between "G49-18" terminal of keyless start control module connector and vehicle body ground (keyless start model) <i>Is each resistance infinity?</i>	Go to Step 16.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
16	Check for short circuit of CAN communication line to power circuit 1) Measure voltage at the following connector terminals with ignition switch turned ON. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "C37-13" terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) - Between "C37-12" terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) - Between "G37-4" terminal of BCM connector and vehicle body ground - Between "G37-2" terminal of BCM connector and vehicle body ground - Between "G49-19" terminal of keyless start control module connector and vehicle body ground (keyless start model) - Between "G49-18" terminal of keyless start control module connector and vehicle body ground (keyless start model) <i>Is each voltage 0 – 1 V?</i>	Substitute a known-good BCM (included in junction block assembly) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

For M16A engine

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual".
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, ESP® control module (ESP® model), keyless start control module (keyless start model) and BCM for DTC. <i>Is there any DTC(s) other than CAN communication DTC(s) at each control module (other than DTC P1674, P1675, P1678, P1685 in ECM, DTC U1073, U1001, U1100, U1144 in BCM, DTC U1073, U1100, U1101, U1126, U1139, U1140 in ESP® control module (ESP® model) and DTC No.31 / 33 in keyless start control module (keyless start model))?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	ECM, BCM, ESP® control module (ESP® model), combination meter, steering angle sensor (ESP® model) and keyless start control module (keyless start model) connectors check 1) Check for proper connection at each ECM, BCM, ESP® control module (ESP® model), combination meter, steering angle sensor (ESP® model) and keyless start control module (keyless start model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. <i>Is there DTC P1674?</i>	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
4	ECM power and ground circuit check 1) Check ECM power and ground circuit referring to "ECM Power and Ground Circuit Check: For M13, M15 and M16 Engines in related manual". <i>Are they in good condition?</i>	Go to Step 5.	Repair ECM power and/or ground circuits.
5	DTC check in BCM, ESP® control module (ESP® model) and keyless start control module (keyless start model) (bus off) 1) Check DTC(s) in BCM, ESP® control module (ESP® model) and keyless start control module (keyless start model). <i>Is there DTC(s) U1073 in BCM, ESP® control module (ESP® model) and/or DTC No.33 in keyless start control module (keyless start model)?</i>	Go to Step 6.	Go to Step 7.
6	DTC check in ECM (bus off) 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check BCM, keyless start control module and ESP® control module for DTC(s). <i>Is there DTC(s) U1073 in BCM, ESP® control module (ESP® model) and/or DTC No.33 in keyless start control module (keyless start model)?</i>	Go to Step 7.	"E23-3" or "E23-18" circuit wire between ECM and ESP® control module is open or high resistance. If wires are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
7	DTC check in ECM 1) Connect connectors to ECM and disconnect connector from ESP® control module (ESP® model) with ignition switch turned OFF. 2) Check ECM for DTC(s). <i>Is there DTC P1674?</i>	Go to Step 8.	“E85-13” or “E85-44” circuit wire between ESP® control module and CAN circuit junction connector is open or high resistance. If wires are OK, substitute a known-good ESP® control module and recheck.
8	DTC check in ECM 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to Step 9.	“G95-2” or “G95-4” circuit wire between BCM and CAN circuit junction connector is open or high resistance. If wires are OK, substitute a known-good BCM and recheck.
9	DTC check in ECM 1) Disconnect connectors from steering angle sensor (ESP® model) with ignition switch turned OFF. 2) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to Step 10.	“G50-9” or “G50-10” circuit wire between steering angle sensor and CAN circuit junction connector is open or high resistance. If wires are OK, substitute a known-good steering angle sensor and recheck.
10	DTC check in ECM 1) Disconnect connector from keyless start control module (keyless start model) with ignition switch turned OFF. 2) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to Step 11.	“G44-19” or “G44-18” circuit wire between keyless start control module and combination meter is open or high resistance. If wires are OK, substitute a known-good steering angle sensor and recheck.
11	DTC check in ECM 1) Disconnect connector from combination meter with ignition switch turned OFF. 2) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to Step 12.	“G28-10” or “G28-8” circuit wire between combination meter and CAN circuit junction connector is open or high resistance. If wires are OK, substitute a known-good combination meter and recheck.
12	ESP® control module check 1) Measure resistance at the following connector terminals. - Between “E85-13” terminal and “E85-42” terminal of ESP® control module connector - Between “E03-10” terminal and “E03-12” terminal of ESP® control module connector <i>Is measured resistance below 1Ω?</i>	Go to Step 13.	Substitute a known-good ESP® control module and recheck.

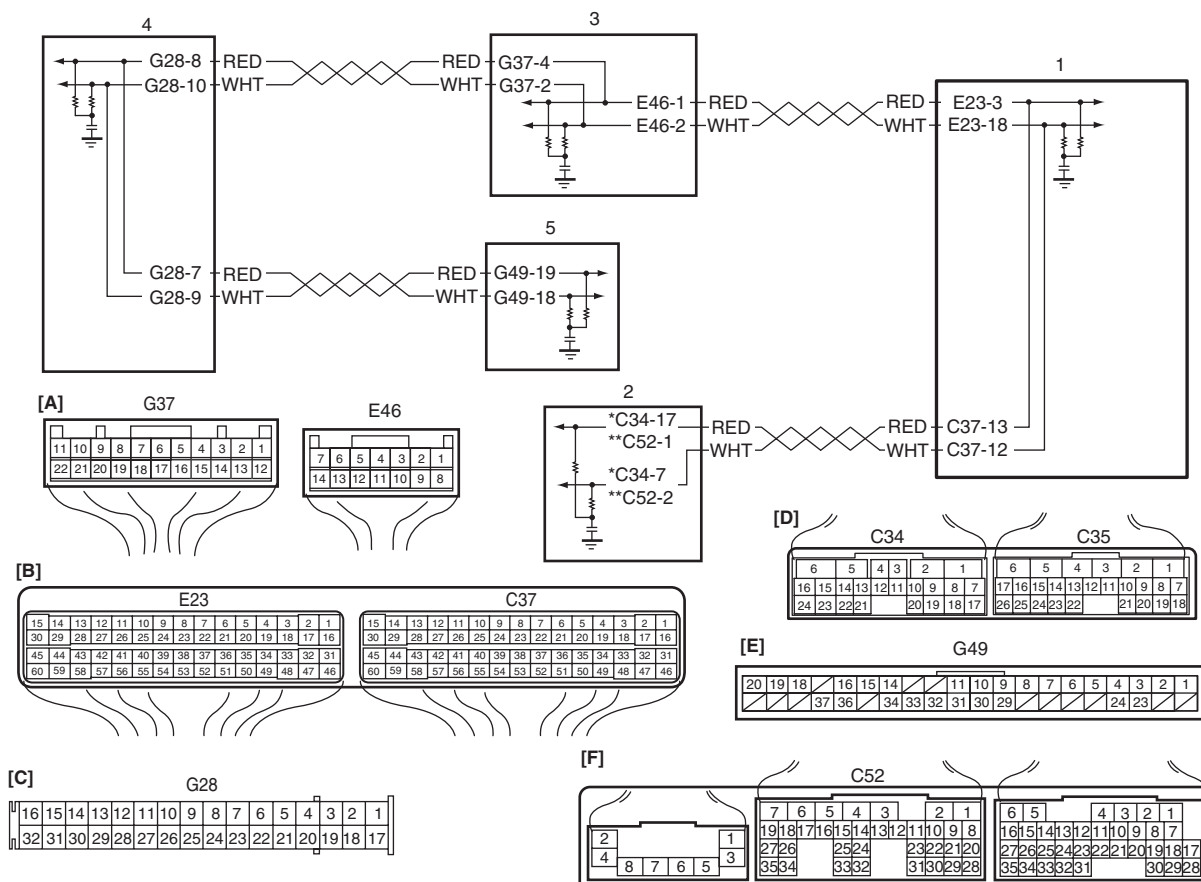
Step	Action	Yes	No
13	CAN communication line circuit insulation check 1) Disconnect connector from ESP® control module (ESP® model) with ignition switch turned OFF. 2) Measure resistance between “E85-13” and “E85-44” terminals of ESP® control module (ESP® model) connector. <i>Is resistance infinity?</i>	Go to Step 14.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
14	CAN communication line circuit insulation check 1) Disconnect connector from ECM with ignition switch turned OFF. 2) Measure resistance between “E23-3” and “E23-18” terminals of ECM connector. <i>Is resistance infinity?</i>	Go to Step 15.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
15	CAN communication line circuit insulation check 1) Disconnect connector from BCM with ignition switch turned OFF. 2) Measure resistance between “G95-2” and “G95-4” terminals of BCM connector. <i>Is resistance infinity?</i>	Go to Step 16.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
16	CAN communication line circuit insulation check 1) Disconnect connector from steering angle sensor (ESP® model) with ignition switch turned OFF. 2) Measure resistance between “G50-9” and “G50-10” terminals of steering angle sensor (ESP® model) connector. <i>Is resistance infinity?</i>	Go to Step 17.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
17	CAN communication line circuit insulation check 1) Disconnect connector from combination meter with ignition switch turned OFF. 2) Measure resistance between “G28-8” and “G28-10” terminals of combination meter connector. <i>Is resistance infinity?</i>	Go to Step 18.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
18	CAN communication line circuit insulation check 1) Disconnect connector from keyless start control module (keyless start model) with ignition switch turned OFF. 2) Measure resistance between “G49-18” and “G49-19” terminals of keyless start control module (keyless start model) connector. <i>Is resistance infinity?</i>	Go to Step 19.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.

Step	Action	Yes	No
19	CAN communication line circuit continuity check 1) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and "E85-42" terminal of ESP® control module (ESP® model) connector - Between "E23-18" terminal of ECM connector and "E85-46" terminal of ESP® control module (ESP® model) connector - Between "E85-13" terminal of ESP® control module (ESP® model) connector and "E84-1" terminal of BCM connector - Between "E85-44" terminal of ESP® control module (ESP® model) connector and "E84-2" terminal of BCM connector - Between "G95-4" terminal of BCM connector and each "G50-9" terminal of steering angle sensor (ESP® model) connector, "G28-8" terminal of combination meter connector - Between "G95-2" terminal of BCM connector and each "G50-10" terminal of steering angle sensor (ESP® model) connector, "G28-10" terminal of combination meter connector - Between "G28-7" terminal of combination meter connector and "G49-19" terminal of keyless start control module (keyless start model) connector - Between "G28-9" terminal of combination meter connector and "G49-18" terminal of keyless start control module (keyless start model) connector <i>Is each resistance below 1Ω?</i>	Go to Step 20.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
20	CAN communication line circuit ground short check 1) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "E85-13" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "E85-44" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "G95-4" terminal of BCM connector and vehicle body ground - Between "G95-2" terminal of BCM connector and vehicle body ground - Between "G28-7" terminal of combination meter connector and vehicle body ground - Between "G28-9" terminal of combination meter connector and vehicle body ground <i>Is each resistance infinity?</i>	Go to Step 21.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

Step	Action	Yes	No
21	CAN communication line circuit power short check 1) Measure voltage at the following connector terminals with ignition switch turned ON. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "E85-13" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "E85-44" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "G95-4" terminal of BCM connector and vehicle body ground - Between "G95-2" terminal of BCM connector and vehicle body ground - Between "G28-7" terminal of combination meter connector and vehicle body ground - Between "G28-9" terminal of combination meter connector and vehicle body ground <i>Is each voltage 0 – 1 V?</i>	Substitute a known-good ESP® control module (ESP® model) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

DTC P1675: CAN Communication (Transmission Error)

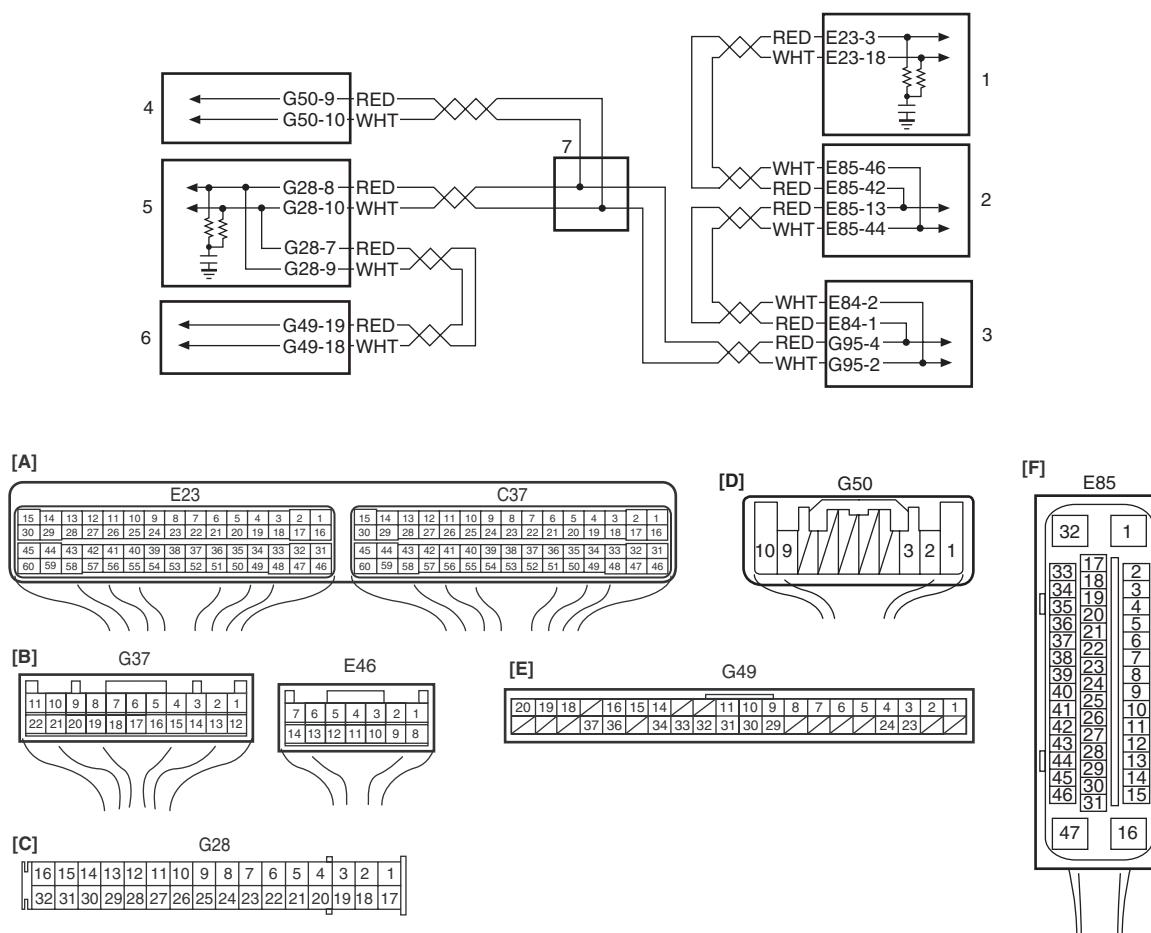
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Wiring Diagram**For M13A and M15A engines**

I4RS0B110045-10

[A]: BCM connector (viewed from harness side)	[F]: TCM connector (Automated Manual Transaxle model) (viewed from harness side)	5. Keyless start control module (keyless start model)
[B]: ECM connector (viewed from harness side)	1. ECM	*: A/T vehicle
[C]: Combination meter connector (viewed from harness side)	2. TCM (A/T or Automated Manual Transaxle model)	** : Automated Manual Transaxle vehicle
[D]: TCM connector (A/T model) (viewed from harness side)	3. BCM	
[E]: Keyless start control module connector (keyless start model) (viewed from harness side)	4. Combination meter	

For M16A engine



I6RS0B111016-01

[A]: ECM connector (viewed from harness side)	[F]: ESP® control module connector (ESP® model) (viewed from harness side)	5. Combination meter
[B]: BCM connector (viewed from harness side)	1. ECM	6. Keyless start control module (keyless start model)
[C]: Combination meter connector (viewed from harness side)	2. ESP® control module (ESP® model)	7. CAN junction connector
[D]: Steering angle sensor connector (ESP® model) (viewed from harness side)	3. BCM	
[E]: Keyless start control module connector (keyless start model) (viewed from harness side)	4. Steering angle sensor (ESP® model)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for ECM is detected for longer than specified time continuously. (1 driving detection logic)	• ECM • BCM • TCM (A/T or Automated Manual Transaxle model) • ESP® control module (ESP® model) • Steering angle sensor (ESP® model) • Keyless start control module (keyless start model) • Combination meter • CAN communication line circuit

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

NOTE

- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.
- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.

For M13A and M15A engines

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual”
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (A/T or Automated Manual Transaxle model) and BCM for DTC. <i>Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (A/T or Automated Manual Transaxle model), DTC U1073, U1001, U1100, U1101 in BCM and DTC No.31 / 33 in keyless start control module (keyless start model))?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	CAN communication error check for ECM 1) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to “DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines”	Go to Step 4.

Step	Action	Yes	No
4	CAN communication error check for BCM, TCM (A/T or Automated Manual Transaxle model) and keyless start control module (keyless start model) 1) Check BCM, TCM (A/T or Automated Manual Transaxle model) and keyless start control module (keyless start model) for DTC(s). <i>Are there DTC U1073 in BCM, DTC P1774 in TCM (A/T or Automated Manual Transaxle model) and DTC No.33 in keyless start control module (keyless start model)?</i>	Go to applicable DTC diag. flow.	Go to Step 5.
5	ECM, TCM (A/T or Automated Manual Transaxle model), BCM, combination meter and keyless start control module (keyless start model) connectors check 1) Check for proper connection at each ECM, TCM (A/T model), BCM, combination meter and keyless start control module (keyless start model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. <i>Is there DTC P1675?</i>	Go to Step 6.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual"
6	ECM power and ground circuit check 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: For M13, M15 and M16 Engines in related manual". <i>Are they in good condition?</i>	Go to Step 7.	Repair ECM power and/or ground circuits.
7	DTC check in ECM 1) Check ECM for DTC(s). <i>Are there DTCs P1676 and P1678?</i>	Go to Step 8.	Go to Step 10.
8	DTC check in TCM (A/T or Automated Manual Transaxle model) and BCM 1) Check TCM (A/T or Automated Manual Transaxle model) and BCM for DTC(s). <i>Are there DTCs P1777, P1778 in TCM (A/T and Automated Manual Transaxle models) and DTCs U1100, U1101 in BCM?</i>	Go to Step 10.	Go to Step 9.
9	Combination meter operation check 1) Check combination meter operation for seat belt warning lamp (fastening and unfastening driver side seat belt) and shift position indicator lamp (A/T model or Automated Manual Transaxle model) with ignition switch turned ON. <i>Are they OK?</i>	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly), TCM (A/T or Automated Manual Transaxle model) and recheck.

Step	Action	Yes	No
10	CAN communication line circuit continuity check 1) Disconnect connectors from ECM, BCM, TCM (A/T or Automated Manual Transaxle model), combination meter and keyless start control module (keyless start model) with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and "E46-1" terminal of BCM connector - Between "E23-18" terminal of ECM connector and "E46-2" terminal of BCM connector - Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM (A/T) connector (A/T model) or "C52-1" terminal of TCM (Automated Manual Transaxle) connector (Automated Manual Transaxle model) - Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM (A/T) connector (A/T model) or "C52-2" terminal of TCM (Automated Manual Transaxle) connector (Automated Manual Transaxle model) - Between "G37-4" terminal of BCM connector and "G28-8" terminal of combination meter connector - Between "G37-2" terminal of BCM connector and "G28-10" terminal of combination meter connector - Between "G28-7" terminal of combination meter connector and "G49-19" terminal of keyless start control module connector (keyless start model) - Between "G28-9" terminal of combination meter connector and "G49-18" terminal of keyless start control module connector (keyless start model) <i>Is each resistance below 1 Ω?</i>	Go to Step 11.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
11	CAN communication line circuit insulation check 1) Measure resistance at the following connector terminals. - Between "E23-3" and "E23-18" terminals of ECM connector - Between "C37-13" and "C37-12" terminals of ECM connector (A/T or Automated Manual Transaxle model) - Between "G37-4" and "G37-2" terminals of BCM connector - Between "G28-7" and "G28-9" terminals of combination meter connector (keyless start model) <i>Is each resistance infinity?</i>	Go to Step 12.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

Step	Action	Yes	No
12	CAN communication line circuit ground short check 1) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "C37-13" terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) - Between "C37-12" terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) - Between "G37-4" terminal of BCM connector and vehicle body ground - Between "G37-2" terminal of BCM connector and vehicle body ground - Between "G49-19" terminal of keyless start control module connector and vehicle body ground (keyless start model) - Between "G49-18" terminal of keyless start control module connector and vehicle body ground (keyless start model) <i>Is each resistance infinity?</i>	Go to Step 13.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
13	Check for short circuit of CAN communication line to power circuit 1) Measure voltage at the following connector terminals with ignition switch turned ON. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "C37-13" terminal of ECM connector and vehicle body ground (A/T model or Automated Manual Transaxle model) - Between "C37-12" terminal of ECM connector and vehicle body ground (A/T model or Automated Manual Transaxle model) - Between "G37-4" terminal of BCM connector and vehicle body ground - Between "G37-2" terminal of BCM connector and vehicle body ground - Between "G49-19" terminal of keyless start control module connector and vehicle body ground (keyless start model) - Between "G49-18" terminal of keyless start control module connector and vehicle body ground (keyless start model) <i>Is each voltage 0 – 1 V?</i>	Substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

For M16A engine

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual".
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, ESP® control module, keyless start control module and BCM for DTC. <i>Is there any DTC(s) (other than DTC P1674, P1675, P1678, P1685 in ECM, DTC U1073, U1001, U1100, U1144 in BCM, DTC U1073, U1100, U1101, U1126, U1139, U1140 in ESP® control module (ESP® model) and DTC No.31 / 33 in keyless start control module (keyless start model))?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	CAN communication error check for ECM 1) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to "DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines".	Go to Step 4.
4	CAN communication error check for BCM, ESP® control module (ESP® model) and keyless start control module (keyless start model) 1) Check BCM, ESP® control module and keyless start control module for DTC(s). <i>Are there DTC U1073 in BCM and ESP® control module (ESP® model) and DTC No.33 in keyless start control module (keyless start model)?</i>	Go to applicable DTC diag. flow.	Go to Step 5.
5	ECM, BCM, ESP® control module, combination meter (ESP® model), steering angle sensor (ESP® model) and keyless start control module (keyless start model) connectors check 1) Check for proper connection at each ECM, BCM, ESP® control module (ESP® model), combination meter, steering angle sensor (ESP® control) and keyless start control module (keyless start model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. <i>Is there DTC P1675?</i>	Go to Step 6.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
6	ECM power and ground circuit check 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: For M13, M15 and M16 Engines in related manual". <i>Are they in good condition?</i>	Go to Step 7.	Repair ECM power and/or ground circuits.
7	DTC check in ECM 1) Check ECM for DTC(s). <i>Are there DTCs P1678 and P1685?</i>	Go to Step 8.	Go to Step 10.

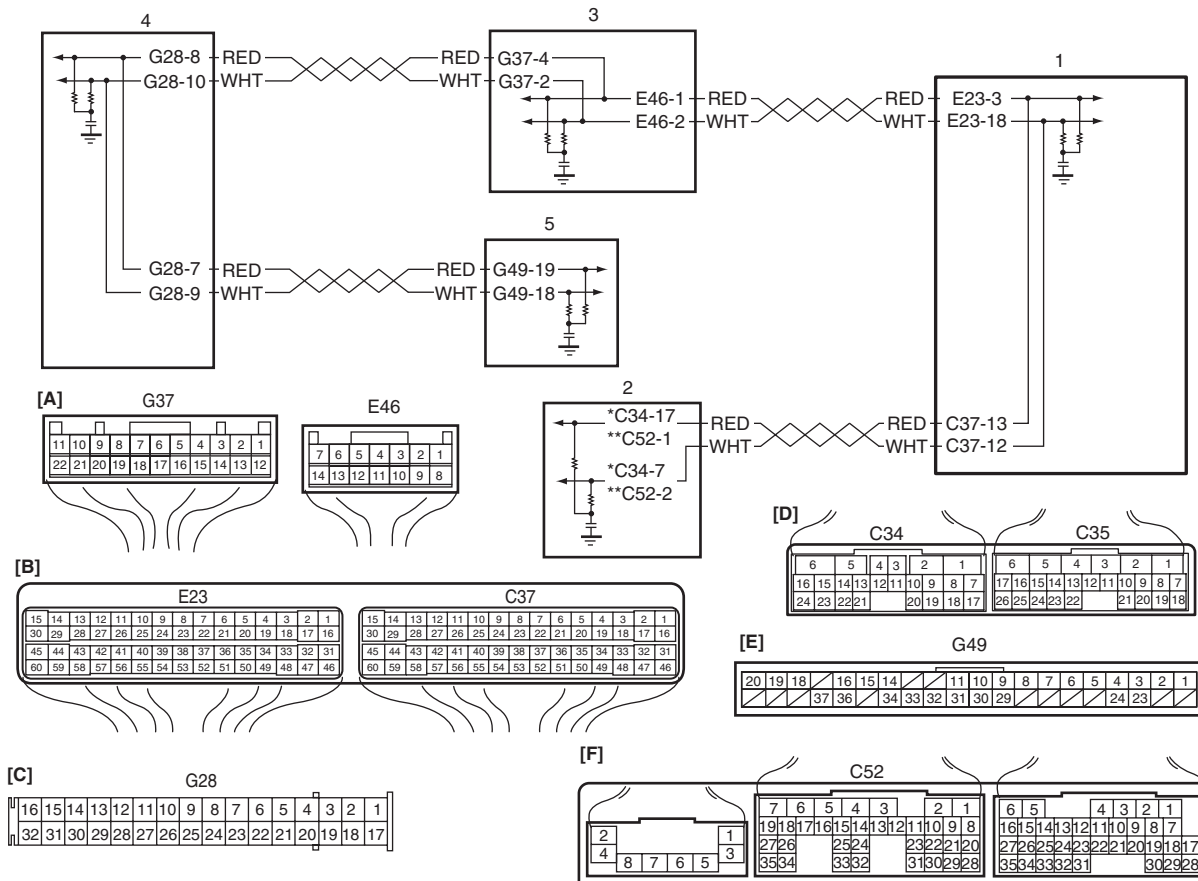
Step	Action	Yes	No
8	DTC check in BCM and ESP® control module (ESP® model) 1) Check DTC(s) in BCM and ESP® control module (ESP® model). <i>Are there DTCs U1100 in BCM and/or U1100 in ESP® control module?</i>	Go to Step 10.	Go to Step 9.
9	Combination meter operation check 1) Check combination meter operation for seat belt warning lamp (fastening and unfastening driver side seat belt) and “ESP® OFF” indicator light with ignition switch turned ON. <i>Are they OK?</i>	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly), ESP® control module and recheck.
10	CAN communication line circuit continuity check 1) Disconnect connectors from ECM, BCM, ESP® control module (ESP® model), combination meter, steering angle sensor (ESP® model) and keyless start control module (keyless start model) with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. - Between “E23-3” terminal of ECM connector and “E85-42” terminal of ESP® control module (ESP® model) connector - Between “E23-18” terminal of ECM connector and “E85-46” terminal of ESP® control module (ESP® model) connector - Between “E85-13” terminal of ESP® control module connector and “E84-1” terminal of BCM connector - Between “E85-44” terminal of ESP® control module connector and “E84-2” terminal of BCM connector - Between “G95-4” terminal of BCM connector and each “G50-9” terminal of steering angle sensor (ESP® model) connector, “G28-8” terminal of combination meter connector - Between “G95-2” terminal of BCM connector and each “G50-10” terminal of steering angle sensor (ESP® model) connector, “G28-10” terminal of combination meter connector - Between “G28-7” terminal of combination meter connector and “G49-19” terminal of keyless start control module (keyless start model) connector - Between “G28-9” terminal of combination meter connector and “G49-18” terminal of keyless start control module (keyless start model) connector <i>Is each resistance below 1 Ω?</i>	Go to Step 11.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.

1A-73 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

Step	Action	Yes	No
11	CAN communication line circuit insulation check 1) Measure resistance at the following connector terminals. - Between "E23-3" and "E23-18" terminal of ECM connector - Between "E85-13" and "E85-44" terminal of ESP® control module (ESP® model) connector - Between "G95-2" and "G95-4" terminal of BCM connector - Between "G49-19" and "G49-18" terminal of keyless start control module (keyless start model) connector <i>Is each resistance infinity?</i>	Go to Step 12.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
12	CAN communication line circuit ground short check 1) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "E85-13" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "E85-44" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "G95-4" terminal of BCM connector and vehicle body ground - Between "G95-2" terminal of BCM connector and vehicle body ground - Between "G28-7" terminal of combination meter connector and vehicle body ground - Between "G28-9" terminal of combination meter connector and vehicle body ground <i>Is each resistance infinity?</i>	Go to Step 13.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
13	CAN communication line circuit power short check 1) Measure voltage at the following connector terminals with ignition switch turned ON. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "E85-13" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "E85-44" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "G95-4" terminal of BCM connector and vehicle body ground - Between "G95-2" terminal of BCM connector and vehicle body ground - Between "G28-7" terminal of combination meter connector and vehicle body ground - Between "G28-9" terminal of combination meter connector and vehicle body ground <i>Is each voltage 0 – 1 V?</i>	Substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

DTC P1676: CAN Communication (Reception Error for TCM (A/T or Automated Manual Transaxle model))

S6RS0B1114063

Wiring Diagram

I4RS0B110045-10

[A]: BCM connector (viewed from harness side)	[F]: TCM connector (Automated Manual Transaxle model) (viewed from harness side)	5. Keyless start control module (keyless start model)
[B]: ECM connector (viewed from harness side)	1. ECM	*: A/T vehicle
[C]: Combination meter connector (viewed from harness side)	2. TCM (A/T or Automated Manual Transaxle model)	** : Automated Manual Transaxle vehicle
[D]: TCM connector (A/T model) (viewed from harness side)	3. BCM	
[E]: Keyless start control module connector (keyless start model) (viewed from harness side)	4. Combination meter	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for TCM or Automated Manual Transaxle control module is detected for longer than specified time continuously. (1 driving detection logic)	- ECM - TCM (A/T or Automated Manual Transaxle model) - CAN communication line circuit

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

NOTE

- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.
- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual”.
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (A/T or Automated Manual Transaxle model) and BCM for DTC. <i>Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (A/T or Automated Manual Transaxle model) and DTC U1073, U1001, U1100, U1101 in BCM)?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Check CAN communication error for ECM 1) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to “DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines”.	Go to Step 4.
4	ECM and TCM (A/T or Automated Manual Transaxle model) connector check 1) Check for proper connection at each ECM and TCM (A/T or Automated Manual Transaxle model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. <i>Is there DTC P1676?</i>	Go to Step 5.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual”.
5	ECM power and ground circuit check 1) Check ECM power and ground circuits referring to “ECM Power and Ground Circuit Check: For M13, M15 and M16 Engines in related manual”. <i>Are they in good condition?</i>	Go to Step 6.	Repair ECM power and/or ground circuits.
6	DTC check in TCM (A/T or Automated Manual Transaxle model) 1) Check DTC P1774 in TCM (A/T or Automated Manual Transaxle model). <i>Is it indicated?</i>	Go to “DTC P1774: Control Module Communication Bus Off in Section 5A in related manual” (A/T model) or “DTC P1774: Control Module Communication Bus Off in Section 5D in related manual” (Automated Manual Transaxle model).	Go to Step 7.

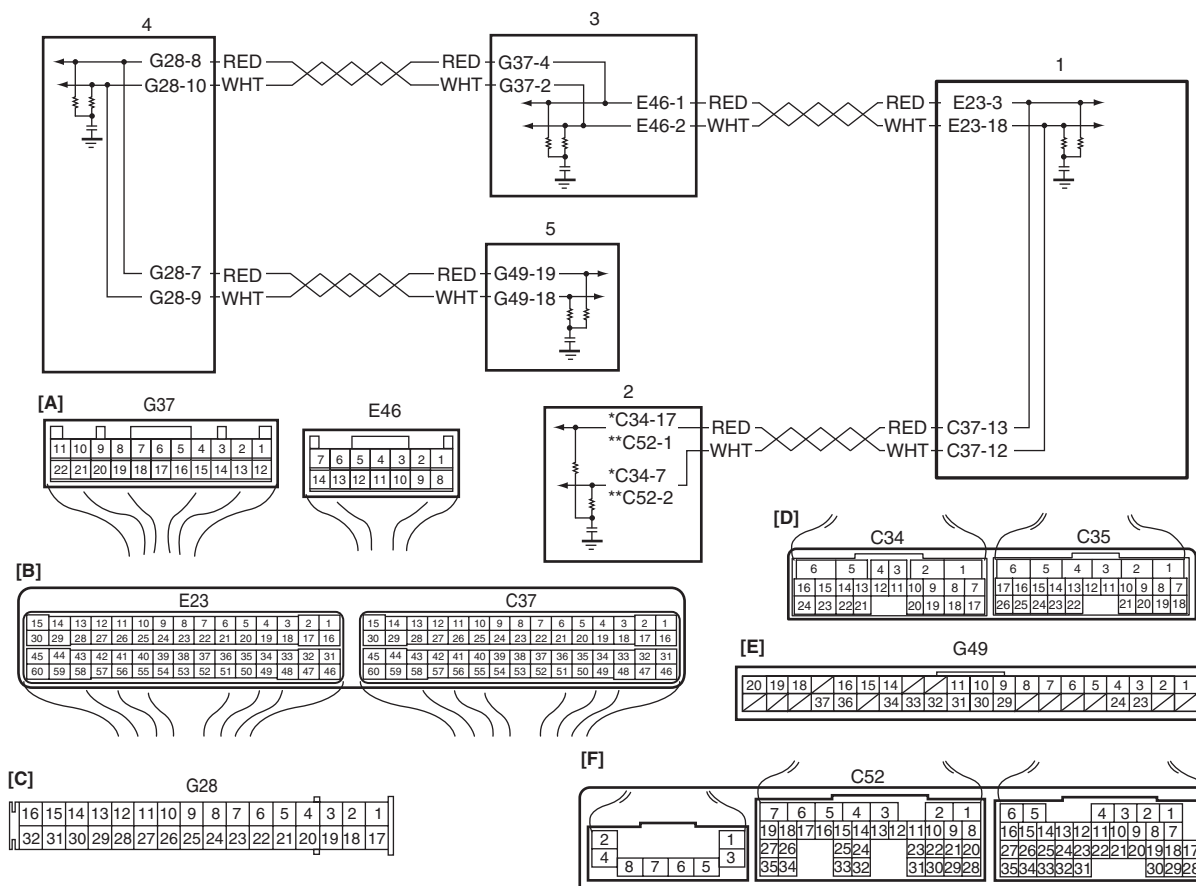
Step	Action	Yes	No
7	DTC check in BCM 1) Check DTC U1101 in BCM. <i>Is it indicated?</i>	Go to "DTC U1101 (No. 1101): Lost Communication with TCM in Section 10B".	Go to Step 8
8	CAN communication line circuit continuity check 1) Disconnect connectors from ECM and TCM (A/T or Automated Manual Transaxle model) with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. - Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM (A/T model) connector or "C52-1" terminal of TCM (Automated Manual Transaxle model) connector - Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM (A/T model) connector or "C52-2" terminal of TCM (Automated Manual Transaxle model) connector <i>Is each resistance below 1 Ω?</i>	Go to Step 9.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
9	CAN communication line circuit insulation check 1) Measure resistance between "C37-13" and "C37-12" terminals of ECM connector. <i>Is resistance infinity?</i>	Go to Step 10.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
10	CAN communication line circuit ground short check 1) Measure resistance at the following connector terminals. - Between "C37-13" terminal of ECM connector and vehicle body ground - Between "C37-12" terminal of ECM connector and vehicle body ground <i>Is each resistance infinity?</i>	Go to Step 11.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
11	Check for short circuit of CAN communication line to power circuit 1) Measure voltage at the following connector terminals with ignition switch turned ON. - Between "C37-13" terminal of ECM connector and vehicle body ground - Between "C37-12" terminal of ECM connector and vehicle body ground <i>Is each voltage 0 – 1 V?</i>	Go to Step 12.	Repair short to power supply of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
12	ECM circuit check 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Connect connectors to ECM. 3) Measure resistance at the following connector terminals. - Between "E23-3" and "C37-13" terminals of ECM connectors - Between "E23-18" and "C37-12" terminals of ECM connectors <i>Is resistance below 1 Ω?</i>	Substitute a known-good TCM (A/T or Automated Manual Transaxle model) and recheck.	Substitute a known-good ECM and recheck.

DTC P1678: CAN Communication (Reception Error for BCM)

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Wiring Diagram

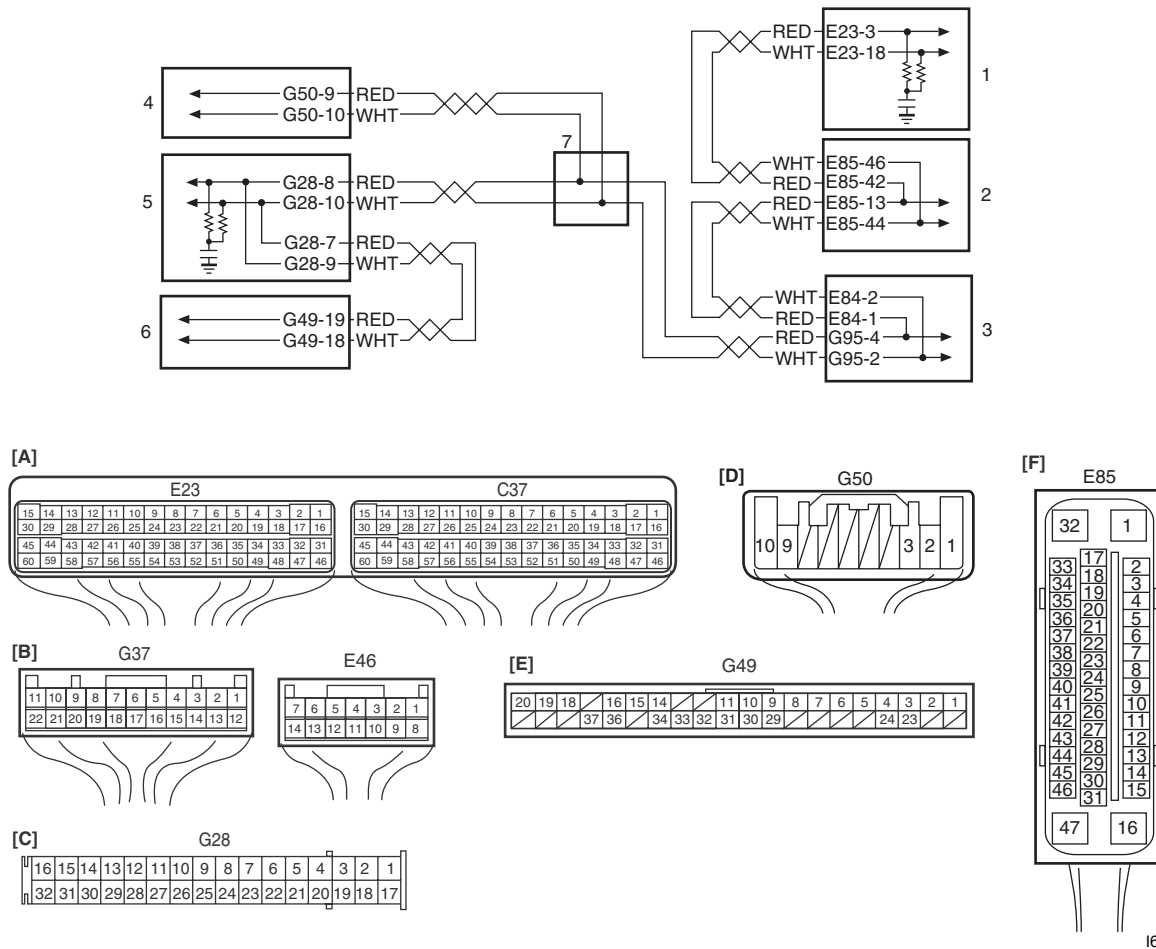
For M13A and M15A engines



14RS0B110045-10

[A]: BCM connector (viewed from harness side)	[F]: TCM connector (Automated Manual Transaxle model) (viewed from harness side)	5. Keyless start control module (keyless start model)
[B]: ECM connector (viewed from harness side)	1. ECM	*: A/T vehicle
[C]: Combination meter connector (viewed from harness side)	2. TCM (A/T or Automated Manual Transaxle model)	** : Automated Manual Transaxle vehicle
[D]: TCM connector (A/T model) (viewed from harness side)	3. BCM	
[E]: Keyless start control module connector (keyless start model) (viewed from harness side)	4. Combination meter	

For M16A engine



I6RS0B111016-01

[A]: ECM connector (viewed from harness side)	2. ESP® control module (ESP® model)
[B]: BCM connector (viewed from harness side)	3. BCM
[C]: Combination meter connector (viewed from harness side)	4. Steering angle sensor (ESP® model)
[D]: Steering angle sensor connector (ESP® model) (viewed from harness side)	5. Combination meter
[E]: Keyless start control module connector (keyless start model) (viewed from harness side)	6. Keyless start control module (keyless start model)
[F]: ESP® control module connector (ESP® model) (viewed from harness side)	7. CAN junction connector
1. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for BCM is detected for longer than specified time continuously. (1 driving detection logic but MIL does not light up)	- ECM - BCM - ESP® control module (ESP® model) - CAN communication line circuit

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

NOTE

- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.
- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.

For M13A and M15A engines

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual”.
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (A/T or Automated Manual Transaxle model) and BCM for DTC. <i>Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (A/T or Automated Manual Transaxle model) and DTC U1073, U1001, U1100, U1101 in BCM)?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	CAN communication error check for ECM 1) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to “DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines”.	Go to Step 4.
4	ECM, TCM (A/T or Automated Manual Transaxle model) and BCM connector check 1) Check for proper connection at each ECM, TCM (A/T or Automated Manual Transaxle model) and BCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. <i>Is there DTC P1678?</i>	Go to Step 5.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual”.
5	ECM power and ground circuit check 1) Check ECM power and ground circuits referring to “ECM Power and Ground Circuit Check: For M13, M15 and M16 Engines in related manual”. <i>Are they in good condition?</i>	Go to Step 6.	Repair ECM power and/or ground circuits.
6	DTC check in BCM 1) Check DTC U1073 in BCM. <i>Is it indicated?</i>	Go to “DTC U1073 (No. 1073): Control Module Communication Bus Off in Section 10B”.	Go to Step 7.

Step	Action	Yes	No
7	CAN communication line circuit continuity check 1) Disconnect connectors from ECM and BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and "E46-1" terminal of BCM connector - Between "E23-18" terminal of ECM connector and "E46-2" terminal of BCM connector <i>Is each resistance below 1 Ω?</i>	Go to Step 8.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
8	CAN communication line circuit insulation check 1) Measure resistance between "E23-3" and "E23-18" terminals of ECM connector. <i>Is resistance infinity?</i>	Go to Step 9.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
9	CAN communication line circuit ground short check 1) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground <i>Is each resistance infinity?</i>	Go to Step 10.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
10	Check for short circuit of CAN communication line to power circuit 1) Measure voltage at the following connector terminals with ignition switch turned ON. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground <i>Is each voltage 0 – 1 V?</i>	Go to Step 11.	Repair short to power supply of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
11	Vehicle spec check <i>Is vehicle equipped with A/T or Automated Manual Transaxle?</i>	Go to Step 12.	Go to Step 14.
12	DTC check in TCM (A/T or Automated Manual Transaxle model) 1) Connect connectors to ECM and BCM with ignition switch turned OFF. 2) Check DTC P1778 in TCM (A/T or Automated Manual Transaxle model). <i>Is it indicated?</i>	Go to Step 13.	Substitute a known-good ECM and recheck.

1A-81 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

Step	Action	Yes	No
13	ECM circuit check 1) Disconnect connectors from BCM and TCM (A/T or Automated Manual Transaxle model) with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. - Between "E23-3" and "C37-13" terminals of ECM connector - Between "E23-18" and "C37-12" terminals of ECM connector <i>Is resistance below 1 Ω?</i>	Substitute a known-good BCM (included in junction block assembly) and recheck.	Substitute a known-good ECM and recheck.
14	Combination meter operation check 1) Check combination meter operation for seat belt warning lamp by fastening and unfastening driver side seat belt with ignition switch turned ON. <i>Is it check result satisfactory?</i>	Go to Step 15.	Substitute a known-good BCM (included in junction block assembly) and recheck.
15	BCM circuit check 1) Disconnect connectors from combination meter with ignition switch turned OFF. 2) Connect connectors to BCM. 3) Measure resistance at the following connector terminals. - Between "E46-1" and "G37-2" terminals of BCM connector - Between "E46-2" and "G37-2" terminals of BCM connector <i>Is resistance below 1 Ω?</i>	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly) and recheck.

For M16A engine

Step	Action	Yes	No
1	<i>Was "Engine and Emission Control System Check" performed?</i>	Go to Step 2.	Go to "Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual".
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, ESP® control module (ESP® model) and BCM for DTC. <i>Is there any DTC(s) (other than DTC P1674, P1675, P1678, P1685 in ECM, DTC U1073, U1001, U1100, U1144 in BCM and DTC U1073, U1100, U1101, U1126, U1139, U1140 in ESP® control module (ESP® model))?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	CAN communication error check for ECM 1) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to "DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines".	Go to Step 4.

Step	Action	Yes	No
4	ECM, BCM and ESP® control module (ESP® model) connectors check 1) Check for proper connection at each ECM, BCM and ESP® control module (ESP® model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. <i>Is there DTC P1678?</i>	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
5	ECM power and ground circuit check 1) Check ECM power and ground circuit referring to "ECM Power and Ground Circuit Check: For M13, M15 and M16 Engines in related manual". <i>Are they in good condition?</i>	Go to Step 6.	Repair ECM power and/or ground circuits.
6	DTC check in BCM 1) Check DTC U1073 in BCM. <i>Is it indicated?</i>	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off in Section 10B".	Go to Step 7.
7	CAN communication line circuit continuity check 1) Disconnect connectors from ECM, BCM and ESP® control module (ESP® model) with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and "E85-42" terminal of ESP® control module (ESP® model) connector - Between "E23-18" terminal of ECM connector and "E85-46" terminal of ESP® control module (ESP® model) connector - Between "E85-13" terminal of ESP® control module connector and "E84-1" terminal of BCM connector - Between "E85-44" terminal of ESP® control module connector and "E84-2" terminal of BCM connector <i>Is each resistance below 1 Ω?</i>	Go to Step 8.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
8	CAN communication line circuit insulation check 1) Measure resistance at the following connector terminals. - Between "E23-3" and "E23-18" terminal of ECM connector - Between "E85-13" and "E85-44" terminal of ESP® control module (ESP® model) connector <i>Is resistance infinity?</i>	Go to Step 9.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
9	CAN communication line circuit ground short check 1) Measure resistance at the following connector terminals. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "E85-13" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "E85-44" terminal of ESP® control module (ESP® model) connector and vehicle body ground <i>Is each resistance infinity?</i>	Go to Step 10.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".

Step	Action	Yes	No
10	CAN communication line circuit power short check 1) Measure voltage at the following connector terminals with ignition switch turned ON. - Between "E23-3" terminal of ECM connector and vehicle body ground - Between "E23-18" terminal of ECM connector and vehicle body ground - Between "E85-13" terminal of ESP® control module (ESP® model) connector and vehicle body ground - Between "E85-44" terminal of ESP® control module (ESP® model) connector and vehicle body ground <i>Is each voltage 0 – 1 V?</i>	Go to Step 11.	Repair short to power supply of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00 in related manual".
11	Combination meter operation check 1) Check combination meter operation for seat belt warning lamp (fastening and unfastening driver side seat belt) and "ESP® OFF" indicator light with ignition switch turned ON. <i>Are they OK?</i>	Go to Step 12.	Substitute a known-good BCM (included in junction block assembly) and recheck.
12	BCM circuit check 1) Disconnect connectors from combination meter with ignition switch turned off. 2) Connect connectors to BCM. 3) Measure resistance at the following connector terminals. - Between "E84-1" and "G95-4" terminal of BCM connector - Between "E84-2" and "G95-2" terminal of BCM connector <i>Is resistance below 1 Ω?</i>	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly) and recheck.

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DTC Troubleshooting

NOTE

- Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines”.
- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual”.
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and ESP® control module (ESP® model) for DTC. <i>Is there any DTC(s) (other than DTC P1674, P1675, P1678, P1685 in ECM and DTC U1073, U1100, U1101, U1126, U1139, U1140 in ESP® control module (ESP® model))?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	CAN communication error check for ECM 1) Check ECM for DTC. <i>Is there DTC P1674?</i>	Go to “DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines”.	Go to Step 4.
4	ECM and ESP® control module connectors check 1) Check for proper connection at each ECM and ESP® control module (ESP® model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. <i>Is there DTC P1685?</i>	Go to Step 5.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual”.
5	ECM power and ground circuit check 1) Check ECM power and ground circuit referring to “ECM Power and Ground Circuit Check: For M13, M15 and M16 Engines in related manual”. <i>Are they in good condition?</i>	Go to Step 6.	Repair ECM power and/or ground circuits.
6	DTC check in ESP® control module 1) Check DTC U1073 in ESP® control module (ESP® model). <i>Is it indicated?</i>	Go to “DTC U1073: Control Module Communication Bus Off in Section 4F”.	Go to Step 7.

Step	Action	Yes	No
7	CAN communication line circuit continuity check 1) Disconnect connectors from ECM and ESP® control module (ESP® model) with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. - Between “E23-3” terminal of ECM connector and “E85-42” terminal of ESP® control module (ESP® model) connector - Between “E23-18” terminal of ECM connector and “E85-46” terminal of ESP® control module (ESP® model) connector <i>Is each resistance below 1 Ω?</i>	Go to Step 8.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
8	CAN communication line circuit insulation check 1) Measure resistance at the following connector terminals. Between “E23-3” and “E23-18” terminal of ECM connector <i>Is each resistance infinity?</i>	Go to Step 9.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
9	CAN communication line circuit ground short check 1) Measure resistance at the following connector terminals. - Between “E23-3” terminal of ECM connector and vehicle body ground - Between “E23-18” terminal of ECM connector and vehicle body ground <i>Is each resistance infinity?</i>	Go to Step 10.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
10	CAN communication line circuit power short check 1) Measure voltage at the following connector terminals with ignition switch turned ON. - Between “E23-3” terminal of ECM connector and vehicle body ground - Between “E23-18” terminal of ECM connector and vehicle body ground <i>Is each voltage 0 – 1 V?</i>	Go to Step 11.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00 in related manual”.
11	ESP® control module circuit check 1) Connect connectors to ESP® control module (ESP® model). 2) Measure resistance at the following connector terminals. - Between “E85-42” and “E85-13” terminal of ESP® control module (ESP® model) connector - Between “E85-46” and “E85-44” terminal of ESP® control module (ESP® model) connector <i>Is resistance below 1 Ω?</i>	Substitute a known-good ECM and recheck.	Substitute a known-good ESP® control module (ESP® model) and recheck.

DTC P2111 / P2112: Throttle Actuator Control System - Stuck Open / Closed (Electric Throttle Body Model)

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2111: Throttle valve default opening is greater than 8° (Automated Manual Transaxle model) or 6° (M16 engine) from complementary closed position when diagnosing throttle valve at ignition switch turned OFF. (1 driving detection logic) P2112: Throttle valve default opening is smaller than 8° (Automated Manual Transaxle model) or 6° (M16 engine) from complementary closed position when diagnosing throttle valve at ignition switch turned OFF. (1 driving detection logic)	• Electric throttle body assembly • ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Ignition switch turned OFF for 20 sec. or more.
- 4) Turn ON ignition switch and check DTC.

DTC Troubleshooting**NOTE**

- Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual".
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines".
- Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check: For M13, M15 and M16 Engines in related manual".
2	Throttle valve visual check 1) Check that there isn't any foreign matter caught between throttle valve and throttle body housing referring to "Throttle Valve Visual Check" under "Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C". <i>Is it in good condition?</i>	Go to Step 3.	Take it out after removing throttle body and clean inside of throttle body thoroughly.
3	Throttle valve operation check 1) Check operation of throttle valve referring to "Throttle Valve Operation Check" under "Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C". <i>Is check result satisfactory?</i>	Go to Step 4.	Replace electric throttle body assembly.

Step	Action	Yes	No
4	Throttle actuator operation check 1) Check operation of throttle actuator referring to "Throttle Actuator Operation Check" under "Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C". <i>Is check result satisfactory?</i>	Go to Step 5.	Replace electric throttle body assembly.
5	Throttle position sensor performance check 1) Check performance of throttle position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C". <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

Inspection of ECM and Its Circuits

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ECM and its circuits can be checked by measuring voltage, pulse signal and resistance with special tool connected.

⚠ CAUTION

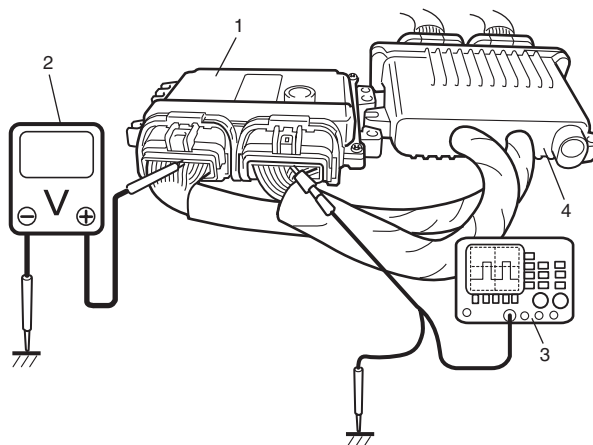
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with ECM connectors disconnected from it.

Voltage Check

- 1) Remove ECM (1) from its bracket referring to "Engine Control Module (ECM) Removal and Installation: For M13, M15 and M16 Engines in Section 1C in related manual".
- 2) Connect special tool (4) between ECM and ECM connectors securely.
- 3) Check voltage and/or pulse signal using voltmeter (2) and oscilloscope (3).

NOTE

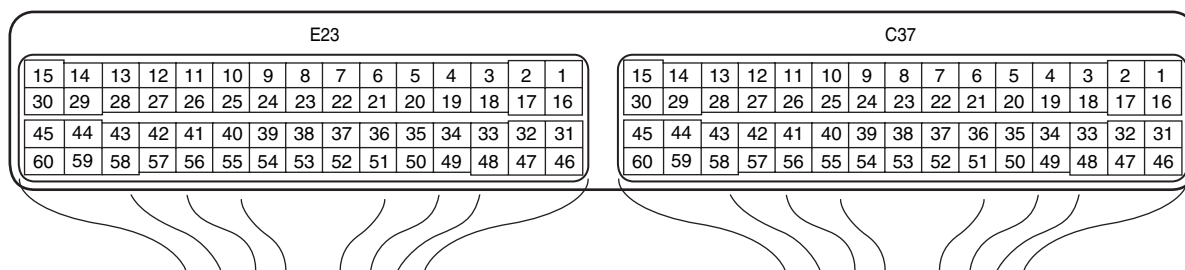
- As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is turned ON.
- Voltage with asterisk (*) cannot be measured with voltmeter because it is pulse signal. Use oscilloscope for its check if necessary.



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- Before performed this inspection, be sure to read the "Precautions of ECM Circuit Inspection: For M13, M15 and M16 Engines in related manual".

Viewed from harness side



I4RS0A110055-01

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-1	BLU/ YEL	Fuel injector No.1 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: For M13, M15 and M16 Engines”, “Reference waveform No.2: For M13, M15 and M16 Engines” and “Reference waveform No.34: For M13, M15 and M16 Engines”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-2	BLU/ WHT	Fuel injector No.2 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: For M13, M15 and M16 Engines” and “Reference waveform No.3: For M13, M15 and M16 Engines”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-3	GRN/ ORN	EGR valve (stepper motor coil 2) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: For M13, M15 and M16 Engines”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-4	GRN/ RED	EGR valve (stepper motor coil 1) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: For M13, M15 and M16 Engines”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-5	GRN/ WHT	Ignition coil No.2 and No.3 output	0 – 0.6 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 3 – 5 V ("Reference waveform No.5: For M13, M15 and M16 Engines" and "Reference waveform No.6: For M13, M15 and M16 Engines")	Engine running at idle after warmed up engine.	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C37-6	GRN/ YEL	Ignition coil No.1 and No.4 output	0 – 0.6 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 3 – 5 V ("Reference waveform No.6: For M13, M15 and M16 Engines", "Reference waveform No.7: For M13, M15 and M16 Engines" and "Reference waveform No.34: For M13, M15 and M16 Engines")	Engine running at idle after warmed up engine.	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C37-7	GRY/ BLU	Engine revolution signal output for TCM (Automated Manual Transaxle model)	4 – 6 V	Ignition switch turned ON with engine stop.	—
			*0 – 1 V ↑↓ 4 – 5 V ("Reference waveform No.30: For M13, M15 and M16 Engines")	While engine running.	Output signal is pulse. Pulse frequency varies depending on engine speed. (12 pulses are generated per 1 crankshaft revolution.)
C37-8	BRN/ WHT	Generator field coil monitor signal (M16A engine)	10 – 14 V	Ignition switch turned ON.	Signal is duty pulse. Duty ratio varies depending on vehicle condition.
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.35: For M13, M15 and M16 Engines")	Engine running at idle after warmed up engine.	
C37-9	PPL	Vehicle speed sensor signal (other than M16A engine and A/T model)	*0 – 1 V ↑↓ 4 – 5 V ("Reference waveform No.8: For M13, M15 and M16 Engines" (M/T) or "Reference waveform No.31: For M13, M15 and M16 Engines" (Automated Manual Transaxle))	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (69 pulses (M/T) or 21 pulses (Automated Manual Transaxle) are generated per sec. at 30 km/h, 19 mph.) (8232 pulses/km (M/T)) (2561 pulses/km (Automated Manual Transaxle))

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Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-10	WHT	Oxygen signal of heated oxygen sensor-1	0 – 1 V	Ignition switch turned ON.	—
			*Deflects between over 0.5 V and under 0.45 V ("Reference waveform No.9: For M13, M15 and M16 Engines" and "Reference waveform No.10: For M13, M15 and M16 Engines")	While engine running at 2,000 r/min. for 1 min. or longer after warmed up.	
C37-11	BRN	Oxygen signal of heated oxygen sensor-2	4 – 5 V	Ignition switch turned ON.	—
			*Deflects between over 0.5 V and under 0.45 V ("Reference waveform No.11: For M13, M15 and M16 Engines")	While engine running at 2,000 r/min. or more after vehicle running over 30 km/h, 19 mph for 5 min.	
C37-12	WHT	CAN (low) (communication line (active low signal) to TCM (A/T or Automated Manual Transaxle model)	*0.5 – 2.5 V ("Reference waveform No.12: For M13, M15 and M16 Engines")	Ignition switch turned ON with engine stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
C37-13	RED	CAN (high) communication line (active high signal) to TCM (A/T or Automated Manual Transaxle model)	*2.5 – 4.5 V ("Reference waveform No.12: For M13, M15 and M16 Engines")		
C37-14	GRY/ RED	Output of 5 V power source for TP sensor (Non-electric throttle body model), MAP sensor, A/C refrigerant pressure sensor (A/C model)	4.5 – 5.5 V	Ignition switch turned ON.	—
C37-15	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-16	BLU/ RED	Fuel injector No.3 output	10 – 14 V	Ignition switch turned ON.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
			*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.1: For M13, M15 and M16 Engines" and "Reference waveform No.13: For M13, M15 and M16 Engines")	Engine running at idle after warmed up engine.	

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-17	BLU/ ORN	Fuel injector No.4 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.1: For M13, M15 and M16 Engines" and "Reference waveform No.14: For M13, M15 and M16 Engines")	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-18	BRN/ YEL	EGR valve (stepper motor coil 4) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.4: For M13, M15 and M16 Engines")	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-19	WHT/ RED	EGR valve (stepper motor coil 3) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.4: For M13, M15 and M16 Engines")	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-20	RED/ YEL	CMP sensor signal	0 – 1 V or 4 – 5 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 4 – 5 V ("Reference waveform No.15: For M13, M15 and M16 Engines" and "Reference waveform No.16: For M13, M15 and M16 Engines")	Engine running at idle after warmed up engine.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (6 pulses are generated per 1 camshaft revolution.)
C37-21	PNK	CKP sensor signal	0 – 1 V or 4 – 5 V	Ignition switch turned ON.	—
			*4 – 5 V ↑↓ 0 – 0.6 V ("Reference waveform No.15: For M13, M15 and M16 Engines" and "Reference waveform No.16: For M13, M15 and M16 Engines")	Engine running at idle after warming up engine.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (30 (36 – 6) pulses are generated per 1 crankshaft revolution.)
C37-22	PPL/ WHT	Vehicle speed signal output for TCM (Automated Manual Transaxle model)	*0 – 1 V ↑↓ 4 – 5 V ("Reference waveform No.31: For M13, M15 and M16 Engines")	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (21 pulses are generated per sec. at 30 km/h, 19 mph.) (2561 pulses/km)
C37-23	—	—	—	—	—

1A-93 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-24	LT GRN	Engine coolant temp. (ECT) sensor signal	3.3 – 3.8 V	Ignition switch turned ON, ECT at 0 °C, 32 °F.	—
			1.38 – 1.72 V	Ignition switch turned ON, ECT at 50 °C, 122 °F.	
			0.40 – 0.53 V	Ignition switch turned ON, ECT at 100 °C, 212 °F.	
C37-25	BLK/ YEL	Intake air temp. (IAT) sensor signal	3.18 – 3.67 V	Ignition switch turned ON, IAT at 0 °C, 32 °F.	—
			1.32 – 1.65 V	Ignition switch turned ON, IAT at 40 °C, 104 °F.	
			0.46 – 0.60 V	Ignition switch turned ON, IAT at 80 °C, 176 °F.	
C37-26	GRN/ BLK	Mass air flow (MAF) sensor signal	0.5 – 1.5 V	Ignition switch turned ON with engine at stop.	—
			1.5 – 2.0 V ("Reference waveform No.17: For M13, M15 and M16 Engines")	When engine running at specified idle speed after warmed up.	
C37-27	GRY	Ground for MAF sensor	Below 0.3 V	Ignition switch turned ON.	—
C37-28	BLU/ YEL	Generator control signal output (M16A engine)	*0 – 0.6 V ↑↓ 5 – 8 V ("Reference waveform No.36: For M13, M15 and M16 Engines")	Engine running at idle speed, headlight switch turned ON.	Output signal is active low duty pulse. Duty ratio varies depending on vehicle condition.
C37-29	BLU/ BLK	EVAP canister purge valve output	10 – 14 V	Ignition switch turned ON with engine at stop.	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.18: For M13, M15 and M16 Engines")	Set EVAP canister purge valve at 52% by using "Misc Test" of scan tool.	Output signal is active low duty pulse. Duty ratio varies depending on vehicle condition.
C37-30	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-31	—	—	—	—	—
C37-32	—	—	—	—	—
C37-33	—	—	—	—	—
C37-34	—	—	—	—	—
C37-35	—	—	—	—	—
C37-36	—	—	—	—	—
C37-37	—	—	—	—	—
C37-38	—	—	—	—	—
C37-39	—	—	—	—	—
C37-40	WHT	Throttle position sensor (sub) signal (Electric throttle body model)	1.57 – 1.90 V	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	—
			3.88 – 4.45 V	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-41	—	Ground for shield wire of TP sensor circuit (Electric throttle body model)	Below 0.3 V	Ignition switch turned ON.	—
C37-42	BLK	Ground for throttle position sensor (Electric throttle body model)	Below 0.3 V	Ignition switch turned ON.	—
C37-43	RED	Output for 5 V power source of throttle position sensor (Electric throttle body model)	4.5 – 5.5 V	Ignition switch turned ON.	—
C37-44	LT GRN/ BLK	Output of throttle actuator (Electric throttle body model)	0 – 1 V	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	Output signal is pulse. Duty ratio varies depending on throttle valve and accelerator pedal position.
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.32: For M13, M15 and M16 Engines" and "Reference waveform No.33: For M13, M15 and M16 Engines")	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	
C37-45	LT GRN/ RED	Output of throttle actuator (Electric throttle body model)	0 – 1 V	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	Output signal is pulse. Duty ratio varies depending on throttle valve and accelerator pedal position.
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.32: For M13, M15 and M16 Engines" and "Reference waveform No.33: For M13, M15 and M16 Engines")	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	
C37-46	BLK/ RED	Heater output of heated oxygen sensor-1	10 – 14 V	Ignition switch turned ON.	—
			*0 – 2 V ↑↓ 10 – 14 V ("Reference waveform No.9: For M13, M15 and M16 Engines" and "Reference waveform No.10: For M13, M15 and M16 Engines")	Engine running at idle after warmed up engine.	Output signal is active low duty pulse. Duty ratio varies depending on engine condition.

1A-95 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-47	RED/ BLU	Heater output of heated oxygen sensor-2	10 – 14 V	Ignition switch turned ON.	—
			0 – 1 V ("Reference waveform No.11: For M13, M15 and M16 Engines")	Engine running at idle after vehicle running over 30 km/h, 19 mph for 5 min.	
C37-48	YEL/ GRN	Starting motor signal	0 – 1 V	Ignition switch turned ON.	—
			6 – 14 V	While engine cranking.	
C37-49	RED/ WHT	IAC valve output (Non-electric throttle body model)	*0 – 2 V ↑↓ 8 – 14 V ("Reference waveform No.19: For M13, M15 and M16 Engines")	Ignition switch turned ON.	Ignition switch turned ON.
			*0 – 2 V ↑↓ 8 – 14 V ("Reference waveform No.20: For M13, M15 and M16 Engines")	Engine running at idle after warmed up engine.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-50	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-51	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-52	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-53	RED/ BLK	Manifold absolute pressure (MAP) sensor signal	Approx. 4 V ("Reference waveform No.21: For M13, M15 and M16 Engines")	Ignition switch turned ON with barometric pressure at 100 kPa, 760 mmHg.	—
			0.4 – 2.0 V ("Reference waveform No.22: For M13, M15 and M16 Engines")	While engine running at specified idle speed after warmed up with barometric pressure at 100 kPa, 760 mmHg.	
C37-54	GRY/ BLU	Throttle position (TP) sensor signal (Non-electric throttle body model)	0.5 – 1.0 V	Ignition switch turned ON and throttle valve at idle position after warmed up engine.	—
			3.4 – 4.7 V	Ignition switch turned ON and throttle valve at full open position after warmed up engine.	
	GRN	Throttle position sensor (main) signal (Electric throttle body model)	0.75 – 1.08 V	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	
			3.67 – 4.24 V	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	
C37-55	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-56	RED	Knock sensor signal	2 – 3 V ("Reference waveform No.23: For M13, M15 and M16 Engines" and "Reference waveform No.24: For M13, M15 and M16 Engines")	Ignition switch turned ON. Engine running at 4000 r/min. after warmed up.	—
C37-57	YEL	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
C37-58	BLK/ORN	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-59	YEL/BLK	Oil control valve ground (VVT model)	Below 1.3 V	Ignition switch turned ON.	—
C37-60	YEL/RED	Oil control valve output (VVT model)	*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.25: For M13, M15 and M16 Engines" and "Reference waveform No.26: For M13, M15 and M16 Engines")	At the moment of ignition switch turned ON.	Output signal is active high pulse. Duty ratio varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-1	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON.	—
E23-2	WHT/RED	Power source for ECM internal memory	10 – 14 V	Ignition switch turned ON.	—
E23-3	RED	CAN (high) communication line (active high signal) for BCM, combination meter	*2.5 – 4.5 V ("Reference waveform No.27: For M13, M15 and M16 Engines")	Ignition switch turned ON with engine at stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency with varies depending on engine condition.
E23-4	BRN	Engine revolution signal output for EPS control module	0 – 0.8 V	Ignition switch turned ON with engine at stop.	—
			*0 – 1 V ↑↓ 8 – 14 V ("Reference waveform No.28: For M13, M15 and M16 Engines" and "Reference waveform No.29: For M13, M15 and M16 Engines")	While engine running.	Output signal is pulse. Pulse frequency varies depending on engine speed. (2 pulses are generated per 1 crankshaft revolution.) (3000 r/min. = 100 Hz)
E23-5	PPL/WHT	Serial communication line of data link connector 12 V	8 – 14 V	Ignition switch turned ON.	—
E23-6	—	—	—	—	—
E23-7	—	—	—	—	—
E23-8	—	—	—	—	—
E23-9	—	—	—	—	—

1A-97 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-10	—	—	—	—	—
E23-11	—	—	—	—	—
E23-12	—	—	—	—	—
E23-13	YEL/ RED	Clock signal for immobilizer coil antenna	10 – 14 V	Ignition switch turned ON.	—
E23-14	—	—	—	—	—
E23-15	GRN/ WHT	Fuel pump relay output	0 – 2.5 V	For 2 sec. from the time ignition switch is turned ON or while engine is running.	—
			10 – 14 V	On and after 2 sec. from the time ignition switch is turned ON or while engine is at stop.	
E23-16	BLK/ RED	Main power supply	10 – 14 V	Ignition switch turned ON.	—
E23-17	—	—	—	—	—
E23-18	WHT	CAN (low) communication line (active low signal) for BCM, combination meter	*0.5 – 2.5 V ("Reference waveform No.27: For M13, M15 and M16 Engines")	Ignition switch turned ON with engine at stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
E23-19	BLU/ WHT	Electric load signal for heater blower motor	10 – 14 V	Ignition switch turned ON, blower fan selector at OFF position.	—
			0 – 1 V	Ignition switch turned ON, blower fan selector at 2nd speed position or more.	
E23-20	GRN/ WHT	Stop lamp switch signal	0 – 1 V	Ignition switch turned ON, stop lamp not lit up.	—
			10 – 14 V	Ignition switch turned ON, stop lamp lit up.	
E23-21	—	—	—	—	—
E23-22	—	—	—	—	—
E23-23	—	—	—	—	—
E23-24	YEL/ RED	Fuel level sensor signal	0 – 6 V	Ignition switch turned ON. Voltage varies depends on fuel level.	—
E23-25	PPL	Vehicle speed signal output for EPS control module	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.8: For M13, M15 and M16 Engines")	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (21 pulses are generated per sec. at 30 km/h, 19 mph.) (2561 pulses/km)
E23-26	RED/ BLU	EPS signal	10 – 14 V	Ignition switch turned ON.	—
			0 – 1 V	With engine running at idle speed, and steering wheel turned to the right or left as far as it stops.	
E23-27	—	—	—	—	—
E23-28	YEL/ BLK	Serial communication line for immobilizer coil antenna	10 – 14 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-29	BLK/ WHT	Ignition switch signal	0 – 1 V	Ignition switch turned OFF.	—
			10 – 14 V	Ignition switch turned ON.	
E23-30	WHT	Starting motor control relay output	0 – 1 V	Ignition switch turned ON.	—
			0 – 1 V	Ignition switch is turned to ST (engine cranking) position.	
E23-31	BLK	Ground for ECM (Electric throttle body model)	Below 0.3 V	Ignition switch turned ON.	—
E23-32	RED/ YEL	Power supply of throttle actuator drive circuit (Electric throttle body model)	10 – 14 V	Ignition switch turned ON.	—
E23-33	—	—	—	—	—
E23-34	RED	Output for 5 V power source of accelerator pedal position (APP) sensor (sub) (Electric throttle body model)	4.5 – 5.5 V	Ignition switch turned ON.	—
E23-35	BRN	Output for 5 V power source of accelerator pedal position (APP) sensor (main) (Electric throttle body model)	4.5 – 5.5 V	Ignition switch turned ON.	—
E23-36	YEL	Accelerator pedal position (APP) sensor (sub) signal (Electric throttle body model)	1.55 – 1.65 V	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	—
			4.18 – 5.12 V	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	
E23-37	GRN	Accelerator pedal position (APP) sensor (main) signal (Electric throttle body model)	0.75 – 0.85 V	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	—
			3.46 – 4.24 V	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	
E23-38	—	—	—	—	—
E23-39	—	—	—	—	—
E23-40	—	—	—	—	—
E23-41	—	—	—	—	—
E23-42	—	—	—	—	—
E23-43	—	—	—	—	—
E23-44	—	—	—	—	—
E23-45	BLU/ ORN	Throttle actuator control relay output (Electric throttle body model)	0 – 1 V	Ignition switch turned ON.	—

1A-99 Engine General Information and Diagnosis: For M13, M15 and M16 Engines

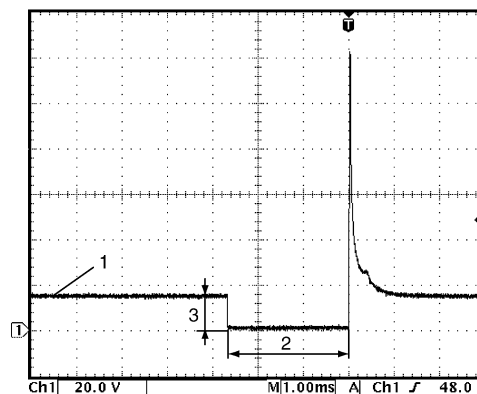
Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-46	LT GRN	Radiator cooling fan relay No.1 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 95 °C (203 °F), or A/C refrigerant pressure (if equipped with A/C): below 600 kPa (87 psi) with A/C switch turned ON while engine is running.	—
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 97.5 °C (207.5 °F) or higher, or A/C refrigerant pressure (if equipped with A/C): 1100 kPa (159.5 psi) or higher with A/C switch turned ON while engine is running.	
E23-47	GRY	A/C compressor relay output (A/C model)	10 – 14 V	Engine running, A/C switch OFF and blower selector at OFF position.	—
			0 – 1 V	Engine running, A/C switch ON and blower selector at 1st position or more.	
E23-48	GRN	Radiator cooling fan relay No.2 and No.3 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 100 °C (212 °F), or A/C refrigerant pressure (if equipped with A/C): below 1200 kPa (174 psi) with A/C switch turned ON while engine is running.	—
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 102.5 °C (216.5 °F) or higher, or A/C refrigerant pressure (if equipped with A/C): 1500 kPa (217.5 psi) or higher with A/C switch turned ON while engine is running.	
E23-49	—	—	—	—	—
E23-50	—	Ground for shield wire of accelerator pedal position (APP) sensor (Electric throttle body model)	Below 0.3 V	Ignition switch turned ON.	—
E23-51	WHT	Ground for accelerator pedal position (APP) sensor (sub) (Electric throttle body model)	Below 0.3 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-52	BLU	Ground for accelerator pedal position (APP) sensor (main) (Electric throttle body model)	Below 0.3 V	Ignition switch turned ON.	—
E23-53	—	—	—	—	—
E23-54	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
E23-55	RED	A/C refrigerant pressure sensor signal (A/C model)	1.38 – 1.52 V	Engine running, A/C switch OFF and blower selector at OFF position, A/C refrigerant pressure: 800 kPa (116 psi)	—
			2.15 – 2.38 V	Engine running, A/C switch ON and blower selector at 1st position or more, A/C refrigerant pressure: 1400 kPa (203 psi)	
			2.67 – 2.95 V	Engine running, A/C switch ON and blower selector at 1st position or more, A/C refrigerant pressure: 1800 kPa (261 psi)	
E23-56	—	—	—	—	—
E23-57	WHT/BLK	A/C evaporator outlet air temp. sensor signal (A/C model)	3.4 – 3.7 V	Ignition switch turned ON at A/C evaporator outlet temperature 0 °C (32 °F).	—
			2.5 – 2.8 V	Ignition switch turned ON at A/C evaporator outlet temperature 15 °C (59 °F).	
			1.7 – 2.0 V	Ignition switch turned ON at A/C evaporator outlet temperature 30 °C (86 °F).	
E23-58	—	—	—	—	—
E23-59	—	—	—	—	—
E23-60	BRN/WHT	Main power supply relay output	10 – 14 V	Ignition switch turned OFF.	—
			0 – 2 V	Ignition switch turned ON.	

Reference waveform No.1

Fuel injector signal (1) with engine idling

Measurement terminal	CH1: "C37-2" to "C37-58"
Oscilloscope setting	CH1: 20 V/DIV TIME: 1 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



I4RS0B110050-01

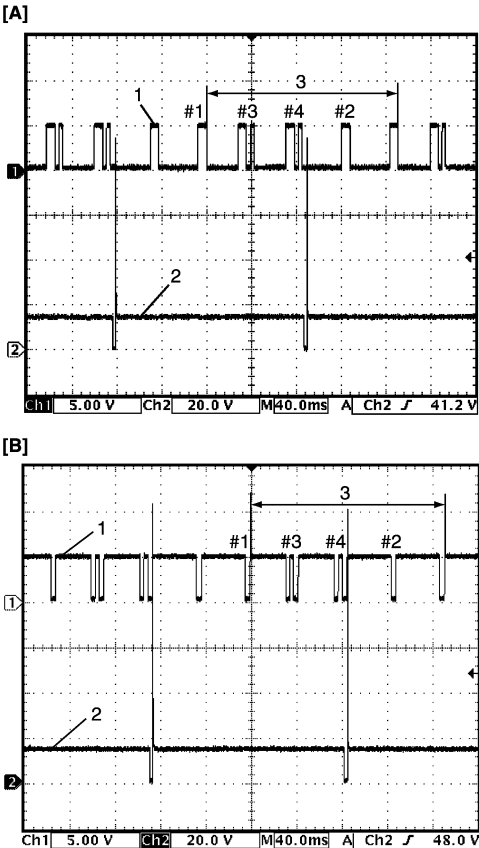
2. Fuel injection pulse width: 2-4 msec.

3. 10 – 14 V

Reference waveform No.2

No.1 fuel injector signal (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-1" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



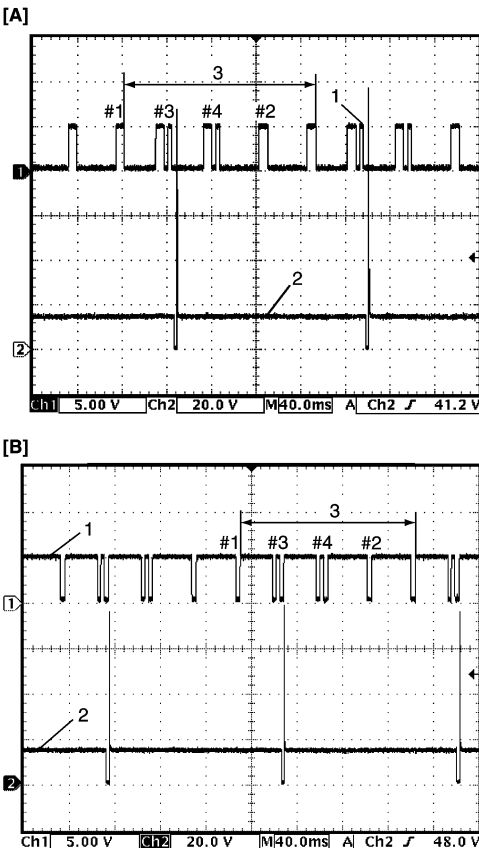
I4RS0B110051-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.3

No.2 fuel injector signal (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-2" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



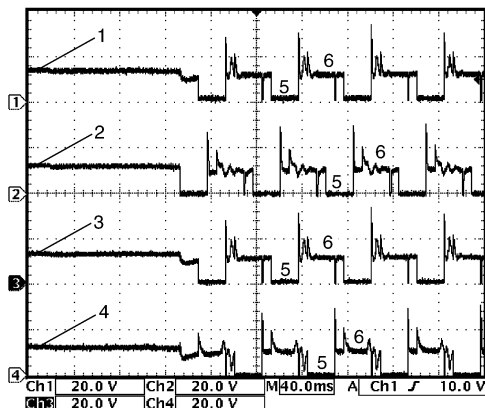
I4RS0B110052-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.4

EGR valve signal

Measurement terminal	CH1: "C37-4" to "C37-58" CH2: "C37-3" to "C37-58" CH3: "C37-19" to "C37-58" CH4: "C37-18" to "C37-58"
Oscilloscope setting	CH1: 20 V/DIV, CH2: 20 V/DIV CH3: 20 V/DIV, CH4: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	Engine at cranking



I4RS0B110053-01

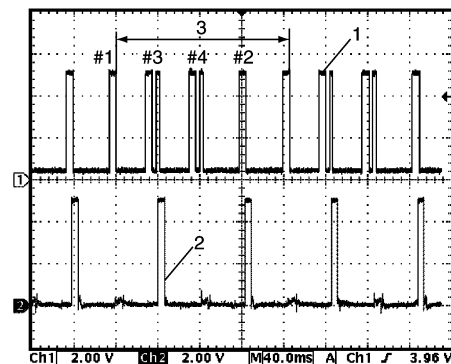
1. EGR valve stepper motor coil 1 signal
2. EGR valve stepper motor coil 2 signal
3. EGR valve stepper motor coil 3 signal
4. EGR valve stepper motor coil 4 signal
5. ON signal
6. OFF signal

Reference waveform No.5

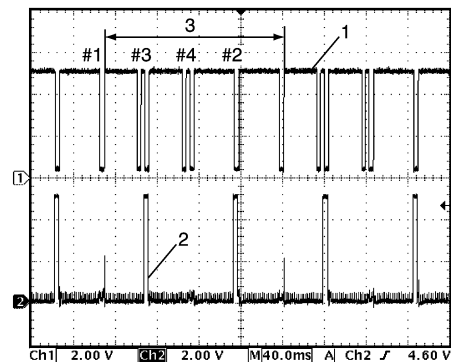
Ignition coil No.2 and No.3 signal (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-5" to "C37-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed

[A]



[B]



I4RS0B110054-01

[A]: VVT model

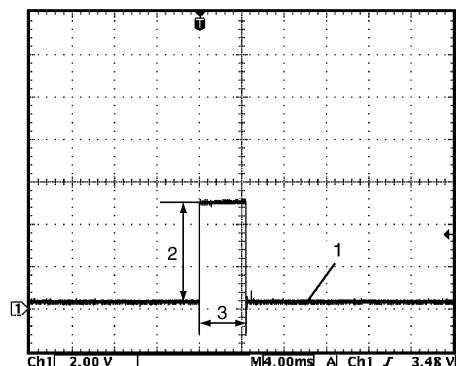
[B]: Non-VVT model

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.6

Ignition coil signal (1) with engine idling

Measurement terminal	CH1: "C37-6" to "C37-58"
Oscilloscope setting	CH1: 2 V/DIV TIME: 4 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



I4RS0B110055-02

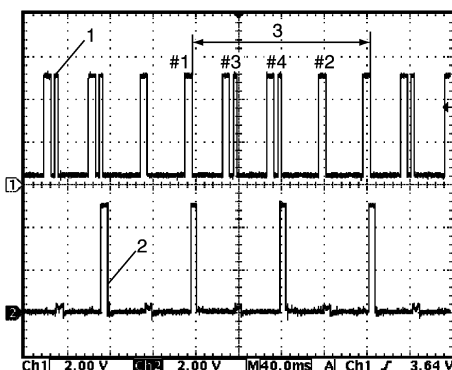
2. 4 – 6 V
3. Ignition coil pulse width: 4 – 5 msec.

Reference waveform No.7

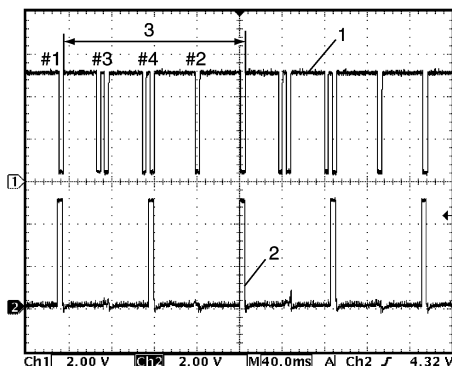
Ignition coil No.1 and No.4 signal (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-6" to "C37-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed

[A]



[B]



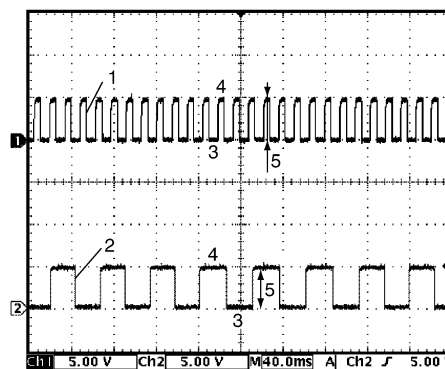
I4RS0B110056-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.8

VSS signal at 30 km/h (19 mph) (M/T model)

Measurement terminal	CH1: "C37-9" to "C37-58" CH2: "E23-25" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Drive vehicle at 30 km/h (19 mph)



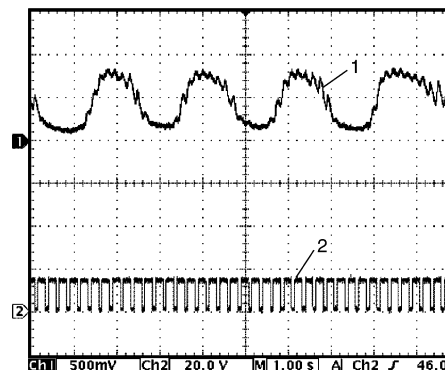
I4RS0B110057-02

1. VSS signal (M/T)
2. VSS signal for EPS control module
3. ON
4. OFF
5. 4 - 5 V

Reference waveform No.9

Heated oxygen sensor-1 signal (1) with engine idling

Measurement terminal	CH1: "C37-10" to "C37-57" CH2: "C37-46" to "C37-58"
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 20 V/DIV TIME: 1 s/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



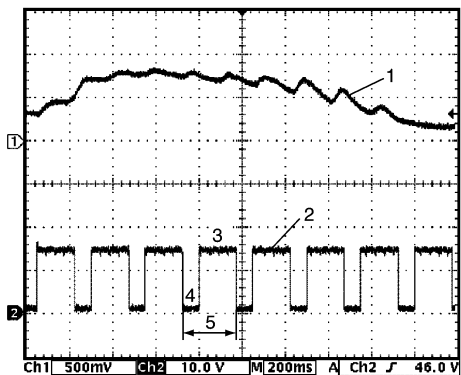
I4RS0B110058-01

2. Heated oxygen sensor-1 heater signal

Reference waveform No.10

Heated oxygen sensor-1 heater signal (2) with engine idling

Measurement terminal	CH1: "C37-10" to "C37-57" CH2: "C37-46" to "C37-58"
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



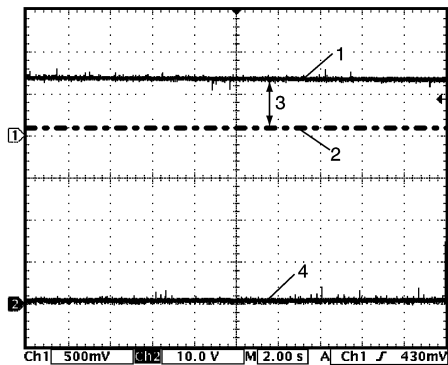
I4RS0B110059-01

1. Heated oxygen sensor-1 signal
3. OFF signal
4. ON signal
5. One duty cycle

Reference waveform No.11

Heated oxygen sensor-2 heater signal (4) with engine idling

Measurement terminal	CH1: "C37-11" to "C37-57" CH2: "C37-47" to "C37-58"
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 2 s/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 60 km/h (37 mph) for 10 min. • Engine at specified idle speed



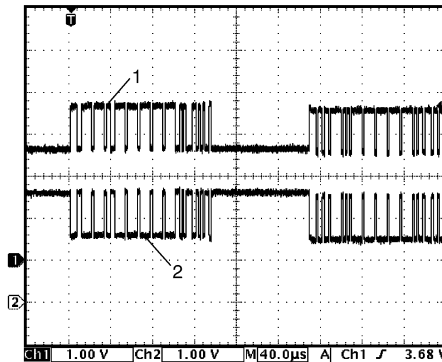
I4RS0B110060-01

1. Heated oxygen sensor-2 signal upper limit
2. Heated oxygen sensor-2 signal lower limit
3. Normal waveform range

Reference waveform No.12

CAN communication line signal from TCM (A/T or Automated Manual Transaxle model) with ignition switch turned ON

Measurement terminal	CH1: "C37-13" to "C37-58" CH2: "C37-12" to "C37-58"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μ s/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



I4RS0B110061-01

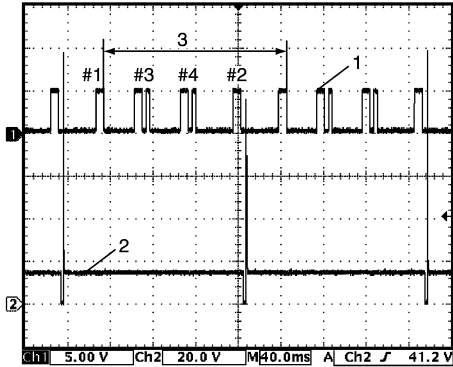
1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No.13

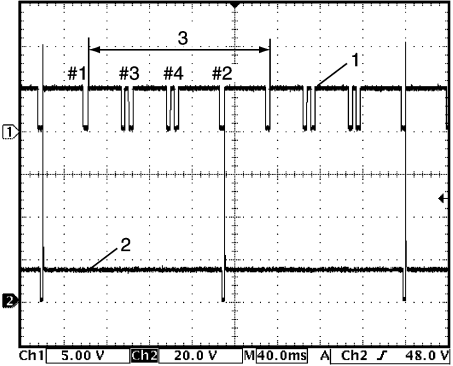
No.3 fuel injector signal (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-16" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed

[A]



[B]



I4RS0B110062-01

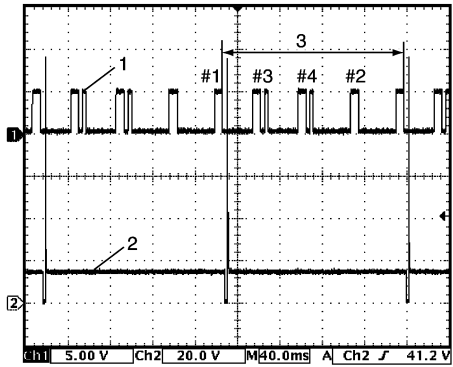
[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.14

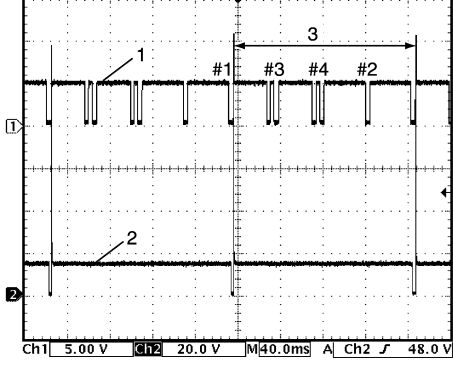
No.4 fuel injector signal (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-17" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed

[A]



[B]



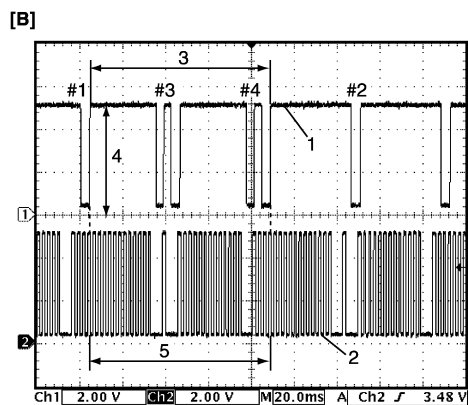
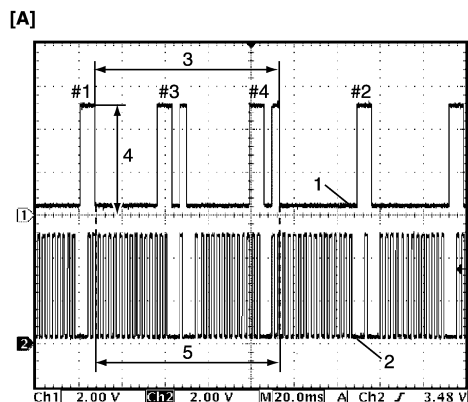
I4RS0B110063-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.15

CMP sensor signal with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-21" to "C37-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 20 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



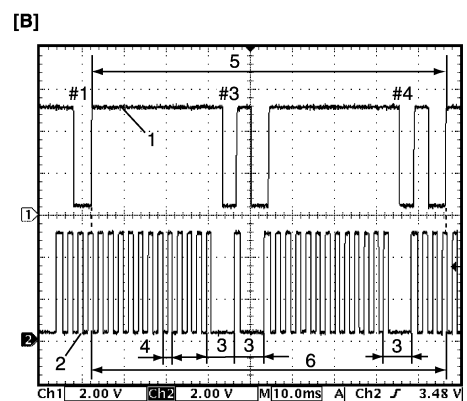
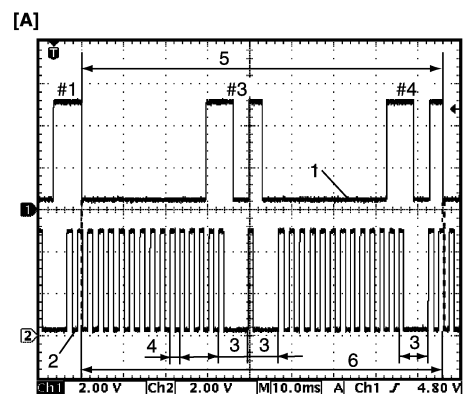
I4RS0B110064-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
2. CKP signal
3. 360° crank angle
4. 4 – 5 V
5. 36 – 6 = 30 CKP pulse

Reference waveform No.16

CMP sensor signal with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-21" to "C37-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



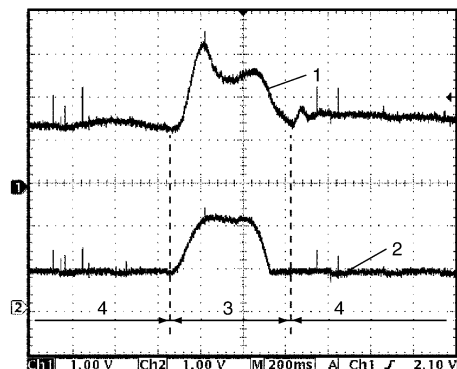
I4RS0B110065-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
2. CKP signal
3. 30° crank angle
4. 10° crank angle
5. 360° crank angle
6. 36 – 6 = 30 CKP pulse

Reference waveform No.17

Mass air flow sensor signal (1) with engine racing

Measurement terminal	CH1: "C37-26" to "C37-27" CH2: "C37-54" to "C37-55"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine racing



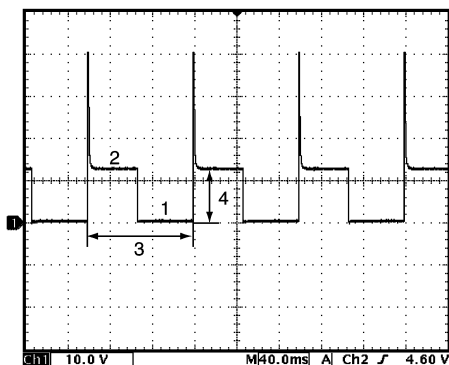
I4RS0B110066-01

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.18

EVAP canister purge valve signal

Measurement terminal	CH1: "C37-29" to "C37-58"
Oscilloscope setting	CH1: 10 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Set EVAP canister purge valve at 52% by using "Misc Test" of scan tool



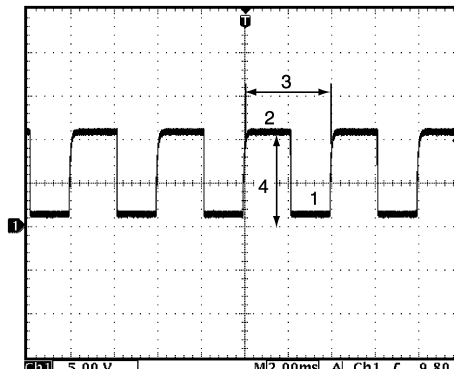
I4RS0B110067-01

1. ON signal
2. OFF signal
3. One duty cycle
4. 10 - 14 V

Reference waveform No.19

IAC valve signal with ignition switch turned ON

Measurement terminal	CH1: "C37-49" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON



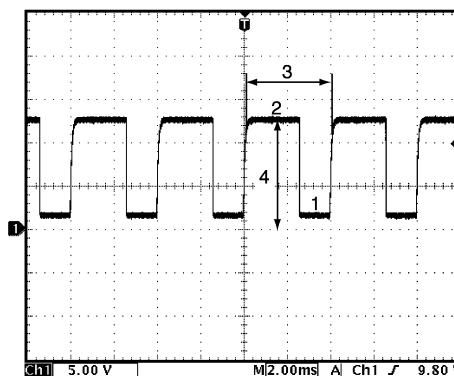
I4RS0B110068-01

1. ON signal
2. OFF signal
3. One duty cycle (Approx. 4 msec.)
4. 8 - 14 V

Reference waveform No.20

IAC valve signal

Measurement terminal	CH1: "C37-49" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



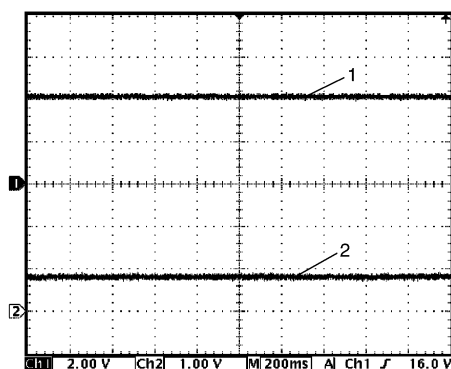
I4RS0B110069-01

1. ON signal
2. OFF signal
3. One duty cycle (Approx. 4 msec.)
4. 8 - 14 V

Reference waveform No.21

Manifold absolute pressure sensor signal (1) with ignition switch turned ON

Measurement terminal	CH1: "C37-53" to "C37-55" CH2: "C37-54" to "C37-55"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON



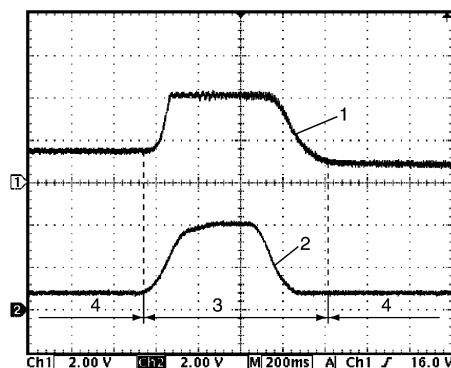
I4RS0B110070-01

2. Throttle position sensor signal

Reference waveform No.22

Manifold absolute pressure sensor signal (1) with engine racing

Measurement terminal	CH1: "C37-53" to "C37-55" CH2: "C37-54" to "C37-55"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine racing



I4RS0B110071-01

2. Throttle position sensor signal

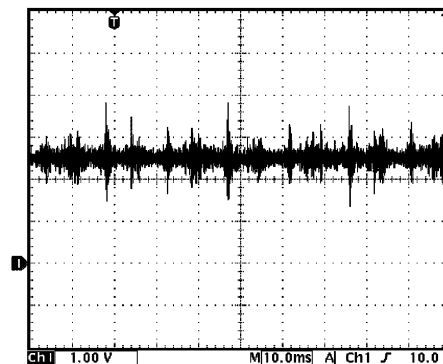
3. Racing

4. Idle

Reference waveform No.23

Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: "C37-56" to "C37-58"
Oscilloscope setting	CH1: 1 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Run engine at 4000 r/min.

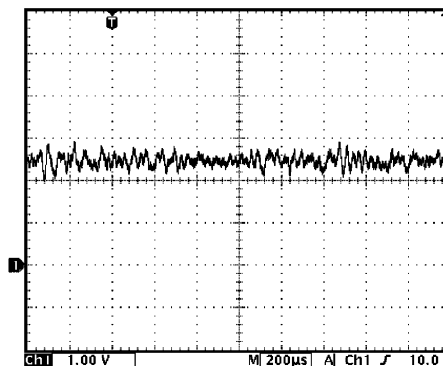


I4RS0B110072-01

Reference waveform No.24

Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: "C37-56" to "C37-58"
Oscilloscope setting	CH1: 1 V/DIV TIME: 200 μs/DIV
Measurement condition	- After warmed up to normal operating temperature - Run engine at 4000 r/min.

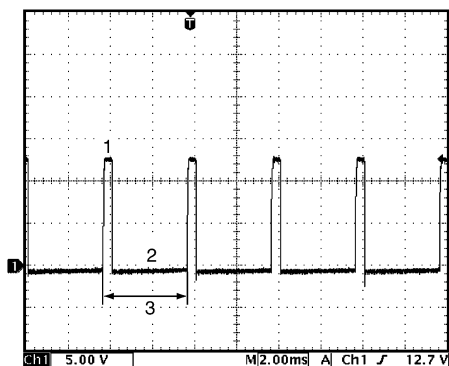


I4RS0B110073-01

Reference waveform No.25

Oil control valve signal with engine idling (VVT model)

Measurement terminal	CH1: "C37-60" to "C37-59"
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	At the moment of the ignition switch turned on



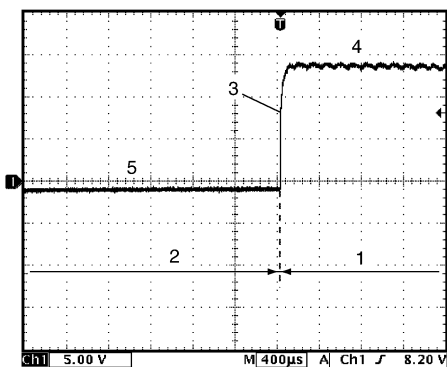
I4RS0B110074-01

1. ON signal
2. OFF signal
3. Only duty cycle

Reference waveform No.26

Oil control valve signal with engine racing (VVT model)

Measurement terminal	CH1: "C37-60" to "C37-59"
Oscilloscope setting	CH1: 5 V/DIV TIME: 400 μ s/DIV
Measurement condition	- After warmed up to normal operating temperature - Drive vehicle at 20 km/h (12 mph) and depress accelerator pedal fully



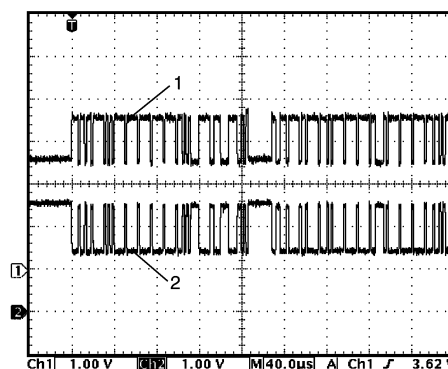
I4RS0B110075-01

1. Accelerator pedal depressed fully
2. Accelerator pedal depressed partially
3. Oil control valve signal
4. ON signal
5. OFF signal

Reference waveform No.27

CAN communication line signal from BCM with ignition switch turned ON

Measurement terminal	CH1: "E23-3" to "C37-58" CH2: "E23-18" to "C37-58"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μ s/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



I4RS0B110076-01

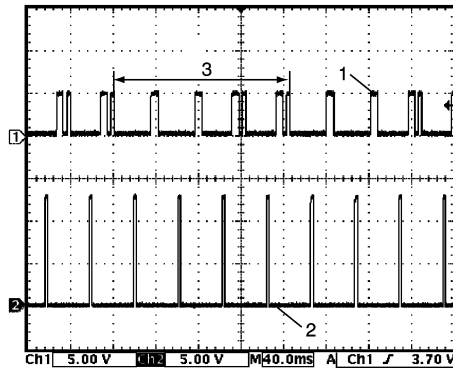
1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No.28

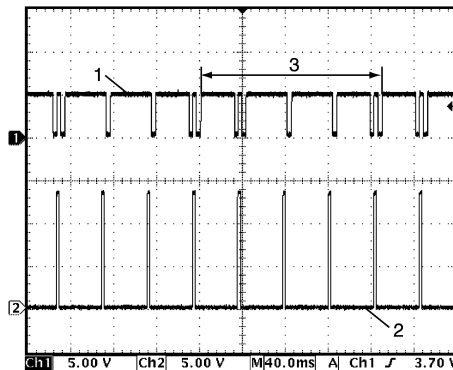
Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "E23-4" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed

[A]



[B]



I4RS0B110077-01

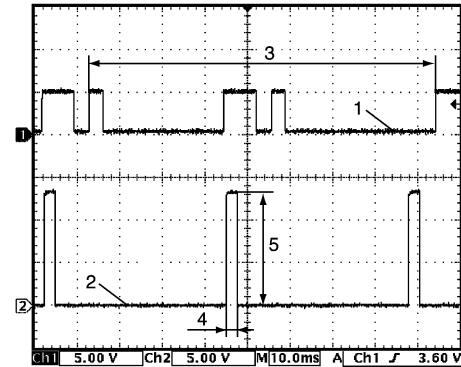
[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.29

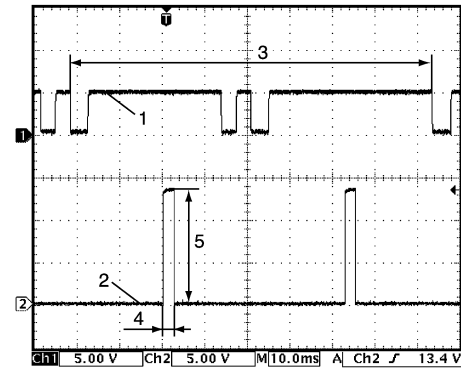
Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "E23-4" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed

[A]



[B]



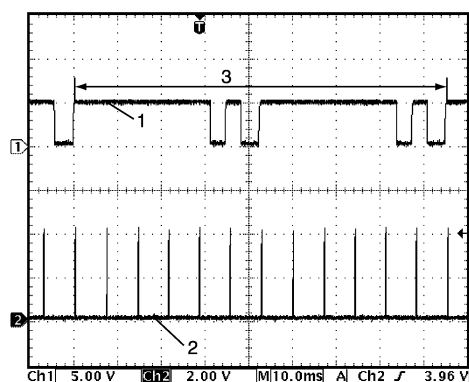
I4RS0B110078-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 360° crank angle
4. 2 to 4 msec.
5. 10 – 14 V

Reference waveform No.30

Engine revolution signal for TCM (Automated Manual Transaxle model) (2) with engine idling

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-7" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



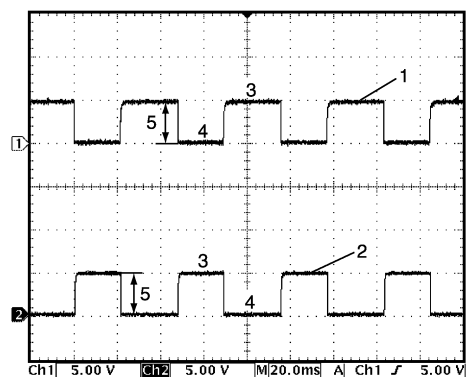
I4RS0B110079-01

1. Cylinder reference signal (CMP reference signal)
3. 360° crank angle

Reference waveform No.31

VSS signal at 30 km/h (19 mph) (Automated Manual Transaxle model)

Measurement terminal	CH1: "C37-9" to "C37-58" CH2: "C37-22" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Drive vehicle at 30 km/h (19 mph)



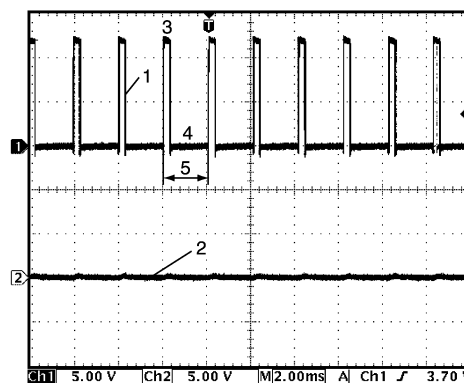
I4RS0B110080-02

1. VSS signal (Automated Manual Transaxle)
2. VSS signal for TCM (Automated Manual Transaxle)
3. OFF
4. ON
5. 4 – 5 V

Reference waveform No.32

Throttle actuator output signal with ignition switch turned ON

Measurement terminal	CH1: "C37-45" to "C37-58" CH2: "C37-44" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON and accelerator pedal at idle position



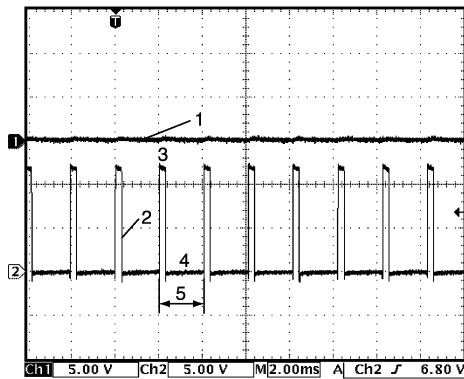
I4RS0B110081-02

1. Throttle actuator drive signal ("C37-45" terminal)
2. Throttle actuator drive signal ("C37-44" terminal)
3. ON signal
4. OFF signal
5. One duty cycle

Reference waveform No.33

Throttle actuator output signal with ignition switch turned ON

Measurement terminal	CH1: "C37-45" to "C37-58" CH2: "C37-44" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON and accelerator pedal at full depressed position



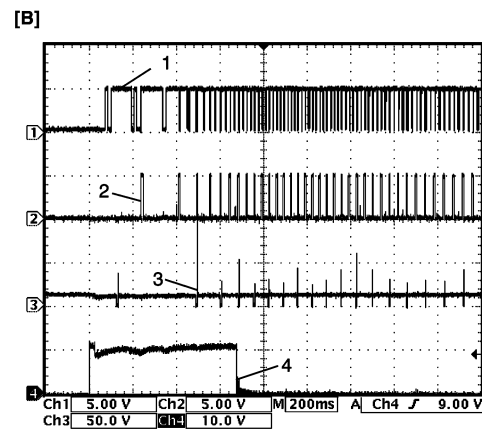
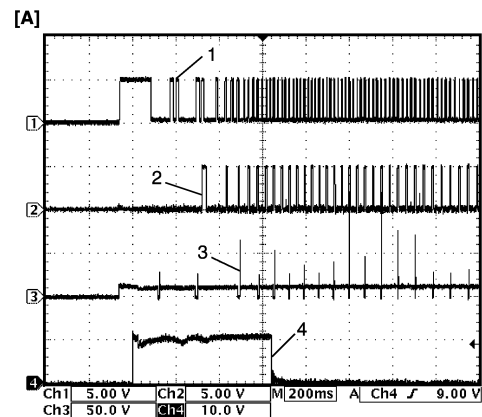
I4RS0B110082-02

- | |
|---|
| 1. Throttle actuator drive signal ("C37-45" terminal) |
| 2. Throttle actuator drive signal ("C37-44" terminal) |
| 3. ON signal |
| 4. OFF signal |
| 5. One duty cycle |

Reference waveform No.34

Ignition coil signal and fuel injector signal with engine cranking

Measurement terminal	CH1: "C37-20" to "C37-58" CH2: "C37-6" to "C37-58" CH3: "C37-1" to "C37-58" CH4: "C37-48" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV CH3: 50 V/DIV, CH4: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at cranking



I4RS0B110083-01

[A]: VVT model

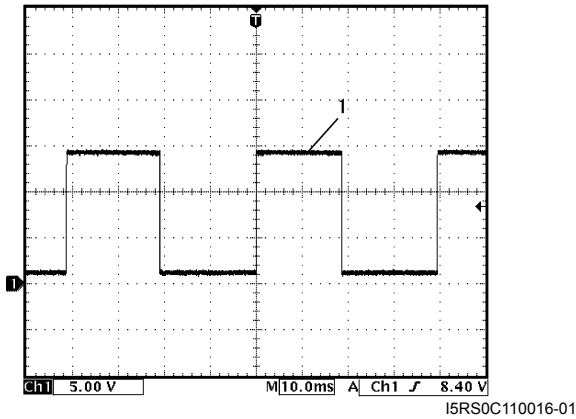
[B]: Non-VVT model

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 2. Ignition coil No.1 and No.4 signal |
| 3. No.1 fuel injector signal |
| 4. Engine start signal |

Reference waveform No.35

Generator field coil monitor signal (1) at engine idling (M16A engine)

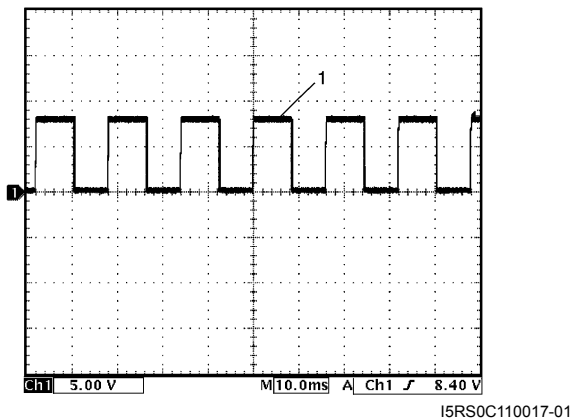
Measurement terminal	CH1: "C37-8" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed • Lighting switch at CLEARANCE position



Reference waveform No.36

Generator control signal (1) at engine idling (M16A engine)

Measurement terminal	CH1: "C37-28" to "C37-58"
Oscilloscope setting	CH1: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed • For a few sec. from headlight switch turned ON



Resistance Check

- 1) Remove ECM from its bracket referring to "Engine Control Module (ECM) Removal and Installation: For M13, M15 and M16 Engines in Section 1C in related manual".

CAUTION

Never touch terminals of ECM itself or connect voltmeter or ohmmeter (2).

- 2) Connect special tool to ECM connectors securely.

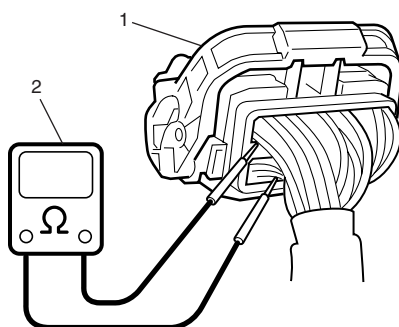
NOTE

Do not connect the other connector of special tool to ECM.

- 3) Check resistance between each pair of terminals of disconnected connectors (1) as listed in the following table.

CAUTION

- Be sure to connect ohmmeter probe from wire harness side of coupler.
- Be sure to turn OFF ignition switch for this check.
- Resistance in the following table represents that measured when parts temperature is 20 °C (68 °F).



I4RS0A110086-02

Terminals	Circuit	Standard resistance	Condition
C37-47 to E23-29	Heater of HO2S-2	4 – 15 Ω	—
E23-46 to E23-1/16	Radiator cooling fan relay No.1	160 – 240 Ω	—
E23-60 to E23-29	Main relay	160 – 240 Ω	Battery disconnected and ignition switch turned ON
E23-15 to E23-29	Fuel pump relay	160 – 240 Ω	—
C37-16 to E23-1/16	No.3 fuel injector	10.8 – 18.2 Ω	—
C37-17 to E23-1/16	No.4 fuel injector		
C37-4 to E23-1/16	EGR valve (stepping motor No.1 coil)	20 – 31 Ω	—
C37-29 to E23-1/16	EVAP canister purge valve	28 – 35 Ω	—
C37-2 to E23-1/16	No.2 fuel injector	10.8 – 18.2 Ω	—
C37-3 to E23-1/16	EGR valve (stepping motor No.2 coil)	20 – 31 Ω	—
C37-18 to E23-1/16	EGR valve (stepping motor No.4 coil)		
C37-19 to E23-1/16	EGR valve (stepping motor No.3 coil)		
C37-46 to E23-29	Heater of HO2S-1	2 – 11 Ω	—
C37-1 to E23-1/16	No.1 fuel injector	10.8 – 18.2 Ω	—
E23-47 to E23-1/16	A/C compressor relay (A/C model)	160 – 240 Ω	—
C37-60 to C37-59	Oil control valve (VVT model)	6 – 15 Ω	—
E23-45 to E23-1/16	Throttle actuator control relay (Electric throttle body model)	160 – 240 Ω	—

Repair Instructions

Idle Speed / Idle Air Control (IAC) Duty Inspection (Non-electric Throttle Body Model)

S6RS0B1116001

Before idle speed / IAC duty check, make sure of the following.

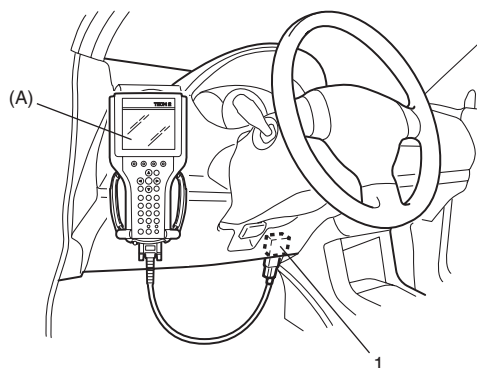
- Lead wires and hoses of electronic fuel injection and engine and emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- Valve lash is checked according to maintenance schedule.
- Ignition timing is within specification.
- All accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.
- No abnormal air drawn in from air intake system.

After all items are confirmed, check idle speed and IAC duty as follows.

NOTE

Before starting engine, place transmission gear shift lever in “Neutral” (shift selector lever to “P” range for A/T model), and set parking brake and block drive wheels.

- 1) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool


I4RS0B110093-01

- 2) Warm up engine to normal operating temperature.
- 3) Check engine idle speed and "IAC duty" by using "Data List" mode on scan tool to check "IAC duty".
- 4) If duty and/or idle speed is out of specification, inspect idle air control system referring to "Idle Air Control System Check (Non-electric Throttle Body Model): For M13, M15 and M16 Engines in related manual".

Engine idle speed and IAC duty

	A/C OFF	A/C ON
M/T vehicle	700 ± 50 rpm 10 – 55%	850 ± 50 rpm
A/T vehicle at P/N range	750 ± 50 rpm 10 – 55%	850 ± 50 rpm

- 5) Check that specified engine idle speed is obtained with A/C turned ON if vehicle is equipped with A/C. If not, check A/C system circuit and idle air control system.

Idle Speed and IAC Throttle Valve Opening Inspection (Electric Throttle Body Model)

S6RS0B1116002

Before idle speed check, make sure of the following.

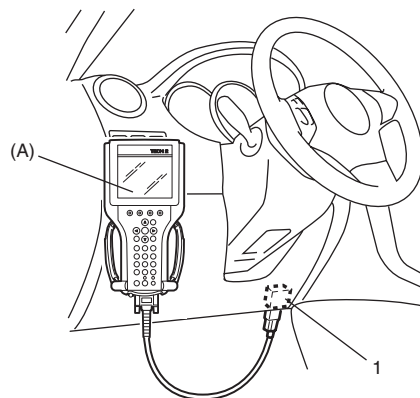
- Lead wires and hoses of electronic fuel injection and engine and emission control systems are connected securely.
- Valve lash is checked according to maintenance schedule.
- Ignition timing is within specification.
- All accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.
- No abnormal air drawn in from air intake system.

After all items are confirmed, check idle speed and IAC throttle opening as follows.

NOTE

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "N" range for Automated Manual Transaxle model), and set parking brake and block drive wheels.

- 1) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool


I5JB0A110106-01

- 2) Warm up engine to normal operating temperature.
- 3) Check engine idle speed and "IAC throttle opening" by using "Data List" mode on scan tool to check "IAC throttle opening".
- 4) If check result is out of specification, inspect electric throttle body assembly referring to "Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C".

Engine idle speed and IAC throttle opening

	A/C OFF	A/C ON
For Automated Manual Transaxle model and M16 engine	700 ± 50 rpm 5 – 55%	850 ± 50 rpm

- 5) Check that specified engine idle speed is obtained with A/C turned ON if vehicle is equipped with A/C. If not, check A/C system.

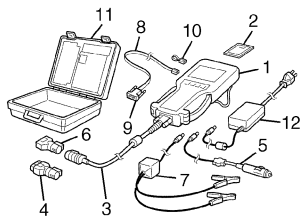
Special Tools and Equipment

Special Tool

S6RS0B1118001

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 loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply



Engine Electrical Devices

For M13, M15 and M16 Engines

Repair Instructions

Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model)

S6RS0B1316008

⚠ WARNING

Never touch throttle valve with finger while ignition switch is turned ON and accelerator pedal is depressed. Otherwise, injury may result by pinching the finger between throttle valve and throttle body housing.

⚠ CAUTION

- Do not disassemble electric throttle body assembly.
- Do not expose electric throttle body assembly to excessive shock like a dropping it. If electric throttle body assembly has been exposed to excessive shock, it should be replaced.
- Be careful not to accurate a foreign material (like dust and/or metallic particle) to the throttle body housing and/or throttle valve.
Otherwise, the throttle body assembly is breaking down by throttle valve accretion.
- Do not apply excessive moving force to throttle valve for throttle valve operation check and/or TP sensor performance check.
Otherwise, the throttle body assembly is breaking down by damaging the internal resinous gear of throttle valve actuator.

NOTE

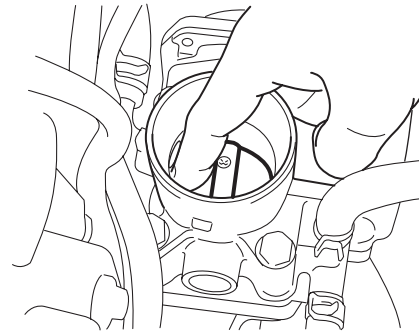
After replacing electric throttle body assembly, perform calibration of electric throttle body assembly referring to “Electric Throttle Body System Calibration (Electric Throttle Body Model): For M13, M15 and M16 Engines in related manual”.

Throttle Valve Visual Check

- 1) Remove air cleaner outlet hose.
- 2) Check that there isn't any foreign matter caught between throttle valve and throttle body housing. If there is, take it out after removing throttle body referring to “Electric Throttle Body Assembly Removal and Installation: For M13, M15 and M16 Engines in Section 1D” and clean inside of throttle body thoroughly.

Throttle Valve Operation Check

- 1) Remove air cleaner outlet hose.
- 2) Turn OFF ignition switch.
- 3) Move throttle valve with finger to its full open position and check that it moves smoothly.
- 4) Move throttle valve with finger to its completely closed position and check that it moves smoothly.



I4RS0B130004-01

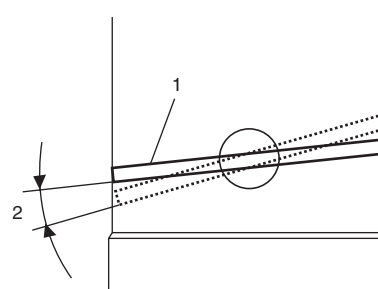
- 5) Take off finger from throttle valve (1) which is at full open position and check that it moves smoothly by its return spring and open spring force back to default position (2) (position where throttle valve is open as specified below from completely closed position).

Default position

For Automated Manual Transaxle: 8°

For M16A engine: 6°

- 6) Take off finger from throttle valve (1) which is at completely closed position and check that it moves smoothly by its return spring and open spring force back to default position.
If check result is not satisfactory, replace electric throttle body assembly.



I4RS0B130005-01

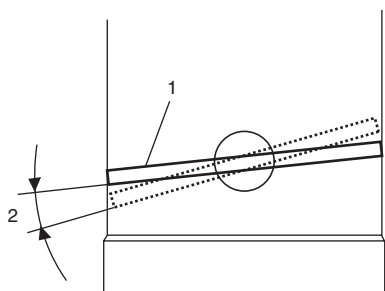
Electric Throttle Body Assembly Operation Check

- 1) Remove air cleaner outlet hose.
- 2) Turn ON ignition switch.
- 3) Depress accelerator pedal gradually and check that throttle valve moves smoothly until it opens fully.
- 4) Release accelerator pedal depressed in Step 3) and check that throttle valve (1) moves back to default position (2) (position where throttle valve is open as specified below from its completely closed position).

Default position

For Automated Manual Transaxle: 8°

For M16A engine: 6°



I4RS0B130005-01

If check result is satisfactory, electric throttle body system is in good condition. If check result is not satisfactory, proceed to next step.

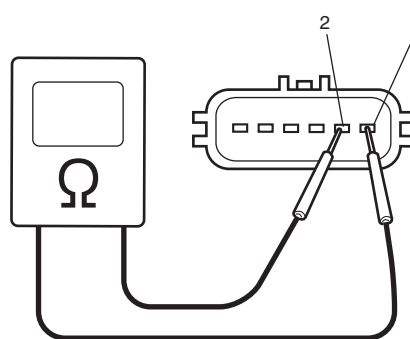
- 5) Perform "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection (Electric throttle body model)", "Throttle Actuator (Motor) Check" and "Throttle Position Sensor Performance Check". If check results are not satisfactory, replace electric throttle body assembly. If check results are satisfactory, wire circuit and/or ECM are faulty.

Throttle Actuator (Motor) Check

- 1) Turn OFF ignition switch.
- 2) Disconnect connector from electric throttle body assembly.
- 3) Measure resistance between "M1" terminal (1) and "M2" terminal (2) of electric throttle body assembly. If measured resistance is out of specified value, replace electric throttle body assembly.

Throttle actuator (motor) resistance

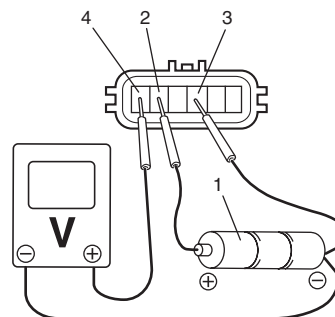
0.3 – 100 Ω at 20 °C, 68 °F



I4RS0B130023-01

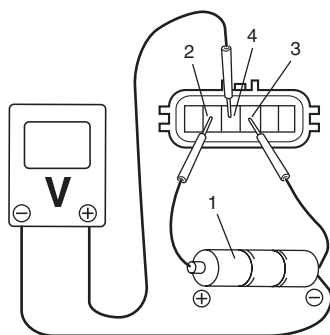
Throttle Position Sensor Performance Check

- 1) Remove air cleaner outlet hose.
- 2) Turn OFF ignition switch.
- 3) Disconnect connector from electric throttle body assembly.
- 4) Check throttle position sensor (main and sub) output voltage as following steps.
 - a) For throttle position sensor (main), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to "Vin" terminal (2) and negative terminal to "Ground" terminal (3) of sensor. Then using voltmeter, connect positive terminal to "Vout 1" terminal (4) of sensor and negative terminal to battery.



I4RS0B130007-02

- b) For throttle position sensor (sub), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 2” terminal (4) of sensor and negative terminal to battery.



I4RS0B130008-01

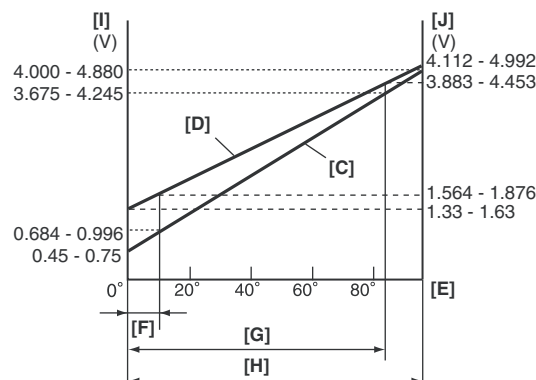
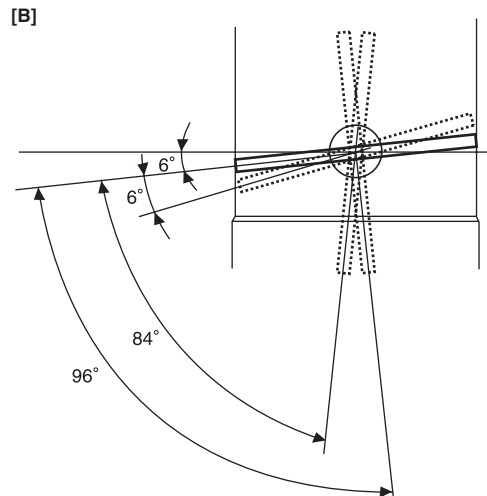
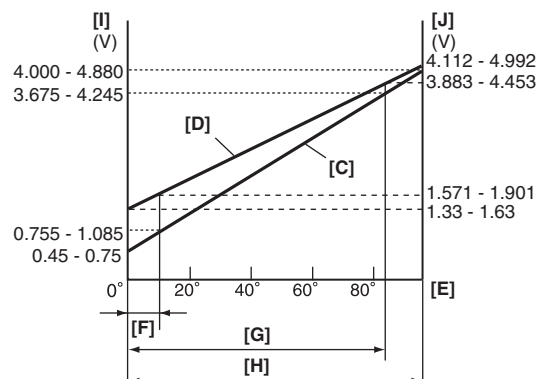
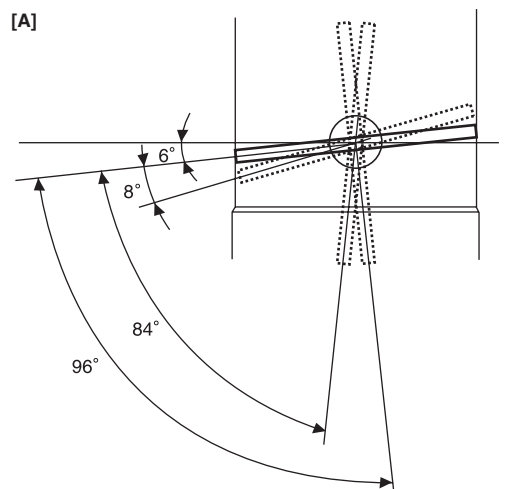
- c) Measure output voltage variation while throttle valve is opened and closed as following specification.

If sensor voltage is out of specified value and linear variation as the following graph, replace electric throttle body assembly.

Throttle position sensor output voltage

Throttle position sensor (main) [C]: 0.45 – 4.88 V, varying according to throttle valve opening by finger (Voltage should vary by 0.04 V for each 1° valve opening)

Throttle position sensor (sub) [D]: 1.33 – 4.992 V varying according to throttle valve opening by finger (Voltage should vary by about 0.032 V for each 1° valve opening)



I6RS0B131001-03

[A]: Automated Manual Transaxle model

[B]: M16A engine model

[E]:	Throttle valve opening
[F]:	Position where throttle valve is open in default position from completely closed position
[G]:	Angle obtained when accelerator pedal is depressed fully (84°)
[H]:	Angle obtained when throttle valve is fully opened with finger (96°)
[I]:	Throttle position sensor (main) output voltage
[J]:	Throttle position sensor (sub) output voltage

Heated Oxygen Sensor (HO2S-1 and HO2S-2) Removal and Installation

S6RS0B1316016

Removal

▲ WARNING

To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

- 1) Disconnect negative cable at battery.
- 2) Disconnect connector of heated oxygen sensor and release its wire harness from clamps.
- 3) Perform following items before removing heated oxygen sensor.
 - a) For HO2S-1, remove exhaust manifold referring to "Exhaust Manifold Removal and Installation: For M13, M15 and M16 Engines in Section 1K", if necessary.
 - b) For HO2S-2, hoist vehicle.
- 4) Remove heated oxygen sensor from exhaust pipe or exhaust manifold.

Installation

Reverse removal procedure noting the following.

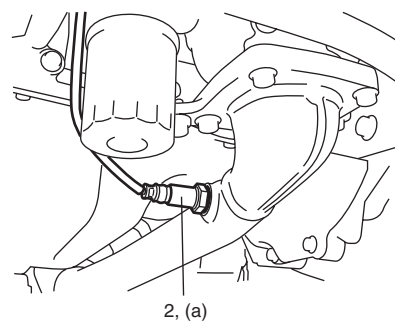
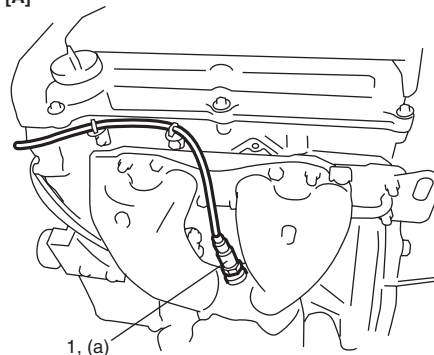
- Tighten heated oxygen sensor to specified torque.

Tightening torque

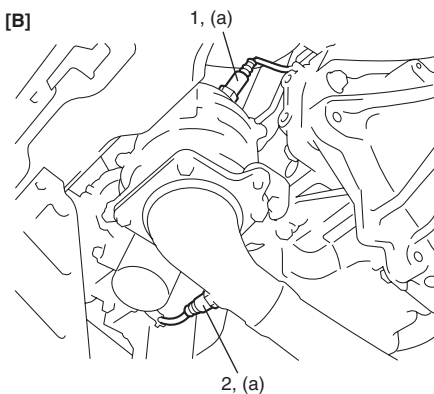
Heated oxygen sensor (a): 45 N·m (4.5 kgf-m, 32.5 lb-ft)

- Install exhaust manifold referring to "Exhaust Manifold Removal and Installation: For M13, M15 and M16 Engines in Section 1K", if removed.
- Connect connector of heated oxygen sensor and clamp wire harness securely.
- After installing heated oxygen sensor, start engine and check that no exhaust gas leakage exists.

[A]



[B]



I6RS0B131003-01

[A]: M13A and M15A engines

[B]: M16A engine

1. HO2S-1

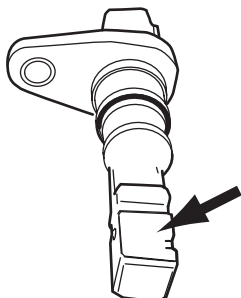
2. HO2S-2

Vehicle Speed Sensor (VSS) Inspection (If Equipped)

S6RS0B1316021

Visual check

- Check that O-ring is free from damage
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.



I4RS0B130018-02

Performance check

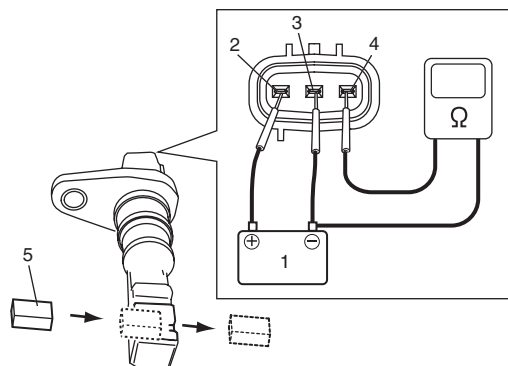
- 1) Remove metal particles on end face of VSS, if any.
- 2) Arrange 12 V battery (1) and connect its positive terminal to "Vin" terminal (2) and negative terminal to "Ground" terminal (3) of sensor. Then using

ohmmeter, measure resistance between "Vout" terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of VSS.

If resistance does not vary as specified below, replace VSS.

VSS resistance

Resistance varies from less than 100 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 100 Ω (ON)



I4RS0B130019-01

Specifications

Tightening Torque Specifications

S6RS0B1317001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Heated oxygen sensor	45	4.5	32.5	🔧

Reference:

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

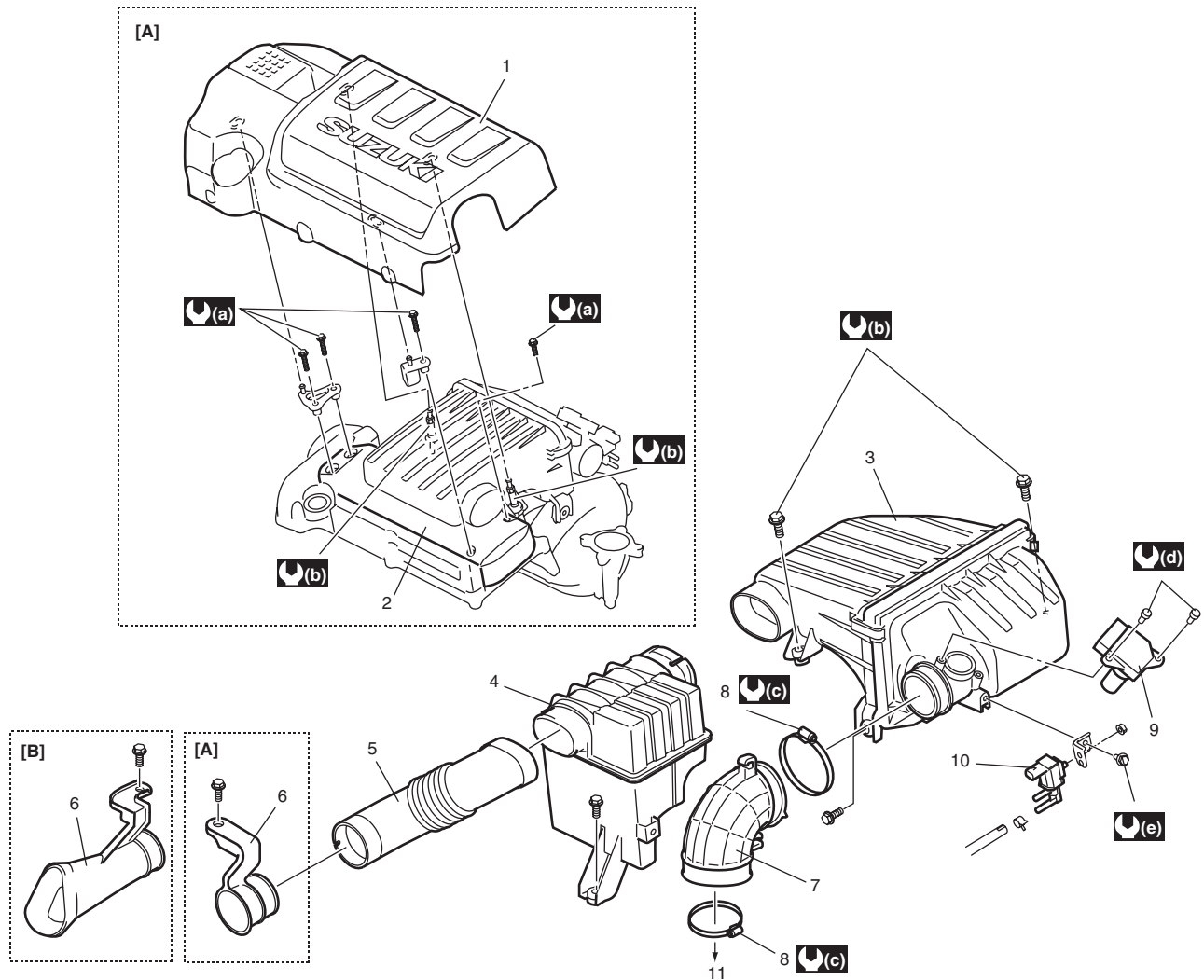
Engine Mechanical

For M13, M15 and M16 Engines

Repair Instructions

Air Cleaner Components

S6RS0B1416045



I6RS0B141002-03

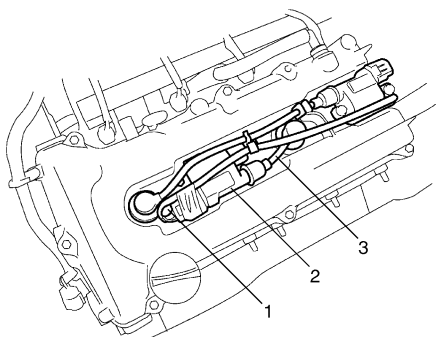
[A]: For M16A engine model	5. Air suction hose	11. To throttle body
[B]: For other than M16A engine model	6. Air cleaner suction pipe	(a) : 8 N·m (0.8 kgf-m, 6.0 lb-ft)
1. Engine Cover	7. Air cleaner outlet hose	(b) : 11 N·m (1.1 kgf-m, 8.0 lb-ft)
2. Cylinder head upper cover	8. Hose clamp	(c) : 3 N·m (0.3 kgf-m, 2.5 lb-ft)
3. Air cleaner assembly	9. MAF sensor	(d) : 1.5 N·m (0.15 kgf-m, 1.0 lb-ft)
4. Air intake pipe	10. EVAP canister purge valve	(e) : 5 N·m (0.5 kgf-m, 4.0 lb-ft)

Cylinder Head Cover Removal and Installation

S6RS0B1416003

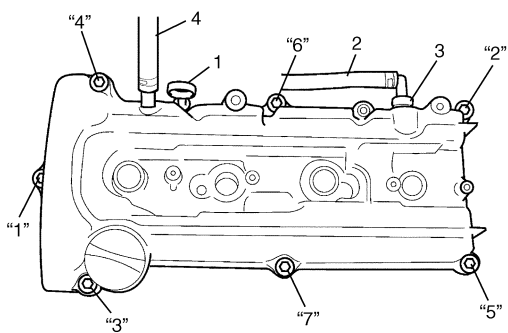
Removal

- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner assembly and air suction hose referring to "Air Cleaner Components: For M13, M15 and M16 Engines".
- 3) Remove cylinder head upper cover.
- 4) Disconnect ignition coil couplers (1).
- 5) Remove ignition coil assemblies (2) with high-tension cord (3).
- 6) Remove wire harness clamp from cylinder head cover.



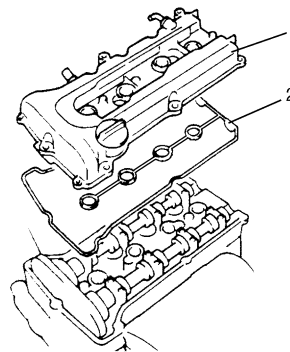
I2RH0B140032-01

- 7) Remove oil level gauge (1).
- 8) Disconnect PCV hose (2) from PCV valve (3) and disconnect breather hose (4) from cylinder head cover.
- 9) Remove cylinder head cover mounting bolts in such order as indicated in the figure.



I2RH0B140033-01

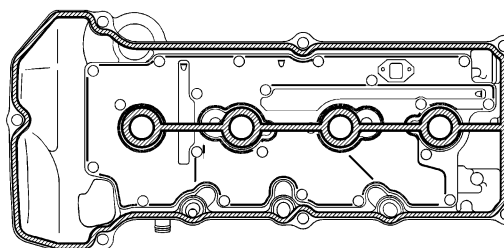
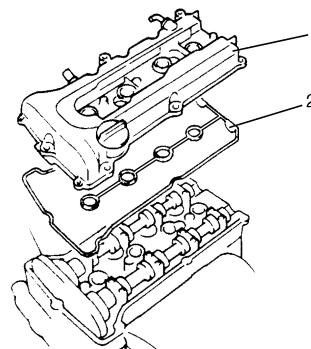
- 10) Remove cylinder head cover (1) with cylinder head cover gasket (2).



I6RS0B141004-01

Installation

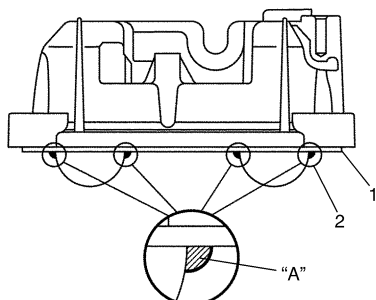
- 1) Install new cylinder head cover gasket (2) to cylinder head cover (1) as shown in the figure.



I6RS0B141005-01

- 2) Remove oil, old sealant, and dust from sealing surfaces on cylinder head and cover. After cleaning, apply sealant "A" to the following point.
 - Cylinder head cover gasket (1) sealing surface area (2) as shown.

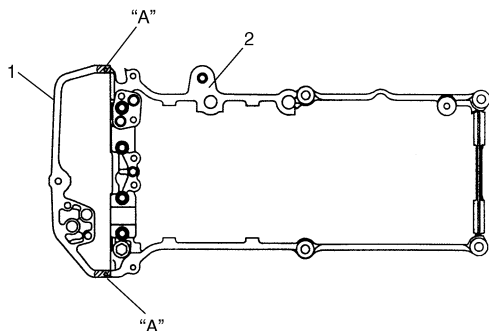
"A": Water tight sealant 99000-31250 (SUZUKI Bond No.1207F)



I2RH0B140036-01

- Timing chain cover (1) and cylinder head (2) mating surface as shown.

"A": Water tight sealant 99000-31250 (SUZUKI Bond No.1207F)



I2RH0B140037-01

- 3) Install cylinder head cover to cylinder head.

NOTE

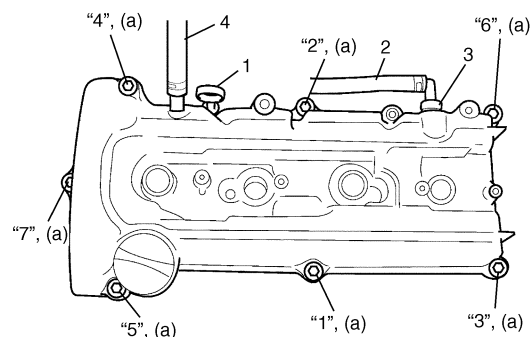
When installing cylinder head cover, use care so that cylinder head cover gasket or spark plug hole gaskets will not get out of place or fall off.

- 4) Tighten cylinder head cover bolts as follows.
 - a) Tighten cylinder head cover bolts to 3 N·m (0.3 kgf-m, 2.5 lb-ft) according to numerical order ("1" through "7") as shown in figure.
 - b) In the same manner as in Step, a) tighten them to 5 N·m (0.5 kgf-m, 4.0 lb-ft).
 - c) Retighten them by turning through 8 N·m (0.8 kgf-m, 6.0 lb-ft) in same manner as Step a).

Tightening torque

Cylinder head cover bolt (a): Tighten 3 N·m (0.3 kgf-m, 2.5 lb-ft), 5 N·m (0.5 kgf-m, 4.0 lb-ft) and 8 N·m (0.8 kgf-m, 6.0 lb-ft) by the specified procedure

- 5) Connect PCV hose (2) to PCV valve (1).
- 6) Connect breather hose (4).
- 7) Install oil level gauge.

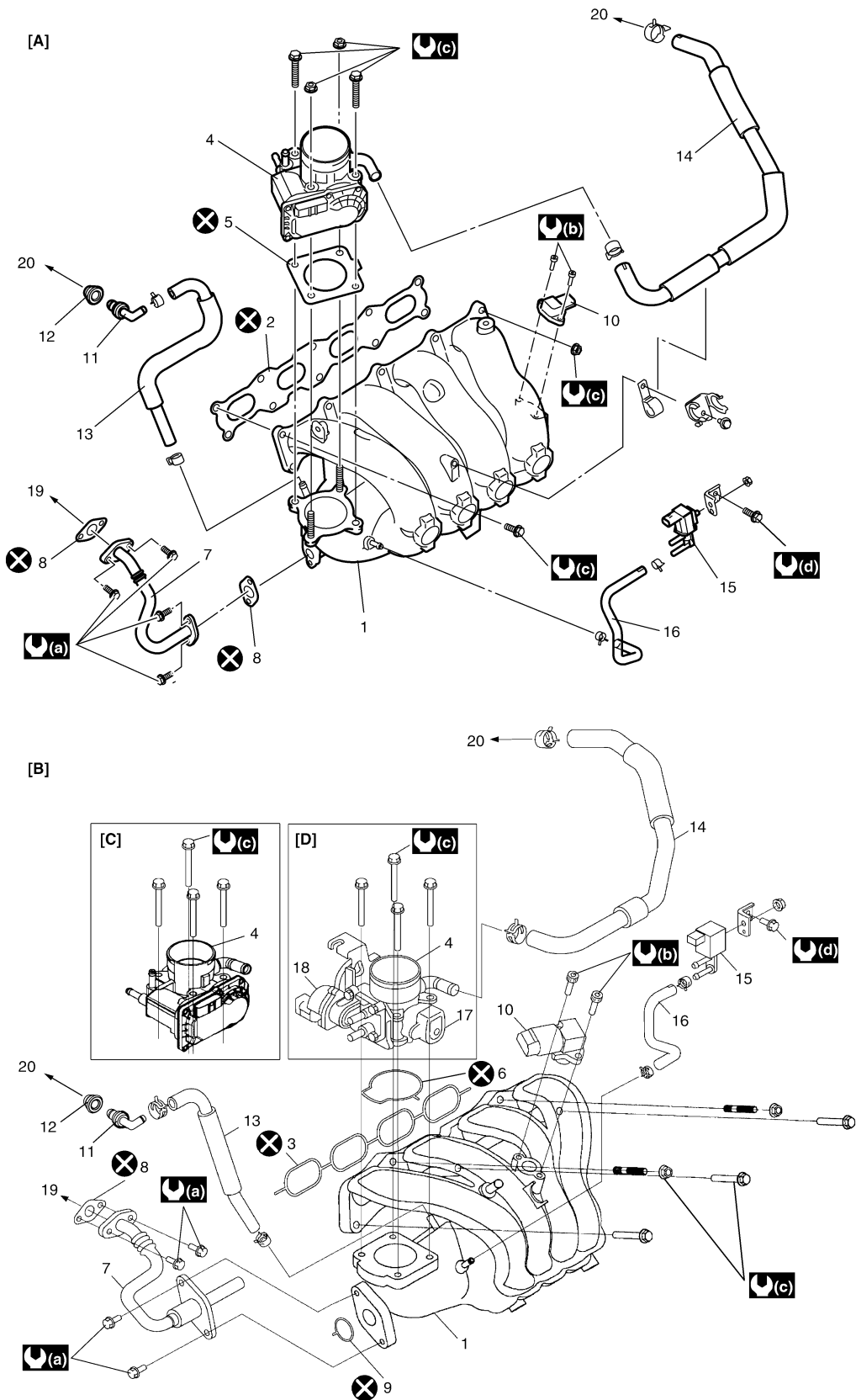


I3RH0B140016-01

- 8) Install wire harness clamp to cylinder head cover.
- 9) Install ignition coil assemblies with high-tension cord.
- 10) Connect ignition coil couplers and clamp harness securely.
- 11) Install cylinder head upper cover.
- 12) Install air cleaner case and resonator.
- 13) Connect negative cable at battery.

Throttle Body and Intake Manifold Components

S6RS0B1416046



I6RS0B141006-05

[A]: For M16A engine model	5. Throttle body gasket	13. PCV hose	(a) : 11 N-m (1.1 kgf-m, 8.0 lb-ft)
[B]: For other than M16A engine model	6. Throttle body O-ring	14. Breather hose	(b) : 8 N-m (0.8 kgf-m, 6.0 lb-ft)
[C]: For Automated Manual Transaxle model	7. EGR pipe	15. EVAP canister purge valve	(c) : 23 N-m (2.3 kgf-m, 17.0 lb-ft)

[D]: For A/T and M/T models	8. Gasket	16. EVAP canister purge valve hose	 (d) : 5 N·m (0.5 kgf-m, 4.0 lb-ft)
1. Intake manifold	9. O-ring	17. TP sensor	 : Do not reuse.
2. Intake manifold gasket	10. MAP sensor	18. IAC valve	
3. Intake manifold O-ring	11. PCV valve	19. To EGR valve	
4. Throttle body	12. PCV valve seal	20. To cylinder head cover	

Throttle Body On-Vehicle Inspection (For M16A Engine Model)

S6RS0B1416047

Check electric throttle body assembly referring to “Throttle Valve Operation Check” and “Electric Throttle Body Assembly Operation Check” under “Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C”.

Electric Throttle Body Assembly Removal and Installation

S6RS0B1416008

CAUTION

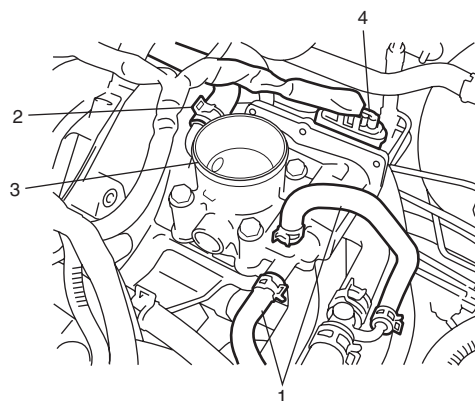
Never disassemble electric throttle body. Disassembly will spoil its original performance. If faulty condition is found, replace it with new one.

NOTE

After replacing electric throttle body assembly, perform calibration of throttle valve referring to “Electric Throttle Body System Calibration (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual”.

Removal

- 1) Disconnect negative cable at battery.
- 2) Drain coolant referring to “Cooling System Draining: For M13, M15 and M16 Engines in Section 1F in related manual”.
- 3) Remove air cleaner assembly referring to “Air Cleaner Components: For M13, M15 and M16 Engines”.
- 4) Detach EVAP canister and purge valve chamber, and remove air cleaner outlet hose.
- 5) Disconnect engine coolant hoses (1) and breather hose (2) from electric throttle body assembly (3).
- 6) Disconnect connector (4) from electric throttle body assembly.

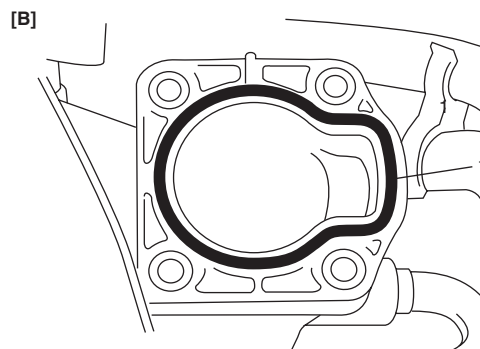
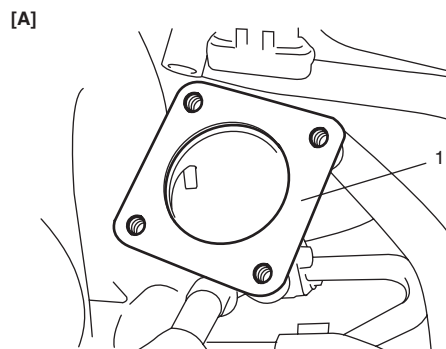


I4RS0B140004-02

- 7) Remove electric throttle body assembly from intake manifold.

Installation

- 1) Clean mating surfaces and install new throttle body gasket (1) to intake manifold.



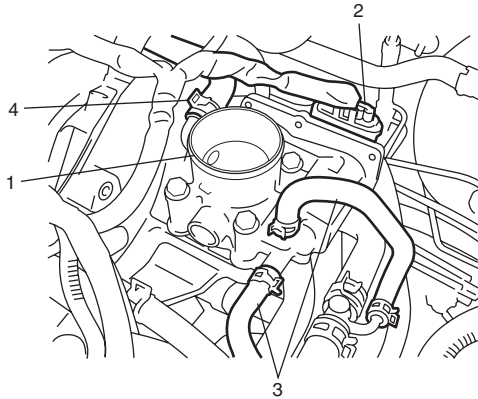
I6RS0B141007-01

[A]: For M16A engine model

[B]: For other than M16A engine model

1D-6 Engine Mechanical: For M13, M15 and M16 Engines

- 2) Install electric throttle body assembly (1) to intake manifold.
- 3) Connect connector (2) to electric throttle body assembly securely.
- 4) Connect engine coolant hoses (3) and breather hose (4) to electric throttle body assembly (1).



I4RS0B140006-01

- 5) Install air cleaner assembly referring to "Air Cleaner Components: For M13, M15 and M16 Engines".
- 6) Install EVAP canister and purge valve chamber and air cleaner outlet hose.
- 7) Refill coolant referring to "Cooling System Flush and Refill: For M13, M15 and M16 Engines in Section 1F in related manual".
- 8) Connect negative cable at battery.

Throttle Body Cleaning (For M16A Engine Model)

S6RS0B1416048

Clean electric throttle body assembly referring to "Throttle Valve Visual Check" under "Electric Throttle Body Assembly On-Vehicle Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C".

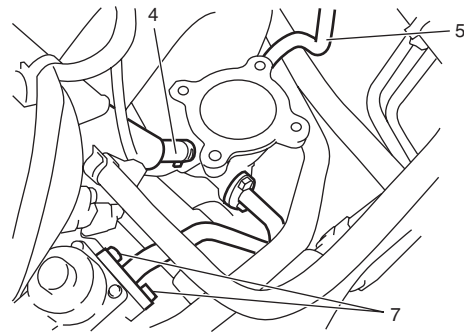
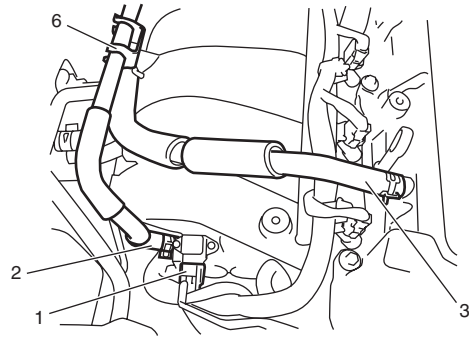
Intake Manifold Removal and Installation (For M16A Engine Model)

S6RS0B1416049

Removal

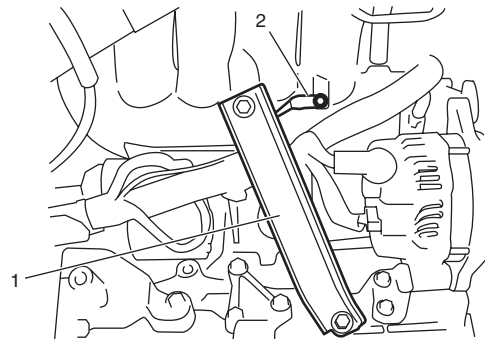
- 1) Remove cowl top plate referring to "Cowl Top Components in Section 9K".
- 2) Remove throttle body referring to "Electric Throttle Body Assembly Removal and Installation: For M13, M15 and M16 Engines".
- 3) Disconnect MAP sensor coupler (1).
- 4) Disconnect the following hoses:
 - Brake booster hose (2) from cylinder head cover
 - Breather hose (3) from cylinder head cover
 - PCV hose (4) from intake manifold
 - EVAP canister purge valve hose (5) from intake manifold

- 5) Remove hose clamp (6) from intake manifold.
- 6) Remove EGR pipe bolt (7) from EGR valve.



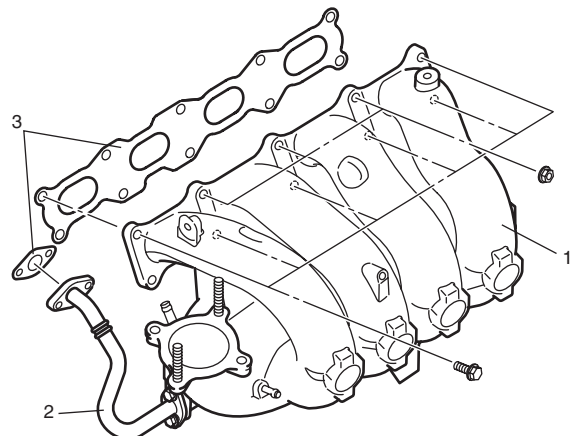
I6RS0B141008-01

- 7) Remove stiffener (1) and ground terminal (2) from intake manifold.



I6RS0B141010-01

- 8) Remove intake manifold (1) with EGR pipe (2) from cylinder head, and then remove their gaskets (3).



I6RS0B141009-01

- 9) Remove EGR pipe from intake manifold, if necessary.

Installation

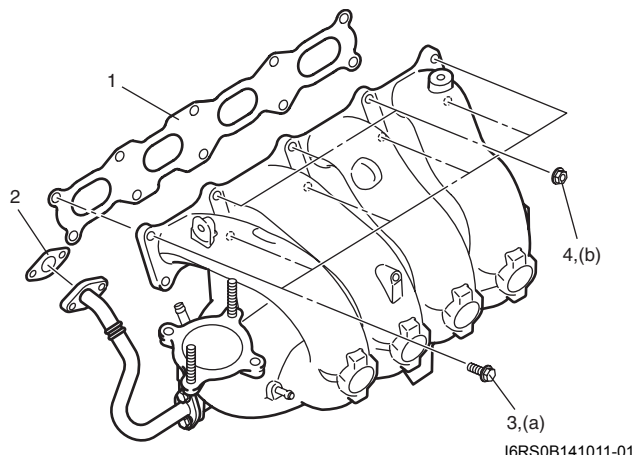
Reverse removal procedure for installation noting the followings.

- Use new intake manifold gasket (1).
- Use new EGR pipe gasket (2).
- Install intake manifold bolts (3) and nuts (4) to specified torque.

Tightening torque

Intake manifold bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)

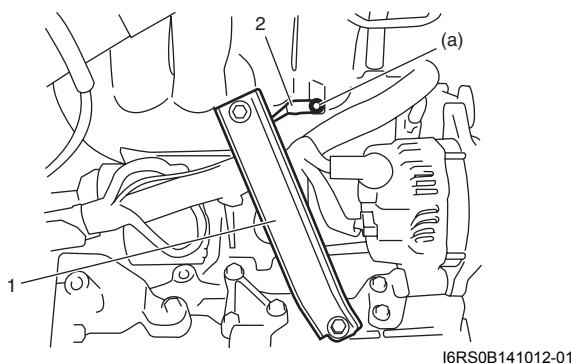
Intake manifold nut (b): 23 N·m (2.3 kgf-m, 17.0 lb-ft)



- Install intake manifold rear stiffener (1) as shown in figure.
- Connect ground terminal (2) to intake manifold to specified torque.

Tightening torque

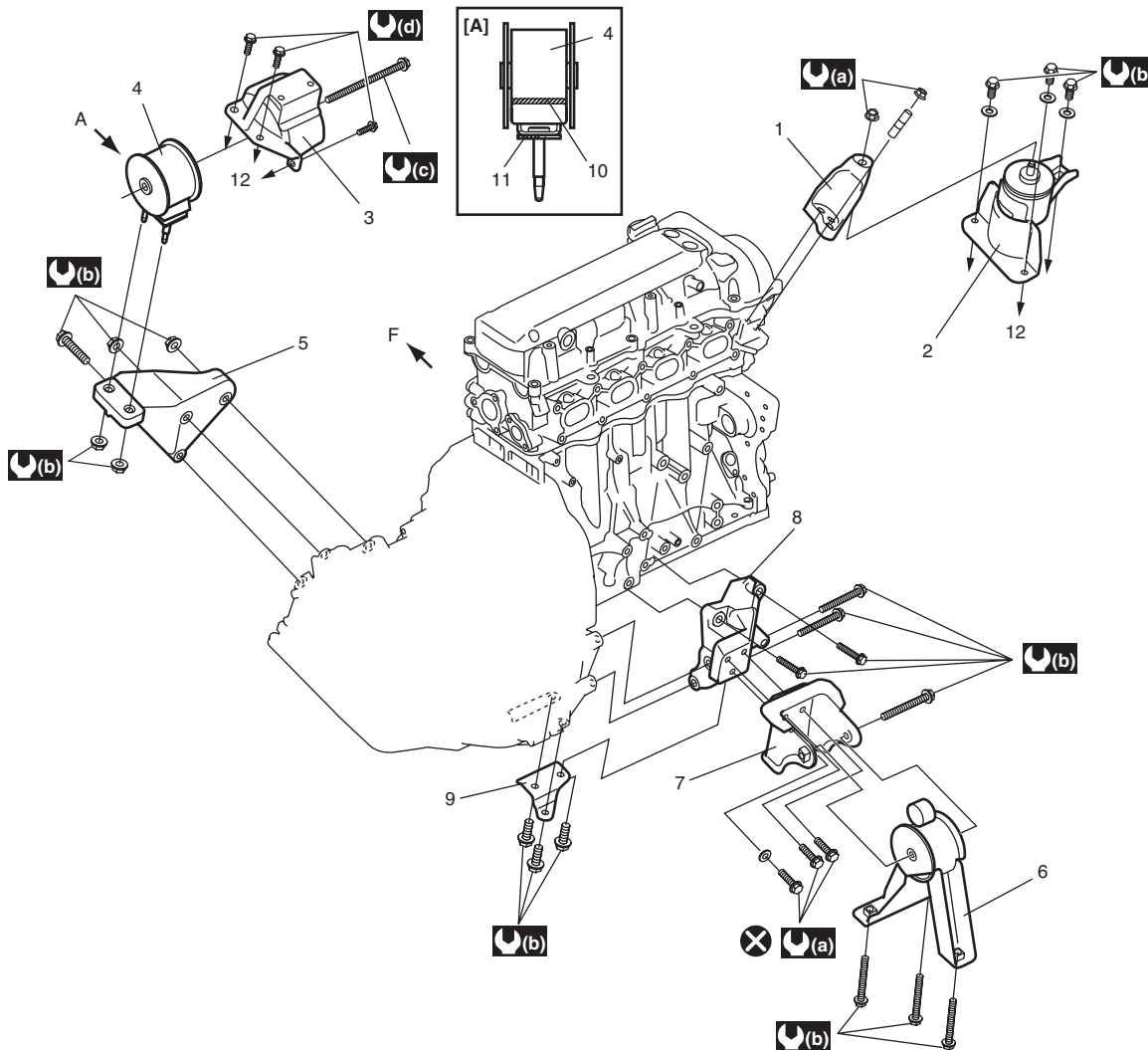
Intake manifold ground terminal bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



- Install throttle body referring to “Electric Throttle Body Assembly Removal and Installation: For M13, M15 and M16 Engines”.
- Install cowl top plate referring to “Cowl Top Components in Section 9K”.
- Refill cooling system referring to “Cooling System Flush and Refill: For M13, M15 and M16 Engines in Section 1F in related manual”.
- Upon completion of installation, turn ignition switch ON but engine OFF and check for fuel leaks.
- Finally, start engine and check for engine coolant leaks.

Engine Mountings Components (For M16A Engine Model)

S6RS0B1416050



I6RS0B141013-04

[A]: View A	6. Engine rear mounting	(a) : 65 N·m (6.5 kgf-m, 47.0 lb-ft)
F: Vehicle front	7. Engine rear mounting No.1 bracket	(b) : 55 N·m (5.5 kgf-m, 40.0 lb-ft)
1. Engine right mounting bracket	8. Engine rear mounting No.2 bracket	(c) : 85 N·m (8.5 kgf-m, 61.5 lb-ft)
2. Engine right mounting	9. Engine rear mounting stiffener	(d) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
3. Engine left mounting No.1 bracket	10. Yellow mark	⊗ : Do not reuse.
4. Engine left mounting	11. Front mark	
5. Engine left mounting No.2 bracket	12. To vehicle body	

Engine Assembly Removal and Installation (For M16A Engine Model)

S6RS0B1416051

NOTE

After replacing electric throttle body assembly, perform calibration of throttle valve referring to “Electric Throttle Body System Calibration (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1C in related manual”.

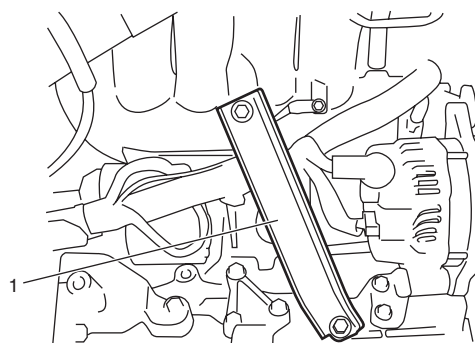
Removal

- 1) Relieve fuel pressure according to “Fuel Pressure Relief Procedure: For M13, M15 and M16 Engines in Section 1G in related manual”.
- 2) Disconnect negative and positive cable at battery.
- 3) Remove battery and tray.
- 4) Remove engine hood after disconnecting windshield washer hose.
- 5) Remove right and left side engine under covers.
- 6) Remove A/C compressor belt by referring to “Compressor Drive Belt Removal and Installation: Automatic Type in Section 7B”.
- 7) Drain engine oil referring to “Engine Oil and Filter Change (Petrol Engine) in Section 0B in related manual”.
- 8) Drain transaxle oil.
- 9) Drain coolant referring to “Cooling System Draining: For M13, M15 and M16 Engines in Section 1F in related manual”.
- 10) Remove cowl top plate referring to “Cowl Top Components in Section 9K”.
- 11) Remove air cleaner assembly referring to “Air Cleaner Components: For M13, M15 and M16 Engines”.
- 12) With hose connected, detach A/C compressor from its bracket (if equipped) referring to “Compressor Assembly Removal and Installation: Automatic Type in Section 7B”.

⚠ CAUTION

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

- 13) Remove intake manifold rear stiffener (1) from intake manifold and cylinder block.



I6RS0B141014-01

- 14) Disconnect the following electric wires:

- MAP sensor (1)
- ECT sensor (2)
- EGR valve (3)
- CMP sensor (4)
- Electric throttle body assembly (5)
- Ignition coil assembly (6)
- Injectors (7)
- Heated oxygen sensor No. 1 (8) and No. 2 (9)
- Oil control valve (10)
- Engine oil pressure switch (11)
- CKP sensor (12)
- Knock sensor (13)
- Back up light switch (14)
- Generator (15)
- Starting motor (16)
- Ground terminal (17) from intake manifold
- Battery ground terminal (18) from exhaust manifold
- Battery ground cable (19) from transaxle
- Magnet clutch switch of A/C compressor (if equipped)
- Each wire harness clamps

- 15) Remove fuse box from its bracket.

- 16) Disconnect the following cables:

- Gear select control cable (23) (for M/T model)
- Gear shift control cable (24) (for M/T model)

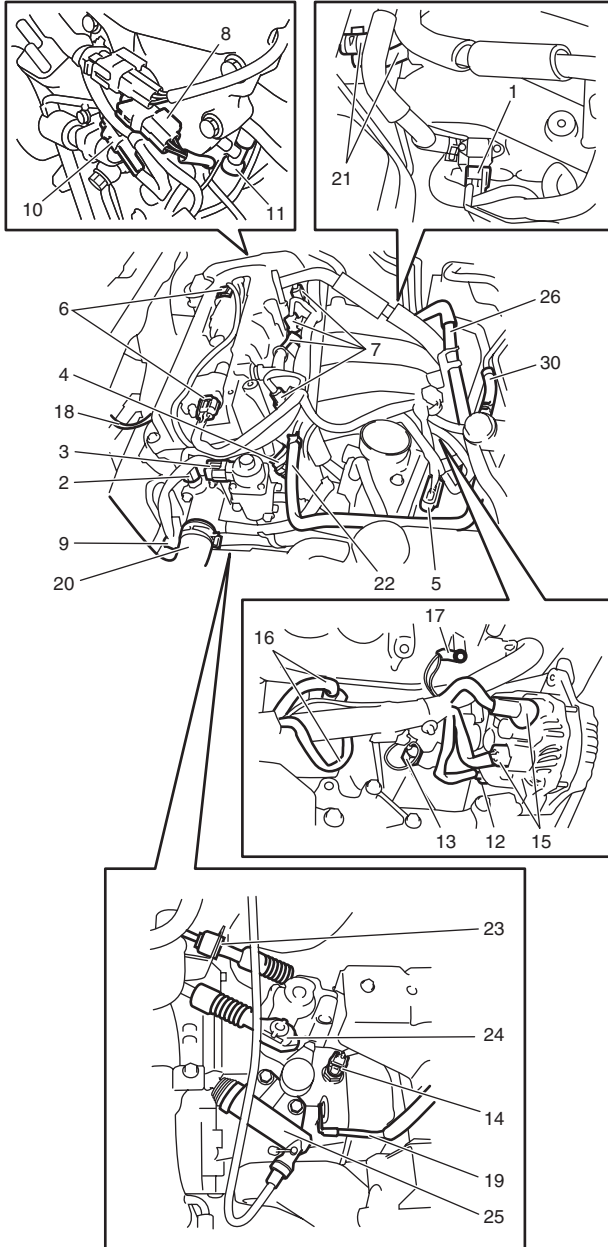
- 17) Disconnect the following hoses:

- Brake booster hose (26) from intake manifold
- Radiator inlet and outlet hoses (20) from each pipe
- Heater inlet and outlet hoses (21) from each pipe
- Fuel feed hoses (22) from fuel feed pipe
- EVAP canister purge valve hose (30) from purge pipe

- 18) With hose connected, detach clutch operating cylinder (25). (for M/T model)

⚠ CAUTION

Suspend removed clutch operating cylinder at a place where no damage will be caused during removal and installation of engine assembly.



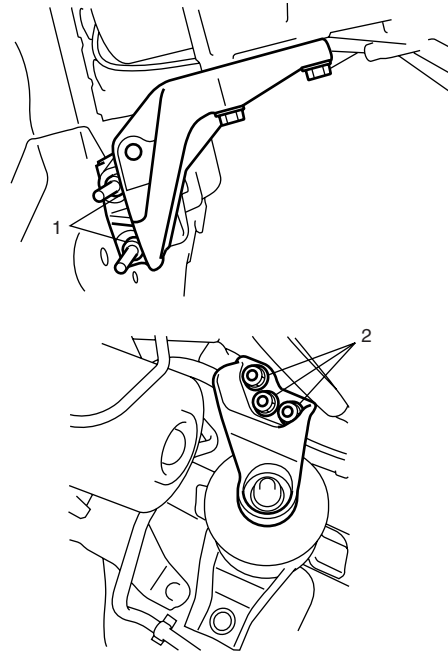
I6RS0B141015-01

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

NOTE

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

- 20) Remove exhaust No.1, No.2 and center pipes referring to "Exhaust Pipe and Muffler Removal and Installation: For M13, M15 and M16 Engines in Section 1K in related manual".
- 21) Support engine assembly by using chain hoist.
- 22) Remove suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation in Section 2B".
- 23) Remove engine rear mounting from engine rear mounting No.1 bracket.
- 24) Support engine and transaxle with jack, and then remove chain hoist.
- 25) Remove engine left mounting bracket nuts (1) and engine right mounting nuts (2).

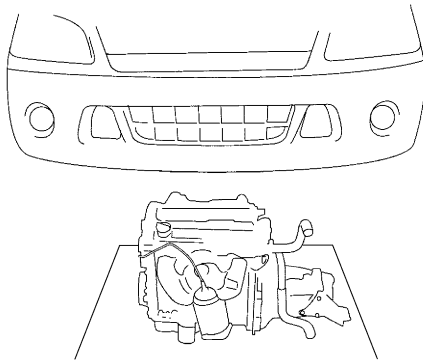


I4RS0A140008-01

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

⚠ CAUTION

Before lowering engine, to avoid damage to A/C compressor and clutch operating cylinder, make clearance by rising them. Be sure not to damage suspended A/C compressor and clutch operating cylinder.



I4RS0A140009-01

- 28) Disconnect transaxle from engine, referring to "Manual Transaxle Unit Dismounting and Remounting: For M15 and M16 Engines Model in Section 5B in related manual".
- 29) Remove clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C in related manual".

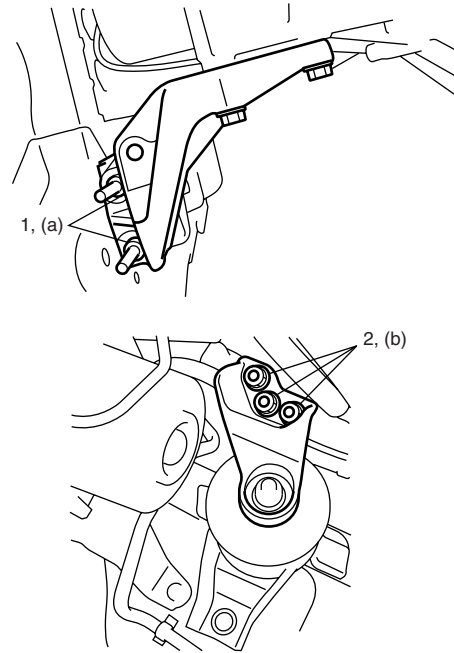
Installation

- 1) Install clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C in related manual".
- 2) Connect transaxle to engine referring to "Manual Transaxle Unit Dismounting and Remounting: For M15 and M16 Engines Model in Section 5B in related manual".
- 3) Lift engine and transaxle into engine compartment with jack.
- 4) Install engine left mounting bracket nuts (1) and engine right mounting nuts (2). Tighten these nuts to specified torque.

Tightening torque

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

Engine right mounting nut (b): 65 N·m (6.5 kgf-m, 47.0 lb-ft)



I4RS0A140010-01

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

Tightening torque

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

- 7) Install suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation in Section 2B".
- 8) Remove chain hoist.
- 9) Install exhaust No.1, No.2 and center pipes referring to "Exhaust Pipe and Muffler Removal and Installation: For M13, M15 and M16 Engines in Section 1K in related manual".
- 10) Connect drive shaft joints referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A in related manual".
- 11) Reverse disconnected hoses, cables and electric wires for connection noting the followings.
 - Tighten nuts to specified torque.

Tightening torque

Starting motor terminal nut: 11 N·m (1.1 kgf-m, 8.0 lb-ft)

Generator terminal nut: 6 N·m (0.6 kgf-m, 4.5 lb-ft)

Intake manifold ground terminal bolt: 11 N·m (1.1 kgf-m, 18.0 lb-ft)

- 12) Install intake manifold rear stiffener to intake manifold and cylinder block.
- 13) Install air cleaner assembly referring to "Air Cleaner Components: For M13, M15 and M16 Engines".
- 14) Install cowl top referring to "Cowl Top Components in Section 9K".

- 15) Install A/C compressor to its bracket (if equipped) referring to "Compressor Assembly Removal and Installation: Automatic Type in Section 7B".
- 16) Adjust A/C compressor belt tension (if equipped) referring to "Compressor Drive Belt Inspection and Adjustment: Automatic Type in Section 7B".
- 17) Check to ensure that all removed parts are back in place.
Reinstall any necessary parts which have not been reinstalled.
- 18) Refill cooling system with coolant referring to "Cooling System Flush and Refill: For M13, M15 and M16 Engines in Section 1F in related manual".
- 19) Refill engine with engine oil referring to "Engine Oil and Filter Change (Petrol Engine) in Section 0B in related manual".
- 20) Refill transaxle with transaxle oil referring to "Manual Transaxle Oil Change: For M15 and M16 Engines Model in Section 5B in related manual".
- 21) Install battery and tray.
- 22) Connect positive and negative cable at battery.
- 23) Install engine hood and connect windshield washer hose.
- 24) Verify that there is no fuel leakage, coolant leakage, oil leakage and exhaust gas leakage at each connection.

Camshaft, Tappet and Shim Inspection

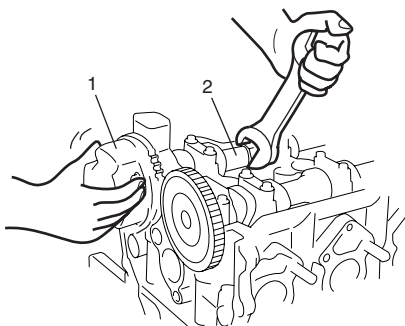
S6RS0B1416024

Intake Cam Timing Sprocket Assembly

Fit intake cam timing sprocket assembly to camshaft (2) and hold hexagonal section of camshaft by using spanner or the like.

Check if sprocket (1) is not turned by hand.

If moved, replace intake cam timing sprocket assembly.



I3RH0B140043-01

Cam Wear

Using a micrometer, measure cam height "a". If measured height underruns its limit, replace camshaft.

Cam height "a"

[For M16A engine model]

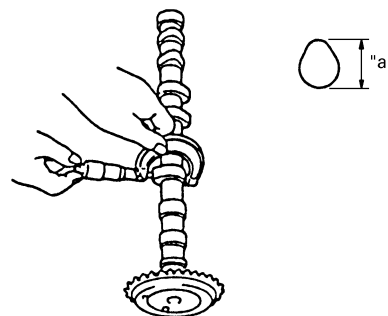
Cam height	Standard	Limit
Intake cam	45.424 – 45.584 mm (1.789 – 1.794 in.)	45.30 mm (1.783 in.)
Exhaust cam	45.030 – 45.190 mm (1.773 – 1.779 in.)	44.91 mm (1.768 in.)

[For M15A engine model]

Cam height	Standard	Limit
Intake cam	44.929 – 45.089 mm (1.769 – 1.775 in.)	44.80 mm (1.764 in.)
Exhaust cam	44.399 – 44.559 mm (1.748 – 1.754 in.)	44.28 mm (1.743 in.)

[For M13A engine model]

Cam height	Standard	Limit
Intake cam	44.919 – 45.079 mm (1.768 – 1.775 in.)	44.80 mm (1.764 in.)
Exhaust cam	44.399 – 44.559 mm (1.748 – 1.754 in.)	44.28 mm (1.743 in.)



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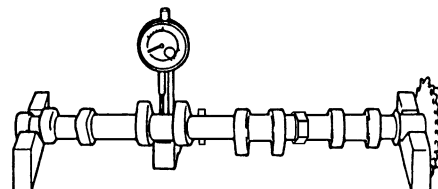
Camshaft Runout

Set camshaft between two "V" blocks, and measure its runout by using a dial gauge.

If measured runout exceeds limit, replace camshaft.

Camshaft runout limit

0.10 mm (0.0039 in.)

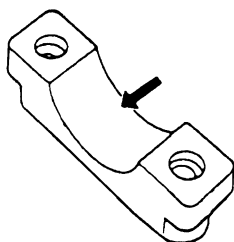


I2RH0B140081-01

Camshaft Journal Wear

Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.

If any malfunction is found, replace camshaft or cylinder head with housing. Never replace cylinder head without replacing housings.



I2RH0B140082-01

Check clearance by using gauging plastic. Checking procedure is as follows.

- 1) Clean housings and camshaft journals.
- 2) Remove all tappets with shims.
- 3) Install camshafts to cylinder head.
- 4) Place a piece of gauging plastic to full width of journal of camshaft (parallel to camshaft).

5) Install camshaft housing.

6) Install camshaft housing as follows.

For engine with VVT:

After applying engine oil to camshaft housing bolts, tighten them temporarily first. Then tighten them as follows.

- a) Tighten camshaft housing bolts to 5 N·m (0.5 kgf-m, 4.0 lb-ft) according to numerical order ("1" through "21") as shown in figure.
- b) Retighten them by turning through 11 N·m (1.1 kgf-m, 8.0 lb-ft) in same manner as Step a).

NOTE

Do not rotate camshaft while gauging plastic is installed.

Tightening torque

Camshaft housing bolt (a): 5 N·m (0.5 kgf-m, 4.0 lb-ft) and 11 N·m (1.1 kgf-m, 8.0 lb-ft) by the specified procedure

For engine without VVT:

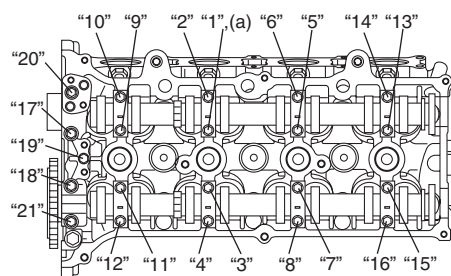
Tighten camshaft housing bolts in such order as indicated in the figure a little at a time till they are tightened to specified torque.

NOTE

Do not rotate camshaft while gauging plastic is installed.

Tightening torque

Camshaft housing bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



I3RH0B140041-01

- 1) Remove housing, and using scale (2) on gauging plastic envelop, measure gauging plastic (1) width at its widest point.

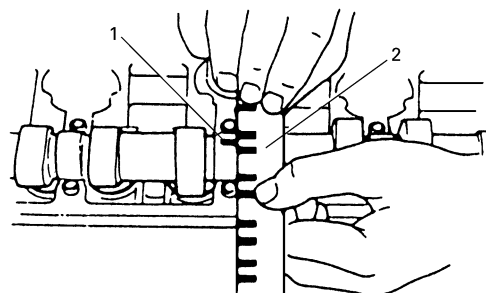
Camshaft journal clearance

[For engine with VVT]

	Standard	Limit
Intake side No.1 housing	0.020 – 0.072 mm (0.0008 – 0.0028 in.)	0.10 mm (0.0039 in.)
Others	0.045 – 0.087 mm (0.0018 – 0.0034 in.)	0.12 mm (0.0047 in.)

[For engine without VVT]

Standard	Limit
0.045 – 0.087 mm (0.0018 – 0.0034 in.)	0.12 mm (0.0047 in.)



I2RH0B140083-01

If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

Camshaft journal diameter [A]

[For engine with VVT]

Item	Standard
Intake side No.1 housing	26.940 – 26.955 mm (1.0606 – 1.0612 in.)
Exhaust side No.1 housing	26.934 – 26.955 mm (1.0604 – 1.0612 in.)
Others	22.934 – 22.955 mm (0.9029 – 0.9037 in.)

[For engine without VVT]

Item	Standard
Intake and Exhaust side No.1 housing	26.934 – 26.955 mm (1.0604 – 1.0612 in.)
Others	22.934 – 22.955 mm (0.9029 – 0.9037 in.)

Camshaft journal bearing bore [B]

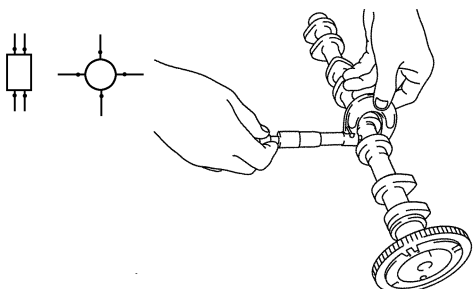
[For engine with VVT]

Item	Standard
Intake side No.1 housing	—
Exhaust side No.1 housing	27.000 – 27.021 mm (1.0630 – 1.0638 in.)
Others	23.000 – 23.021 mm (0.9055 – 0.9063 in.)

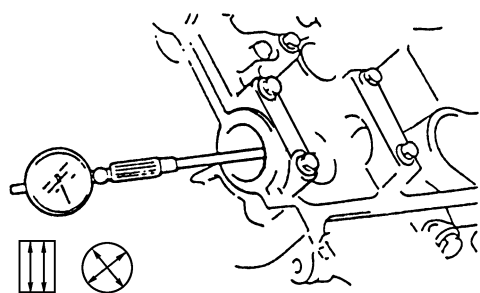
[For engine without VVT]

Item	Standard
Intake and Exhaust side No.1 housing	27.000 – 27.021 mm (1.0630 – 1.0638 in.)
Others	23.000 – 23.021 mm (0.9055 – 0.9063 in.)

[A]



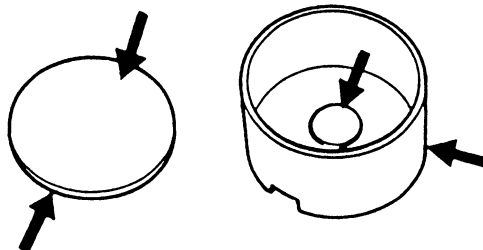
[B]



I2RH0B140084-01

Wear of Tappet and Shim

Check tappet and shim for pitting, scratches, or damage. If any malfunction is found, replace.



I2RH0B140085-01

Measure cylinder head bore and tappet outside diameter to determine cylinder head-to-tappet clearance. If clearance exceeds limit, replace tappet or cylinder head.

Cylinder head to tappet clearance

Standard: 0.025 – 0.066 mm (0.0010 – 0.026 in.)

Limit: 0.15 mm (0.0059 in.)

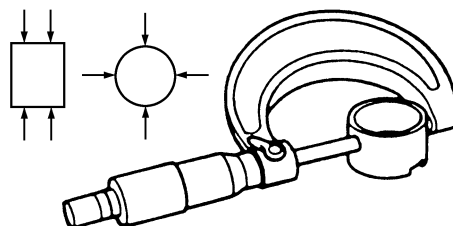
Tappet outside diameter [A]

Standard: 30.959 – 30.975 mm (1.2189 – 1.2195 in.)

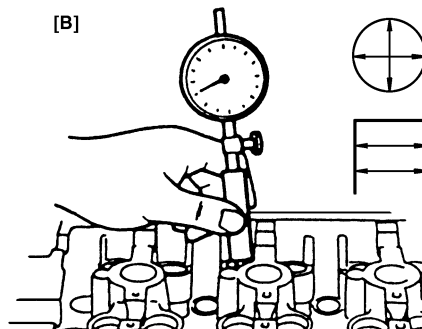
Cylinder head tappet bore [B]

Standard: 31.000 – 31.025 mm (1.2205 – 1.2215 in.)

[A]



[B]



I2RH0B140086-01

Valve Spring Inspection

S6RS0B1416030

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

[For M16A engine model]

Standard: 37.49 mm (1.476 in.)

Limit: 36.49 mm (1.437 in.)

[For other than M16A engine model]

Standard: 36.83 mm (1.450 in.)

Limit: 35.83 mm (1.411 in.)

Valve spring preload

[For M16A engine model]

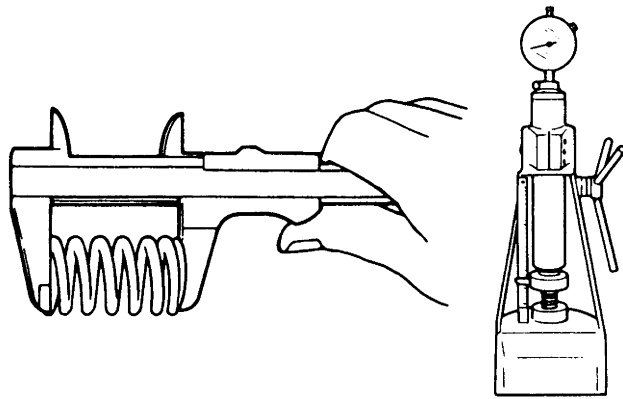
Standard: 120 – 136 N (12.0 – 13.6 kg) for 31.50 mm
(26.5 – 30.0 lb / 1.240 in.)

Limit: 114 N (11.4 kg) for 31.50 mm (25.1 lb / 1.240 in.)

[For other than M16A engine model]

Standard: 107 – 125 N (10.7 – 12.5 kg) for 31.50 mm
(23.6 – 27.6 lb/1.240 in.)

Limit: 102 N (10.2 kg) for 31.50 mm (22.5 lb/1.240 in.)



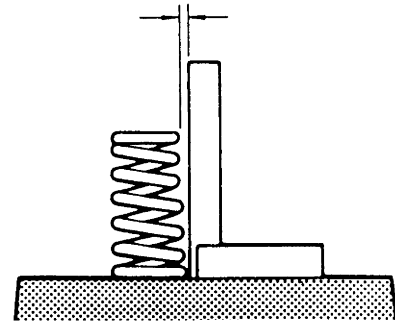
I2RH01140143-01

Spring Squareness

Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve springs found to exhibit a larger clearance than limit must be replaced.

Valve spring squareness

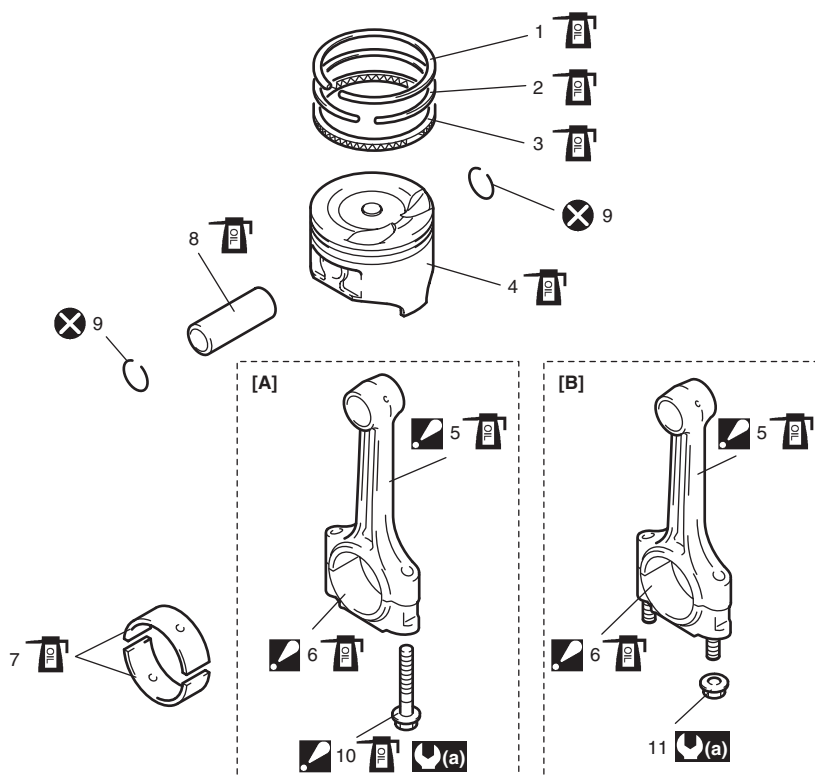
Limit: 1.6 mm (0.063 in.)



I2RH01140144-01

Pistons, Piston Rings, Connecting Rods and Cylinders Components

S6RS0B1416031



I6RS0B141024-01

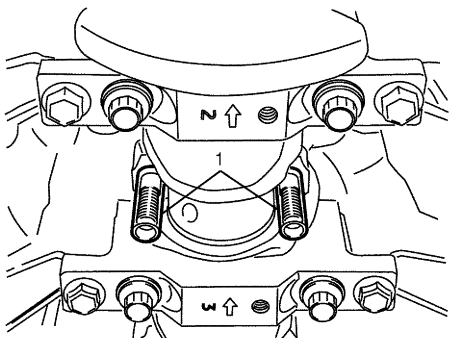
[A]: For M16A engine model	5. Connecting rod : See "A"	11. Connecting rod bearing cap nut
[B]: For other than M16A engine model	6. Connecting rod bearing cap : See "B"	(a) : Tighten 15 N·m (1.5 kgf-m, 11.0 lb-ft), 45° and 45° by the specified procedure.
1. Top ring	7. Connecting rod bearing	Apply engine oil to sliding surface of each part.
2. 2nd ring	8. Piston pin	Do not reuse.
3. Oil ring	9. Piston pin circlip	
4. Piston	10. Connecting rod bearing cap bolt : See "C"	
"A": Apply engine oil to sliding surface except inner surface of big end, and rod bolts (for other than M16A engine model). Make sure rod bolt diameter when reuse it due to plastic deformation tightening. Refer to "Piston Pins and Connecting Rods Inspection: For M13, M15 and M16 Engines" (for other than M16A engine model).		
"B": Point arrow mark on cap to crankshaft pulley side.		
"C": Make sure bearing cap bolt diameter when reuse it due to plastic deformation tightening. Refer to "Piston Pins and Connecting Rods Inspection: For M13, M15 and M16 Engines".		

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

S6RS0B1416032

Removal

- 1) Remove engine assembly from vehicle referring to "Engine Assembly Removal and Installation (For Other Than M16A Engine Model): For M13, M15 and M16 Engines in related manual" or "Engine Assembly Removal and Installation (For M16A Engine Model): For M13, M15 and M16 Engines".
- 2) Remove cylinder head referring to "Valves and Cylinder Head Removal and Installation: For M13, M15 and M16 Engines in related manual".
- 3) Mark cylinder number on all pistons, connecting rods and connecting rod caps using silver pencil or quick drying paint.
- 4) Remove rod bearing caps.
- 5) Install guide hose (1) over threads of rod bolts. This prevents damage to bearing journal and rod bolt threads when removing connecting rod (for other than M16A engine model).



I2RH0B140109-01

- 6) Decarbonize top of cylinder bore before removing piston from cylinder.
- 7) Push piston and connecting rod assembly out through the top of cylinder bore.

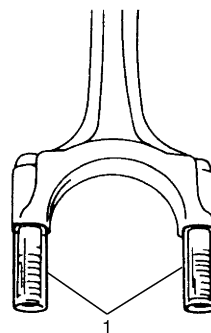
Installation

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

NOTE

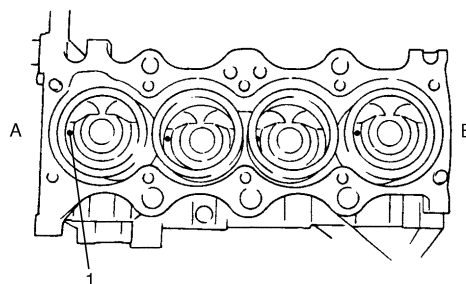
Do not apply oil between connecting rod and bearing or between bearing cap and bearing.

- 2) Install guide hoses (1) over connecting rod bolts. These guide hoses protect crank pin and threads of rod bolt from damage during installation of connecting rod and piston assembly.



I2RH01140147-01

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



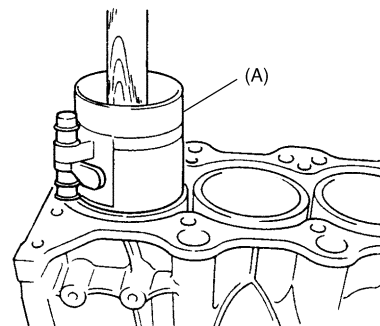
I2RH0B140110-01

A: Crankshaft pulley side
B: Flywheel side

- 4) Install piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft. Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

Special tool

(A): 09916-77310



I2RH0B140111-01

5) Install bearing cap (1):

Point arrow mark (2) on cap to crankshaft pulley side.

After applying engine oil to rod bolts or bearing cap bolts and tighten cap nuts or bolts gradually as follows.

- a) Tighten all cap nuts or bolts to 15 N·m (1.5 kgf-m, 11.0 lb-ft).
- b) Retighten them to 45°.
- c) Repeat Step b) once again.

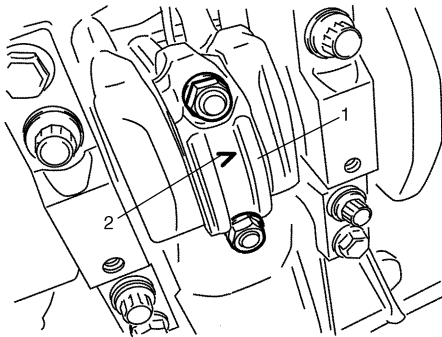
NOTE

Before installing bearing cap, make sure that checking for connecting rod bolt or bearing cap bolt deformation. Refer to “Piston Pins and Connecting Rods Inspection: For M13, M15 and M16 Engines”.

Tightening torque

Connecting rod bearing cap nut: 15 N·m (1.5 kgf-m, 11.0 lb-ft) and then retighten by turning through 45° twice

Connecting rod bearing cap bolt: 15 N·m (1.5 kgf-m, 11.0 lb-ft) and then retighten by turning through 45° twice



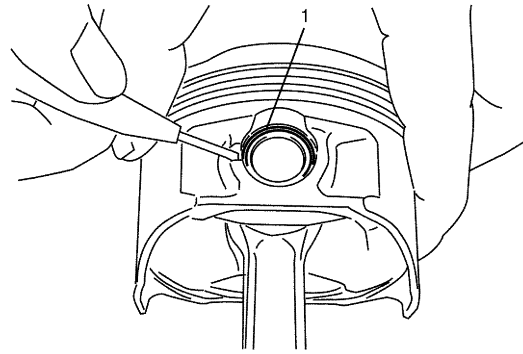
I6RS0B141025-01

6) Install cylinder head referring to “Valves and Cylinder Head Removal and Installation: For M13, M15 and M16 Engines in related manual”.**Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly**

S6RS0B1416033

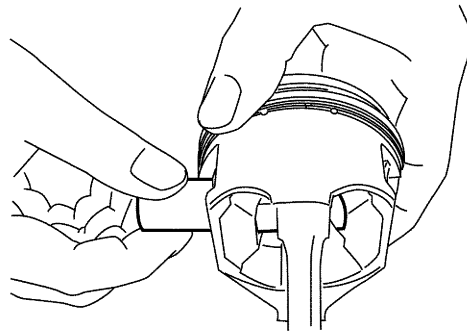
Disassembly

- 1) Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
- 2) Remove piston pin from connecting rod as follows.
 - a) Ease out piston pin circlip (1), as shown.



I2RH0B140113-01

- b) Force piston pin out.



I2RH0B140114-01

Assembly

- 1) Decarbonize piston head and ring grooves using a suitable tool.
- 2) Install piston pin to piston (1) and connecting rod (2):
 - a) After applying engine oil to piston pin and piston pin holes in piston and connecting rod.
 - b) Fit connecting rod as shown in figure.

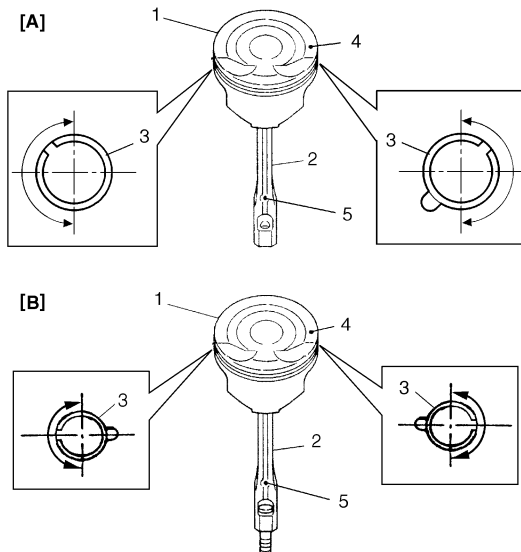
NOTE

Be sure to position front mark (4) or arrow mark (6) on piston and oil hole (5) of connecting rod at specified position as shown in figure.

- c) Insert piston pin to piston and connecting rod.
- d) Install piston pin circlips (3).

NOTE

Circlip should be installed with its cut part facing as shown in figure. Install so that circlip end gap comes within such range as indicated by arrow.



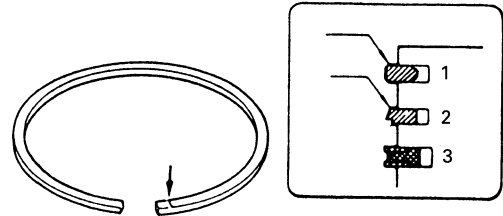
I6RS0B141016-04

[A]: For M16A engine model

[B]: For other than M16A engine model

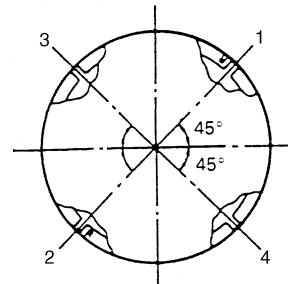
3) Install piston rings to piston:

- As indicated in the figure, 1st and 2nd rings have discrimination 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 referring to the figure.
- When installing oil ring (3), install spacer first and then two rails.



I2RH0B140116-01

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



I6RS0B141018-01

1. 1st ring end gap	3. Oil ring upper rail gap
2. 2nd ring end gap and oil ring spacer gap	4. Oil ring lower rail gap

Cylinders, Pistons and Piston Rings Inspection

S6RS0B1416034

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, rebore cylinder and use over size piston.

Cylinder bore diameter, taper and out-of-round

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

If any of the following conditions is noted, rebore cylinder.

- 1) Cylinder bore dia. exceeds limit.
- 2) Difference of measurements at two positions exceeds taper limit.
- 3) Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore diameter

Standard: 78.000 – 78.014 mm (3.0709 – 3.0714 in.)

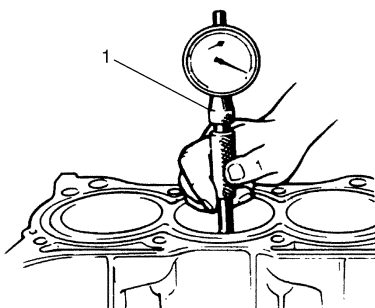
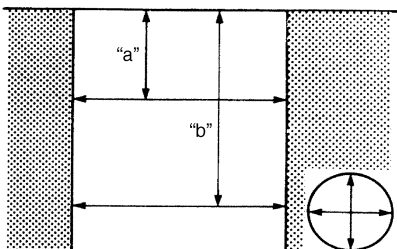
Limit: 78.114 mm (3.075 in.)

Cylinder taper and out-of-round

Limit: 0.10 mm (0.004 in.)

NOTE

If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.



I2RH0B140117-01

"a": 50 mm (1.96 in.)

"b": 95 mm (3.74 in.)

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

[For M16A engine model]

Standard size (used piston):

77.953 – 77.968 mm (3.0690 – 3.0696 in.)

Standard size (new piston with coating):

77.963 – 77.990 mm (3.0694 – 3.0704 in.)

Oversize (0.05 mm (0.0196 in.)):

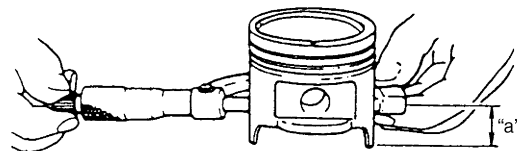
78.453 – 78.468 mm (3.0887 – 3.0893 in.)

[For other than M16A engine model]

Standard size (used piston): 77.953 – 77.968 mm (3.0690 – 3.0696 in.)

Standard size (new piston with coating): 77.963 – 77.990 mm (3.0694 – 3.0705 in.)

Oversize (0.50 mm (0.0196 in.)): 78.453 – 78.468 mm (3.0887 – 3.0893 in.)



I2RH01140157-01

"a": 19.5 mm (0.77 in.) (M13A and M15A engine models)

"a": 7.0 mm (0.28 in.) (for M16A engine model)

Piston clearance

Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. Piston clearance should be within specification as follows. If it is out of specification, rebore cylinder and use oversize piston.

NOTE

Cylinder bore diameters used here are measured in thrust direction at two positions.

Piston clearance

[For M16A engine model]

Standard (used piston): 0.032 – 0.061 mm (0.0013 – 0.0024 in.)

Standard (new piston with coating): 0.010 – 0.051 mm (0.0004 – 0.0020 in.)

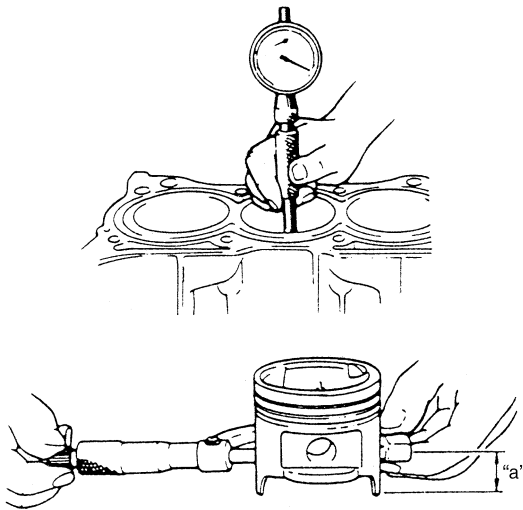
Limit: 0.161 mm (0.0063 in.)

[For other than M16A engine model]

Standard (used piston): 0.032 – 0.061 mm (0.0013 – 0.0024 in.)

Standard (new piston with coating): 0.010 – 0.051 mm (0.0006 – 0.0018 in.)

Limit: 0.161 mm (0.0065 in.)



I4RS0A140022-01

"a": 19.5 mm (0.77 in.) (M13A and M15A engine models)

"a": 7.0 mm (0.28 in.) (for M16A engine model)

Ring groove clearance

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

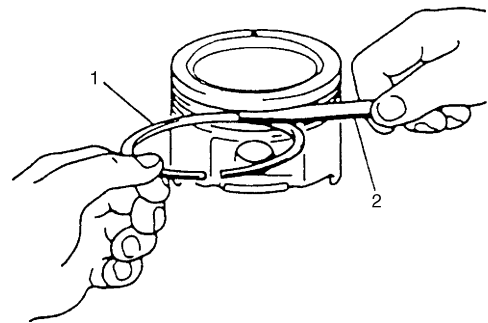
Fit new piston ring (1) into piston groove, and measure clearance between ring and ring land by using thickness gauge (2). If clearance is out of specification, replace piston.

Ring groove clearance (for M16A engine model)

	Standard	Limit
Top ring	0.04 – 0.08 mm (0.0016 – 0.0031 in.)	0.12 mm (0.0047 in.)
2nd ring	0.03 – 0.07 mm (0.0012 – 0.0027 in.)	0.10 mm (0.0394 in.)
Oil ring	0.04 – 0.12 mm (0.0016 – 0.0047 in.)	—

Ring groove clearance (for other than M16A engine model)

	Standard	Limit
Top ring	0.03 – 0.07 mm (0.0012 – 0.0028 in.)	0.12 mm (0.0047 in.)
2nd ring	0.02 – 0.06 mm (0.0008 – 0.0024 in.)	0.10 mm (0.0039 in.)
Oil ring	0.03 – 0.17 mm (0.0012 – 0.0067 in.)	—



I2RH01140159-01

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 exceeds limit, replace ring.

NOTE

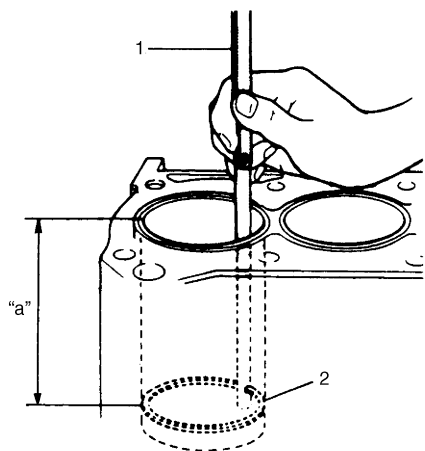
Decarbonize and clean top of cylinder bore before inserting piston ring.

Ring groove clearance (for M16A engine model)

Item	Standard	Limit
Top ring	0.20 – 0.33 mm (0.0079 – 0.0129 in.)	0.7 mm (0.0276 in.)
2nd ring	0.43 – 0.56 mm (0.0170 – 0.0220 in.)	1.0 mm (0.0394 in.)
Oil ring	0.10 – 0.40 mm (0.0040 – 0.0157 in.)	0.7 mm (0.0276 in.)

Piston ring end gap (for other than M16A engine model)

Item	Standard	Limit
Top ring	0.20 – 0.35 mm (0.0079 – 0.0138 in.)	0.7 mm (0.0276 in.)
2nd ring	0.35 – 0.50 mm (0.0138 – 0.0197 in.)	1.0 mm (0.0394 in.)
Oil ring	0.20 – 0.70 mm (0.0079 – 0.0276 in.)	1.2 mm (0.0472 in.)



I2RH01140161-01

"a": 120 mm (4.72 in.)

Piston Pins and Connecting Rods Inspection

S6RS0B1416035

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

Standard: 0.003 – 0.014 mm (0.0001 – 0.0006 in.)

Piston pin clearance in piston

Standard: 0.006 – 0.017 mm (0.00024 – 0.00067 in.)

Small-end bore

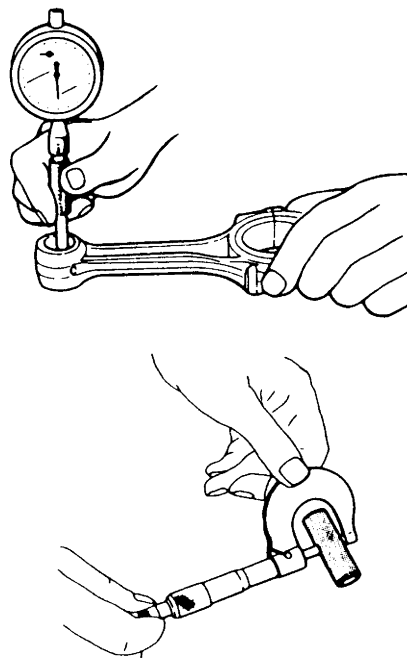
20.003 – 20.011 mm (0.7875 – 0.7878 in.)

Piston pin dia.

19.997 – 20.000 mm (0.7873 – 0.7874 in.)

Piston bore

20.006 – 20.014 mm (0.7876 – 0.7880 in.)



I4RS0A140023-01

Connecting Rod

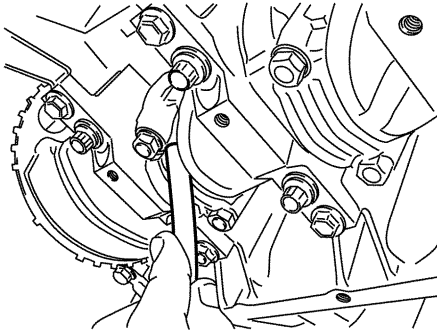
Big-end side clearance

Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Big-end side clearance

Standard: 0.25 – 0.40 mm (0.0098 – 0.0157 in.)

Limit: 0.55 mm (0.0217 in.)



I2RH0B140148-01

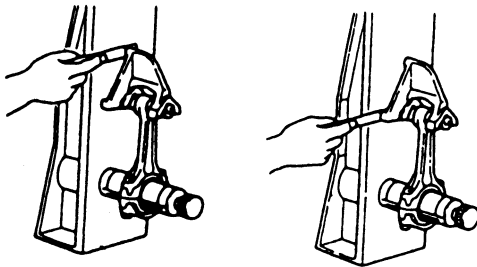
Connecting rod alignment

Mount connecting rod on aligner to check it for bow and twist. If measured value exceeds the limit, replace it.

Connecting rod alignment

Limit on bow: 0.05 mm (0.0020 in.)

Limit on twist: 0.10 mm (0.0039 in.)



I4RH01140053-01

Connecting rod bolt or connecting rod bearing cap bolt deformation (Plastic deformation tightening bolt)

Measure each thread diameter of connecting rod bolt (2) or connecting rod bearing cap bolt (4) at "A" on 32 mm (1.25 in.) from bolt mounting surface and "B" on 40 mm (1.57 in.) from bolt mounting surface by using a micrometer (3).

Calculate difference in diameters ("A" – "B"). If it is exceeds limit, replace connected rod (1) or connecting rod bearing cap bolt (4).

Connecting rod bolt measurement points

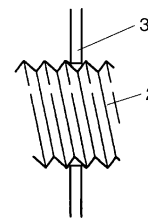
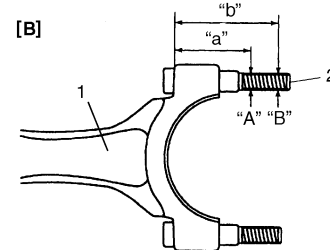
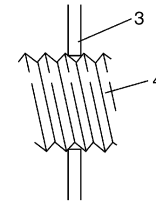
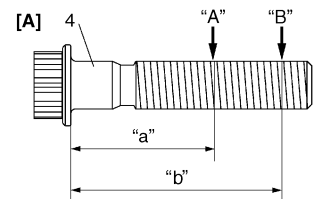
"a": 32 mm (1.25 in.) (M13A and M15A engine models)

"a": 25 mm (0.98 in.) (M16A engine model)

"b": 40 mm (1.57 in.)

Connecting rod bolt diameter difference

Limit ("A" – "B"): 0.1 mm (0.004 in.)



I6RS0B141019-01

[A]: For M16A engine model

[B]: For other than M16A engine model

Crank Pin and Connecting Rod Bearings Inspection

S6RS0B1416036

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 limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

Crank pin diameter

Connecting rod bearing size	Crank pin diameter
Standard	41.982 – 42.000 mm (1.6528 – 1.6535 in.)
0.25 mm (0.0098 in.) undersize	41.732 – 41.750 mm (1.6430 – 1.6437 in.)

Out-of-round

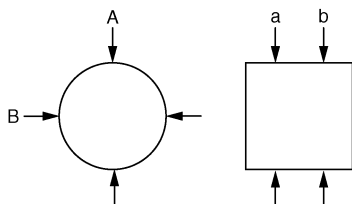
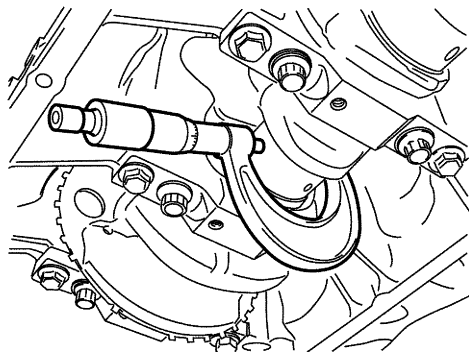
A – B

Taper

a – b

Crank pin taper and out-of-round

Limit: 0.01 mm (0.0004 in.)

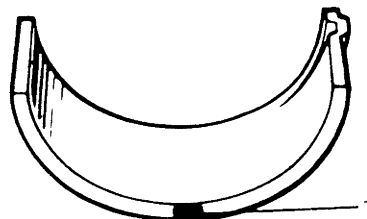


I2RH0B140120-01

Connecting Rod Bearing General Information

Service connecting rod bearings are available in standard size and 0.25 mm (0.0098 in.) undersize bearing, and standard size bearing has 5 kinds of bearings differing in tolerance.

For identification of undersize bearing, it is painted red at the position as indicated in the figure, undersize bearing thickness is 1.605 – 1.615 mm (0.0632 – 0.0635 in.) at the center of it.



I2RH01140164-01

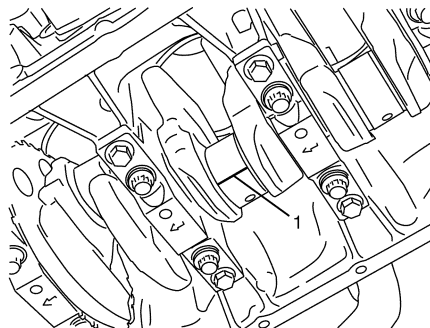
1. Red paint

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 bearing in connecting rod and bearing cap.
- 3) Place a piece of gauging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.



I2RH0B140121-01

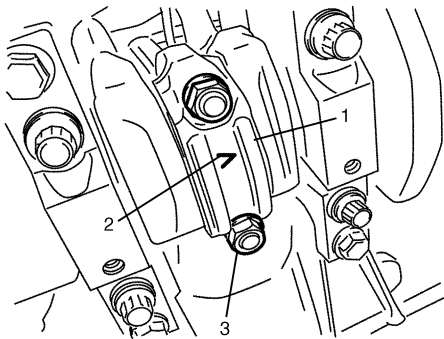
- 4) Install rod bearing cap (1) to connecting rod. When installing cap, be sure to point arrow mark (2) on cap to crankshaft pulley side, as shown in figure. After applying engine oil to rod bolts, tighten cap nuts (3) or bolts gradually as follows.

- Tighten all cap nuts or bolts to 15 N·m (1.5 kgf-m, 11.0 lb-ft)
- Retighten them to 45°
- Repeat Step b) once again.

Tightening torque

Connecting rod bearing cap bolt: 15 N·m (1.5 kgf-m, 11.0 lb-ft) and then retighten by turning through 45° twice

Connecting rod bearing cap nut: 15 N·m (1.5 kgf-m, 11.0 lb-ft) and then retighten by turning through 45° twice



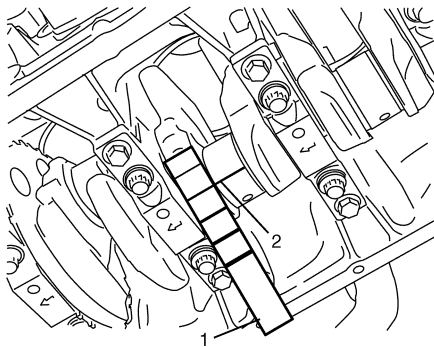
I6RS0B141026-01

- 5) Remove cap and using a scale (1) on gauging plastic envelope (2), measure gauging plastic (2) width at the widest point (clearance). If clearance exceed its limit, use a new standard size bearing referring to "Selection of Connecting Rod Bearings: For M13, M15 and M16 Engines". After selecting new bearing, recheck clearance.

Connecting rod bearing clearance

Standard: 0.029 – 0.047 mm (0.0011 – 0.0018 in.)

Limit: 0.065 mm (0.0026 in.)



I2RH0B140123-01

- 6) If clearance can not be brought to its limit even by using a new standard size bearing, use next thicker bearing and recheck clearance or regrind crank pin to undersize and use 0.25 mm undersize bearing.

Selection of Connecting Rod Bearings

NOTE

- If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.
- When replacing crankshaft or connecting rod and its bearing due to any reason, select new standard bearings to be installed by referring to numbers stamped on connecting rod and its cap and/or alphabets stamped on crank web of No.3 cylinder.

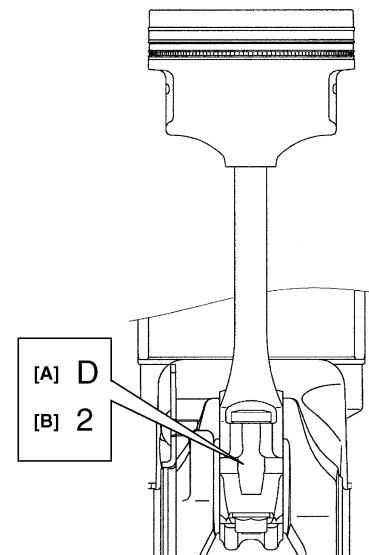
- 1) Check stamped numbers on connecting rod and its cap as shown.

Three kinds of numbers ("1", "2" and "3") represent the following connecting rod big end inside diameters.

For example, stamped number "1" indicates that corresponding connecting rod big end inside diameter is 45.000 – 45.006 mm (1.7717 – 1.7718 in.).

Connecting rod big end inside diameter

Stamped numbers	Connecting rod big end inside diameter
1	45.0000 – 45.0060 mm (1.7717 – 1.7718 in.)
2	45.0061 – 45.0120 mm (1.7719 – 1.7721 in.)
3	45.0121 – 45.0180 mm (1.7722 – 1.7723 in.)



I6RS0B141027-01

[A]: Weight indication mark

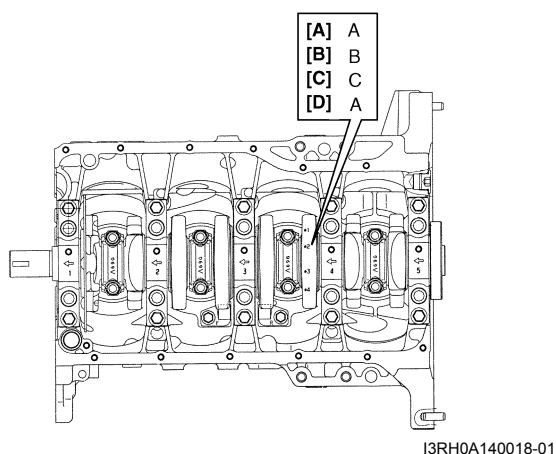
[B]: Connecting rod big end inside diameter number

- 2) Next, check crankshaft pin diameter. On crank web No.3, four alphabets are stamped as shown in the figure.

Three kinds of alphabet ("A", "B" and "C") represent the following crankshaft pin diameter respectively. For example, stamped "A" indicates that corresponding crankshaft pin diameter is 41.994 – 42.000 mm (1.6533 – 1.6534 in.).

Crankshaft pin outer diameter

Stamped alphabet	Crankshaft pin diameter
A	41.9940 – 42.0000 mm (1.6533 – 1.6534 in.)
B	41.9880 – 41.9939 mm (1.6531 – 1.6532 in.)
C	41.9820 – 41.9879 mm (1.6529 – 1.6530 in.)



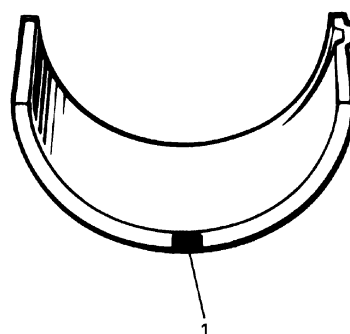
[A]:	Crankshaft pin diameter for No.1 cylinder
[B]:	Crankshaft pin diameter for No.2 cylinder
[C]:	Crankshaft pin diameter for No.3 cylinder
[D]:	Crankshaft pin diameter for No.4 cylinder

- 3) There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in the figure.

Each color indicated the following thickness at the center of bearing.

Standard size of connecting rod bearing thickness

Color painted	Bearing thickness
Blue	1.4991 – 1.5020 mm (0.05902 – 0.05913 in.)
Yellow	1.4961 – 1.4990 mm (0.05890 – 0.05901 in.)
Nothing	1.4931 – 1.4960 mm (0.05878 – 0.05889 in.)
Black	1.4901 – 1.4930 mm (0.05867 – 0.05877 in.)
Green	1.4870 – 1.4900 mm (0.05855 – 0.05866 in.)



I3RH0A140019-01

1. Paint

- 4) From number stamped on connecting rod and its cap and alphabets stamped on crank web No.3, determine new standard bearing to be installed to connecting rod big end inside, by referring to the table.

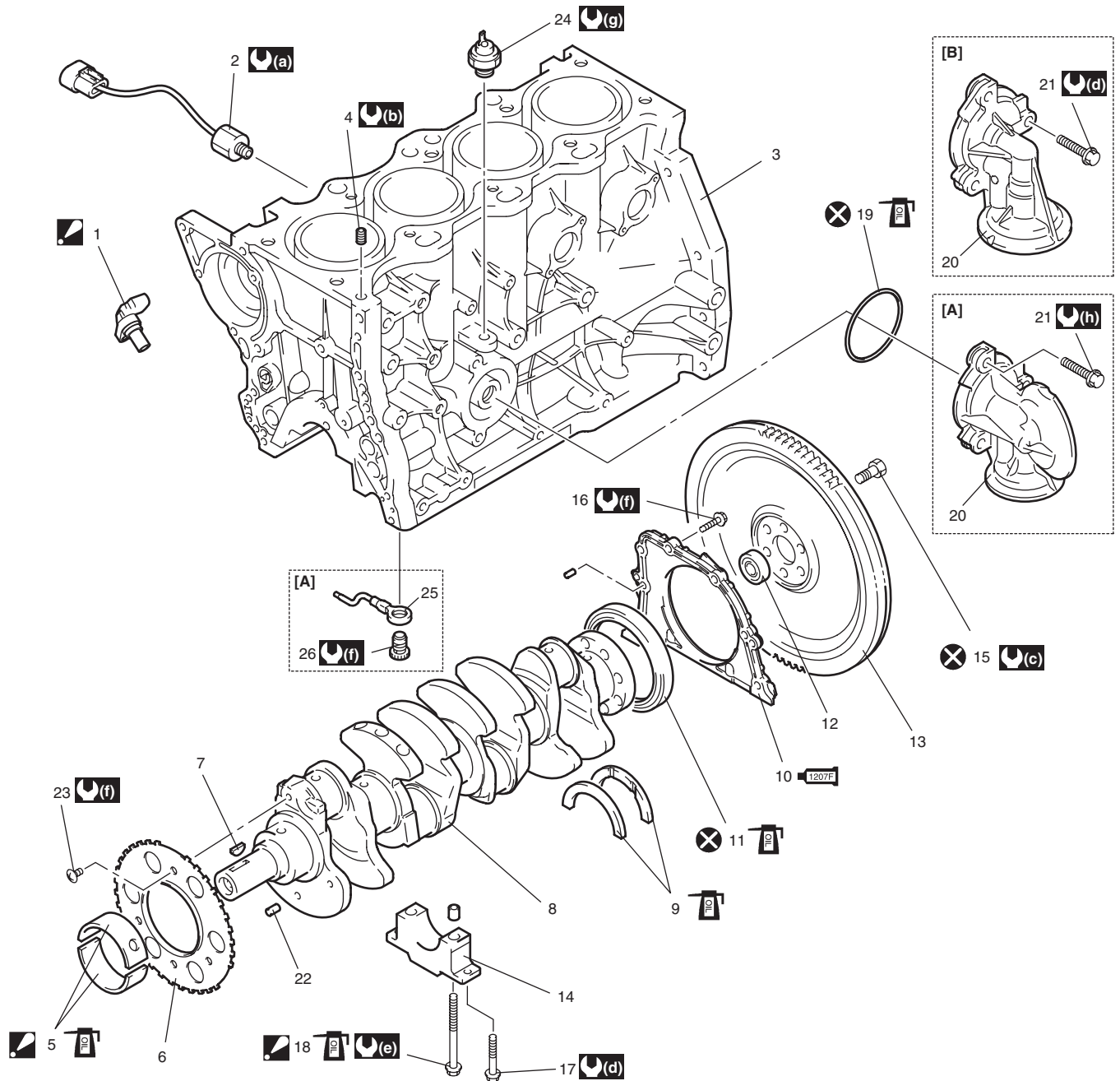
For example, if number stamped on connecting rod and its cap is "1" and alphabet stamped on crank web No.3 is "B", install a new standard bearing painted in "Black" to its connecting rod big end inside.

Specification of new standard connecting rod bearing size

		Number stamped on connecting rod and its cap (connecting rod big end inside diameter)		
		1	2	3
Alphabet stamped on crank web No.3 (Crankshaft pin diameter)	A	Green	Black	Nothing
	B	Black	Nothing	Yellow
	C	Nothing	Yellow	Blue
		New standard bearing to be installed.		

Main Bearings, Crankshaft and Cylinder Block Components

S6RS0B1416037



I6RS0B141020-01

[A]: For M16A engine model	11. Rear oil seal	23. Sensor plate bolt
[B]: For other than M16A engine model	12. Input shaft bearing (For A/T and M/T models)	24. Oil pressure switch
1. CKP sensor (if equipped) : See "A"	13. Flywheel or drive plate	25. Piston cooling nozzle
2. Knock sensor	14. Main bearing cap	26. Piston cooling valve
3. Cylinder block	15. Flywheel or drive plate bolt	(a) : 22 N·m (2.2 kgf-m, 16.0 lb-ft)
4. Venturi plug	16. Rear oil seal housing mounting bolt	(b) : 5 N·m (0.5 kgf-m, 4.0 lb-ft)
5. Main bearing : See "B"	17. Main bearing cap No.2 bolt	(c) : 70 N·m (7.0 kgf-m, 51.0 lb-ft)
6. Sensor plate	18. Main bearing cap No.1 bolt : See "D"	(d) : Tighten 25 N·m (2.5 kgf-m, 18.0 lb-ft) by the specified procedure.
7. Crankshaft timing sprocket key	19. O-ring	(e) : Tighten 30 N·m (3.0 kgf-m, 22.0 lb-ft), 50 N·m (5.0 kgf-m, 36.5 lb-ft) and 60° by the specified procedure.
8. Crankshaft	20. Oil filter adapter case	(f) : 11 N·m (1.1 kgf-m, 8.0 lb-ft)
9. Thrust bearing	21. Oil filter adapter bolt	(g) : 13 N·m (1.3 kgf-m, 9.5 lb-ft)
10. Rear oil seal housing : See "C"	22. Spring pin	(h) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)

"A": When servicing CKP sensor, refer to "Crankshaft Position (CKP) Sensor Removal and Installation: For M13, M15 and M16 Engines in Section 1C in related manual".	⊗ : Do not reuse.
"B": Upper half of bearing has an oil groove.	 : Apply engine oil to inside / sliding surface.
"C": Apply sealant 99000-31250 to mating surface.	
"D": Make sure main bearing cap No.1 bolt deformation when reuse it due to plastic deformation tightening referring to "Main Bearings Inspection: For M13, M15 and M16 Engines".	

Main Bearings, Crankshaft and Cylinder Block Removal and Installation

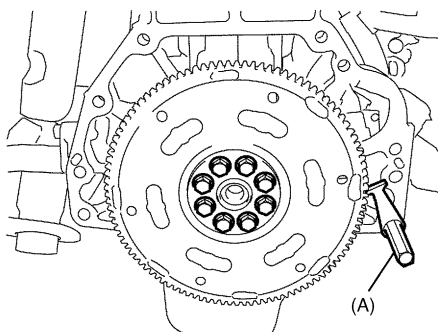
S6RS0B1416038

Removal

- 1) Remove engine assembly from vehicle referring to "Engine Assembly Removal and Installation (For Other Than M16A Engine Model): For M13, M15 and M16 Engines in related manual" or "Engine Assembly Removal and Installation (For M16A Engine Model): For M13, M15 and M16 Engines".
- 2) Remove clutch cover, clutch disc and flywheel (drive plate for A/T) by using special tool.

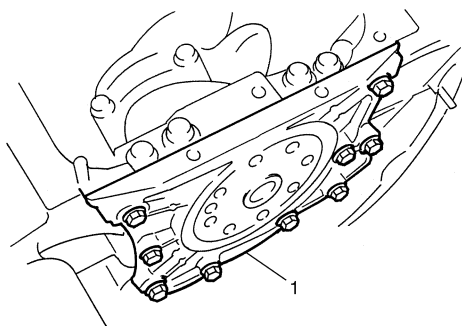
Special tool

(A): 09924-17811



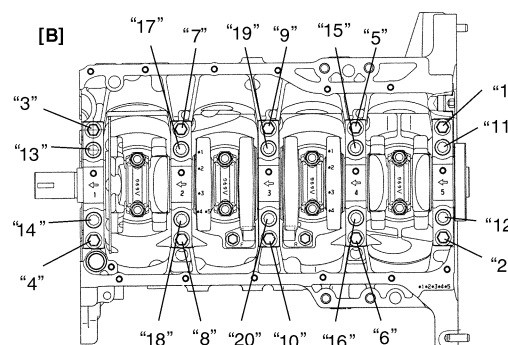
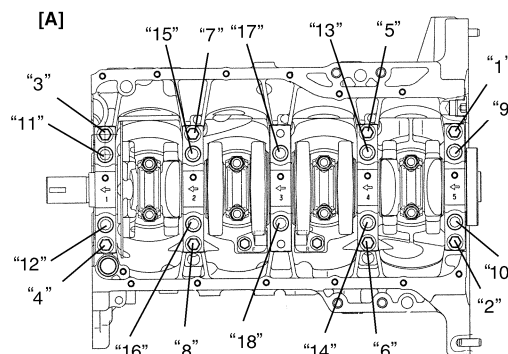
I2RH0B140125-01

- 3) Remove piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: For M13, M15 and M16 Engines".
- 4) Remove rear oil seal housing (1).



I2RH0B140126-01

- 5) Loosen main bearing cap No.1 and No.2 bolts in such order as indicated in figure and remove them.



I6RS0B141021-03

[A]: For M16A engine model

[B]: For other than M16A engine model

- 6) Remove crankshaft from cylinder block.
- 7) Remove piston cooling valves and nozzles, if necessary (for M16A engine model).

Installation

NOTE

- Use new bearing cap No.1 bolts. They are deformed once they are used because they are plastic deformation tightening bolts.
- All parts to be installed must be perfectly clean.
- Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.
- Journal bearings, bearing caps, connecting rods, rod bearings, 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.

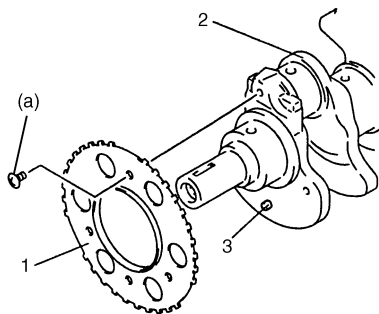
- 1) Install sensor plate (1) to crankshaft (2) and tighten bolts to specified torque.

NOTE

When installing sensor plate, align spring pin (3) on crankshaft and hole of sensor plate.

Tightening torque

Sensor plate bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



I2RH0B140128-01

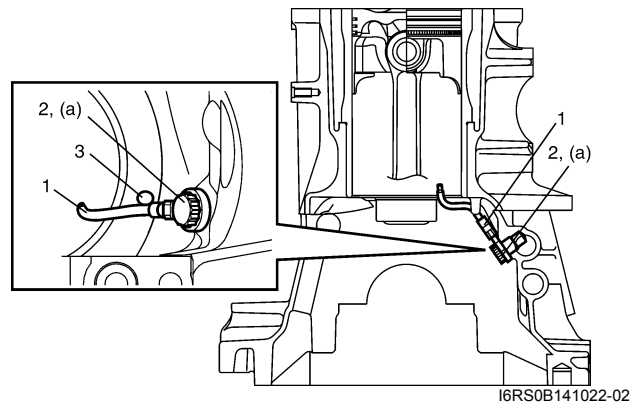
- 2) Install piston cooling valves and nozzles, if removed (for M16A engine model).

NOTE

Install piston cooling valve while matching piston cooling nozzle (1) to positioning (3) of cylinder block when installed piston cooling valve (2).

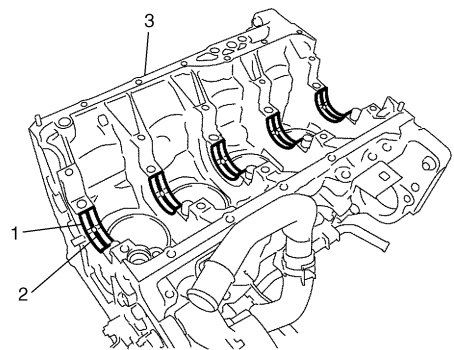
Tightening torque

Piston cooling valve (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



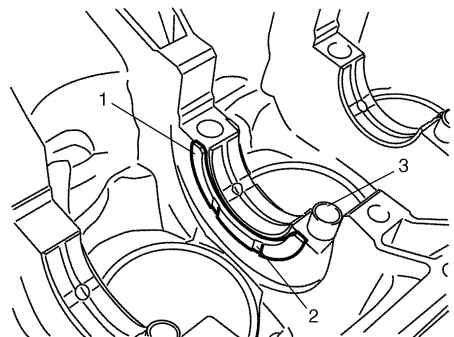
I6RS0B141022-02

- 3) Install main bearings to cylinder block. Upper half of bearing (1), has an oil groove (2). Install it to cylinder block (3), and the other half without oil groove to bearing cap. Make sure that two halves are painted in the same color.



I2RH0B140129-01

- 4) Confirm that dowel pins (3) are installed to intake side of each journal.



I2RH0B140130-01

- 5) Install crankshaft to cylinder block.
- 6) Install thrust bearings (1) to cylinder block between No.2 and No.3 cylinders. Face oil groove (2) sides to crank webs.
- 7) Install bearing cap to cylinder block, making sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side. After applying engine oil to main bearing cap No.1 bolts (a) and main bearing cap No.2 bolts (b), tighten them gradually as follows.

- Tighten bolts ("1" through "10") to 30 N·m (3.0 kgf-m, 22.0 lb-ft) according to numerical order as shown by using a 12 corner socket wrenches.
- In the same manner as in Step a), tighten them to 50 N·m (5.0 kgf-m, 36.5 lb-ft).
- In the same manner as in Step a), retighten them to 60°.
- Tighten bolts ("11" through "18") (for M16A engine model) or ("11" through "20") (for other than M16A engine model) to 25 N·m (2.5 kgf-m, 18.0 lb-ft) according to numerical order as shown.

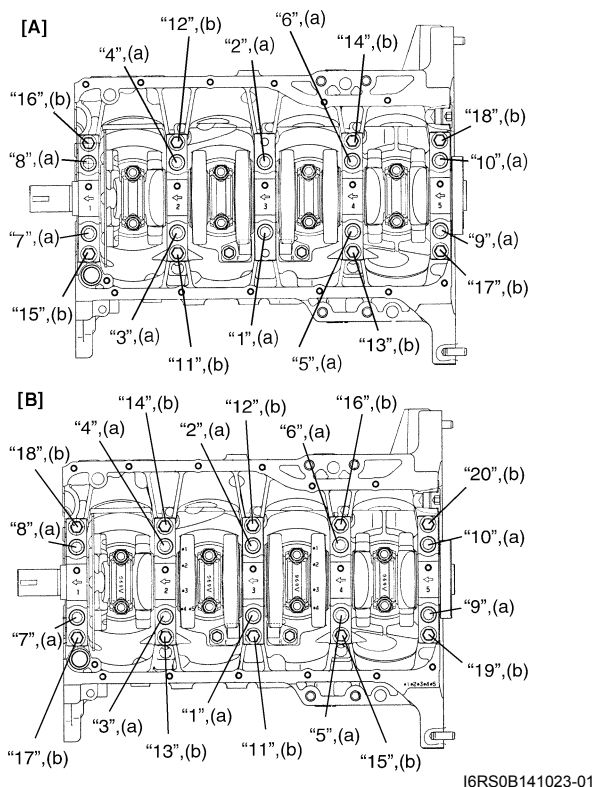
Tightening torque

Main bearing cap No.1 bolt (a): 30 N·m (3.0 kgf-m, 22.0 lb-ft), 50 N·m (5.0 kgf-m, 36.5 lb-ft) and then retighten by turning through 60°

Main bearing cap No.2 bolt (b): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

⚠ CAUTION

After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turning it by 12 N·m (1.2 kgf-m, 9.0 lb-ft) torque or below.



I6RS0B141023-01

[A]: For M16A engine model

[B]: For other than M16A engine model

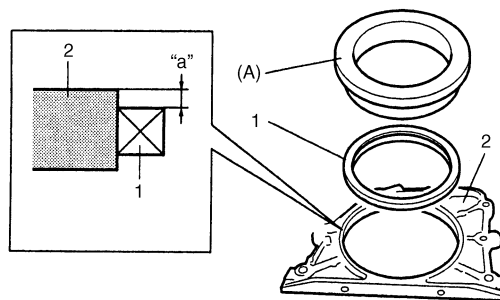
- If necessary, press-fit rear oil seal (1) to oil seal housing (2) by using special tool as shown in the figure.

Special tool

(A): 09911-97821

Crank rear oil seal installing position (dimension)

"a": 2 mm (0.08 in.)



I4RS0A140017-01

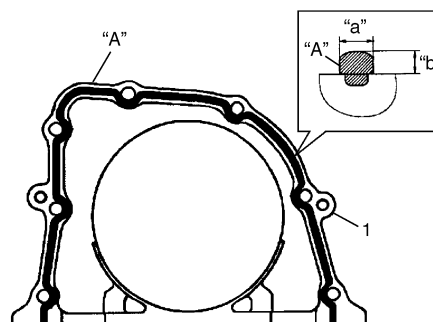
- Apply sealant to mating surface of rear oil seal housing (1).

"A": Water tight sealant 99000-31250 (SUZUKI Bond No.1207F)

Sealant amount for rear oil seal housing

Width "a": 3 mm (0.12 in.)

Height "b": 2 mm (0.08 in.)



I4RS0A140018-01

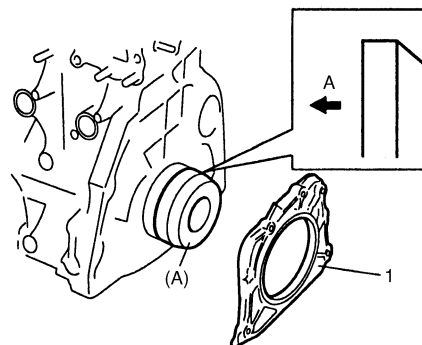
- Install rear oil seal housing (1) and tighten bolts to specified torque by using special tool.

Special tool

(A): 09911-97720

Tightening torque

Rear oil seal housing bolt: 11 N·m (1.1 kgf-m, 8.0 lb-ft)



I4RS0A140019-01

A: Crankshaft side

- 11) Install flywheel (drive plate for A/T).
Using special tool, lock flywheel or drive plate, and tighten flywheel or drive plate bolts to specified torque.

NOTE

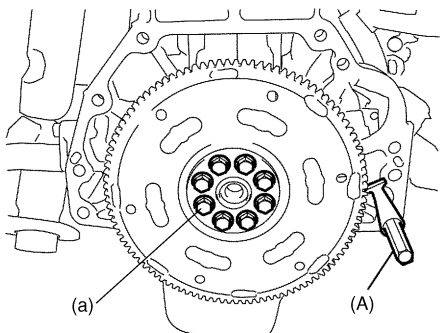
Use new flywheel or drive plate bolts.

Special tool

(A): 09924-17811

Tightening torque

Flywheel or drive plate bolt (a): 70 N·m (7.0 kgf-m, 51.0 lb-ft)



I6RS0B141029-01

- 12) Install piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: For M13, M15 and M16 Engines".
- 13) Install cylinder head referring to "Valves and Cylinder Head Removal and Installation: For M13, M15 and M16 Engines in related manual".
- 14) Install camshafts, tappet and shim referring to "Camshaft, Tappet and Shim Removal and Installation: For M13, M15 and M16 Engines in related manual".
- 15) Install timing chain referring to "Timing Chain and Chain Tensioner Removal and Installation: For M13, M15 and M16 Engines in related manual".
- 16) Install timing chain cover referring to "Timing Chain Cover Removal and Installation: For M13, M15 and M16 Engines in related manual".
- 17) Install cylinder head cover referring to "Cylinder Head Cover Removal and Installation: For M13, M15 and M16 Engines".
- 18) Install oil pan referring to "Oil Pan and Oil Pump Strainer Removal and Installation: For M13, M15 and M16 Engines in Section 1E in related manual".
- 19) Install engine assembly to vehicle referring to "Engine Assembly Removal and Installation (For Other Than M16A Engine Model): For M13, M15 and M16 Engines in related manual" or "Engine Assembly Removal and Installation (For M16A Engine Model): For M13, M15 and M16 Engines".

Crankshaft Inspection

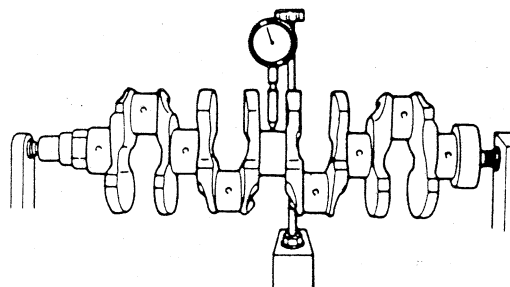
S6RS0B1416039

Crankshaft Runout

Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

Crankshaft runout

Limit: 0.02 mm (0.0008 in.)



I2RH0B140135-01

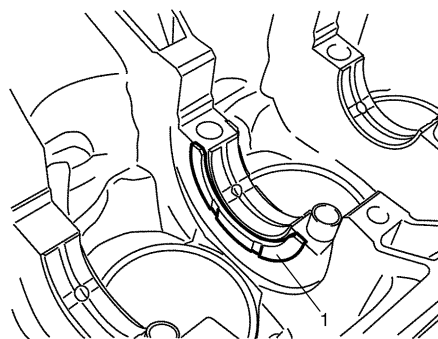
Crankshaft Thrust Play

- 1) Measure this play with crankshaft set in cylinder block in the normal manner, that is with thrust bearing (1) and journal bearing caps installed.

Thickness of crankshaft thrust bearing

Standard: 2.500 mm (0.0984 in.)

Oversize (0.125 mm (0.0049 in.)): 2.563 mm (0.1009 in.)



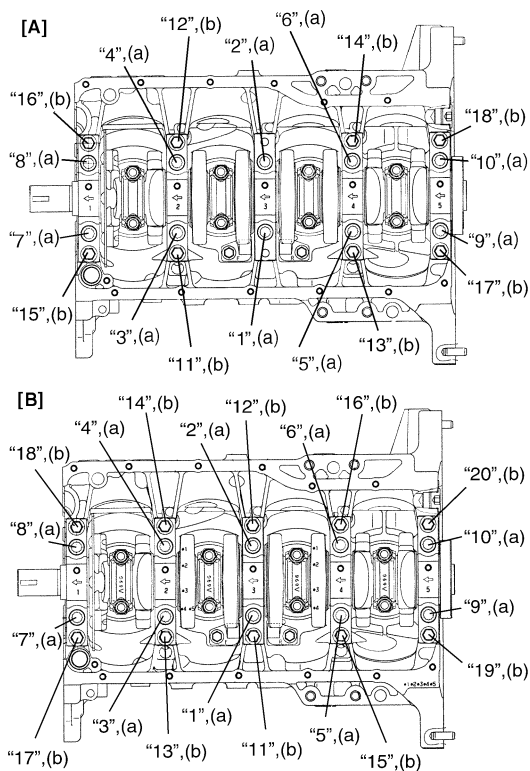
I2RH0B140136-01

- 2) Tighten main bearing cap No.1 bolts (a) and main bearing cap No.2 bolts (b) gradually as follows.
 - a) Tighten bolts ("1" through "10") to 30 N·m (3.0 kgf-m, 22.0 lb-ft) according to numerical order in the figure.
 - b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kgf-m, 36.5 lb-ft).
 - c) In the same manner as in Step a), retighten them to 60°.
 - d) Tighten bolts ("11" through "18") (for M16A engine model) or ("11" through "20") (for other than M16A engine model) to 25 N·m (2.5 kgf-m, 18.0 lb-ft) according to numerical order in the figure.

Tightening torque

Main bearing cap No.1 bolt (a): 30 N·m (3.0 kgf-m, 22.0 lb-ft), 50 N·m (5.0 kgf-m, 36.5 lb-ft) and then retighten by turning through 60°

Main bearing cap No.2 bolt (b): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



16RS0B141023-01

[A]: For M16A engine model

[B]: For other than M16A engine model

- 3) Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.
If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

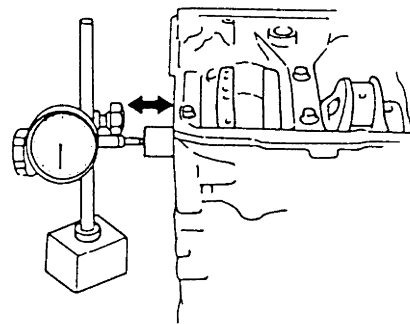
Crankshaft thrust play

Standard: 0.11 – 0.31 mm (0.0043 – 0.0122 in.)

Limit: 0.35 mm (0.0138 in.)

NOTE

After checking the thrust play, make sure that thread deformation of each bearing cap No.1 bolt referring to "Main Bearing Cap No.1 Bolt" in "Main Bearings Inspection: For M13, M15 and M16 Engines".



12RH01140183-01

Out-of-Round and Taper (Uneven Wear) of Journals

An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings. If any one of journals is badly damaged or if amount of uneven wear in the sense exceeds its limit, regrind or replace crankshaft.

Crankshaft out-of-round and taper

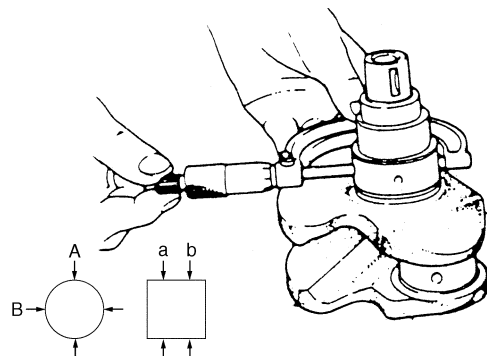
Limit: 0.01 mm (0.0004 in.)

Out-of-round

A – B

Taper

a – b



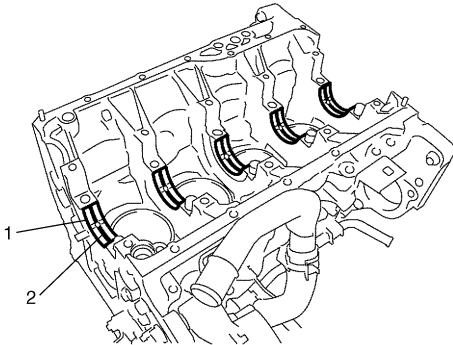
12RH0B140138-01

Main Bearings Inspection

S6RS0B1416040

General Information

- Service main bearings are available in standard size and 0.25 mm (0.0098 in.) undersize, and each of them has 5 kinds of bearings differing in tolerance.
- 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 malfunction is found, replace both upper and lower halves. Never replace either half without replacing the other half.

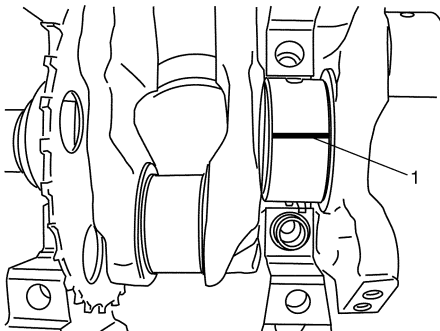
Main Bearing Clearance

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.



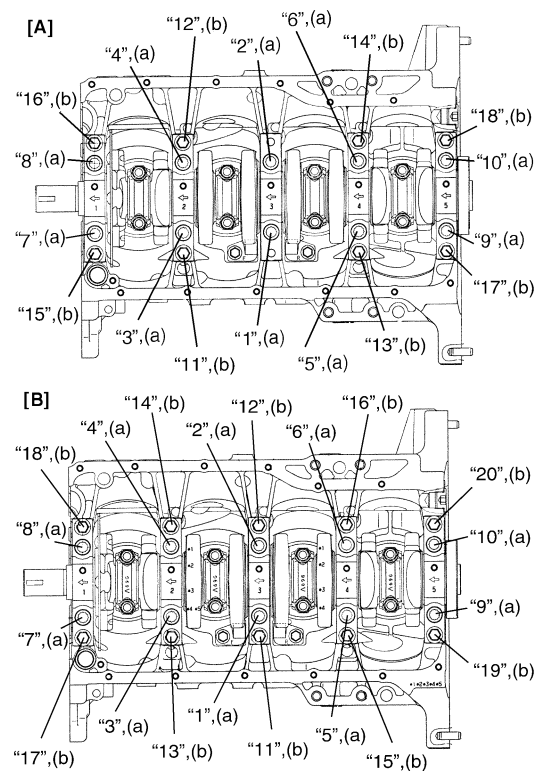
I2RH0B140140-01

- 4) Tighten main bearing cap No.1 bolts (a) and main bearing cap No.2 bolts (b) gradually as follows.
 - a) Tighten bolts ("1" through "10") to 30 N·m (3.0 kgf-m, 22.0 lb-ft) according to numerical order in the figure.
 - b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kgf-m, 36.5 lb-ft).
 - c) In the same manner as in Step a), retighten them to 60°.
 - d) Tighten bolts ("11" through "18") (for M16A engine model) or ("11" through "20") (for other than M16A engine model) to 25 N·m (2.5 kgf-m, 18.0 lb-ft) according to numerical order in the figure.

Tightening torque

Main bearing cap No.1 bolt (a): 30 Nm (3.0 kgf-m, 22.0 lb-ft), 50 Nm (5.0 kgf-m, 36.5 lb-ft) and then retighten by turning through 60°

Main bearing cap No.2 bolt (b): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



I6RS0B141023-01

[A]: For M16A engine model

[B]: For other than M16A engine model

- 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 standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.

After selecting new bearing, recheck clearance.

Main bearing clearance

[For engine with VVT]

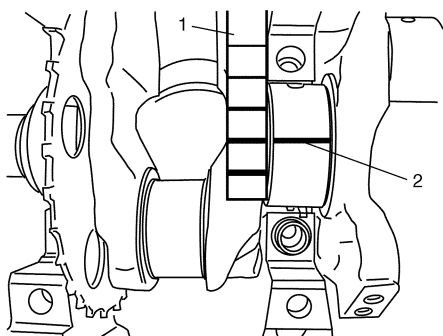
Standard: 0.021 – 0.041 mm (0.0008 – 0.0016 in.)

Limit: 0.054 mm (0.0021 in.)

[For engine without VVT]

Standard: 0.025 – 0.045 mm (0.0010 – 0.0018 in.)

Limit: 0.065 mm (0.0026 in.)



I2RH0B140141-01

Selection of Main Bearings

Standard bearing

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.

- 1) First check journal diameter. As shown in the figure, crank web No.2 has stamped numbers.

Three kinds of numbers ("1", "2" and "3") represent the following journal diameters.

Stamped numbers on crank web No.2 represent journal diameters marked with an arrow in the figure respectively. For example of engine with VVT, stamped number "1" indicates that corresponding journal diameter is 51.9940 – 52.0000 mm (2.0471 – 2.0472 in.).

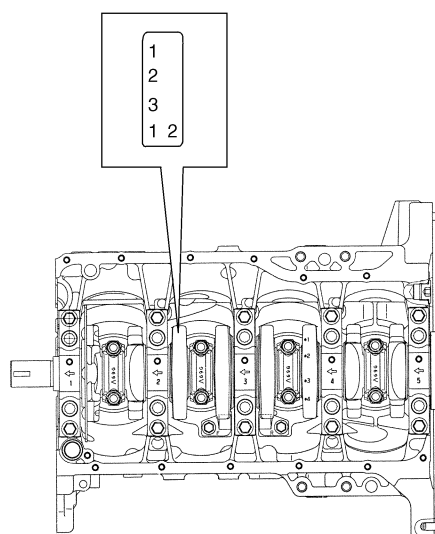
Crankshaft journal diameter

[For engine with VVT]

Stamped numbers	Journal diameter
1	51.9940 – 52.0000 mm (2.0471 – 2.0472 in.)
2	51.9880 – 51.9939 mm (2.0468 – 2.0470 in.)
3	51.9820 – 51.9879 mm (2.0465 – 2.0467 in.)

[For engine without VVT]

Stamped numbers	Journal diameter
1	44.9940 – 45.0000 mm (1.7715 – 1.7716 in.)
2	44.9880 – 44.9939 mm (1.7712 – 1.7714 in.)
3	44.9820 – 44.9879 mm (1.7710 – 1.7711 in.)



I2RH0B140142-01

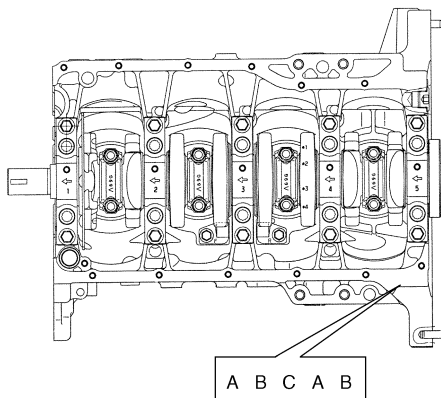
- 2) Next, check bearing cap bore diameter without bearing. On mating surface of cylinder block, five alphabets are stamped as shown in the figure. Three kinds of alphabets ("A", "B" and "C") or numbers ("1", "2" and "3") represent the following cap bore diameters. Stamped alphabets or numbers on cylinder block represent bearing cap bore diameter marked with an arrow in the figure respectively. For example of engine with VVT, stamped "A" or "1" indicates that corresponding bearing cap bore diameter is 56.0000 – 56.0060 mm (2.2048 – 2.2049 in.).

Crankshaft bearing cap bore
[For engine with VVT]

Stamped alphabet (number)	Bearing cap bore diameter (without bearing)
A or 1	56.0000 – 56.0060 mm (2.2048 – 2.2049 in.)
B or 2	56.0061 – 56.0120 mm (2.2050 – 2.2051 in.)
C or 3	56.0121 – 56.0180 mm (2.2052 – 2.2054 in.)

[For engine without VVT]

Stamped alphabet (number)	Bearing cap bore diameter (without bearing)
A or 1	49.0000 – 49.0060 mm (1.9292 – 1.9293 in.)
B or 2	49.0061 – 49.0120 mm (1.9294 – 1.9296 in.)
C or 3	49.0121 – 49.0180 mm (1.9297 – 1.9298 in.)



I2RH0B140143-01

- 3) There are 5 kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in the figure. Each color indicated the following thickness at the center of bearing.

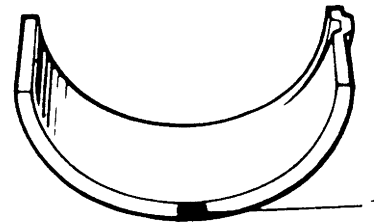
Standard size of crankshaft main bearing thickness

[For engine with VVT]

Color painted	Bearing thickness
Purple	1.992 – 1.996 mm (0.07843 – 0.07858 in.)
Brown	1.995 – 1.999 mm (0.07855 – 0.07870 in.)
Green	1.998 – 2.002 mm (0.07867 – 0.07882 in.)
Black	2.001 – 2.005 mm (0.07878 – 0.07893 in.)
Colorless (no paint)	2.004 – 2.008 mm (0.07890 – 0.07906 in.)

[For engine without VVT]

Color painted	Bearing thickness
Pink	1.990 – 1.994 mm (0.0783 – 0.0785 in.)
Purple	1.993 – 1.997 mm (0.0785 – 0.0786 in.)
Brown	1.996 – 2.000 mm (0.0786 – 0.0787 in.)
Green	1.999 – 2.003 mm (0.0787 – 0.0789 in.)
Black	2.002 – 2.006 mm (0.0788 – 0.0790 in.)



I2RH01140191-01

1. Paint

- 4) From number stamped on crank web No.2 and alphabets stamped on cylinder block, determine new standard bearing to be installed to journal, by referring to the table shown.
For example of engine with VVT, if number stamped on crank web No.2 is "1" and alphabet stamped on cylinder block is "B", install a new standard bearing painted in "Brown" to its journal.

New standard size crankshaft main bearing specification

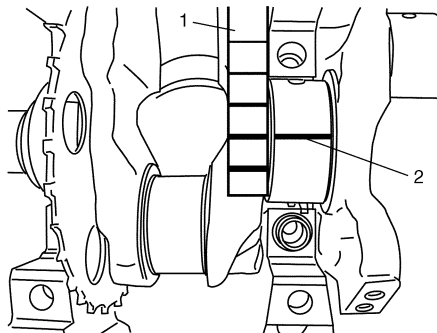
[For engine with VVT]

		Number stamped on crank web No.2 (Journal diameter)		
		1	2	3
Alphabet stamped on cylinder block (Cap bore dia.)	A or 1	Purple	Brown	Green
	B or 2	Brown	Green	Black
	C or 3	Green	Black	Colorless
		New standard bearing to be installed		

[For engine without VVT]

		Number stamped on crank web No.2 (Journal diameter)		
		1	2	3
Alphabet stamped on cylinder block (Cap bore dia.)	A or 1	Pink	Purple	Brown
	B or 2	Purple	Brown	Green
	C or 3	Brown	Green	Black
		New standard bearing to be installed		

- 5) Using scale (1) on gauging plastic (2), check bearing clearance with newly selected standard bearing.
If clearance still exceeds its limit, use next thicker bearing and recheck clearance.



I2RH0B140141-01

- 6) When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to number stamped on new crankshaft or alphabets stamped on new cylinder block.

Undersize bearing (0.25 mm (0.0098 in.))

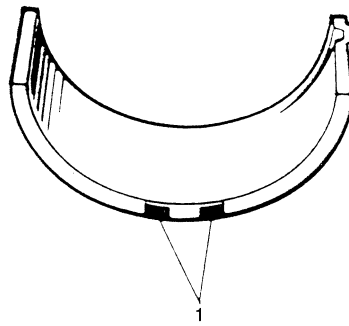
- 0.25 mm (0.0098 in.) undersize bearing is available, in five kinds varying in thickness.
To distinguish them, each bearing is painted in the following colors at such position as indicated in the figure.
Each color represents the following thickness at the center of bearing.

Undersize of crankshaft main bearing thickness**[For engine with VVT]**

Color painted	Bearing thickness
Red and Purple	2.117 – 2.121 mm (0.08335 – 0.08350 in.)
Red and Brown	2.120 – 2.124 mm (0.08347 – 0.08362 in.)
Red and Green	2.123 – 2.127 mm (0.08359 – 0.08374 in.)
Red and Black	2.126 – 2.130 mm (0.08371 – 0.08385 in.)
Red only	2.129 – 2.133 mm (0.08382 – 0.08397 in.)

[For engine without VVT]

Color painted	Bearing thickness
Red and Pink	2.115 – 2.119 mm (0.0833 – 0.0834 in.)
Red and Purple	2.118 – 2.122 mm (0.0834 – 0.0835 in.)
Red and Brown	2.121 – 2.125 mm (0.0835 – 0.0837 in.)
Red and Green	2.124 – 2.128 mm (0.0836 – 0.0838 in.)
Red and Black	2.127 – 2.131 mm (0.0837 – 0.0839 in.)



I2RH01140192-01

1. Paint

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.
 - Regrind journal to the following finished diameter.

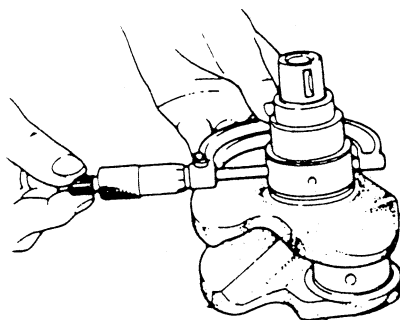
Finished journal diameter**[For engine with VVT]**

51.7320 – 51.7500 mm (2.0367 – 2.0374 in.)

[For engine without VVT]

44.7320 – 44.7500 mm (1.7611 – 1.7618 in.)

- b. Using micrometer, measure regrind journal diameter.
Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
- c. Using journal diameter measured above and alphabets stamped on cylinder block, select an undersize bearing by referring to the following table.
Check bearing clearance with newly selected undersize bearing.



I2RH0B140144-01

New undersize crankshaft main bearing specification
[For engine with VVT]

		Measured journal diameter		
		51.7320 – 51.7379 mm (2.0367 – 2.0369 in.)	51.7380 – 51.7439 mm (2.0370 – 2.0371 in.)	51.7440 – 51.7500 mm (2.0372 – 2.0373 in.)
Alphabets stamped on cylinder block	A (1)	Red and Green	Red and Brown	Red and Purple
	B (2)	Red and Black	Red and Green	Red and Brown
	C (3)	Red only	Red and Black	Red and Green
		Undersize bearing to be installed		

[For engine without VVT]

		Measured journal diameter		
		44.7320 – 44.7379 mm (1.7611 – 1.7613 in.)	44.7380 – 44.7439 mm (1.7614 – 1.7615 in.)	44.7440 – 44.7500 mm (1.7616 – 1.7618 in.)
Alphabets stamped on cylinder block	A (1)	Red and Brown	Red and Purple	Red and Pink
	B (2)	Red and Green	Red and Brown	Red and Purple
	C (3)	Red and Black	Red and Green	Red and Brown
		Undersize bearing to be installed		

Main Bearing Cap No.1 Bolt

Measure each thread diameter main bearing cap No.1 bolts (1) at "A" on 60 mm (2.36 in.) from seat side of flange bolt and "B" on 90 mm (3.54 in.) from seat side of flange bolt by using a micrometer (2).
Calculate difference in diameters ("A" – "B").
If it exceeds limit, replace with new one.

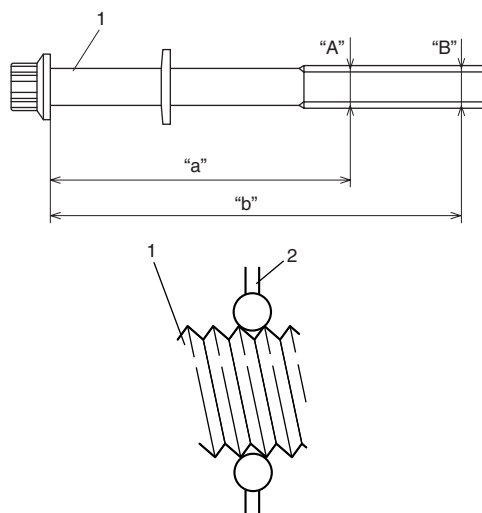
Main bearing cap No.1 bolt diameter measurement points

"a": 60 mm (2.36 in.)

"b": 90 mm (3.54 in.)

Main bearing cap No.1 bolt diameter difference

Limit ("A" – "B"): 0.2 mm (0.008 in.)



I2RH0B140145-01

Cylinder Block Inspection

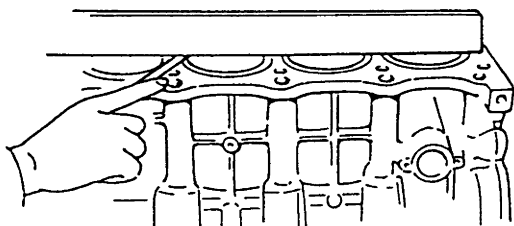
S6RS0B1416044

Distortion of Gasketed Surface

Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct it.

Cylinder block flatness

Limit: 0.03 mm (0.0012 in.)



I2RH01140199-01

Honing or Reboring Cylinders

- 1) When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
- 2) Select oversized piston according to amount of cylinder wear.

Oversize piston specification

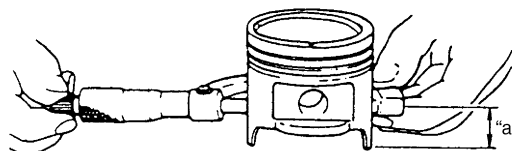
Oversize 0.50: 78.453 – 78.468 mm (3.0887 – 3.0893 in.)

- 3) Using micrometer, measure piston diameter.

Measurement position for piston diameter

“a”: 19.5 mm (0.77 in.) (M13A and M15A engine models)

“a”: 7.0 mm (0.28 in.) (M16A engine model)



I2RH01140157-01

- 4) Rebore and hone cylinder to the following dimension.

NOTE

Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

Cylinder bore diameter to be rebored

Oversize 0.50: 78.500 – 78.514 mm (3.0906 – 3.0911 in.)

- 5) Measure piston clearance after honing.

Piston clearance

0.032 – 0.061 mm (0.0013 – 0.0024 in.)

Specifications

Tightening Torque Specifications

S6RS0B1417001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Cylinder head cover bolt	Tighten 3 N·m (0.3 kgf·m, 2.5 lb·ft), 5 N·m (0.5 kgf·m, 4.0 lb·ft) and 8 N·m (0.8 kgf·m, 6.0 lb·ft) by the specified procedure			⌚
Intake manifold bolt	23	2.3	17.0	⌚
Intake manifold nut	23	2.3	17.0	⌚
Intake manifold ground terminal bolt	11	1.1	8.0	⌚
Engine left mounting bracket nut	55	5.5	40.0	⌚
Engine right mounting nut	65	6.5	47.0	⌚
Engine rear mounting bush bolt	55	5.5	40.0	⌚
Starting motor terminal nut	11	1.1	8.0	⌚
Generator terminal nut	6	0.6	4.5	⌚
Intake manifold ground terminal bolt	11	1.1	18.0	⌚
Camshaft housing bolt	5 N·m (0.5 kgf·m, 4.0 lb·ft) and 11 N·m (1.1 kgf·m, 8.0 lb·ft) by the specified procedure			⌚
Camshaft housing bolt	11	1.1	8.0	⌚
Connecting rod bearing cap nut	15 N·m (1.5 kgf·m, 11.0 lb·ft) and then retighten by turning through 45° twice			⌚ / ⌚
Connecting rod bearing cap bolt	15 N·m (1.5 kgf·m, 11.0 lb·ft) and then retighten by turning through 45° twice			⌚ / ⌚
Sensor plate bolt	11	1.1	8.0	⌚
Piston cooling valve	11	1.1	8.0	⌚

1D-40 Engine Mechanical: For M13, M15 and M16 Engines

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Main bearing cap No.1 bolt (a)	30 N·m (3.0 kgf-m, 22.0 lb-ft), 50 N·m (5.0 kgf-m, 36.5 lb-ft) and then retighten by turning through 60°			🔩
Main bearing cap No.2 bolt (b)	25	2.5	18.0	🔩
Rear oil seal housing bolt	11	1.1	8.0	🔩
Flywheel or drive plate bolt	70	7.0	51.0	🔩
Main bearing cap No.1 bolt	30 N·m (3.0 kgf-m, 22.0 lb-ft), 50 N·m (5.0 kgf-m, 36.5 lb-ft) and then retighten by turning through 60°			🔩
Main bearing cap No.2 bolt	25	2.5	18.0	🔩 / 🔩
Main bearing cap No.1 bolt	30 Nm (3.0 kgf-m, 22.0 lb-ft), 50 Nm (5.0 kgf-m, 36.5 lb-ft) and then retighten by turning through 60°			🔩

NOTE

The specified tightening torque is also described in the following.

“Air Cleaner Components: For M13, M15 and M16 Engines”

“Throttle Body and Intake Manifold Components: For M13, M15 and M16 Engines”

“Engine Mountings Components (For M16A Engine Model): For M13, M15 and M16 Engines”

“Pistons, Piston Rings, Connecting Rods and Cylinders Components: For M13, M15 and M16 Engines”

“Main Bearings, Crankshaft and Cylinder Block Components: For M13, M15 and M16 Engines”

Reference:

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

Special Tools and Equipment

Recommended Service Material

S6RS0B1418001

Material	SUZUKI recommended product or Specification		Note
Water tight sealant	SUZUKI Bond No.1207F	P/No.: 99000-31250	🔩 / 🔩 / 🔩

NOTE

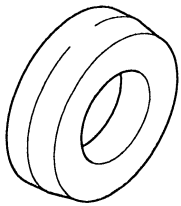
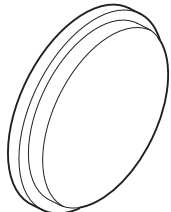
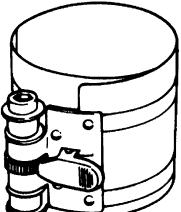
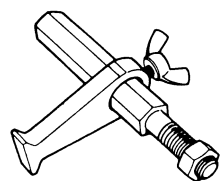
Required service material is also described in the following.

“Pistons, Piston Rings, Connecting Rods and Cylinders Components: For M13, M15 and M16 Engines”

“Main Bearings, Crankshaft and Cylinder Block Components: For M13, M15 and M16 Engines”

Special Tool

S6RS0B1418002

09911-97720 Oil seal installer 🔩		09911-97821 Oil seal installer 🔩	
09916-77310 Piston ring compressor (50-125 mm) 🔩		09924-17811 Flywheel holder 🔩 / 🔩	

Engine Lubrication System

For M13, M15 and M16 Engines

General Description

Engine Lubrication Description

S6RS0B1511001

The oil pump is of a trochoid type, and mounted on the crankshaft. Oil is drawn up through the oil pump strainer and passed through the pump to the oil filter.

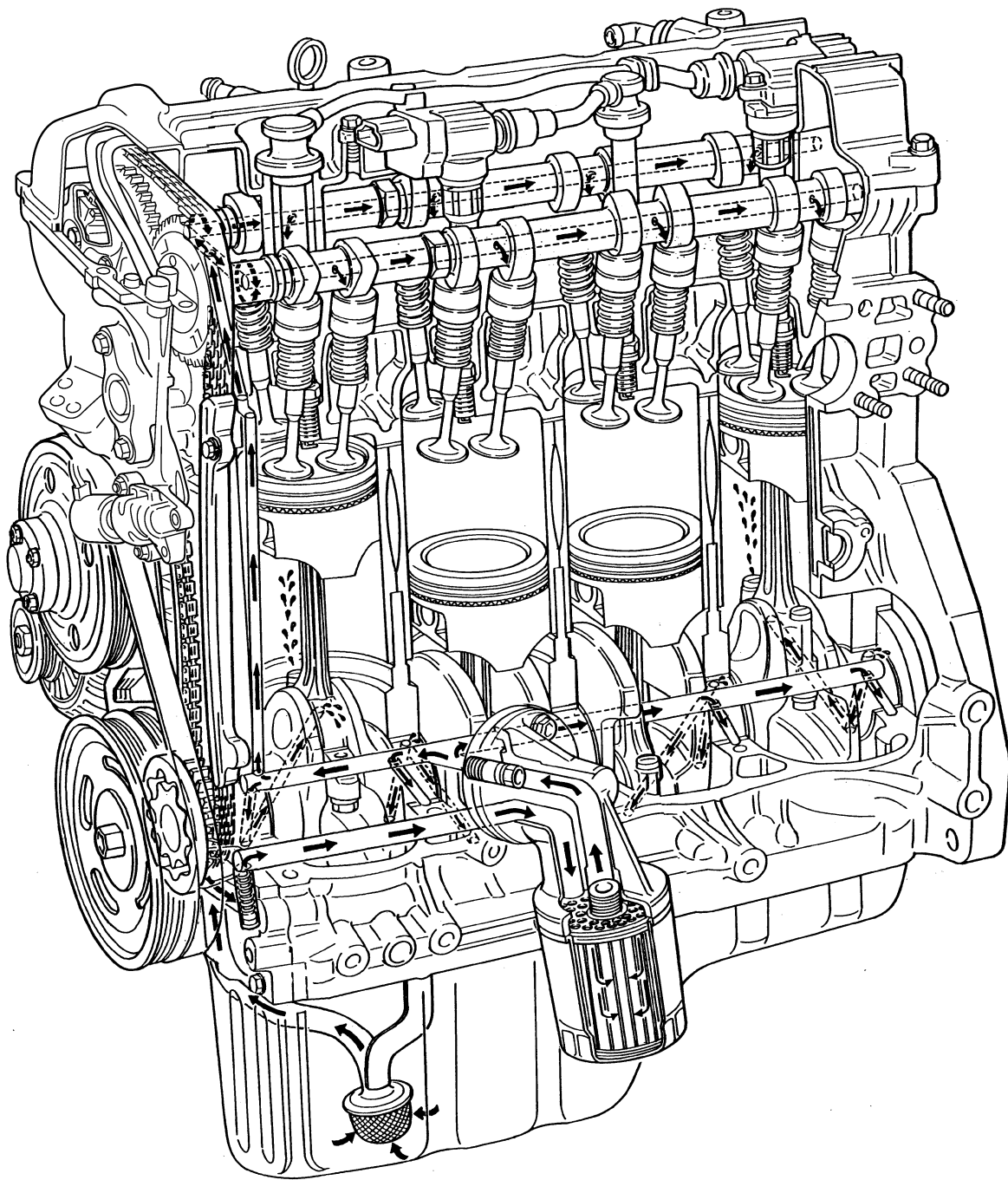
For M13A and M15A engine models, the filtered oil flows into two paths in cylinder block.

The filtered oil is passed to the passage in heat exchanger and cylinder block to piston cooling valve of oil gushed to the lower side of piston.

In one path, oil reaches the crankshaft journal bearings. Oil from the crankshaft journal bearings is supplied to the connecting rod bearings by means of intersecting passages drilled in the crankshaft, and then injected from the big end of connecting rod to lubricate piston, rings and cylinder wall.

In the other path oil goes up to the cylinder head and lubricates valves and camshafts, etc., after passing through the internal oil way of camshafts.

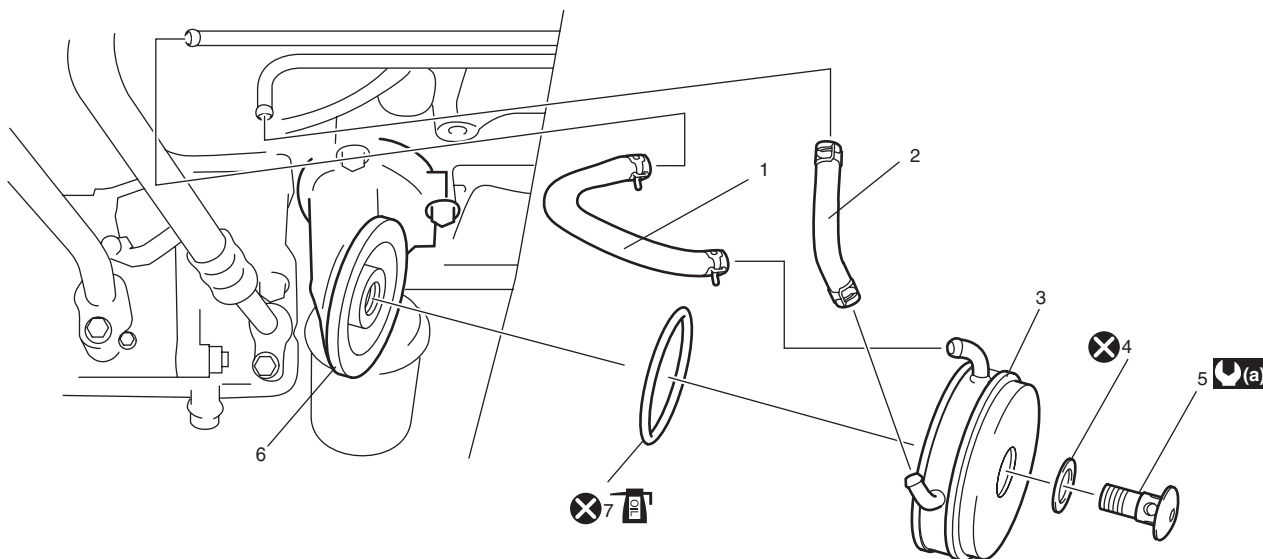
An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure exceeds about 350 kPa (3.5 kg/cm², 49.8 psi).



Repair Instructions

Heat Exchanger Components (For M16A Engine Model)

S6RS0B1516008



I6RS0B151001-02

1. Heat exchanger inlet No. 1 hose	4. Gasket	7. O-ring : Apply engine oil.
2. Heat exchanger outlet No. 1 hose	5. Heat exchanger stand bolt	(a) : 22 N·m (2.2 kgf-m, 16.0 lb-ft)
3. Heat exchanger	6. Oil filter adapter case	⊗ : Do not reuse.

Heat Exchanger On-Vehicle Inspection (For M16A Engine Model)

S6RS0B1516009

- Check heat exchanger for deformation wear or damage.
- Check heat exchanger for coolant leakage and oil leakage.

If any malfunction is found, replace O-ring, stand bolt gasket and/or heat exchanger.

Heat Exchanger Removal and Installation (For M16A Engine Model)

S6RS0B1516010

Removal

- 1) Drain engine oil by removing drain plug.
- 2) Drain coolant referring to "Cooling System Draining: For M13, M15 and M16 Engines in Section 1F in related manual".
- 3) Remove exhaust manifold referring to "Exhaust Manifold Removal and Installation: For M13, M15 and M16 Engines in Section 1K".
- 4) Remove heat exchanger inlet No. 1 hose and outlet No. 1 hose.
- 5) Remove heat exchanger, O-ring and gasket by removing heat exchanger stand bolt.

Installation

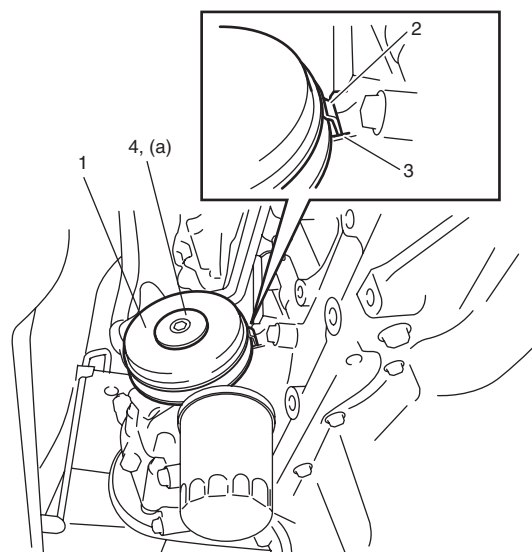
Reverse removal procedure for installation noting the followings.

- Use new stand bolt gasket.

- Apply engine oil to new O-ring and install it to heat exchanger.
- Install heat exchanger (1) while matching the projection of heat exchanger (2) in rib of the cylinder block (3) as shown in figure.
- Install heat exchanger stand bolt (4) to specified torque.

Tightening torque

Heat exchanger stand bolt (a): 22 N·m (2.2 kgf-m, 16.0 lb-ft)



I6RS0B151002-01

1E-4 Engine Lubrication System: For M13, M15 and M16 Engines

- Refill cooling system with coolant referring to “Cooling System Flush and Refill: For M13, M15 and M16 Engines in Section 1F in related manual”.
- Refill engine with engine oil referring to “Engine Oil and Filter Change (Petrol Engine) in Section 0B in related manual”.
- Upon completion of installation, check for engine coolant and oil leaks.

Specifications

Tightening Torque Specifications

S6RS0B1517001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Heat exchanger stand bolt	22	2.2	16.0	

NOTE

The specified tightening torque is also described in the following.

“Heat Exchanger Components (For M16A Engine Model): For M13, M15 and M16 Engines”

Reference:

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

Special Tools and Equipment

Recommended Service Material

S6RS0B1518001

NOTE

Required service material is also described in the following.

“Heat Exchanger Components (For M16A Engine Model): For M13, M15 and M16 Engines”

Engine Cooling System

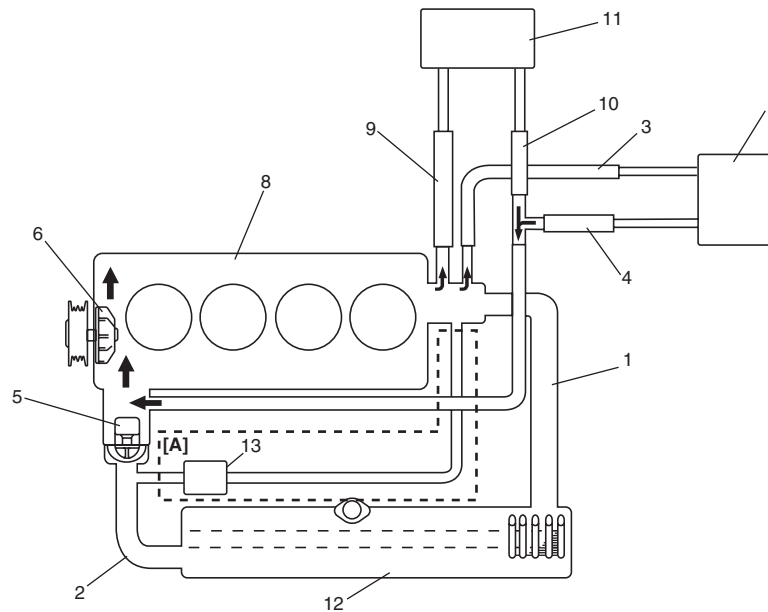
For M13, M15 and M16 Engines

Schematic and Routing Diagram

Coolant Circulation

S6RS0B1612001

While the engine is warmed up (thermostat closed), coolant circulates as follows.

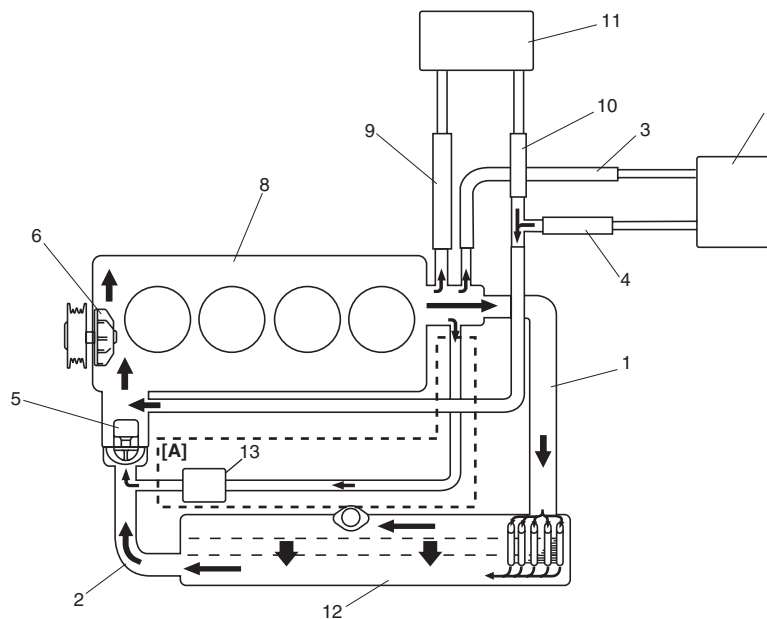


I6RS0B161001-01

[A]: For M16A engine model only	5. Thermostat	10. Heater core outlet hose
1. Radiator inlet hose	6. Water pump	11. Heater core
2. Radiator outlet hose	7. Throttle body	12. Radiator
3. Throttle body inlet hose	8. Engine	13. Heat exchanger
4. Throttle body outlet hose	9. Heater core inlet hose	

1F-2 Engine Cooling System: For M13, M15 and M16 Engines

When coolant is warmed up to normal temperature and the thermostat opens, coolant passes through the radiator core to be cooled as follows.



I6RS0B161002-01

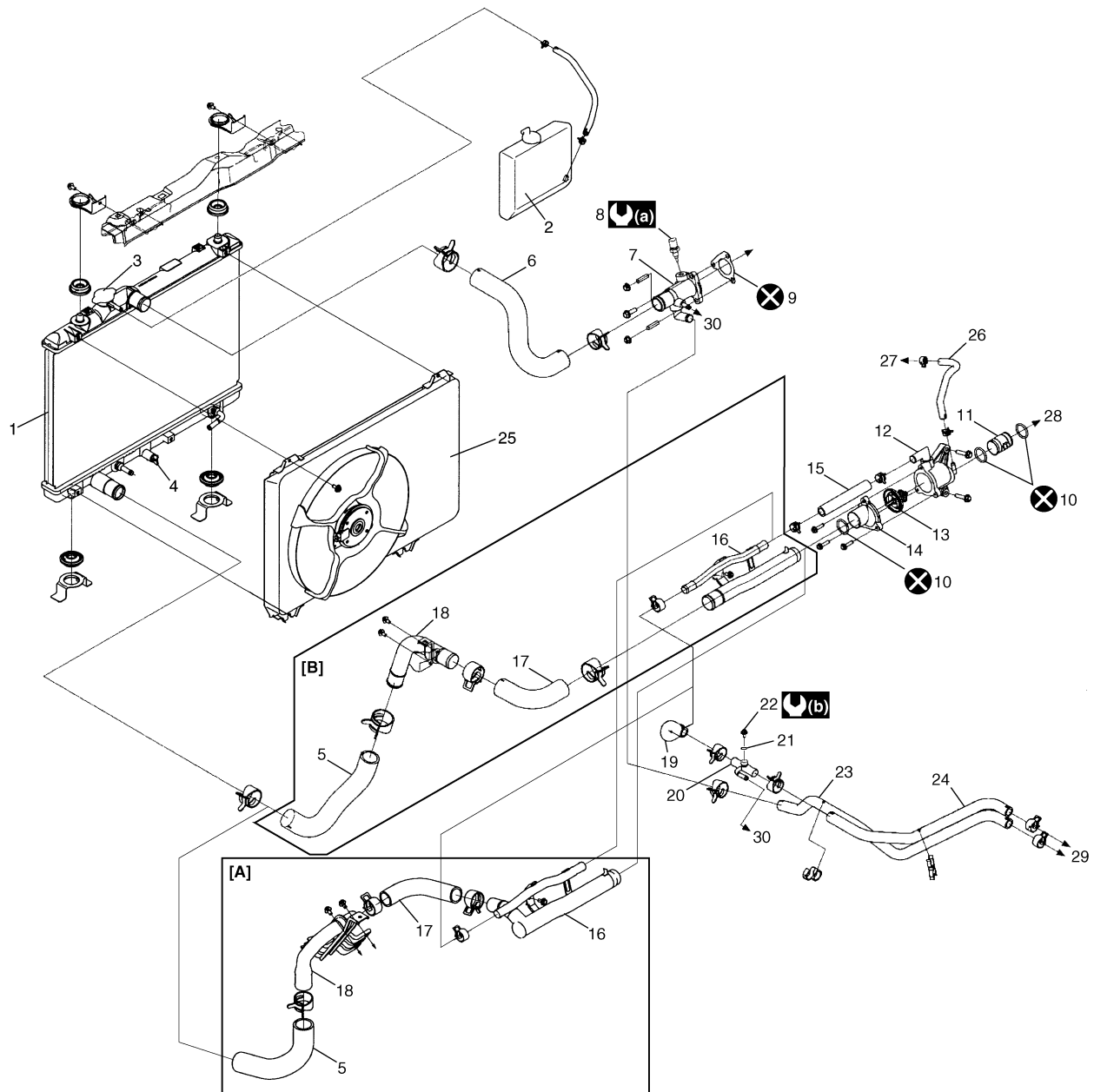
[A]: For M16A engine model only	5. Thermostat	10. Heater core outlet hose
1. Radiator inlet hose	6. Water pump	11. Heater core
2. Radiator outlet hose	7. Throttle body	12. Radiator
3. Throttle body inlet hose	8. Engine	13. Heat exchanger
4. Throttle body outlet hose	9. Heater core inlet hose	

Repair Instructions

Cooling System Components

S6RS0B1616001

For M13A and M15A Engine Models

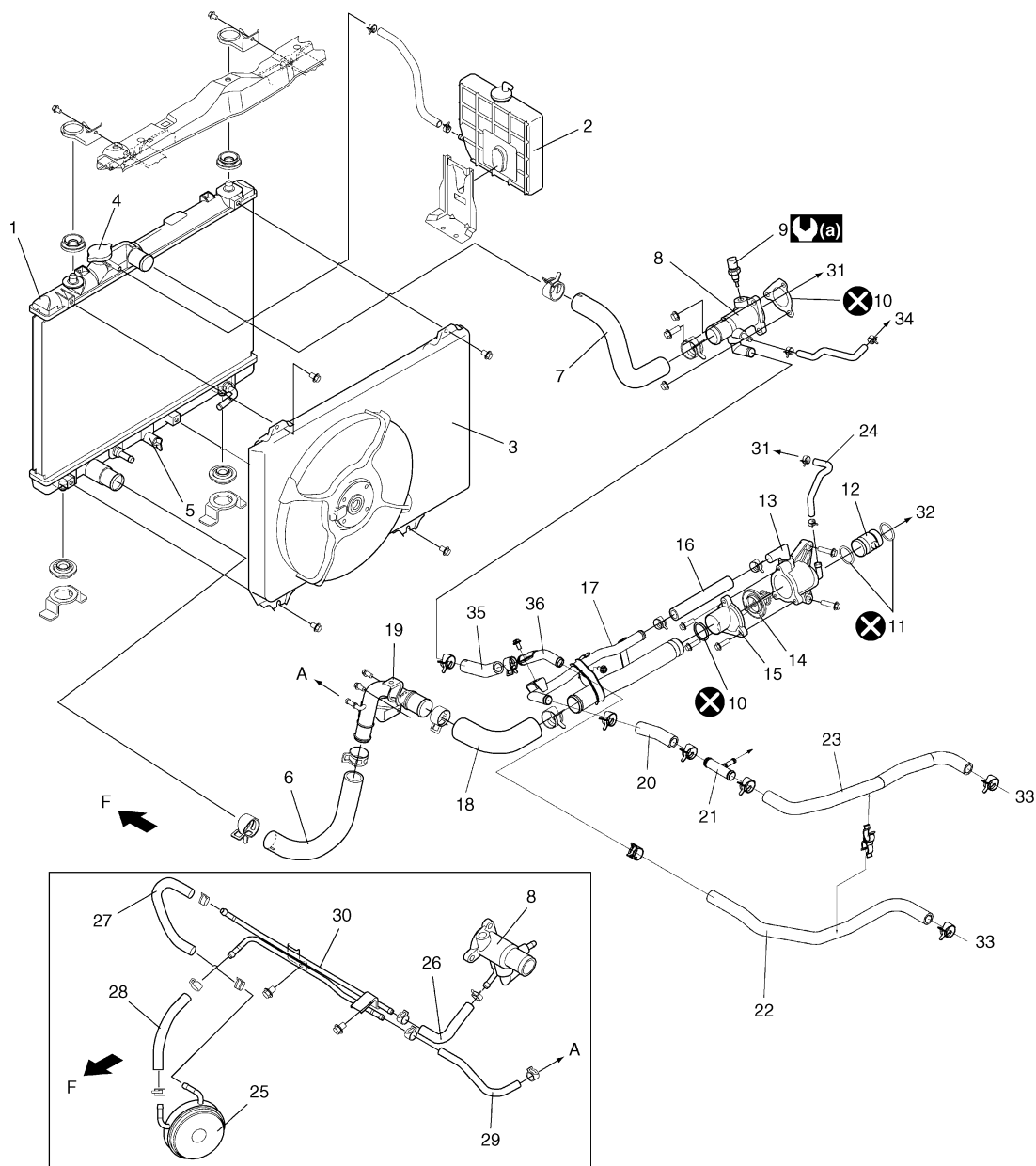


I4RS0B160001-04

[A]: For Automated Manual Transaxle model	11. Thermostat case water outlet pipe	23. Heater inlet hose
[B]: For A/T and M/T models	12. Thermostat case	24. Heater outlet No.1 hose
1. Radiator	13. Thermostat	25. Engine cooling fan assembly
2. Reservoir	14. Thermostat cap	26. Water bypass No.2 hose
3. Radiator cap	15. Water bypass No.1 hose	27. To cylinder head
4. Drain plug	16. Water inlet No.1 pipe	28. To water pump
5. Radiator outlet hose	17. Water inlet No.2 pipe	29. To heater core
6. Radiator inlet hose	18. Water inlet No.2 pipe	30. To throttle body
7. Water outlet cap	19. Heater outlet No.2 hose	(a) : 15 N·m (1.5 kgf-m, 11.0 lb-ft)
8. ECT sensor	20. Heater union	(b) : 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)
9. Water outlet cap gasket	21. Heater union gasket	⊗ : Do not reuse.
10. O-ring	22. Air ventilation bolt	

1F-4 Engine Cooling System: For M13, M15 and M16 Engines

For M16A Engine Model



I6RS0B161003-04

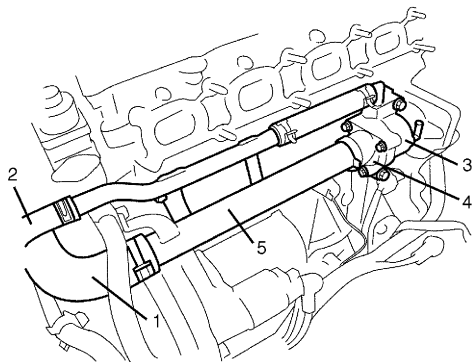
F: Vehicle forward	10. Water outlet cap gasket	20. Heater outlet No.2 hose	30. Heat exchanger water pipe
1. Radiator	11. O-ring	21. Heater union	31. To cylinder head
2. Reservoir	12. Thermostat case water outlet pipe	22. Heater inlet No.1 hose	32. To water pump
3. Engine cooling fan assembly	13. Thermostat case	23. Heater outlet No.1 hose	33. To heater core
4. Radiator cap	14. Thermostat	24. Water bypass No.2 hose	34. To throttle body
5. Drain plug	15. Thermostat cap	25. Heat exchanger	35. Heater inlet No.2 hose
6. Radiator outlet hose	16. Water bypass No.1 hose	26. Heat exchanger inlet No.1 hose	36. Heater inlet pipe
7. Radiator inlet hose	17. Water inlet No.1 pipe	27. Heat exchanger inlet No.2 hose	(a) : 15 N·m (1.5 kgf-m, 11.0 lb-ft)
8. Water outlet cap	18. Water inlet hose	28. Heat exchanger outlet No.1 hose	(b) : 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)
9. ECT sensor	19. Water inlet No.2 pipe	29. Heat exchanger outlet No.2 hose	X : Do not reuse.

Thermostat Removal and Installation

S6RS0B1616007

Removal

- 1) Drain coolant referring to "Cooling System Draining: For M13, M15 and M16 Engines in related manual".
- 2) Remove intake manifold referring to "Intake Manifold Removal and Installation (For Other Than M16A Engine Model): For M13, M15 and M16 Engines in Section 1D in related manual".
- 3) Remove generator referring to "Generator Dismounting and Remounting: For M13, M15 and M16 Engines in Section 1J".
- 4) Disconnect water hose (1) and heater hose (2) from each pipe.
- 5) Remove thermostat case (3) with thermostat cap (4) and water inlet pipe (5).
- 6) Remove water inlet pipe with thermostat cap from thermostat case.
- 7) Remove thermostat from thermostat case (3).

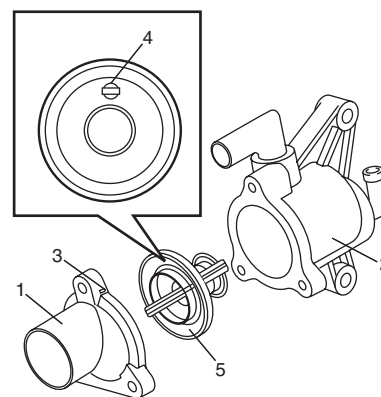


I3RM0A160007-01

Installation

Reverse removal procedure for installation noting the following points.

- Install thermostat cap (1) to thermostat case (2) by aligning match mark (3) of thermostat cap with air bleed valve (4) of the thermostat (5).



I5RW0C160013-01

- Use new O-rings when installing.
- Adjust water pump belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment: For M13, M15 and M16 Engines".
- Adjust A/C compressor belt tension referring to "Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual Type in Section 7B in related manual" or "Compressor Drive Belt Inspection and Adjustment: Automatic Type in Section 7B".
- Refill cooling system referring to Step 7) to 22) of "Cooling System Flush and Refill: For M13, M15 and M16 Engines in related manual".
- Verify that there is no coolant leakage at each connection.

Water Pump / Generator Drive Belt Tension Inspection and Adjustment

S6RS0B1616014

Refer to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment: For M13, M15 and M16 Engines in Section 1J".

Water Pump / Generator Drive Belt Removal and Installation

S6RS0B1616015

Refer to "Water Pump / Generator Drive Belt Removal and Installation: For M13, M15 and M16 Engines in Section 1J".

Specifications

Tightening Torque Specifications

S6RS0B1617001

NOTE

The specified tightening torque is also described in the following.
"Cooling System Components: For M13, M15 and M16 Engines"

Reference:

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

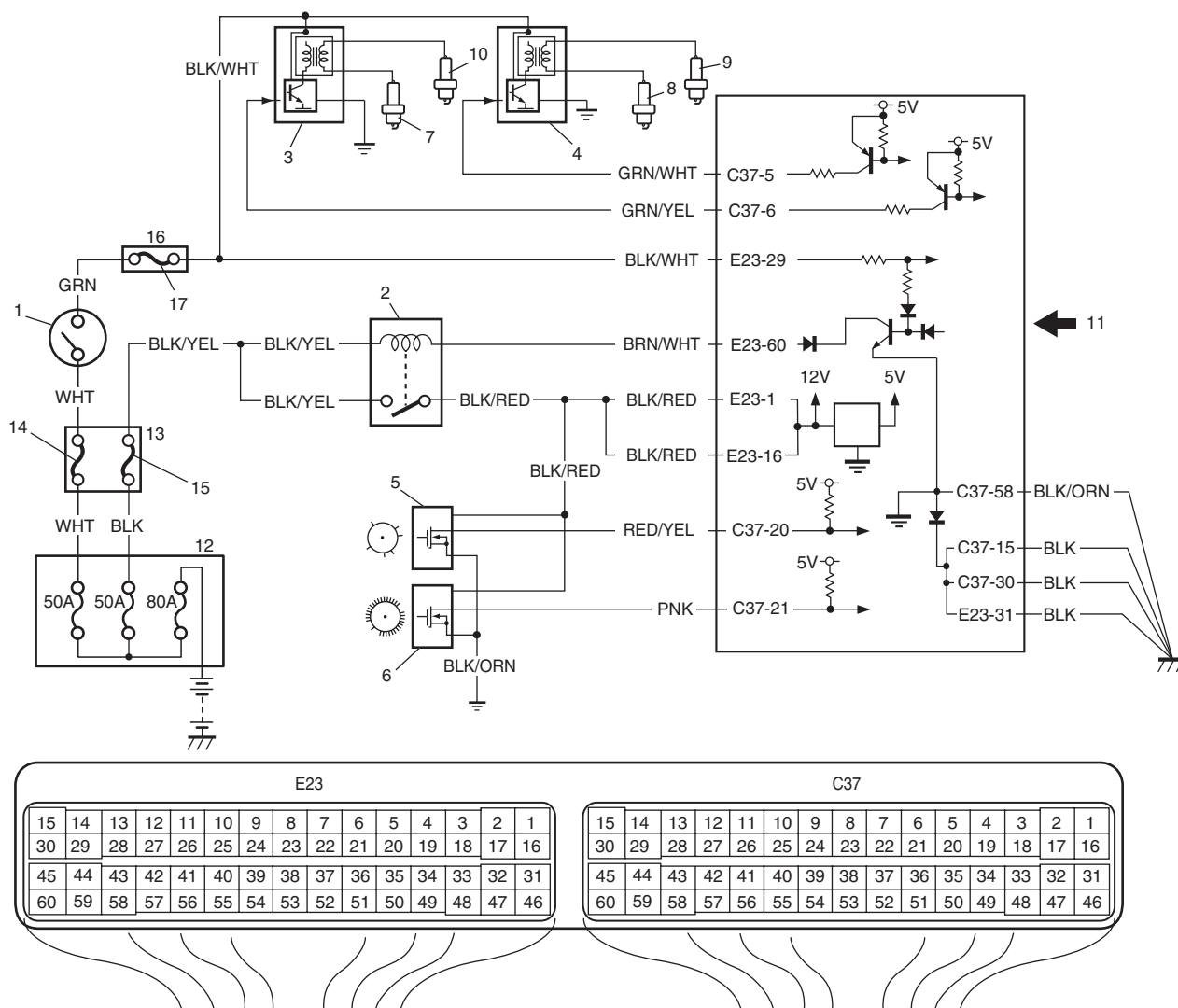
Ignition System

For M13, M15 and M16 Engines

Schematic and Routing Diagram

Ignition System Wiring Circuit Diagram

S6RS0B1802001



I4RS0B180001-01

1. Ignition switch	7. No.1 spark plug	13. Relay box
2. Main relay	8. No.2 spark plug	14. "IG ACC" fuse
3. Ignition coil assembly for No.1 and No.4 spark plugs	9. No.3 spark plug	15. "FI" fuse
4. Ignition coil assembly for No.2 and No.3 spark plugs	10. No.4 spark plug	16. Junction block assembly
5. CMP sensor	11. Sensed information	17. "IG COIL" fuse
6. CKP sensor	12. Battery fuse box	

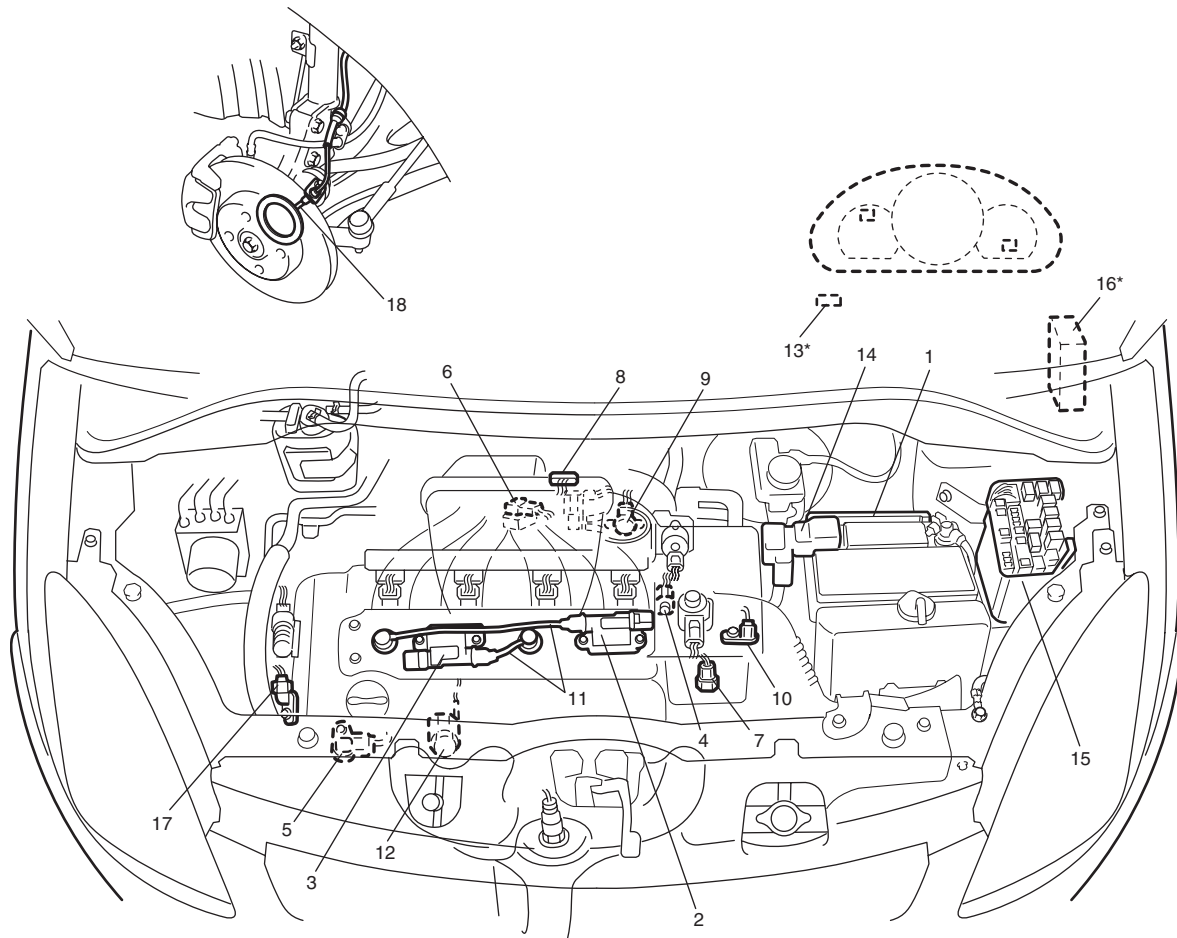
Component Location

Ignition System Components Location

S6RS0B1803001

NOTE

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



I6RS0B180001-01

1. ECM	7. ECT sensor	13. Data link connector
2. Ignition coil assembly for No.1 and No.4 spark plugs	8. MAF and IAT sensor	14. Battery fuse box
3. Ignition coil assembly for No.2 and No.3 spark plugs	9. TP sensor (non-electric throttle body model) or electric throttle body assembly (if equipped)	15. Relay box
4. CMP sensor (VVT model)	10. VSS (Non-M16A engine model)	16. Junction block assembly
5. CKP sensor	11. High-tension cords	17. CMP sensor (for M13A engine model)
6. MAP sensor	12. Knock sensor	18. Wheel speed sensor (for M16A engine model)

Repair Instructions

Spark Plug Inspection

S6RS0B1806004

⚠ CAUTION

- When servicing the iridium / platinum spark plugs (slender center electrode type plugs), do not touch the center electrode to avoid damage to it. The electrode is not strong enough against mechanical force as it is slender and its material is not mechanically tough.
- Do not clean or adjust gap for the iridium / platinum spark plugs.

Inspect spark plug for:

- Electrode wear
- Carbon deposits
- Insulator damage

If any abnormality is found for nickel spark plugs, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.

For iridium / platinum spark plugs, replace them with new plugs.

Spark plug air gap

"a": 1.0 – 1.1 mm (0.040 – 0.043 in.)

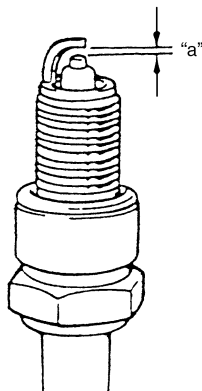
Spark plug type

NGK: BKR6E-11 (Nickel) / IFR6J11 (Iridium)

DENSO: K20PR-U11 (Nickel)

NOTE

NGK IFR6J11 is highly recommended for better engine starting performance under -25°C (-13°F).



IYSQ01181012-01

Ignition Timing Inspection

S6RS0B1806007

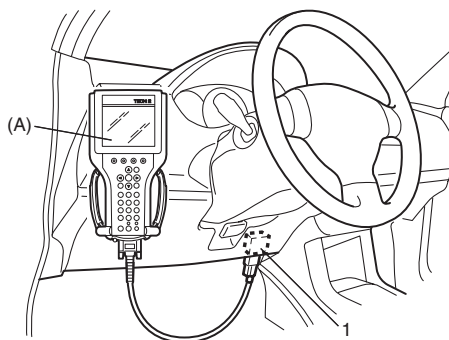
NOTE

- Ignition timing is not adjustable. If ignition timing is out of specification, check system related parts.
- Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake.

- 1) Connect scan tool to DLC (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool



I4RS0B180003-01

- 2) Start engine and warm it up to normal operating temperature.
- 3) Make sure that all of electrical loads except ignition are switched off.
- 4) Check to be sure that idle speed is within specification referring to "Idle Speed / Idle Air Control (IAC) Duty Inspection (Non-electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1A" or "Idle Speed and IAC Throttle Valve Opening Inspection (Electric Throttle Body Model): For M13, M15 and M16 Engines in Section 1A".
- 5) Fix ignition timing by using "Fixed Spark" of "Misc Test" mode on scan tool.
- 6) Set timing light (1) to high-tension cord for No.1 cylinder and check that ignition timing is within specification.

Initial ignition timing (fixed with SUZUKI scan tool)

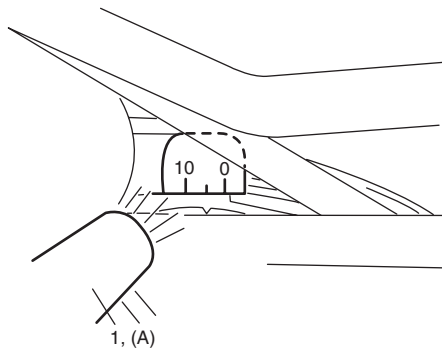
5 ± 3° BTDC (at specified idle speed)

Ignition order

1 – 3 – 4 – 2

Special tool

(A): 09930-76420



I3RB0A180004-01

- 7) If ignition timing is out of specification, check the followings.
 - CKP sensor
 - CKP sensor plate
 - TP sensor (non-electric throttle body model)
 - CMP sensor
 - CMP sensor rotor tooth of camshaft
 - VSS (non-M16A engine model)
 - Vehicle speed signal from ESP® control module (ESP® model)
 - Timing chain cover installation
- 8) After checking initial ignition timing, release ignition timing fixation by using scan tool.
- 9) With engine idling (throttle opening at closed position and vehicle stopped), check that ignition timing is about 5° – 15° BTDC for M13A and M16A engines or 3° – 13° BTDC for M15A engine. (Constant variation within a few degrees from 5° – 15° BTDC for M13A and M16A engines or 3° – 13° BTDC for M15A engine indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
If the check results are not satisfactory, check CKP sensor and ECM.

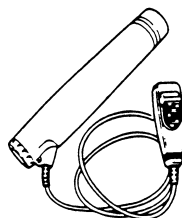
Special Tools and Equipment

Special Tool

S6RS0B1808001

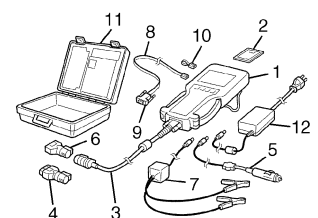
09930-76420

Timing-light (dry cell type)



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 loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply



Charging System

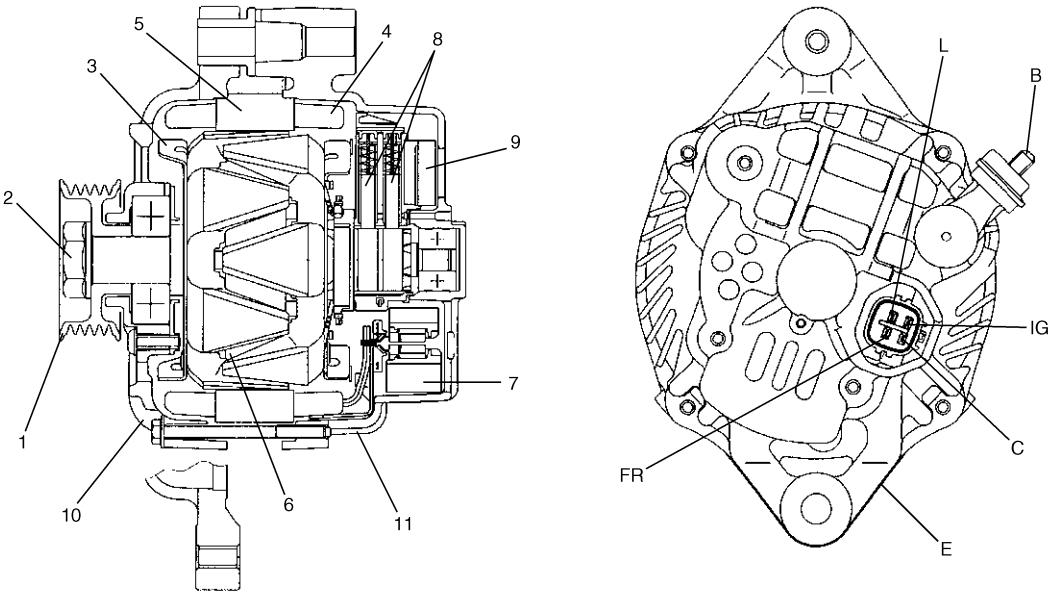
For M13, M15 and M16 Engines

General Description

Generator Description (For 80A Type)

S6RS0B1A11003

The basic charging system is the IC integral regulator charging system. The internal components are connected electrically as shown below.



I5JB0A1A0004-01

1. Pulley	6. Field coil	11. Rear housing	IG: Ignition terminal
2. Pulley nut	7. Rectifier	B: Generator output (Battery terminal)	L: Lamp terminal
3. Rotor fan	8. Brush	C: Generator cut	
4. Stator coil	9. Regulator	E: Ground	
5. Stator core	10. Front housing	FR: Field duty monitor	

Charging System Circuit

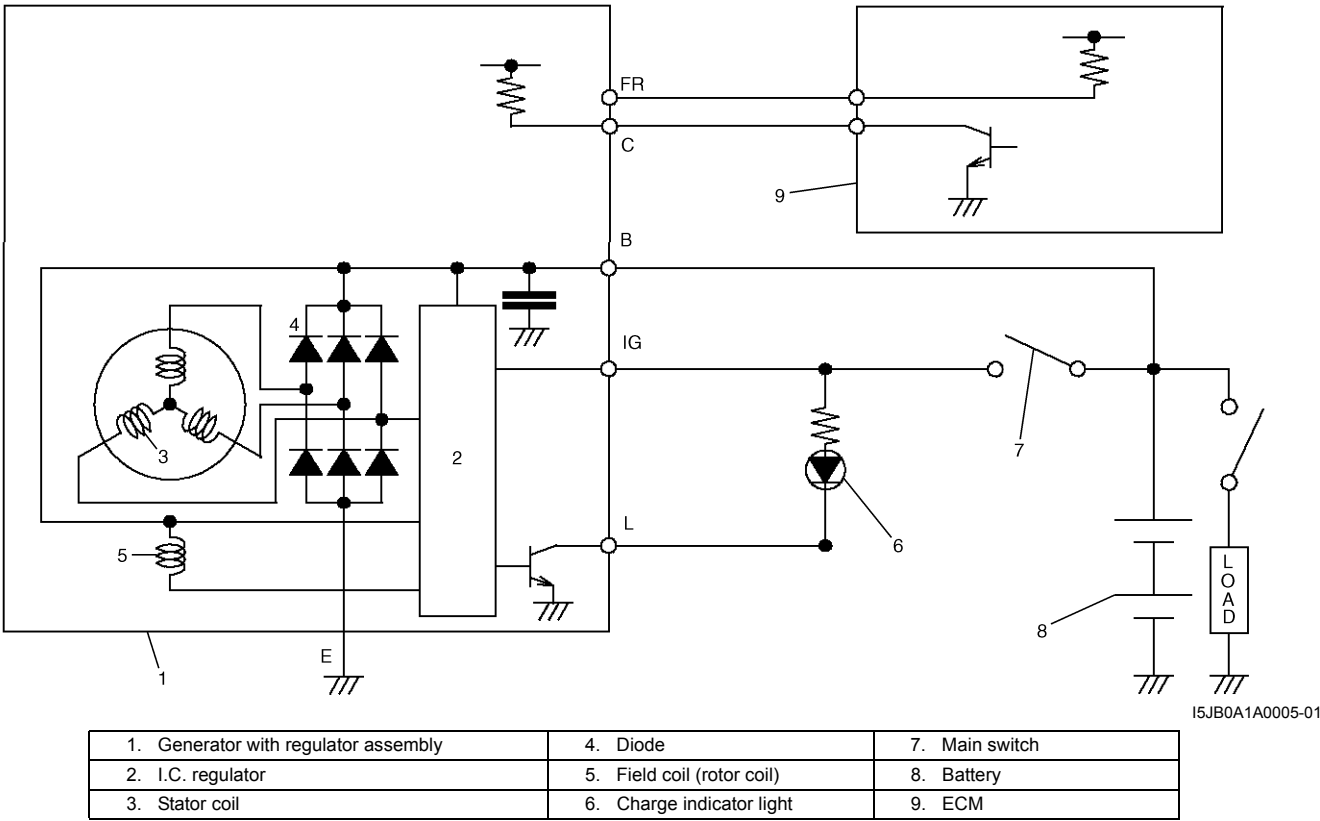
The generator features solid state regulator that it mounted inside the generator. All regulator components are enclosed into a solid mold, and this unit along with the brush holder assembly is attached to the rear housing. The regulator voltage is being controlled by ECM under some conditions while driving. Refer to “Generator Control System Description (M16A Engine): For M13, M15 and M16 Engines in Section 1A”.

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 inside a laminated core that forms part of the generator frame.

A rectifier bridge connected to the stator windings contains diodes, and electrically changes the stator AC. voltages to a D.C. voltage which appears at the generator output terminal.



Diagnostic Information and Procedures

Battery Inspection

S6RS0B1A14001

Common Causes of Failure

A battery is not designed to last indefinitely; however, with proper care, it will provide many years of service. If the battery performs satisfactorily during test but fails to operate properly for no apparent reason, the following are some factors that may point to the cause of trouble:

- Accessories left on overnight or for an extended period without the generator operating.
- Slow average driving speeds for short periods.
- Electrical load exceeding generator output particularly with addition of aftermarket equipment.

- Defects in charging system such as high resistance, slipping drive belt, loose generator output terminal, faulty generator or voltage regulator, Refer to “Generator Symptom Diagnosis: For M13, M15 and M16 Engines”.
- Battery abuse, including failure to keep battery cable terminals clean and tight or loose battery hold down.
- Mechanical problems in electrical system such as shorted or pinched wires.

Visual Inspection

Check for obvious damage, such as cracked or broken case or cover, that could permit loss of electrolyte. If obvious damage is noted, replace battery. Determine cause of damage and correct as needed.

Generator Symptom Diagnosis

S6RS0B1A14002

⚠ CAUTION

- Do not mistake polarities of “IG” terminal and “L” terminal.
- Do not create short circuit between “IG” and “L” terminals. Always connect these terminals through a lamp.
- 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: For M13, M15 and M16 Engines”.

Trouble in charging system will show up as one or more of the following conditions:

- 1) Faulty indicator lamp operation.
- 2) An undercharged battery as evidenced by slow cranking or indicator dark.
- 3) An overcharged battery as evidenced by excessive spewing of electrolyte from vents.

Condition	Possible cause	Correction / Reference Item
Noisy generator	Loose drive belt	<i>Adjust or replace drive belt.</i>
	Loose drive belt pulley	<i>Check generator.</i>
	Loose mounting bolts	<i>Check mounting connection.</i>
	Worn or dirty bearings	<i>Check generator.</i>
	Defective diode or stator	<i>Check generator.</i>
Charge light does not light with ignition ON and engine off	Fuse blown	<i>Check fuse.</i>
	Indicator lamp (LED) faulty	<i>Replace combination meter.</i>
	Wiring connection loose	<i>Tighten loose connection.</i>
	IC regulator or field coil faulty	<i>Check generator.</i>
	Poor contact between brush and slip ring	<i>Repair or replace.</i>
Charge light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	<i>Adjust or replace drive belt.</i>
	IC regulator or generator faulty	<i>Check charging system.</i>
	Wiring faulty	<i>Repair wiring.</i>

Generator Test (Undercharged Battery Check) (For 80A Type)

S6RS0B1A14004

This condition, as evidenced by slow cranking or indicator clear with dark or light yellow dot 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.

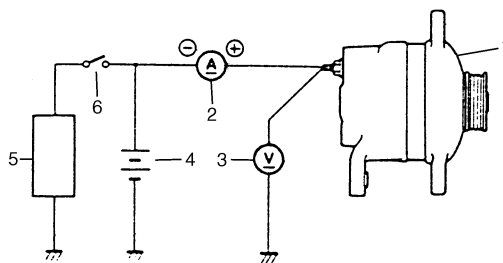
- 1) Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
- 2) Check drive belt for proper tension.
- 3) If battery defect is suspected, refer to “Battery Description: For M13, M15 and M16 Engines in related manual”.
- 4) Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor, ignition ground cable and no “C” terminal circuit at ground.
- 5) Connect switch (6), load (5), battery (4), voltmeter (3) and ammeter (2) to generator (1) as shown in figure.

Voltmeter: Set between generator “B” terminal and ground.

Ammeter: Set between generator “B” terminal and battery (+) terminal.

NOTE

Use fully charged battery.



IYSQ011A0007-01

- 6) Measure current and voltage.

No-Load Check

- 1) Run engine from idling up to 2000 rpm and read meters.

NOTE

Turn off switches of all accessories (wiper, heater etc.).

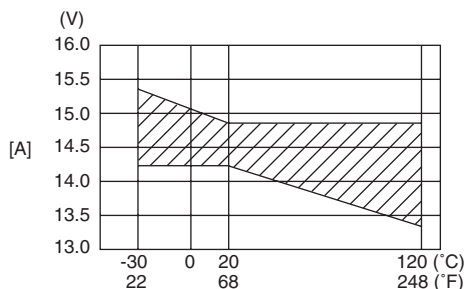
Specification for undercharged battery (No-load check)

Current: 10 A

Voltage: 14.2 – 14.8 V (at 20 °C, 68 °F)

NOTE

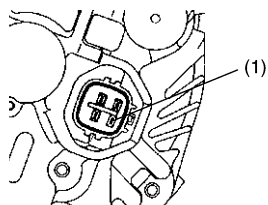
Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in figure.



I6RS0B1A1002-01

[A]:	Regulated voltage (V)
[B]:	Heat sink temperature (°C)

- 2) Using service wire, ground "C" terminal (1) of generator.



I5JB0A1A0011-01

- 3) Measure voltage between "B" terminal of generator and body ground.

Standard voltage

: 12.5 – 13.1 V (at 20 °C, 68 °F)

- If voltage is higher than standard value**

If voltage is higher than standard value, check ground of brushes.

If brushes are not grounded, replace IC regulator.

If voltage is lower than standard value, proceed to the following check.

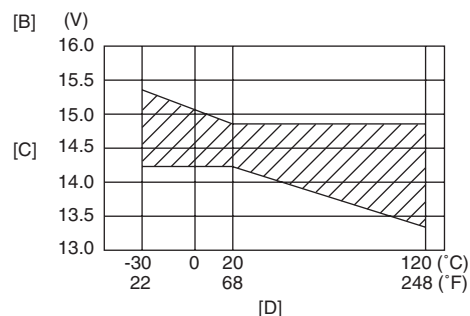
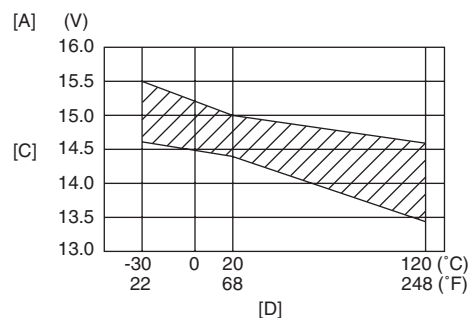
Load Check

- 1) Run engine at 2000 rpm and turn on head light and blower motor.
- 2) Measure current.
If measure current is less than 30 A, repair or replace generator.

Generator Test (Overcharged Battery Check)

S6RS0B1A14005

- 1) To determine battery condition, refer to "Battery Description: For M13, M15 and M16 Engines in related manual".
- 2) If obvious overcharge condition exists as evidenced by excessive spewing of electrolyte, measure generator "B" terminal voltage at engine 2000 rpm.



I6RS0B1A1003-01

[A]:	For 75A type
[B]:	For 80A type
[C]:	Regulated voltage (V)
[D]:	Heat sink temperature (°C)

- 3) If measured voltage is higher than upper limit value, proceed to disassemble generator.
- 4) Check ground of brushes. If brushes are not grounded, replace IC regulator. Then check field coil for grounds and shorts, referring to "Generator Inspection: For M13, M15 and M16 Engines".

Repair Instructions

Jump Starting in Case of Emergency

S6RS0B1A16001

⚠ CAUTION

If vehicle is manual transaxle model and has a catalytic converter, do not push or tow it to start. Damage to its emission system and/or to other parts may result.

Both booster and discharged battery should be treated carefully when using jumper cables. Follow the procedure outlined as follows, being careful not to cause sparks.

⚠ WARNING

- Departure from these conditions or procedure described as follows could result in:
 - Serious personal injury (particularly to eyes) or property damage from such causes as battery explosion, battery acid, or electrical burns.
 - Damage to electronic components of either vehicle.
 - Remove rings, watches, and other jewelry. Wear approved eye protection.
 - Be careful so that metal tools or jumper cables do not contact positive battery terminal (or metal in contact with it) and any other metal on vehicle, because a short circuit could occur.
 - Never expose battery to open flame or electric spark. Batteries generate gas which is flammable and explosive.
 - 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.
 - Batteries should always be kept out of reach of children.
 - Do not connect negative cable directly to negative terminal of dead battery.
- 1) Set parking brake and place automatic transaxle in PARK (NEUTRAL on manual transaxle and automated manual transaxle). Turn off ignition, turn off lights and all other electrical loads.
 - 2) Check electrolyte level. If it is below low level line, add distilled water.
 - 3) Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. (Use 12-volt battery only to jump start engine).

- 4) Attach one end of the remaining negative cable to negative terminal of booster battery, and the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.
- 5) Start engine of vehicle with booster battery and turn off electrical accessories. Then start engine of the vehicle with discharged battery.

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

S6RS0B1A16002

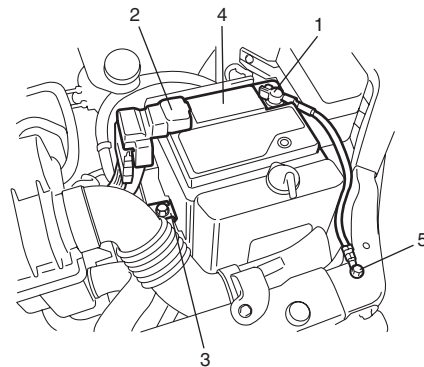
⚠ WARNING

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).



5. Body ground bolt

I4RS0B1A0006-01

Remounting

- 1) Reverse removal procedure.
- 2) Tighten battery cables securely.

Water Pump / Generator Drive Belt Tension Inspection and Adjustment

S6RS0B1A16006

▲ WARNING

Disconnect negative cable at battery before checking and adjusting belt tension.

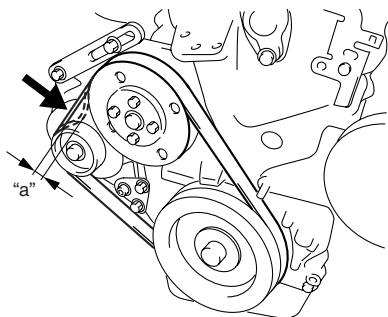
- 1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to "Water Pump / Generator Drive Belt Removal and Installation: For M13, M15 and M16 Engines".
- 2) Check belt for tension. Belt is in proper tension when it deflects the following specification under thumb pressure (about 10 kg or 22 lb.).
If belt tension is out of specification, go to next steps.

Water pump / generator drive belt tension

"a": 4.5 – 5.5 mm (0.18 – 0.22 in.) as deflection / 10 kg (22 lbs)

NOTE

When replacing belt with a new one, adjust belt tension to 3 – 4 mm (0.12 – 0.16 in.).



I2RH0B160012-01

- 3) Adjust drive belt as follows.

For except M16 engine model

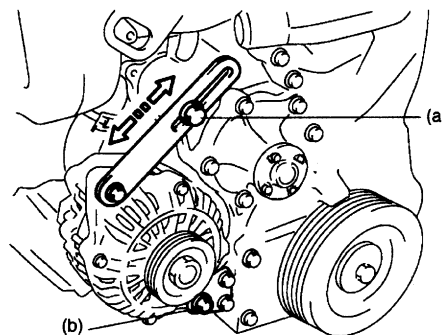
- a) If belt is too tight or too loose, adjust it to proper tension by displacing generator position.
- b) Tighten generator adjusting bolt and pivot bolts as specified torque.

Tightening torque

Generator adjusting bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)

Generator pivot bolt (b): 50 N·m (5.0 kgf-m, 36.0 lb-ft)

- c) Check belt tension for specification after turning crankshaft two rotations clockwise.



I2RH0B160013-01

- d) Connect negative cable at battery.

For M16 engine model

- a) After loosening generator bracket bolts (2) and pivot bolt (3), adjust belt tension to specification described at step 2) by loosening / tightening generator adjust bolt (1).
- b) Tighten generator bracket bolts and pivot bolt as specified torque.

Tightening torque

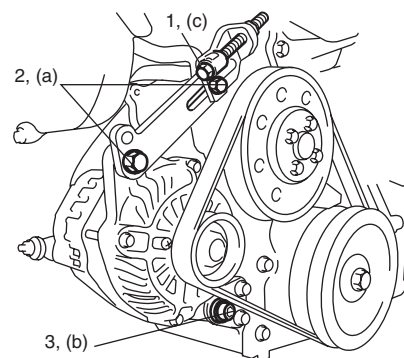
Generator bracket bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

Generator pivot bolt (b): 50 N·m (5.0 kgf-m, 36.0 lb-ft)

- c) Check belt tension for specification after turning crankshaft two rotations clockwise.
- d) Tighten generator adjusting bolt (1) as specified torque.

Tightening torque

Generator adjusting bolt (c): 7 N·m (0.7 kgf-m, 5.0 lb-ft) by the specified procedure.



I5RW0C160007-01

- e) Connect negative cable at battery.

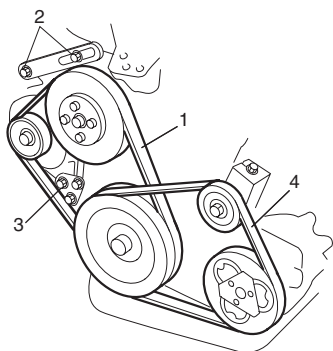
Water Pump / Generator Drive Belt Removal and Installation

S6RS0B1A16007

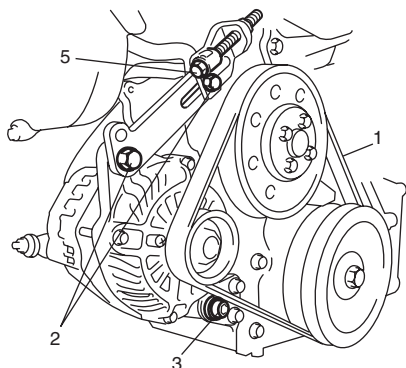
Removal

- 1) Disconnect negative cable at battery.
- 2) If vehicle equipped with A/C, remove compressor drive belt (4) before removing water pump belt (1). Refer to "Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual Type in Section 7B in related manual" or "Compressor Drive Belt Removal and Installation: Automatic Type in Section 7B".
- 3) Loosen drive belt adjusting bolt (2) and generator pivot bolt (3).
- 4) For except M16 engine model, slacken belt by displacing generator and then remove water pump belt.
- 5) For M16 engine model, loosen generator adjusting bolt (5), and then remove water pump belt.

[A]



[B]



I6RS0B1A1005-04

Installation

Reverse removal procedure for installation noting the following.

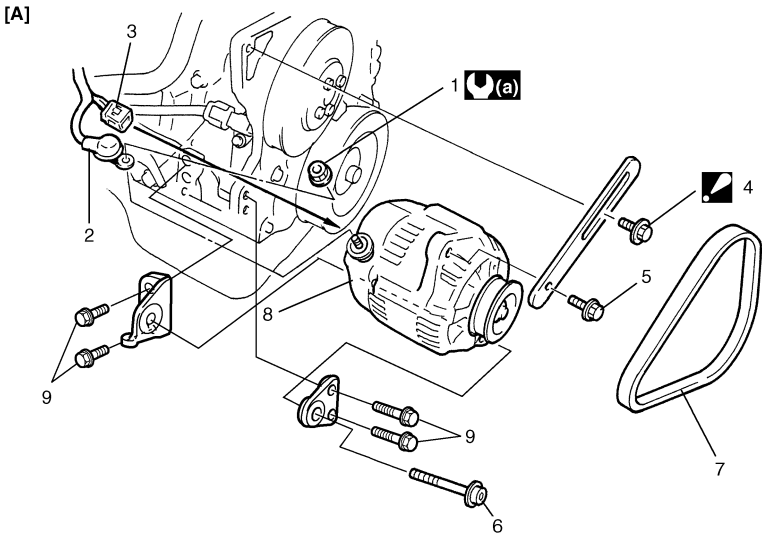
- Adjust belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment: For M13, M15 and M16 Engines" and "Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual Type in Section 7B in related manual" or "Compressor Drive Belt Removal and Installation: Automatic Type in Section 7B".

[A]: For except M16 engine model

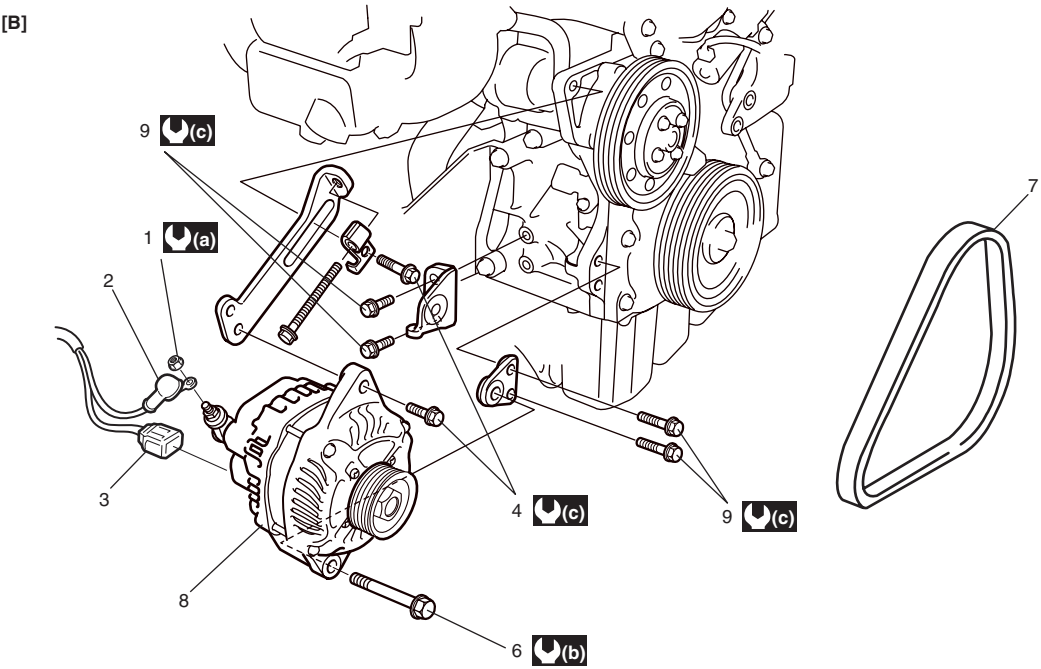
[B]: For M16 engine model

Generator Unit Components

S6RS0B1A16008



I6RS0B1A1014-01



I6RS0B1A1009-02

[A]: For except M16 engine model	4. Generator adjusting bolt : Only loosen this bolt.	9. Generator bracket bolt
[B]: For M16 engine model	5. Generator adjusting arm bolt	: 5 N·m (0.5 kgf-m, 3.5 lb-ft)
1. "B" terminal nut	6. Generator pivot bolt	: 50 N·m (5.0 kgf-m, 36.0 lb-ft)
2. "B" terminal wire	7. Generator belt	: 25 N·m (2.5 kgf-m, 18.5 lb-ft)
3. Connector	8. Generator	

Generator Dismounting and Remounting

S6RS0B1A16010

Dismounting

- 1) Disconnect negative (–) cable at battery.
- 2) Remove right side drive shaft referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A in related manual”.
- 3) Disconnect generator lead wire (“B” terminal wire) and coupler from generator.
- 4) Remove generator belt. Refer to “Water Pump / Generator Drive Belt Removal and Installation: For M13, M15 and M16 Engines”.

- 5) Remove generator bracket bolts and generator pivot bolt.
- 6) Remove generator.

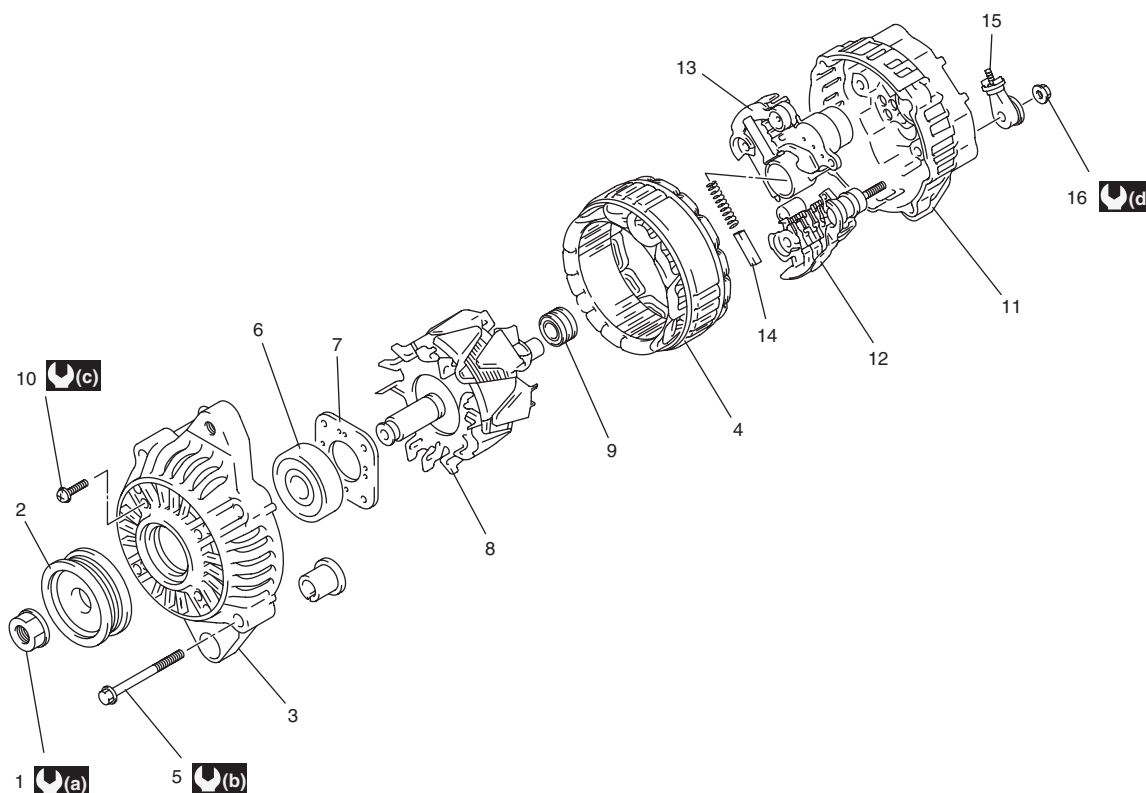
Remounting

Reverse dismounting procedure for remounting noting the followings.

- Tighten each bolt and nut to specified torque referring to “Generator Unit Components: For M13, M15 and M16 Engines”.
- Adjust belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: For M13, M15 and M16 Engines”.

Generator Components

S6RS0B1A16004



I4RS0B1A0007-01

1. Pulley nut	6. Drive end bearing	11. Rear housing	16. "B" terminal nut
2. Pulley	7. Bearing retainer	12. Rectifier	: 118 N·m (11.8 kgf-m, 85.5 lb-ft)
3. Front housing	8. Rotor	13. Regulator	: 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)
4. Stator	9. Rear end bearing	14. Brush	: 3.5 N·m (0.35 kgf-m, 2.5 lb-ft)
5. Frame bolt	10. Retainer screw	15. "B" terminal	: 8.0 N·m (0.8 kgf-m, 6.0 lb-ft)

Generator Inspection

S6RS0B1A16005

Rotor

- 1) Using an ohmmeter (1), check for continuity between slip rings (2) of rotor. If there is no continuity, replace the rotor.

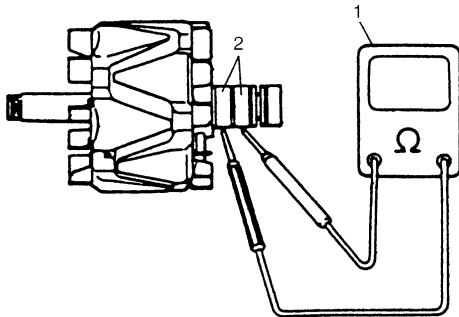
Standard resistance between slip rings of rotor

For 75A type

: 2.5 – 2.9 Ω

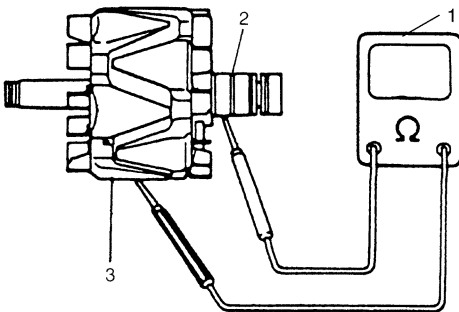
For 80A type

: 1.7 – 2.0 Ω



I4RS0B1A0005-01

- 2) Using an ohmmeter (1), check that there is no continuity between slip ring (2) and rotor core (3). If there is continuity, replace the rotor.

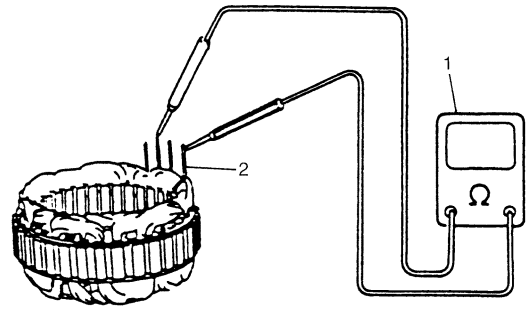


I4RS0B1A0008-01

- 3) Check slip rings for roughness or scoring. If rough or scored, replace the rotor.

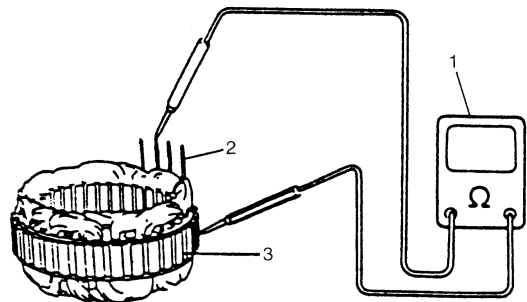
Stator

- 1) Using an ohmmeter (1), check all leads (2) for continuity. If there is no continuity, replace the stator.



I4RS0B1A0009-01

- 2) Using an ohmmeter (1), check that there is no continuity between coil leads (2) and stator core (3). If there is continuity, replace the stator.



I4RS0B1A0010-01

Brush and Brush Holder

Check each brush (1) for wear by measuring its length as shown. If brush is found worn down to service limit, replace brush.

Exposed brush length "a"

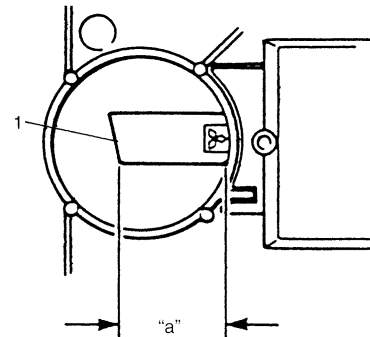
Standard: 16 mm (0.63 in.)

For 75A type

: Limit: 2.0 mm (0.08 in.)

For 80A type

: Limit: 5.0 mm (0.20 in.)

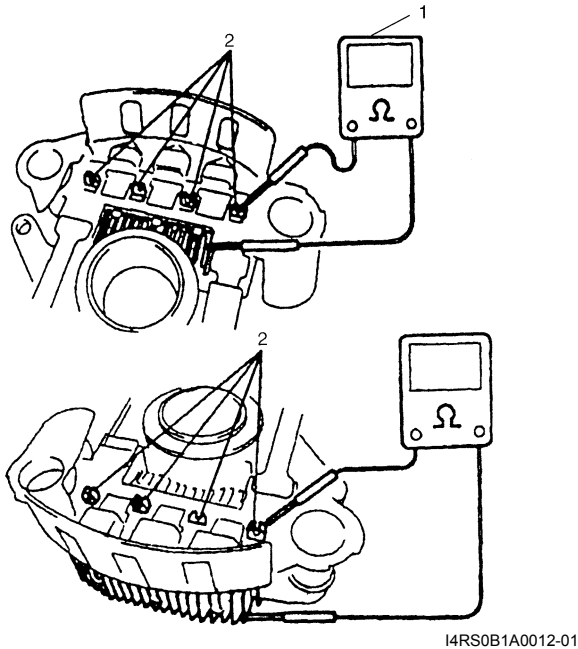


I4RS0B1A0011-01

Rectifier

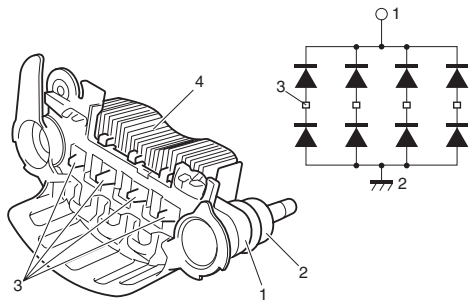
For 75A type

Using ohmmeter (1), check continuity between each of upper and lower rectifier bodies and each diode lead (2). Check both directions by reversing probes of ohmmeter and there should be only one-way continuity in each case. If check result is not satisfactory, replace rectifier.



For 80A type

Using ohmmeter, check continuity between “B” terminal (1) or “E” terminal (2) and each diode lead (3). Check both directions by reversing probes of ohmmeter and there should be only one-way continuity in each case. If check result is not satisfactory, replace rectifier (4).



Specifications

Charging System Specifications

Battery

NOTE

The battery used in each vehicle is one of the following two types, depending on specification.

Battery Type	CCA 180A	CCA 210A
Nominal output	12 V	
Rated capacity	36 Ah/20 h	44 Ah/20 h
	28 Ah/5 h	36 Ah/5 h
Cold cranking amperes	180 A (DIN)	210 A (DIN)

Generator**NOTE**

The generator used in each vehicle is one of the following two types, depending on specification.

Type	75A type	80A type
Rated voltage	12 V	
Nominal output	75A	80A
Permissible max. speed	18,000 r/min.	
No-load speed	1020 r/min. (rpm)	1200 r/min. (rpm)
Regulated voltage	14.2 – 14.8 V at 25 °C (77 °F)	
Exposed brush length	Standard: 16 mm (0.63 in.) Limit: 2.0 mm (0.08 in.)	Standard: 16 mm (0.63 in.) Limit: 5.0 mm (0.02 in.)
Permissible ambient temperature	–30 to 100 °C (–22 to 212 °F)	
Polarity	Negative ground	
Rotation	Clockwise viewed from pulley side	

Tightening Torque Specifications

S6RS0B1A17002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Generator adjusting bolt	23	2.3	17.0	⌚
Generator pivot bolt	50	5.0	36.0	⌚ / ⌚
Generator bracket bolt	25	2.5	18.0	⌚
Generator adjusting bolt	7 N·m (0.7 kgf-m, 5.0 lb-ft) by the specified procedure.			⌚

NOTE

The specified tightening torque is also described in the following.

“Generator Unit Components: For M13, M15 and M16 Engines”

“Generator Components: For M13, M15 and M16 Engines”

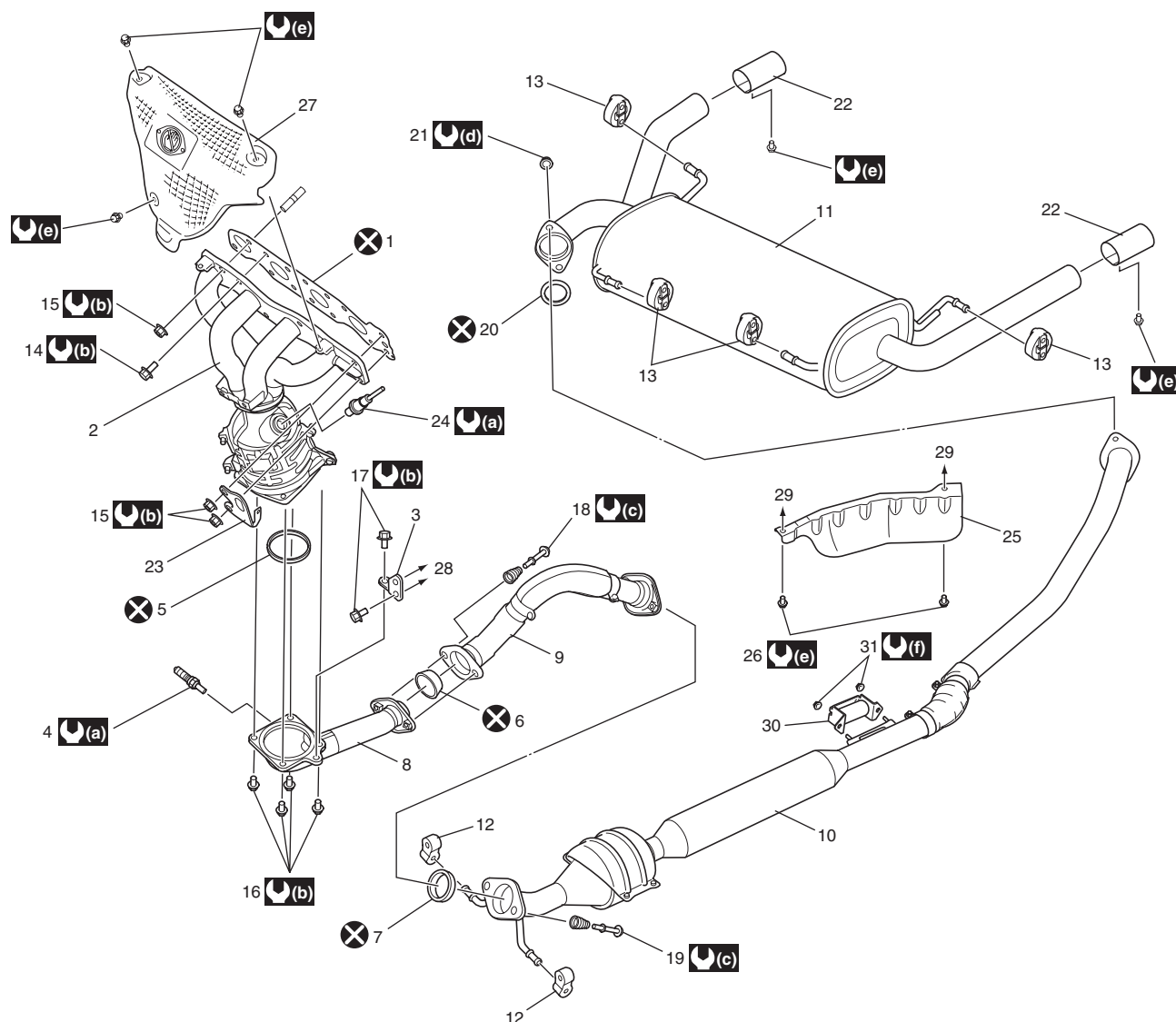
Reference:

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

I6RS0B1B1001-01

1. Exhaust manifold gasket	12. Center pipe mounting	23. Engine hook
2. Exhaust manifold	13. Muffler mounting	24. Heated oxygen sensor No.1 (connector color: gray)
3. Exhaust manifold stiffener	14. Exhaust manifold bolt	25. Heat insulator
4. Heated oxygen sensor No.2 (connector color: green)	15. Exhaust manifold nut	26. Heat insulator bolt
5. Exhaust pipe No.1 gasket	16. Exhaust No.1 pipe bolt	⚙️(a) : 45 N-m (4.5 kgf-m, 32.5 lb-ft)
6. No.1 seal ring	17. Exhaust manifold stiffener bolt	⚙️(b) : 50 N-m (5.0 kgf-m, 36.5 lb-ft)
7. No.2 seal ring	18. Exhaust No.2 pipe bolt	⚙️(c) : 43 N-m (4.3 kgf-m, 31.0 lb-ft)
8. Exhaust No.1 pipe	19. Exhaust center pipe bolt	⚙️(d) : 60 N-m (6.0 kgf-m, 43.5 lb-ft)
9. Exhaust No.2 pipe	20. Exhaust pipe No.2 gasket	⚙️(e) : 10 N-m (1.0 kgf-m, 7.5 lb-ft)
10. Exhaust center pipe	21. Muffler nut	⚙️(f) : 3 N-m (0.3 kgf-m, 2.5 lb-ft)
11. Muffler	22. Muffler tail pipe	⊗ : Do not reuse.

For M16 Engine Model



I6RS0B1B1002-04

1. Exhaust manifold gasket	14. Exhaust manifold bolt	27. Exhaust manifold cover
2. Exhaust manifold	15. Exhaust manifold nut	28. To transmission
3. Exhaust manifold stiffener	16. Exhaust No.1 pipe bolt	29. To vehicle body
4. Heated oxygen sensor No.2 (connector color: green)	17. Exhaust manifold stiffener bolt	30. Damper
5. Exhaust pipe No.1 gasket	18. Exhaust No.2 pipe bolt	31. Damper nut
6. No.1 seal ring	19. Exhaust center pipe bolt	⚙️(a) : 45 N-m (4.5 kgf-m, 32.5 lb-ft)
7. No.2 seal ring	20. Exhaust pipe No.2 gasket	⚙️(b) : 50 N-m (5.0 kgf-m, 36.5 lb-ft)
8. Exhaust No.1 pipe	21. Muffler nut	⚙️(c) : 43 N-m (4.3 kgf-m, 31.0 lb-ft)
9. Exhaust No.2 pipe	22. Muffler tail pipe	⚙️(d) : 60 N-m (6.0 kgf-m, 43.5 lb-ft)
10. Exhaust center pipe	23. Engine hook	⚙️(e) : 10 N-m (1.0 kgf-m, 7.5 lb-ft)

1K-3 Exhaust System: For M13, M15 and M16 Engines

11. Muffler	24. Heated oxygen sensor No.1 (connector color: gray)	 : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
12. Center pipe mounting	25. Heat insulator	 : Do not reuse.
13. Muffler mounting	26. Heat insulator bolt	

Exhaust Manifold Removal and Installation

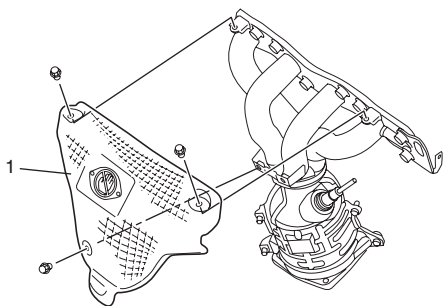
S6RS0B1B16002

Removal

WARNING

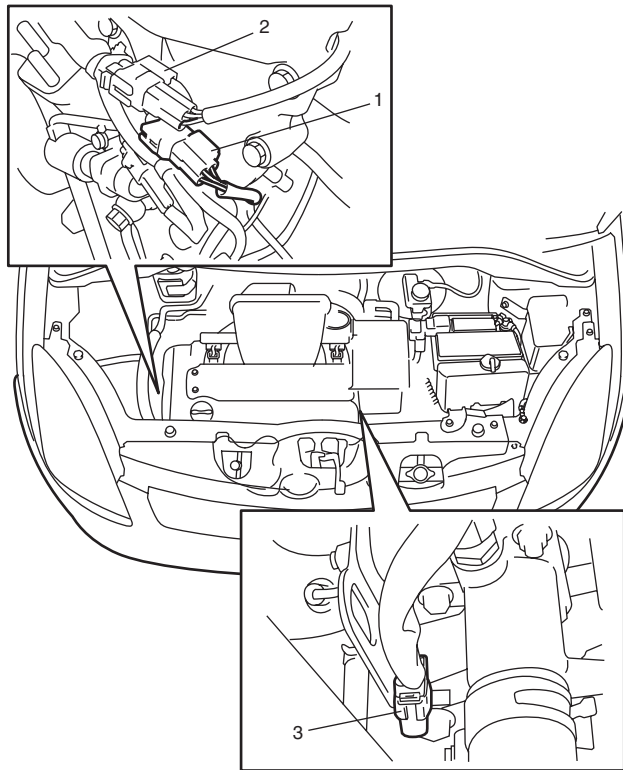
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

- 1) Disconnect negative cable at battery.
- 2) For M16 engine model, remove engine cover.
- 3) Remove front bumper with front grille referring to "Front Bumper and Rear Bumper Components in Section 9K".
- 4) Remove radiator referring to "Radiator Removal and Installation: For M13, M15 and M16 Engines in Section 1F in related manual" for equipped with A/C.
- 5) With hose connected, detach A/C condenser from vehicle body for equipped with A/C.
- 6) For M16 engine model, remove exhaust manifold cover (1) from exhaust manifold.



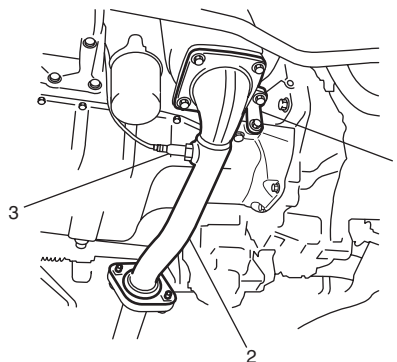
I6RS0B1B1003-01

- 7) Disconnect heated oxygen sensor No.2 connector (1) (connector color: green) and heated oxygen sensor No.1 connector (2) (connector color: gray (for except M16 engine model)) or (3) (connector color: black (for M16 engine model)), and then detach it from its stay.



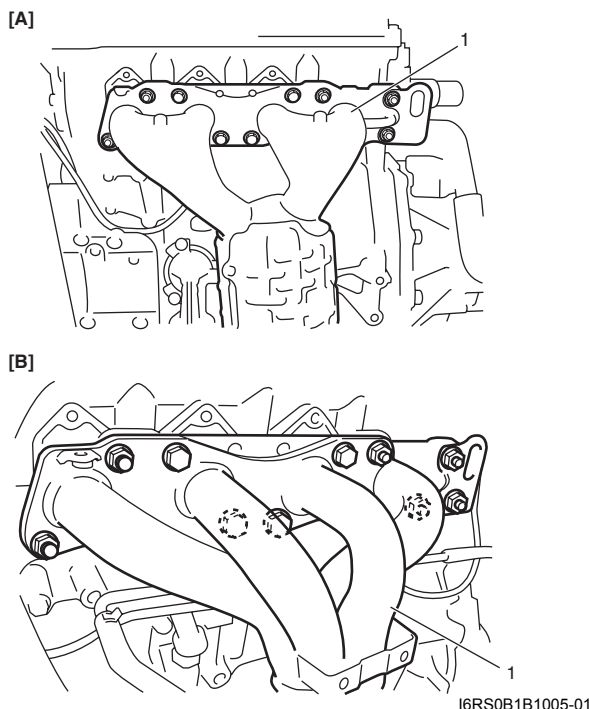
I6RS0B1B1004-01

- 8) Remove exhaust manifold stiffener (1).
- 9) Remove heated oxygen sensors (3) from exhaust manifold and exhaust No.1 pipe, if necessary.
- 10) Disconnect exhaust No.1 pipe (2) from exhaust manifold.



I4RS0A1B0002-01

- 11) Remove exhaust manifold (1) and its gasket from cylinder head.



[A]: For except M16 engine model

[B]: For M16 engine model

Installation

- 1) Install new gasket to cylinder head. Then install exhaust manifold (3).
Tighten manifold bolts (1) and nuts (2) to specified torque.

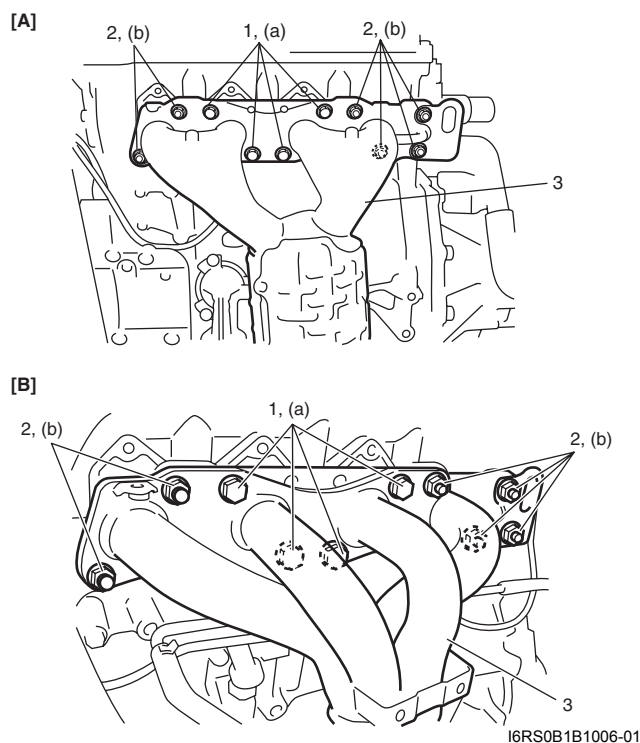
Tightening torque

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

Exhaust manifold nut (b): 50 N·m (5.0 kgf-m, 36.5 lb-ft)

NOTE

Be sure to install exhaust manifold bolts and nuts to proper location referring to "Exhaust System Components: For M13, M15 and M16 Engines".



[A]: For except M16 engine model

[B]: For M16 engine model

- 2) Install new seal ring and connect exhaust No.1 pipe (1) to exhaust manifold.
Tighten pipe fasteners to specified torque.

Tightening torque

Exhaust No.1 pipe bolt (a): 50 N·m (5.0 kgf-m, 36.5 lb-ft)

- 3) Install exhaust manifold stiffener (2).
Tighten exhaust manifold stiffener bolts to specified torque.

Tightening torque

Exhaust manifold stiffener bolt (b): 50 N·m (5.0 kgf-m, 36.5 lb-ft)

- 4) Install new seal ring and connect exhaust No.1 pipe (1) to exhaust No.2 pipe. Tighten pipe fasteners to specified torque.

Tightening torque

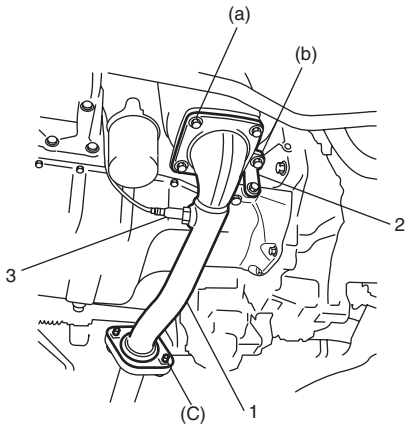
Exhaust No.2 pipe bolt (c): 43 N·m (4.3 kgf-m, 31.0 lb-ft)

1K-5 Exhaust System: For M13, M15 and M16 Engines

- 5) Install heated oxygen sensors (3) referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Removal and Installation: For M13, M15 and M16 Engines in Section 1C”, if removed.

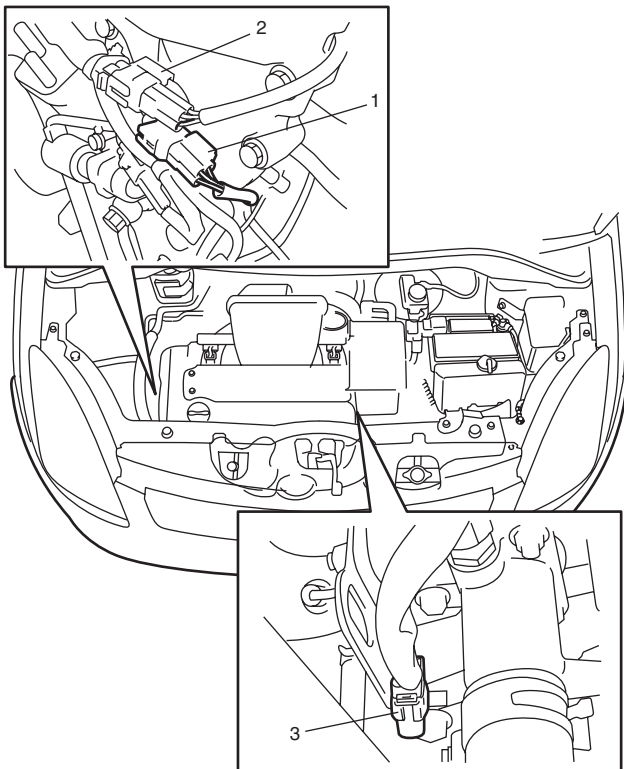
NOTE

Be sure to identify heated oxygen sensor No.1 and No.2 by its connector color.



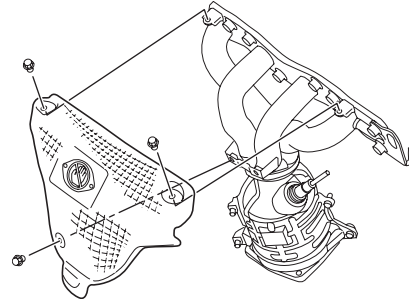
I4RS0A1B0005-01

- 6) Connect heated oxygen sensor No.2 connector (1) (connector color: green) and heated oxygen sensor No.1 connector (2) (connector color: gray (for except M16 engine model)) or (3) (connector color: black (for M16 engine model)), and then fit coupler to bracket securely.



I6RS0B1B1004-01

- 7) For M16 engine model, install exhaust manifold cover (1) to exhaust manifold.



I6RS0B1B1007-01

- 8) Install A/C condenser to vehicle body for equipped with A/C.
- 9) Install radiator referring to “Radiator Removal and Installation: For M13, M15 and M16 Engines in Section 1F in related manual” for equipped with A/C.
- 10) Install front bumper with front grille by referring to “Front Bumper and Rear Bumper Components in Section 9K”.
- 11) For M16 engine model, install engine cover.
- 12) Connect negative cable at battery.
- 13) Check exhaust system for exhaust gas leakage.

Specifications

Tightening Torque Specifications

S6RS0B1B17001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Exhaust manifold bolt	50	5.0	36.5	🔩
Exhaust manifold nut	50	5.0	36.5	🔩
Exhaust No.1 pipe bolt	50	5.0	36.5	🔩
Exhaust manifold stiffener bolt	50	5.0	36.5	🔩
Exhaust No.2 pipe bolt	43	4.3	31.0	🔩

NOTE

The specified tightening torque is also described in the following.

“Exhaust System Components: For M13, M15 and M16 Engines”

Reference:

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

Section 2

Suspension

CONTENTS

NOTE

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

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Precautions

Precautions

Precautions on Suspension

S6RS0B2000001

Suspension Caution

Refer to "Suspension Caution in Section 00 in related manual".

Wheels and Tires Caution

Refer to "Wheels and Tires Caution in Section 00 in related manual".

General Precautions

Refer to "General Precautions in Section 00 in related manual".

Vehicle Lifting Points

Refer to "Vehicle Lifting Points in Section 0A in related manual".

Fastener Caution

Refer to "Fastener Caution in Section 00 in related manual".

Fastener Information

Refer to "Fasteners Information in Section 0A in related manual".

Brake Caution

Refer to "Brake Caution in Section 00".

Suspension General Diagnosis

Specifications

Wheel Alignment Specifications

S6RS0B2107001

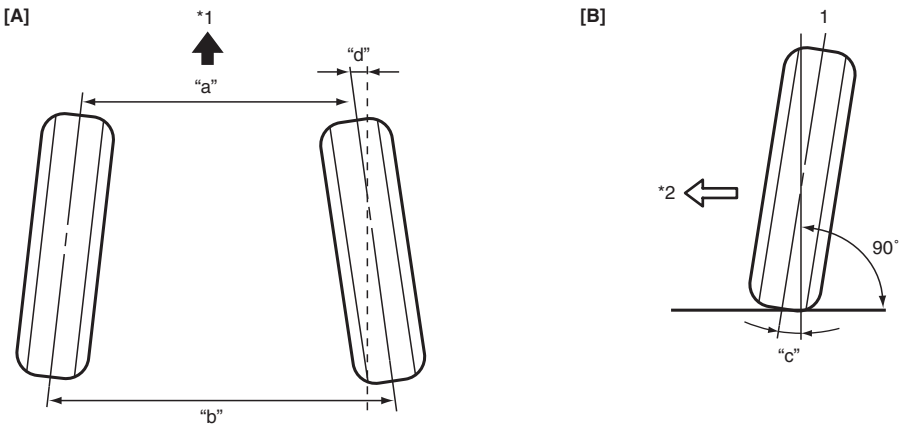
Wheel alignment specifications

Item		Front	Rear
Toe ("b" – "a") (total)	(mm) (in.)	IN 1.0 ± 1.0 0.0394 ± 0.0394	IN 5.2 ± 5.2 0.205 ± 0.205
Toe "d"	(degree)	0 to 12'	0 to 30'
Camber "c"		0° 00' ± 1°	-1° 00' ± 1°
Caster		5° 12' ± 2°	—
Side Slip Limit	(mm/m) (in./3.3 ft)	0 to IN 3.0 0 to IN 0.118	— —

		Inside	Outside
Steering Angle (Turning Angle)	Other Than M16A Engine Model	39.1° ± 3°	33.3° ± 3°
	M16A Engine Model	33.8° ± 3°	29.8° ± 3°

NOTE

- Adjust air pressure in the tires to a specified valve, before it measures.
- Measure it after unloading luggage in the car.
- Toe value in the specification table was measured by using a toe-in gauge.
- As for rear toe, camber and caster, regulation is impossible.



[A]: Toe-in (Top view)	1. Center line of wheel	*2. Body center
[B]: Camber (Front view)	*1. Forward	

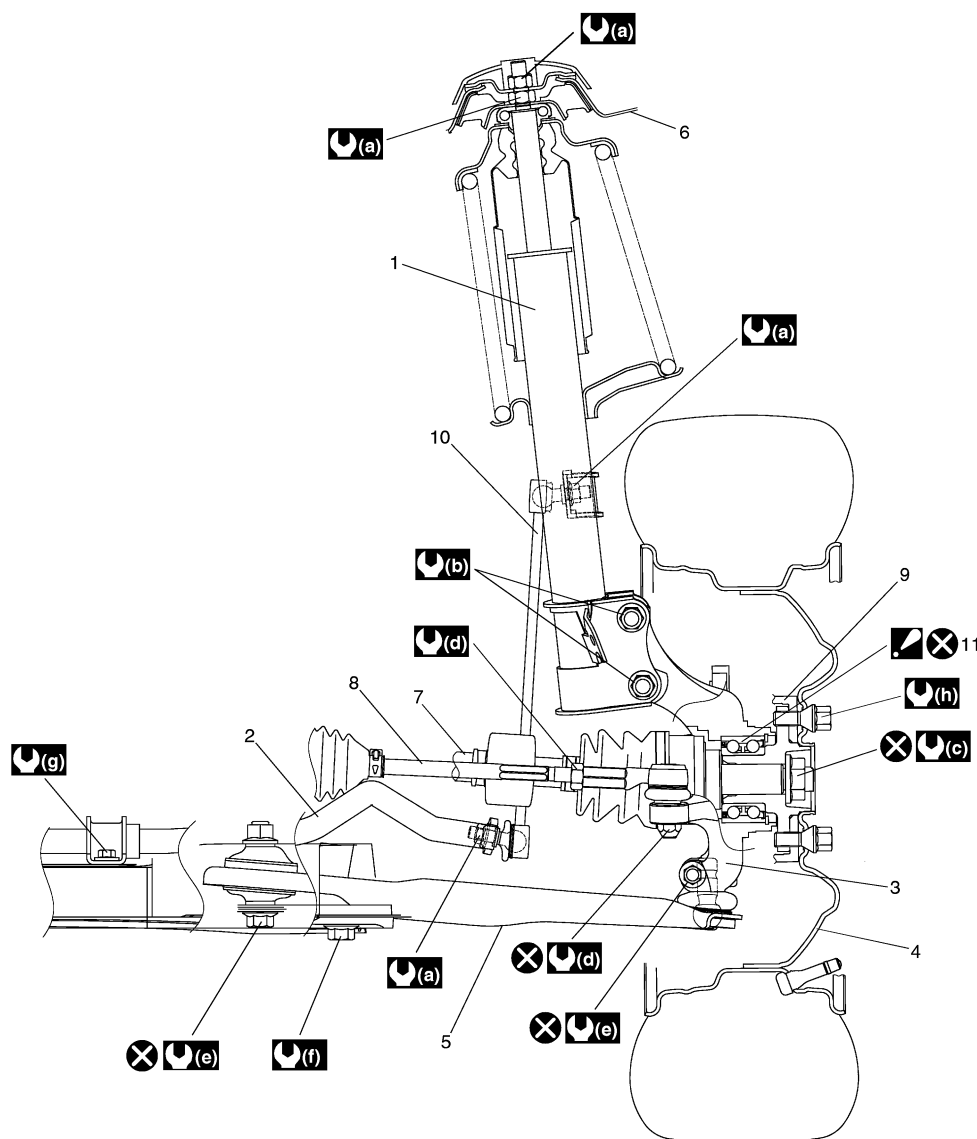
I6RS0B210001-02

Front Suspension

General Description

Front Suspension Construction (Other Than M16A Engine Model)

S6RS0B2201001



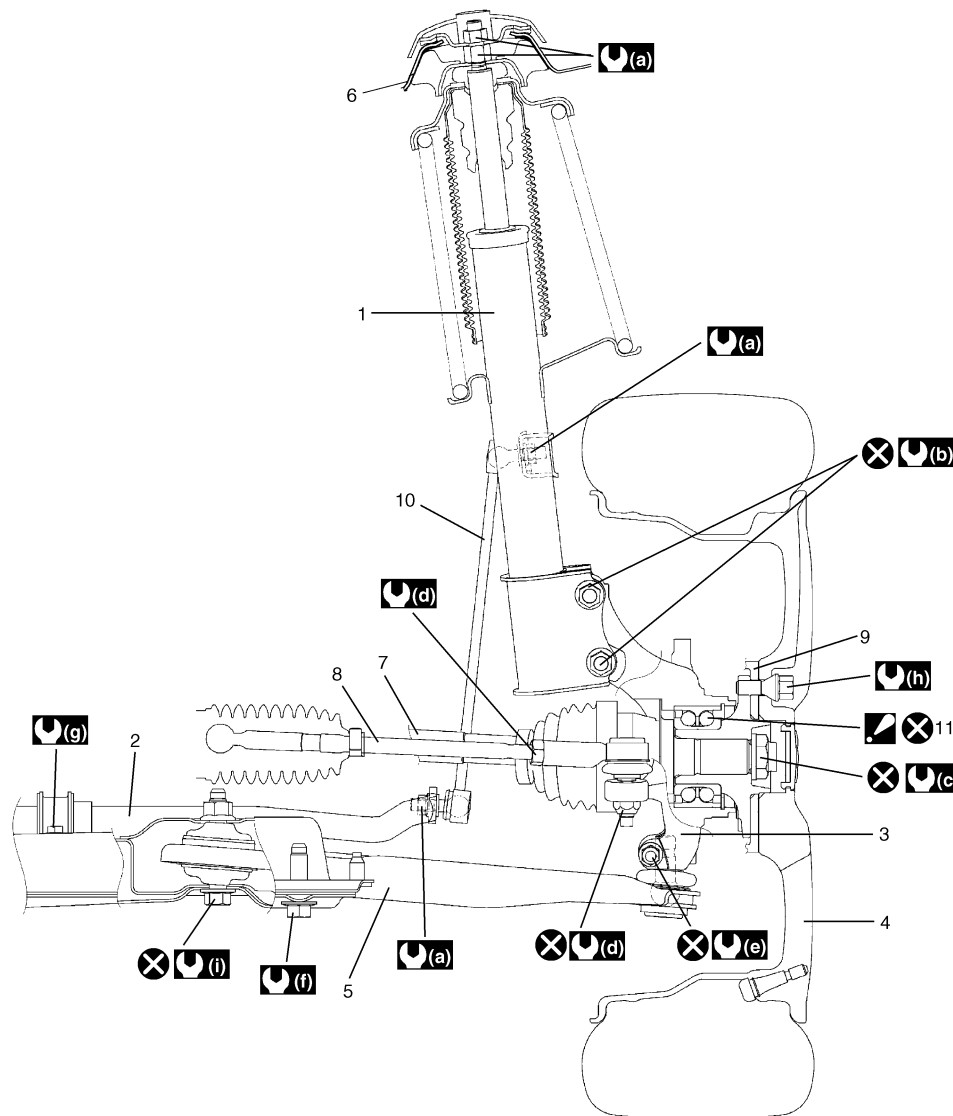
I6RS0B220003-01

1. Strut assembly	8. Tie-rod	(d) : 45 N·m (4.5 kgf-m, 32.5 lb-ft)
2. Stabilizer bar	9. Brake disc	(e) : 60 N·m (6.0 kgf-m, 43.5 lb-ft)
3. Steering knuckle	10. Stabilizer bar joint	(f) : 150 N·m (15.0 kgf-m, 108.5 lb-ft)
4. Wheel	11. Wheel bearing : Rubber seal side of bearing faces vehicle outside.	(g) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
5. Suspension control arm	(a) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)	(h) : 85 N·m (8.5 kgf-m, 61.5 lb-ft)
6. Vehicle body	(b) : 105 N·m (10.5 kgf-m, 76.0 lb-ft)	: Do not reuse.
7. Drive shaft	(c) : 175 N·m (17.5 kgf-m, 126.5 lb-ft)	

2B-2 Front Suspension:

Front Suspension Construction (For M16A Engine Model)

S6RS0B2201003



I6RS0B220004-05

1. Strut assembly	8. Tie-rod	⌚(d) : 45 N·m (4.5 kgf-m, 32.5 lb-ft)
2. Stabilizer bar	9. Brake disc	⌚(e) : 60 N·m (6.0 kgf-m, 43.5 lb-ft)
3. Steering knuckle	10. Stabilizer bar joint	⌚(f) : 150 N·m (15.0 kgf-m, 108.5 lb-ft)
4. Wheel	11. Wheel bearing : Rubber seal side of bearing faces vehicle outside.	⌚(g) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
5. Suspension control arm	⌚(a) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)	⌚(h) : 85 N·m (8.5 kgf-m, 61.5 lb-ft)
6. Vehicle body	⌚(b) : 90 N·m (9.0 kgf-m, 65.5 lb-ft)	⌚(i) : 95 N·m (9.5 kgf-m, 69.0 lb-ft)
7. Drive shaft	⌚(c) : 200 N·m (20.0 kgf-m, 145.0 lb-ft)	⊗ : Do not reuse.

Repair Instructions

Front Wheel Alignment Inspection and Adjustment

S6RS0B2206001

Toe Inspection and Adjustment

Preparation for toe inspection and adjustment.

- Place vehicle in unloaded state on level surface.
- Set steering wheel in straight state.
- Check that inflation pressure of each tire is adjusted properly and wheel is free from deflection.
- Check that each suspension part is free from bend, dent, wear or damage in any other form.
- Check that ground clearance at the right and left is just about the same.

Inspection

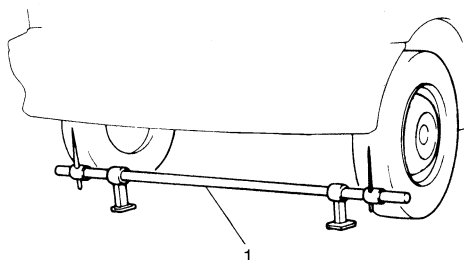
Measure toe with toe-in gauge (1).

Toe should be within following specifications.

If toe is out of the specification, adjust toe properly.

Toe

IN 1.0 ± 1.0 mm (0.0394 ± 0.0394 in.)



I2RH01220062-01

Adjustment

- 1) Loosen right and left tie-rod end lock nuts (1) first.
- 2) Rotate right and left tie-rods (2) by the same amount to align toe to specification. In this adjustment, the lengths "A" of both right and left tie-rod should be equal.

NOTE

Before rotating tie-rods (2), apply grease between tie-rods and rack boots so that boots won't be twisted.

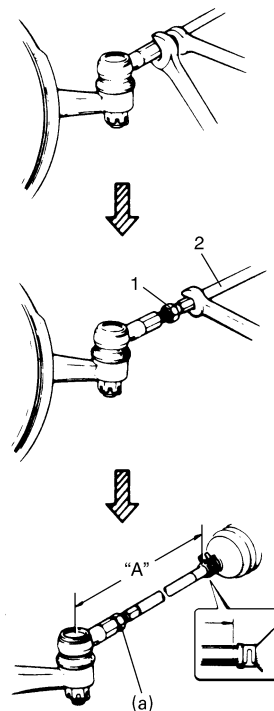
- 3) After adjustment, tighten lock nuts (1) to specified torque.

Tightening torque

Tie-rod end lock nut (a): 45 N·m (4.5 kgf-m, 32.5 lb-ft)

NOTE

Make sure that rack boots are not twisted.



I3RH0A220002-01

2B-4 Front Suspension:

Steering Angle Check and Adjustment

When tie-rod or tie-rod end was replaced, check toe and then also steering angle with turning radius gauge (1). If steering angle is not correct, check whether right and left tie-rods length "A" are equal.

NOTE

If tie-rod lengths were changed to adjust steering angle, reinspect toe-in.

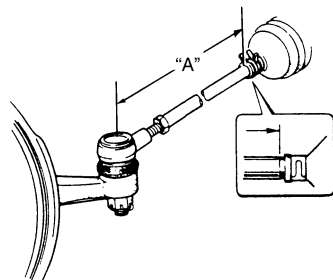
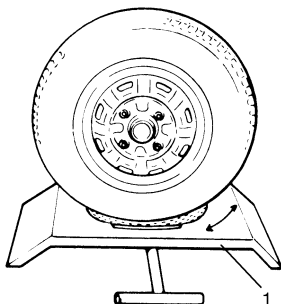
Steering angle

Inside: $39.1^{\circ} \pm 3^{\circ}$ (other than M16A engine model)

$33.8^{\circ} \pm 3^{\circ}$ (for M16A engine model)

Outside: $33.3^{\circ} \pm 3^{\circ}$ (other than M16A engine model)

$29.8^{\circ} \pm 3^{\circ}$ (for M16A engine model)



I3RH0A220003-01

Reference Information

Side slip

When checked with side slip tester, side slip should satisfy following specification.

Side slip

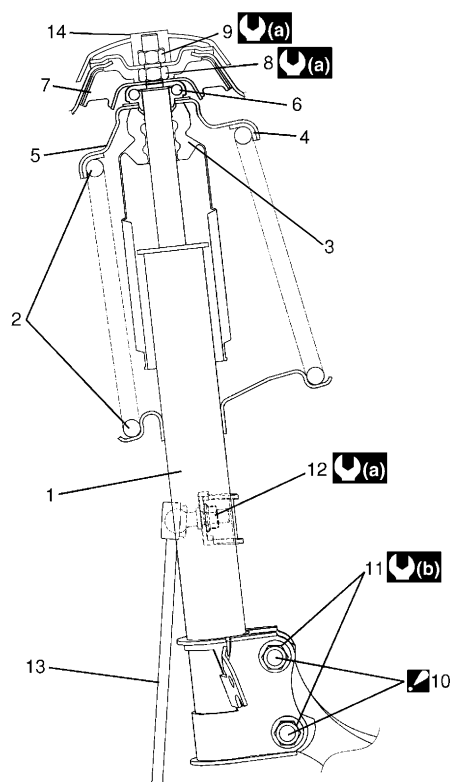
0 to IN 3.0 mm/m (0 to IN 0.118 in/3.3 ft)

If side slip is greatly different, toe or front wheel alignment may not be correct.

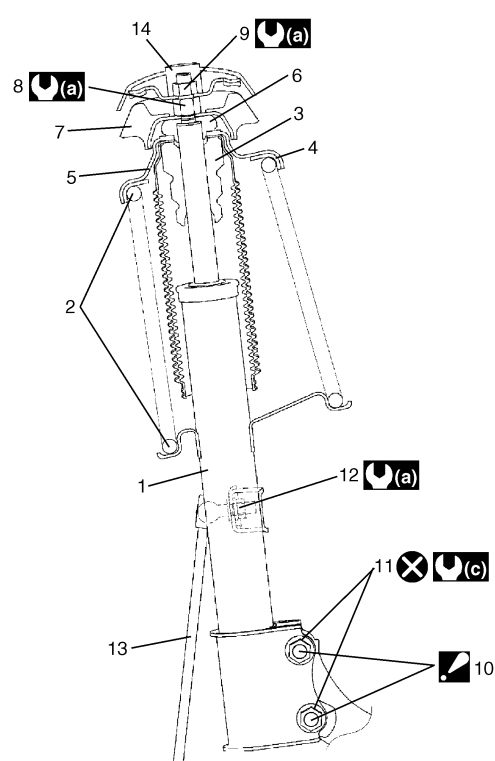
Front Strut Assembly Components

S6RS0B2206002

[A]



[B]



I6RS0B220005-03

1. Strut assembly	6. Strut bearing	11. Strut bracket nut	⚙️(b) : 105 N·m (10.5 kgf-m, 76.0 lb-ft)
2. Coil spring	7. Strut support	12. Stabilizer joint nut	⚙️(c) : 90 N·m (9.0 kgf-m, 65.5 lb-ft)
3. Bump stopper	8. Strut support lower nut	13. Stabilizer joint	[A]: Other than M16A engine model
4. Coil spring seat	9. Strut nut	14. Strut rod cap	[B]: For M16A engine model
5. Coil spring upper seat	10. Strut bracket bolt : Insert from vehicle front side.	⚙️(a) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)	

Front Strut Assembly Removal and Installation

S6RS0B2206003

Removal

- 1) Remove windshield wiper arms with wiper blades.
- 2) Remove cowl top covers referring to "Cowl Top Components in Section 9K".

NOTE

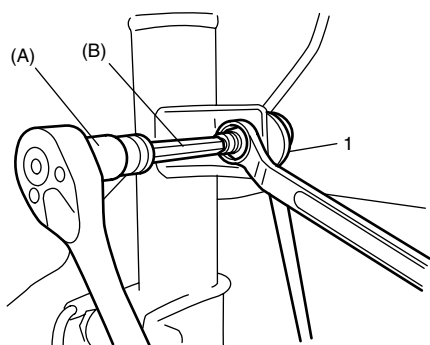
When servicing component parts of strut assembly, remove strut rod cap and then loosen strut nut a little before removing strut assembly. This will make service work easier. Note that the nut must not be removed at this point.

- 3) Hoist vehicle, allowing front suspension to hang free.
- 4) Remove wheel and disconnect stabilizer joint (1) from strut bracket. When loosening joint nut, hold stud with special tools.

Special tool

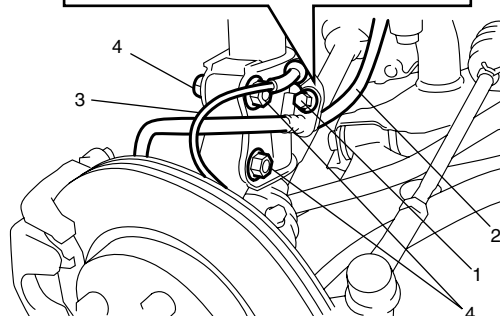
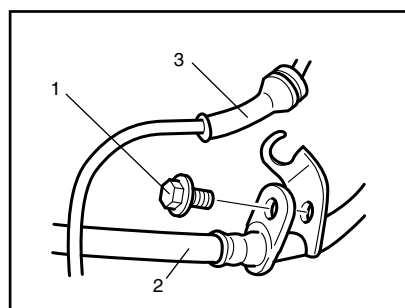
(A): 09900-00411 socket

(B): 09900-00413 5 mm



I4RS0A220004-01

- 5) Remove brake hose mounting bolt (1) and remove brake hose (2) from bracket and then wheel speed sensor harness (3) from strut bracket as shown in figure.
- 6) Remove strut bracket bolts and nuts (4).

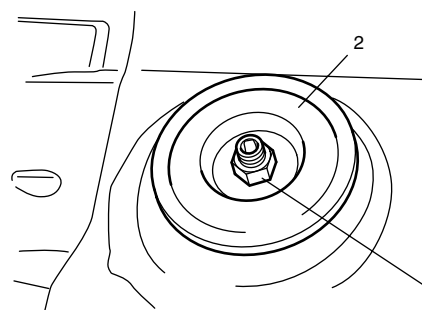


I4RS0A220005-01

- 7) Remove strut rod cap.
- 8) Remove strut nut (1), and remove rebound stopper (2).

NOTE

Hold strut by hand so that it will not fall off.



I4RS0A220006-01

- 9) Remove strut assembly.

Installation

Install strut assembly by reversing removal procedure, noting the following instructions.

- Insert bolts in such direction as shown in figure.
- Tighten all fasteners to specified torque.

Tightening torque

Strut bracket nut (other than M16A engine model)

(a): 105 N·m (10.5 kgf-m, 76.0 lb-ft)

Strut bracket nut (for M16A engine model) (a): 90 N·m (9.0 kgf-m, 65.5 lb-ft)

Brake hose mounting bolt (c): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

Stabilizer joint nut (d): 50 N·m (5.0 kgf-m, 36.5 lb-ft)

- Lower hoist and vehicle in unloaded condition, tighten strut nut (b) to specified torque.

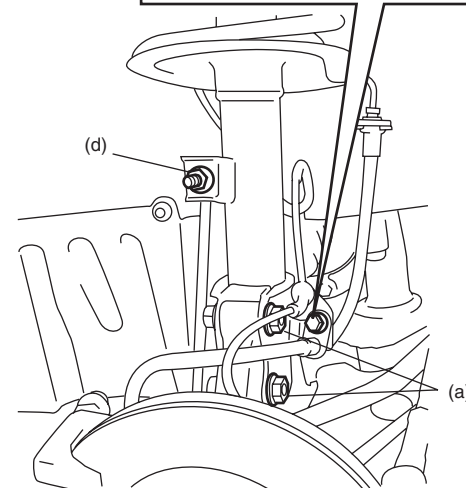
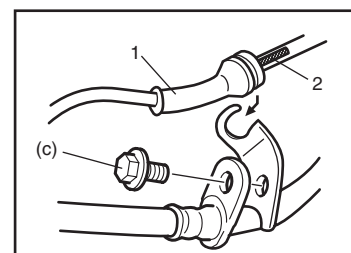
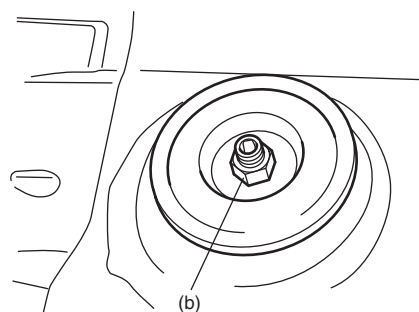
Tightening torque

Strut nut (b): 50 N·m (5.0 kgf-m, 36.5 lb-ft)

- Install windshield wiper arms with blades referring to "Windshield Wiper Removal and Installation in Section 9D in related manual".

NOTE

- Don't twist brake hose and wheel speed sensor harness when installing them.
- Install wheel speed sensor harness (1) which marking (2) in figure is placed to open hook side of the bracket.



I4RS0B220012-01

- Tighten wheel bolts to specified torque.

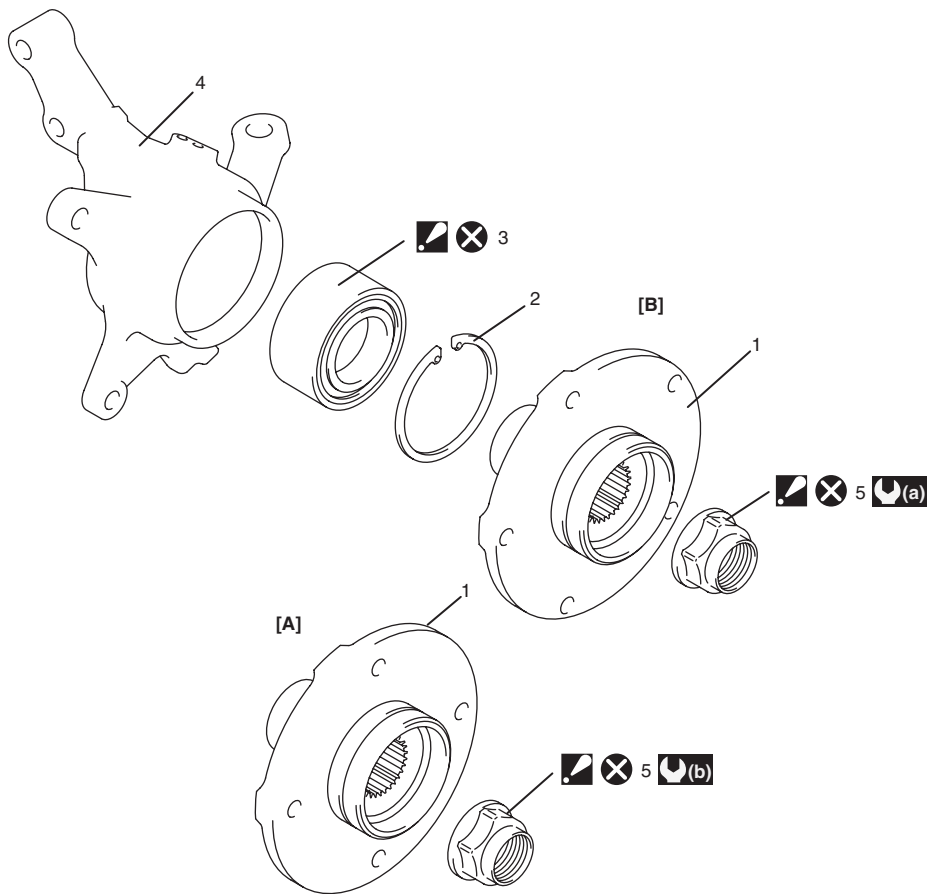
Tightening torque

Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

- After installation, confirm front wheel alignment.

Front Wheel Hub and Steering Knuckle Components

S6RS0B2206006



I6RS0B220011-01

[A]: Other than M16A engine model	2. Circlip	5. Drive shaft nut : Calk, after tightening.	⊗ : Do not reuse.
[B]: For M16A engine model	3. Wheel bearing : Face grooved rubber seal side to wheel hub.	(a) : 200 N-m (20.0 kgf-m, 145 lb-ft)	
1. Front wheel hub	4. Steering knuckle	(b) : 175 N-m (17.5 kgf-m, 126.5 lb-ft)	

Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation

S6RS0B2206007

Removal

- 1) Hoist vehicle and remove wheel.
- 2) Uncaulk drive shaft nut (1).
- 3) Depress foot brake pedal and hold it. Remove drive shaft nut (1).
- 4) Remove brake disc referring to “Front Brake Disc Removal and Installation in Section 4B in related manual”.
- 5) Pull out wheel hub (1) with special tools.

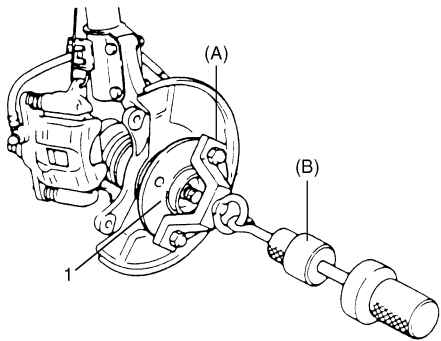
Special tool

(A): 09943-17912

(B): 09942-15511

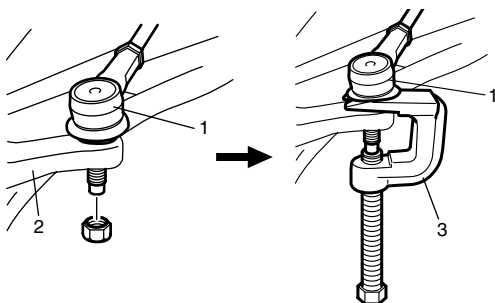
⚠ CAUTION

When wheel hub is removed, replace wheel bearing with new one.



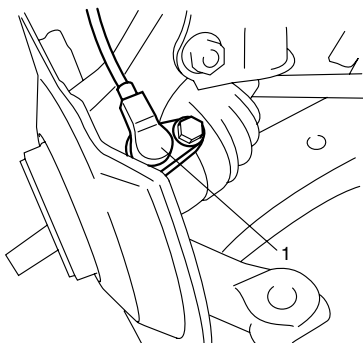
I3RM0A220023-01

- 6) Disconnect tie-rod end (1) from steering knuckle (2) with puller (3).



I4RS0A220017-01

- 7) Remove wheel speed sensor (1) from knuckle.

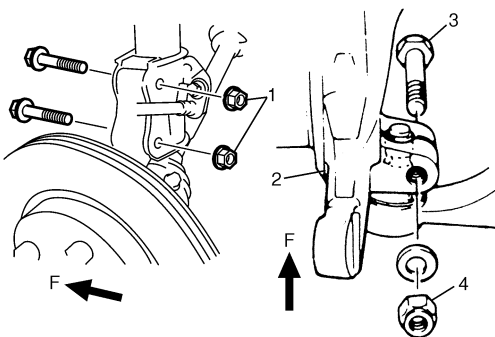


I4RS0B220005-01

- 8) Loosen strut bracket nuts (1).

- 9) Remove ball joint bolt (3) and nut (4).

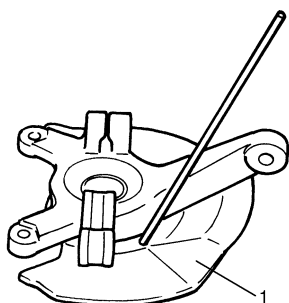
- 10) Remove strut bracket bolts from strut bracket and then steering knuckle (2).



I4RS0B220013-01

F: Vehicle front

- 11) Uncaulk and remove dust cover (1).



I2RH01220032-01

- 12) Remove circlip from knuckle.

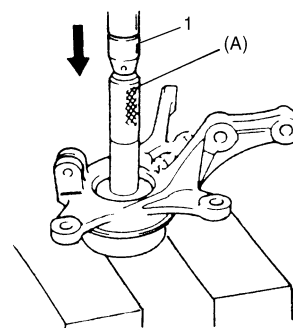
- 13) Using hydraulic press (1) and special tool, remove wheel bearing.

Special tool

(A): 09913-75520

⚠ CAUTION

When installing wheel bearing, replace it with new one.



I2RH01220033-01

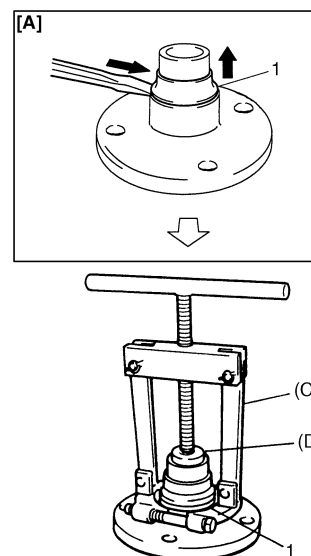
- 14) Remove wheel bearing outside inner race (1).

Special tool

(C): 09913-65810

(D): 09926-37610-003 (other than M16A engine model)

: 09913-85230 (for M16A engine model)



I6RS0B220012-02

[A]: Other than M16A engine model

2B-10 Front Suspension:

Installation

For installation, reverse removal procedure, noting the following instructions.

- 1) Face grooved rubber seal side (1) of new wheel bearing (2) upward as shown in figure and press-fit it into knuckle (3) using special tool.

Special tool

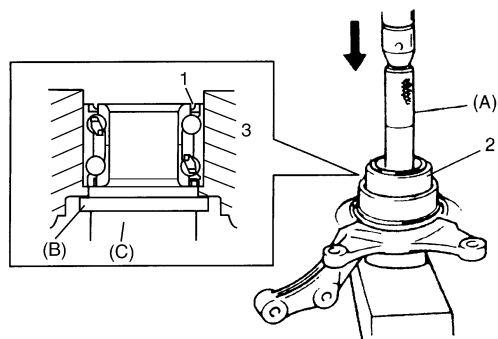
(A): 09913-75510

(B): 09926-68310

(C): 09951-18210

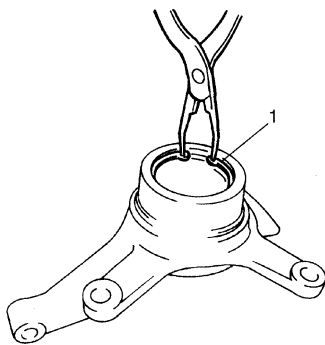
⚠ CAUTION

When installing wheel bearing, replace it with new one.



I3RM0A220032-01

- 2) Install circlip (1).

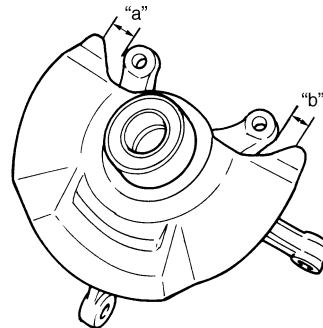


I2RH01220037-01

- 3) Drive in dust cover so that dimensions "a" and "b" become equal as shown in the figure.

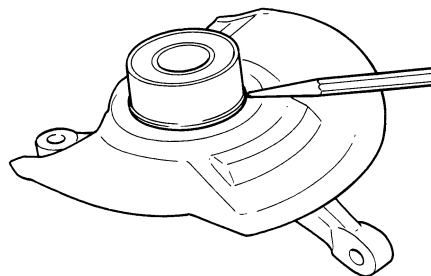
⚠ CAUTION

When drive in dust cover, be careful not to deform it.



I2RH01220038-01

- 4) Caulk more than 6 places with a punch.



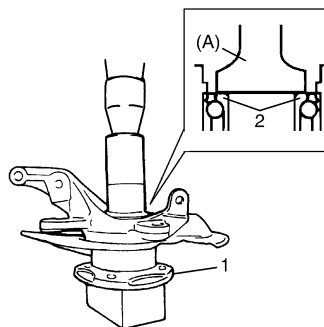
I2RH01220039-01

- 5) Using special tool and hydraulic press, press fit wheel hub (1) into wheel bearing (2) (Face grooved rubber seal side to wheel hub).

Special tool

(A): 09913-75810 (other than M16A engine model)

: 09913-75510 (for M16A engine model)



I3RM0A220026-01

- 6) Install ball joint bolt (1) and nut (2) from the direction as shown in figure.
- 7) Tighten new suspension arm ball joint nut (2) to specified torque.

Tightening torque

Suspension arm ball joint nut (a): 60 N·m (6.0 kgf-m, 43.5 lb-ft)

⚠ CAUTION

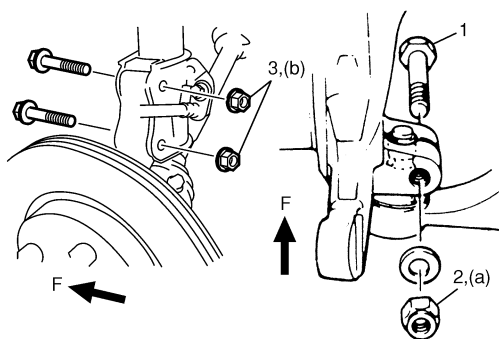
Never reuse the removed suspension arm ball joint nut.

- 8) Tighten strut bracket nuts (3) to specified torque.

Tightening torque

Strut bracket nut (other than M16A engine model) (b): 105 N·m (10.5 kgf-m, 76.0 lb-ft)

Strut bracket nut (for M16A engine model) (b): 90 N·m (9.0 kgf-m, 65.5 lb-ft)



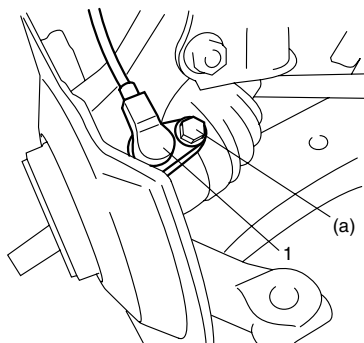
I4RS0B220015-01

F: Vehicle front

- 9) Install wheel speed sensor (1).

Tightening torque

Wheel speed sensor mounting bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

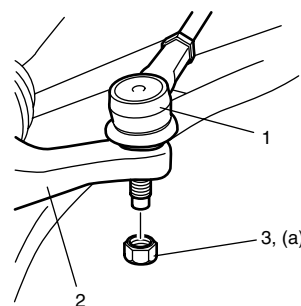


I4RS0B220006-01

- 10) Connect tie-rod end (1) to steering knuckle (2), tighten new nut (3) to specified torque.

Tightening torque

Tie-rod end nut (a): 45 N·m (4.5 kgf-m, 32.5 lb-ft)



I4RS0B220007-01

- 11) Install brake disc (2) and brake caliper (3).
- 12) Tighten brake disc screws (4) and caliper carrier bolt to specified torque.

Tightening torque

Brake disc screw (a): 9 N·m (0.9 kgf-m, 6.5 lb-ft)

Caliper carrier bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

- 13) Depress foot brake pedal and hold it there. Tighten new drive shaft nut (1) to specified torque.

Tightening torque

Drive shaft nut (other than M16A engine model) (b): 175 N·m (17.5 kgf-m, 126.5 lb-ft)

Drive shaft nut (for M16A engine model) (b): 200 N·m (20.0 kgf-m, 145.0 lb-ft)

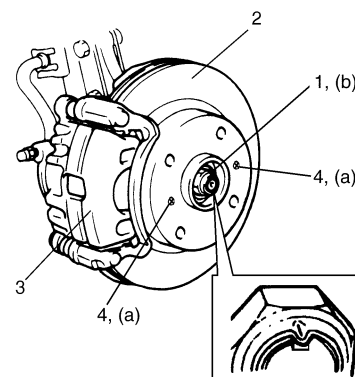
⚠ CAUTION

Never reuse drive shaft nut (1).

- 14) Caulk drive shaft nut (1) as shown.

⚠ CAUTION

Be careful not to damage the drive shaft nut while caulking it. If it is damaged, replace it with new one.



I4RS0B220008-02

- 15) Tighten wheel bolts to specified torque.

Tightening torque

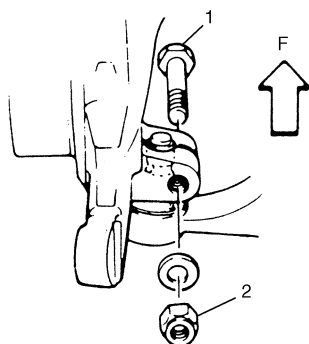
Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

Suspension Control Arm / Bushing Removal and Installation

S6RS0B2206009

Removal

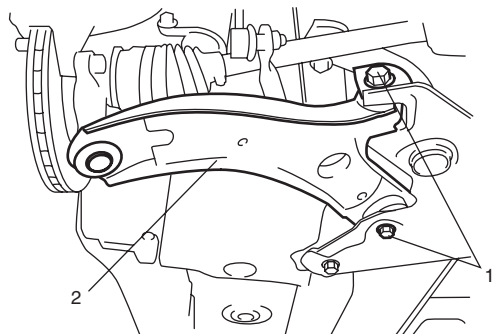
- 1) Remove suspension control arm ball joint bolt (1) and nut (2).



I2RH01220046-01

F: Vehicle front

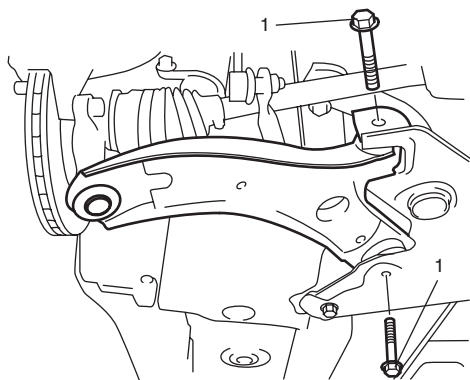
- 2) Remove suspension control arm bolts (1).
- 3) Remove suspension control arm (2).



I4RS0B220016-01

Installation

- 1) Install suspension control arm as shown but tighten suspension control arm bolts (1) only temporarily.

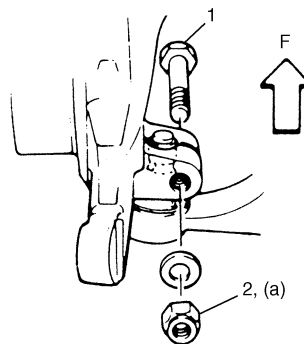


I4RS0B220017-01

- 2) Install suspension control arm ball joint to steering knuckle. Align ball stud groove with steering knuckle bolt hole. Then install ball joint bolt (1) from the direction as shown in figure. Tighten suspension arm ball joint nut (2) to specified torque.

Tightening torque

Suspension arm ball joint nut (a): 60 N·m (6.0 kgf-m, 43.5 lb-ft)



I2RH01220054-01

F: Vehicle front

- 3) Lower hoist and vehicle in unloaded condition, tighten new control arm front bolt and control arm rear bolt to specified torque.

⚠ CAUTION

Never reuse control arm front and rear mounting bolts.

Bolts are pre-coated with friction stabilizer. Be sure to replace pre-coated bolt with a new one, or bolt may loosen.

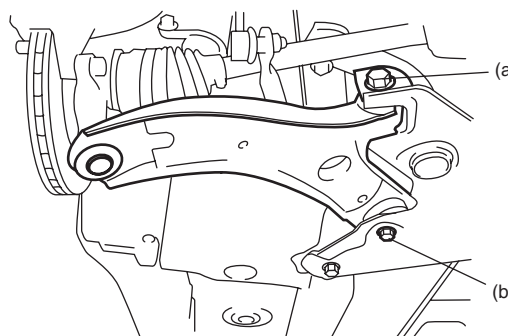
Tightening torque

Control arm front bolt (other than M16A engine model) (a): 95 N·m (9.5 kgf-m, 68.0 lb-ft)

Control arm front bolt (M16A engine model) (a): 95 N·m (9.5 kgf-m, 68.0 lb-ft)

Control arm rear bolt (other than M16A engine model) (b): 60 N·m (6.0 kgf-m, 43.5 lb-ft)

Control arm rear bolt (M16A engine model) (b): 95 N·m (9.5 kgf-m, 68.0 lb-ft)

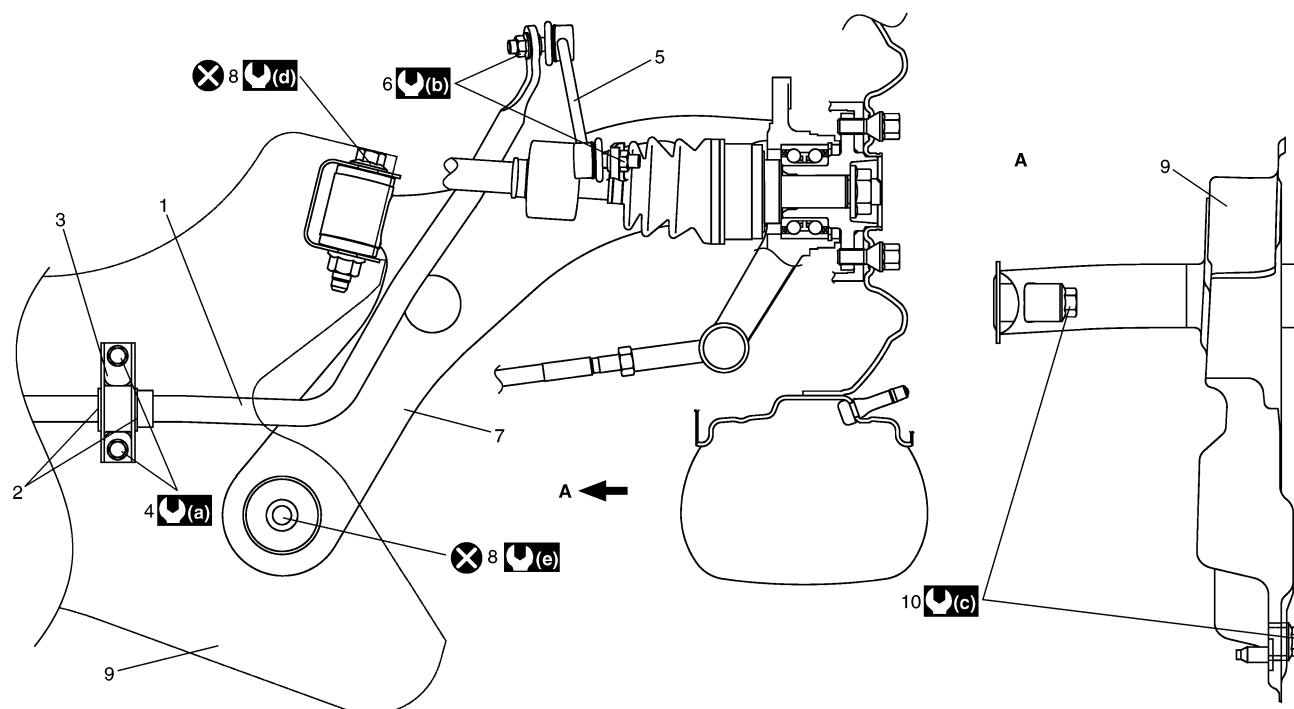


I4RS0B220018-01

- 4) Confirm front wheel alignment referring to "Front Wheel Alignment Inspection and Adjustment".

Front Suspension Frame, Stabilizer Bar and/or Bushings Components (Other Than M16A Engine Model)

S6RS0B2206019

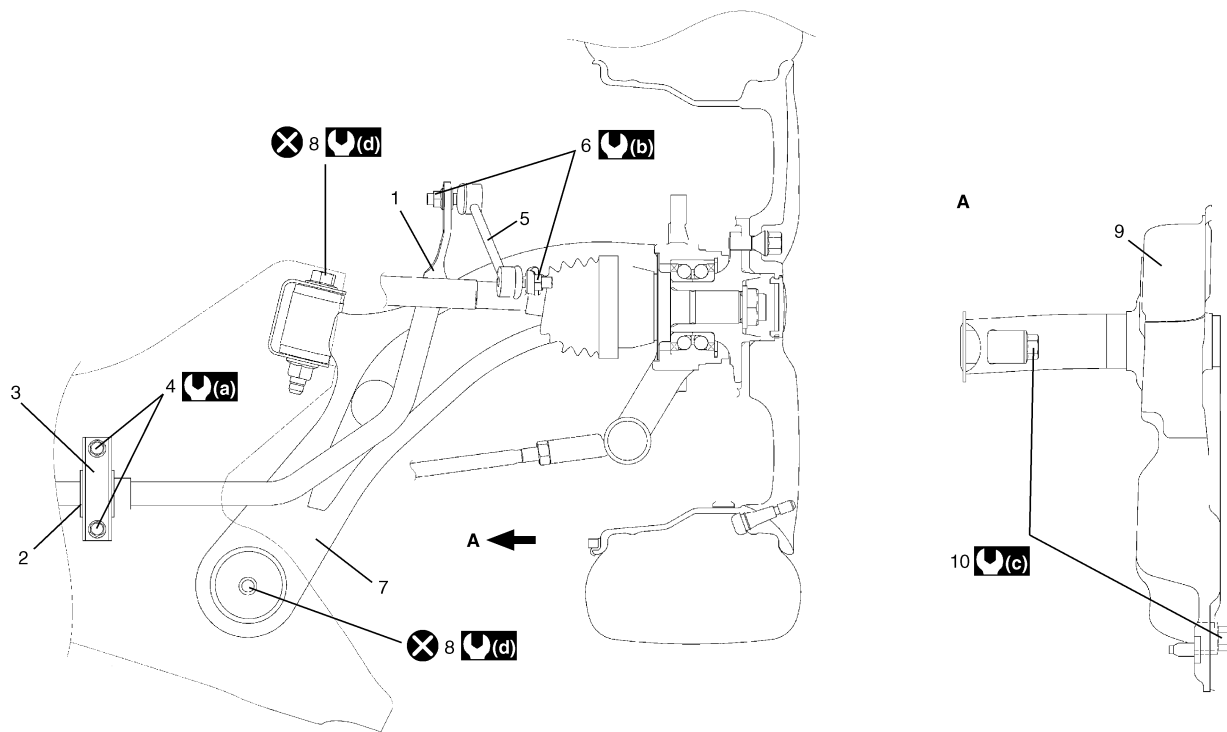


I6RS0B220014-02

A: View A	5. Stabilizer joint	10. Suspension frame mounting bolt	⚙️(e) : 60 N·m (6.0 kgf-m, 43.5 lb-ft)
1. Stabilizer bar	6. Stabilizer joint nut	⚙️(a) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)	⊗ : Do not reuse.
2. Stabilizer bushing	7. Suspension control arm	⚙️(b) : 50 N·m (5.0 kgf-m, 36.5 lb-ft)	
3. Stabilizer mounting bracket	8. Control arm mounting bolt	⚙️(c) : 150 N·m (15.0 kgf-m, 108.5 lb-ft)	
4. Stabilizer bar mounting bracket bolt	9. Suspension frame	⚙️(d) : 95 N·m (9.5 kgf-m, 68.0 lb-ft)	

Front Suspension Frame, Stabilizer Bar and/or Bushings Components (For M16A Engine Model)

S6RS0B2206014



I6RS0B220013-04

A: View A	4. Stabilizer bar mounting bracket bolt	8. Control arm mounting bolt	 (b) : 50 N·m (5.0 kgf·m, 36.5 lb·ft)
1. Stabilizer bar	5. Stabilizer joint	9. Suspension frame	 (c) : 150 N·m (15.0 kgf·m, 108.5 lb·ft)
2. Stabilizer bushing	6. Stabilizer joint nut	10. Suspension frame mounting bolt	 (d) : 95 N·m (9.5 kgf·m, 68.0 lb·ft)
3. Stabilizer mounting bracket	7. Suspension control arm	 (a) : 23 N·m (2.3 kgf·m, 17.0 lb·ft)	 : Do not reuse.

Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation

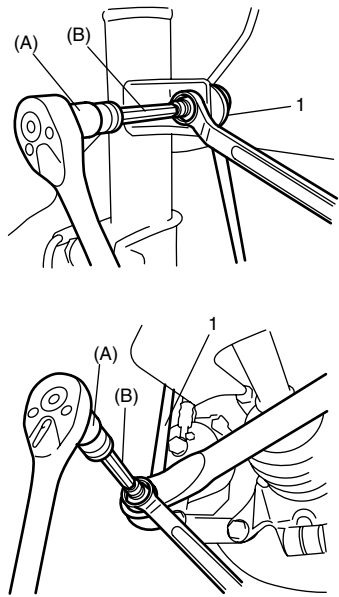
S6RS0B2206015

Removal

- 1) Hoist vehicle and remove wheels (right & left).
- 2) Remove suspension control arm referring to “Suspension Control Arm / Bushing Removal and Installation”.
- 3) Remove stabilizer joints (1).
When loosening joint nut, hold stud with special tools.

Special tool

- (A): 09900-00411 socket
(B): 09900-00413 5 mm

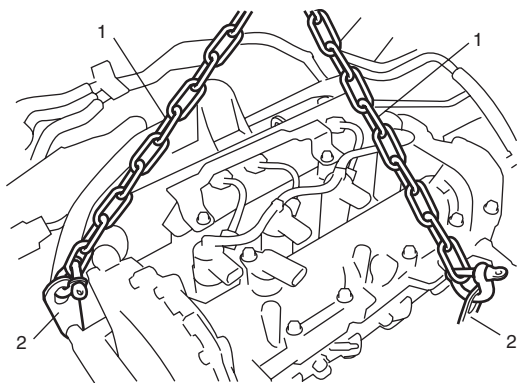


I4RS0A220038-01

- 4) Other than diesel engine model, support engine assemble by using supporting device referring to "Engine Supporting Points in Section 0A in related manual".
- 5) For diesel engine model, support engine assembly according to the following procedure.
 - a) Remove engine hood after disconnecting windshield washer hose.
 - b) Remove engine cover from engine assembly.
 - c) Remove intercooler outlet pipe referring to "Intercooler Components: For Z13DT Engine in Section 1D in related manual".
 - d) Disconnect the following connectors, and then remove wire harness from engine.
 - Injector connectors
 - Glow plug connectors
 - e) Remove oil with level gauge and oil level gauge guide.
 - f) By using chain hoist (1), support engine assemble with engine hangers (2).

NOTE

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

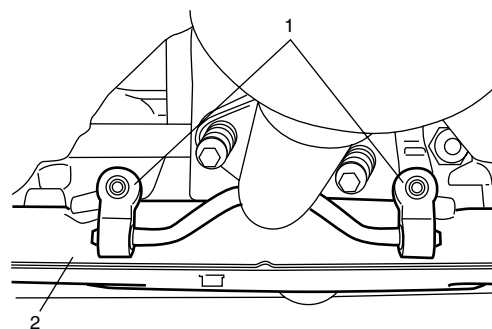


I5RS0B220001-01

- 6) Remove steering gear case from vehicle referring to "Steering Gear Case Assembly Removal and Installation in Section 6C in related manual".
- 7) Other than diesel engine model, disconnect muffler No.1 mounting (1) from suspension frame (2). For diesel engine model, disconnect center pipe mounting (1) from suspension frame (2).

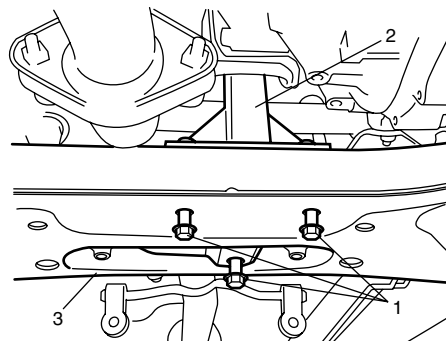
⚠ WARNING

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



I4RS0A220040-01

- 8) Remove engine rear mounting bolts (1) from engine rear mounting (2).



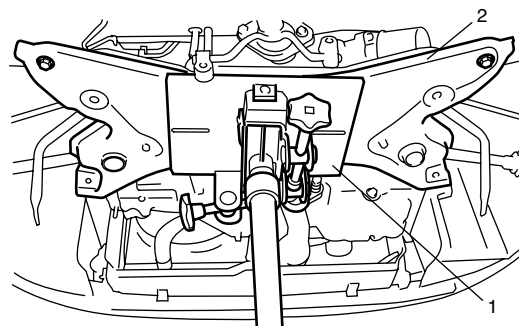
I4RS0A220041-01

3. Suspension frame

- 9) Support suspension frame by using mission jack (1) under suspension frame (2).

⚠ WARNING

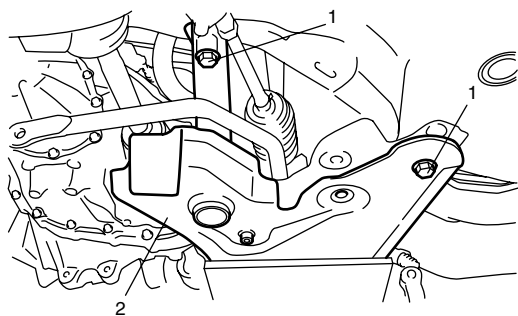
When removing suspension frame, be sure to apply some supporting equipment (such as mission jack) under it at well-balanced position in the center section so as to prevent from its drop.



I4RS0A220042-01

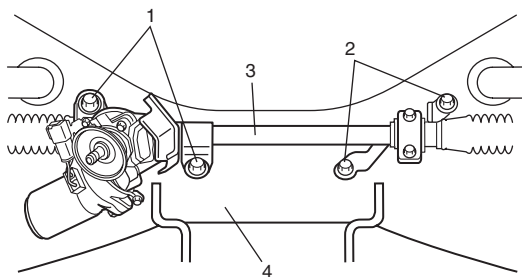
2B-16 Front Suspension:

- 10) Remove suspension frame mounting bolts (1), and then lower mission jack and remove suspension frame (2) with stabilizer bar and steering gear case.



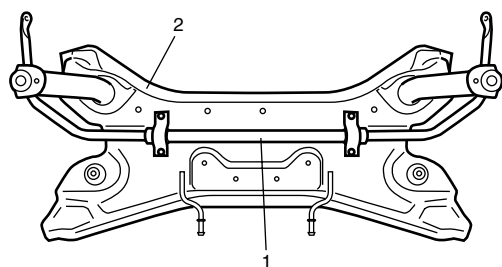
I4RS0A220043-01

- 11) Remove steering gear case mounting No.1 bolts (1) and No.2 bolts (2), then remove gear case (3) from suspension frame (4).



I4RS0B220010-02

- 12) Remove stabilizer bar (1) and bushing from suspension frame (2).



I4RS0A220044-01

Installation

- 1) When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side.
- 2) Install stabilizer bar (1), stabilizer bushing (2) and stabilizer mounting bracket (3) to suspension frame as shown in figure.

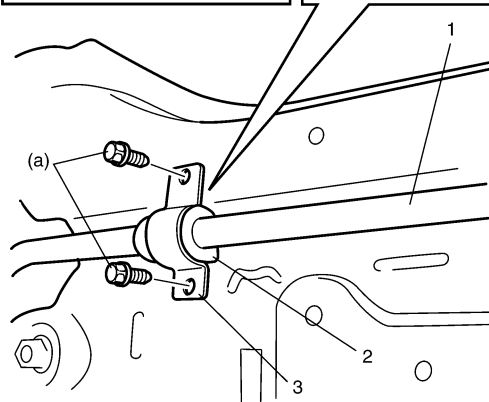
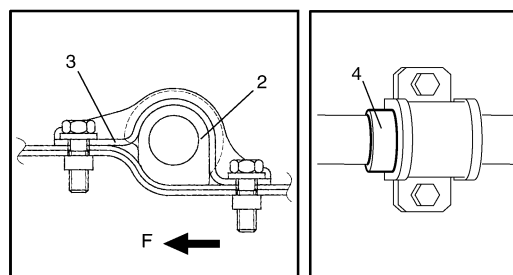
NOTE

For correct installation of stabilizer bar, side-to-side, be sure that stopper ring (4) on stabilizer bar aligns with mount bush, both right and left, as shown in figure.

- 3) Tighten stabilizer bar mounting bracket bolts to specified torque.

Tightening torque

Stabilizer bar mounting bracket bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)



I4RS0A220055-01

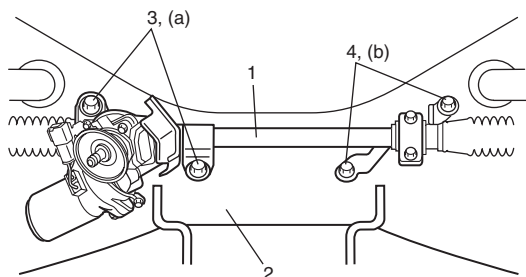
F: Forward

- 4) Mount steering gear case (1) to suspension frame (2) and tighten gear case mounting No.1 bolts (3) and No.2 bolts (4) to specified torque.

Tightening torque

Steering gear case mounting No.1 bolt (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)

Steering gear case mounting No.2 bolt (b): 55 N·m (5.5 kgf-m, 40.0 lb-ft)

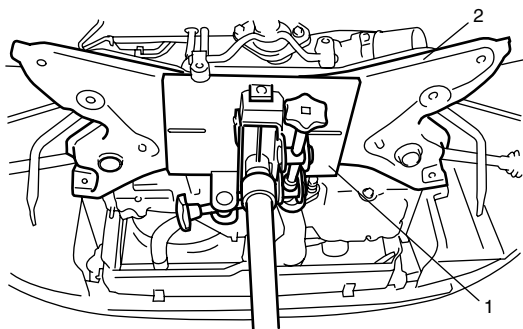


I4RS0B220011-02

- 5) Support suspension frame (2) with stabilizer bar by using mission jack (1), and jack up it.

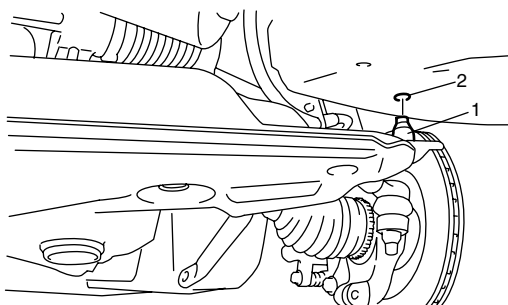
⚠ WARNING

When mounting suspension frame, be sure to apply some supporting equipment (such as mission jack) under it at well-balanced position in the center section so as to prevent from its drop.



I4RS0A220046-01

- 6) Align lugs (1) (right and left) of suspension frame with holes (2) in vehicle body respectively.

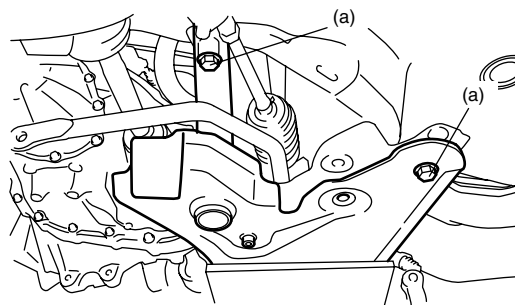


I4RS0A220047-01

- 7) Tighten suspension frame mounting bolts (a) to specified torque.

Tightening torque

Suspension frame mounting bolt (a): 150 N·m (15.0 kgf-m, 108.5 lb-ft)



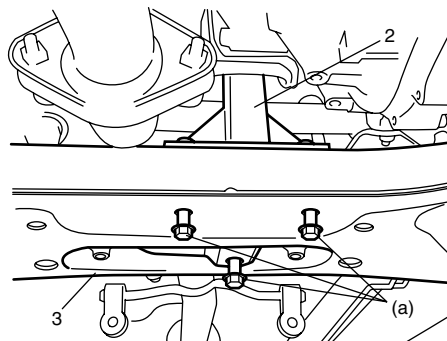
I4RS0A220048-01

- 8) Lower mission jack.

- 9) Tighten engine rear mounting bolts (a) to specified torque.

Tightening torque

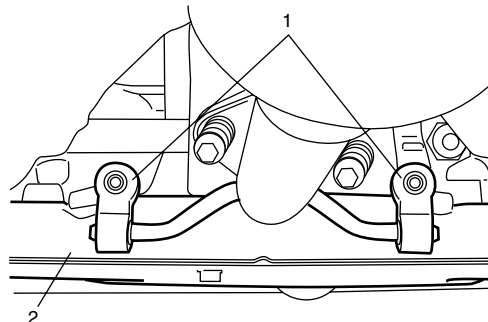
Engine rear mounting bolt (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)



I4RS0A220049-01

- | |
|-------------------------|
| 2. Engine rear mounting |
| 3. Suspension frame |

- 10) Other than diesel engine model, connect muffler No.1 mounting (1) to suspension frame (2). For diesel engine model, connect center pipe mounting (1) to suspension frame.



I4RS0A220040-01

2B-18 Front Suspension:

- 11) Other than diesel engine model, remove supporting device from engine.
- 12) For diesel engine model, according to the following procedure.
 - a) Remove chain hoist from engine.
 - b) Install oil level gauge guide and oil level gauge.
 - c) Reverse disconnected electric wires and connectors for connection in removal procedure.
 - d) Install intercooler outlet pipe referring to "Intercooler Components: For Z13DT Engine in Section 1D in related manual"
 - e) Install engine cover to engine assembly.

Tightening torque

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

- f) Install engine hood and connect windshield washer hose.

- 13) Install steering gear case to vehicle referring to "Steering Gear Case Assembly Removal and Installation in Section 6C in related manual".
- 14) Install stabilizer joints (1), and tighten nuts to specified torque.
When tightening, hold stud with special tools.

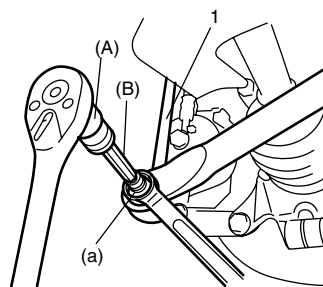
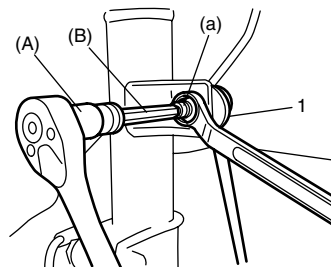
Special tool

(A): 09900-00411 socket

(B): 09900-00413 5 mm

Tightening torque

Stabilizer joint nut (a): 50 N·m (5.0 kgf-m, 36.5 lb-ft)



I4RS0A220051-01

- 15) Install suspension control arm referring to "Suspension Control Arm / Bushing Removal and Installation".
- 16) Install wheels (right & left) and lower hoist.
- 17) Confirm front wheel alignment referring to "Front Wheel Alignment Inspection and Adjustment".

Specifications

Tightening Torque Specifications

S6RS0B2207001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Tie-rod end lock nut	45	4.5	32.5	⌚
Strut bracket nut (other than M16A engine model)	105	10.5	76.0	⌚ / ⌚
Strut bracket nut (for M16A engine model)	90	9.0	65.5	⌚ / ⌚
Brake hose mounting bolt	25	2.5	18.0	⌚
Stabilizer joint nut	50	5.0	36.5	⌚ / ⌚
Strut nut	50	5.0	36.5	⌚
Wheel bolt	85	8.5	61.5	⌚ / ⌚
Suspension arm ball joint nut	60	6.0	43.5	⌚ / ⌚
Wheel speed sensor mounting bolt	25	2.5	18.0	⌚
Tie-rod end nut	45	4.5	32.5	⌚
Brake disc screw	9	0.9	6.5	⌚
Caliper carrier bolt	85	8.5	61.5	⌚
Drive shaft nut (other than M16A engine model)	175	17.5	126.5	⌚
Drive shaft nut (for M16A engine model)	200	20.0	145.0	⌚
Control arm front bolt (other than M16A engine model)	95	9.5	68.0	⌚
Control arm front bolt (M16A engine model)	95	9.5	68.0	⌚
Control arm rear bolt (other than M16A engine model)	60	6.0	43.5	⌚
Control arm rear bolt (M16A engine model)	95	9.5	68.0	⌚
Stabilizer bar mounting bracket bolt	23	2.3	17.0	⌚
Steering gear case mounting No.1 bolt	55	5.5	40.0	⌚
Steering gear case mounting No.2 bolt	55	5.5	40.0	⌚
Suspension frame mounting bolt	150	15.0	108.5	⌚
Engine rear mounting bolt	55	5.5	40.0	⌚
Engine cover bolt	8	0.8	6.0	⌚

NOTE

The specified tightening torque is also described in the following.

“Front Suspension Construction (Other Than M16A Engine Model): ”

“Front Suspension Construction (For M16A Engine Model): ”

“Front Strut Assembly Components: ”

“Front Wheel Hub and Steering Knuckle Components: ”

“Front Suspension Frame, Stabilizer Bar and/or Bushings Components (Other Than M16A Engine Model): ”

“Front Suspension Frame, Stabilizer Bar and/or Bushings Components (For M16A Engine Model): ”

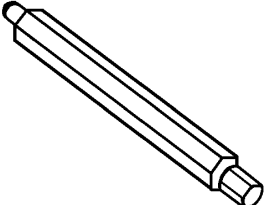
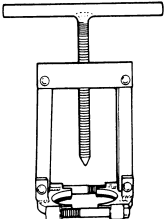
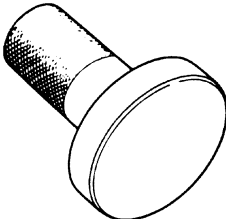
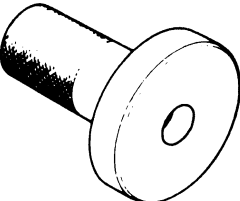
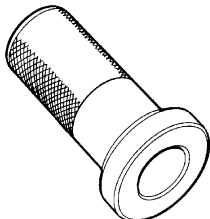
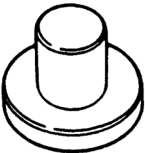
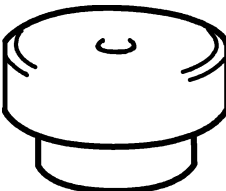
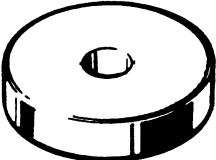
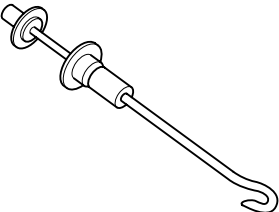
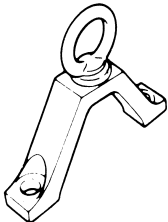
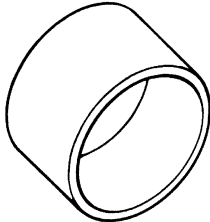
Reference:

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

Special Tools and Equipment

Special Tool

S6RS0B2208001

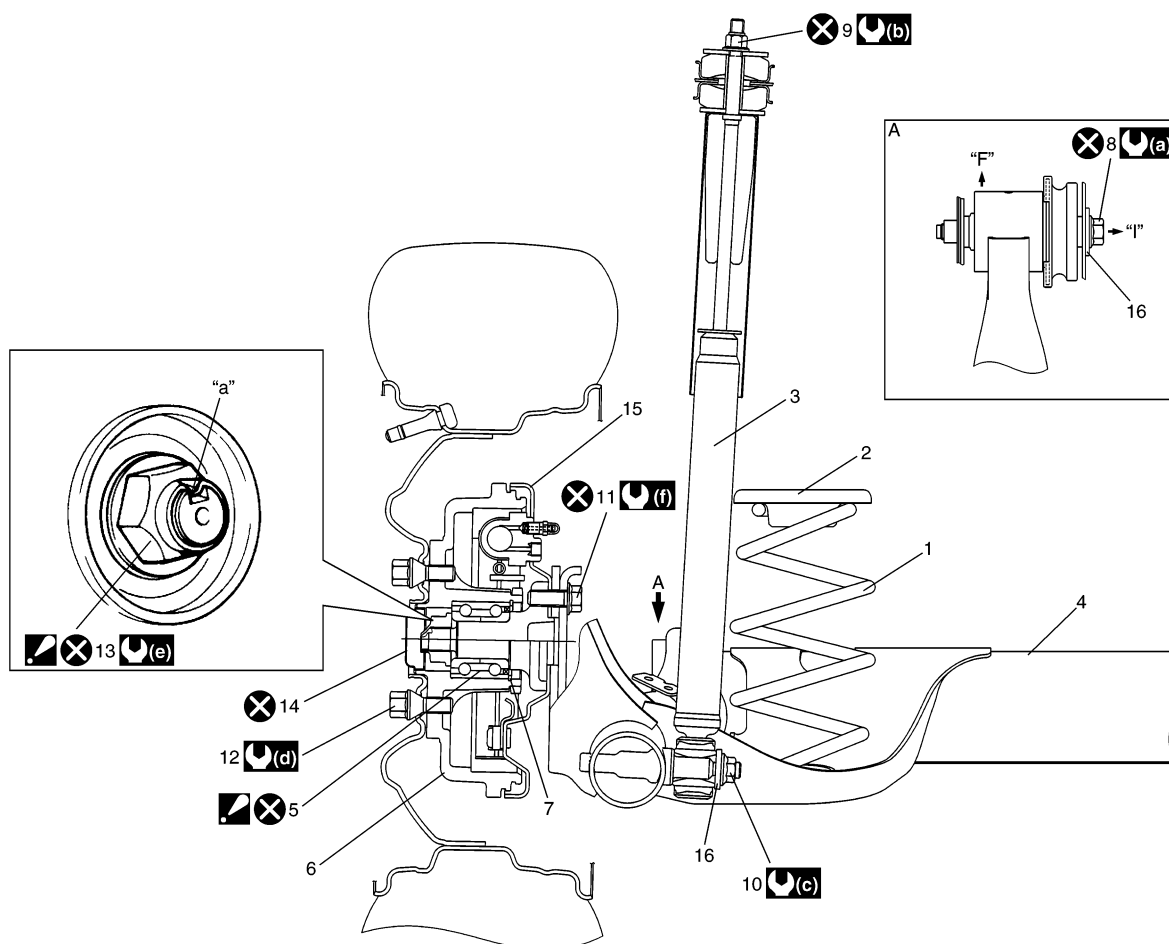
09900-00411 Hexagon bit socket 	09900-00413 Hexagon bit (5 mm) 
09913-65810 Crankshaft bearing puller 	09913-75510 Bearing installer 
09913-75520 Bearing installer 	09913-75810 Bearing installer 
09913-85230 Bearing remover tool 	09926-37610-003 Bearing remover attachment 
09926-68310 Differential bevel pinion bearing installer 	09942-15511 Sliding hammer 
09943-17912 Wheel hub remover 	09951-18210 Oil seal remover & installer No. 2 

Rear Suspension

General Description

Rear Suspension Construction (For Drum Brake Type)

S6RS0B2301001



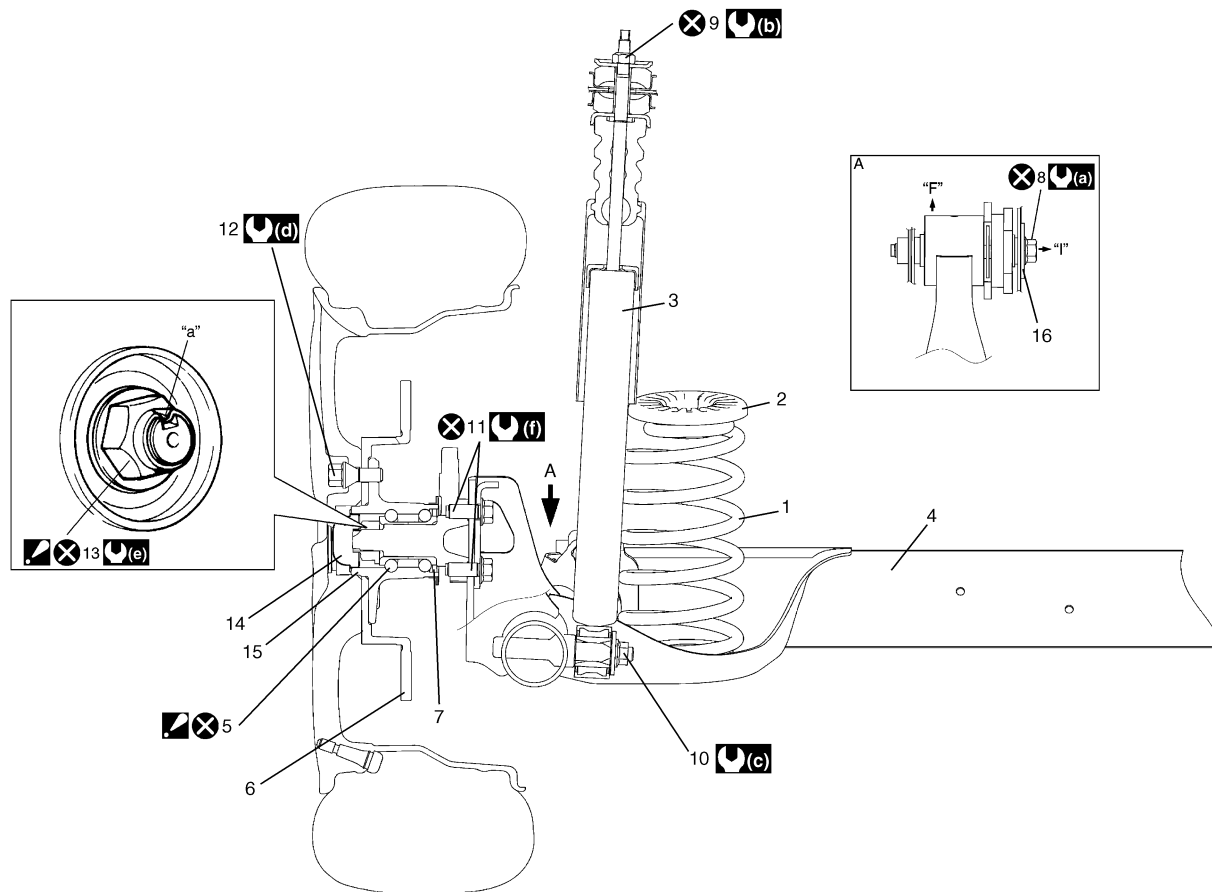
I6RS0B230018-03

A: View A	7. Circlip	14. Spindle cap	(c) : 90 N·m (9.0 kgf-m, 65.0 lb-ft)
1. Rear coil spring	8. Rear trailing arm bolt	15. Wheel hub	(d) : 85 N·m (8.5 kgf-m, 61.5 lb-ft)
2. Rear spring upper seat	9. Rear shock absorber upper nut	16. Washer	(e) : 175 N·m (17.5 kgf-m, 126.5 lb-ft)
3. Rear shock absorber	10. Rear shock absorber lower nut	"F": Vehicle front	(f) : 88 N·m (8.8 kgf-m, 64.0 lb-ft)
4. Rear axle	11. Rear spindle bolt	"I": Body inside	: Do not reuse.
5. Wheel bearing : Seal side of bearing comes brake back plate side.	12. Wheel bolt	(a) : 73 N·m (7.3 kgf-m, 53.0 lb-ft)	
6. Brake drum	13. Rear spindle nut : Caulk spindle nut as shown "a".	(b) : 28 N·m (2.8 kgf-m, 20.0 lb-ft)	

2C-2 Rear Suspension:

Rear Suspension Construction (For Disc Brake Type)

S6RS0B2301002



I6RS0B230001-02

A: View A	7. Circlip	14. Spindle cap	⌚(c) : 90 N·m (9.0 kgf-m, 65.0 lb-ft)
1. Rear coil spring	8. Rear trailing arm bolt	15. Wheel hub	⌚(d) : 85 N·m (8.5 kgf-m, 61.5 lb-ft)
2. Rear spring upper seat	9. Rear shock absorber upper nut	16. Washer	⌚(e) : 175 N·m (17.5 kgf-m, 126.5 lb-ft)
3. Rear shock absorber	10. Rear shock absorber lower nut	"F": Vehicle front	⌚(f) : 88 N·m (8.8 kgf-m, 64.0 lb-ft)
4. Rear axle	11. Rear spindle bolt	"I": Body inside	⊗ : Do not reuse.
⚙ 5. Wheel bearing : Seal side of bearing comes brake back plate side.	12. Wheel bolt	⌚(a) : 73 N·m (7.3 kgf-m, 53.0 lb-ft)	
6. Brake disc	⚙ 13. Rear spindle nut : Caulk spindle nut as shown "a".	⌚(b) : 28 N·m (2.8 kgf-m, 20.0 lb-ft)	

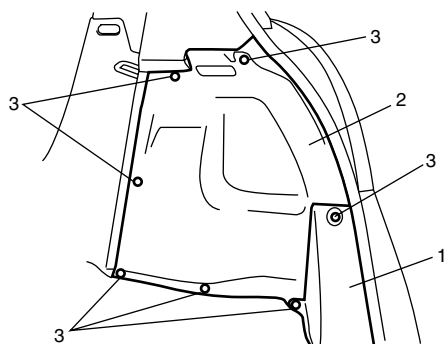
Repair Instructions

Rear Shock Absorber Removal and Installation

S6RS0B2306001

Removal

- 1) Hoist vehicle.
- 2) Remove tail end member trim (1) and quarter inner trim (2).



I4RS0A230003-01

3. Clip

- 3) Support rear axle by using floor jack to prevent it from lowering.
- 4) Remove absorber lower nut.
- 5) Remove absorber upper nut. Then remove shock absorber, a pair of upper washers and lower washer.

Installation

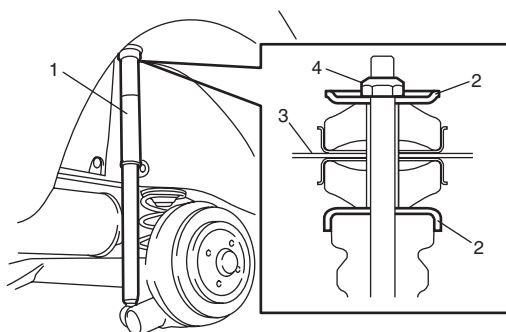
- 1) Install shock absorber (1), a pair of upper washers (2) and lower washer.
- Tighten new rear shock absorber upper nut (4) and lower nut temporarily at this step.

⚠ CAUTION

Never reuse the removed rear shock absorber upper nut.

NOTE

A pair of upper washers (2) are installed as shown in figure.



I4RS0B230002-02

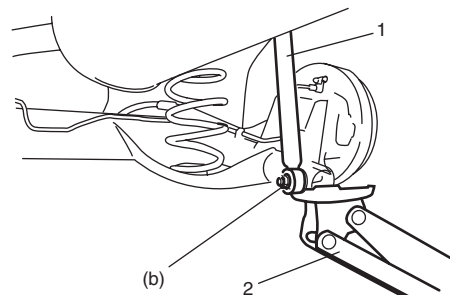
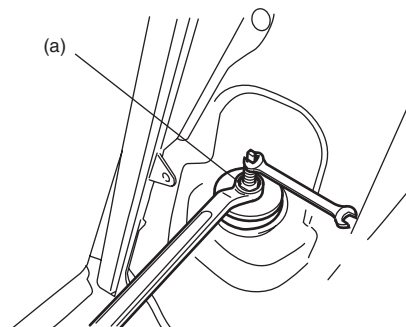
3. Body panel

- 2) Remove floor jack (2) from rear axle and lower hoist.
- 3) Tighten nuts to specified torque.

Tightening torque

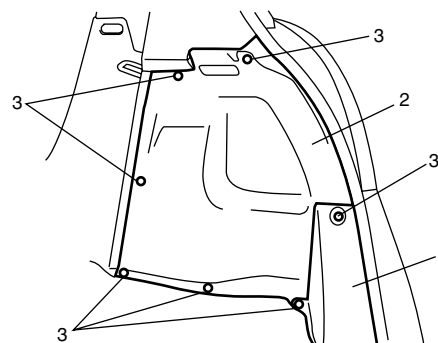
Rear shock absorber upper nut (a): 28 N·m (2.8 kgf-m, 20.0 lb-ft)

Rear shock absorber lower nut (b): 90 N·m (9.0 kgf-m, 65.0 lb-ft)



I4RS0B230003-01

- 4) Install tail end member trim (1) and quarter inner trim (2).



I4RS0A230003-01

3. Clip

Rear Axle Removal and Installation (For Disc Brake Type)

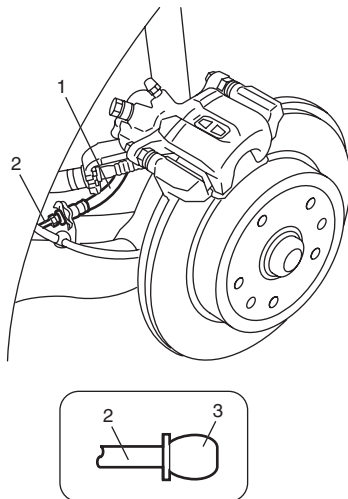
S6RS0B2306016

Removal

- 1) Hoist vehicle and remove rear wheels (right & left).
- 2) Disconnect rear brake caliper flexible hoses (1) (right & left) from brake pipes (2) and put bleeder plug cap (3) onto pipe (2) prevent fluid from spilling.

⚠ CAUTION

Do not drop brake fluid onto painted surface.

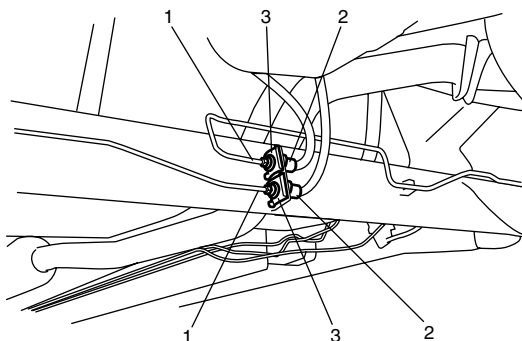


I6RS0B230002-01

- 3) Remove rear brake caliper assemblies (right & left) and brake discs (right & left). For details, refer to Step 2) to 4) of "Removal" under "Rear Brake Disc Removal and Installation: Disc Brake Type in Section 4C".
- 4) Remove rear wheel hubs (right & left). For details, refer to Step 3) to 5) of "Removal" under "Rear Wheel Hub Removal and Installation (For Disc Brake Type)".
- 5) Disconnect brake pipes (1) from brake hoses (2) and remove E-rings (3).

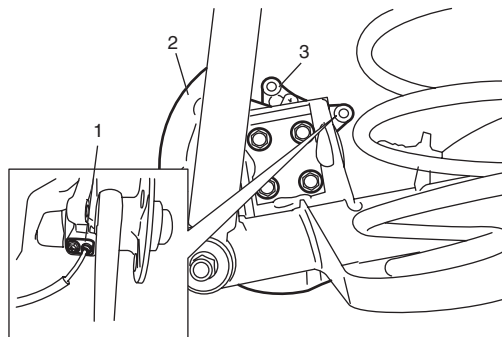
⚠ CAUTION

Do not drop brake fluid onto painted surface.



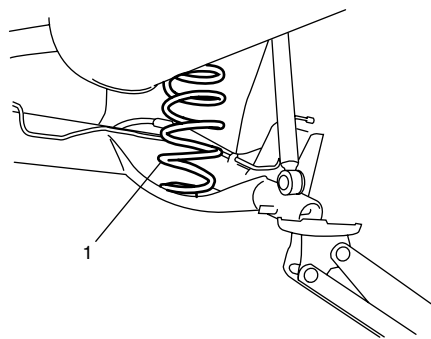
I4RS0A230018-01

- 6) Disconnect wheel speed sensors (1) and lead wire clamps (right & left).
- 7) Remove brake disc dust cover (2) and spindles (3) (right & left) from rear axle.



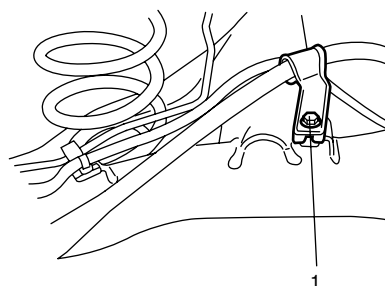
I6RS0B230003-01

- 8) Remove coil springs (1) (right & left) referring to "Coil Spring Removal and Installation in related manual".



I4RS0A230020-01

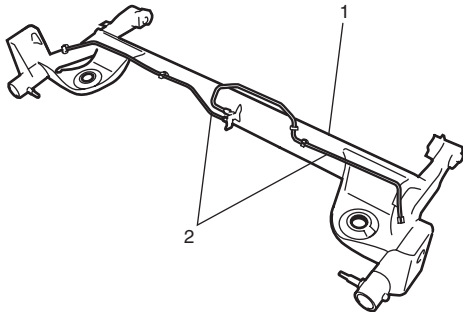
- 9) Disconnect wheel speed sensor clamp and parking brake cable clamp from rear axle.



I4RS0A230021-01

1. Parking brake cable clamp bolt

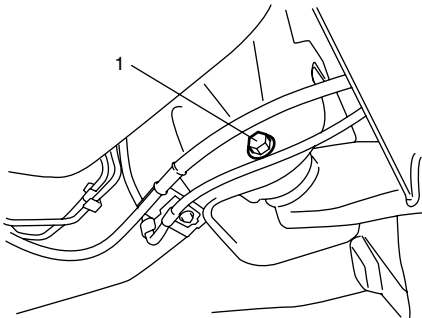
- 10) While supporting rear axle (1) at both ends (right & left), remove rear trailing arm bolts and then remove rear axle from chassis by lowering floor jack gradually.
- 11) Remove brake pipes (2) from rear axle (1) if necessary.



I6RS0B230004-01

Installation

- 1) Install brake pipes to rear axle.
- 2) Place rear axle on floor jacks.
Then install trailing arm, washers and new trailing arm bolts (1) (right & left) and tighten bolts temporarily by hand.



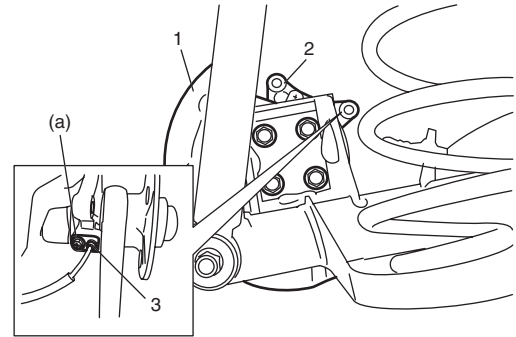
I4RS0A230023-01

- 3) Install coil springs (right & left) on spring seats of rear axle referring to "Spring Upper Seat and Lower Seat Removal and Installation in related manual" and "Coil Spring Removal and Installation in related manual".
- 4) Install shock absorbers lower side (right & left) and washers referring to "Rear Shock Absorber Removal and Installation".
- 5) Install brake dust covers, spindles and wheel speed sensors (right and left) referring to "Spindle Removal and Installation (For Disc Brake Type)".

- 6) Connect wheel speed sensors (1) and lead wire clamps (2) (right & left).

Tightening torque

Wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

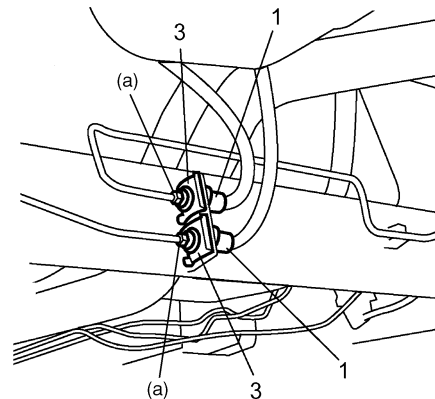


I6RS0B230005-01

- 7) Connect brake flexible hoses (1) to bracket on rear axle with E-rings (3) (right & left) and tighten brake pipe flare nuts (a) to specified torque.

Tightening torque

Brake pipe flare nut (a): 16 N·m (1.6 kgf-m, 11.5 lb-ft)

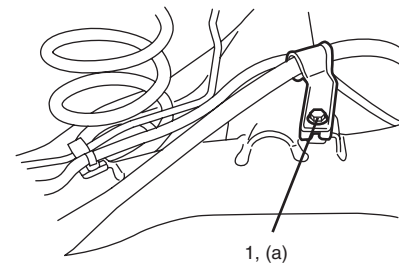


I4RS0A230028-01

- 8) Install wheel speed sensor clamp and parking brake clamp and tighten parking brake clamp bolts (1) to specified torque.

Tightening torque

Parking brake cable clamp bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



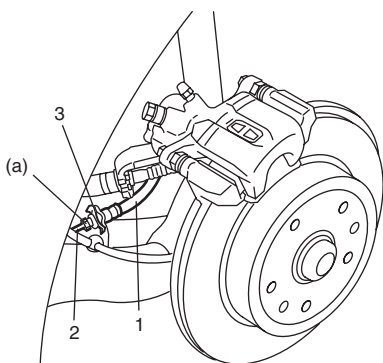
I6RS0B230006-01

2C-6 Rear Suspension:

- 9) Install rear wheel hubs (right & left) referring to "Rear Wheel Hub Removal and Installation (For Disc Brake Type)".
- 10) Install brake discs (right & left) and rear brake caliper assemblies (right & left) referring to "Rear Brake Disc Removal and Installation: Disc Brake Type in Section 4C".
- 11) Connect rear brake caliper flexible hoses (1) to brake pipes (2) with E-rings (3) (right & left). Tighten brake pipe flare nuts to specified torque.

Tightening torque

Brake pipe flare nut (a): 16 N·m (1.6 kgf-m, 11.5 lb-ft)



I6RS0B230007-01

- 12) Fill reservoir with brake fluid and bleed brake system. For bleeding operation, see "Air Bleeding of Brake System in Section 4A".
- 13) Install wheel and tighten wheel bolts to specified torque.

Tightening torque

Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

- 14) Adjust parking brake cable. For adjustment, refer to "Parking Brake Inspection and Adjustment in Section 4D".
- 15) Lower hoist and bounce vehicle up and down several times to stabilize suspension.

- 16) Tighten shock absorber lower nuts (1) and trailing arm bolts (2) to specified torque.

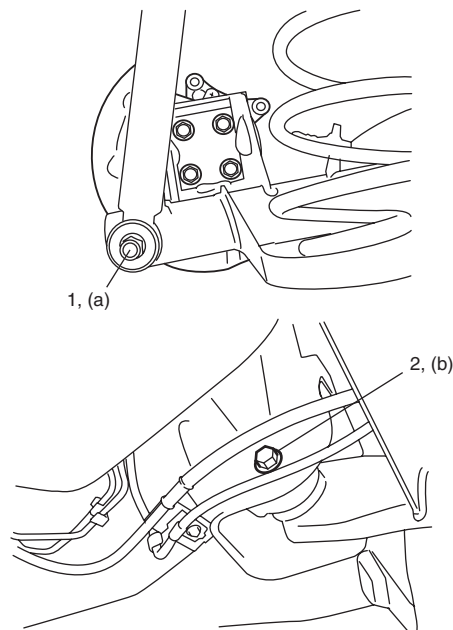
NOTE

When tightening these nuts and bolts, be sure that vehicle is not on hoist and in unloaded condition.

Tightening torque

Rear shock absorber lower nut (a): 90 N·m (9.0 kgf-m, 65.0 lb-ft)

Trailing arm bolt (b): 73 N·m (7.3 kgf-m, 53.0 lb-ft)

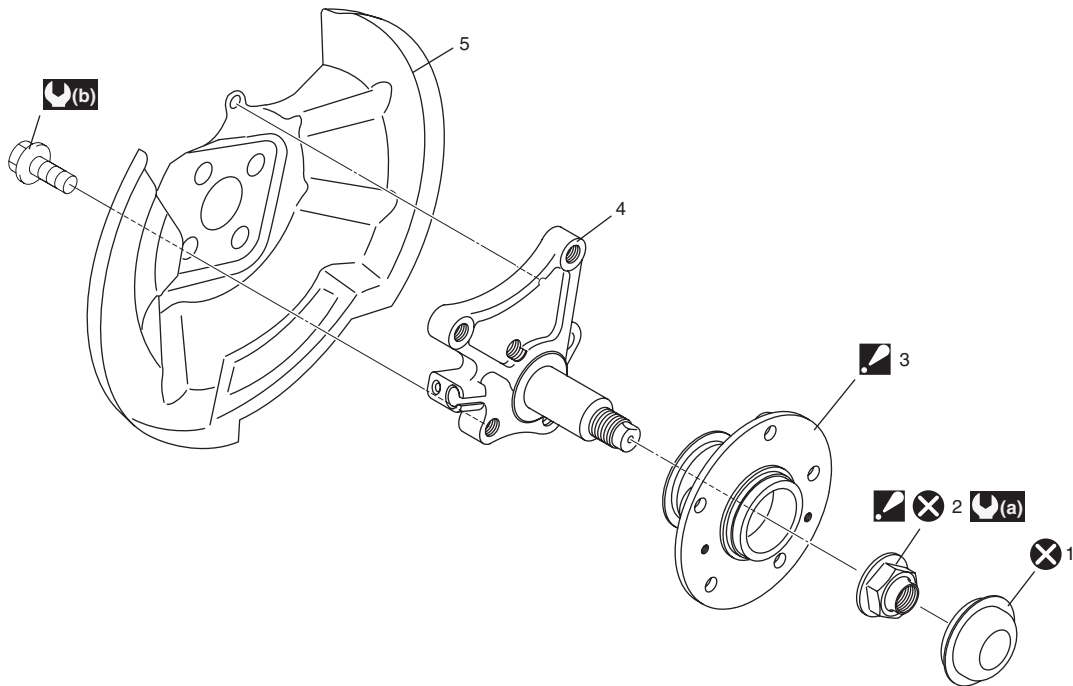


I6RS0B230008-01

- 17) Perform brake test (foot brake and parking brake).
- 18) Check each installed part for fluid leakage.

Rear Wheel Hub Components (For Disc Brake Type)

S6RS0B2306024



I6RS0B230009-04

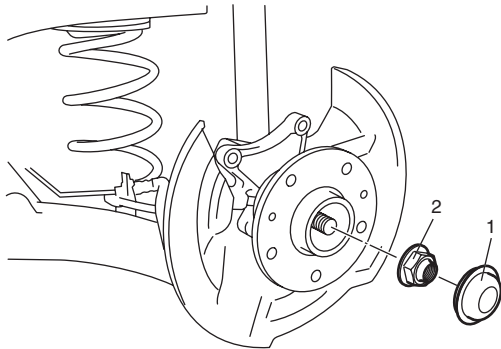
1. Spindle cap	4. Spindle	88 N·m (8.8 kgf-m, 64.0 lb-ft)
2. Rear axle nut :Calk, after Tightening	5. Disc dust cover	Do not reuse.
3. Rear wheel hub :Never disassemble wheel hub assembly	175 N·m (17.5 kgf-m, 126.5 lb-ft)	

Rear Wheel Hub Removal and Installation (For Disc Brake Type)

S6RS0B2306025

Removal

- 1) Hoist vehicle and remove wheel.
- 2) Remove rear brake caliper assembly and rear brake disc referring to “Rear Brake Disc Removal and Installation: Disc Brake Type in Section 4C”.
- 3) Remove spindle cap (1) by hammering lightly at 3 locations around it so as not to deform or cause damage to seating part of cap.
- 4) Unstake and remove rear axle nut (2).



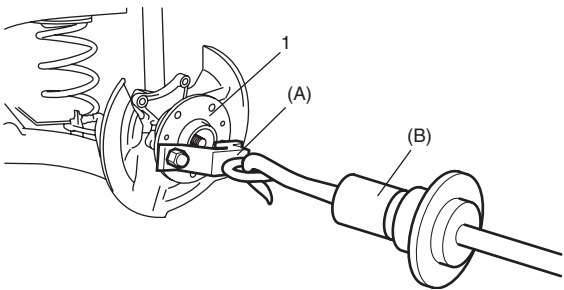
I6RS0B230010-01

- 5) Using special tools, draw out wheel hub (1).

Special tool

(A): 09943-17912

(B): 09942-15511



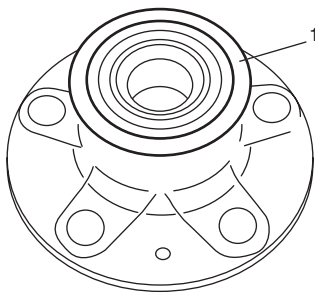
I6RS0B230011-01

2C-8 Rear Suspension:

Installation

Install wheel hub by reversing removal procedure noting the following instructions.

- Never apply grease to encoder (1).



I6RS0B230012-01

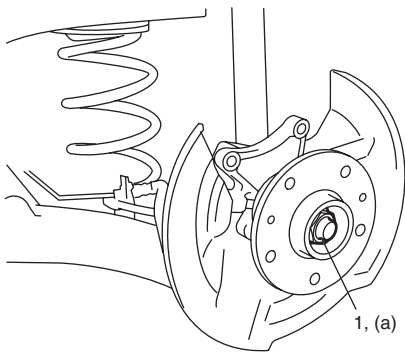
- Install new rear axle nut (1) and tighten to specified torque.

⚠ CAUTION

Never reuse rear axle nut.

Tightening torque

Rear axle nut (a): 175 N·m (17.5 kgf-m, 126.5 lb-ft)



I6RS0B230013-01

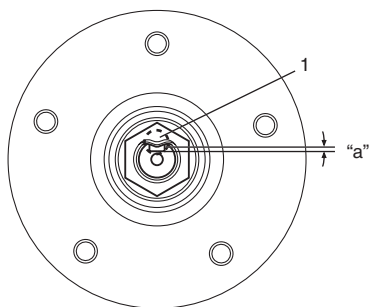
- Caulk new rear axle nut (1) as shown.

⚠ CAUTION

Take care while staking nut. If a split occurs in staked area of nut, replace it with new one.

Stake specification

"a": 0.5 mm (0.02 in.) or more



I6RS0B230014-01

- Install new spindle cap.

Rear Wheel Disc, bolt and Bearing Inspection

S6RS0B2306012

- Check tightness of wheel bolts and, if necessary, retighten to specified torque.
- Check wheel disc deformation, damage, crack and etc.
Replace defective disc with new one.
- Check installation face inside of wheel disc for rust.
As rust affects adversely, remove it thoroughly.

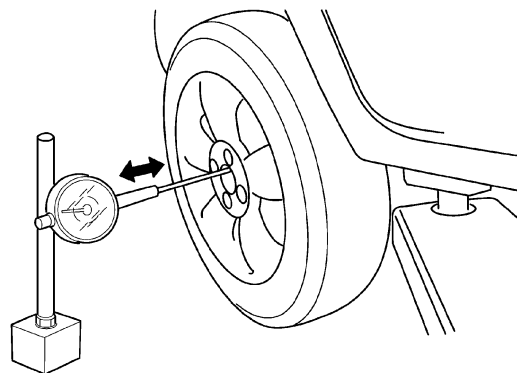
Tightening torque

Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

- Check wear of wheel bearings. When measuring thrust play, apply a dial gauge to axle shaft center. When the thrust play exceeds limit, replace bearing.

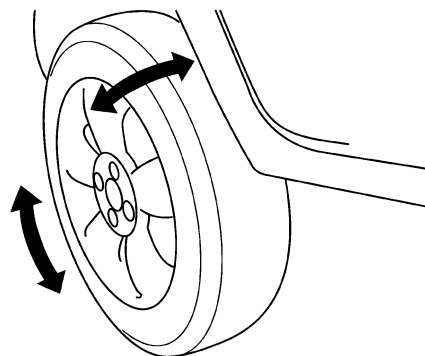
Thrust play limit

"a": 0.1 mm (0.004 in.)



I3RM0A230049-01

- Check noise and smooth rotation of wheel by rotating wheel. If it is defective, replace bearing.



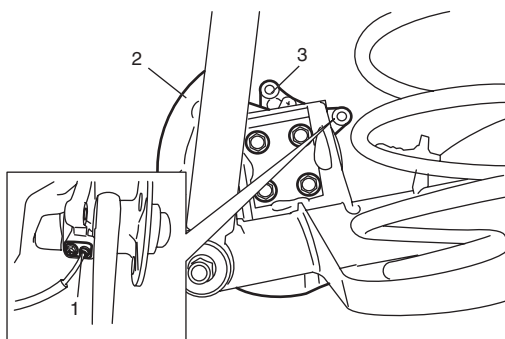
I3RM0A230050-01

Spindle Removal and Installation (For Disc Brake Type)

S6RS0B2306013

Removal

- 1) Remove rear brake caliper assembly and brake disc. For details, refer to Step 2) to 4) of "Removal" under "Rear Brake Disc Removal and Installation: Disc Brake Type in Section 4C".
- 2) Remove rear wheel hub. For details, refer to Step 3) to 5) of "Removal" under "Rear Wheel Hub Removal and Installation (For Disc Brake Type)".
- 3) Disconnect wheel speed sensor (1).
- 4) Remove brake disc dust cover (2) and spindle (3) from rear axle.



I6RS0B230015-01

Installation

- 1) Install brake disc dust cover (1), spindle (2) and new spindle bolts (3) and then tighten spindle bolts to specified torque.

⚠ CAUTION

Never reuse the removed rear spindle bolts.

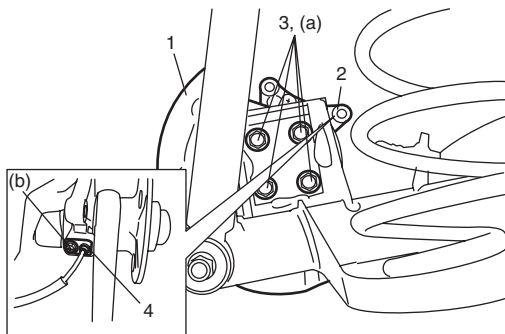
Tightening torque

Rear spindle bolt (a): 88 N·m (8.8 kgf-m, 64.0 lb-ft)

- 2) Connect wheel speed sensor (4) and tighten wheel speed sensor bolt to specified torque.

Tightening torque

Wheel speed sensor bolt (b): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



I6RS0B230016-01

- 3) Install rear wheel hub referring to "Rear Wheel Hub Removal and Installation (For Disc Brake Type)".
- 4) Install brake disc and rear brake caliper assembly referring to "Rear Brake Disc Removal and Installation: Disc Brake Type in Section 4C".
- 5) Install wheel and tighten wheel bolts to specified torque.

Tightening torque

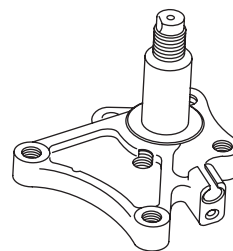
Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

- 6) Adjust parking brake cable. For adjustment, see "Parking Brake Inspection and Adjustment in Section 4D".
- 7) Perform brake test (foot brake and parking brake).
- 8) Check each installed part for fluid leakage.

Spindle Inspection (For Disc Brake Type)

S6RS0B2306014

- Inspect for cracks, deformation or damage. Replace any defective part.



I6RS0B230017-01

Rear Suspension Fasteners Inspection

S6RS0B2306015

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque referring to the figure in "Rear Suspension Construction (For Drum Brake Type)".

Specifications

Tightening Torque Specifications

S6RS0B2307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Rear shock absorber upper nut	28	2.8	20.0	🔩
Rear shock absorber lower nut	90	9.0	65.0	🔩 / 🔩
Wheel speed sensor bolt	11	1.1	8.0	🔩 / 🔩
Brake pipe flare nut	16	1.6	11.5	🔩 / 🔩
Parking brake cable clamp bolt	11	1.1	8.0	🔩
Wheel bolt	85	8.5	61.5	🔩 / 🔩 / 🔩
Trailing arm bolt	73	7.3	53.0	🔩
Rear axle nut	175	17.5	126.5	🔩
Rear spindle bolt	88	8.8	64.0	🔩

NOTE

The specified tightening torque is also described in the following.

“Rear Suspension Construction (For Drum Brake Type): ”

“Rear Suspension Construction (For Disc Brake Type): ”

“Rear Wheel Hub Components (For Disc Brake Type): ”

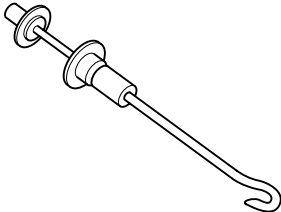
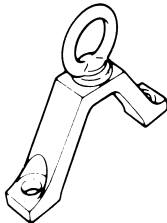
Reference:

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

Special Tools and Equipment

Special Tool

S6RS0B2308001

09942-15511 Sliding hammer 	09943-17912 Wheel hub remover 
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Wheels and Tires

Repair Instructions

General Balance Procedures

S6RS0B2406001

Deposits of mud, etc. must be cleaned from inside of rim.

⚠ WARNING

Stones should be removed from the tread in order to avoid operator injury during spin balancing and to obtain good balance.

Each tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

Off-Vehicle Balancing

Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin balancing, this is overcome by their accuracy, usually to within 1/8 ounce.

On-Vehicle Balancing

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

⚠ WARNING

Wheel spin should be limited to 55 km/h (35 mph) as indicated on speedometer. This limit is necessary because speedometer only indicates one-half of actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped. Unless care is taken in limiting drive wheel spin, spinning wheel can reach excessive speeds. This can result in possible tire disintegration or differential failure, which could cause serious personal injury or extensive vehicle damage.

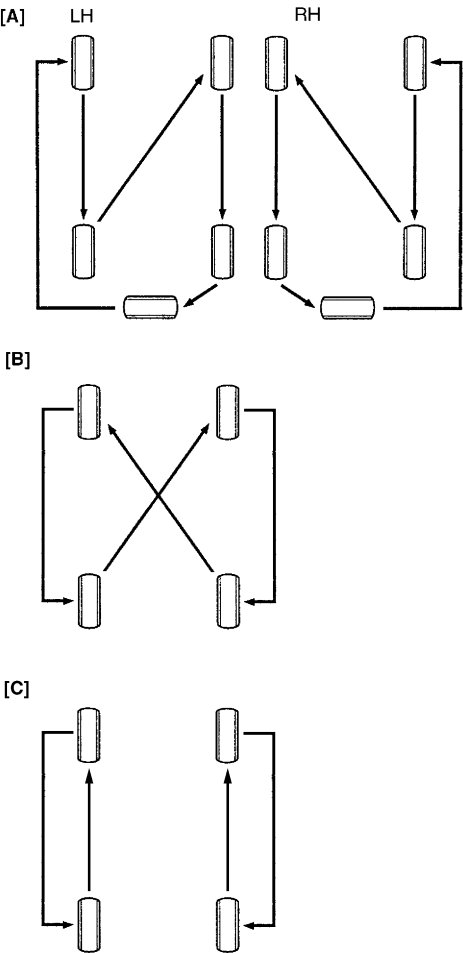
⚠ CAUTION

For vehicle equipped with ABS or ESP®, using on-vehicle balancing method with ignition switch ON may set malfunction diagnostic trouble code (DTC) of ABS or ESP® even when system is in good condition. Never turn ignition switch ON while spinning wheel.

Tire Rotation

S6RS0B2406002

To equalize wear, rotate tires according to figure. Radial tires should be rotated periodically. Set tire pressure.



I6RS0B240001-01

[A]: 5-tire rotation *1
[B]: 4-tire rotation
[C]: 4-tire rotation (Rotation direction is indicated.)
LH: Left-hand drive
RH: Right-hand drive

NOTE

***1: Applicable to vehicle equipped with 5 tires including spare tire all of which are identical in size (5-tire rotation). Due to their design, radial tires tend to wear faster in the shoulder area, particularly in front positions. This makes regular rotation especially necessary.**

Wheel Removal and Installation

S6RS0B2406003

Removal

⚠ WARNING

Do not removal all of the wheel bolts at once, because all the wheels of this vehicle are mounted by the wheel bolts.

Leave a bolt at least not to drop the wheel. Support the wheel and/or tire and then remove the bolt(s) left with the wheel.

- 1) Loosen wheel bolts by approximately 180° (half a rotation).
- 2) Hoist vehicle.
- 3) Make sure that the vehicle will not fall off by trying to move vehicle body in both ways.
- 4) Remove wheel bolts except one.
- 5) Support the wheel and/or tire not to drop the wheel and then remove the bolt left with the wheel.

⚠ CAUTION

Never use heat to loosen tight wheel because the application of heat to wheel causes the wheel life shorter and the wheel bearing damage.

Installation

For installation, reverse removal procedure, noting the following.

- Wheel bolts must be tightened in sequence and to specified torque to avoid bending wheel or brake disc.

NOTE

Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel bolts to loosen, which can later allow a wheel to come off while vehicle is moving.

Tightening order

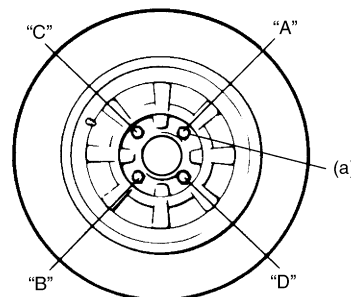
“A” – “B” – “C” – “D” (other than M16A engine model)

“A” – “B” – “C” – “D” – “E” (for M16A engine model)

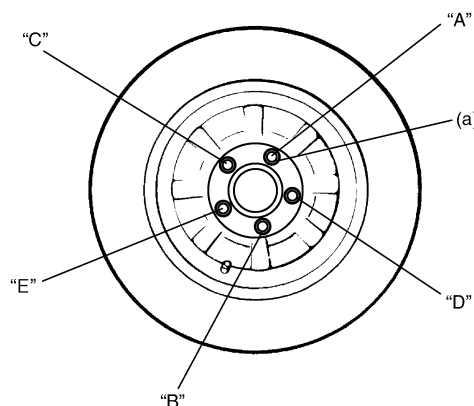
Tightening torque

Wheel bolt (a): 85 N·m (8.5 kgf-m, 61.5 lb-ft)

[A]



[B]



I6RS0B240002-01

[A]: Other than M16A engine model
[B]: For M16A engine model

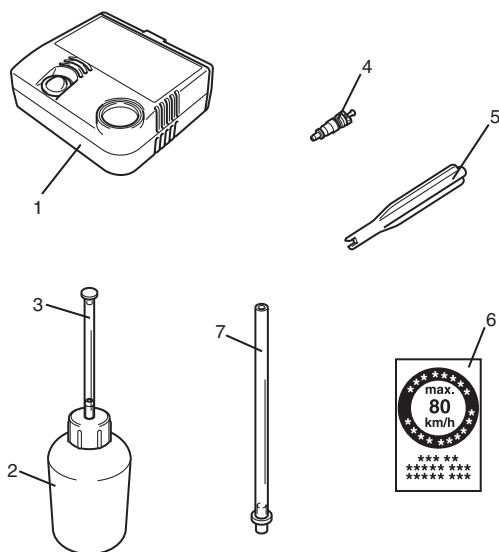
Sealant Extraction of Sealed Tire

S6RS0B2406006

Although this vehicle is not equipped with a spare tire, it has Emergency Flat Tire Repair Kit instead. Emergency Flat Tire Repair Kit includes air compressor (1), sealant bottle (2), filler hose (3), valve core (4), valve core remover (5), speed restriction sticker (6) and extension hose (7). To repair temporarily sealed tire completely by using this kit, it is necessary to extract sealant remaining in tire first according to the procedure described below.

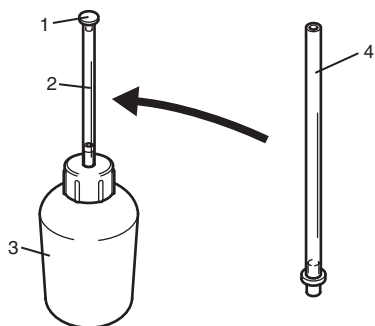
NOTE

For extraction of sealant from tire, borrow Emergency Flat Tire Repair Kit from the user and use the tools included in it.



I6RS0B240003-01

- 1) Remove sealed tire from vehicle.
- 2) Remove plug (1) from filler hose (2) of used sealant bottle (3), and then connect enclosed extension hose (4) to tip of filler hose.



I6RS0B240004-01

- 3) Using care not to let sealant of the sealed tire come out, make tire bead fall inside of wheel rim.
- 4) Insert extension hose (1) between tire bead and wheel rim as shown in figure.

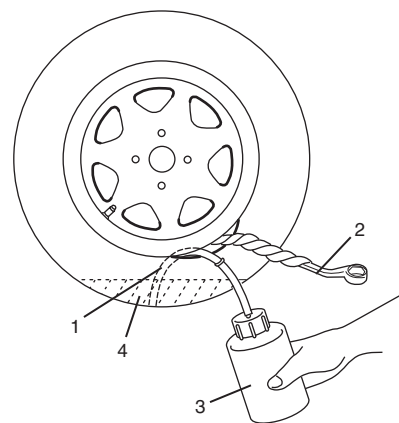
⚠ CAUTION

To prevent the extension hose from being pressed flat, make clearance by inserting tool (2) between tire bead and wheel rim as shown in figure. (Wear tool with rag or other things not to damage tire or wheel.)

- 5) Use sealant bottle (3) as pump. Press sealant bottle and suck out sealant (4) in sealed tire.

NOTE

To make sealant easy to suck up from tire, set sealant bottle lower than sealant surface.

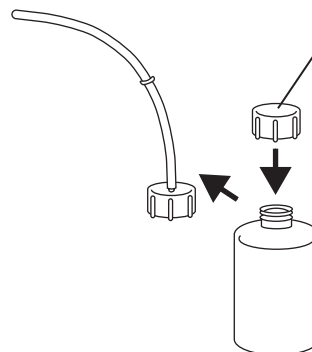


I6RS0B240005-01

- 6) Change extension hose end position and repeat Step 5) until sealant is not sucked out.
- 7) Put cap (1) on the sealant bottle so that collected sealant does not leak.

NOTE

Dispose of bottle containing extracted sealant properly as noncombustible.



I6RS0B240006-01

2D-4 Wheels and Tires:

- 8) Dismount sealed tire from wheel, and then wipe off sealant from sealed tire, wheel and tire valve.
- 9) Repair or change flat tire.

CAUTION

- Use enclosed valve core.
- Replace valve core with a new one, or air leak may occur due to sealant attached to valve core.

Specifications

Wheels and Tires Specifications

S6RS0B2407002

Tire size (Standard)

165/70R14 81T or 185/60R15 84H (other than M16A engine model)

195/50R16 87V or 195/45R17 81W (for M16A engine model)

Wheel size (Standard)

14 x 5 J (for 165/70R14), 15 x 5 1/2 J (for 185/60R15) or 15 x 5 1/2 JJ (for 185/60R15) (other than M16A engine model)

16x 6 J (for 195/50R16), 17 x 6 1/2 J (for 195/45R17) (for M16A engine model)

Tightening torque

Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

NOTE

- Tire inflation pressure should be checked when tires are cool.
- Specified tire inflation pressure should be found on tire placard or in owner's manual which came with the vehicle.

Tightening Torque Specifications

S6RS0B2407003

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Wheel bolt	85	8.5	61.5	 / 

Reference:

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

Section 3

Driveline / Axle

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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Precautions

Precautions

Precautions for Driveline / Axle

S6RS0B3000001

Fastener Caution

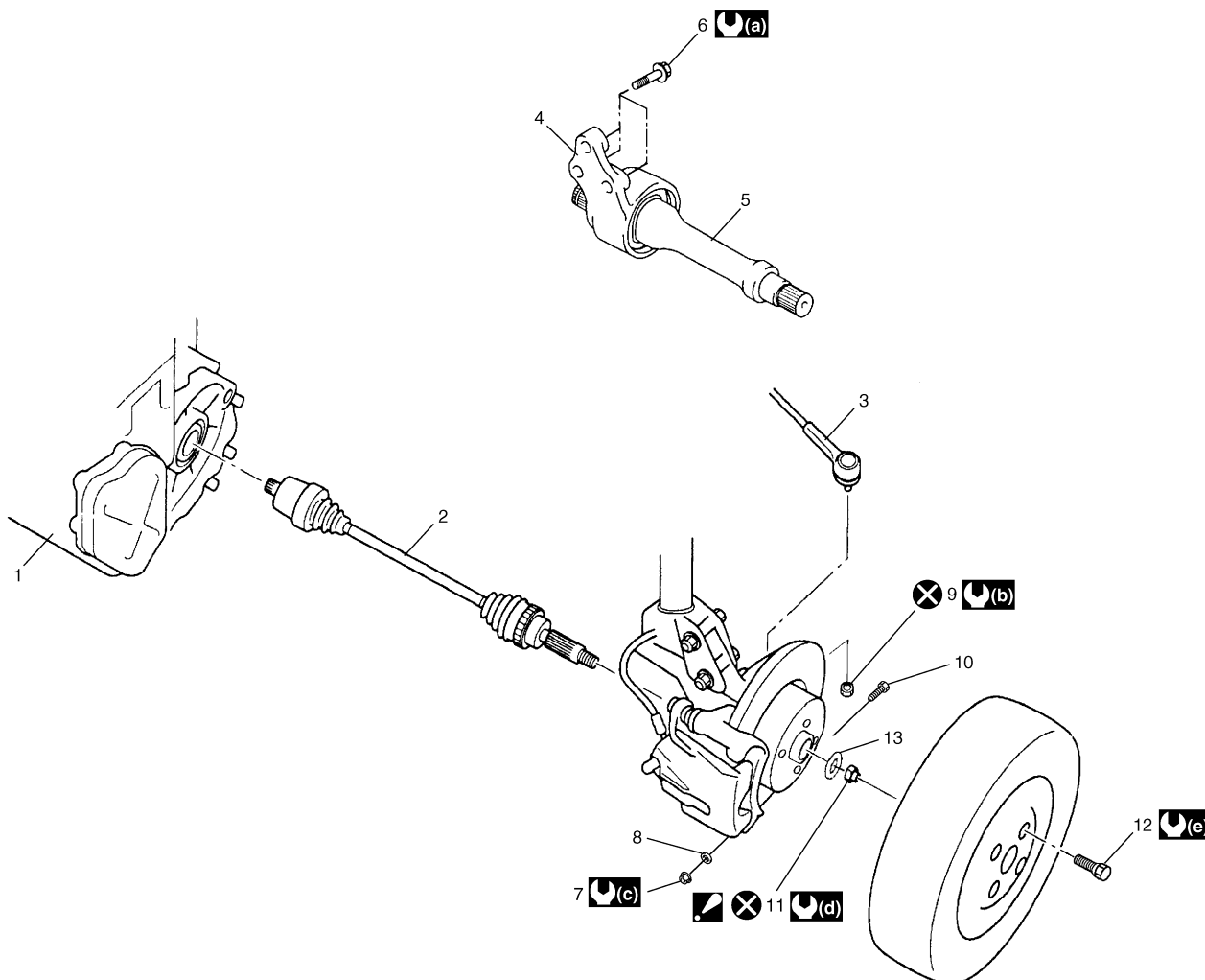
Refer to “Fastener Caution in Section 00 in related manual”.

Drive Shaft / Axle

Component Location

Front Drive Shaft Assembly Components Location

S6RS0B3103001



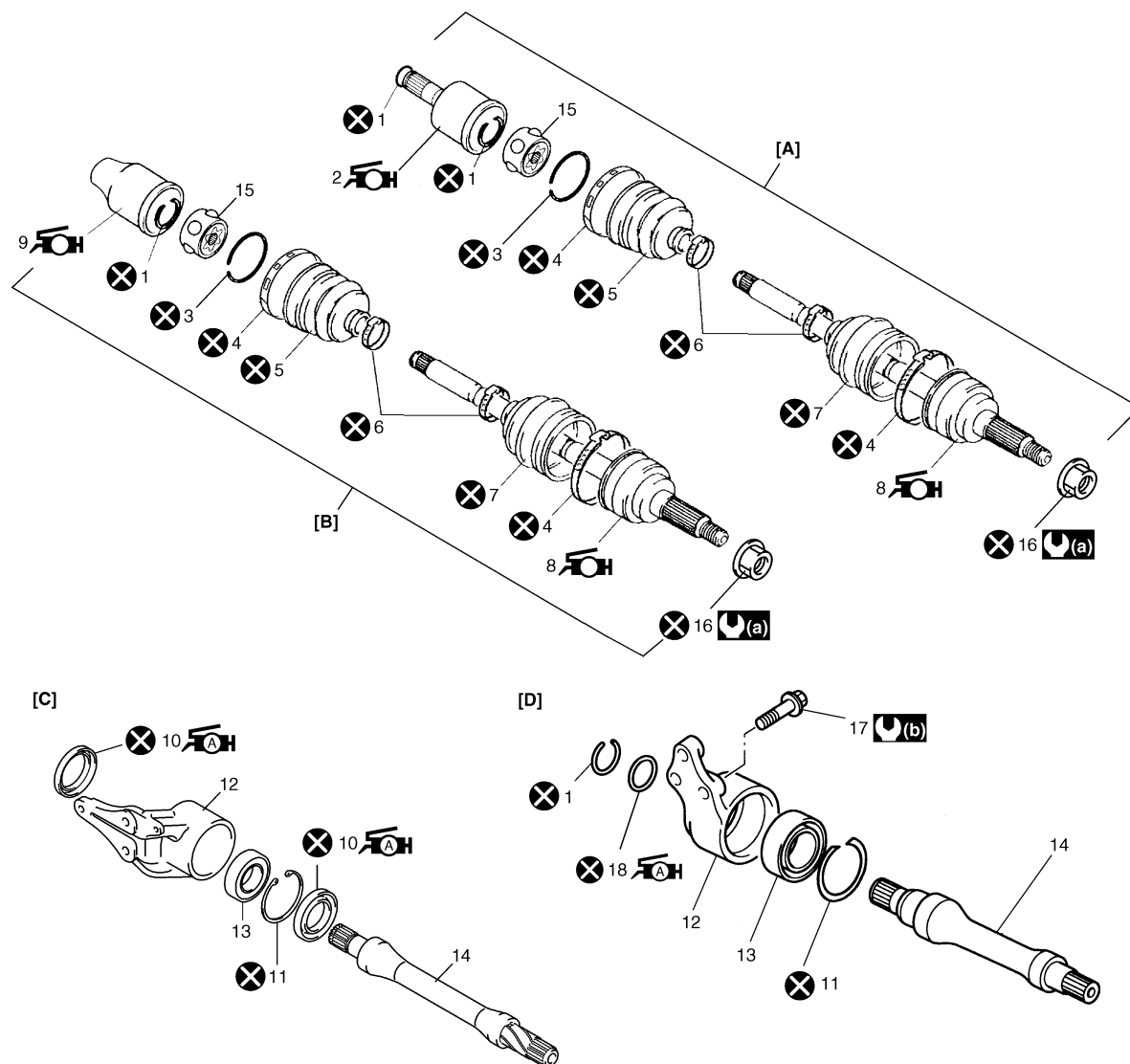
I6RS0B310001-02

1. Transaxle	8. Ball stud washer	: 45 N·m (4.5 kgf-m, 32.5 lb-ft)
2. Drive shaft assembly	9. Tie-rod end nut	: 60 N·m (6.0 kgf-m, 43.5 lb-ft)
3. Tie-rod end	10. Ball stud bolt	: 200 N·m (20.0 kgf-m, 145.0 lb-ft) (for M16A engine model) 175 N·m (17.5 kgf-m, 126.5 lb-ft) (for except M16A engine model)
4. Center bearing support	11. Drive shaft nut : After tightening nut, caulk nut securely.	: 85 N·m (8.5 kgf-m, 61.5 lb-ft)
5. Center shaft	12. Wheel bolt	: Do not reuse.
6. Center bearing support bolts	13. Drive shaft washer	
7. Ball stud nut	: 55 N·m (5.5 kgf-m, 40.0 lb-ft) (for petrol engine model) 25 N·m (2.5 kgf-m, 18.0 lb-ft) (for diesel engine model)	

Repair Instructions

Front Drive Shaft Components (M16A Engine and Z13DT Engine Models)

S6RS0B3106006



I6RS0B310011-01

[A]: Left side drive shaft assembly	10. Oil seal : Apply grease 99000-25011 to oil seal lip.
[B]: Right side drive shaft assembly	11. Center bearing support circlip
[C]: Z13DT engine model	12. Center bearing support
[D]: M16A engine model	13. Center bearing
1. Circlip	14. Center shaft
2. Differential side joint (Constant velocity DOJ) : Apply dark gray grease included in spare part to joint.	15. Cage
3. Snap ring	16. Drive shaft nut
4. Boot band (Large)	17. O-ring : Apply grease 99000-25011 to all round of O-ring.
5. Boot (Differential or center shaft side)	18. Center bearing support bolt
6. Boot band (Small)	200 N·m (20.0 kgf-m, 145.0 lb-ft) (M16A engine model) 175 N·m (17.5 kgf-m, 126.5 lb-ft) (Z13DT engine model)
7. Boot (Wheel side)	55 N·m (5.5 kgf-m, 40.0 lb-ft)
8. Wheel side joint (Constant velocity ball joint) : Apply black grease included in spare part to joint.	Do not reuse.
9. Center shaft side joint (Constant velocity DOJ) : Apply dark gray grease included in spare part to joint.	

Front Drive Shaft Disassembly and Assembly

S6RS0B3106004

Disassembly

For tripod joint type

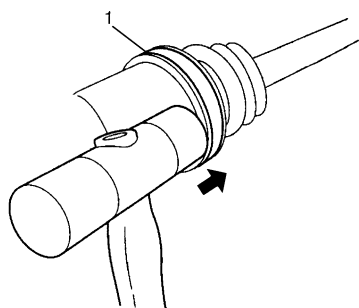
⚠ CAUTION

- Disassembly of wheel side joint is not allowed. If any noise or damage exists in it, replace it as assembly.
- Do not disassemble tripod joint spider. If any malfunction is found in it, replace it as differential side joint assembly.

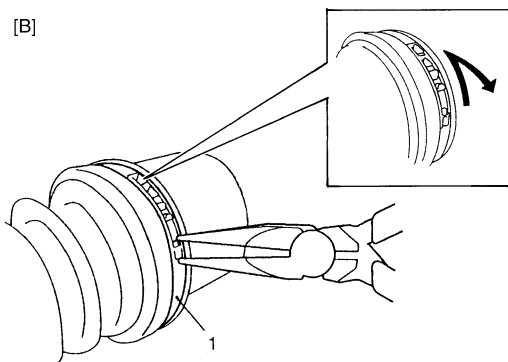
1) Remove differential side (or center shaft side) boot big band (1) as follows.

- For boot big band without joint:
Remove boot big band by tapping boot and band with plastic hammer. If it is hard to remove boot big band, cut it using a nipper or an iron saw with care not to damage joint housing.
- For boot big band with joint:
Draw hooks of boot big band together and remove band.

[A]



[B]

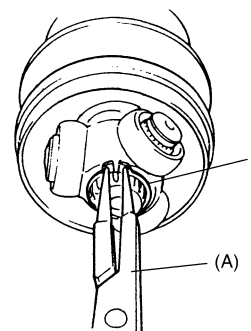


I4RH0A310004-01

[A]: For boot big band without joint

[B]: For boot big band with joint

2) Wipe off grease from shaft and take off snap ring (1) using special tool.

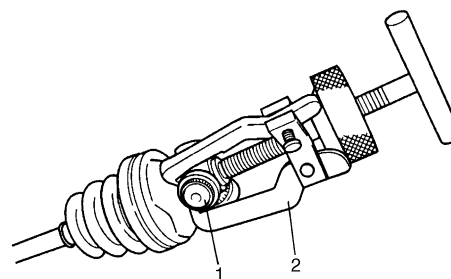
Special tool**(A): 09900-06107**

I3RH0A311009-01

3) Remove tripod joint spider (1) using 3 arms puller (2).

⚠ CAUTION

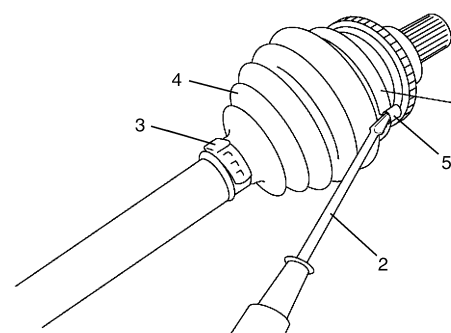
To prevent any problem caused by washing solution, do not wash tripod joint except its housing. Degreasing of tripod joint with cloth is allowed.



I3RH0A311004-01

4) Remove boot band as follows.

- Remove differential side (or center shaft side) boot small band, and then pull out differential side (or center shaft side) boot from shaft.
- Remove damper band, and then pull out damper through shaft, if equipped.
- Undo caulking (5) of wheel side boot big band (1) and small band (3) using flat end rod (2) or the like, then pull out wheel side boot (4) from shaft.



I4RS0A310006-01

For DOJ type

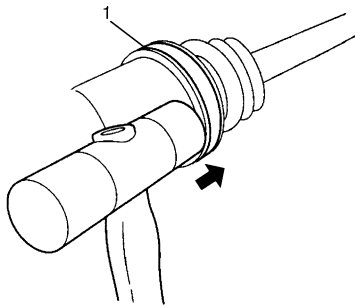
⚠ CAUTION

Disassembly of wheel side joint is not allowed. If any noise or damage exists in it, replace it as assembly.

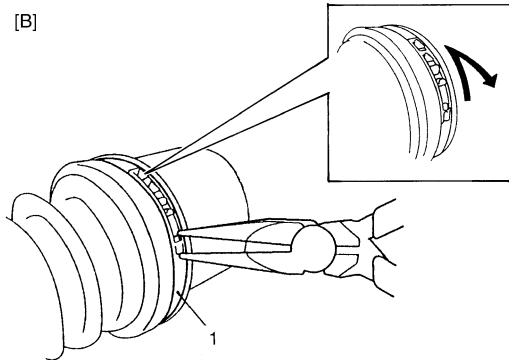
1) Remove differential side (or center shaft side) boot big band (1) as follows.

- For boot big band without joint:
Remove boot big band by tapping boot and band with plastic hammer. If it is hard to remove boot big band, cut it using a nipper or an iron saw with care not to damage joint housing.
- For boot big band with joint:
Draw hooks of boot big band together and remove band.

[A]



[B]

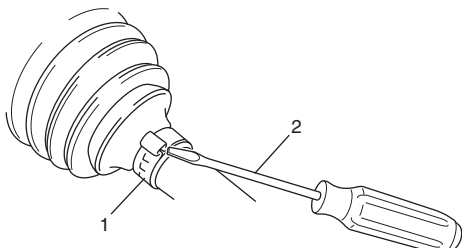


I4RH0A310004-01

[A]: For boot big band without joint

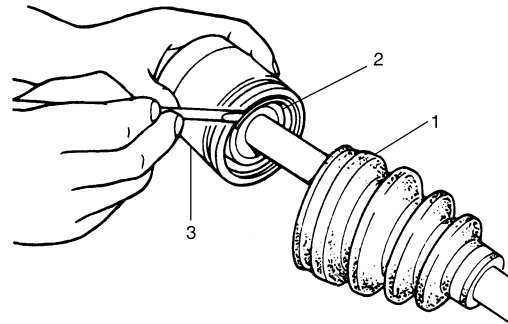
[B]: For boot big band with joint

2) Remove differential side (or center shaft side) boot small band (1) using flat end rod (2) or the like.



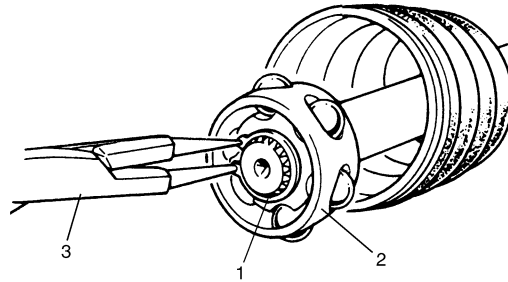
I5RS0B310005-01

3) Side boot (1) toward the center of shaft and remove snap ring (2) from outer race, and then take shaft out of outer race (3).



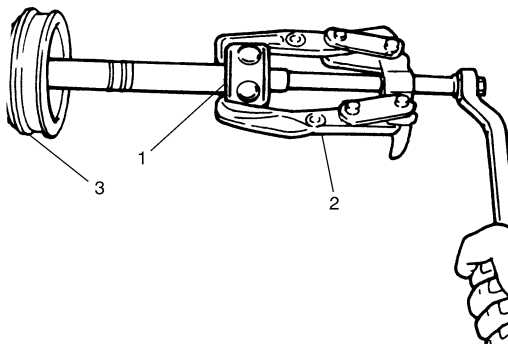
I2RH01310012-01

4) Wipe off grease and remove circlip (1) used to fix cage (2) by using snap ring plier (3).



I5RS0B310006-01

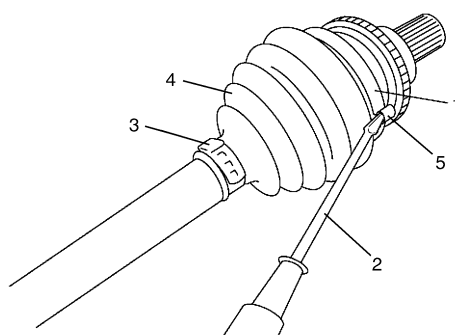
5) Draw away cage (1) by using bearing puller (2), and remove boot (3) from shaft.



I2RH01310014-01

6) Pull out differential side (or center shaft side) boot from shaft.

7) Undo caulking (5) of wheel side boot big band (1) and small band (3) using flat end rod (2) or the like, then pull out wheel side boot (4) from shaft.



I4RS0A310006-01

Assembly

For tripod joint type

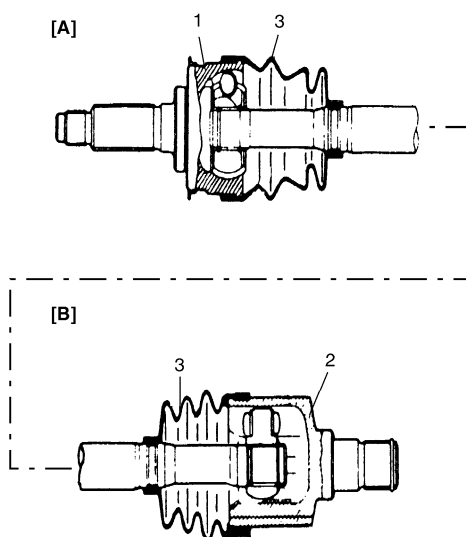
Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly.

Make sure that wheel side joint assembly (1) and tripod joint housing (2) are washed thoroughly and air dried.

Replace boot(s) (3) with new one(s).

⚠ CAUTION

- Do not wash boots in degreaser such as gasoline or kerosene. etc. Washing in degreaser causes deterioration of boot.
- To ensure full performance of joint as designed, be sure to distinguish between two types of grease in repair set and apply specified volume to respective joint referring to the followings for identification of the grease.



I4RS0A310007-01

[A]: Wheel side

[B]: Differential side (or center shaft side)

- 1) Wash disassembled parts (except boots). After washing, dry parts completely by blowing air.
- 2) Clean boots with cloth.
- 3) Apply grease to wheel side joint. Use specified grease in tube in wheel side boot set as a spare parts.

Grease color

: Black

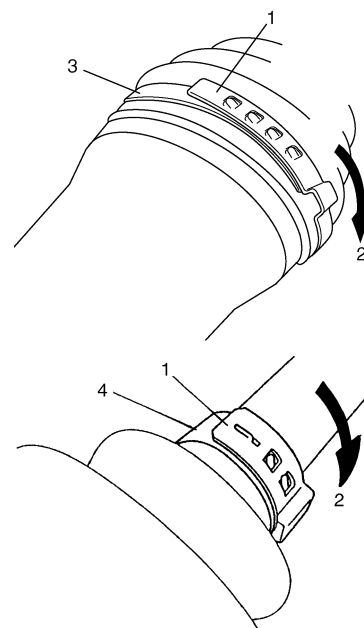
Amount

: 55 – 75 g (1.9 – 2.6 oz)

4) Install wheel side boot on shaft.

5) Fill up boot inside with specified grease.

6) Place new wheel side boot big band (3) and small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



I4RS0A310009-01

7) Fasten boot bands (1) securely using special tool.

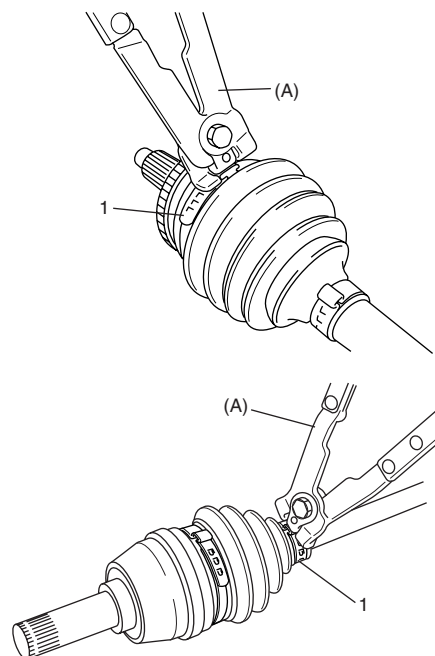
⚠ CAUTION

Do not squeeze or distort boot when fastening it with bands.

Distorted boot caused by squeezing air may reduce its durability.

Special tool

(A): 09943-57010



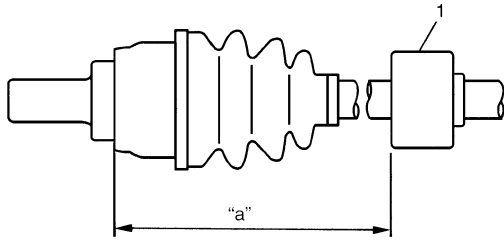
I4RS0A310010-01

3A-6 Drive Shaft / Axle:

- 8) Install damper (1) on drive shaft according to dimension specified below, if equipped.

Drive shaft damper installing position

"a": 154 – 160 mm (6.1 – 6.3 in.)



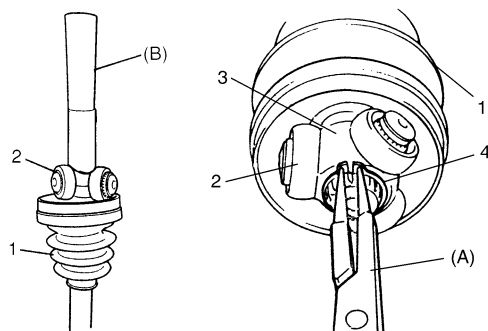
I4RS0B310002-01

- 9) Set new differential side (or center shaft side) small band and new differential side (or center shaft side) boot (1) on shaft temporarily, and then apply grease to tripod joint (2). Use specified grease in tube included in spare parts.
- 10) Install tripod joint spider (3) on shaft using special tool with hammer, directing its chamfered spline toward wheel side, and then fasten it with new snap ring (4).

Special tool

(A): 09900-06107

(B): 09925-98220



I3RH0A311006-01

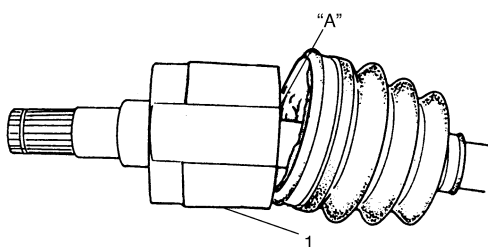
- 11) Apply grease (including in spare parts) to inside of tripod joint housing (1), joint it with tripod joint.

Grease color

"A": Dark gray

Amount

"A": 70 – 90 g (2.5 – 3.2 oz)



I4RS0B310003-01

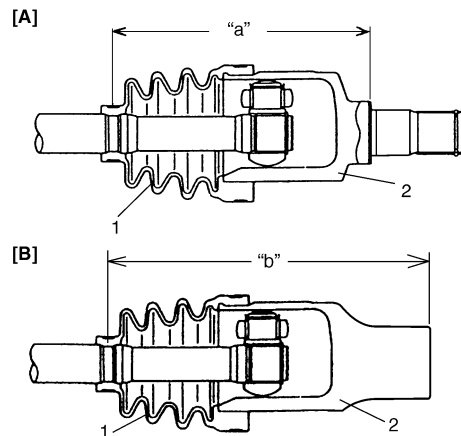
- 12) Fit boot (1) to grooves of shaft and housing (2) adjust length to specification below.
- 13) Insert screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

Drive shaft boot fixing position (distance between housing end and small boot band)

Left side and right side drive shafts (M/T vehicle with M13 engine) "a": 142.0 mm (5.59 in.)

Left side drive shaft (other than M/T vehicle with M13 engine) "a": 152.0 mm (5.98 in.)

Right side drive shaft (other than M/T vehicle with M13 engine) "b": 176.0 mm (6.93 in.)



I4RS0B310004-01

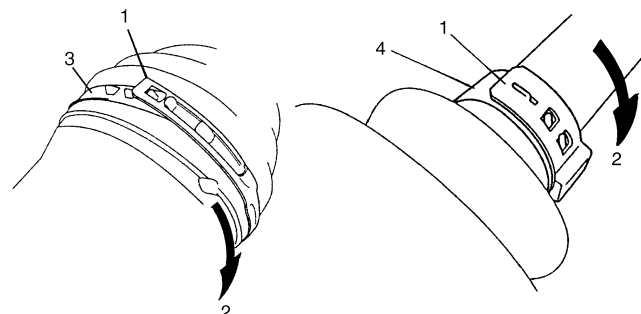
[A]: Drive shaft inserted into differential side

[B]: Drive shaft inserted into center shaft side

CAUTION

- Bend each boot band against forward rotation.
- Do not squeeze or distort boot when fastening it with bands. Distorted boot caused by squeezing air may reduce its durability.

- 14) Place differential side (or center shaft side) boot new big band (3) and new small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



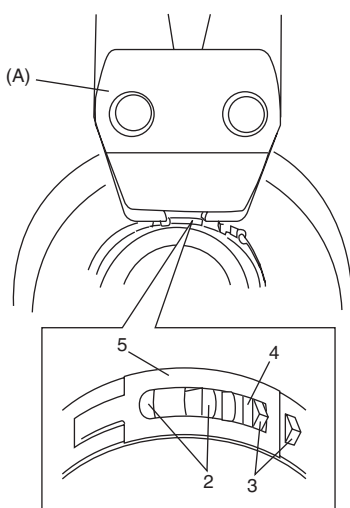
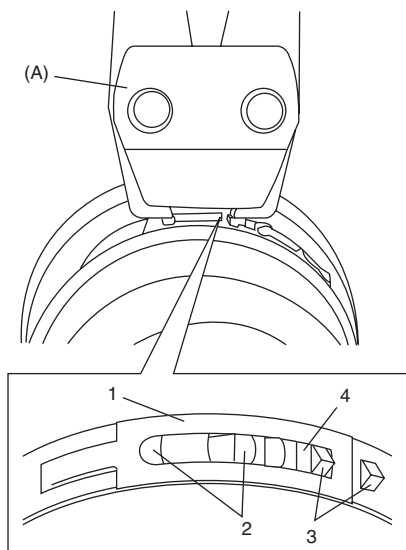
I5JB0A311006-01

15) Fasten differential side (or center shaft side) boot band.

- For differential side (or center shaft side) boot big band (1) and small band (5). Fasten band by drawing hooks (2) with special tool and engage hooks (3) in slot and window (4).

Special tool

(A): 09943-57021



I6RS0B310005-02

For DOJ type

Judging from abnormality noted before disassembly and what is found through visual check of components parts after disassembly, prepare replacing parts and proceed to reassembly.

Make sure that wheel side joint assembly and DOJ housing are washed thoroughly and air dried.

Replace boot(s) with new one(s).

⚠ CAUTION

- Do not wash boots in degreaser such as gasoline or kerosene. etc. Washing in degreaser causes deterioration of boot.
- To ensure full performance of joint as designed, be sure to distinguish between two types of grease in repair set and apply specified volume to respective joint referring to the followings for identification of the grease.

- Wash disassembled parts (except boots). After washing, dry parts completely by blowing air.
- Clean boots with cloth.
- Apply grease to wheel side joint. Use specified grease in tube in wheel side boot set as a spare parts.

Grease color

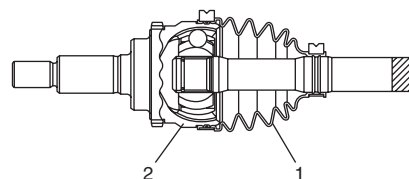
: Black

Amount

: 55 – 75 g (1.9 – 2.6 oz) (Z13DT engine model)

: 60 – 80 g (2.1 – 2.8 oz) (M16A engine model)

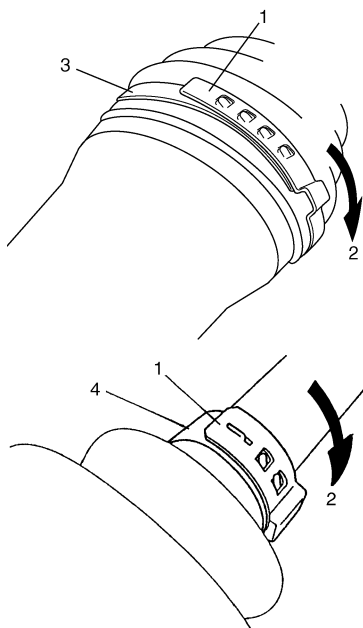
- Install wheel side boot on shaft.
- Fill up boot inside with specified grease.
- Fit boot (1) to grooves of shaft and housing (2).
- Insert screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.



I5RS0B310007-01

3A-8 Drive Shaft / Axle:

- 8) Place new wheel side boot big band (3) and small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



I4RS0A310009-01

- 9) Fasten boot bands (1) using special tool as shown in figure.

Distance "a"

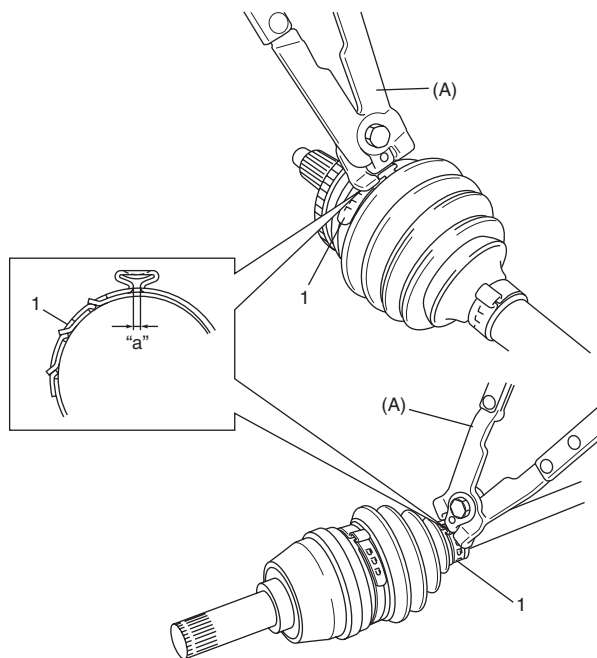
: $2.6 \pm 1.4 \text{ mm}$ ($0.102 \pm 0.055 \text{ in.}$)

⚠ CAUTION

Do not squeeze or distort boot when fastening it with bands.
Distorted boot caused by squeezing air may reduce its durability.

Special tool

(A): 09943-57010



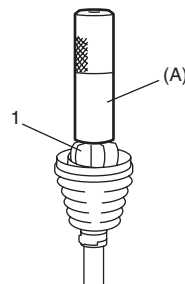
I5RS0B310008-01

- 10) Set new differential side (or center shaft side) small band and new differential side (or center shaft side) boot on shaft temporarily.

- 11) Drive in the cage (1) by using special tool.

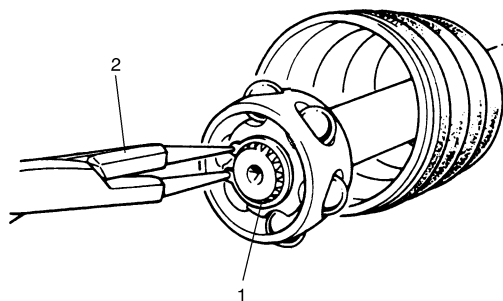
Special tool

(A): 09913-84510



I5RS0B310009-01

- 12) Install circlip (1) by using snap ring plier (2).

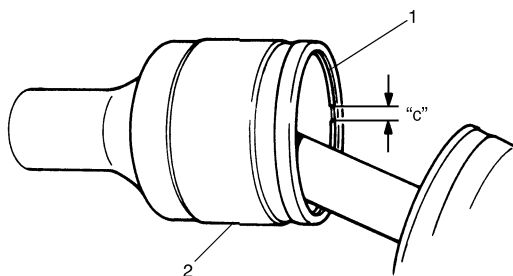


I5RS0B310010-01

- 13) Apply grease to entire surface of cage. Use specified grease in tube included in spare parts.
- 14) Insert cage into joint housing (2) and fit snap ring (1) into groove of joint housing (2).

⚠ CAUTION

Position opening of snap ring "c" so that it will not be lined up with a ball.



I2RH01310036-01

- 15) Apply grease (including in spare parts) to inside of joint housing (1).

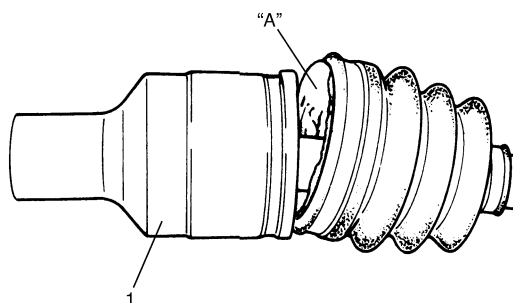
Grease color

"A": Dark gray

Amount

"A": 85 – 105 g (3.0 – 3.7 oz) (Z13DT engine model)

"A": 70 – 90 g (2.5 – 3.2 oz) (M16A engine model)



I5RS0B310011-02

- 16) Fit boot (1) to grooves of shaft and housing (2) adjust length to specification below.
- 17) Inset screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

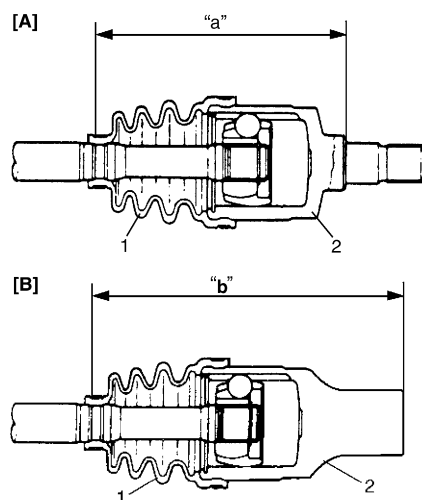
Drive shaft boot fixing position (distance between boot end (housing side) and small boot band center)

Left side drive shaft (Z13DT engine) "a": 164.5 mm (6.48 in.)

Left side drive shaft (M16A engine) "a": 170.0 mm (6.69 in.)

Right side drive shaft (Z13DT engine) "b": 197.3 mm (7.77 in.)

Right side drive shaft (M16A engine) "b": 189.0 mm (7.44 in.)



I6RS0B310010-01

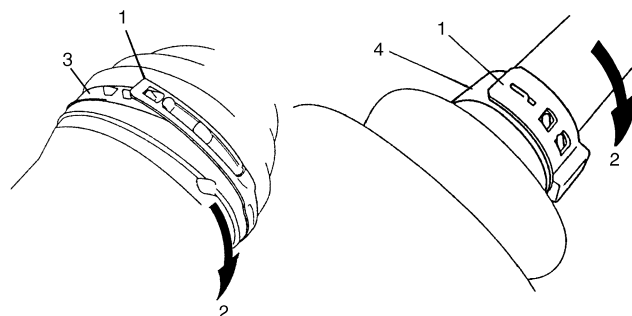
[A]: Drive shaft inserted into differential side

[B]: Drive shaft inserted into center shaft side

⚠ CAUTION

- **Band each boot band against forward rotation.**
- **Do not squeeze or distort boot when fastening it with bands. Distorted boot caused by squeezing air may reduce its durability.**

- 18) Place differential side boot (or center shaft side) new big band (3) and new small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



I5JB0A311006-01

3A-10 Drive Shaft / Axle:

19) Fasten differential side (or center shaft side) boot band.

- For differential side (or center shaft side) boot big band
Fasten band (1) by drawing hooks (2) with special tool and engage hooks (3) in slot and window (4).

Special tool

(A): 09943-57021

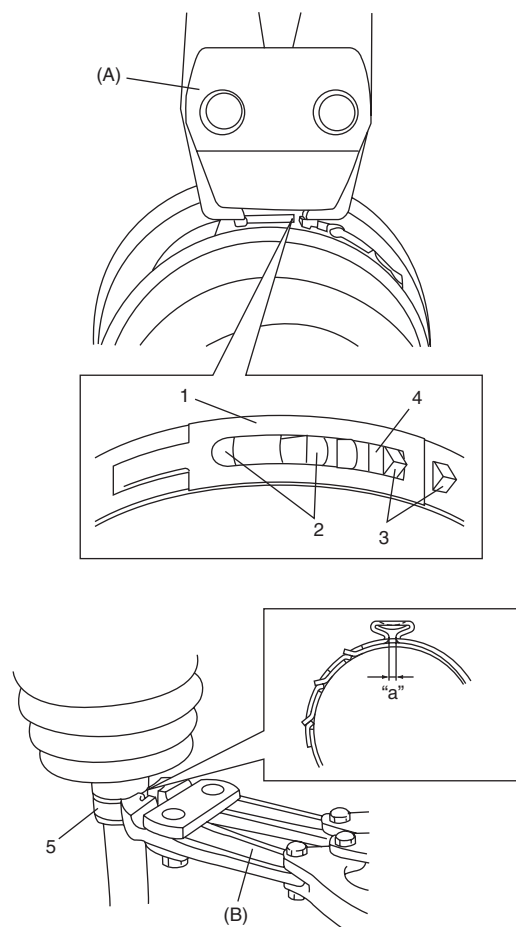
- For differential side (or center shaft side) boot small band
Fasten band (5) using special tool as shown in figure.

Distance "a"

: $2.6 \pm 1.4 \text{ mm}$ ($0.102 \pm 0.055 \text{ in.}$)

Special tool

(B): 09943-57010



I5RS0B310013-01

Center Shaft and Center Bearing Support Disassembly and Assembly

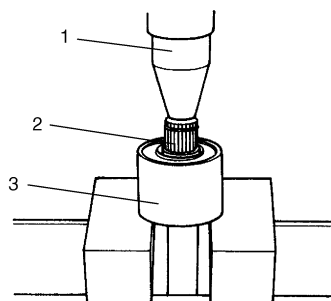
S6RS0B3106005

Automated Manual Transaxle vehicle with M13 engine and M/T vehicle with M15 engine and Z13DT engine

Disassembly

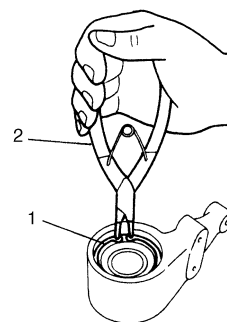
- Using hydraulic press (1), draw out center shaft (2) from center bearing.

2) Remove oil seals from center bearing support (3).



I3RM0A310012-01

3) Remove bearing support circlip (1) using snap ring pliers (2).



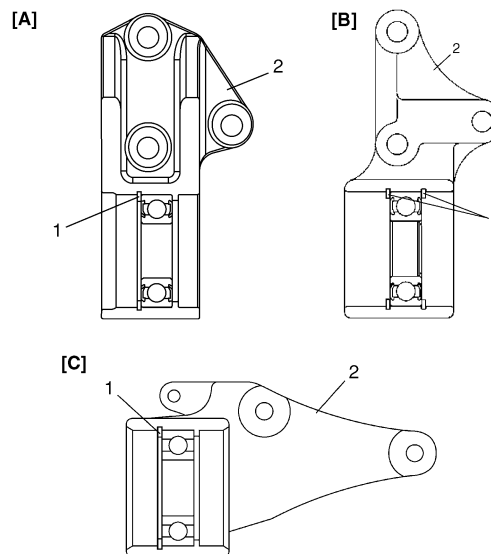
I6RS0B310006-03

4) Remove center bearing from center bearing support.

Assembly

Install center shaft by reversing removal procedure and noting the following points.

- When installing bearing support circlip (1), make sure that it fits in circlip groove in center bearing support (2) securely as shown.



I6RS0B310008-01

[A]: Automated Manual Transaxle vehicle with M13 engine
[B]: M/T vehicle with M15 engine
[C]: Z13DT engine

- When installing left oil seal (1) and right oil seal (2) using special tool, use care so that oil seals in proper direction and position as shown in figure.

Special tool
: 09925-15410

Distance

Automated Manual Transaxle vehicle with M13 engine

"a": 7 – 8 mm (0.28 – 0.31 in.)

"b": 0 – 1 mm (0 – 0.04 in.)

M/T vehicle with M15 engine

"a": 8 – 9 mm (0.13 – 0.35 in.)

"b": 2 – 3 mm (0.08 – 0.11 in.)

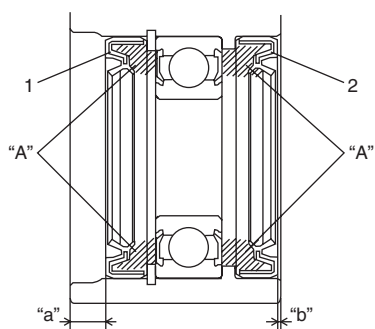
Z13DT engine

"a": 3.5 – 4.5 mm (0.14 – 0.17 in.)

"b": 3.5 – 4.5 mm (0.14 – 0.17 in.)

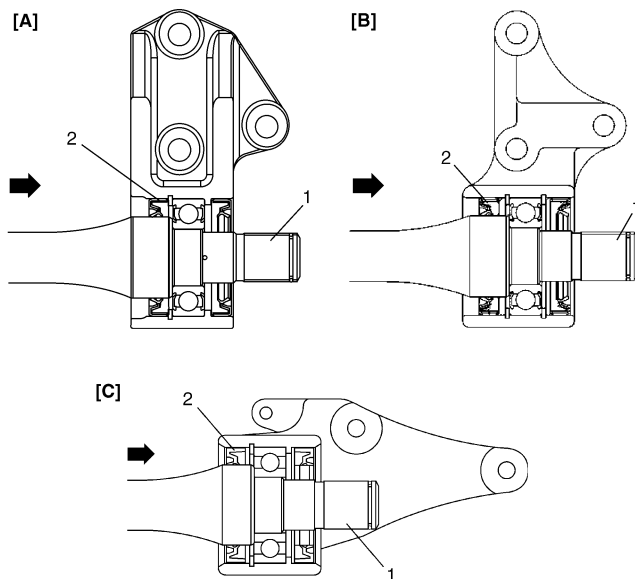
- Be sure to apply grease to oil seal lip and bearing side space indicated in the figure.

"A": Grease 99000-25011 (SUZUKI Super Grease A)



I4RS0A310014-01

- Press-fit center shaft (1) from left oil seal (2) side.



I6RS0B310009-02

[A]: Automated Manual Transaxle vehicle with M13 engine

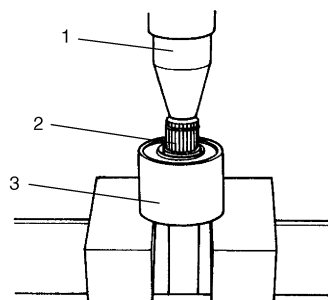
[B]: M/T vehicle with M15 engine

[C]: Z13DT engine

A/T vehicle with M15 engine

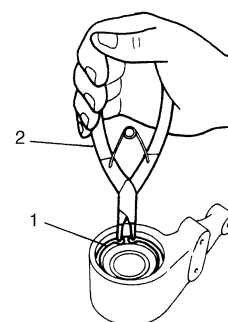
Disassembly

- 1) Remove wheel side oil seal and circlip from center bearing support (3).
- 2) By using hydraulic press (1), draw out center shaft (2) from center bearing.
- 3) Remove oil seal from center bearing support (3).



I3RM0A310012-01

- 4) Remove bearing support circlip (1) using snap ring pliers (2).

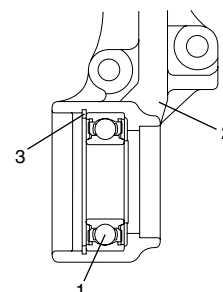


I6RS0B310006-03

- 5) Remove center bearing from center bearing support.

Assembly

- 1) Install center bearing (1) to center bearing support (2), and then install circlip (3) into groove of bearing support as shown in figure.



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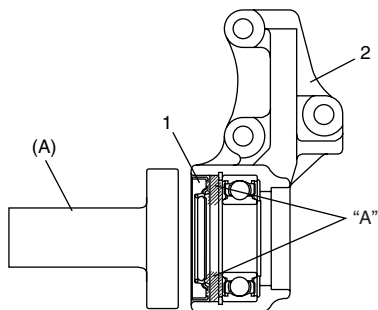
3A-12 Drive Shaft / Axle:

- 2) Install left oil seal (1) to center bearing support (2) until it become flush with bearing support using special tool, and then apply grease to oil seal lip.

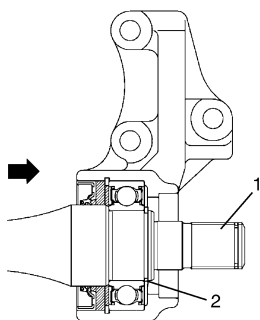
"A": Grease 99000-25011 (SUZUKI Super Grease A)

Special tool

(A): 09913-75510



- 3) Press-fit center shaft (1) from left oil seal side, and then install circlip (2) into groove of center shaft as shown in figure.

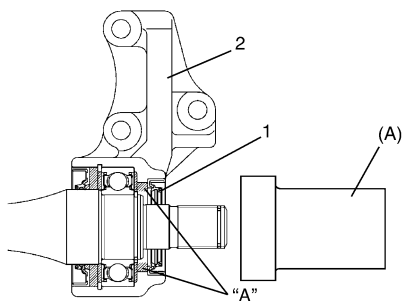


- 4) Install right oil seal (1) to center bearing support (2) until it become flush with bearing support using special tool, and then apply grease to oil seal lip.

"A": Grease 99000-25011 (SUZUKI Super Grease A)

Special tool

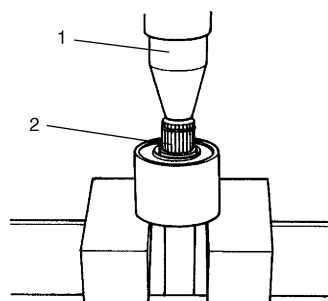
(A): 09913-85210



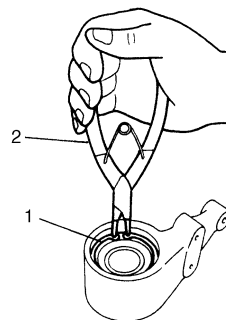
M16A engine

Disassembly

- 1) Using hydraulic press (1), draw out center shaft (2) from center bearing.



- 2) Remove bearing support circlip (1) using snap ring pliers (2).

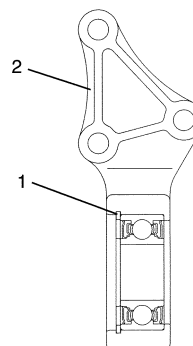


- 3) Remove center bearing from center bearing support.

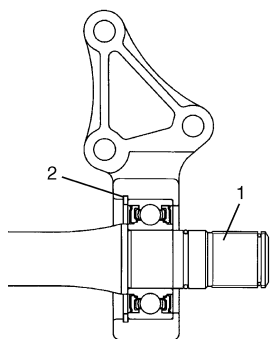
Assembly

Install center shaft by reversing removal procedure and noting the following points.

- When installing bearing support circlip (1), make sure that it fits in circlip groove in center bearing support (2) securely as shown.



- Press-fit center shaft (1) from bearing support circlip (2) side.



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Front Drive Shaft Inspection

S6RS0B3106007

- Check shaft and joint for damage, wear or bend. Replace them as necessary.
- Check retaining ring and snap ring for breakage or deformation. Replace as necessary.
- Check boots for breakage or deterioration.

Specifications

Tightening Torque Specifications

S6RS0B3107001

NOTE

The specified tightening torque is also described in the following.

“Front Drive Shaft Assembly Components Location: ”

“Front Drive Shaft Components (M16A Engine and Z13DT Engine Models): ”

Reference:

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

Special Tools and Equipment

Recommended Service Material

S6RS0B3108001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000-25011	🔧 / 🔧 / 🔧

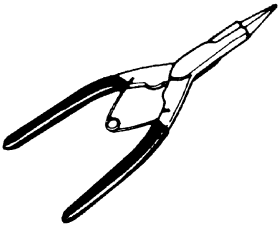
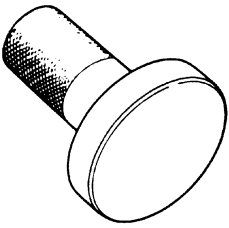
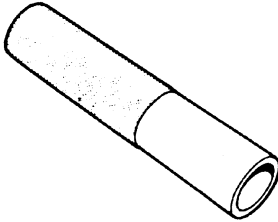
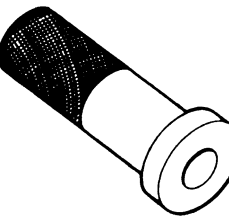
NOTE

Required service material is also described in the following.

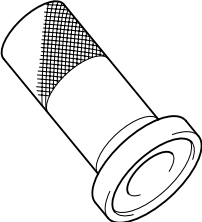
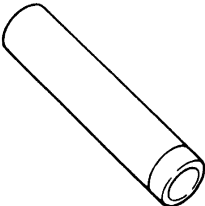
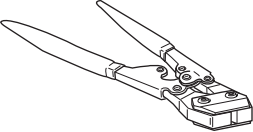
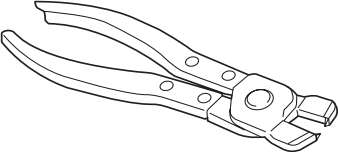
“Front Drive Shaft Components (M16A Engine and Z13DT Engine Models): ”

Special Tool

S6RS0B3108002

09900-06107 Snap ring pliers (opening type) 	09913-75510 Bearing installer 
09913-84510 Bearing installer 	09913-85210 Bearing installer 

3A-14 Drive Shaft / Axle:

09925-15410 Oil seal installer 	09925-98220 Bearing installer 
09943-57010 Band compressor 	09943-57021 Pliers, Low-Profile Clamp 

Section 4

Brakes

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NOTE

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

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Precautions

Precautions

Precautions for Brakes

S6RS0B4000001

Suspension Caution

Refer to "Suspension Caution in Section 00 in related manual".

Wheels and Tires Caution

Refer to "Wheels and Tires Caution in Section 00 in related manual".

Brake Caution

Refer to "Brake Caution in Section 00".

General Precautions

Refer to "General Precautions in Section 00 in related manual".

Vehicle Lifting Points

Refer to "Vehicle Lifting Points in Section 0A in related manual".

Fastener Caution

Refer to "Fastener Caution in Section 00 in related manual".

Fastener Information

Refer to "Fasteners Information in Section 0A in related manual".

Brake Control System and Diagnosis

Precautions

Precautions on Brake

S6RS0B4100001

Air Bag Warning

Refer to "Air Bag System Service Warning in Section 00 in related manual".

Brakes Diagnosis Note

Refer to "Brakes Diagnosis Note in related manual".

General Description

Brakes Construction

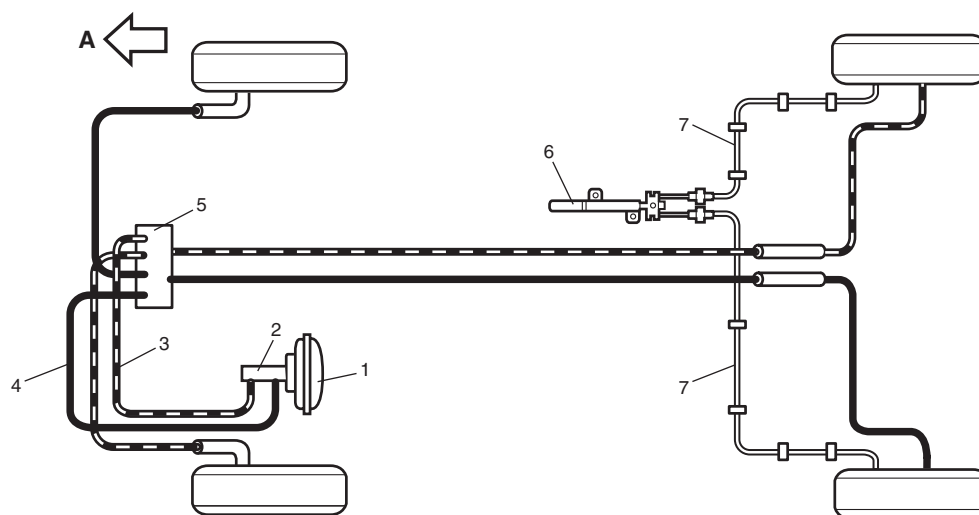
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When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (other than M16A engine model, two in front and four in rear. And for M16A engine model, two in front and two in rear). The master cylinder is a tandem master cylinder. Brake pipes are connected to the master cylinder and they make two independent circuits. One connects front right & rear left brakes and the other connects front left & rear right brakes. In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading / trailing shoes) for the rear brake (for M16A engine model, the disc brake type is used for the rear wheel brake.). The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes or pads are used for both parking and foot brakes.

NOTE

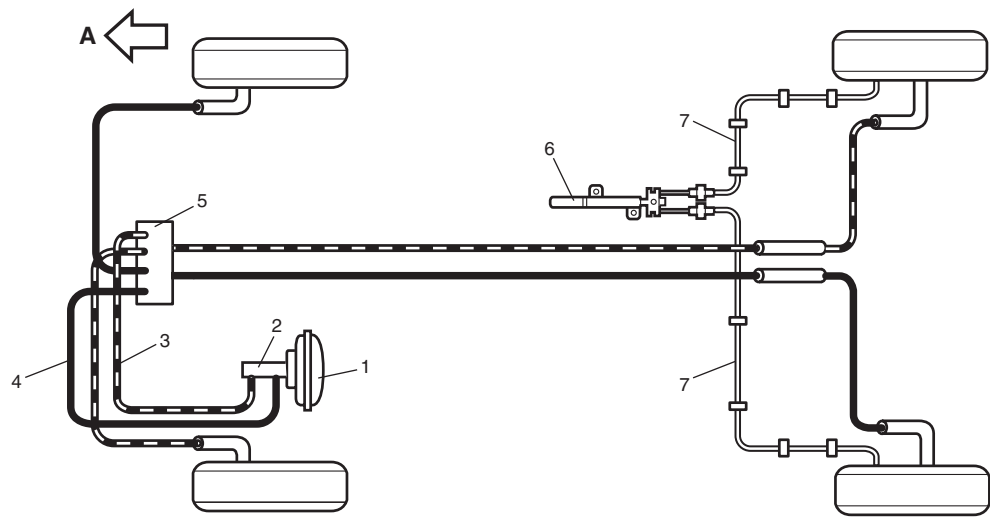
The figures shows LH steering vehicle.

[A]



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[B]

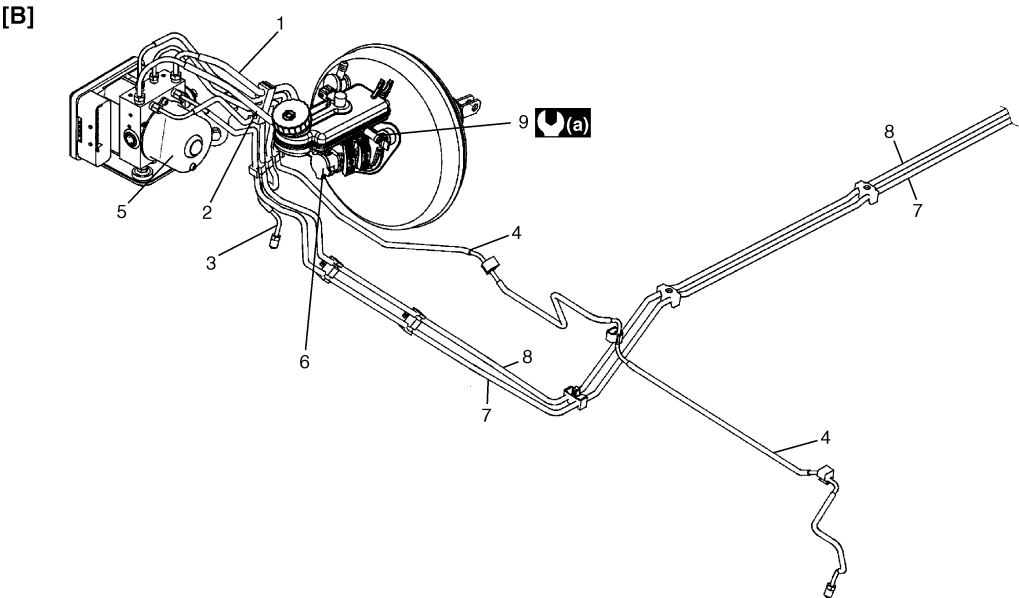
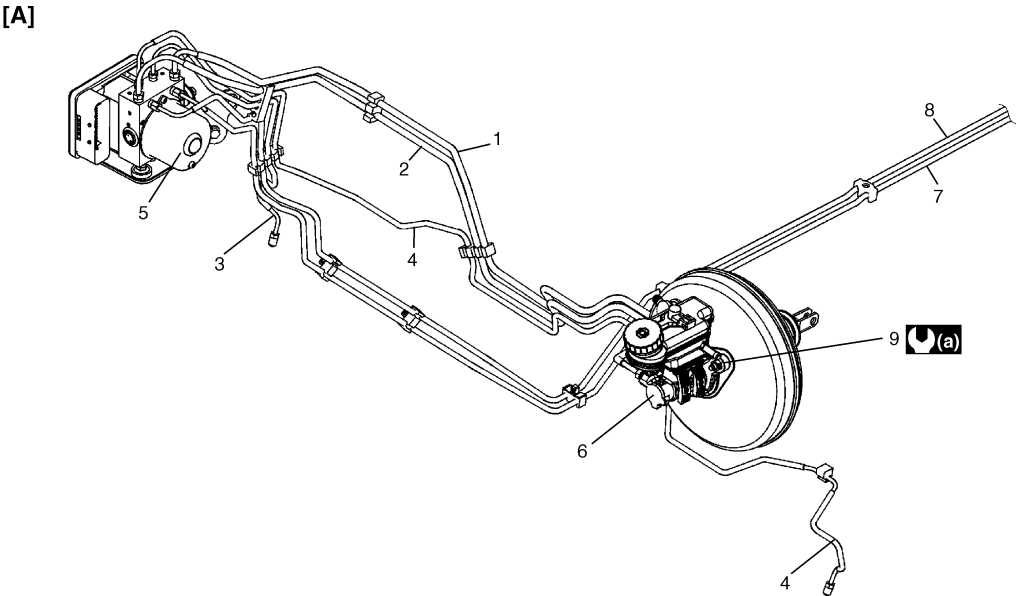


I6RS0B410002-01

[A]: Other than M16A engine model	3. Secondary side	7. Parking brake cable
[B]: For M16A engine model	4. Primary side	A: Forward
1. Brake booster	5. ABS or ESP® hydraulic unit / control module assembly	
2. Master cylinder	6. Parking brake lever	

Front Brake Hose / Pipe Construction (For M16A Engine Model)

S6RS0B4101004



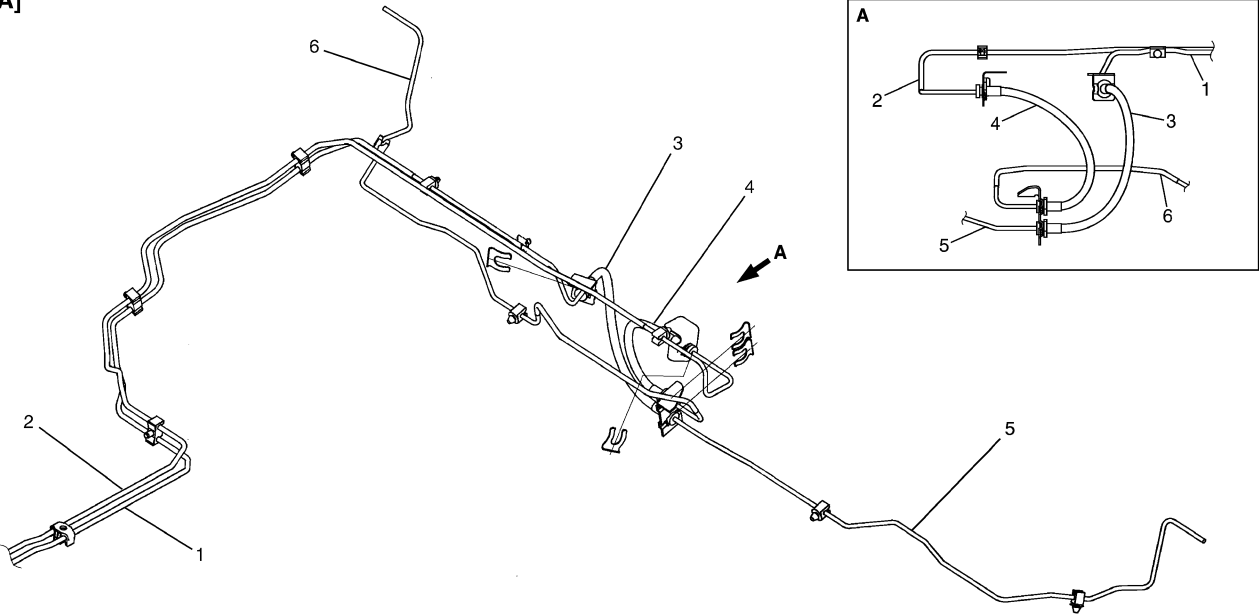
I6RS0B410003-02

[A]: For LH steering vehicle	3. From ESP® hydraulic unit to right front brake	7. From ESP® hydraulic unit to left rear brake
[B]: For RH steering vehicle	4. From ESP® hydraulic unit to left front brake	8. From ESP® hydraulic unit to right rear brake
1. From master cylinder primary to ESP® hydraulic unit	5. ESP® hydraulic unit	9. Master cylinder fixing nut
2. From master cylinder secondary to ESP® hydraulic unit	6. Master cylinder	 (a) : 20 N·m (2.0 kgf-m, 14.5 lb-ft)

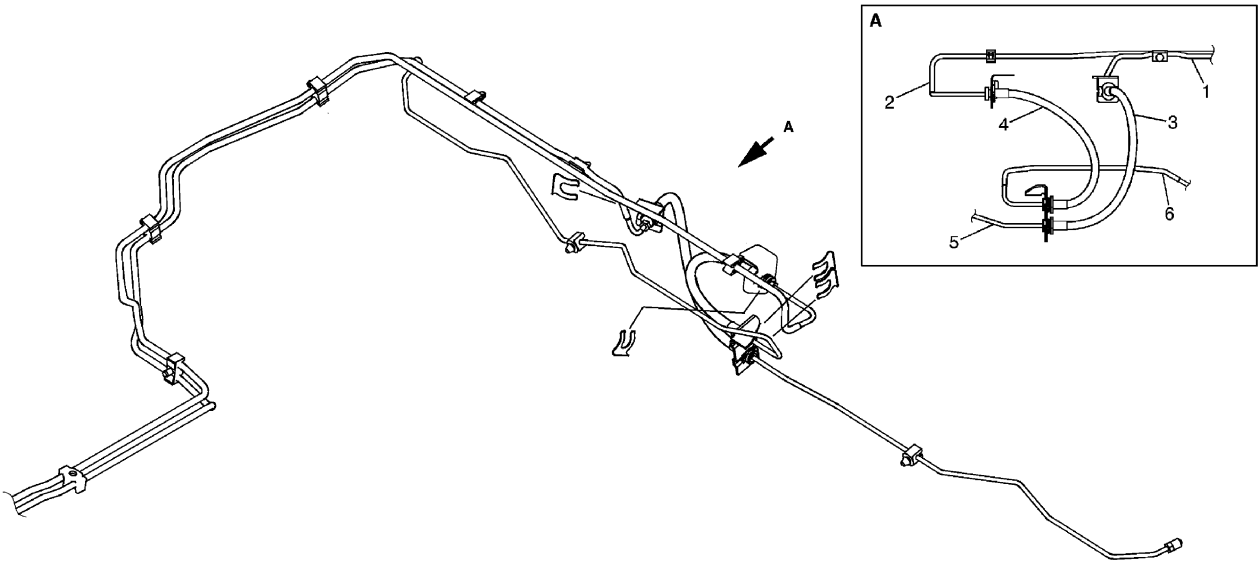
Rear Brake Hose / Pipe Construction

S6RS0B4101003

[A]



[B]



I6RS0B410004-01

[A]: Other than M16A engine model	1. To left rear brake hose	4. Right rear brake hose
[B]: For M16A engine model	2. To right rear brake hose	5. Left rear brake hose to left brake
A: View A	3. Left rear brake hose	6. Right rear brake hose to right brake

Diagnostic Information and Procedures

Brakes Symptom Diagnosis

S6RS0B4104002

Condition	Possible cause	Correction / Reference Item
Not enough braking force	Brake oil leakage from brake lines	<i>Locate leaking point and repair.</i>
	Brake disc or pads stained with oil	<i>Clean or replace.</i>
	Overheated brakes	<i>Determine cause and repair.</i>
	Poor contact of shoes on brake drum (other than M16A engine model)	<i>Repair for proper contact.</i>
	Brake shoes linings stained with oil or wet with water (other than M16A engine model)	<i>Replace.</i>
	Badly worn brake pad linings	<i>Replace.</i>
	Defective wheel cylinders (other than M16A engine model)	<i>Repair or replace.</i>
	Malfunctioning caliper assembly	<i>Repair or replace.</i>
	Air in system	<i>Bleed system.</i>
	Malfunctioning ABS (Antilock brake system) or ESP®	<i>Check system and replace as necessary.</i>
Brake pull (Brakes not working in unison)	Pad linings and/or shoe linings are wet with water or stained with oil in some brakes	<i>Replace.</i>
	Drum-to-shoe clearance out of adjustment in some brakes (Malfunctioning auto adjusting mechanism) (other than M16A engine model)	<i>Check for inoperative auto adjusting mechanism.</i>
	Disc and/or drum is out of round in some brakes	<i>Replace.</i>
	Tires are inflated unequally	<i>Inflate equally.</i>
	Malfunction in wheel cylinders (other than M16A engine model)	<i>Repair or replace.</i>
	Disturbed front wheel alignment	<i>Adjust as prescribed.</i>
	Unmatched tires on same axle	<i>Tires with approximately the same amount of tread should be used on the same axle.</i>
	Restricted brake pipes or hoses	<i>Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.</i>
	Malfunctioning caliper assembly	<i>Caliper should slide. Check for stuck or sluggish pistons and proper lubrication of caliper slide pin.</i>
	Loose suspension parts	<i>Check all suspension mountings.</i>
	Loose calipers	<i>Check and torque bolts to specifications.</i>
Noise (high pitched squeak without brake applied)	Lining worn out	<i>Replace linings.</i>
	Contact wear indicator to brake disc	<i>Replace pads.</i>
Excessive pedal travel (Pedal stroke too large)	Partial brake system failure	<i>Check brake systems and repair as necessary.</i>
	Insufficient fluid in master cylinder reservoirs	<i>Check warning light. Bleed system if required. Check for leaks and air in brake system. Fill reservoirs with approved brake fluid.</i>
	Air in system (soft / spongy pedal)	<i>Bleed system.</i>
	Rear brake system not adjusted (malfunctioning auto adjusting mechanism) (other than M16A engine model)	<i>Adjust rear brakes. Repair auto adjusting mechanism.</i>
	Bent brake shoes (other than M16A engine model)	<i>Replace brake shoes.</i>
	Worn rear brake shoes (other than M16A engine model)	<i>Replace brake shoes.</i>

Condition	Possible cause	Correction / Reference Item
Brake locked	Malfunctioning ABS or ESP®	Check system referring to "ABS Check in Section 4E in related manual" or "Electronic Stability Program Check in Section 4F".
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released)	Master cylinder pistons not returning correctly	Replace master cylinder.
	Restricted brake pipes or hoses	Check for soft hoses or damaged pipes and replace with new hoses and/or new brake piping.
	Incorrect parking brake adjustment on rear brakes	Check and adjust to correct specifications.
	Weakened or broken return springs in the brake (other than M16A engine model)	Replace.
	Sluggish parking brake cables or linkage	Repair or replace.
	Wheel cylinder or caliper piston sticking	Repair as necessary.
	Badly worn piston seal in caliper	Replace piston seal.
	Improper brake pedal free height	Check brake pedal free height.
Pedal pulsation (Pedal pulsates when depressed for braking)	Damaged or loose wheel bearings	Replace wheel bearings.
	Distorted steering knuckle or rear wheel spindle	Replace knuckle or rear wheel spindle.
	Excessive disc lateral runout	Check per instructions. If not within specifications, replace or machine disc.
	Parallelism between pad and disc not within specifications	Check per instructions. If not within specifications, replace or machine disc.
	Rear drums out of round (other than M16A engine model)	Repair or replace drum as necessary. Check runout.
Braking noise	Glazed shoe linings, or foreign matters stuck to linings	Repair or replace shoe linings.
	Worn or distorted linings	Replace lining (or pad).
	Loose front wheel bearings	Replace wheel bearings.
	Distorted backing plates or loose mounting bolts	Replace or retighten securing bolts.
	Contact wear indicator to brake disc	Replace pads.
Brake warning lamp lights after engine start	Parking brake applied	Release parking brake and check that brake warning lamp turns off.
	Insufficient amount of brake fluid	Add brake fluid.
	Brake fluid leaking from brake line	Investigate leaky point, correct it and add brake fluid.
	Brake warning lamp circuit faulty	Repair circuit.
	Malfunctioning EBD system	Check system referring to "EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady in Section 4E in related manual" or "EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady (with ESP® Model) in Section 4F".
Brake warning lamp turns on when brake is applied	Brake fluid leaking from brake line	Investigate leaky point, correct it and add brake fluid.
	Insufficient amount of brake fluid	Add brake fluid.
Brake warning lamp fails to turn on even when parking brake is applied	Brake warning lamp circuit faulty	Replace bulb or repair circuit.
ABS or ESP® warning lamp turns on after engine start	Malfunctioning ABS or ESP®	Check system referring to "ABS Check in Section 4E in related manual" or "Electronic Stability Program Check in Section 4F".
ABS or ESP® warning lamp turns on when brake is applied	Malfunctioning ABS or ESP®	Check system referring to "ABS Check in Section 4E in related manual" or "Electronic Stability Program Check in Section 4F".

4A-7 Brake Control System and Diagnosis:

Condition	Possible cause	Correction / Reference Item
ABS or ESP® warning lamp does not turn on for 2 sec. after ignition switch has turned ON	Bulb burnt out	Replace bulb.
	Malfunctioning ABS or ESP®	Check system referring to “ABS Check in Section 4E in related manual” or “Electronic Stability Program Check in Section 4F”.
ABS or ESP® warning lamp flashes	New ABS or ESP® hydraulic unit / control module assembly installed.	Perform “ABS Hydraulic Unit Operation Check in Section 4E in related manual” or “ESP® Hydraulic Unit Operation Check in Section 4F”.

Repair Instructions

Air Bleeding of Brake System

S6RS0B4106006

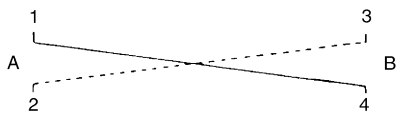
⚠ CAUTION

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system. Hydraulic lines of brake system are based on the diagonal split system. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder of other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at all 4 wheel brakes.

NOTE

Perform bleeding operation starting with wheel cylinder or rear brake caliper farthest from master cylinder and then at front caliper of the same brake line. Do the same on the other brake line.

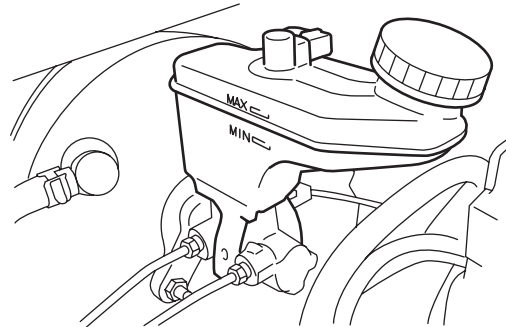


I2RH01410013-01

1. Right front brake caliper	4. Left wheel cylinder or brake caliper
2. Left front brake caliper	A: FRONT
3. Right wheel cylinder or brake caliper	B: REAR

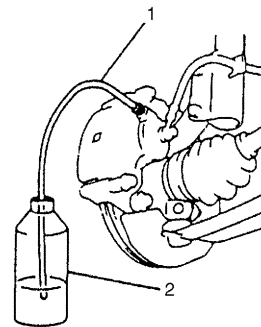
- 1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.

: **Brake Fluid (DOT 4)**



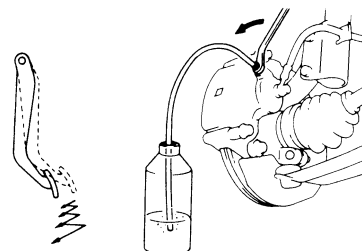
I4RS0B410006-01

- 2) Remove bleeder plug cap. Attach a vinyl tube (1) to bleeder plug, and insert the other end into container (2).



I2RH01410015-01

- 3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.
- 4) When fluid pressure in cylinder is almost depleted, retighten bleeder plug.
- 5) Repeat this operation until there are no more air bubbles in hydraulic line.



I2RH01410016-01

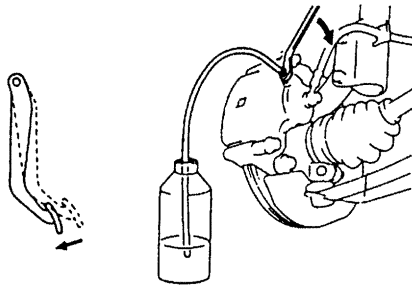
- 6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

Tightening torque

Front brake caliper bleeder plug: 8.0 N·m (0.8 kgf-m, 6.0 lb-ft)

Rear wheel cylinder bleeder plug (other than M16A engine model): 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)

Rear brake caliper bleeder plug (for M16A engine model): 9.0 N·m (0.9 kgf-m, 6.5 lb-ft)

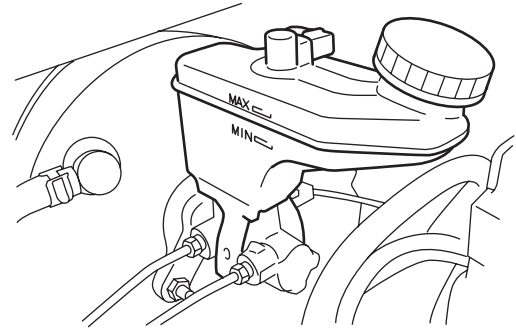


I2RH01410017-01

- 7) Then attach bleeder plug cap.

- 8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.

- 9) Replenish fluid into reservoir up to specified level.



I4RS0B410006-01

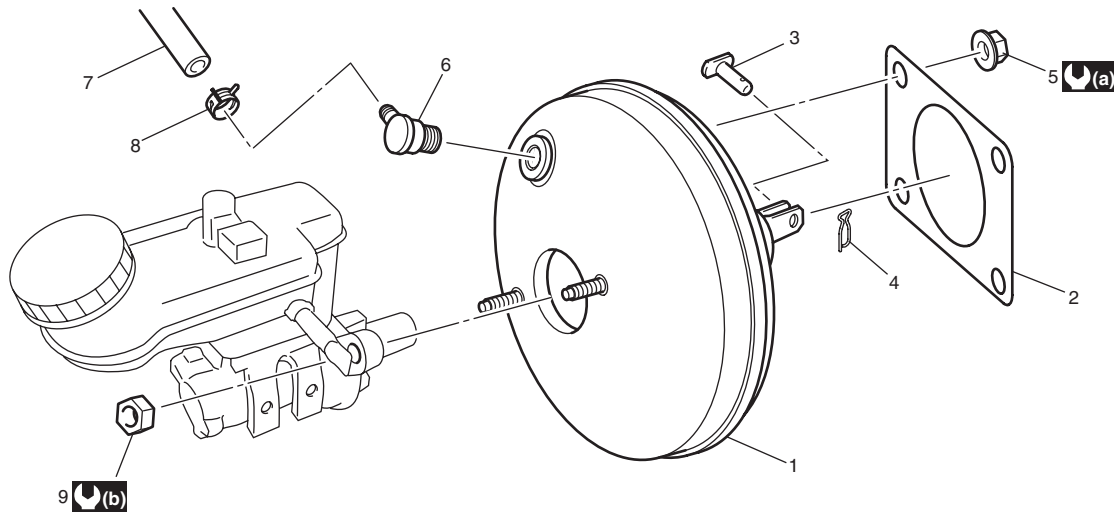
- 10) Check brake pedal for sponginess. If found spongy, repeat entire procedure of bleeding.

Brake Booster Components

S6RS0B4106014

⚠ CAUTION

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



I4RS0B410019-03

1. Brake booster assembly	5. Booster mounting nut	9. Master cylinder fixing nut
2. Gasket	6. Vacuum check valve	U(a) : 13 N·m (1.3 kgf-m, 9.5 lb-ft)
3. Clevis pin	7. Brake vacuum hose	U(b) : 20 N·m (2.0 kgf-m, 14.5 lb-ft)
4. Clip	8. Hose clamp	

Specifications

Tightening Torque Specifications

S6RS0B4107001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Front brake caliper bleeder plug	8.0	0.8	6.0	
Rear wheel cylinder bleeder plug (other than M16A engine model)	7.5	0.75	5.5	
Rear brake caliper bleeder plug (for M16A engine model)	9.0	0.9	6.5	

NOTE

The specified tightening torque is also described in the following.

“Front Brake Hose / Pipe Construction (For M16A Engine Model): ”

“Brake Booster Components: ”

Reference:

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

Special Tools and Equipment

Recommended Service Material

S6RS0B4108001

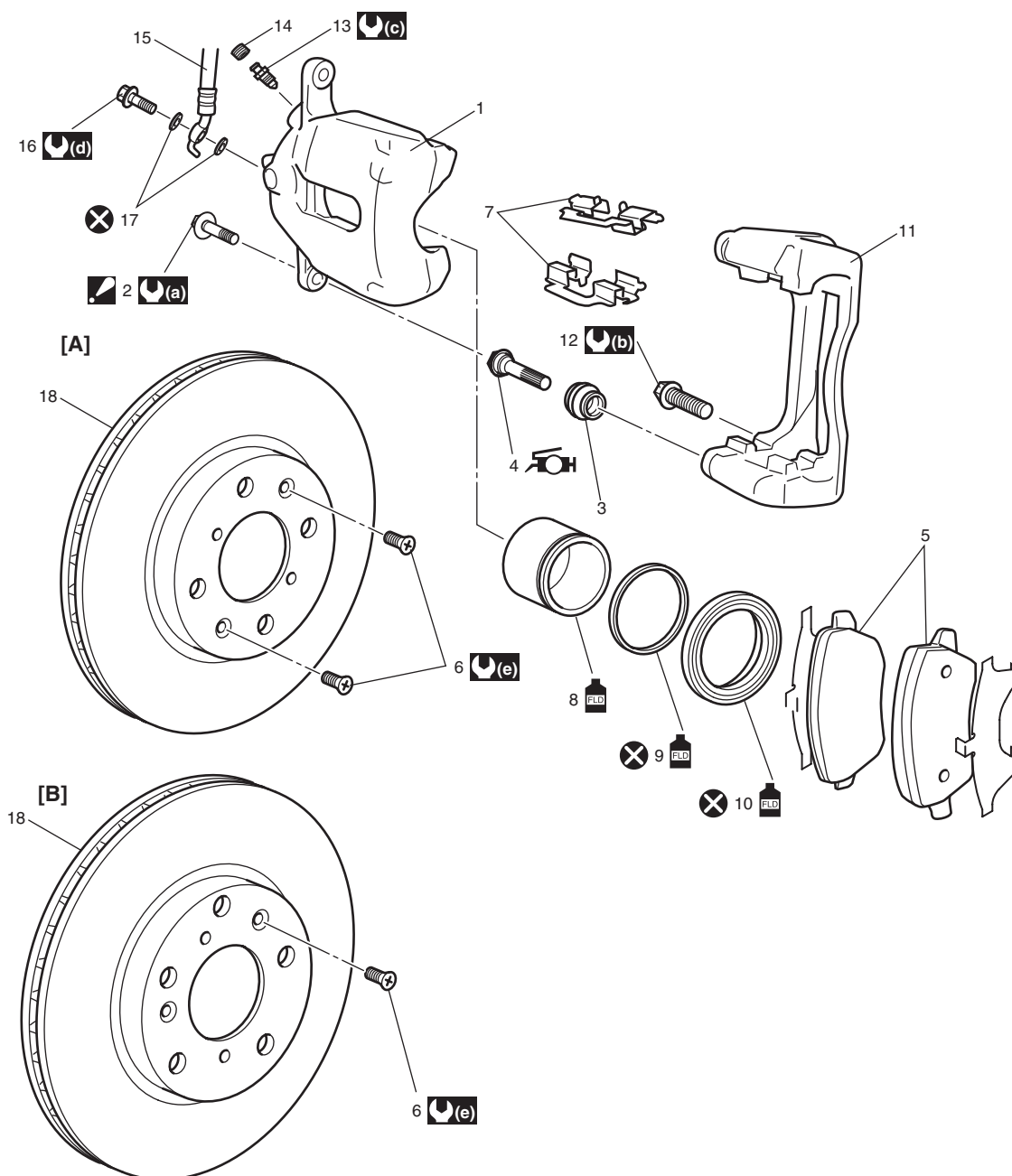
Material	SUZUKI recommended product or Specification		Note
Brake Fluid	DOT 4	—	

Front Brakes

Repair Instructions

Front Disc Brake Components

S6RS0B4206001



I6RS0B420001-02

[A]: Other than M16A engine model	8. Disk brake piston: Apply brake fluid to contact surface of cylinder.	17. Hose washer
[B]: For M16A engine model	9. Piston seal: Apply small amount of brake fluid to all around part of piston seal.	18. Brake disc
1. Caliper	10. Cylinder boot: Apply small amount of brake fluid.	: 35 N-m (3.5 kgf-m, 25.5 lb-ft)
2. Caliper pin bolt: If brake pads are replaced, use new caliper pin bolts included in repair kit.	11. Brake caliper carrier	: 85 N-m (8.5 kgf-m, 61.5 lb-ft)
3. Boot	12. Caliper carrier bolt	: 8.0 N-m (0.8 kgf-m, 6.0 lb-ft)
4. Slide pin: Apply rubber grease.	13. Bleeder plug	: 30 N-m (3.0 kgf-m, 22.0 lb-ft)
5. Brake pad	14. Bleeder plug cap	: 9 N-m (0.9 kgf-m, 6.5 lb-ft)
6. Disc screw	15. Flexible hose	: Do not reuse.

4B-2 Front Brakes:

7. Pad spring	16. Flexible hose joint bolt	
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Specifications

Tightening Torque Specifications

S6RS0B4207001

NOTE

The specified tightening torque is also described in the following.
“Front Disc Brake Components: ”

Reference:

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

Special Tools and Equipment

Recommended Service Material

S6RS0B4208001

NOTE

Required service material is also described in the following.
“Front Disc Brake Components: ”

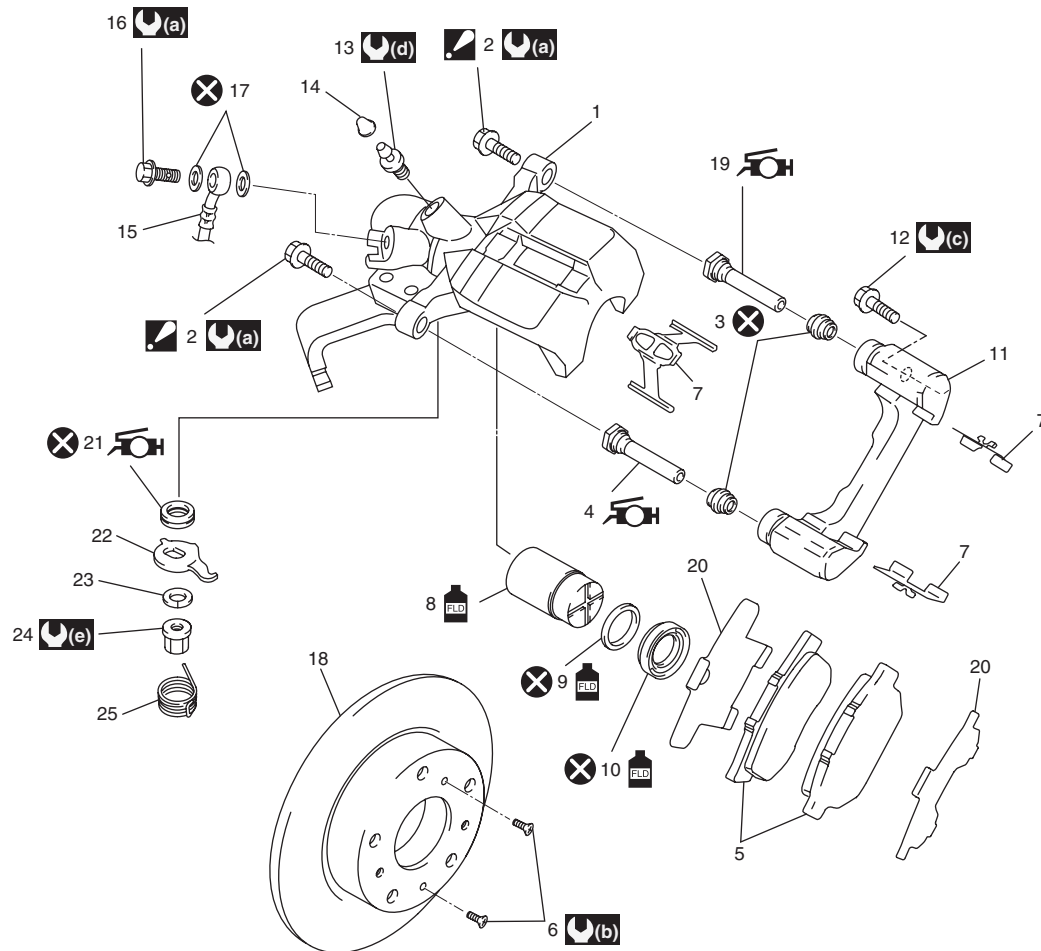
Rear Brakes

Disc Brake Type

Repair Instructions

Rear Disc Brake Components

S6RS0B4326001



I6RS0B431001-01

1. Caliper	12. Caliper carrier bolt	23. Washer
2. Caliper pin bolt	13. Rear caliper bleeder plug	24. Parking nut
3. Boot	14. Bleeder plug cap	25. Return spring
4. No.1 slide pin : Apply rubber grease.	15. Brake flexible hose	(a) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
5. Brake pad	16. Flexible hose joint bolt	(b) : 8.5 N·m (0.85 kgf-m, 6.5 lb-ft)
6. Disc screw	17. Hose washer	(c) : 60 N·m (6.0 kgf-m, 43.5 lb-ft)
7. Pad spring	18. Brake disc	(d) : 9 N·m (0.9 kgf-m, 6.5 lb-ft)
8. Disk brake piston : Apply brake fluid to contact surface of cylinder.	19. No.2 slide pin : Apply rubber grease.	(e) : 27 N·m (2.7 kgf-m, 19.5 lb-ft)
9. Piston seal : Apply small amount of brake fluid to all around part of piston seal.	20. Pad shim	: Do not reuse.
10. Cylinder boot : Apply small amount of brake fluid.	21. Shaft cover : Apply rubber grease.	
11. Brake caliper carrier	22. Lever	

Rear Disc Brake Pad Removal and Installation

S6RS0B4326002

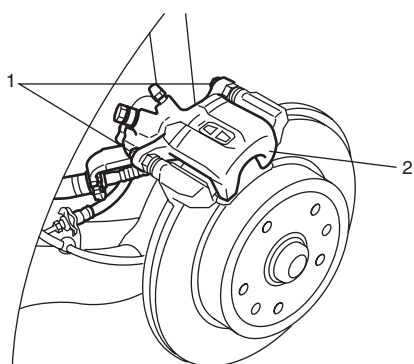
Removal

- 1) Hoist vehicle and remove wheel.
- 2) Release parking brake lever.
- 3) Remove caliper pin bolts (1).
- 4) Remove caliper (2) from caliper carrier.

NOTE

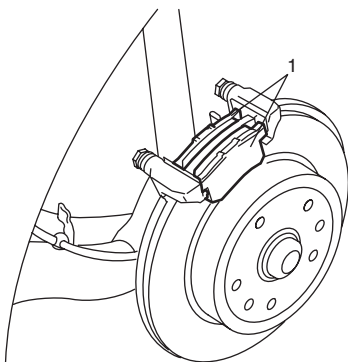
Hang removed caliper (2) with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.

Don't operate brake pedal with brake pads removed.



I6RS0B431002-01

- 5) Remove brake pads (1) and pad springs.



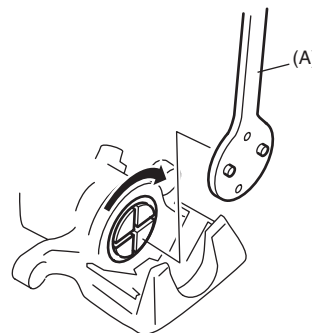
I6RS0B431003-01

Installation

- 1) Turn brake caliper piston clockwise to obtain clearance between brake disc and pads.

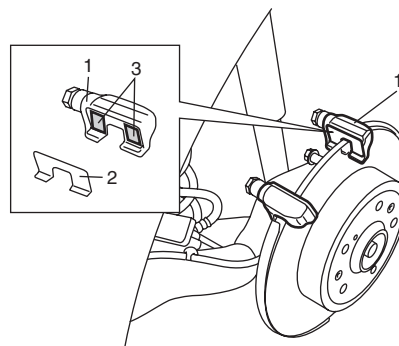
Special tool

(A): 09945-16060



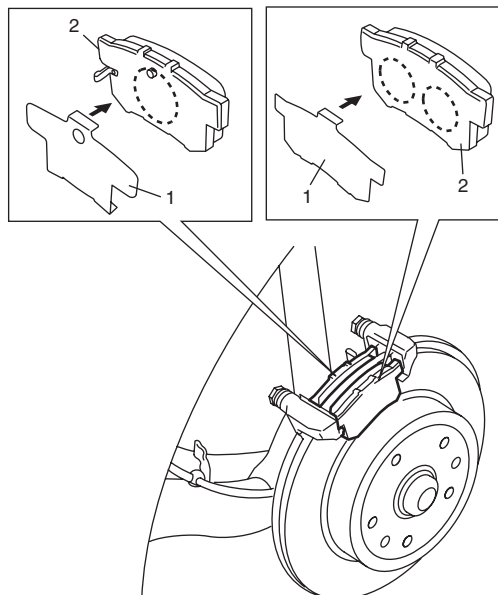
I6RS0B431004-01

- 2) Clean (and degrease) pad spring installation face (3) of caliper carrier (1).
- 3) Attach pad springs (2) to caliper carrier (1).



I6RS0B431005-03

- 4) Before installing brake pad shims (1), apply small amount of grease (included in spare parts) to mating surfaces of brake pad and pad shim.
- 5) Set pad shims (1) to brake pads (2).

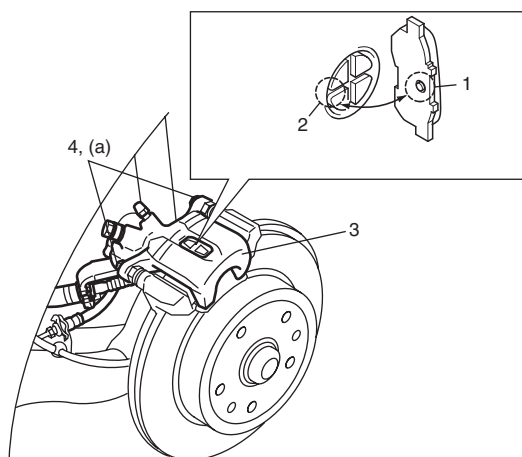


I6RS0B431006-02

- 6) With lug (1) of brake pad matched with dent (2) of brake piston, install caliper (3) to caliper carrier.
- 7) Tighten caliper pin bolts (4) to specified torque.

Tightening torque

Caliper pin bolt (a): 23 N·m (2.3 kgf-m, 17 lb-ft)



I6RS0B431007-01

- 8) Tighten wheel bolts temporarily and lower lift.
- 9) Tighten wheel bolts to specified torque.

Tightening torque

Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

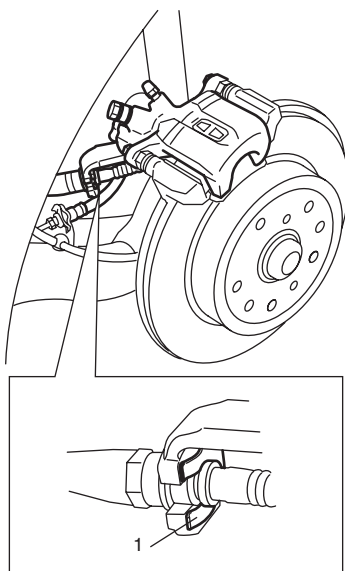
- 10) After completion of installation, check for brake effectiveness.

Rear Disc Brake Caliper Removal and Installation

S6RS0B4326004

Removal

- 1) Hoist vehicle and remove rear wheel.
- 2) Release parking brake lever.
- 3) Remove clip (1).

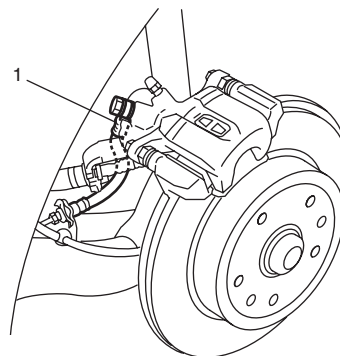


I6RS0B431008-01

- 4) Disconnect flexible hose (1) from caliper.

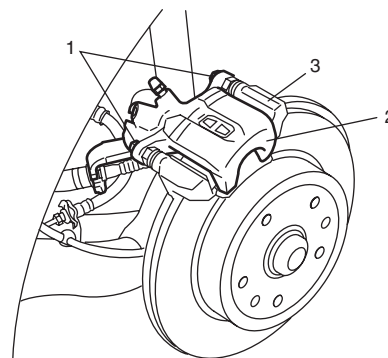
⚠ CAUTION

Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.



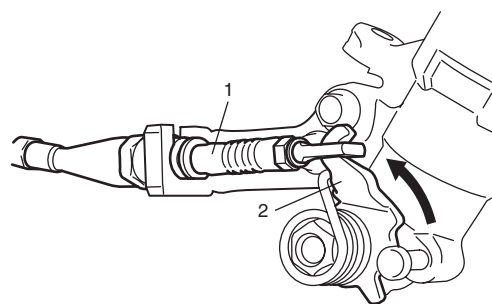
I6RS0B431009-01

- 5) Remove caliper pin bolts (1).
- 6) Remove caliper (2) from brake caliper carrier (3).



I6RS0B431010-01

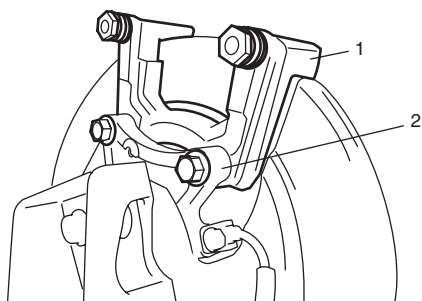
- 7) Disconnect parking brake cable (1) from lever (2) while rotating lever in direction of arrow.



I6RS0B431011-01

4C-4 Rear Brakes: Disc Brake Type

- 8) Remove brake pads, slide pins and slide pin boots from brake caliper carrier.
- 9) Remove brake caliper carrier (1) from spindle (2).



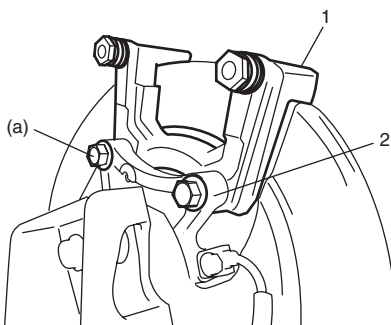
I6RS0B431012-01

Installation

- 1) Install brake caliper carrier (1) to spindle (2).

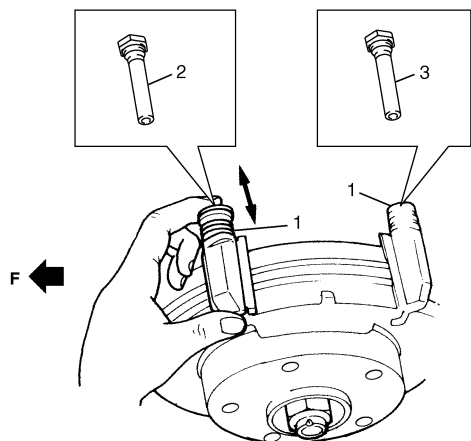
Tightening torque

Brake caliper carrier bolt (a): 60 N·m (6.0 kgf-m, 43.5 lb-ft)



I6RS0B431023-01

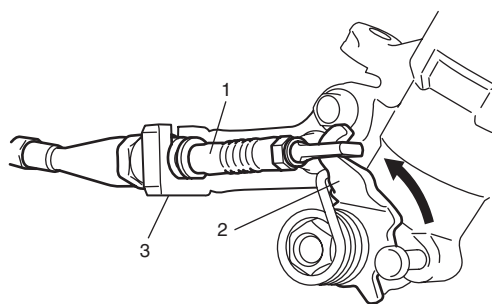
- 2) Install new slide pin boots (1) to brake caliper carrier.
- 3) Apply rubber grease to slide pins, then install slide pin (2) to front side and slide pin (3) to rear side of brake caliper carrier.



I6RS0B431024-02

F: Vehicle front

- 4) Pass parking brake cable (1) through bracket (3) of caliper.
- 5) Hang parking brake cable on lever (2) while rotating lever in direction of arrow.



I6RS0B431025-01

- 6) Install brake pads and caliper referring to "Rear Disc Brake Pad Removal and Installation: Disc Brake Type".

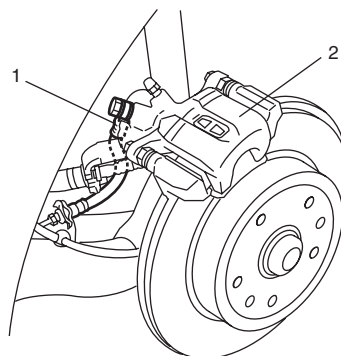
- 7) Connect flexible hose (1) with new washers to caliper (2).

⚠ WARNING

Make sure that flexible hose is not twisted when tightening joint bolt. If it is twisted, reconnect it using care not to twist it.

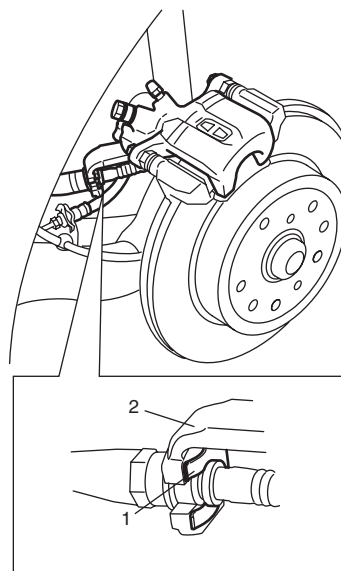
Tightening torque

Flexible hose joint bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)



I6RS0B431026-01

- 8) Install brake cable clip (1) securely to bracket (2).



I6RS0B431027-01

- 9) After reassembling brake lines, bleed air from them referring to "Air Bleeding of Brake System in Section 4A".
- 10) Tighten wheel bolts temporarily and lower hoist.
- 11) Tighten wheel bolts to specified torque.

Tightening torque**Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)**

- 12) Upon completion of installing all parts, fill reservoir tank with specified fluid and bleed brake system of entrapped air.
- 13) Check to make sure that system is free from fluid leakage.
- 14) Depress brake pedal with about 300 N (30 kg, 66 lbs) load five times or more so as to obtain proper disc to pad clearance.
- 15) Check to make sure that parking brake lever stroke is as specified. If not, adjust.
- 16) Remove vehicle from hoist and perform brake test (foot brake and parking brake).

Rear Disc Brake Pad Inspection

S6RS0B4326003

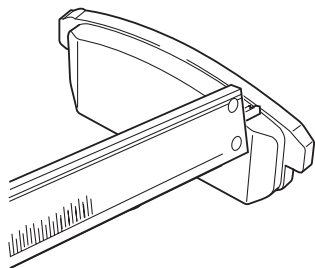
Check pad lining for wear. When wear exceeds limit, replace with new one.

⚠ CAUTION

Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Brake pad thickness (lining thickness)**Standard: 9.0 mm (0.354 in.)****Limit: 1.0 mm (0.039 in.)****NOTE**

When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.



I6RS0B431034-01

Rear Disc Brake Caliper Disassembly and Assembly

S6RS0B4326005

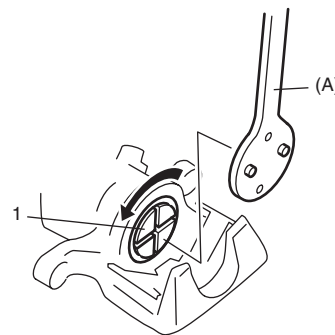
Disassembly**⚠ CAUTION**

Clean around caliper with brake fluid before disassembly.

- 1) Remove disc brake piston (1) by turning piston counterclockwise with special tool.

⚠ CAUTION

Be careful not to damage inside (bore side) of cylinder.

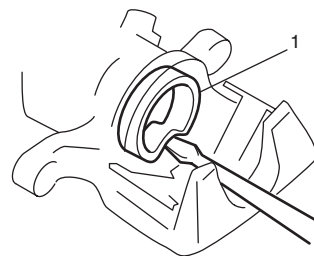
Special tool**(A): 09945-16060**

I6RS0B431013-01

- 2) Remove cylinder boot and piston seal (1).

⚠ CAUTION

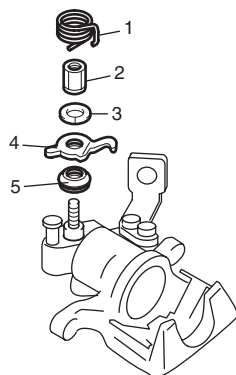
Be careful not to damage inside (bore side) of cylinder.



I6RS0B431014-01

4C-6 Rear Brakes: Disc Brake Type

- 3) Remove bleeder plug and cap from caliper.
- 4) Remove return spring (1), parking nut (2), washer (3), lever (4) and shaft cover (5).



I6RS0B431015-01

Assembly

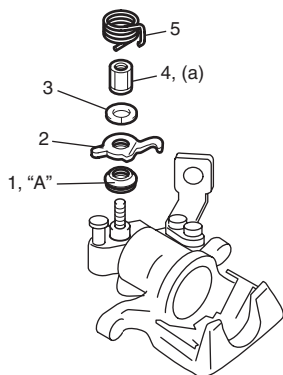
⚠ CAUTION

- Wash each part cleanly before installation in the same fluid as the one used in master cylinder reservoir.
- Never use other fluid or thinner.
- Before installing caliper to brake caliper carrier, install slide pins with grease applied into carrier hole and check for its smooth movement in thrust direction.
- Before installing piston seal to cylinder, apply fluid to them.
- Install a piston seal into groove in cylinder securely making sure that it is not twisted.

- 1) Apply grease to inside of new shaft cover (1).
- 2) Install new shaft cover, lever (2), washer (3), parking nut (4) and return spring (5) to caliper.

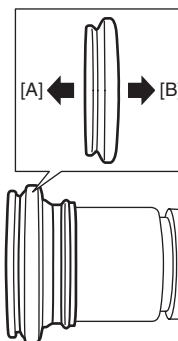
Tightening torque

Parking nut (a): 27 N·m (2.7 kgf-m, 19.5 lb-ft)



I6RS0B431016-01

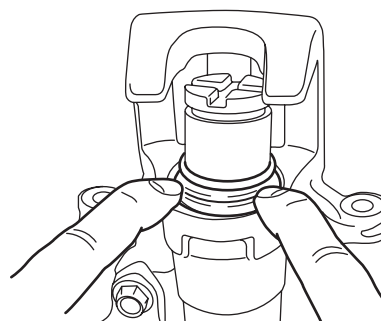
- 3) Install bleeder plug and cap to caliper.
- 4) Install new piston seal to caliper.
- 5) Before inserting piston (2) into cylinder, install boot (1) onto piston as shown.



I6RS0B431017-01

[A]: Cylinder side
[B]: Brake pad side

- 6) Fit boot as it is in figure into boot groove in cylinder with fingers.



I6RS0B431033-01

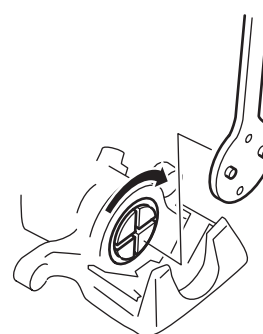
- 7) Turn brake caliper piston clockwise to obtain clearance between brake disc and pads.

NOTE

Check that boot is fitted in boot groove securely all around piston.

Special tool

(A): 09945-16060



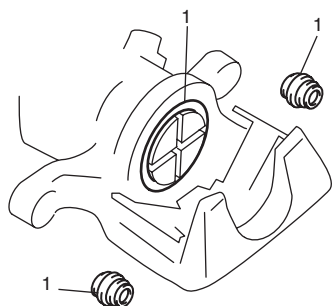
I6RS0B431018-01

Rear Disc Brake Caliper Inspection

S6RS0B4326006

Pin Boot and Cylinder Boot

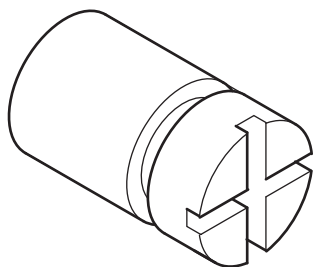
Check boots (1) for breakage, crack and damage.
If defective, replace.



I6RS0B431019-01

Disc Brake Piston

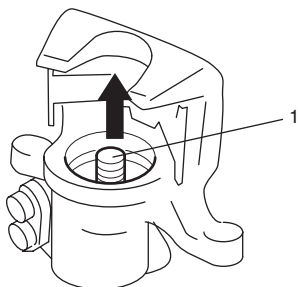
Check all around piston for rust, corrosion and any other damage.
If it is found faulty, replace.



I6RS0B431020-01

Caliper

Push in adjusting bolt (1) by hand and move lever to check that adjusting bolt (1) moves smoothly in the arrow direction.
Also, check adjusting bolt (1) for any damage. If it is found faulty, replace.



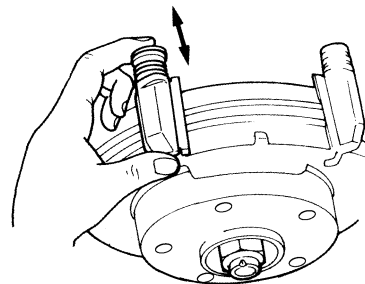
I6RS0B431021-01

Slide Pin

Check guide pin for smooth movement as shown.

If it is found faulty, correct or replace.

Apply rubber grease to guide pin outer surface. Rubber grease should be the one whose viscosity is less affected by such low temperature as -40°C (-40°F).



I6RS0B431022-01

Rear Brake Disc Removal and Installation

S6RS0B4326007

Removal

- 1) Hoist vehicle and remove wheel.
- 2) Remove caliper assembly by removing caliper carrier bolts (1) (2 pcs).

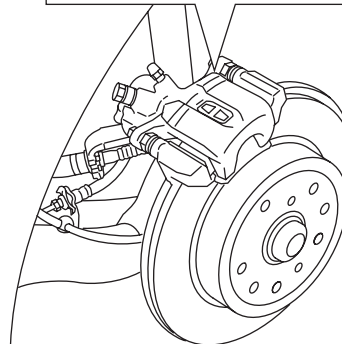
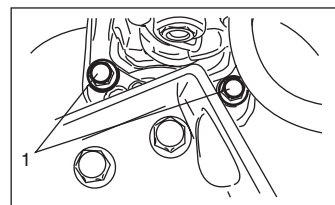
⚠ CAUTION

During removal, be careful not to damage brake flexible hose and not to depress brake pedal.

NOTE

Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.

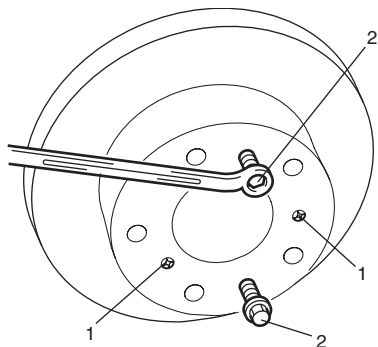
Don't operate brake pedal with brake pads removed.



I6RS0B431028-01

4C-8 Rear Brakes: Disc Brake Type

- 3) Remove brake disc screws (1).
- 4) Pull brake disc off by using 8 mm bolts (2) (2 pcs).



I6RS0B431029-01

Installation

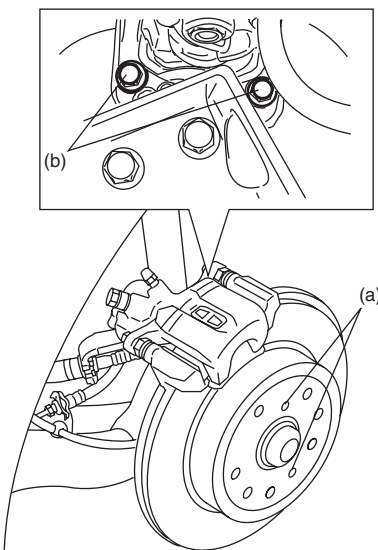
Install in reverse order of removal nothing the following.

- Tighten brake disc screws and caliper carrier bolts to specified torque.

Tightening torque

Brake disc screws (a): 8.5 N·m (0.85 kgf-m, 6.5 lb-ft)

Caliper carrier bolt (b): 60 N·m (6.0 kgf-m, 43.5 lb-ft)



I6RS0B431030-01

- Tighten wheel bolts to specified torque.

Tightening torque

Wheel bolt: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

- Upon completion of installation, perform brake test.

Rear Brake Disc Inspection

S6RS0B4326008

- Using magnetic stand and with dial gauge positioned at about 10 mm (0.39 in.) inward from periphery of disc, measure deflection of disc.
If limit value is exceeded, replace correct or replace.

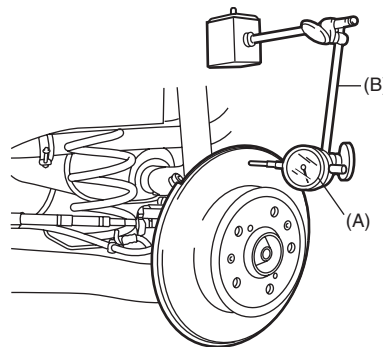
Disc deflection

Limit: 0.10 mm (0.004 in.) max.

Special tool

(A): 09900-20607

(B): 09900-20701



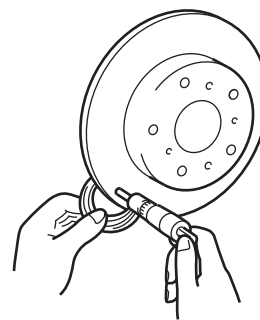
I6RS0B431031-01

- Using micrometer, measure thickness of brake disc.
If limit value is exceeded, replace brake disc.

Brake disc thickness

Standard: 9 mm (0.354 in.)

Limit: 8 mm (0.315 in.)



I6RS0B431032-01

Specifications

Tightening Torque Specifications

S6RS0B4327001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Caliper pin bolt	23	2.3	17	⌚
Wheel bolt	85	8.5	61.5	⌚ / ⌚ / ⌚
Brake caliper carrier bolt	60	6.0	43.5	⌚
Flexible hose joint bolt	23	2.3	17.0	⌚
Parking nut	27	2.7	19.5	⌚
Brake disc screws	8.5	0.85	6.5	⌚
Caliper carrier bolt	60	6.0	43.5	⌚

NOTE

The specified tightening torque is also described in the following.
 “Rear Disc Brake Components: Disc Brake Type”

Reference:

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

Special Tools and Equipment

Recommended Service Material

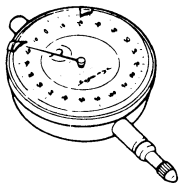
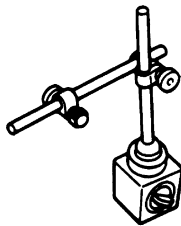
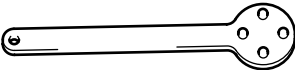
S6RS0B4328001

NOTE

Required service material is also described in the following.
 “Rear Disc Brake Components: Disc Brake Type”

Special Tool

S6RS0B4328002

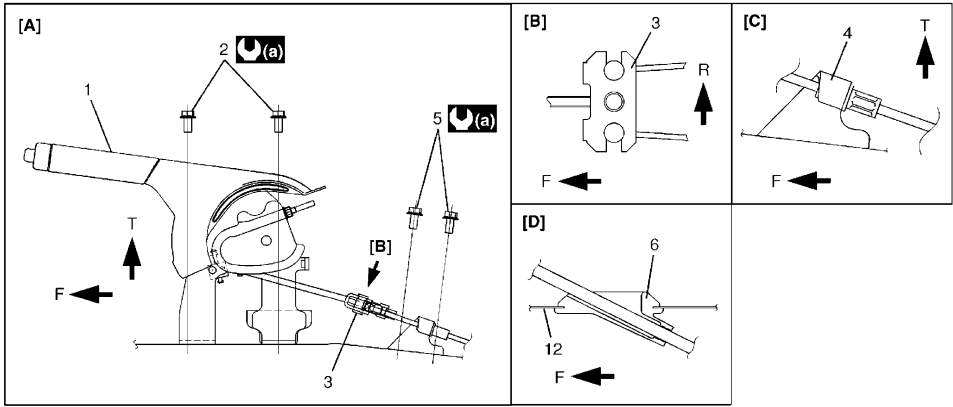
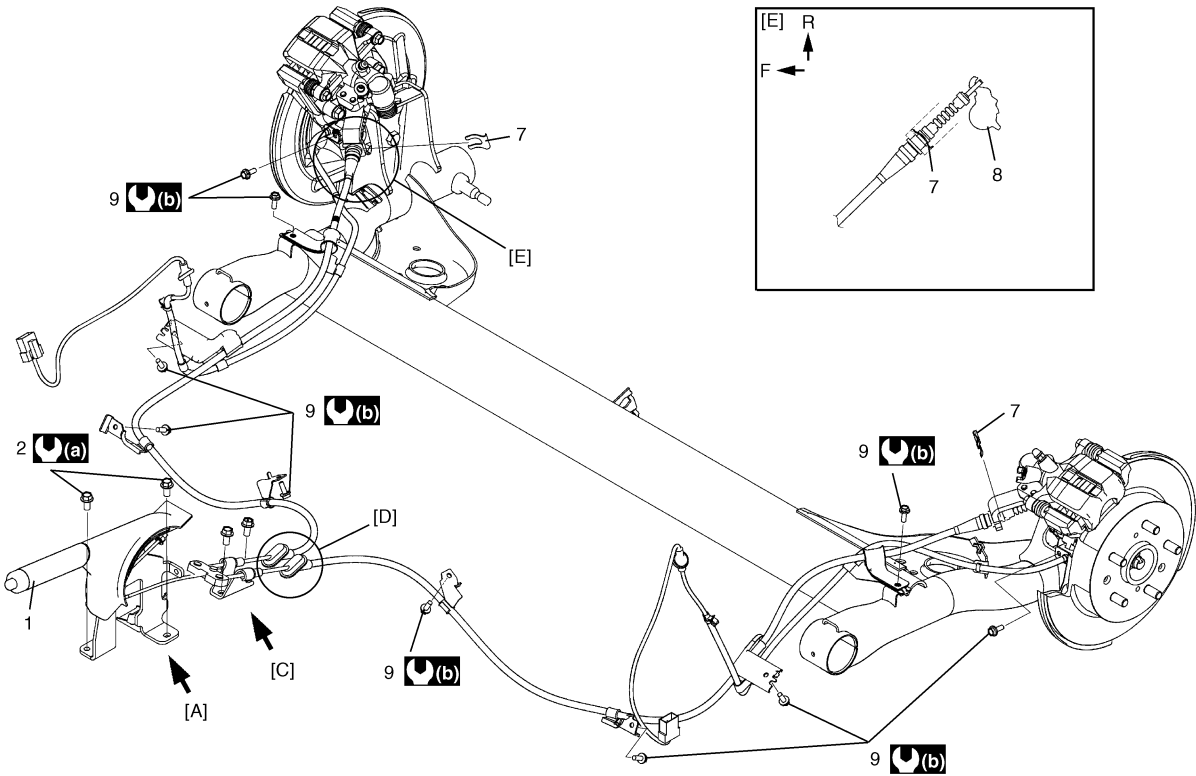
09900-20607 Dial gauge 	09900-20701 Magnetic stand 
09945-16060 Piston installer handle 	

Parking Brake

General Description

Parking Brake Cable Construction (For M16A Engine Model)

S6RS0B4401002



I6RS0B440001-01

T: Top side	3. Equalizer	8. Lever	[C]: View [C]
F: Front side	4. Parking cable bracket	9. Parking cable clamp bolt	[D]: View [D]
R: Right side	5. Parking cable bracket bolt	10. Vehicle body	(a) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
1. Parking brake lever assembly	6. Grommet	[A]: View [A]	(b) : 11 N·m (1.1 kgf-m, 8.0 lb-ft)
2. Parking brake lever bolt	7. E-ring	[B]: View [B]	

Repair Instructions

Parking Brake Inspection and Adjustment

S6RS0B4406001

Inspection

Hold center of parking brake lever grip and pull it up with 200 N (20 kg, 44 lbs) force.

With parking brake lever pulled up as shown, count ratchet notches. There should be 4 to 9 notches.

Also, check if both right and left rear wheels are locked firmly.

To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button.

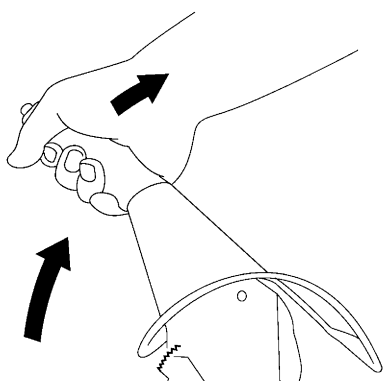
One click sound corresponds to one notch.

If number of notches is out of specification, adjust cable referring to adjustment procedure so as to obtain specified parking brake stroke.

NOTE

Check tooth tip of each notch for damage or wear.

If any damage or wear is found, replace parking brake lever.



I4RS0B440002-01

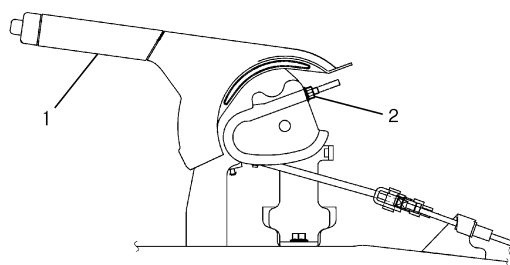
Adjustment

NOTE

Make sure for the following conditions before cable adjustment.

- No air is trapped in brake system.
- Brake pedal travel is proper.
- Brake pedal has been depressed a few times with about 160 N (16.0 kg, 35.3 lbs) load.
- Parking brake lever (1) has been pulled up a few times with about 200 N (20 kg, 44 lbs) load.
If parking brake cable is replaced with new one, pull up parking brake lever a few times with about 500 N-m (50 kg, 110 lbs) force.
- Rear brake shoes are not worn beyond limit, and self adjusting mechanism operates properly (other than M16A engine model)

After confirming that the conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening adjust nut (2).



I4RS0A440003-01

NOTE

Check brake drum or disc for dragging after adjustment.

Parking brake stroke (When lever is pulled up at 200 N (20 kg, 44 lbs))
4 to 9 notches

Parking Brake Cable Removal and Installation

S6RS0B4406002

Removal**NOTE**

When it is necessary to remove both right and left parking brake cables, repeat below steps 1) and 5) on right and left wheels.

- 1) Hoist vehicle.
- 2) Remove wheel.
- 3) Disconnect parking brake cable from equalizer (parking brake lever) and clamps.
- 4) Remove brake drum. Refer to "Rear Brake Drum Removal and Installation: Drum Brake Type in Section 4C in related manual". (other than M16A engine model)
- 5) Disconnect parking brake cable from brake shoe lever referring to "Rear Brake Shoe Removal and Installation: Drum Brake Type in Section 4C in related manual". (other than M16A engine model)
- 6) Disconnect parking brake cable from lever referring to "Rear Disc Brake Caliper Removal and Installation: Disc Brake Type in Section 4C". (for M16A engine model)

- 7) Remove parking brake cable and parking cable bracket.

Installation

Install it by reversing removal procedure, noting the following points.

- Install clamps properly referring to "Parking Brake Cable Construction (Other Than M16A Engine Model) in related manual".
- Tighten bolts and nuts to specified torque referring to "Parking Brake Cable Construction (Other Than M16A Engine Model) in related manual".

Tightening torque

Parking brake lever bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

Parking cable clamp bolt: 11 N·m (1.1 kgf-m, 8.0 lb-ft)

Parking cable bracket bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

- Adjust parking brake cable. Refer to "Parking Brake Inspection and Adjustment".
- Check brake drum or disc for dragging and brake system for proper performance. Brake test should be performed.

Specifications**Tightening Torque Specifications**

S6RS0B4407001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Parking brake lever bolt	25	2.5	18.0	☞
Parking cable clamp bolt	11	1.1	8.0	☞
Parking cable bracket bolt	25	2.5	18.0	☞

NOTE

The specified tightening torque is also described in the following.
"Parking Brake Cable Construction (For M16A Engine Model): "

Reference:

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

ABS

General Description

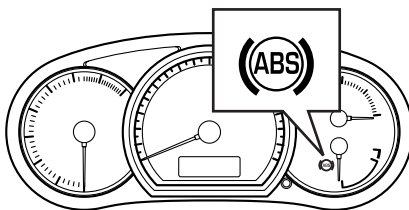
ABS Hydraulic Unit / Control Module Assembly Description

S6RS0B4501002

ABS control module is a component of ABS hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ABS control module diagnoses conditions of the system component parts (whether or not there is any abnormality) all the time and indicates the results (warning of abnormality occurrence and DTC) through the ABS warning lamp as described.



I4RS0A450001-01

- When ignition switch is turned ON, ABS warning lamp lights for 2 seconds to check its circuit.
- When no abnormality has been detected (the system is in good condition), ABS warning lamp turns OFF after 2 seconds.
- When an abnormality in the system is detected, ABS warning lamp lights and the area where that abnormality lies is stored in the memory of EEPROM in ABS control module.

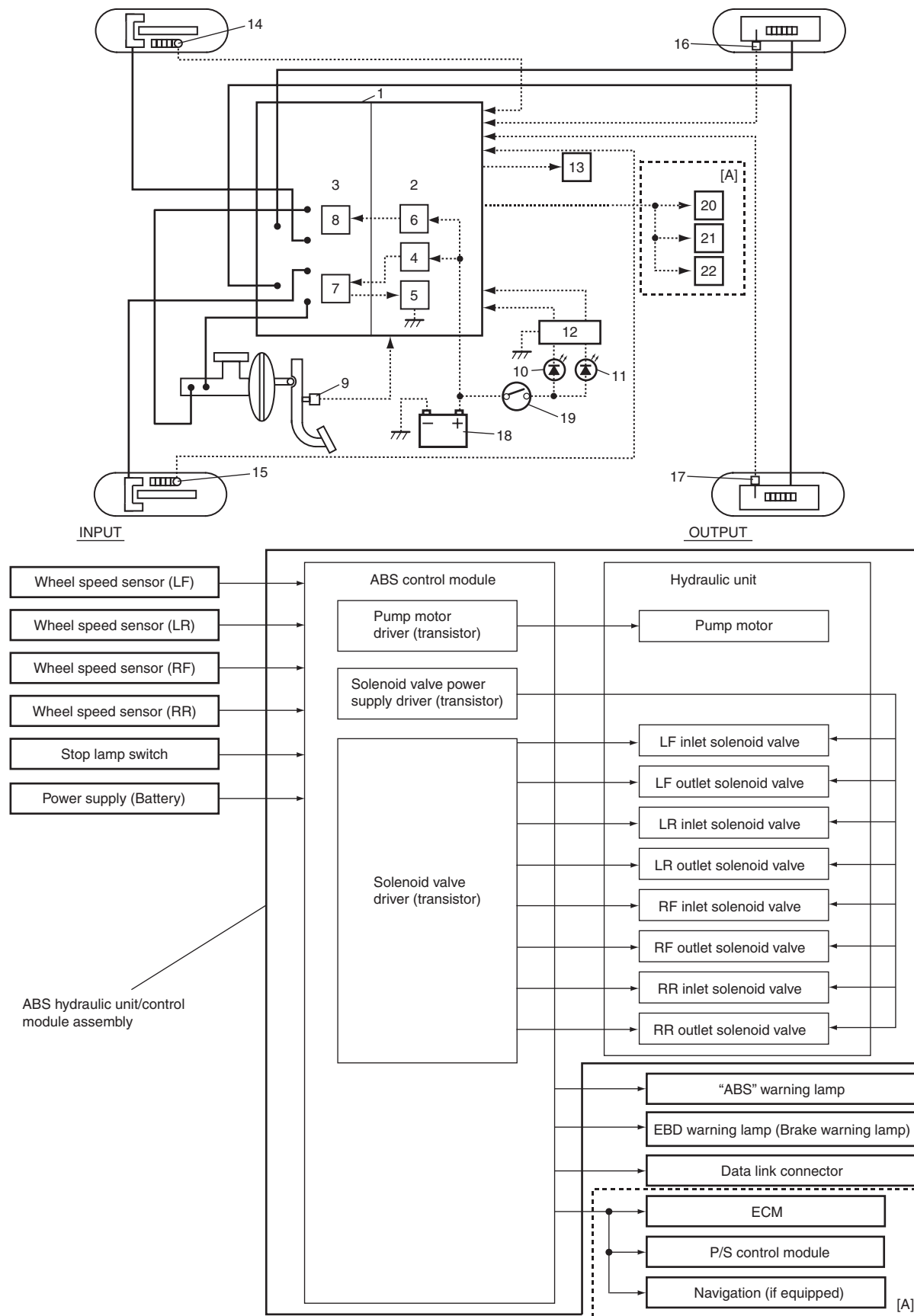
Vehicle Speed Signal Function (For diesel engine model)

ABS control module transmits of right front vehicle speed sensor to other control modules.

Schematic and Routing Diagram

ABS Schematic

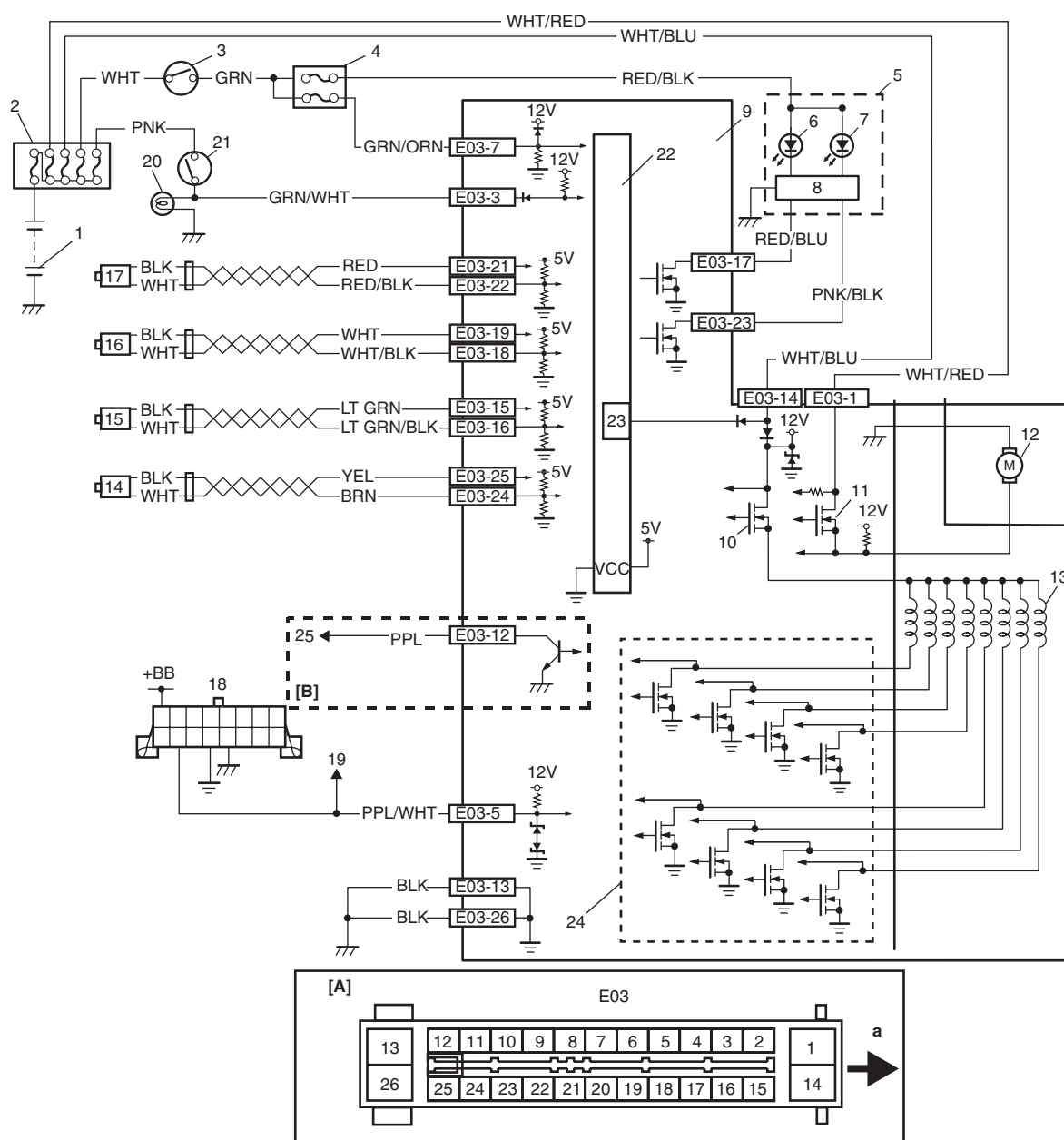
S6RS0B4502001



[A]: For diesel engine model	8. Pump motor	16. Wheel speed sensor (Right-rear)
1. ABS hydraulic unit / control module assembly	9. Stop lamp switch	17. Wheel speed sensor (Left-rear)
2. ABS control module	10. ABS warning lamp	18. Battery
3. ABS hydraulic unit	11. EBD warning lamp (Brake warning lamp)	19. Ignition switch
4. Solenoid valve power supply driver (transistor)	12. Lamp driver module	20. ECM
5. Solenoid valve driver (transistor)	13. Data link connector	21. P/S control module
6. Pump motor driver (transistor)	14. Wheel speed sensor (Right-front)	22. Navigation (if equipped)
7. Solenoid valve	15. Wheel speed sensor (Left-front)	

ABS Wiring Circuit Diagram

S6RS0B4502002



I6RS0B450002-01

[A]: Terminal arrangement of ABS hydraulic unit / control module assembly	8. Lamp driver module	18. Data link connector
[B]: For diesel engine model	9. ABS hydraulic unit / control module assembly	19. To ECM, TCM, SDM and BCM
a: Upside	10. Solenoid valve power supply driver (transistor)	20. Stop lamp
1. Battery	11. ABS pump motor driver (transistor)	21. Brake light switch
2. Main fuse box	12. Pump motor	22. Power control unit
3. Ignition switch	13. Solenoid valves	23. Internal memory
4. Circuit fuse box	14. Right-rear wheel speed sensor	24. Solenoid valve driver (transistor)

4E-4 ABS:

5. Combination meter	15. Left-rear wheel speed sensor	25. To ECM, P/S control module and navigation (if equipped)
6. ABS warning lamp	16. Right-front wheel speed sensor	
7. EBD warning lamp (Brake warning lamp)	17. Left-front wheel speed sensor	

Terminal	Wire color	Circuit
E03	1	WHT/RED
	2	—
	3	GRN/WHT
	4	—
	5	PPL/WHT
	6	—
	7	GRN/ORN
	8	—
	9	—
	10	—
	11	—
	12	PPL
	13	BLK
	14	WHT/BLU
	15	LT GRN
	16	LT GRN/BLK
	17	RED/BLU
	18	WHT/BLK
	19	WHT
	20	—
	21	RED
	22	RED/BLK
	23	PNK/BLK
	24	BRN
	25	YEL
	26	BLK
		Ground

Repair Instructions

Rear Wheel Speed Sensor Ring Removal and Installation

S6RS0B4506014

For removal and installation of rear wheel speed sensor ring, refer to “ABS Sensor Ring Removal and Installation: Drum Brake Type in Section 4C in related manual”.

Electronic Stability Program

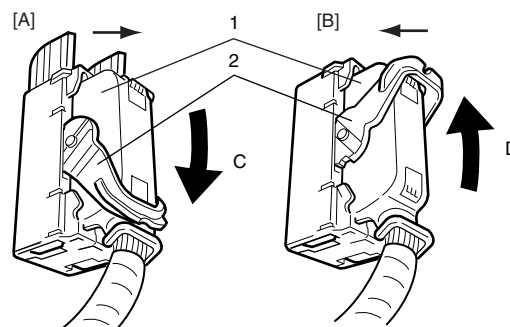
Precautions

Precautions in Diagnosing Troubles

S6RS0B4600001

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 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 down the lock lever (2) of connector. When connecting, set the connector on ESP® 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

- Communication of ECM, BCM, ESP® control module, keyless start control module (if equipped), steering angle sensor and combination meter 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 handling CAN communication line.

Precautions in On-Vehicle Service

S6RS0B4600002

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

S6RS0B4600003

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 "ESP® Hydraulic Unit Operation Check" 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

S6RS0B4600004

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

S6RS0B4600005

When performing speedometer or other tests using speedometer tester or chassis dynamometer, ESP® function must be deactivated by ESP® OFF switch or using SUZUKI scan tool to complete the tests correctly.

When using SUZUKI scan tool, set to the “MISC. TEST” mode to stop the ESP® function. Refer to SUZUKI scan tool operator's manual for further details.

General Description

Electronic Stability Program Description

S6RS0B4601001

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 in related manual”.
- **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.

ESP® is a registered trademark of Daimler Chrysler AG.

ESP® Hydraulic Unit / Control Module Assembly Description

S6RS0B4601002

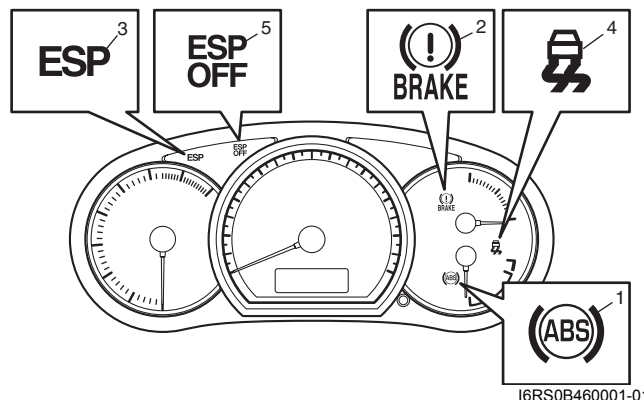
ESP® control module is a component of ESP® hydraulic unit / control module assembly and has the following functions.

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.



16RS0B460001-01

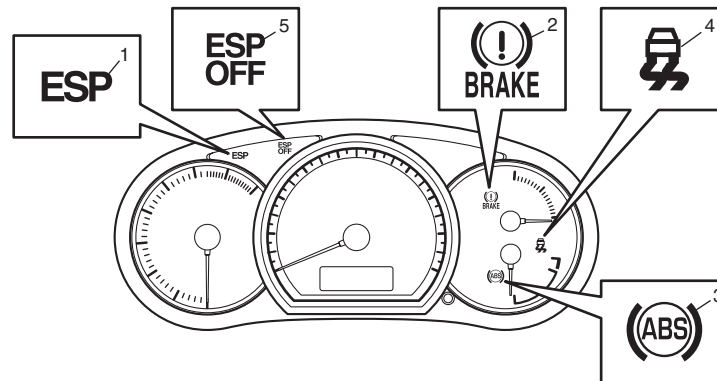
Fail-Safe Mode

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

S6RS0B4601003

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.



I6RS0B460002-01

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 brake 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® systems 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. - 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 320 °C (608 °F) and any of wheel is in wheel spin condition.

CAN Communication System Description

S6RS0B4601004

Refer to "CAN Communication System Description: For M13, M15 and M16 Engines 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	Steering angle sensor
ESP® control module	Transmit	DATA	Torque up request	☐	
			Torque down request	☐	
			Wheel speed signal (front right)	☐	
			Wheel speed signal (front left)	☐	
			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		☐

I6RS0B460003-01

ESP® Control Module Reception Data

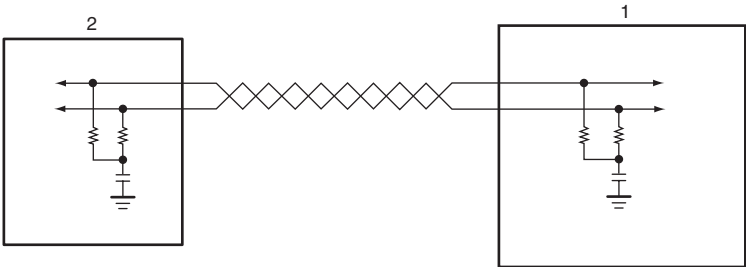
			ECM	BCM	Steering angle sensor
ESP® control module	Receive	DATA	Engine torque signal	☐	
			Accelerator pedal position	☐	
			Engine speed	☐	
			Brake pedal switch signal	☐	
			Brake fluid level switch signal	☐	
			Parking brake switch signal	☐	
			Steering angle signal		☐
			Steering angle sensor related malfunction		☐

I6RS0B460004-01

CAN Communication System For Electronic Stability Program Description

S6RS0B4601005

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.



I6JB01460006-01

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

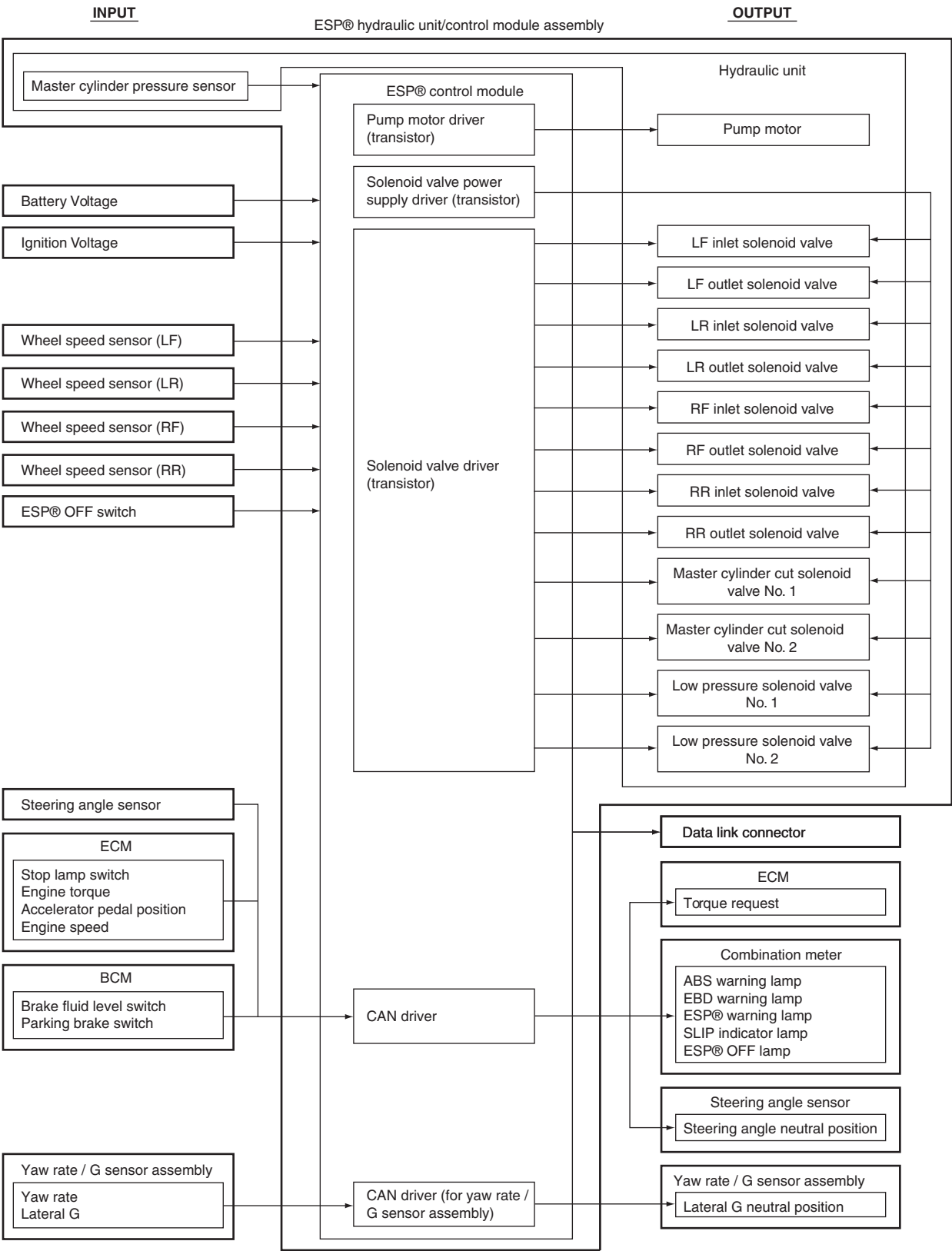
ESP® Reception Data from Yaw Rate / G Sensor Assembly

- Vehicle yaw rate signal
- Vehicle longitudinal G signal
- Vehicle lateral G signal
- Yaw rate / G sensor assembly related malfunction

Schematic and Routing Diagram

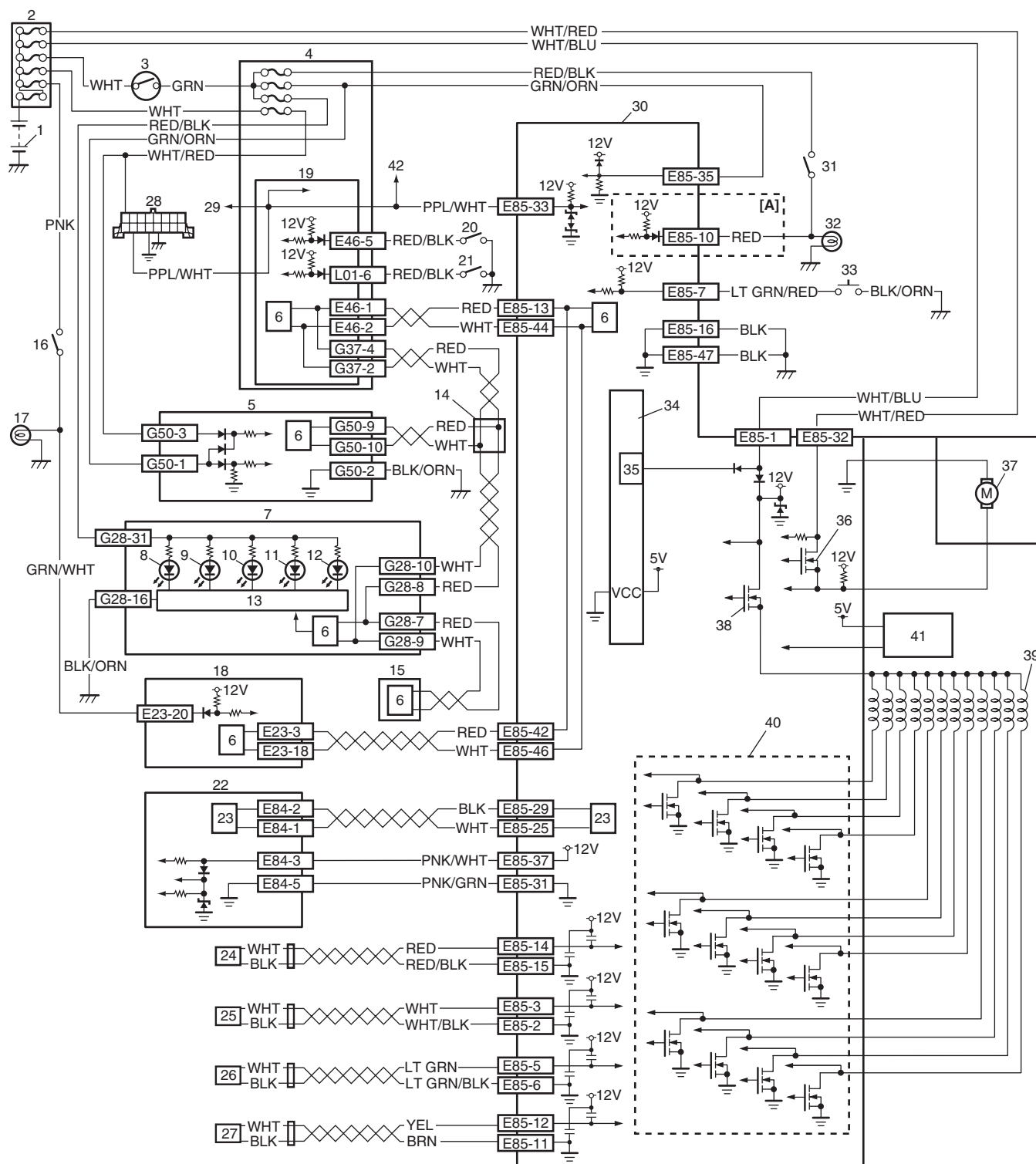
Electronic Stability Program Schematic

S6RS0B4602001



Electronic Stability Program Wiring Circuit Diagram

S6RS0B4602002

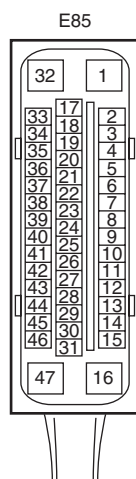


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[A]: For M/T model	15. Keyless start control module	30. ESP® hydraulic unit / control module assembly
1. Battery	16. Stop lamp switch	31. Back up light switch
2. Main fuse box	17. Stop lamp	32. Back-up light
3. Ignition switch	18. ECM	33. ESP® OFF switch
4. Junction block assembly	19. BCM (included in junction block assembly)	34. Power control unit
5. Steering angle sensor	20. Brake fluid level switch	35. Internal memory
6. CAN driver	21. Parking brake switch	36. Pump motor driver (transistor)
7. Combination meter	22. Yaw rate / G sensor assembly	37. Pump motor

8. SLIP indicator lamp	23. CAN driver (for yaw rate / G sensor assembly)	38. Solenoid valve power supply driver (transistor)
9. ESP® OFF lamp	24. Left-front wheel speed sensor	39. Solenoid valves
10. ESP® warning lamp	25. Right-front wheel speed sensor	40. Solenoid valve driver (transistor)
11. ABS warning lamp	26. Left-rear wheel speed sensor	41. Master cylinder pressure sensor
12. EBD warning lamp (brake warning lamp)	27. Right-rear wheel speed sensor	42. To ECM and P/S control module
13. Lamp driver module	28. Data link connector	
14. Junction connector	29. To SDM	

Terminal Arrangement of ESP® Control Module Connector (Viewed from Terminal Side)



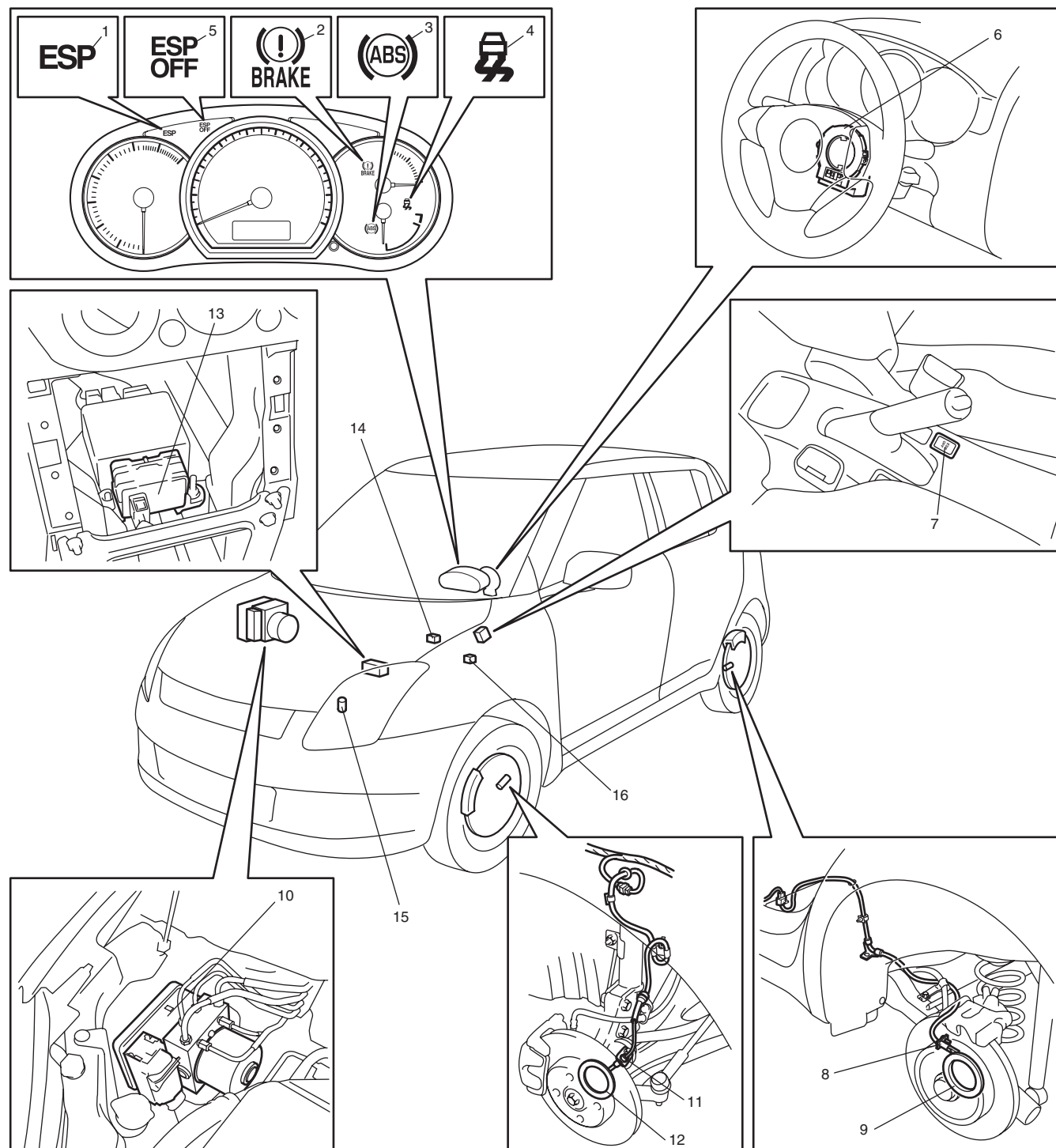
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Terminal	Circuit	Terminal	Circuit
E85-1	Solenoid valve power supply driver (transistor)	E85-25	CAN communication line (low) for yaw rate / G sensor assembly
E85-2	Right-front wheel speed sensor (–)	E85-26	—
E85-3	Right-front wheel speed sensor (+)	E85-27	—
E85-4	—	E85-28	—
E85-5	Left-rear wheel speed sensor (+)	E85-29	CAN communication line (high) for yaw rate / G sensor assembly
E85-6	Left-rear wheel speed sensor (–)	E85-30	—
E85-7	ESP® OFF switch input	E85-31	Ground for yaw rate / G sensor assembly
E85-8	—	E85-32	Pump motor driver (transistor)
E85-9	—	E85-33	Data link connector
E85-10	Back up light Input (for M/T model)	E85-34	—
E85-11	Right-rear wheel speed sensor (–)	E85-35	Ignition switch
E85-12	Right-rear wheel speed sensor (+)	E85-36	—
E85-13	CAN communication line (high)	E85-37	Power source for yaw rate / G sensor assembly
E85-14	Left-front wheel speed sensor (+)	E85-38	—
E85-15	Left-front wheel speed sensor (–)	E85-39	—
E85-16	Ground	E85-40	—
E85-17	—	E85-41	—
E85-18	—	E85-42	CAN communication line (high) for ECM
E85-19	—	E85-43	—
E85-20	—		CAN communication line (low)
E85-21	—	E85-45	—
E85-22	—	E85-46	CAN communication line (low) for ECM
E85-23	—	E85-47	Ground
E85-24	—		

Component Location

Electronic Stability Program Component Location

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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 (for M/T model)
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

S6RS0B4604001

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. <i>Is there any malfunction DTC?</i>	Go to Step 4.	Go to Step 2.
2	🔧 Driving test 1) Perform "Step 2: Driving Test: ". <i>Is trouble symptom identified?</i>	Go to Step 3.	Go to Step 6.
3	🔧 DTC check 1) Perform "DTC Check". <i>Is it malfunction code?</i>	Go to Step 4.	Go to Step 5.
4	🔧 ESP® check 1) Inspect and repair referring to applicable DTC flow. <i>Does trouble recur?</i>	Go to Step 5.	Go to Step 7.
5	🔧 Brakes diagnosis 1) Inspect and repair referring to "Brakes Symptom Diagnosis in Section 4A". <i>Does trouble recur?</i>	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. <i>Does trouble recur?</i>	Go to Step 4.	Go to Step 7.
7	🔧 Final confirmation test 1) Perform "Step 7: Final Confirmation Test: ". <i>Does trouble recur?</i>	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 (with ESP® Model)", "ABS Warning Lamp Check (with ESP® Model)" 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 at 40 km/h for more than a minute including left and right turns and check if any trouble symptom (such as 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” 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.

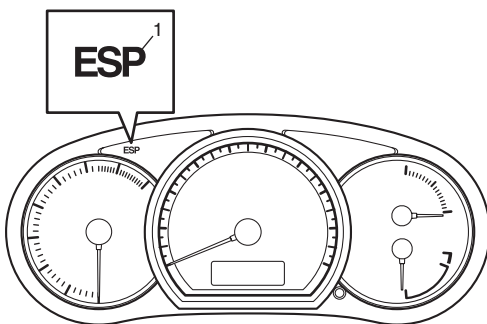
Step 7: Final Confirmation Test

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”.

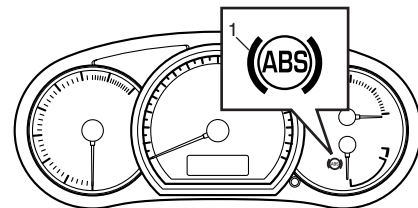


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ABS Warning Lamp Check (with ESP® Model)

S6RS0B4604046

- 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 (with ESP® Model)” or “ABS Warning Lamp Comes ON Steady (with ESP® Model)”.



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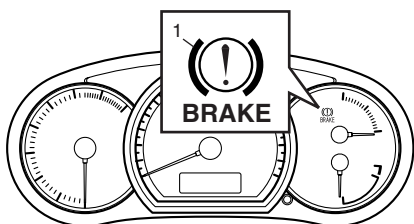
EBD Warning Lamp (Brake Warning Lamp) Check (with ESP® Model)

S6RS0B4604047

NOTE

Perform this check on a level place.

- 1) Turn ignition switch ON with parking brake applied.
- 2) Check that EBD warning lamp (brake warning lamp) (1) is turned ON.
- 3) Release parking brake with ignition switch ON and check that EBD warning lamp (brake warning lamp) goes off.
If it doesn't go off, go to "EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady (with ESP® Model)".



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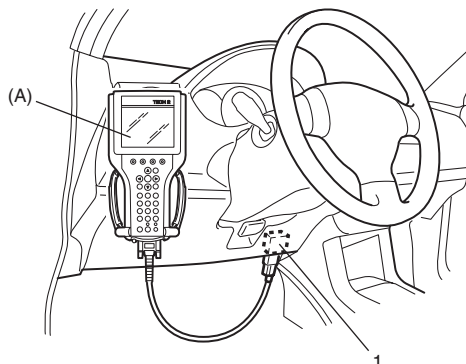
DTC Check

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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

S6RS0B4604005

⚠ 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	—	—	—	—
 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 signal of brake fluid level switch to BCM is low level.	—	—	○
 C1020	Master cylinder pressure sensor power supply failure	Power supply voltage to master cylinder pressure sensor in ESP® hydraulic unit / control module assembly is out of specification.	—	—	○

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
 C1021	RF	Wheel speed sensor circuit failure	Wheel sensor signal is out of specified range.	○	*1	○
 C1025	LF					
 C1031	RR					
 C1035	LR					
 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.			
 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 from 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.	—	—	○
 C1040	Stability control system function failure		Stability control is active for more than specified time without yaw rate change.	—	—	○

4F-14 Electronic Stability Program:

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					
 C1057	ESP® control module power supply circuit failure *2		ESP® control module power supply voltage is too high.	○	○	○
			ESP® control module power supply voltage is too low.	○	*4	○
 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® control module internal defect		ESP® 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.	—	—	○
 C1075	Steering angle sensor calibration incomplete *3		Missing steering angle sensor calibration point data is detected.	—	—	○
 C1076	Master cylinder pressure sensor calibration incomplete		Master cylinder pressure sensor calibration is incompleted.	—	—	○
 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 from ESP® control module		ESP® control module rolling counter failure is detected by ECM.	—	—	○
 C1091	ECM data in CAN line failure		ECM 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.	—	—	○

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
 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.			
 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: SLIP indicator lamp and ESP® OFF lamp turn ON when power supply circuit voltage is low.
- *3: SLIP indicator lamp flashes continuously at Intervals of 1 Hz.
- *4: EBD warning lamp is lit when power supply circuit voltage is too low.

DTC Clearance

S6RS0B4604006

▲ 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 details.

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

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 resoluteive
	ABS	EBD	TCS / stability	
 C1016	○	○	○	—
 C1017	○	○	X	When ESP® control module detects the system as normal, 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 detects system as normal.
 C1025				
 C1031				
 C1035				
 C1022	X	*1	X	
 C1026				
 C1032				
 C1036				
 C1023	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1024	○	○	X	
 C1027 *2	○	○	○	—
 C1028	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1034	○	○	X	
 C1037	○	○	X	—
 C1038	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1039	○	○	X	
 C1040	○	○	X	

DTC No.	Fail-safe operation			Fail-safe condition resolvable
	ABS	EBD	TCS / stability	
 C1041	X	X	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1042				
 C1043				
 C1044				
 C1045				
 C1046				
 C1051				
 C1052				
 C1053				
 C1054				
 C1055				
 C1056				
 C1057	X	*3	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1061	X	○	X	When estimated vehicle speed exceeds 10 km/h (6.5 mile/h) and detects system as normal.
 C1063	X	X	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1071	X	X	X	
 C1073	○	○	X	
 C1075	○	○	X	Steering angle sensor calibration completed.
 C1076	○	○	X	Master cylinder pressure sensor calibration completed.
 C1078	○	○	X	Yaw rate / G sensor assembly calibration completed.
 C1090	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1091	○	○	X	
 U1073	○	○	X	
 U1100	○	○	X	
 U1126				
 U1140				

NOTE

- **O: 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: ESP® OFF mode is cancelled and all control functions are activated.**
- ***3: EBD control function is activated only if power supply circuit is little low voltage malfunction.**

Scan Tool Data

S6RS0B4604024

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 the wheel 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
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	Brake function 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.

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.

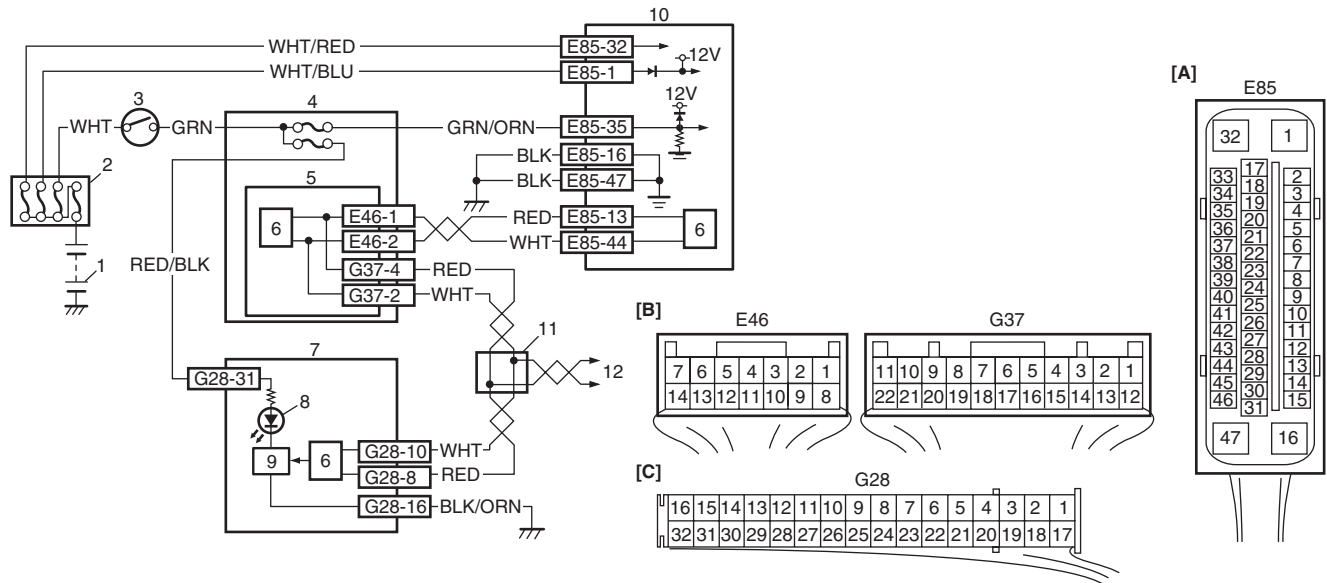
ESP® off state (cont) (ESP® ON, ESP® OFF): State of ESP® OFF switch.

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

S6RS0B4604008

Wiring Diagram



I6RS0B460010-01

[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	8. ESP® warning lamp
[B]: BCM connector (viewed from harness side)	4. Junction block assembly	9. Lamp driver module
[C]: Combination meter connector (viewed from harness side)	5. BCM (included in junction block assembly)	10. ESP® hydraulic unit / control module assembly
1. Battery	6. CAN driver	11. Junction connector
2. Main fuse box	7. Combination meter	12. To steering angle sensor

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	Check warning lamp 1) Turn ignition switch to ON position. <i>Do other warning lamps come ON?</i>	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.	Go to Step 2.

4F-20 Electronic Stability Program:

Step	Action	Yes	No
2	Check fuse <i>Is Circuit fuse for combination meter in good condition?</i>	Go to Step 3.	Replace fuse and check for short circuit to ground.
3	Check combination meter power supply circuit 1) Remove combination meter with ignition switch turned OFF. 2) Check for proper connection to combination meter connector terminal at "G28-31" and "G28-16". 3) If OK, turn ON ignition switch and measure voltage between connector terminal "G28-31" and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 4.	Repair power supply circuit for combination meter.
4	Check combination meter ground circuit 1) Measure resistance between connector terminal "G28-16" and vehicle body ground. <i>Is resistance less than 2 Ω?</i>	Replace combination meter.	"BLK/ORN" circuit open or high resistance.

ESP® Warning Lamp Comes ON Steady

S6RS0B4604009

Wiring Diagram

Refer to "Wiring Diagram" under "ESP® Warning Lamp Does Not Come ON at Ignition Switch ON".

Circuit Description

Refer to "Circuit Description" under "ESP® Warning Lamp Does Not Come ON at Ignition Switch ON".

Troubleshooting

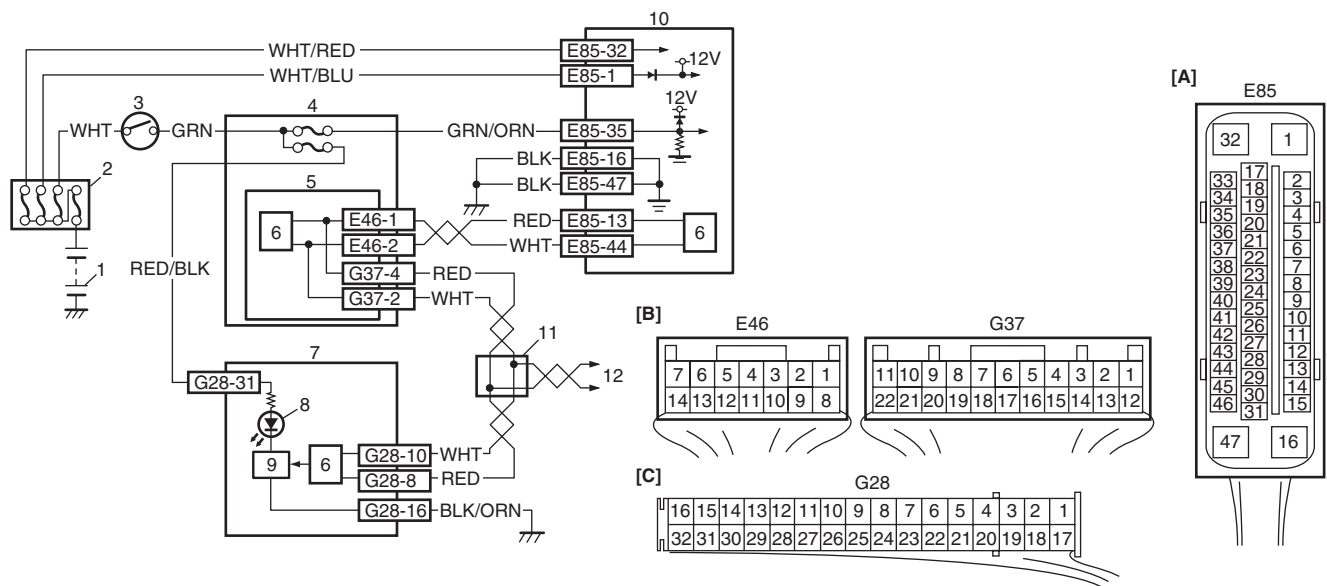
Step	Action	Yes	No
1	DTC Check for ESP® 1) Perform diagnostic trouble code check. <i>Is there any DTC(s)?</i>	Go to applicable DTC diag. flow.	Go to Step 2.
2	Check fuse <i>Are main fuses for good condition?</i>	Go to Step 3.	Replace fuse and check circuit for short to ground.
3	Check ESP® control module power supply circuit 1) Turn ignition switch to OFF. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector at terminals "E85-35", "E85-16" and "E85-47". 4) If OK then turn ignition switch to ON position and measure voltage between terminal "E85-35" and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 4.	"GRN/ORN" circuit open.
4	Check ESP® control module power supply circuit 1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals "E85-1" and "E85-32". 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of "E85-1", "E85-32" and vehicle body ground. <i>Are they 10 – 14 V?</i>	Go to Step 5.	"WHT/BLU" and/or "WHT/RED" circuit open.

Step	Action	Yes	No
5	Check ESP® control module ground circuit 1) Turn ignition switch to OFF and measure resistance between each terminal of “E85-16”, “E85-47” and vehicle body ground. <i>Is resistance less than 2 Ω?</i>	Go to Step 6.	Ground circuit for ESP® control module open or high resistance.
6	CAN communication circuit check 1) Check CAN communication circuit between combination meter and ESP® control module referring to “DTC U1073: Control Module Communication Bus Off”. <i>Is CAN communication circuit in good condition?</i>	Substitute a known-good combination meter and recheck. If warning lamp remains ON, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair or replace.

ABS Warning Lamp Does Not Come ON at Ignition Switch ON (with ESP® Model)

S6RS0B4604048

Wiring Diagram



I6RS0B460010-01

[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	8. ABS warning lamp
[B]: BCM connector (viewed from harness side)	4. Junction block assembly	9. Lamp driver module
[C]: Combination meter connector (viewed from harness side)	5. BCM (included in junction block assembly)	10. ESP® hydraulic unit / control module assembly
1. Battery	6. CAN driver	11. Junction connector
2. Main fuse box	7. Combination meter	12. To steering angle sensor

Circuit Description

Operation (ON/OFF) of ABS warning lamp is controlled by ESP® control module through lamp driver module in combination meter.

If antilock brake system is in good condition, 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 ESP® control module. Also, it is turned ON continuously by lamp driver module when the connector of ESP® control module is disconnected.

Troubleshooting

Refer to “Troubleshooting” under “ESP® Warning Lamp Does Not Come ON at Ignition Switch ON”.

ABS Warning Lamp Comes ON Steady (with ESP® Model)

S6RS0B4604049

Wiring Diagram

Refer to “Wiring Diagram” under “ABS Warning Lamp Does Not Come ON at Ignition Switch ON (with ESP® Model)”.

Circuit Description

Refer to “Circuit Description” under “ABS Warning Lamp Does Not Come ON at Ignition Switch ON (with ESP® Model)”.

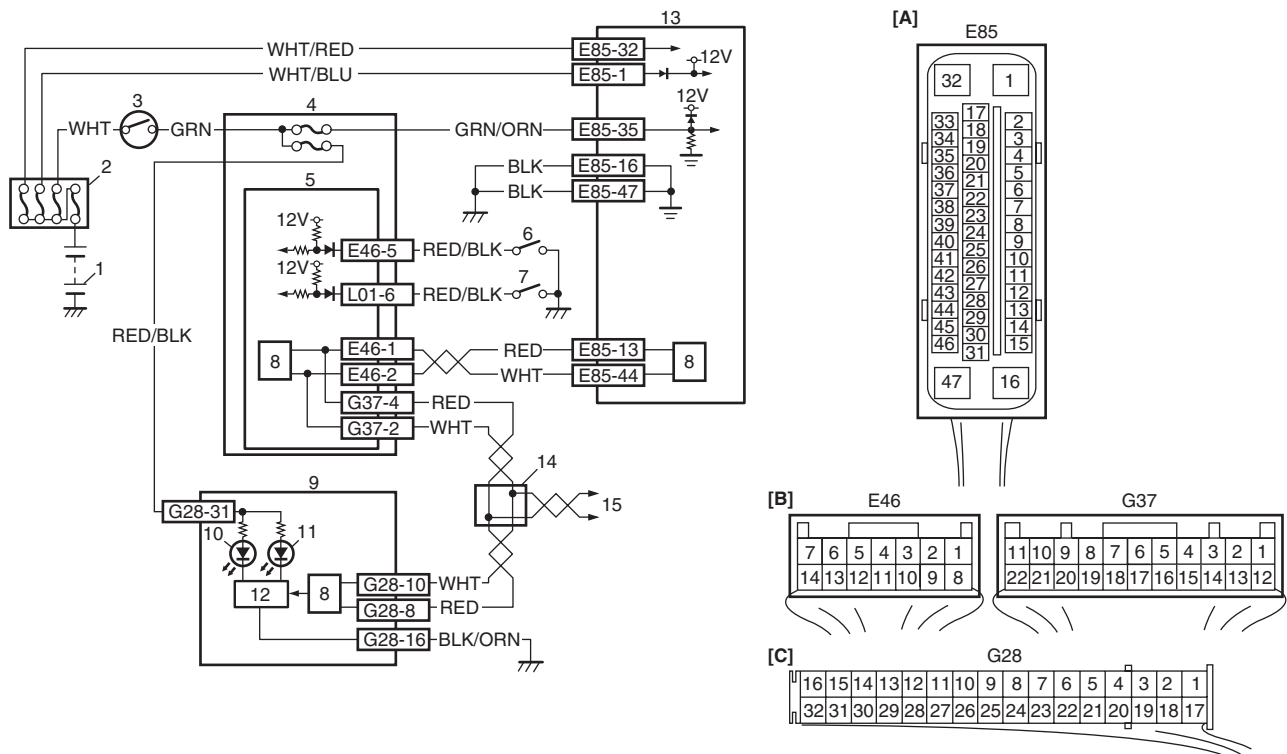
Troubleshooting

Refer to “Troubleshooting” under “ESP® Warning Lamp Comes ON Steady”.

EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady (with ESP® Model)

S6RS0B4604050

Wiring Diagram



I6RS0B460011-01

[A]: ESP® control module connector (viewed from terminal side)	4. Junction block assembly	10. EBD warning lamp (brake warning lamp)
[B]: BCM connector (viewed from harness side)	5. BCM (included in junction block assembly)	11. ABS warning lamp
[C]: Combination meter connector (viewed from harness side)	6. Brake fluid level switch	12. Lamp driver module
1. Battery	7. Parking brake switch	13. ESP® hydraulic unit / control module assembly
2. Main fuse box	8. CAN driver	14. Junction connector
3. Ignition switch	9. Combination meter	15. To steering angle sensor

Circuit Description

EBD warning lamp (brake warning lamp) is controlled by ESP® control module and BCM through lamp driver module in combination meter.

If EBD system is in good condition, ESP® control module turns EBD warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF.

EBD warning lamp is turned ON continuously at the following conditions.

- EBD system is an abnormality
- Connector of ESP® control module is disconnected
- Parking brake switch is ON
- 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.

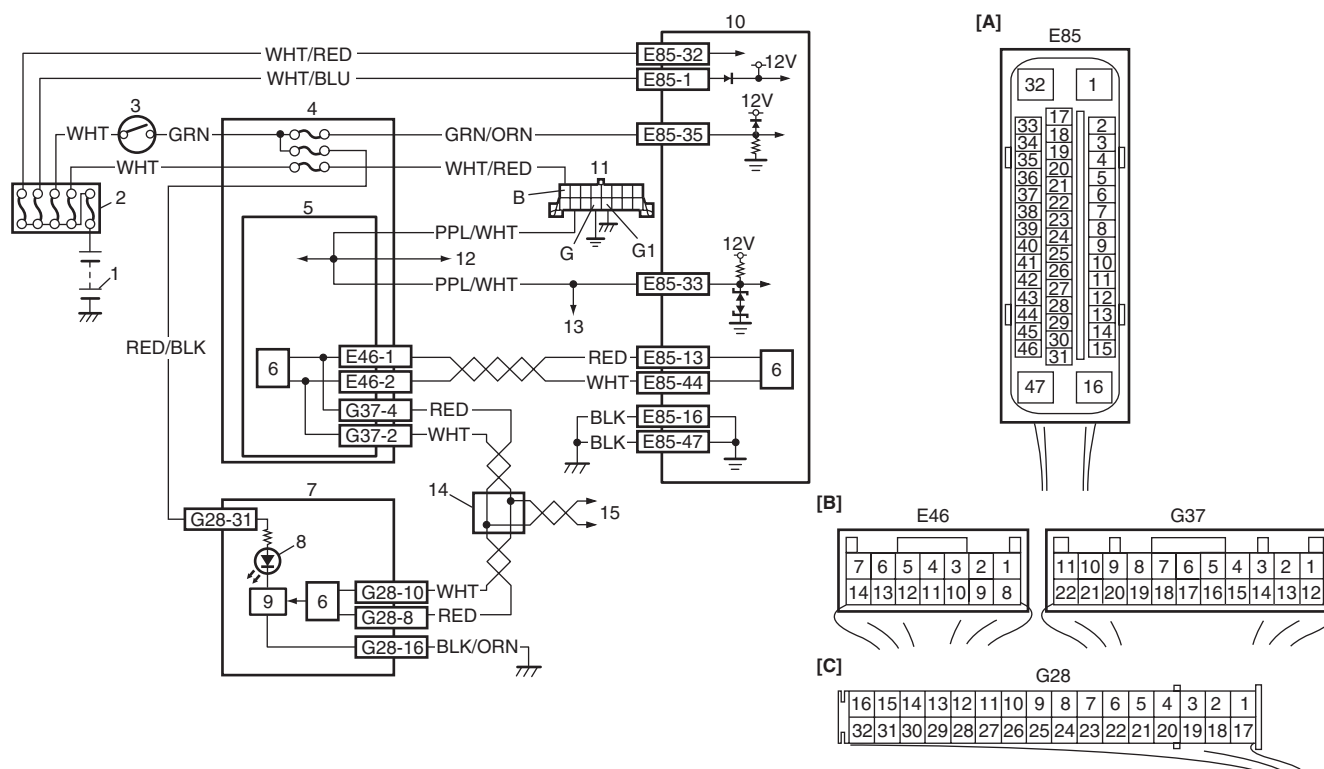
Troubleshooting

Step	Action	Yes	No
1	Check parking brake and brake fluid level 1) Make sure that: • Parking brake is completely released. • Brake fluid level is upper than the minimum level. <i>Are the check results OK?</i>	Go to Step 2.	Release parking brake completely and/or replenish brake fluid.
2	Check ABS warning lamp 1) Turn ignition switch to ON position. <i>Does ABS warning lamp come on steady?</i>	Perform "ABS Warning Lamp Does Not Come ON at Ignition Switch ON (with ESP® Model)" previously outlined.	Go to Step 3.
3	Check parking brake switch circuit and brake fluid level switch circuit 1) Release parking brake completely, and replenish brake fluid. 2) Disconnect BCM connectors with ignition switch turned OFF. 3) Measure resistance between each terminal of "L01-6", "E46-5" and vehicle body ground. <i>Are resistance $\infty \Omega$?</i>	Go to Step 4.	Check each applicable circuit for short to vehicle body ground. If OK, then check parking brake switch and/or brake fluid level switch.
4	CAN communication circuit check 1) CAN communication circuit between combination meter, ABS (ESP®) control module and BCM referring to "DTC U1073: Control Module Communication Bus Off". <i>Is CAN communication circuit in good condition?</i>	Substitute a known-good combination meter and recheck. If EBD warning lamp remains ON, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair or replace.

Serial Data Link Circuit Check

S6RS0B4604012

Wiring Diagram



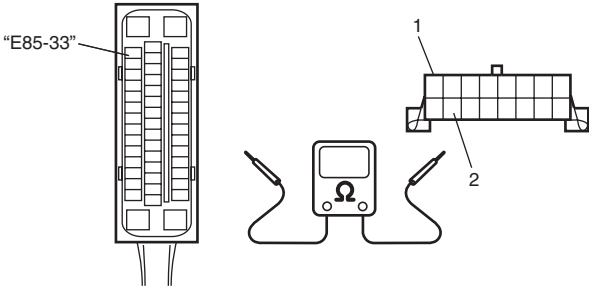
I6RS0B460012-01

[A]: ESP® control module connector (viewed from terminal side)	4. Junction block assembly	10. ESP® hydraulic unit / control module assembly
[B]: BCM connector (viewed from harness side)	5. BCM (included in junction block assembly)	11. Data link connector (DLC)
[C]: Combination meter connector (viewed from harness side)	6. CAN driver	12. To SDM
1. Battery	7. Combination meter	13. To ECM and P/S control module
2. Main fuse box	8. ESP® warning lamp	14. Junction connector
3. Ignition switch	9. Lamp driver module	15. To steering angle sensor

Inspection

Step	Action	Yes	No
1	Check ESP® warning lamp 1) Turn ignition switch to ON position. <i>Does ESP® warning lamp come ON?</i>	Go to Step 2.	Go to Step 6.
2	Check fuse 1) Turn ignition switch to OFF position. <i>Are main fuses for good condition?</i>	Go to Step 3.	Replace fuse and check for short.
3	Check ESP® control module power supply circuit 1) Disconnect ESP® control module connector. 2) Check for proper connection to ESP® control module connector at terminal "E85-35". 3) If OK then turn ignition switch to ON position and measure voltage between terminal "E85-35" and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 4.	"GRN/ORN" wire circuit open.

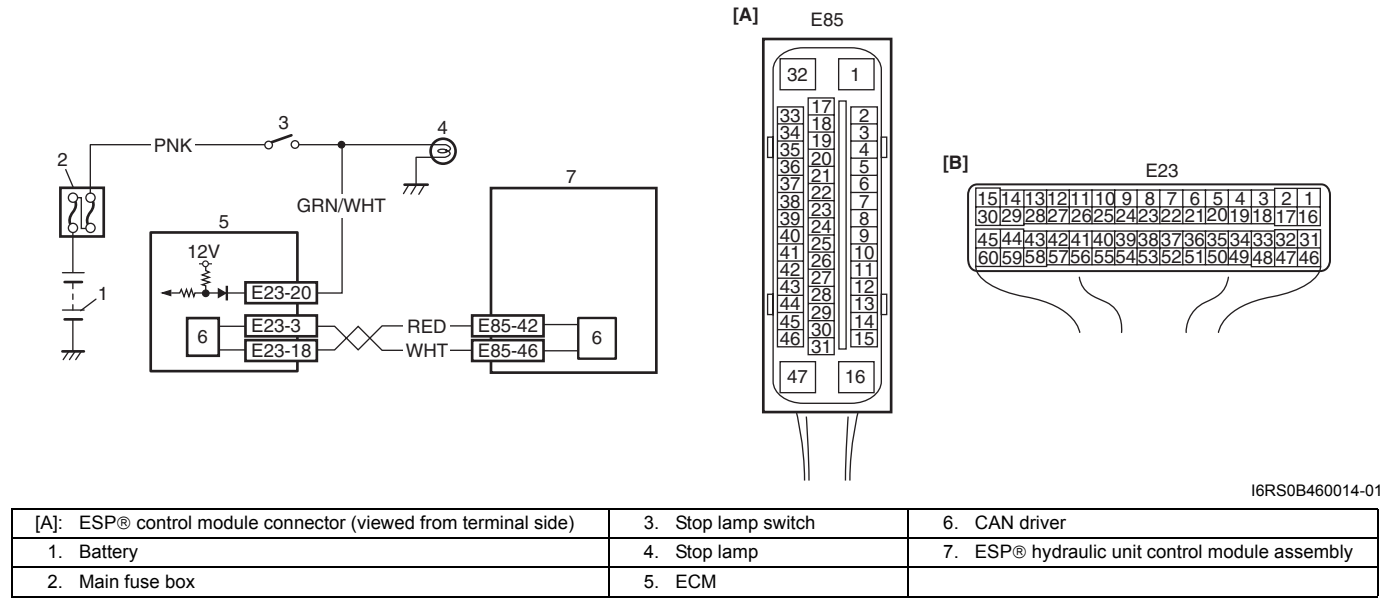
Step	Action	Yes	No
4	Check ESP® control module power supply circuit 1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals “E85-1” and “E85-32”. 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E85-1”, “E85-32” and vehicle body ground. <i>Are they 10 – 14 V?</i>	Go to Step 5.	“WHT/BLU” and/or “WHT/RED” wire circuit open.
5	Check ESP® control module ground circuit 1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals “E85-16” and “E85-47”. 3) If OK, measure resistance between each terminal of “E85-16”, “E85-47” and vehicle body ground. <i>Are resistance less than 2 Ω?</i>	Go to Step 6.	Ground circuit for ESP® control module open or high resistance.
6	Check serial data circuit 1) Check if communication is possible by trying communication with other controller (ECM, BCM, P/S control module or SDM). <i>Is it possible to communicate with other controller?</i>	Go to Step 7.	Repair open in common section of serial data circuit (“PPL/WHT” wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit (“PPL/WHT” wire circuit).
7	Check DLC power supply circuit 1) Turn ignition switch to ON position. 2) Measure voltage between terminal B of data link connector and vehicle body ground. <i>Is voltage 10 – 12 V?</i>	Go to step 8.	Terminal B circuit open or shorted to ground.
8	Check DLC ground circuit 1) Turn ignition switch to OFF position. 2) Measure resistance between the following terminals; - Terminal G of data link connector and vehicle body ground. - Terminal G1 of data link connector and vehicle body ground. <i>Is each resistance 1 Ω or less?</i>	Go to step 9.	Terminal G and/or G1 circuit open or high resistance.

Step	Action	Yes	No
9	Check serial data circuit 1) Turn ignition switch to OFF position. 2) Check proper connection at “E85-33” (“PPL/WHT” wire) terminal for serial data circuit. 3) If OK, then check resistance between “E85-33” (“PPL/ WHT” wire) terminal and “PPL/WHT” wire terminal (2) for serial data circuit in DLC (1). <i>Is resistance 1 Ω or less?</i> 	Substitute a known-good ESP® hydraulic unit / control module and recheck.	Check high resistance or open in “PPL/WHT” wire circuit for electronic stability program. If circuit is OK, substitute a known-good BCM and recheck.

DTC C1016: Stop Lamp Switch Circuit Failure

S6RS0B4604026

Wiring Diagram



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®. <i>Is DTC U1073 and/or U1100 detected?</i>	Go to applicable diag. flow.	Go to Step 3.
3	Check stop lamp switch circuit 1) Check stop lamp, stop lamp (brake pedal) switch and their circuit referring to "Stop (Brake) Lamp Symptom Diagnosis in Section 9B in related manual". <i>Are they in good condition?</i>	Go to Step 4.	Repair or replace.
4	Check ECM circuit for stop lamp switch 1) Disconnect connectors from ECM. 2) Check for proper connection to "E23-20" wire of ECM connector. 3) If connections are OK, check stop lamp switch circuit for the following. • Resistance of "GRN/WHT" wire terminal of stop lamp switch between stop lamp switch connector and ECM connector is less than 1 Ω (continuity check) • Resistance between "GRN/WHT" wire terminal of stop lamp switch connector and vehicle body ground is infinity (ground short check) • Voltage of between "GRN/WHT" wire terminal of stop switch connector and vehicle body ground is 0 V with ignition switch tuned ON (power short check) <i>Are they in good condition?</i>	Substitute a known-good ECM and recheck. If DTC C1016 is still detected, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair or replace defective wire.

DTC C1017 / C1023: Lateral G Sensor / Yaw Rate Sensor in Yaw Rate / G Sensor Assembly Failure

S6RS0B4604025

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
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

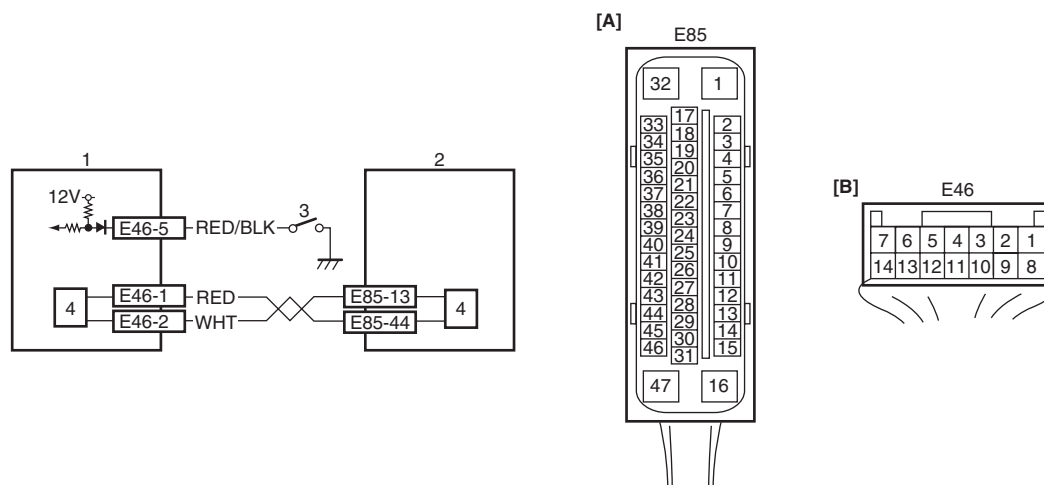
DTC Troubleshooting

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®. <i>Are DTC C1034 and/or C1073 detected?</i>	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®. <i>Are DTC C1017 and/or C1023 still detected?</i>	Go to Step 4.	Yaw rate / G sensor assembly calibration is incompleting.
4	Check yaw rate / G sensor assembly 1) Check yaw rate / G sensor assembly referring to "Yaw Rate / G Sensor Assembly On-Vehicle Inspection". <i>Is it good condition?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Substitute a known-good yaw rate / G sensor assembly and recheck.

DTC C1018: Brake Fluid Level Switch Failure

S6RS0B4604027

Wiring Diagram



I6RS0B460015-01

[A]: ESP® control module connector (viewed from terminal side)	1. BCM	3. Brake fluid level switch
[B]: BCM connector (viewed from harness side)	2. ESP® hydraulic unit control module assembly	4. CAN driver

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
- Brake fluid level is too low. - Input signal of brake fluid level switch to BCM is low level.	- 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. <i>Is brake fluid level upper than the minimum level?</i>	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®. <i>Is DTC U1073 and/or U1140 detected?</i>	Go to applicable diag. flow.	Go to Step 3.
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". <i>Is check result OK?</i>	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 "E46-5" terminal. 3) If OK, then check resistance between "E46-5" terminal and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 6.	"BLKL/RED" wire circuit is shorted to ground.
6	Check BCM 1) Connect brake fluid level switch connector and BCM connector. 2) Check voltage at "E46-5" terminal of BCM referring to "Inspection of BCM and its Circuits in Section 10B". <i>Is voltage in good condition?</i>	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 1020: Master Cylinder Pressure Sensor Power Supply Failure

S6RS0B4604028

DTC Detecting Condition and Trouble Area

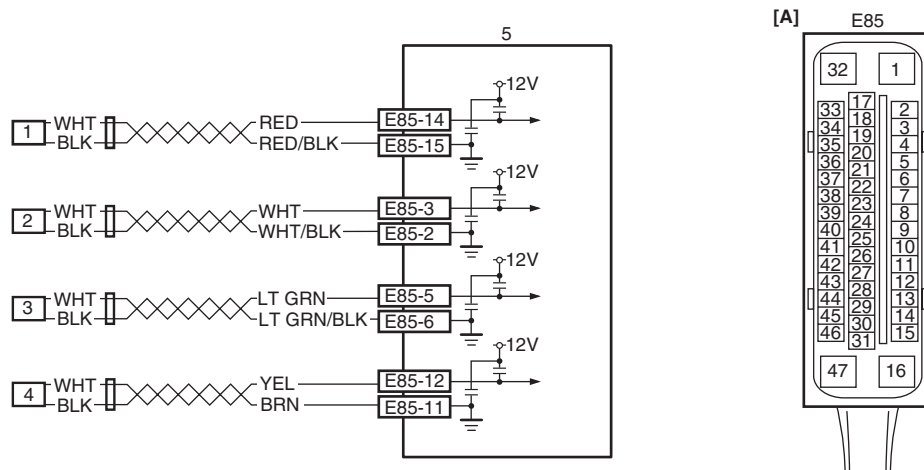
DTC Detecting Condition	Trouble Area
Power supply voltage to master cylinder pressure sensor in ESP® hydraulic unit / control module assembly is out of specification.	• ESP® control module

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

S6RS0B4604051

Wiring Diagram

I6RS0B460016-01

[A]: ESP® control module connector (viewed from terminal side)	2. Right- front wheel speed sensor	4. Right-rear wheel speed sensor
1. Left-front wheel speed sensor	3. Left-rear wheel speed sensor	5. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
DTC C1021, C1025, C1031, C1035: Wheel sensor signal is out of specified range. DTC C1022, C1026, C1032, C1036: Abnormal wheel speed sensor signal is detected.	- Wheel speed sensor - Wheel speed sensor circuit - Wheel encoder - ESP® control module

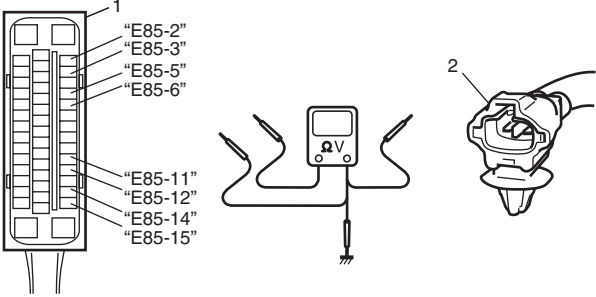
NOTE

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” and then performing the driving test as described in Step 2 of “Electronic Stability Program 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 “Electronic Stability Program Check” performed?	Go to Step 2.	Go to “Electronic Stability Program Check”.

Step	Action	Yes	No
2	Check wheel speed sensor circuit 1) Turn ignition switch OFF. 2) Disconnect connector from ESP® control module and applicable wheel speed sensor coupler. 3) Check for proper connection of ESP® control module and wheel speed sensor coupler. 4) If connections are OK, check wheel speed sensor circuit for the following. • Resistance of both ESP® control module connector (1) terminals a pair of applicable sensor terminals is no continuity (circuit short check) • Resistance of applicable sensor terminal of ESP® control module connector and vehicle body ground is no continuity (ground short check) • Resistance of applicable sensor terminal of ESP® control module connector and corresponding terminal of wheel speed sensor connector (2) in main harness (for front sensor) or floor harness (for rear sensor) is continuity (continuity check) • Voltage of applicable sensor terminal of ESP® control module connector and vehicle body ground is 0 V with ignition switch turned ON (power short check)  I6RS0B460017-02 <i>Are they in good condition?</i>	Go to Step 3.	Repair or replace defective circuit.
3	Check wheel speed sensor 1) Remove applicable wheel speed sensor. 2) Check sensor for damage or foreign material attached. <i>Is it in good condition?</i>	Go to Step 4.	Clean, repair or replace.
4	Check wheel encoder 1) Check front and/or rear wheel encoder for the following (remove front drive shaft and/or rear wheel hub assembly): • Encoder surface neither crack nor damaged • No foreign material being attached • Encoder not being eccentric • Wheel bearing free from excessive play <i>Are they in good condition?</i>	Go to Step 5.	Clean, repair or replace front wheel bearing and/or rear wheel hub assembly.
5	Check wheel speed sensor installing condition 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. <i>Is it OK?</i>	Go to Step 6.	Replace wheel speed sensor.

4F-32 Electronic Stability Program:

Step	Action	Yes	No
6	Check wheel speed sensor 1) Refer to "Front / Rear Wheel Speed Sensor On-Vehicle Inspection", check output voltage or waveform. <i>Is specified voltage and/or waveform obtained?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Replace wheel speed sensor and recheck.

DTC C1024: Steering Angle Sensor Circuit Failure

S6RS0B4604029

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

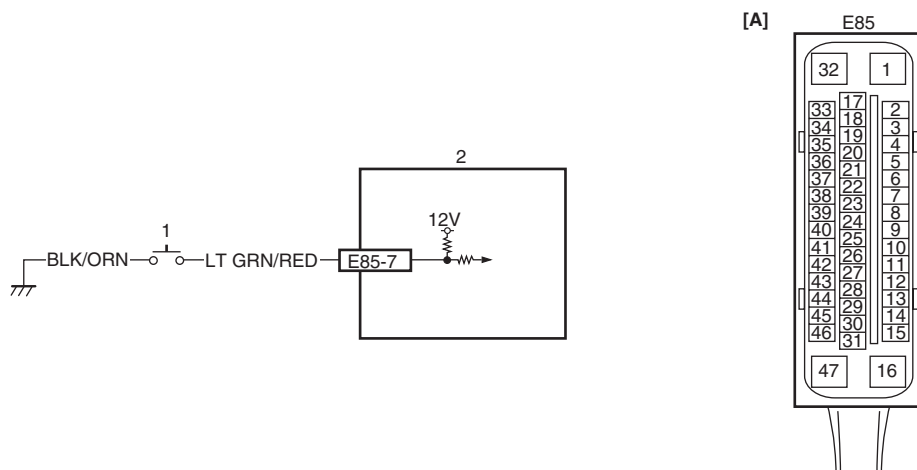
DTC Troubleshooting

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®. <i>Are DTC U1073 and/or U1126 detected?</i>	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 check DTC for ESP®. <i>Is DTC C1024 still detected?</i>	Go to Step 4.	Steering angle sensor calibration was incompleting.
4	Check steering angle sensor 1) Check steering angle sensor referring to "Steering Angle Sensor On-Vehicle Inspection". <i>Is it good condition?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Replace steering angle sensor.

DTC C1027: ESP® OFF Switch Circuit Failure

S6RS0B4604030

Wiring Diagram



I6RS0B460018-01

[A]: ESP® control module connector (viewed from terminal side)	1. ESP® OFF Switch	2. ESP® hydraulic unit control module assembly
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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 <i>Is ESP® OFF switch is OFF condition?</i>	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". <i>Is it good condition?</i>	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 "E85-7" terminal. 3) If OK, then check resistance between "E85-7" terminal and vehicle body ground. <i>Is resistance infinity?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"LT GRN/RED" wire circuit is shorted to ground.

DTC C1028: Master Cylinder Pressure Sensor Circuit Failure

S6RS0B4604031

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

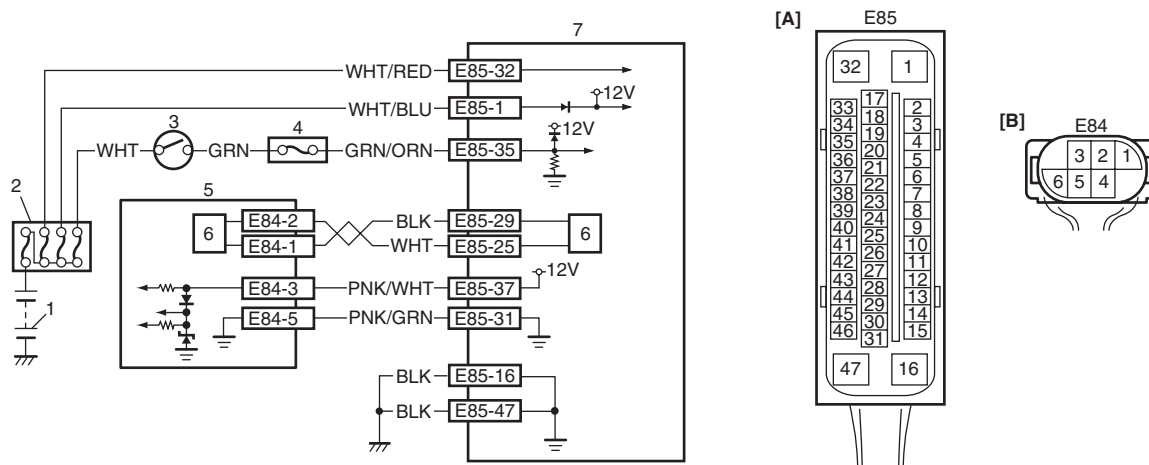
DTC Troubleshooting

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 <i>Are they in good condition?</i>	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 recheck DTC. <i>Is DTC C1028 still detected?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly recheck.	Master cylinder pressure sensor calibration was incomplected.

DTC C1034: Yaw Rate / G Sensor Assembly Power Supply Failure

S6RS0B4604032

Wiring Diagram



I6RS0B460019-01

[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

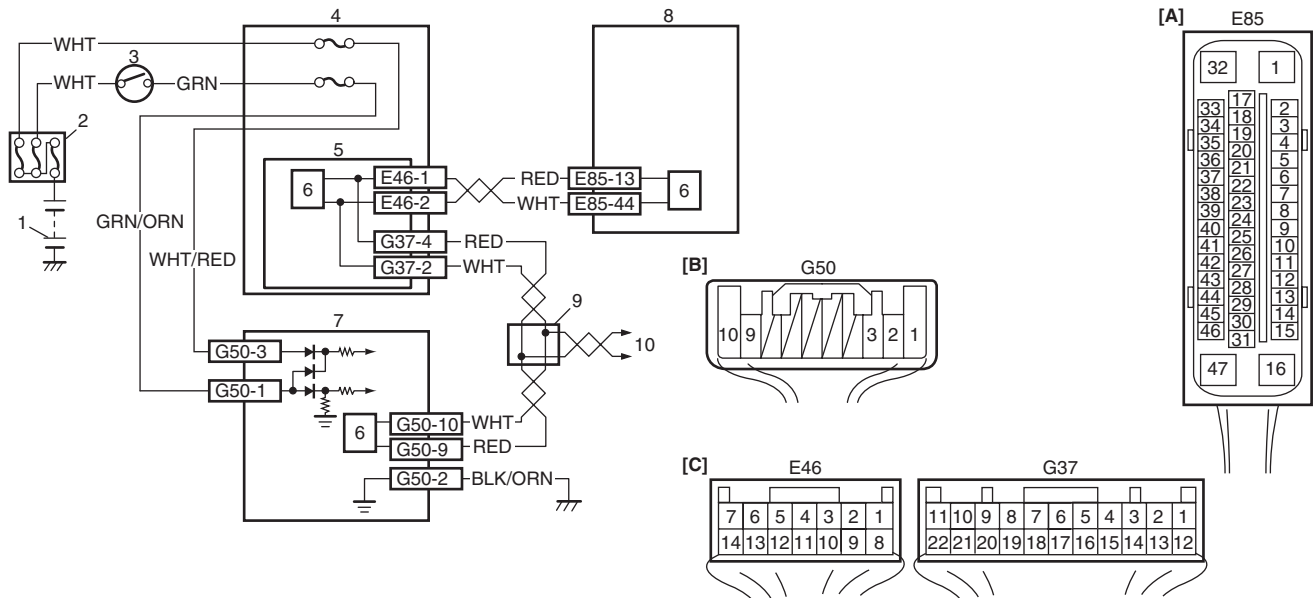
Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check yaw rate / G sensor assembly ground circuit - Turn ignition switch to OFF position. - Disconnect yaw rate / G sensor assembly connector. - Check for proper connection to yaw rate / G sensor assembly connector terminals at "E84-3" and "E84-5". - If OK, then measure voltage between connector terminal "E84-3" and vehicle body ground. Is it 0 V?	Go to Step 3.	Go to Step 4.
3	Check yaw rate / G sensor assembly power supply circuit Measure voltage between connector terminal "E84-3" and "E84-5" with ignition switch turned ON. Is it 10 – 14 V?	Substitute a known-good yaw rate / G sensor assembly and recheck.	Go to Step 4.

Step	Action	Yes	No
4	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 “E85-31” and “E85-37”. 4) If OK, then measure voltage between connector terminal “E85-37” and vehicle body ground. <i>Is it 0 V?</i>	Go to Step 5.	“PNK/WHT” wire circuit is shorted to power circuit.
5	Check yaw rate / G sensor assembly power supply circuit 1) Measure resistance between the following points. • Between terminal “E85-37” of module connector and terminal “E84-3” of sensor terminal. • Between terminal “E85-31” of module connector and terminal “E84-5” of sensor terminal. <i>Are resistance less than 2 Ω?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly recheck.	“PNK/WHT” and/or “PNK/GRN” wire circuit open or high resistance.

DTC C1037: Steering Angle Sensor Power Supply Failure

S6RS0B4604033

Wiring Diagram



I6RS0B460020-01

[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	8. ESP® hydraulic unit control module assembly
[B]: Steering angle sensor connector (viewed from harness side)	4. Junction block assembly	9. Junction connector
[C]: BCM connector (viewed from harness side)	5. BCM (included in junction block assembly)	10. To Combination meter and keyless start control module
1. Battery	6. CAN driver	
2. Main fuse box	7. Steering angle sensor	

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 fuse 1) Check circuit fuses for steering angle sensor and its circuit. <i>Is it good condition?</i>	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 "G50-1", "G50-2" and "G50-3". 4) If OK, then measure voltage between connector terminal "G50-3" and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 4.	"WHT/RED" wire circuit open.
4	Check steering angle sensor power supply circuit 1) Measure voltage between connector terminal "G50-1" and vehicle body ground with ignition switch turned ON. <i>Is it 10 – 14 V?</i>	Go to Step 5.	"GRN/ORN" wire circuit open.
5	Check steering angle sensor ground circuit 1) Turn ignition switch to OFF position. 2) Measure resistance between connector terminal "G50-2" and vehicle body ground. <i>Is resistance less than 2 Ω?</i>	Go to Step 6.	"BLK/ORN" 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". <i>Is it good condition?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Substitute a known-good steering angle sensor and recheck.

DTC C1038: Steering Angle Sensor Detect Rolling Counter Failure from ESP® Control Module

S6RS0B4604034

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".

Step	Action	Yes	No
2	Check DTC 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC. <i>Is there any DTC(s) other than C1038 and C1090?</i>	Go to applicable DTC diag. flow.	Substitute a known-good steering angle sensor and recheck. If DTC C1038 is still detected, substitute a known-good ESP® hydraulic unit control module assembly and recheck.

DTC C1039: Yaw Rate / G Sensor Assembly Internal Failure

S6RS0B4604035

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	<i>Was "Electronic Stability Program Check" performed?</i>	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. <i>Are DTC C1034 and/or C1073 detected?</i>	Go to applicable DTC diag. flow.	Go to step 3.
3	Check yaw rate / G sensor assembly 1) Check yaw rate / G sensor assembly referring to "Yaw Rate / G Sensor Assembly On-Vehicle Inspection". <i>Is it good condition?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Substitute a known-good yaw rate / G sensor assembly and recheck.

DTC C1040: Stability Control System Function Failure

S6RS0B4604036

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	<i>Was "Electronic Stability Program Check" performed</i>	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®. <i>Is there any DTC(s) other than C1040?</i>	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly 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

S6RS0B4604052

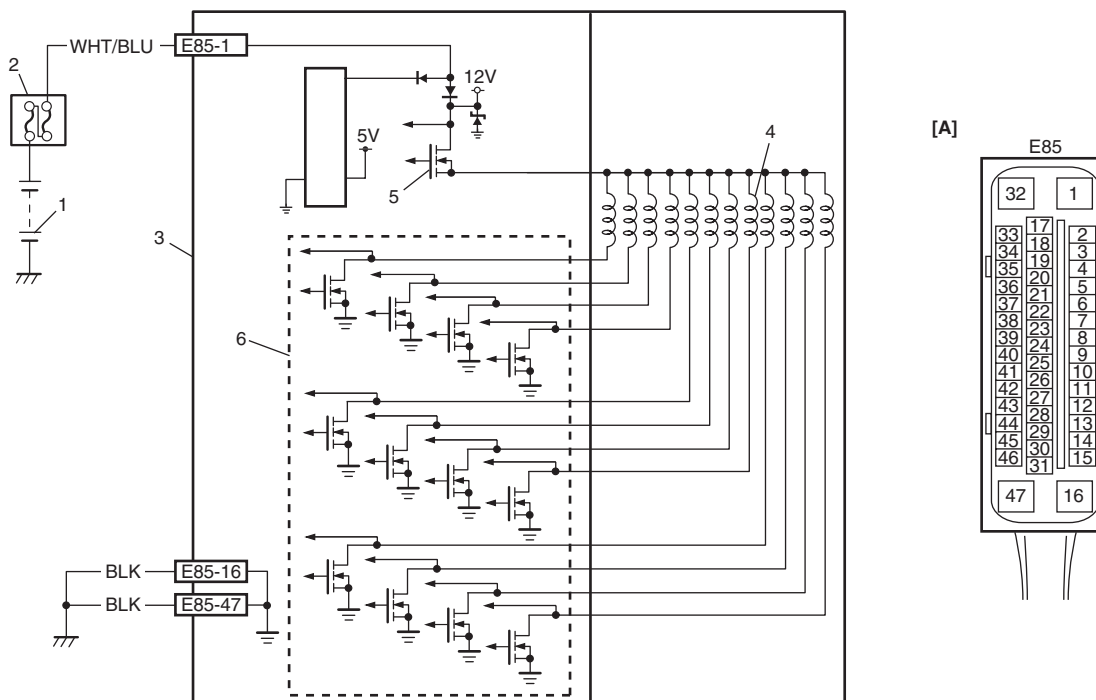
DTC C1041 / C1045 / C1051 / C1055: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit Failure

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

Wiring Diagram



I6RS0B460021-01

[A]: ESP® control module connector (viewed from terminal side)	3. ESP® hydraulic unit / control module assembly	6. Solenoid valve driver (transistor)
1. Battery	4. Solenoid valve	
2. Main fuse box	5. Solenoid valve power supply driver (transistor)	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
DTC C1041, C1042, C1043, C1044, C1045, C1046, C1051, C1052, C1053, C1054, C1055, C1056 Mismatching solenoid output and solenoid monitor is detected.	ESP® control module

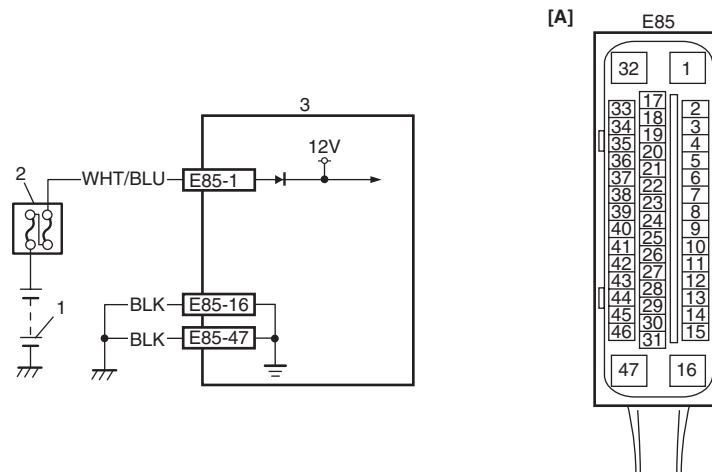
DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".

Step	Action	Yes	No
2	Check solenoid valve 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 at terminal “E85-1”, “E85-16” and “E85-47”. 4) If OK, then measure voltage between terminal “E85-1” of module connector and “E85-16, E85-47”. <i>Are they 10 – 14 V?</i>	Substitute a known-good ESP® hydraulic unit /control module assembly and recheck.	“WHT/BLU” or “BLK” circuit open.

DTC C1057: ESP® Control Module Power Supply Circuit Failure

S6RS0B4604053

Wiring Diagram

I6RS0B460023-02

[A]: ESP® control module connector (viewed from terminal side)	2. Main fuse box
1. Battery	3. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• ESP® control module power supply voltage is too high. • ESP® control module power supply voltage is too low.	• ESP® control module power supply 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 power supply circuit from battery 1) Disconnect ESP® hydraulic unit / control module connector with ignition switch turned OFF. 2) Check for proper connection to ESP® control module connector at terminals “E83-1”, “E85-16” and “E85-47”. 3) If OK, then turn ignition switch to ON position and measure voltage between terminals “E85-1” and “E85-16”, “E85-47”. <i>Are voltage 9.7 ± 0.3 V or more?</i>	Go to Step 5.	Go to Step 3.

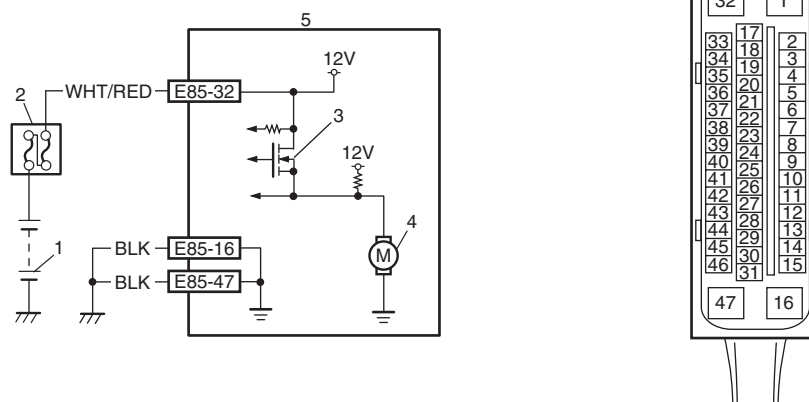
4F-40 Electronic Stability Program:

Step	Action	Yes	No
3	Check ESP® control module ground circuit 1) Measure resistance between each terminal of “E85-16”, “E85-47” and vehicle body ground. <i>Is resistance less than 2 Ω?</i>	Go to Step 4.	“BLK” wire circuit in open or high resistance.
4	Check power supply circuit from battery 1) Measure voltage between positive battery terminal and vehicle body ground with engine running. <i>Is voltage 9.7 ± 0.3 V or more?</i>	Imperfect short between “WHT/BLU” wire circuit and vehicle body ground.	Check charging system referring to “Generator Test (Undercharged Battery Check) (For 75A Type): For M13, M15 and M16 Engines in Section 1J in related manual”.
5	Check power supply circuit from battery 1) Measure voltage between terminals “E85-1” and “E85-16”, “E85- 47” with engine running. <i>Are voltage 18 ± 1.0 V or less?</i>	Poor connection of “E85-1”, “E85-16” and/or “E85-47” terminals. If the terminals are in good condition, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check charging system referring to “Generator Test (Overcharged Battery Check): For Z13DT Engine in Section 1J in related manual”.

DTC C1061: Pump Motor and/or Motor Driver Circuit Failure

S6RS0B4604054

Wiring Diagram



I6RS0B460024-02

[A]: ESP® control module connector (viewed from terminal side)	2. Main fuse box	4. Pump motor
1. Battery	3. Pump motor driver (transistor)	5. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Defective pump motor and/or motor power supply voltage is too low.	- Pump Motor and/or Motor Driver power supply circuit - ESP® control module

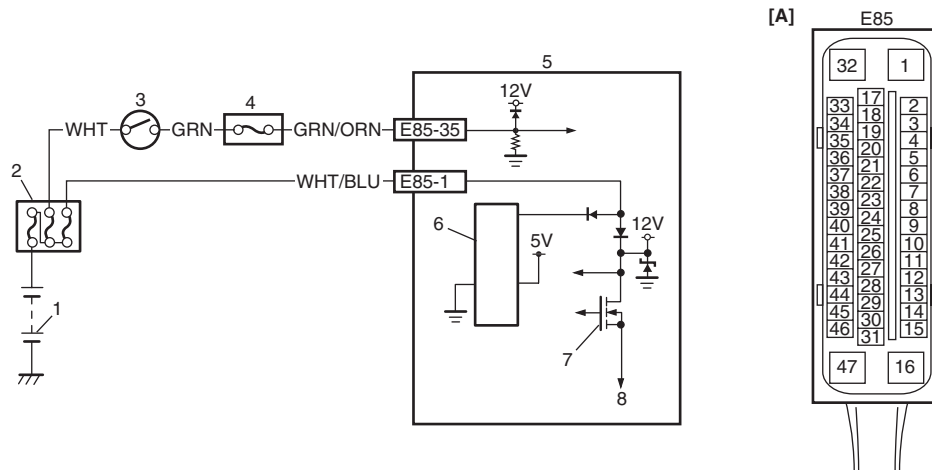
DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check ESP® control module 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 at terminal "E85-32". 4) If OK, then measure voltage between terminal "E85-32" of module connector and body ground. <i>Is it 10 – 14 V?</i>	Go to Step 3.	"WHT/RED" circuit open.
3	Check ESP® control module ground circuit 1) Measure resistance between terminal "E85-16" and "E85-47" ESP® control module connector and vehicle body ground. <i>Are resistance less than 1 Ω?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Ground circuit for ESP® control module open or high resistance.

DTC C1063: Solenoid Valve Power Supply Driver Circuit Failure

S6RS0B4604055

Wiring Diagram



I6RS0B460025-02

[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	6. Power control unit
1. Battery	4. Junction block assembly	7. Solenoid valve power supply driver (transistor)
2. Main fuse box	5. ESP® hydraulic unit / control module assembly	8. To solenoid valve

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
- Mismatching solenoid output and solenoid monitor is detected. - Solenoid valve circuit is shorted to power or ground circuit in ESP® control module	- Solenoid valve power supply 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 power supply circuit from battery 1) Check battery voltage. <i>Is it about 11 V or higher?</i>	Go to Step 3.	Check charging system referring to "Battery Inspection: For M13, M15 and M16 Engines in Section 1J" and "Generator Test (Undercharged Battery Check) (For 75A Type): For M13, M15 and M16 Engines in Section 1J in related manual".
3	Check fuse 1) Check main fuse for solenoid and its terminal. <i>Is it in good condition?</i>	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	Check solenoid valve power supply circuit 1) Turn ignition switch to OFF position. 2) Disconnect control module connector. 3) Check for proper connection to ESP® control module at terminal "E85-1". 4) If OK, then measure voltage between connector terminal "E85-1" and vehicle body ground. <i>Is it 10 – 14 V?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"WHT/BLU" circuit imperfect short to ground.

DTC 1071: ESP® Control Module Internal Defect

S6RS0B4604056

DTC Detecting Condition and Trouble Area

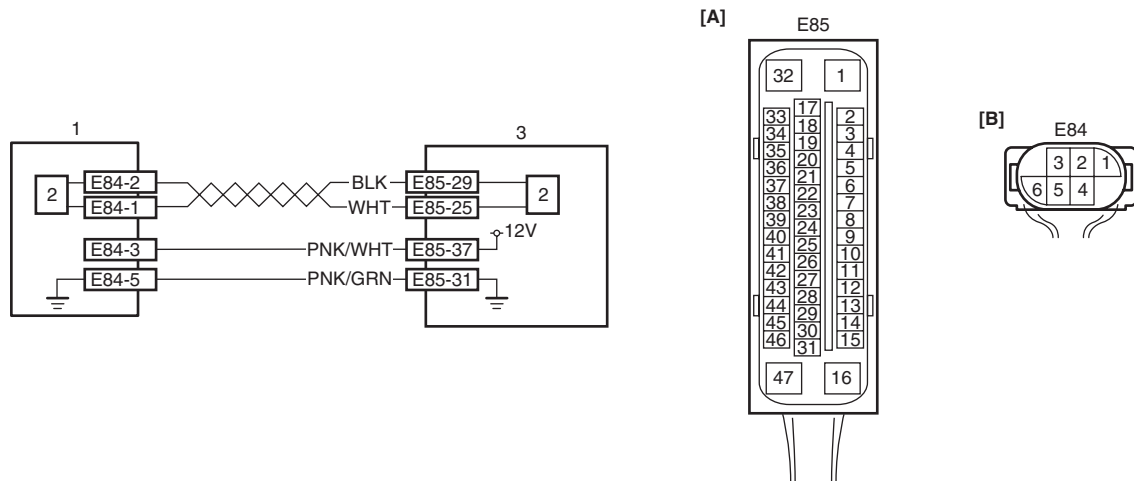
DTC Detecting Condition	Trouble Area
ESP® control module internal defect is detected.	• ESP® control module

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 C1073: Lost Communication With Yaw Rate / G Sensor Assembly

S6RS0B4604038

Wiring Diagram

I6RS0B460026-03

[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	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 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 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.

4F-44 Electronic Stability Program:

Step	Action	Yes	No
4	Check yaw rate / G sensor assembly 1) Check yaw rate / G sensor assembly power and ground circuit referring to "DTC Troubleshooting" under "DTC C1034: Yaw Rate / G Sensor Assembly Power Supply Failure". 2) If OK, then substitute a known-good yaw rate / G sensor assembly. 3) Connect connectors to ESP® control module and yaw rate / G sensor assembly. 4) Clear all DTC(s) and check DTC for ESP®. <i>Is DTC C1073 still detected?</i>	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Yaw rate / G sensor assembly was malfunction.

DTC C1075 / 1076 / 1078: Steering Angle Sensor / Master Cylinder Pressure Sensor / Lateral G Sensor in Yaw Rate / G Sensor Assembly Calibration Incomplete

S6RS0B4604039

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
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®. <i>Is there any DTC(s) other than C1075, C1076 and C1078?</i>	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 check DTC for ESP®. <i>Is DTC C1075, C1076 and/or C1078 still detected?</i>	DTC C1075: Substitute a known-good steering angle sensor and recheck. DTC C1076: Substitute a known-good ESP® hydraulic unit / control module assembly and recheck. DTC C1078: Substitute a known-good yaw rate / G sensor assembly and recheck.	Calibration was incompleted.

DTC C1090: ECM Detect Rolling Counter Failure from ESP® Control Module

S6RS0B4604040

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®. <i>Is there any DTC(s) other than C1038 and C1090?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	DTC check for ECM 1) Check DTC for ECM. <i>Is DTC P1674 and/or DTC P1685 detected?</i>	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC C1091: ECM Data in CAN Line Failure

S6RS0B4604041

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ECM sent invalid signal to ESP® control module.	• Engine control system • ECM • ESP® control module

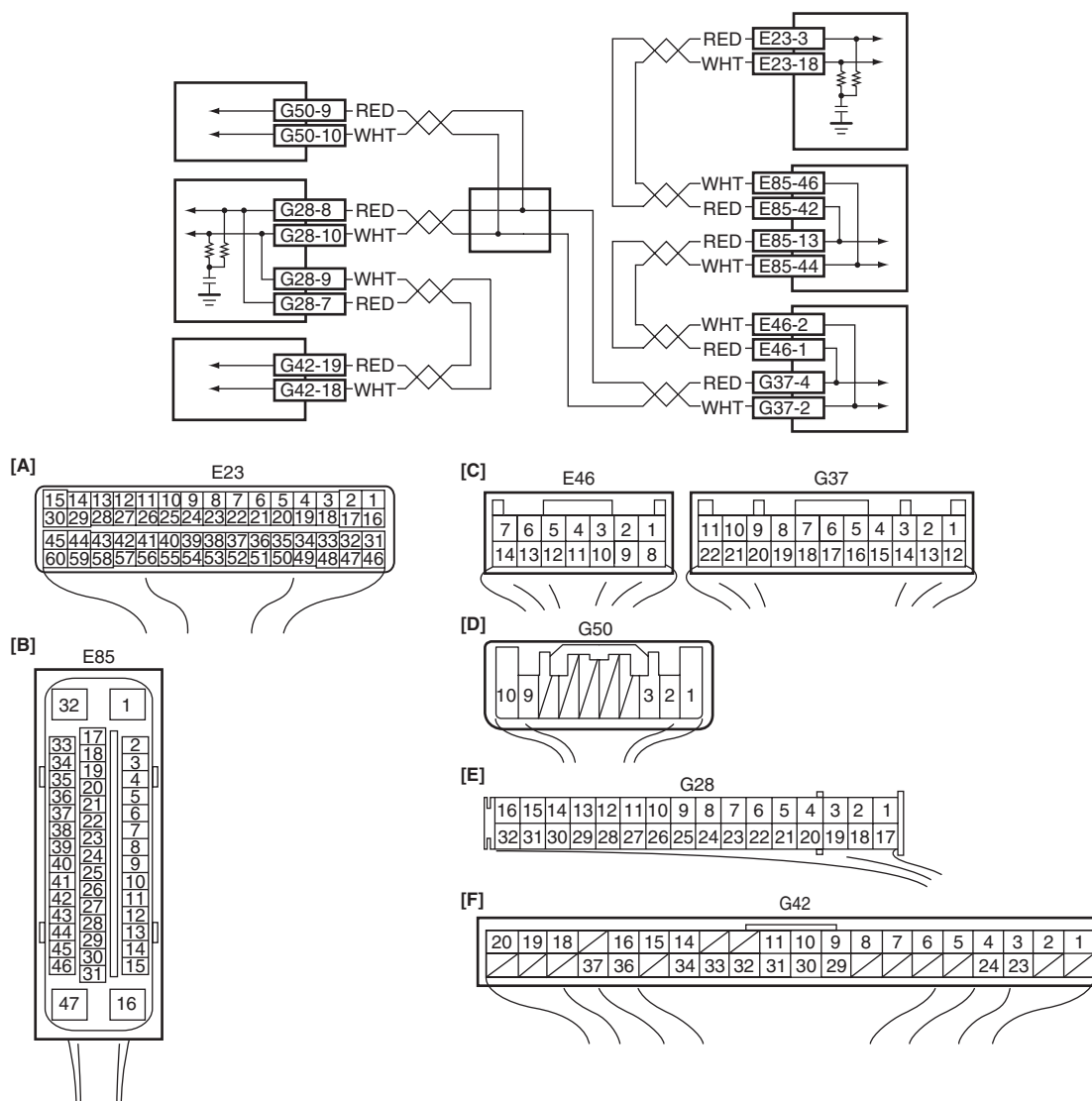
DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	DTC check other control module than ESP® 1) Check DTC for ECM. <i>Is there any DTC(s)?</i>	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

S6RS0B4604057

Wiring Diagram



I6RS0B460027-02

[A]: ECM connector (viewed from harness side)	[F]: Keyless start control module connector (viewed from harness side)	5. Combination meter
[B]: ESP® control module connector (viewed from terminal side)	1. ECM	6. Keyless start control module (if equipped)
[C]: BCM connector (viewed from harness side)	2. ESP® hydraulic unit / control module assembly	7. Junction connector
[D]: Steering angle sensor connector (viewed from harness side)	3. BCM	
[E]: Combination meter connector (viewed from harness side)	4. Steering angle sensor	

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.	- CAN communication circuit - ECM - ESP® control module - BCM - Steering angle sensor - Combination meter - Keyless start control module (if equipped)

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 connection of connectors of all control modules communicating by means of CAN. 2) Recheck DTC for ESP®. <i>Is DTC U1073 indicated?</i>	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. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 4.	Repair or replace the CAN communication line.
4	DTC check for ESP® 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector. • ECM • Keyless start control module (if equipped) • Combination meter • Steering angle sensor • BCM 3) Recheck DTC for ESP®. <i>Is DTC U1073 detected?</i>	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 U1100: Lost Communication with ECM (Reception Error)

S6RS0B4604058

Wiring Diagram

Refer to "Wiring Diagram" under "DTC U1073: Control Module Communication Bus Off".

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ECM message data is missing from CAN communication.	• 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) Check DTC for ESP®. <i>Is DTC U1100 and DTC U1073 detected together?</i>	Go to "DTC U1073: Control Module Communication Bus Off".	Go to Step 3.
3	DTC check for ECM 1) Check DTC for ECM. <i>Is DTC P1674 detected?</i>	Go to "DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines in Section 1A".	Go to Step 4.

4F-48 Electronic Stability Program:

Step	Action	Yes	No
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®. <i>Is DTC U1100 detected?</i>	Go to Step 5.	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 ECM communicating by means of CAN. 3) Check CAN communication circuit between ESP® control module and ECM for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	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. 2) Check CAN communication circuit between control modules other than Step 5 for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 7.	Repair or replace the CAN communication line.
7	DTC check for ESP® 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector. • ECM • Keyless start control module (if equipped) • Combination meter • Steering angle sensor • BCM 3) Recheck DTC for ESP®. <i>Is DTC U1100 detected?</i>	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 U1126: Lost Communication with Steering Angle Sensor (Reception Error)

S6RS0B4604043

Wiring Diagram

Refer to "Wiring Diagram" under "DTC U1073: Control Module Communication Bus Off".

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	<i>Was "Electronic Stability Program Check" performed?</i>	Go to Step 2.	Go to "Electronic Stability Program Check".
2	DTC check for ESP® 1) Check DTC for ESP®. <i>Is DTC U1126 and DTC U1073 detected together?</i>	Go to "DTC U1073: Control Module Communication Bus Off".	Go to Step 3.

Step	Action	Yes	No
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®. <i>Is DTC U1126 detected?</i>	Go to Step 4.	Check for intermittent trouble 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, BCM and steering angle sensor communicating by means of CAN. 3) Check CAN communication circuit for open, short and high resistance. - Between ESP® control module and BCM - Between steering angle sensor and BCM <i>Is each CAN communication circuit in good condition?</i>	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. 2) Check CAN communication circuit between control modules other than Step 4 for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	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. - ECM - Keyless start control module - Combination meter - Steering angle sensor - BCM 3) Check DTC for ESP®. <i>Is DTC U1126 detected?</i>	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)

S6RS0B4604045

Wiring Diagram

Refer to "Wiring Diagram" under "DTC U1073: Control Module Communication Bus Off".

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
BCM message data is missing from CAN communication.	- CAN communication circuit - 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	DTC check for ESP® 1) Check DTC for ESP®. <i>Is DTC U1140 and DTC U1073 detected together?</i>	Go to "DTC U1073: Control Module Communication Bus Off".	Go to Step 3.
3	DTC check for BCM 1) Check DTC for BCM. <i>Is DTC U1073 detected?</i>	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®. <i>Is DTC U1140 detected?</i>	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. 3) Check CAN communication circuit between ESP® control module and BCM for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	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. 2) Check CAN communication circuit between control modules other than Step 5 for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 7.	Repair or replace the CAN communication line.
7	DTC check for ESP® 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector. • ECM • Keyless start control module • Combination meter • Steering angle sensor • BCM 3) Check DTC for ESP®. <i>Is DTC U1140 detected?</i>	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

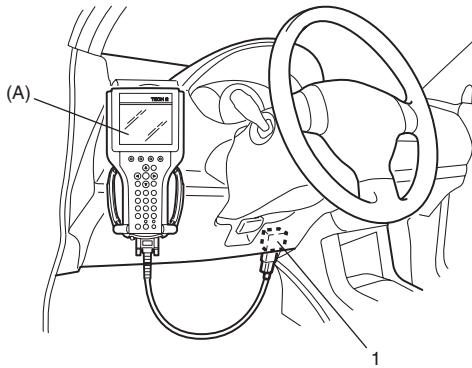
ESP® Hydraulic Unit Operation Check

S6RS0B4606025

- 1) Check that basic brake system other than 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 braked ragging 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



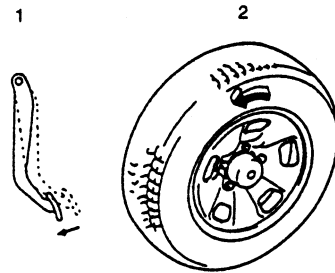
I4RS0B450003-01

- 7) Turn ignition switch to ON position and select menu press / depress in "HYDRAULIC CONTROL TEST" under "miscellaneous test" ("MISC. TEST") mode of SUZUKI scan tool.
Refer to SUZUKI scan tool operator's manual for further details.
- 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.



I4RH01450021-01

- 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.

Sensor Calibration

S6RS0B4606015

⚠ CAUTION

If any DTC(s) other than C1075, C1076 or C1078 are detected, sensor calibration can not be completed. 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.

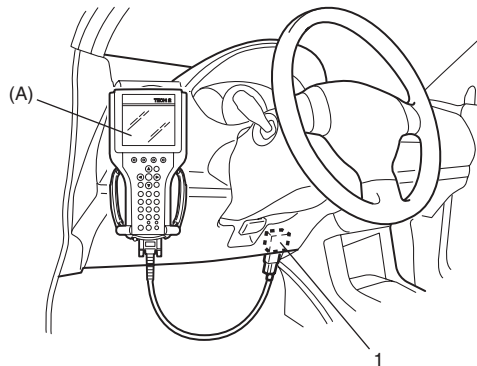
When ESP® control module and/or yaw rate / G sensor assembly is removed, sensor calibration is needed with SUZUKI Scan Tool.

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



I4RS0B450003-01

- 3) Turn ignition switch to ON position and confirm that only any of DTC(s) C1075, C1076 and/or C1077 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 pedal.

⚠ CAUTION

Hold the above condition in Step 4) to calibrate sensor correctly until sensor calibration is 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 details.
- 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

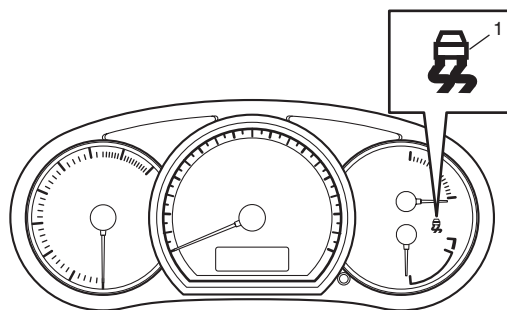
When power is not supplied to the steering angle sensor by removing battery or fuse, steering angle sensor should be calibrated.

- 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 flashes and other indicator illuminate. In that case, repair the detected DTC first.



I6RS0B460028-02

- 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

S6RS0B4606027

⚠ CAUTION

Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ESP® hydraulic unit / control module assembly.

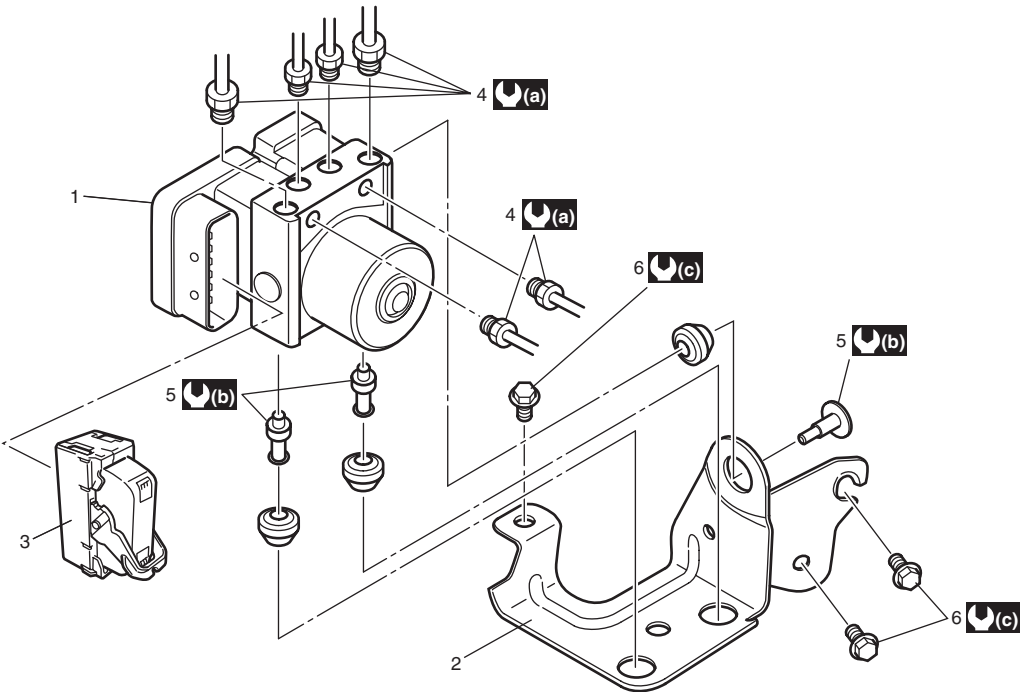
Check hydraulic unit for fluid leakage.
If any, repair or replace.

ESP® Hydraulic Unit / Control Module Assembly Removal and Installation

S6RS0B4606026

⚠ CAUTION

Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ESP® hydraulic unit / control module assembly.

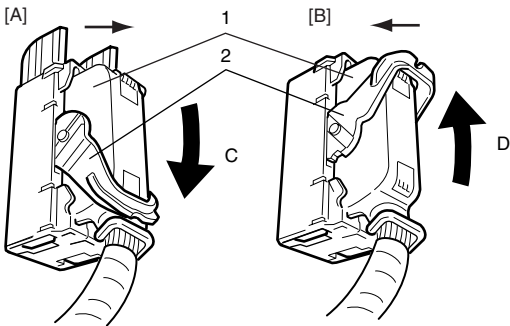


I6RS0B460029-02

1. ESP® hydraulic unit / control module assembly	4. Brake pipe flare nut	⚙(a) : 16 N·m (1.6 kgf·m, 11.5 lb·ft)
2. Bracket	5. ESP® hydraulic unit / control module assembly bolt	⚙(b) : 9 N·m (0.9 kgf·m, 6.5 lb·ft)
3. ESP® control module connector	6. ESP® hydraulic unit / control module assembly bracket bolt	⚙(c) : 25 N·m (2.5 kgf·m, 18.0 lb·ft)

Removal

- 1) Disconnect negative (–) cable from battery.
- 2) Disconnect ESP® control module connector as shown in figure.



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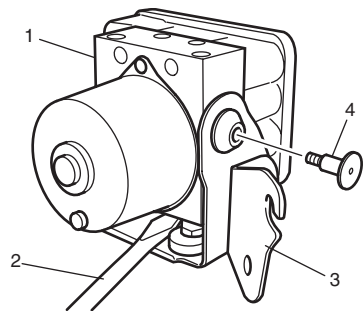
[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

- 3) Remove front brake pipe referring to “Front Brake Hose / Pipe Removal and Installation in Section 4A in related manual”.
- 4) Remove ABS (ESP®) hydraulic unit / control module with bracket from vehicle by removing bracket bolts.

- 5) Remove bolt (4) and pull out 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.



I6RS0B460030-02

Installation

Install hydraulic unit / control module assembly by reversing removal procedure, noting the following instructions.

- Tighten all fasteners to specified torque.

Tightening torque

Brake pipe flare nut: 16 N·m (1.6 kgf-m, 11.5 lb-ft)
ESP® hydraulic unit / control module assembly bolt: 9 N·m (0.9 kgf-m, 6.5 lb-ft)
ESP® hydraulic unit / control module assembly bracket bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

- Install front brake pipe referring to “Front Brake Hose / Pipe Removal and Installation in Section 4A in related manual”.
- Bleed air from brake system referring to “Air Bleeding of Brake System in Section 4A”.
- Check each installed part for fluid leakage and perform “ESP® Hydraulic Unit Operation Check”.

NOTE

For new ESP® hydraulic unit / control module assembly, if “ESP® Hydraulic Unit Operation Check” has not been performed, ABS warning lamp may flash when ignition switch is turned ON position. Accordingly preform “ESP® Hydraulic Unit Operation Check”, to stop flashing of ABS warning lamp.

Front / Rear Wheel Speed Sensor On-Vehicle Inspection

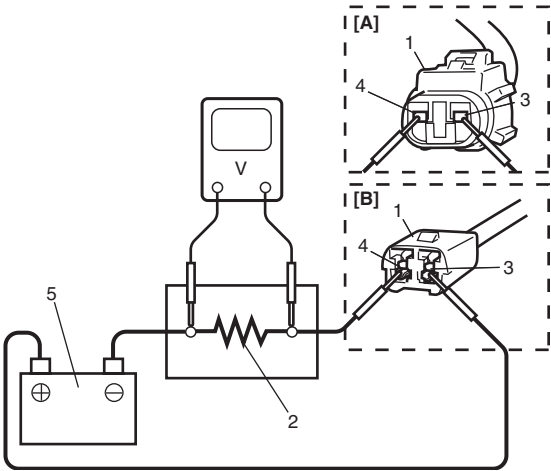
S6RS0B4606028

Output Voltage Inspection

- 1) Disconnect negative (–) cable from battery.
- 2) Hoist vehicle a little.
- 3) Disconnect wheel speed sensor connector.
- 4) Disconnect wheel speed grommet from vehicle body.
- 5) Set up measuring devices as shown in figure, the resistance to 115 Ω and the power supply voltage to 12 V.

⚠ CAUTION

Incorrect voltage and/or wrong connection cause damage to wheel speed sensor.



I6RS0B460031-02

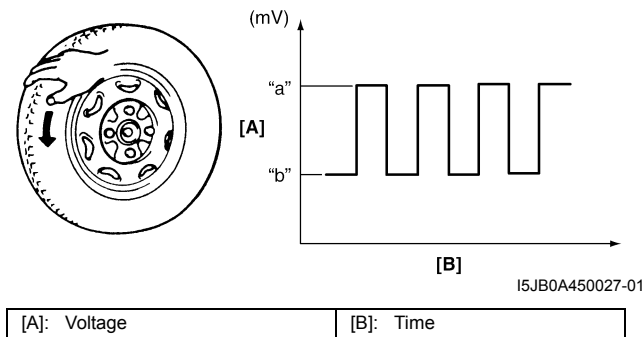
[A]: Front wheel speed sensor	3. “WHT” wire terminal
[B]: Rear wheel speed sensor	4. “BLK” wire terminal
1. Wheel speed sensor connector	5. Power supply (12 V)
2. Resistance (115Ω)	

- 6) Measure voltage at resistance without wheel rotation.
If voltage is out of specification, check sensor, mating encoder and their installation conditions.

Voltage at the resistance (115 Ω) without wheel rotation
680 to 960 mV

- 7) Measure voltage at resistance with wheel rotation and confirm voltage alternately changes between high and low voltages.
If voltage does not change with wheel rotation, check sensor, mating encoder and their installation conditions.

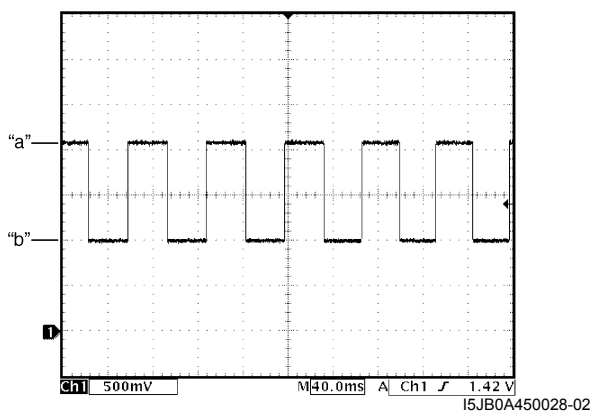
Voltage at the resistance (115 Ω) with wheel rotation
High voltage "a": 1360 to 1930 mV
Low voltage "b": 680 to 960 mV



Reference

When using oscilloscope for this check, check if peak-to-peak voltage and waveform meet specification.

Peak-to-peak Voltage at the resistance (115 Ω) with wheel rotation
High voltage "a": 1360 to 1930 mV
Low voltage "b": 680 to 960 mV



Front Wheel Speed Sensor Removal and Installation

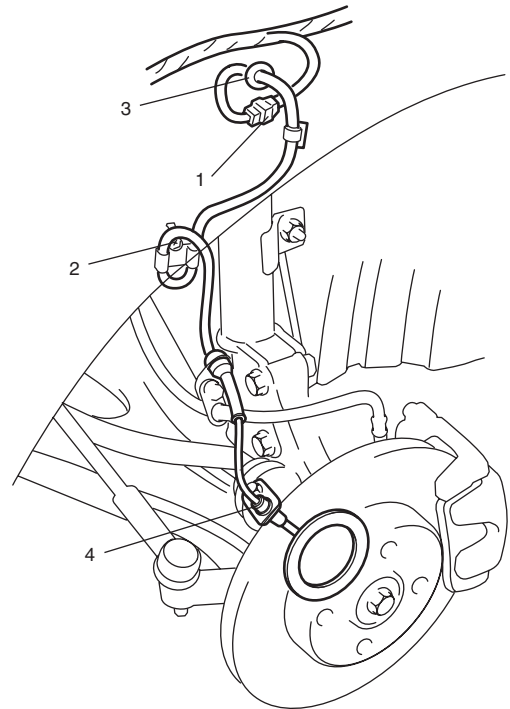
S6RS0B4606029

Removal

- 1) Disconnect negative (-) cable from battery.
- 2) Disconnect front wheel speed sensor coupler (1).
- 3) Hoist vehicle and remove wheel.
- 4) Remove harness clamp, clamp bolts (2) and grommet (3).
- 5) Remove front wheel speed sensor (4) from knuckle.

NOTE

- Do not pull wire harness when removing front wheel speed sensor.
- Do not cause damage to surface of front wheel speed sensor and do not allow dust, etc. to enter its installation hole.



I6RS0B460032-02

Installation

- 1) Check that no foreign material is attached to sensor(1) and mating encoder (2).
- 2) Install it by reversing removal procedure.

Tightening torque

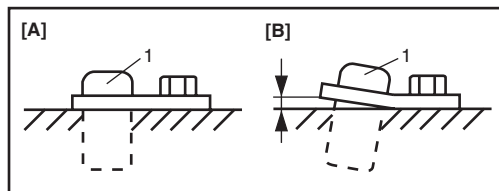
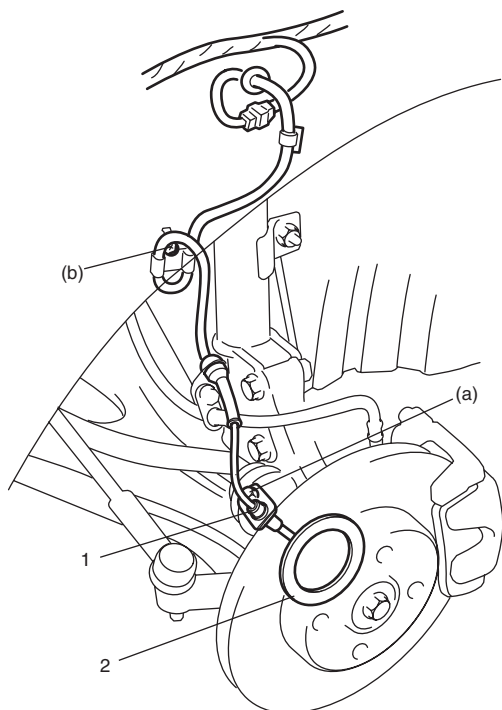
Front wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

Front wheel speed sensor harness clamp bolt (b): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

⚠ CAUTION

Do not pull or twist wire harness more than necessary when installing front wheel speed sensor.

- 3) Check that there is no clearance between sensor and knuckle.



I6RS0B460033-02

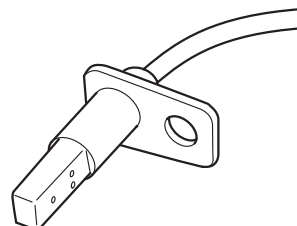
[A]: OK	[B]: NG
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Front Wheel Speed Sensor Inspection

S6RS0B4606030

Check sensor for damage.

If any malfunction is found, replace.



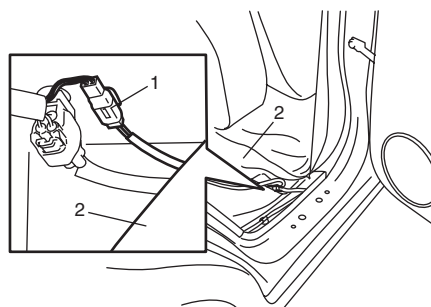
I5JB0A450031-01

Rear Wheel Speed Sensor Removal and Installation

S6RS0B4606031

Removal

- 1) Disconnect negative (-) cable from battery.
- 2) Remove quarter inner trim to brake referring to "Floor Carpet Removal and Installation in Section 9H in related manual".
- 3) Turn over floor carpet (2) and disconnect connector (1) of wheel speed sensor.

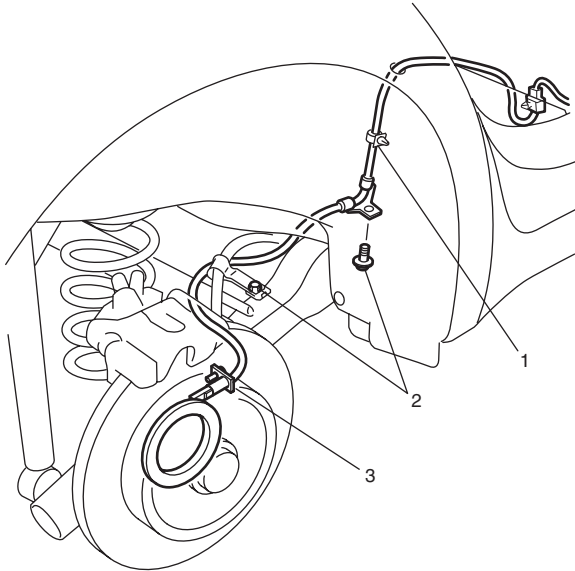


I6RS0B460035-02

- 4) Hoist vehicle and remove wheel.
- 5) Remove harness clamp (1) and clamp bolts (2).
- 6) Remove rear wheel speed sensor (3) from knuckle.

⚠ CAUTION

- Do not pull wire harness when removing rear wheel speed sensor.
- Do not cause damage to surface of rear wheel speed sensor and do not allow dust, etc. to enter its installation hole.



I6RS0B460036-02

Installation

Reverse removal procedure for installation noting the following.

- Check that no foreign material is attached to sensor(1) and mating encoder (2).
- Be sure to install wheel speed sensor (1) and its bolt at the correct position as shown in figure. Tighten sensor bolt and harness clamp bolts to specified torque.

Tightening torque

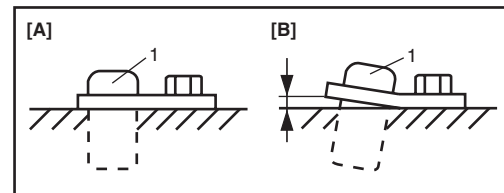
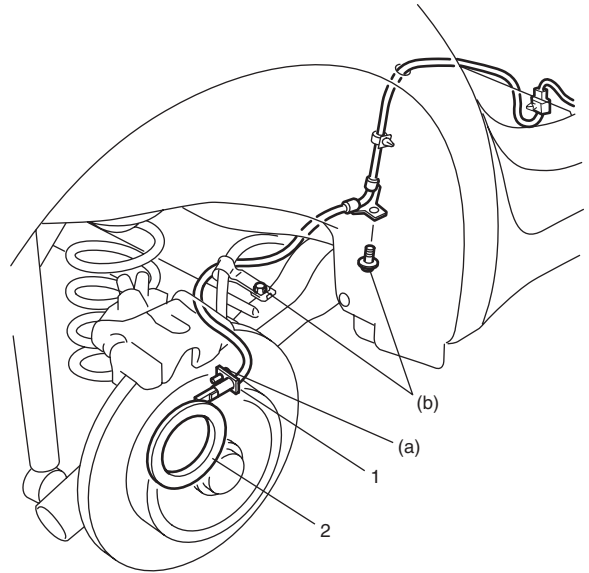
Rear wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

Rear wheel speed sensor harness clamp bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

⚠ CAUTION

Do not pull or twist wire harness more than necessary when installing rear wheel speed sensor.

- Check that there is no clearance between sensor and brake back plate.



I6RS0B460037-02

[A]: OK

[B]: NG

Rear Wheel Speed Sensor Inspection

S6RS0B4606032

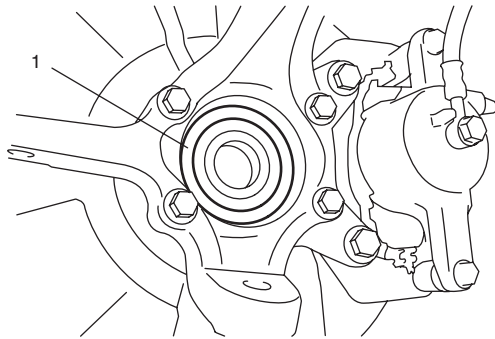
Refer to "Front Wheel Speed Sensor Inspection" since rear wheel speed sensor is the same as front wheel speed sensor.

Front Wheel Encoder On-Vehicle Inspection

S6RS0B4606033

Before inspect front wheel encoder, remove front drive shaft or front wheel spindle referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A in related manual".

- Check encoder (1) for being crack, damaged or deformed.
- Turn wheel and check if encoder rotation is free from eccentricity and looseness.
- Check that no foreign material is attached.
If any faulty is found, clean encoder or replace wheel bearing. Refer to "Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation in Section 2B".



I5JB0A450034-01

Front Wheel Encoder Removal and Installation

S6RS0B4606034

⚠ CAUTION

Front wheel encoder is included in front wheel bearing. If front wheel encoder needs to be replaced, replace it as a front wheel bearing.

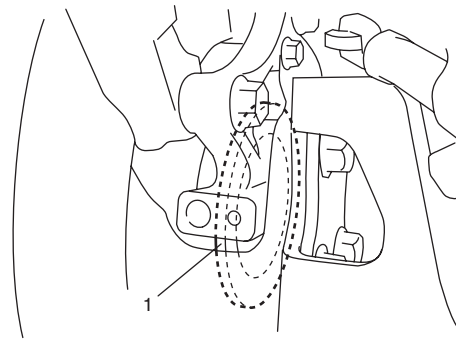
For removal and installation of front wheel bearing, referring to "Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation in Section 2B".

Rear Wheel Encoder On-Vehicle Inspection

S6RS0B4606035

Before inspect rear wheel encoder, hoist vehicle and remove wheel.

- Check encoder (1) for being crack, damaged or deformed.
- Turn wheel and check if encoder rotation is free from eccentricity and looseness.
- Check that no foreign material is attached.
If any faulty is found, clean encoder or replace rear wheel hub assembly. Refer to "Rear Wheel Hub Removal and Installation (For Disc Brake Type) in Section 2C".



I6RS0B460038-02

Rear Wheel Encoder Removal and Installation

S6RS0B4606036

⚠ CAUTION

Rear wheel encoder is included in rear wheel hub assembly. If rear wheel encoder needs to be replaced, replace it as a rear wheel hub assembly.

For removal and installation of front wheel hub assembly, referring to "Rear Wheel Hub Removal and Installation (For Disc Brake Type) in Section 2C".

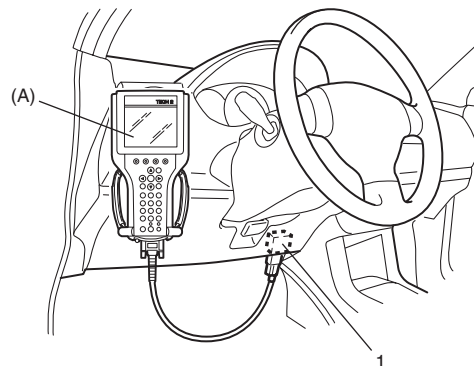
Master Cylinder Pressure Sensor On-Vehicle Inspection

S6RS0B4606016

- 1) Calibrate yaw rate / G sensor assembly referring to "Sensor Calibration".
- 2) Check that basic brake system other than ESP® refer to "Brakes 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



I4RS0B450003-01

- 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 details.
- 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.

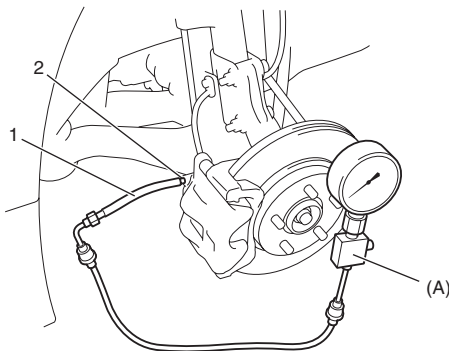
Master cylinder pressure specification

Brake pedal released: $0 \pm 0.8 \text{ MPa}$ ($0 \pm 8 \text{ kg/cm}^2$, $0 \pm 113 \text{ psi}$)

- 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 loosens 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): $10 \pm 1.2 \text{ MPa}$ ($100 \pm 12 \text{ kg/cm}^2$, $1422 \pm 170 \text{ psi}$)

- 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".

Yaw Rate / G Sensor Assembly On-Vehicle Inspection

S6RS0B4606017

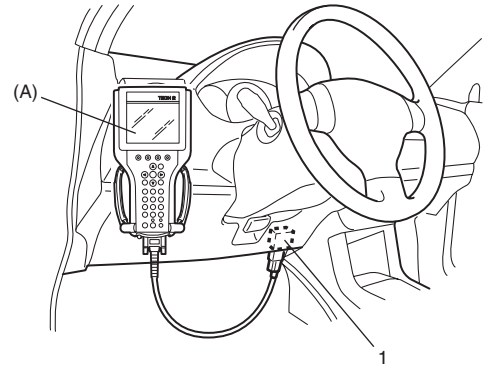
Lateral G Inspection

- 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



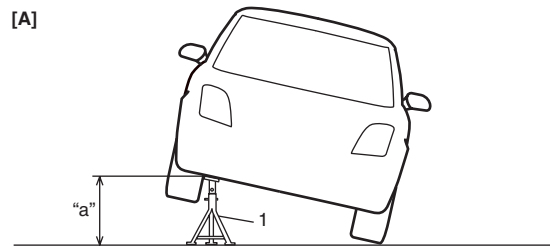
I4RS0B450003-01

- 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 details.
- 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.

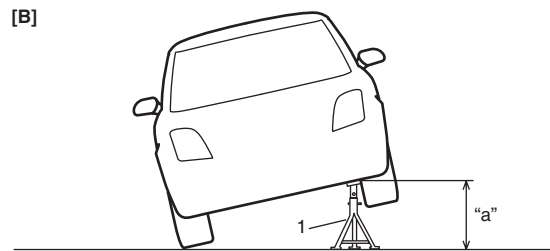
Lateral G specification

Vehicle condition	G Sensor (lateral)
Level condition	$0 \pm 0.1 \text{ G}$
Right-up condition	$0.1 \pm 0.1 \text{ G}$
Left-up condition	$-0.1 \pm 0.1 \text{ G}$

[A]



[B]

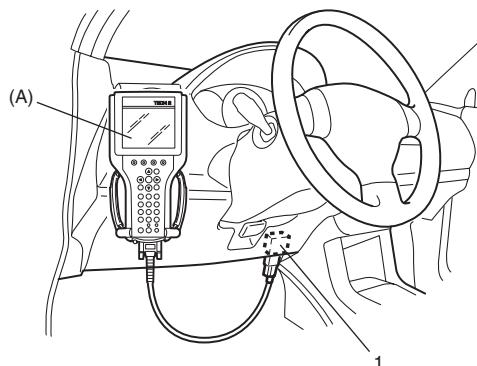


I6RS0B460039-02

[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**

I4RS0B450003-01

- 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 details.
- 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

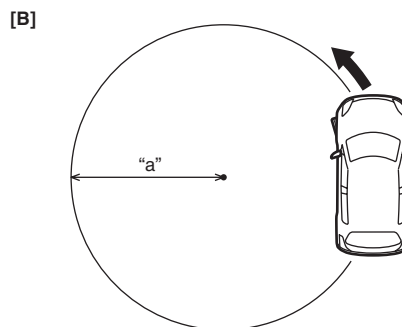
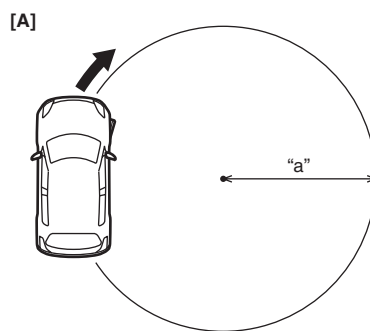
If yaw rate condition is out of specification, replace yaw rate / G sensor assembly.

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).



I6RS0B460040-02

[A]: Right turning	"a": Approx 5.3 m (17.4 ft.)
[B]: Left turning	

Yaw Rate / G Sensor Assembly Removal and Installation

S6RS0B4606018

⚠ 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

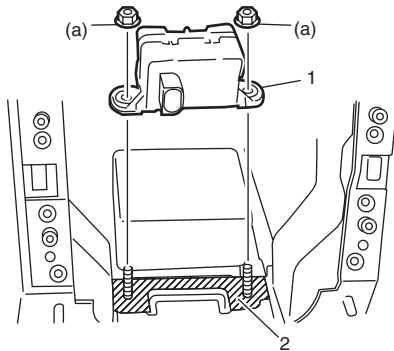
- 1) Disconnect negative (–) cable at battery.
- 2) Remove front console box referring to “Console Box Components in Section 9H in related manual”.
- 3) Disconnect connector from yaw rate / G sensor assembly.
- 4) Remove yaw rate / G sensor assembly from sensor bracket.

Installation

- 1) Before installing yaw rate / G sensor assembly (1), check installing condition as follows.
 - Deformations around sensor installation area (2) (in sensor bracket).
 - Foreign matters on mating surface between sensor and sensor bracket.
- 2) Install yaw rate / G sensor assembly (1) to floor panel.

Tightening torque

Yaw rate / G sensor assembly nut (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)



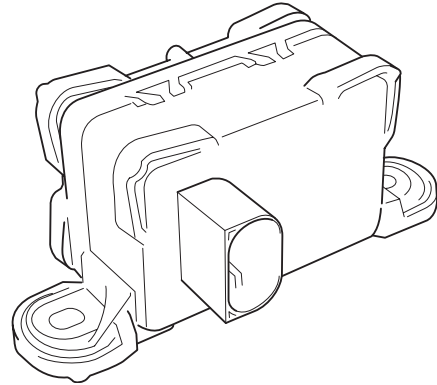
I6RS0B460041-02

- 3) Connect connector to yaw rate / G sensor assembly.
- 4) Install console box referring to “Console Box Components in Section 9H in related manual”.
- 5) Connect negative (–) cable to battery.
- 6) After completing installation, calibrate yaw rate / G sensor assembly referring to “Sensor Calibration”.

Yaw Rate / G Sensor Inspection

S6RS0B4606019

- 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

S6RS0B4606020

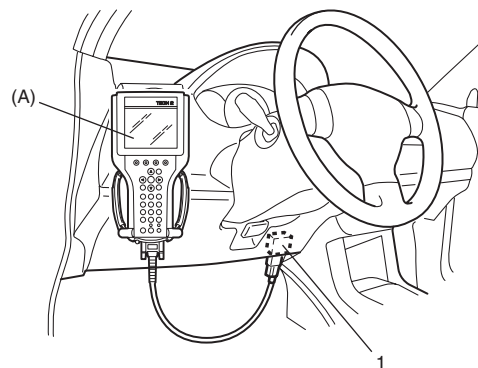
⚠ CAUTION

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

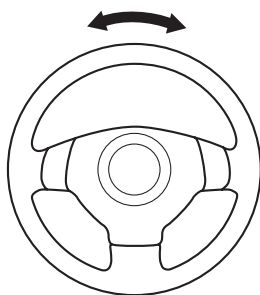


I4RS0B450003-01

- 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 details.
- 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	$0 \pm 3^\circ$
Rotate steering wheel a round in clockwise	$360 \pm 3^\circ$
Rotate steering wheel a round in counterclockwise	$-360 \pm 3^\circ$



I6JB01460032-01

Steering Angle Sensor Removal and Installation

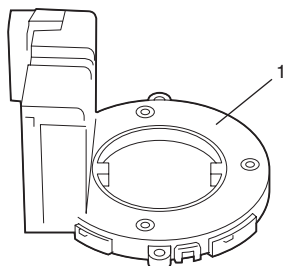
S6RS0B4606021

Refer to "Steering Angle Sensor Removal and Installation in Section 6B".

Steering Angle Sensor Inspection

S6RS0B4606022

- 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).



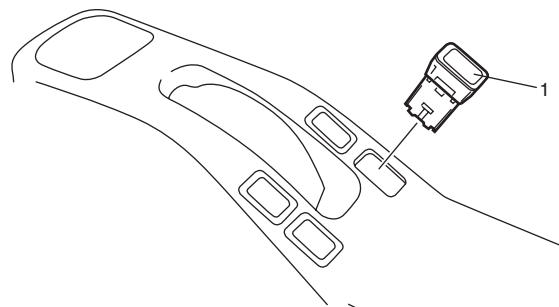
I6JB01460033-01

ESP® OFF Switch Removal and Installation

S6RS0B4606023

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove rear console box referring to "Console Box Components in Section 9H in related manual".
- 3) Disconnect ESP® OFF switch coupler.
- 4) Remove ESP® OFF switch (1) from rear console box (2).



I6RS0B460042-02

Installation

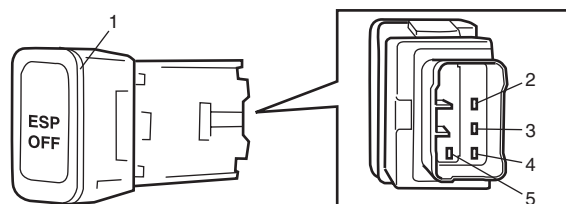
Reverse removal procedure.

ESP® OFF Switch Inspection

S6RS0B4606024

Check for continuity between terminals at each switch position.

If check result is not as specified, replace ESP® OFF switch.



	2	3	4	5
[A]			○	○
[B]	○	○	○	○

I6RS0B460043-02

[A]: Free	[B]: Push
-----------	-----------

Specifications

Tightening Torque Specifications

S6RS0B4607001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Brake pipe flare nut	16	1.6	11.5	🔩
ESP® hydraulic unit / control module assembly bolt	9	0.9	6.5	🔩
ESP® hydraulic unit / control module assembly bracket bolt	25	2.5	18.0	🔩
Front wheel speed sensor bolt	11	1.1	8.0	🔩
Front wheel speed sensor harness clamp bolt	11	1.1	8.0	🔩
Rear wheel speed sensor bolt	11	1.1	8.0	🔩
Rear wheel speed sensor harness clamp bolt	11	1.1	8.0	🔩
Yaw rate / G sensor assembly nut	8	0.8	6.0	🔩

NOTE

The specified tightening torque is also described in the following.

“ESP® Hydraulic Unit / Control Module Assembly Removal and Installation: ”

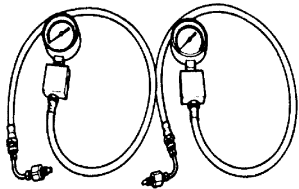
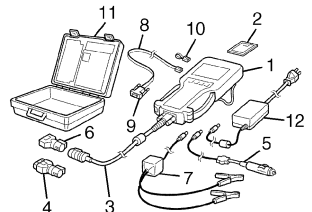
Reference:

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

Special Tools and Equipment

Special Tool

S6RS0B4608001

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 loop back 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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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 on Transmission / Transaxle

S6RS0B5000001

Air Bag Warning

Refer to “Air Bag System Service Warning in Section 00 in related manual”.

Precautions in Diagnosing Trouble

Refer to “Precautions in Diagnosing Trouble in Section 5A in related manual”.

Precautions in Diagnosing Trouble

Refer to “Precautions in Diagnosing Trouble in Section 5D in related manual”.

Precautions for Disassembly and Reassembly

Refer to “Precautions for Disassembly and Reassembly in Section 5A in related manual”.

Precaution for CAN Communication System

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

Precautions for Electrical Circuit Service

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

Manual Transmission/Transaxle

For M15 and M16 Engines Model

General Description

Manual Transaxle Construction and Servicing

S6RS0B5221001

The transaxle provides five forward speeds and one reverse speed by means of three synchromeshs and three shafts (input shaft, countershaft and reverse gear shaft). All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

The low speed synchronizer sleeve & hub is mounted on countershaft and engaged with countershaft 1st gear or 2nd gear, while the high speed synchronizer sleeve & hub is done on input shaft and engaged with input shaft 3rd gear or 4th gear. The 5th speed synchronizer sleeve & hub on input shaft is engaged with input shaft fifth gear mounted on the input shaft.

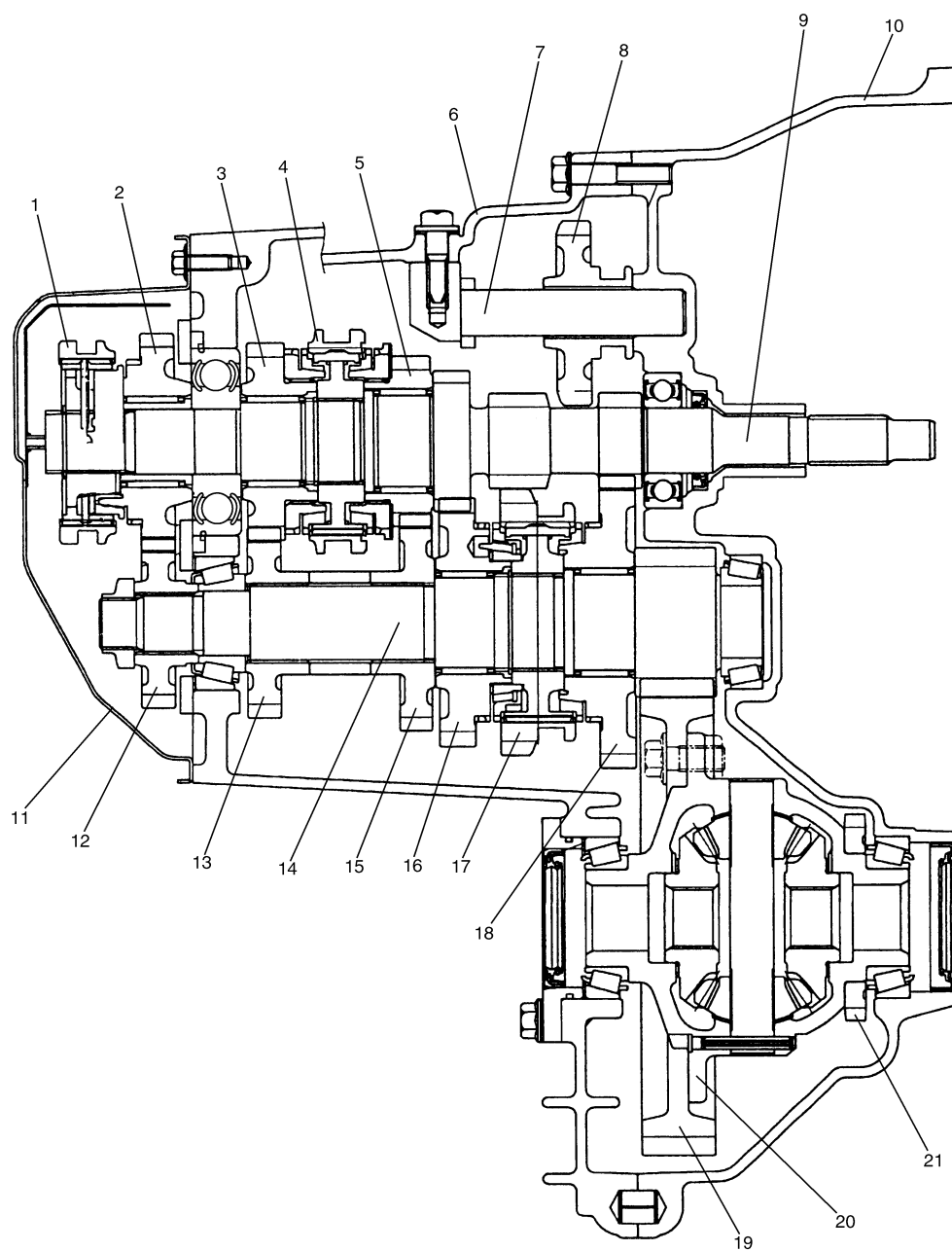
To prevent the cracking noise from the reverse gear when shifting transaxle gear into the reverse gear, the reverse shift braking device is used.

The device utilizes the 5th synchromesh, which is the lever synchro type, to apply the brake on the input shaft rotation. The double cone synchronizing mechanism is provided to 2nd gear synchromesh device for high performance of shifting to 2nd gear.

The countershaft turns the final gear and differential assembly, thereby turning the front drive shafts which are attached to the front wheels.

For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transaxle case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

Further, care must be taken to adjust preload of countershaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.



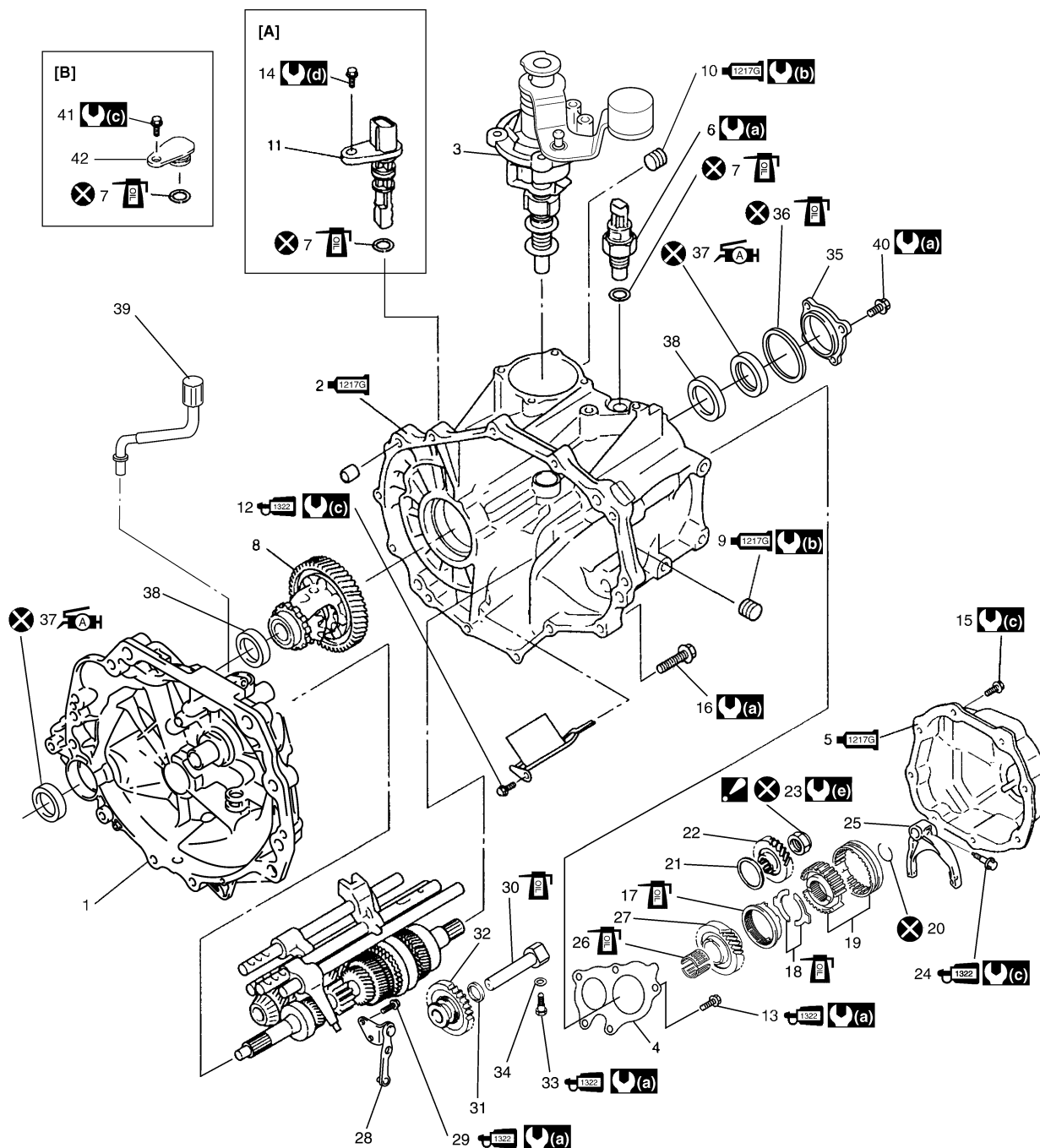
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1. 5th speed sleeve & hub	8. Reverse idler gear	15. Countershaft 3rd gear
2. Input shaft 5th gear	9. Input shaft	16. Countershaft 2nd gear
3. Input shaft 4th gear	10. Right case	17. Low speed synchronizer sleeve & hub
4. High speed synchronizer sleeve & hub	11. Side cover	18. Countershaft 1st gear
5. Input shaft 3rd gear	12. Countershaft 5th gear	19. Final gear
6. Left case	13. Countershaft 4th gear	20. Differential case
7. Reverse gear shaft	14. Countershaft	21. Vehicle speed sensor rotor (if equipped)

Repair Instructions

Manual Transaxle Assembly Components

S6RS0B5226014



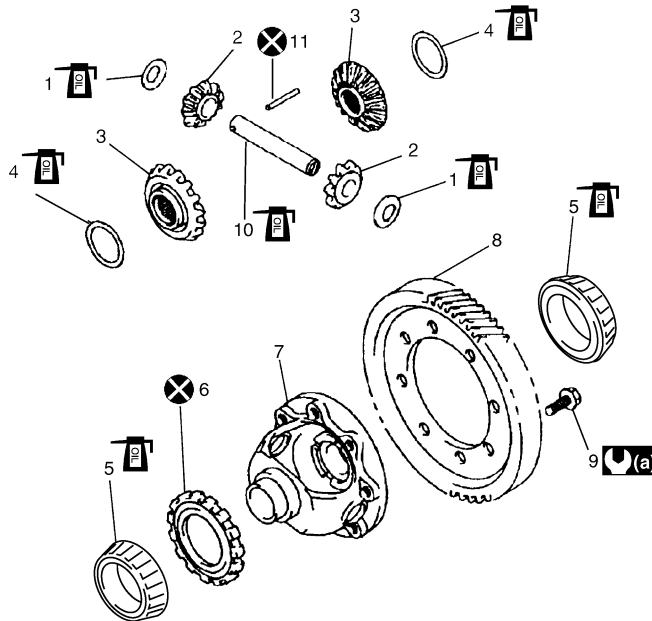
I6RS0B522001-01

[A]: For M15 engine model	25. 5th gear shift fork
[B]: For M16 engine model	26. Needle bearing (Separated steel cage type.)
1. Transaxle right case	27. Input shaft 5th gear
1217G 2. Transaxle left case : Apply sealant 99000-31260 to mating surface of left case and right case.	28. Reverse gear shift lever
3. Gear shift and select shaft assembly	1322 29. Reverse gear shift lever bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
4. Transaxle left case plate	30. Reverse gear shaft
1217G 5. Transaxle side cover : Apply sealant 99000-31260 to mating surface of side cover and left case.	31. Washer
6. Back up lamp switch	32. Reverse idler gear

7. O-ring	 33. Reverse shaft bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
8. Differential assembly	34. Washer
 9. Oil level/filler plug : Apply sealant 99000-31260 to all around thread part of plug.	35. Side bearing retainer
 10. Oil drain plug : Apply sealant 99000-31260 to all around thread part of plug.	36. O-ring
11. VSS	 37. Oil seal : Apply grease 99000-25011 to oil seal lip.
 12. Oil gutter bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	38. Outer race
 13. Left case plate bolts : Apply thread lock 99000-32110 to all around thread part of bolt.	39. Breather hose
14. VSS bolt	40. Side bearing retainer bolt
15. Side cover bolts	41. Sensor cap bolt
16. Transaxle case bolts	42. Sensor cap
17. 5th speed synchronizer ring	 (a) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
18. 5th speed synchronizer lever	 (b) : 21 N·m (2.1 kgf-m, 15.5 lb-ft)
19. 5th speed synchronizer sleeve & hub	 (c) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
20. Circlip	 (d) : 5 N·m (0.5 kgf-m, 4.0 lb-ft)
21. Bearing set shim	 (e) : 100 N·m (10.0 kgf-m, 72.5 lb-ft)
22. Countershaft 5th gear	 : Do not reuse.
 23. Countershaft nut : After tightening nut to specified torque, caulk nut securely.	 : Apply transaxle oil.
 24. Shift fork bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	

Differential Components

S6RS0B5226026



I4RS0A520016-01

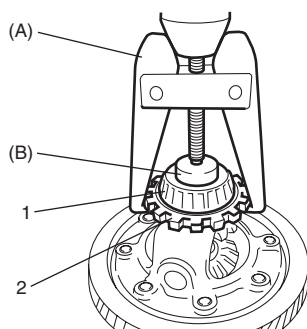
1. Differential pinion washer	8. Final gear
2. Differential side pinion gear	9. Final gear bolt
3. Differential side gear	10. Differential pinion shaft
4. Side gear washer	11. Differential pinion shaft pin
5. Differential side bearing	 (a) : 90 N·m (9.0 kgf-m, 65.0 lb-ft)
6. Speed sensor ring (For M15 engine model)	 : Do not reuse.
7. Differential case	 : Apply transaxle oil.

Differential Disassembly and Assembly

S6RS0B5226027

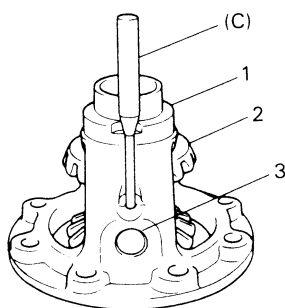
Disassembly

- 1) Using special tools, remove right bearing (1) and sensor rotor (2) (if equipped).

Special tool**(A): 09913-60910****(B): 09925-88210**

I4RH01520039-01

- 2) Remove left bearing in the same manner at Step 1).
- 3) Support differential case with soft jawed vise and remove final gear bolts then take out final gear.
- 4) Using special tool and hammer, drive out differential pinion shaft pin and then disassemble component parts.

Special tool**(C): 09922-85811**

IYSY01521077-01

1. Differential case
2. Differential gear
3. Differential pinion shaft

Assembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly. Make sure that all parts are clean.

- 1) Assemble differential gear and measure thrust play of differential gear as follows.

Special tool**(A): 09900-20607****(B): 09900-20701****Differential gear thrust play****0.03 – 0.31 mm (0.001 – 0.012 in.)****Left side**

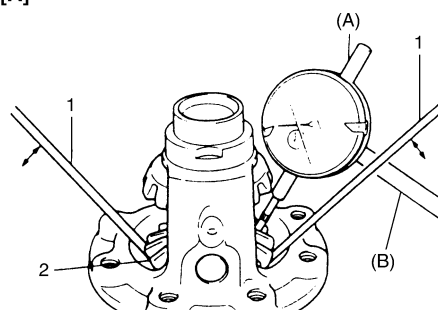
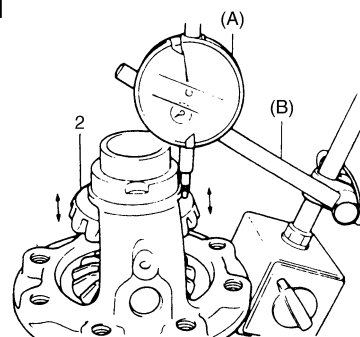
1. Hold differential assembly with soft jawed vise and apply measuring tip of dial gauge to top surface of gear (2).
2. Using 2 screwdrivers (1), move gear up and down and read movement of dial gauge pointer.

Right side

1. Using similar procedure to the left side, set dial gauge tip to gear (2) shoulder.
 2. Move gear up and down by hand and read dial gauge.
- 2) If thrust play is out of specification, select suitable thrust washer from among the following available size, install it and check again that specified gear play is obtained.

Available thrust washer thickness

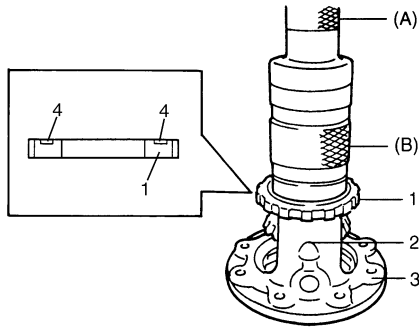
*1 0.85 mm (0.033 in.)	1.05 mm (0.041 in.)
0.90 mm (0.035 in.)	1.10 mm (0.043 in.)
0.95 mm (0.037 in.)	1.15 mm (0.045 in.)
1.00 mm (0.039 in.)	*2 1.20 mm (0.047 in.)

NOTE***1: M16A engine model only.*****2: M15A engine model only.****[A]****[B]**

I3RH0A520083-01

[A]: Left side**[B]: Right side**

- 3) Drive in new differential pinion shaft pin (2) till the depth from differential case (3) surface is about 1 mm (0.04 in.).
- 4) For M15 engine model, press-fit new sensor rotor (1) with groove (4) upward as shown in figure using special tools and copper hammer.

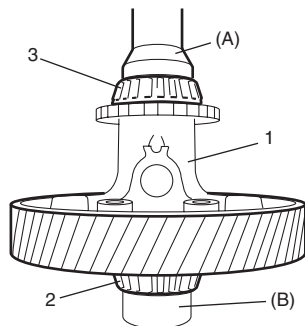
Special tool**(A): 09913-76010****(B): 09940-54910**

I3RM0B521024-01

- 5) Press-fit left bearing (2) using special tools and copper hammer.

Special tool**(A): 09913-76010**

- 6) Support differential assembly (1) as illustrated so as to left bearing is floating, and then press-fit right bearing (3) using special tools.

Special tool**(A): 09913-76010****(B): 09951-16060**

I3RM0B521025-01

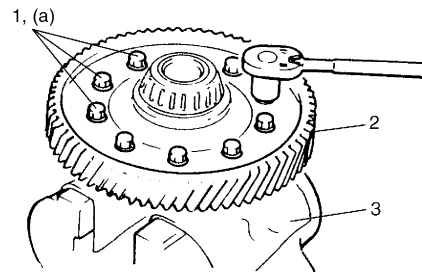
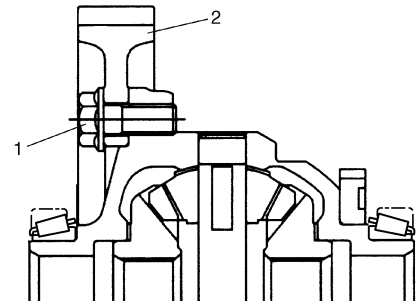
- 7) Hold differential assembly with soft jawed vise (3), install final gear (2) as shown in the figure and then tighten bolts (1) to specified torque.

⚠ CAUTION

Use of any other bolts than specified ones is prohibited.

Tightening torque

Final gear bolt (a): 90 N·m (9.0 kgf-m, 65.0 lb-ft)



I4RS0A520043-01

Specifications

Tightening Torque Specifications

S6RS0B5227001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Final gear bolt	90	9.0	65.0	

NOTE

The specified tightening torque is also described in the following.
 “Manual Transaxle Assembly Components: For M15 and M16 Engines Model”
 “Differential Components: For M15 and M16 Engines Model”

Reference:

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

Special Tools and Equipment

Recommended Service Material

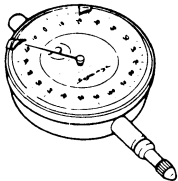
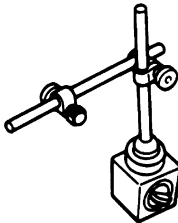
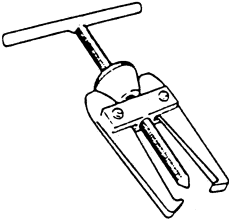
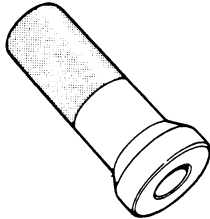
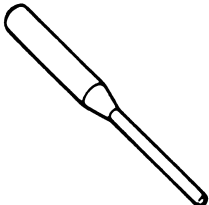
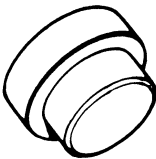
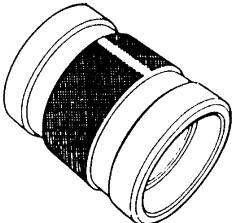
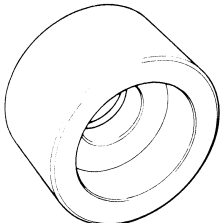
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NOTE

Required service material is also described in the following.
 “Manual Transaxle Assembly Components: For M15 and M16 Engines Model”
 “Differential Components: For M15 and M16 Engines Model”

Special Tool

S6RS0B5228002

09900-20607 Dial gauge 	09900-20701 Magnetic stand 
09913-60910 Bearing and gear puller (40-60mm) 	09913-76010 Bearing installer  
09922-85811 Spring pin remover (4.5 mm) 	09925-88210 Bearing puller attachment 
09940-54910 Front fork oil seal install driver 	09951-16060 Control arm bush remover 

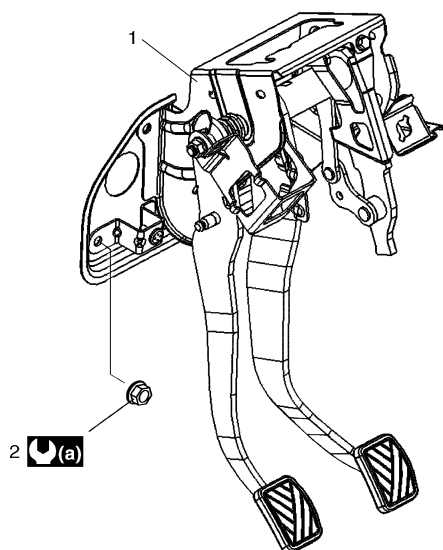
Clutch

Repair Instructions

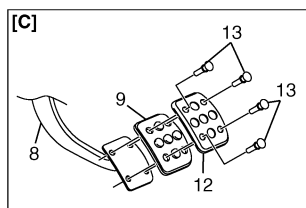
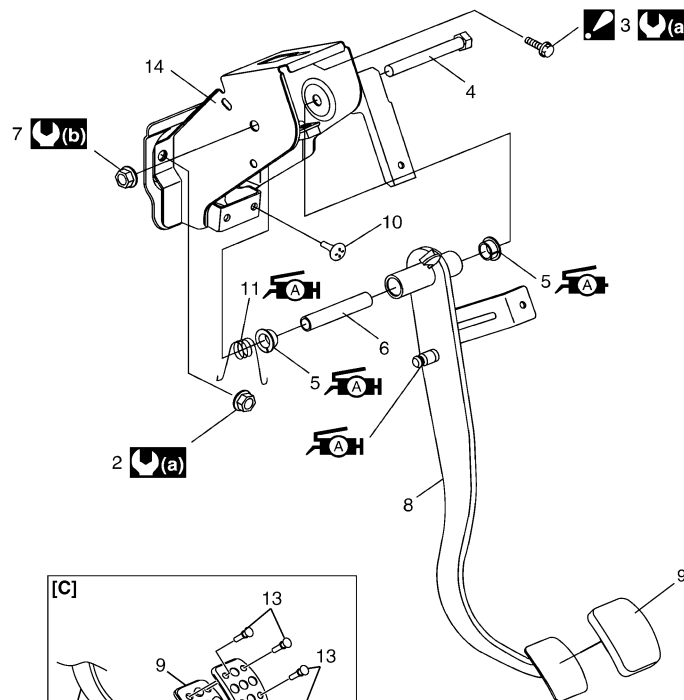
Clutch Pedal and Clutch Pedal Bracket Components

S6RS0B5306009

[A]



[B]



I6RS0B530004-04

[A]: LH steering vehicle	8. Clutch pedal : Apply grease 99000-25011 to outside surface of pin.
[B]: RH steering vehicle	9. Pedal pad
[C]: For M16 engine model	10. Cushion
1. Clutch & brake pedal assembly	11. Return spring : Apply grease 99000-25011 to inside of spring.
2. Pedal bracket nut	12. Pedal cover plate
3. Pedal bracket bolt : Pedal bracket bolt must be tighten after pedal bracket nut.	13. Pedal plate cushion
4. Pedal shaft bolt	14. Clutch pedal bracket
5. Pedal bush : Apply grease 9900-25011 to outside of bush.	: 13 N·m (1.3 kgf-m, 9.5 lb-ft)
6. Pedal shaft spacer	: 23 N·m (2.3 kgf-m, 17.0 lb-ft)
7. Pedal shaft nut	

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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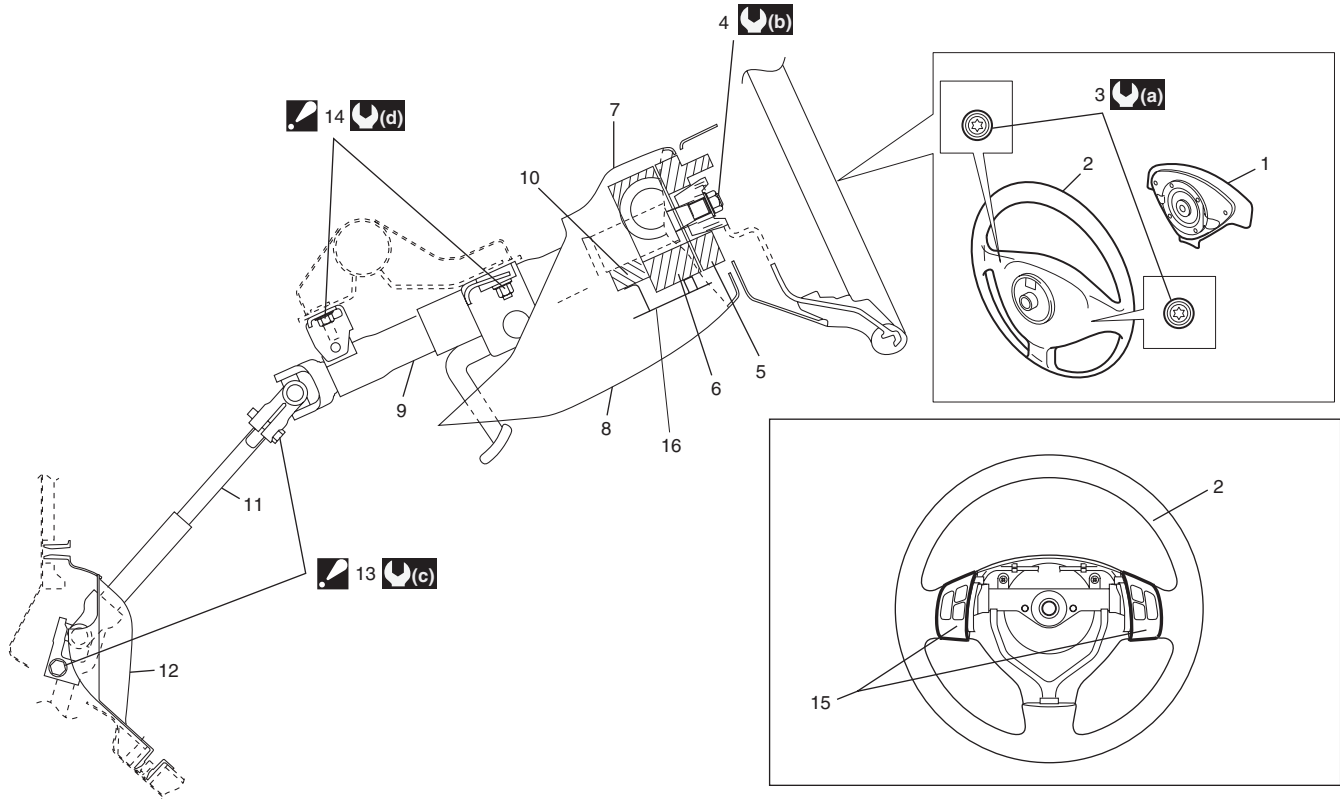
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Steering Wheel and Column

Repair Instructions

Steering Wheel and Column Construction

S6RS0B6206001



I4RS0B620001-04

1. Driver air bag (inflator) module	8. Steering column lower cover	15. Audio control switch (if equipped)
2. Steering wheel	9. Steering column	16. Knee protector plate
3. Driver air bag (inflator) module mounting bolt	10. Steering lock assembly (ignition switch)	: 9 N·m (0.9 kgf-m, 6.5 lb-ft)
4. Steering wheel nut	11. Steering lower shaft	: 33 N·m (3.3 kgf-m, 24 lb-ft)
5. Contact coil cable assembly with steering angle sensor (if equipped)	12. Steering joint cover	: 25 N·m (2.5 kgf-m, 18 lb-ft)
6. Wiper switch and lighting switch	13. Upper and lower joint bolt : After tightening lower joint bolt, tighten upper joint bolt.	: 14 N·m (1.4 kgf-m, 10.5 lb-ft)
7. Steering column upper cover	14. Steering column mounting nut : After tightening lower nut, tighten upper nut.	

Contact Coil Cable Assembly Removal and Installation

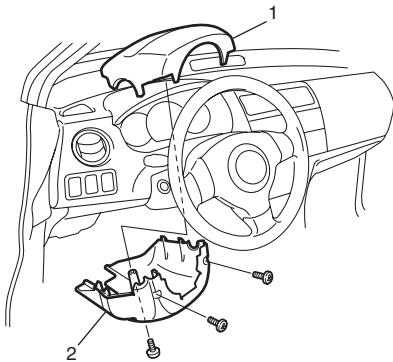
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⚠ CAUTION

Do not turn contact coil more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

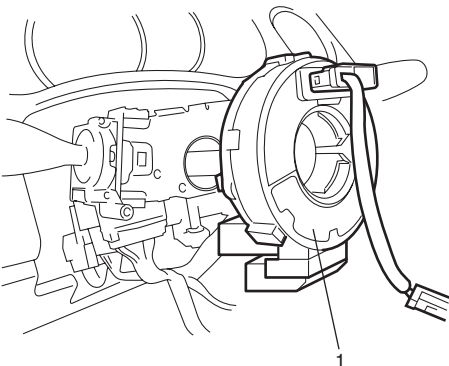
Removal

- 1) Disconnect negative (–) battery cable at battery terminal.
- 2) Disable air bag system referring to “Disabling Air Bag System in Section 8B in related manual”.
- 3) Remove steering wheel from steering column referring to “Steering Wheel Removal and Installation in related manual”.
- 4) Remove steering column lower cover (2) and upper cover (1).



I4RS0B620002-04

- 5) Remove contact coil cable assembly with steering angle sensor (if equipped) (1) from steering column.



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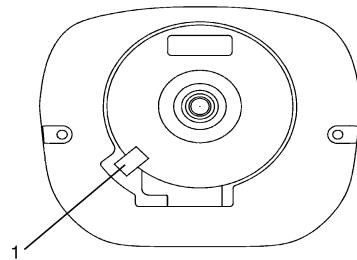
- 6) Separate steering angle sensor from contact coil cable assembly referring to “Steering Angle Sensor Removal and Installation”.

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 steering angle sensor to contact coil cable assembly referring to “Steering Angle Sensor Removal and Installation”.
- 3) Install contact coil cable assembly (1) to steering column securely.

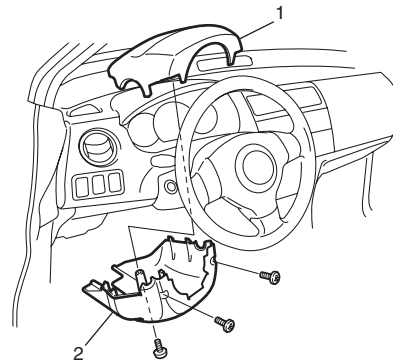
NOTE

New contact coil cable assembly is supplied with contact coil 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.



I4RS0A620010-01

- 4) Install steering column upper cover (1) and lower cover (2).



I4RS0B620002-04

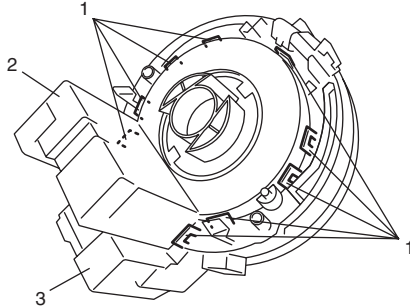
- 5) Install steering wheel to steering column. Refer to “Steering Wheel Removal and Installation in related manual”.
- 6) Connect battery negative (–) cable.
- 7) Enable air bag system referring to “Enabling Air Bag System in Section 8B in related manual”.

Steering Angle Sensor Removal and Installation

S6RS0B6206010

Removal

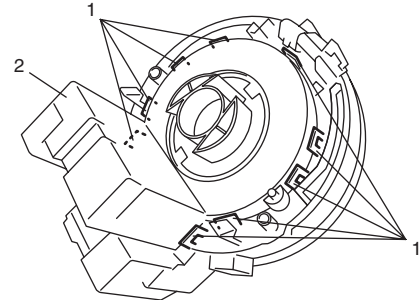
- 1) Remove steering wheel and contact coil cable assembly. Refer to "Steering Wheel Removal and Installation in related manual" and "Contact Coil Cable Assembly Removal and Installation".
- 2) Remove steering angle sensor (2) from contact coil cable assembly (3) while opening fitting parts (1) of contact coil cable assembly.



I6JB01620003-01

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.



I6JB01620004-01

- 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

S6RS0B6206011

Refer to "Steering Angle Sensor Inspection in Section 4F".

Specifications**Tightening Torque Specifications**

S6RS0B6207001

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 "Fasteners Information in Section 0A in related manual".

Power Assisted Steering System

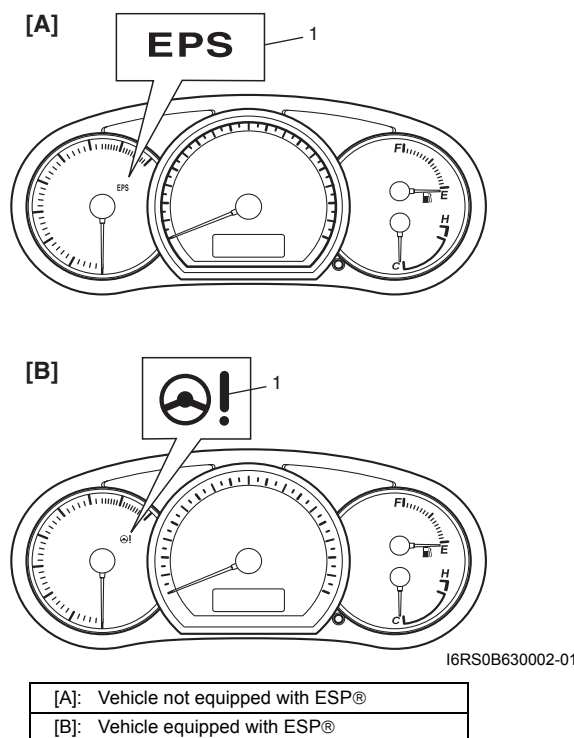
General Description

On-Board Diagnostic System Description

S6RS0B6301003

The P/S control module performs the on-board diagnosis (self-diagnosis) on the system and operates the “EPS” warning lamp (1) as follows.

- The “EPS” warning lamp lights when the ignition switch is turned to ON position (but the engine at stop) regardless of the condition of the P/S control system. This is only to check if the “EPS” warning lamp is operated properly.
- If the areas monitored by the P/S control module is free from any trouble after the engine start (while engine is running), the “EPS” warning lamp turns OFF.
- When the P/S control module detects a trouble which has occurred in the monitored areas the “EPS” warning lamp comes ON while the engine is running to warn the driver of such occurrence of the trouble and at the same time it stores the exact trouble area in memory inside of the P/S control module.



Driving Cycle

A “Driving Cycle” consists of engine startup and engine shutoff.

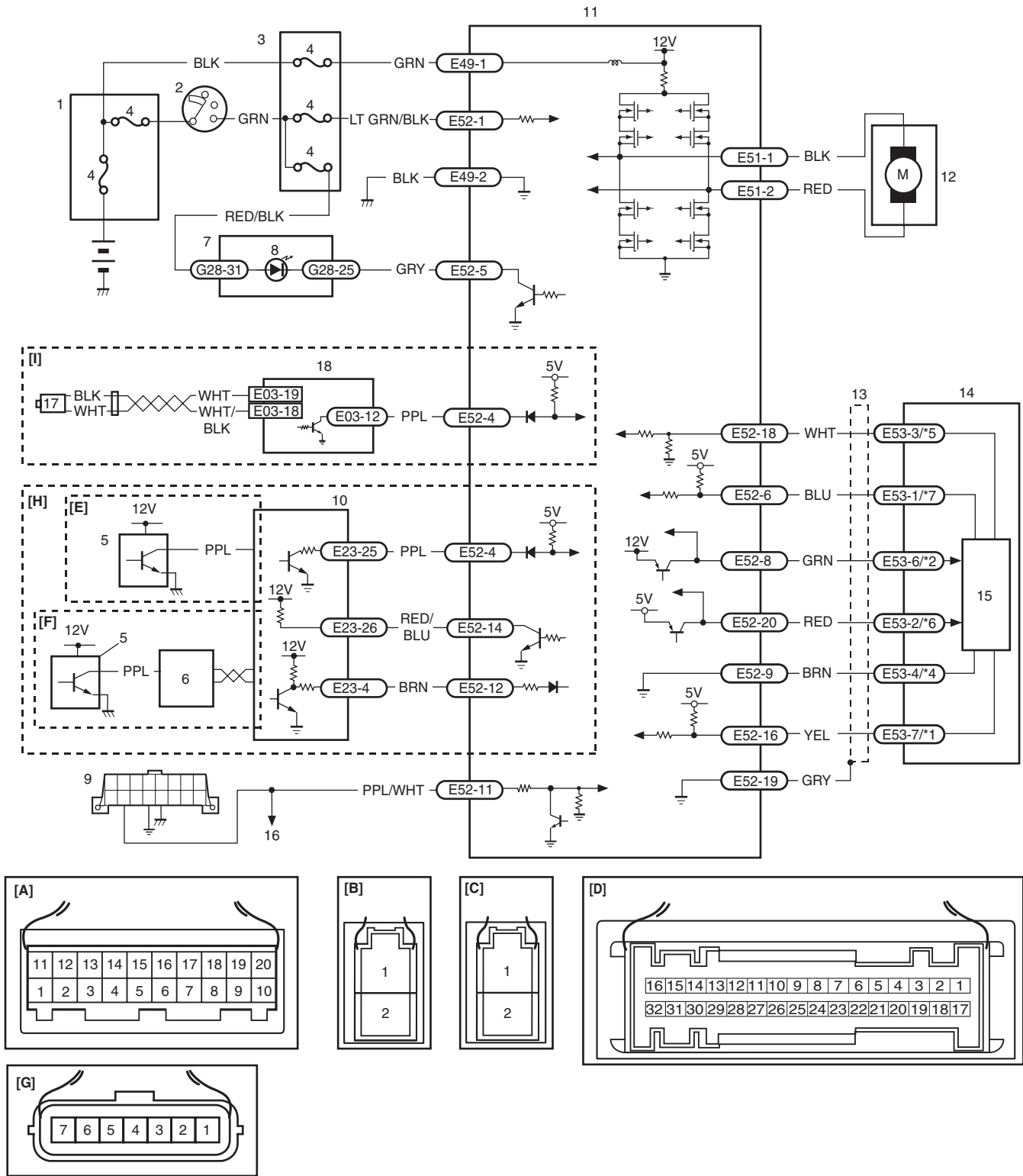
3 Driving Cycles Detection Logic

The malfunction detected in the first and second driving cycle is stored in P/S control module memory (in the form of pending DTC) but the “EPS” warning lamp does not light at these time. It lights up at the third detection of same malfunction also in the next driving cycle.

Schematic and Routing Diagram

EPS System Wiring Circuit Diagram

S6RS0B6302001



I6RS0B630003-03

[A]: Connector "E52" (viewed from harness side)	2. Ignition switch	12. P/S motor
[B]: Connector "E49" (viewed from harness side)	3. Junction block assembly	13. Shield
[C]: Connector "E51" (viewed from harness side)	4. Fuse	14. Torque sensor
[D]: Connector "G28" (viewed from harness side)	5. VSS	15. Torque sensor amplifier
[E]: For M/T or Automated Manual Transaxle model	6. TCM	16. To ECM, BCM, Air bag SDM and ABS or ESP® control module assembly
[F]: For A/T model	7. Combination meter	17. Right-front wheel speed sensor

6C-3 Power Assisted Steering System:

[G]: Connector "E53" (viewed from harness side)	8. "EPS" warning lamp	18. ABS or ESP® control module
[H]: For petrol engine model	9. Data link connector (DLC)	*. For RH steering vehicle
[I]: For diesel engine model	10. ECM	
1. Main fuse	11. P/S control module	

Terminal Arrangement of P/S Control Module Coupler (Viewed from Harness Side)

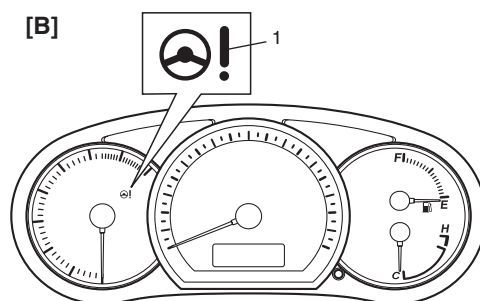
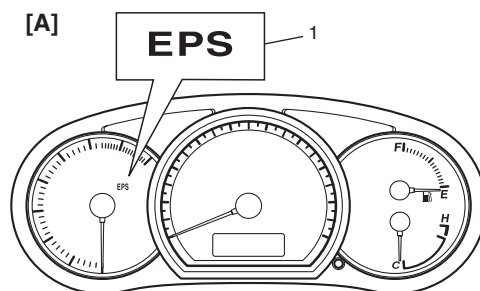
Terminal	Circuit	Terminal	Circuit
E49-1	Power supply for internal memory and EPS motor	E52-9	Ground for torque sensors
E49-2	Ground	E52-10	—
E51-1	Motor output 1	E52-11	Serial communication for data link connector
E51-2	Motor output 2	E52-12	Engine speed signal
E52-1	Main power supply for P/S control module	E52-13	—
E52-2	—	E52-14	P/S operation signal (idle up signal) (for petrol engine models)
E52-3	—	E52-15	—
E52-4	Vehicle speed signal	E52-16	Torque sensor failure signal
E52-5	"EPS" Light	E52-17	—
E52-6	Torque sensor signal (Sub)	E52-18	Torque sensor signal (Main)
E52-7	—	E52-19	Ground for shield
E52-8	12 V power supply for torque sensor	E52-20	5 V power supply for torque sensor

Diagnostic Information and Procedures

"EPS" Warning Lamp Check

S6RS0B6304002

- 1) Turn ignition switch to ON position (without engine running) and check if the "EPS" warning lamp (1) lights up. If the lamp does not light up, go to "EPS" Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stops in related manual" of the diagnostic flows.
- 2) Start engine and check if the "EPS" warning lamp turns OFF. If the lamp comes OFF, the P/S system is in good condition.



I6RS0B630002-01

[A]: Vehicle not equipped with ESP®
[B]: Vehicle equipped with ESP®

DTC Table

S6RS0B6304005

⚠ CAUTION

Be sure to perform the “EPS System Check in related manual” before starting troubleshooting corresponding to each DTC.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
No CODES	Normal	—	—
☞ C1113	Torque sensor main and sub circuit voltage difference high	Voltage difference between torque sensor main signal and sub signal is more than 0.6 V for 1 second continuously	1 driving cycle
☞ C1114	Torque sensor 5 V power supply circuit failure	Circuit voltage of torque sensor 5 V power supply is more than 5.7 V or less than 4.3 V for 1 second continuously	1 driving cycle
☞ C1117	Torque sensor failure (signal voltage low)	Torque sensor failure signal circuit voltage is less than 1.7 V when ignition switch turned ON	1 driving cycle
☞ C1118	Torque sensor failure (signal voltage high)	Torque sensor failure signal circuit voltage is more than 3.7 V for 1 second continuously	1 driving cycle
☞ C1119	Torque sensor 12 V power supply circuit failure	Circuit voltage of torque sensor 12 V power supply is less than 7.5 V for 1 second continuously	1 driving cycle
☞ C1121 (for petrol engine model) / ☞ C1121 (for diesel engine model)	VSS circuit signal not input (60 seconds or more)	Vehicle speed signal is 0 km/h even though engine speed is more than 4000 rpm for more than 60 seconds continuously (before elapse of 5 min from engine start) or vehicle speed signal is 0 km/h even though engine speed is more than 2500 rpm for more than 60 seconds continuously (after elapse of 5 min for engine start).	1 driving cycle
☞ C1122	Engine speed signal circuit failure	Engine speed signal is less than 220 rpm for more than 0.8 seconds. or Engine speed signal is less than 220 rpm for more than 20 seconds continuously even though vehicle speed signal is more than 50 km/h.	1 driving cycle
☞ C1123 (for petrol engine model) / ☞ C1123 (for diesel engine model)	VSS circuit signal not input (30 seconds or more)	Vehicle speed signal is 0 km/h with continuously more than 3 driving cycles even though engine speed is more than 4000 rpm for more than 30 seconds continuously (before elapse of 5 min from engine start) or vehicle speed signal is 0 km/h with continuously more than 3 driving cycles even though engine speed is more than 2500 rpm for more than 30 seconds continuously (after elapse of 5 min for engine start).	3 driving cycles
☞ C1124 (for petrol engine model) / ☞ C1124 (for diesel engine model)	VSS circuit failure (abnormal deceleration)	Vehicle speed signal is less than 5 km/h for more than 5 seconds continuously with more than specified deceleration speed (-20 m/s^2) from over 20 km/h.	1 driving cycle
☞ C1141	Motor circuit voltage abnormal	Voltage between both motor drive circuits is more than 8.5 V or less than 0.2 V for 0.5 seconds continuously while motor is not driven	1 driving cycle

6C-5 Power Assisted Steering System:

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
C1142	Motor circuit current high command with P/S control module target current	Measured motor drive current is more than 10 A as compared with target motor drive current.	1 driving cycle
C1143	Motor circuit current excessive	Measured motor drive current is more than 50 A.	1 driving cycle
C1145	Motor circuit current low command with P/S control module target current	Measured motor drive current is less than 2 A continuously for more than 3 seconds even though target motor drive current is more than 4 A. or Measured motor drive current is less than 0.8 A for total 1 second even though motor control duty is more than 90% while target motor drive current is less than 8 A.	1 driving cycle
C1153	P/S control module power supply circuit failure	Power supply voltage of P/S control module is less than 9 V for 5 seconds continuously	1 driving cycle
C1155	P/S control module failure	Internal circuit or memory is faulty. or Power supply voltage of P/S control module exceeded 17.5 V.	1 driving cycle

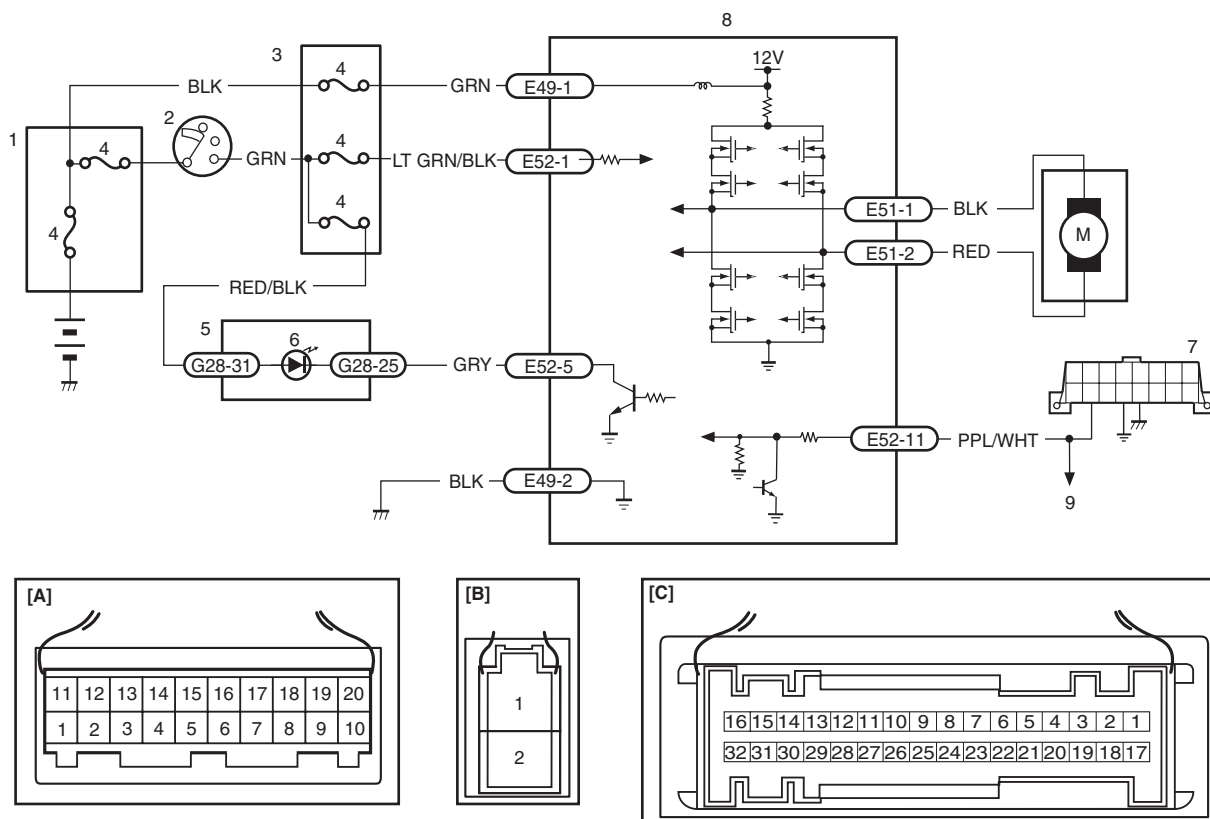
Serial Data Link Circuit Check

S6RS0B6304008

⚠ CAUTION

Be sure to perform “EPS System Check in related manual” before starting “Troubleshooting”.

Wiring Diagram

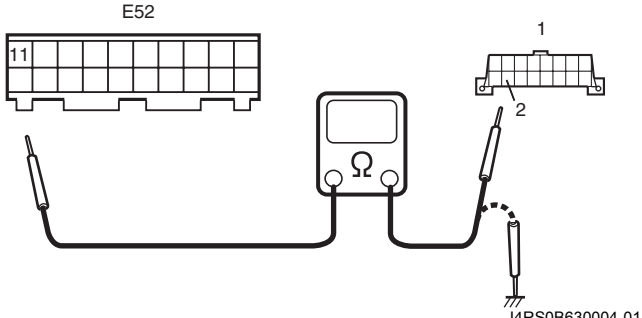


I6RS0B630004-01

[A]: Connector "E52" (viewed from harness side)	2. Ignition switch	6. "EPS" warning lamp
[B]: Connector "E49" (viewed from harness side)	3. Junction block assembly	7. Date link connector (DLC)

[C]: Connector "G28" (viewed from harness side)	4. Fuse	8. P/S control module
1. Main fuse	5. Combination meter	9. To ECM, BCM, Air bag SDM control module and ABS or ESP® control module assembly

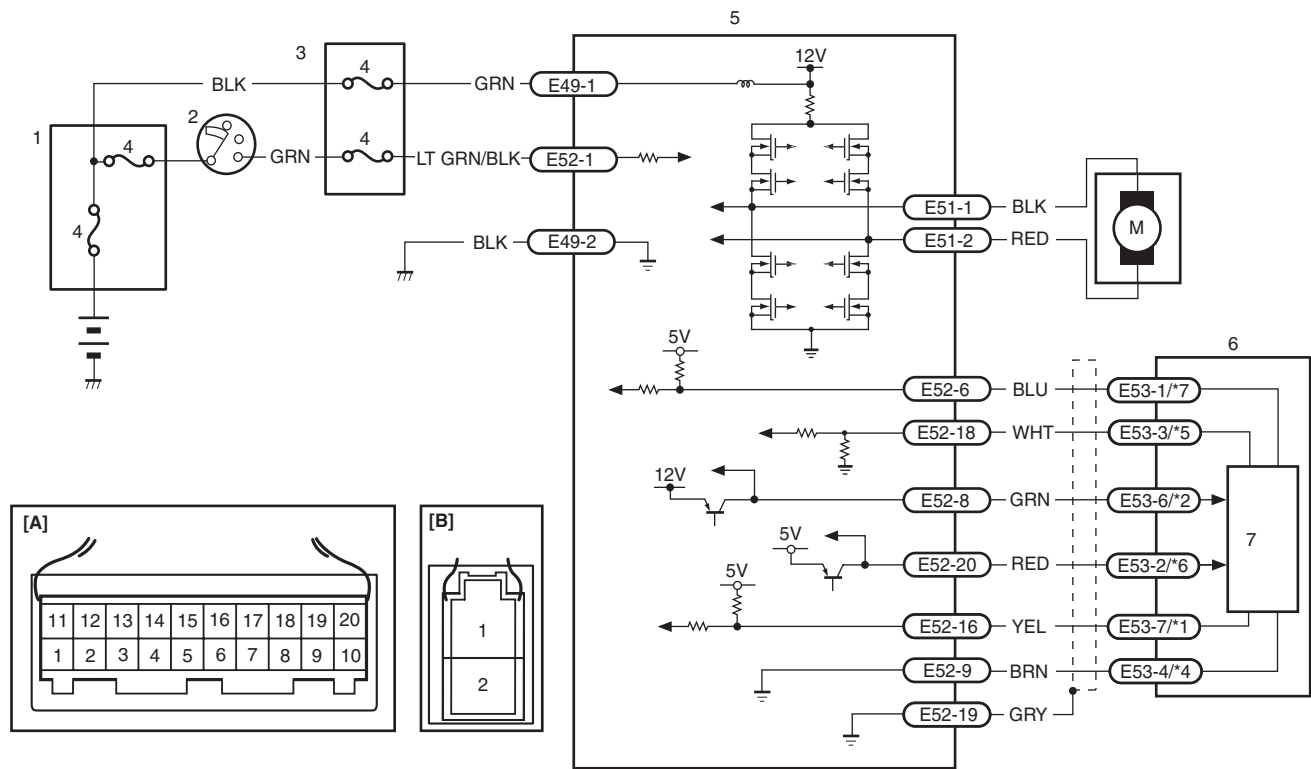
Troubleshooting

Step	Action	Yes	No
1	Was "EPS System Check" performed?	Go to Step 2.	Go to "EPS System Check in related manual".
2	1) Make sure that SUZUKI scan tool is free from malfunction and that correct program card (software) for P/S system is used. 2) Turn ignition switch to OFF position. 3) Check proper connection of SUZUKI scan tool to DLC. Is connection in good condition?	Go to Step 3.	Connect SUZUKI scan tool to DLC properly.
3	1) Check if communication is possible by making communication with other controllers (ECM, BCM, ABS (or ESP® control module assembly) (if equipped) or SDM) or other vehicles. Is it possible to communicate with the other controllers?	Go to Step 4.	Repair open in common section of serial data circuit ("PPL/WHT" wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit ("PPL/WHT" wire circuit).
4	1) Check for proper connection to P/S control module at "E49-1" terminal. 2) If OK, check for voltage between "E49-1" ("GRN" wire) terminal and body ground with ignition switch ON. Is it 10 – 14 V?	Go to Step 5.	"BLK" or "GRN" wire circuit open or short to ground.
5	1) Check for proper connection to the P/S control module at "E52-1" terminal. 2) If OK, check for voltage between "E52-1" ("LT GRN/BLK" wire) terminal and body ground with ignition switch ON. Is it 10 – 14 V?	Go to Step 6.	"LT GRN/BLK" wire circuit open or short to ground.
6	1) With ignition switch at OFF position, disconnect "E52" connector from P/S control module. 2) Check proper connection at "E52-11" ("PPL/WHT" wire) terminal (2) for serial data circuit. 3) If OK, then check for high resistance, open or short to power circuit or ground in "PPL/WHT" wire circuit for P/S system.  Is check result in good condition?	Substitute a known-good P/S control module and recheck.	Repair "PPL/WHT" wire circuit for P/S system.

DTC C1114: Torque Sensor 5 V Power Supply Circuit Failure

S6RS0B6304012

Wiring Diagram



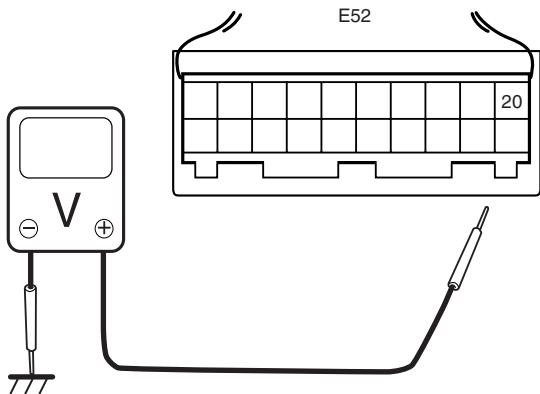
I6RS0B630006-01

[A]: Connector "E52" (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector "E49" (viewed from harness side)	3. Junction block assembly	6. Torque sensor
1. Main fuse	4. Fuse	7. Torque sensor amplifier

DTC Detecting Condition and Trouble Area

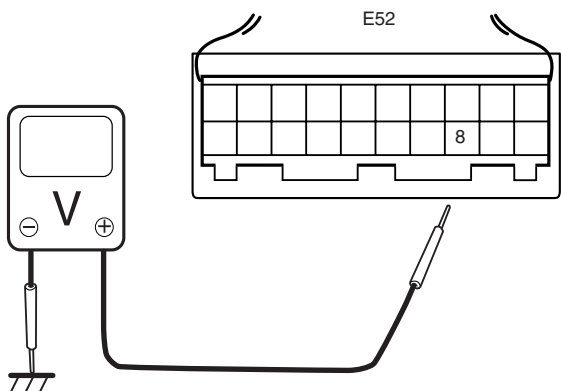
DTC detecting condition	Trouble area
Circuit voltage of torque sensor 5 V power supply is more than 5.7 V or less than 4.3 V for 1 second continuously (1 driving cycle detection logic)	• Torque sensor circuit • Torque sensor • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "EPS System Check" performed?	Go to Step 2.	Go to "EPS System Check in related manual".
2	Is DTC C1153 and/or DTC C1155 indicated together?	Go to "DTC C1153: P/S Control Module Power Supply Circuit Voltage Low in related manual" and/or "DTC C1155: P/S Control Module Failure in related manual".	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector ("E52") for proper connection. 3) If OK, turn ignition switch ON. 4) Check for voltage between "E52-20" ("RED" wire) terminal and body ground with connector ("E52") connected to the P/S control module.  I4RS0A630013-02 Is it about 5 V?	Check intermittent trouble referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 4.
4	1) Disconnect torque sensor connector with ignition switch turned to OFF position. 2) Check torque sensor connector for proper connection. 3) Check for voltage between "RED" wire terminal and body ground. Is it about 5 V?	Replace the steering gear case assembly, and then recheck.	Short to ground or power circuit in "RED" wire circuit. If wire is OK, substitute a known-good P/S control module and recheck.

S6RS0B6304013

DTC Troubleshooting

Step	Action	Yes	No
1	Was "EPS System Check" performed?	Go to Step 2.	Go to "EPS System Check in related manual".
2	Is DTC C1153, too?	Go to "DTC C1153: P/S Control Module Power Supply Circuit Voltage Low in related manual".	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector ("E52") for proper connection. 3) If OK, turn ignition switch ON. 4) Check for voltage between "E52-8" ("GRN" wire) terminal and body ground with connector ("E52") connected to the P/S control module.  I4RS0A630021-02 Is it about 12 V?	Go to Step 4.	Repair high resistance, open or short to power circuit or ground in 12 V power supply ("GRN" wire) circuit.
4	1) Disconnect torque sensor connector with ignition switch turned to OFF position. 2) Check torque sensor connector for proper connection. 3) Check for voltage between "GRN" wire terminal and body ground. Is it about 12 V?	Replace the steering gear case assembly, and recheck.	Short to ground in "GRN" wire circuit. If wire is OK, substitute a known-good P/S control module and recheck.

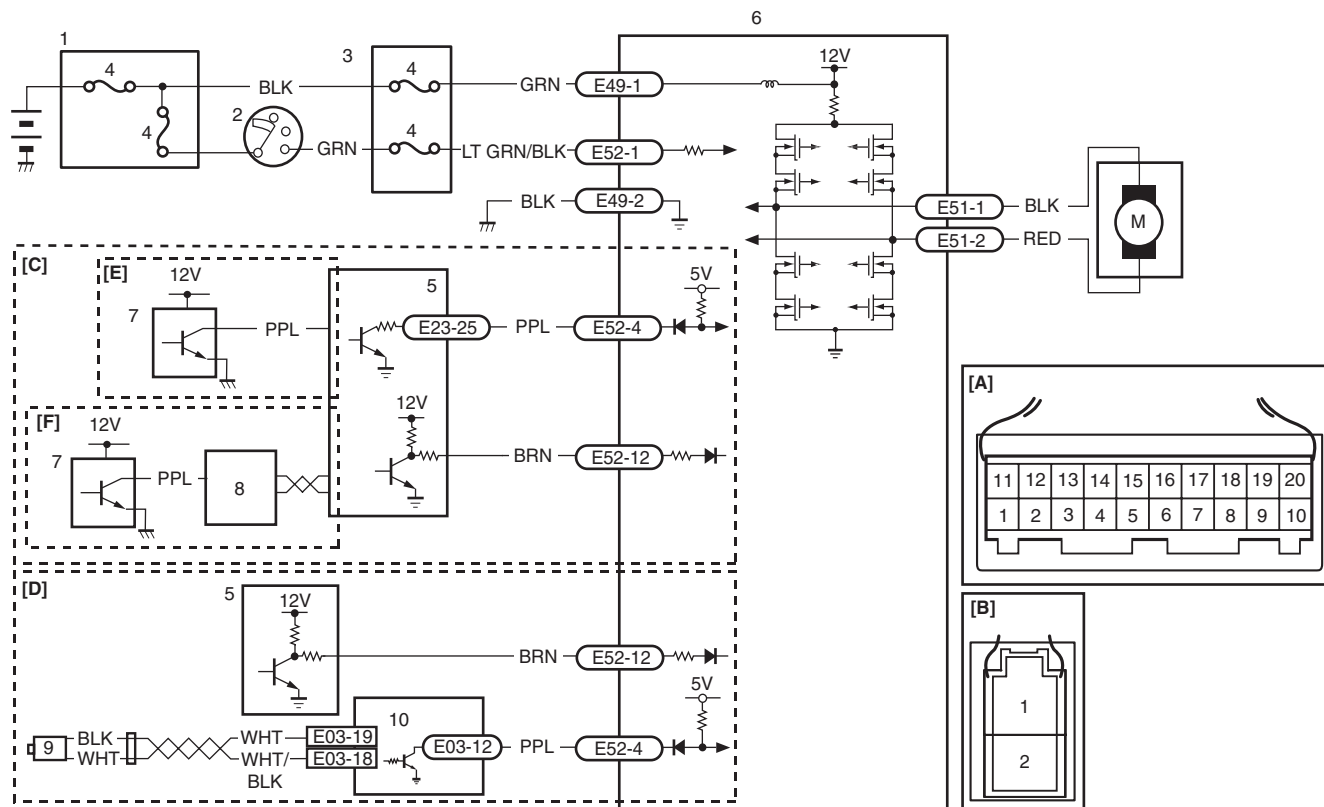
DTC C1122: Engine Speed Signal Circuit Failure

S6RS0B6304015

NOTE

DTC C1122 (engine speed signal failure) is indicated when ignition switch is at ON position and engine is not running, but means there is nothing abnormal if indication changes to a normal one when engine is started.

Wiring Diagram



I6RS0B63009-04

[A]: Connector "E52" (viewed from harness side)	1. Main fuse	7. VSS
[B]: Connector "E49" (viewed from harness side)	2. Ignition switch	8. TCM
[C]: For petrol engine models	3. Junction block assembly	9. Right-front wheel speed sensor
[D]: For diesel engine model	4. Fuse	10. ABS control module
[E]: For M/T or Automated Transaxle models	5. ECM	
[F]: For A/T model	6. P/S control module	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Engine speed signal is less than 220 rpm for more than 0.8 seconds. or Engine speed signal is less than 220 rpm for more than 20 seconds continuously even though vehicle speed signal is more than 50 km/h. (1 driving cycle detection logic)	- Engine speed signal circuit - ECM - P/S control module - Vehicle speed signal circuit

DTC Troubleshooting

Step	Action	Yes	No
1	Was "EPS System Check" performed?	Go to Step 2.	Go to "EPS System Check in related manual".
2	1) Clear DTC(s) referring to "DTC Clearance in related manual". 2) Run engine at idle speed. 3) Check if any DTC is detected referring to "DTC Check in related manual". <i>Is DTC C1122 still detected?</i>	Go to Step 3.	Check intermittent trouble referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
3	DTC Check for ECM referring to "DTC Check: For M13, M15 and M16 Engines in Section 1A in related manual" (for petrol engine models) or "DTC Check: For Z13DT Engine in Section 1A in related manual" (for diesel engine model). <i>Is DTC P0340 detected?</i>	Go to "DTC P0340: Camshaft Position (CMP) Sensor Circuit: For M13, M15 and M16 Engines in Section 1A in related manual" (for petrol engine models) or "C-20, Camshaft Position Sensor Circuit: For Z13DT Engine in Section 1A in related manual" (for diesel model).	Go to Step 4.
4	Engine speed circuit signal check 1) Check for proper connection to the P/S control module and ECM at each "BRN" wire terminal (engine speed signal circuit). 2) If they are OK, check for high resistance, open or short to power circuit or ground in "BRN" wire circuit. <i>Is check result in good condition?</i>	Go to Step 5.	Repair "BRN" wire circuit.
5	Vehicle speed signal circuit check 1) Check vehicle speed signal ("E52-4" terminal circuit signal) referring to "Inspection of P/S Control Module and Its Circuits". <i>Is it OK?</i>	Substitute a known-good P/S control module and recheck.	Repair vehicle speed signal (PPL wire) circuit for short to other circuit. If its circuit is OK, substitute a known-good ECM and recheck.

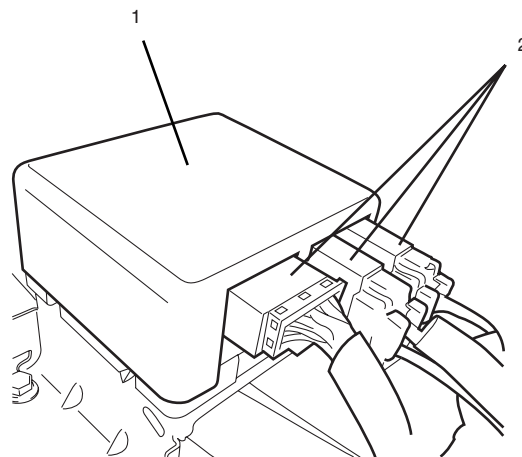
Inspection of P/S Control Module and Its Circuits

S6RS0B6304019

The P/S control module (1) and its circuits can be checked at the P/S control module wiring couplers (2) by measuring voltage and resistance.

CAUTION

P/S control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to the P/S control module with connectors disconnected from the P/S control module.



I4RS0A630008-01

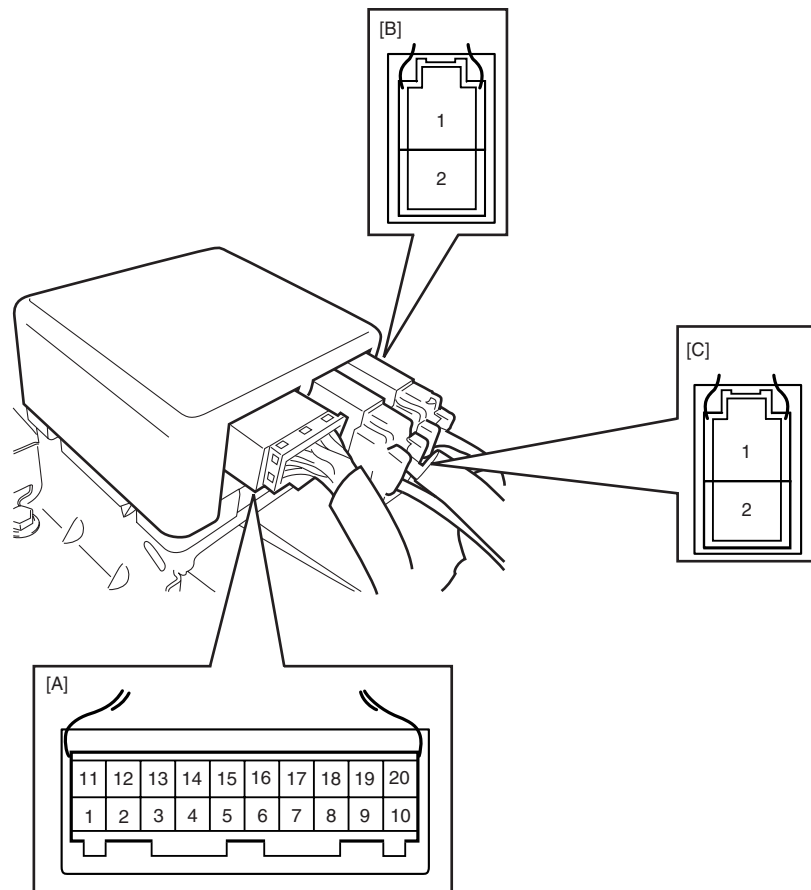
Voltage Check

- 1) Remove console box.
- 2) Check for voltage at each terminal with connectors connected to the P/S control module.

NOTE

As each terminal voltage is affected by the battery voltage, confirm if the battery voltage is 11 V or more when ignition switch is ON.

*: The voltage of this circuit may not be checked by voltmeter. If so, use oscilloscope.



[A]: Connector "E52" (viewed from harness side)

[B]: Connector "E51" (viewed from harness side)

[C]: Connector "E49" (viewed from harness side)

Terminal	Wire color	Circuit	Normal voltage	Remarks
E49-1	GRN	Power supply for internal memory and EPS motor	10 – 14 V	—
E49-2	BLK	Ground	—	—
E51-1	BLK	Motor output 1	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.1: ", "Reference waveform No.2: " "and "Reference waveform No.3: ")	- Engine idling and steering wheel at straight position - Voltage between "E51-1" and vehicle body ground
E51-2	RED	Motor output 2	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.1: ", "Reference waveform No.2: " "and "Reference waveform No.3: ")	- Engine idling and steering wheel at straight position - Voltage between "E51-2" and vehicle body ground
E52-1	LT GRN/BLK	Main power supply for P/S control module	10 – 14 V	Ignition switch ON
E52-2	—	—	—	—
E52-3	—	—	—	—
E52-4	PPL	Vehicle speed signal	*0 – 1 V ↑↓ 8 – 14 V ("Reference waveform No.8" under "Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines in Section 1A".) (for petrol engine model)	- Ignition switch ON - Front left tire turned quickly with right tire locked
E52-5	GRY	"EPS" Light	0 V	Ignition switch ON
			10 – 14 V	Engine idling
E52-6	BLU	Torque sensor (Sub)	About 0 – 2.5 V	- Steering wheel with left turn - Out put voltage varies linearly depending on steering force
			About 2.5 V	Steering wheel at free
			About 2.5 – 6 V	- Steering wheel with right turn - Out put voltage varies linearly depending on steering force
E52-7	—	—	—	—
E52-8	GRN	12 V power supply for torque sensor	About 12 V	- Ignition switch ON - Check voltage between "E52-8" and "E52-9" terminals
E52-9	BRN	Torque sensor (GND)	0 V	—
E52-10	—	—	—	—
E52-11	PPL/WHT	Data link connector	—	—

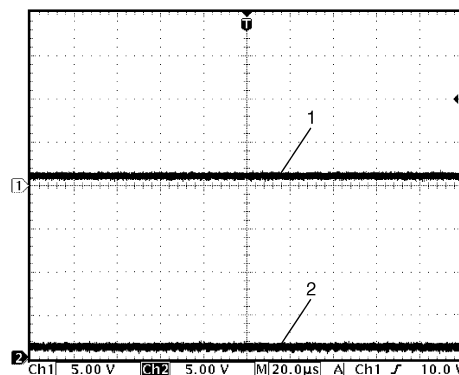
6C-15 Power Assisted Steering System:

Terminal	Wire color	Circuit	Normal voltage	Remarks
E52-12	BRN	Engine speed signal	$0 - 1 \text{ V}$ $\uparrow\downarrow$ $8 - 14 \text{ V}$ ("Reference waveform No.28" under "Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines in Section 1A" (for petrol engine models) $0 - 1 \text{ V}$ $\uparrow\downarrow$ $6 - 10 \text{ V}$ (for diesel engine model)	Engine idling
E52-13	—	—	—	—
E52-14	RED/BLU	P/S operation signal (idle up signal) (for petrol engine models)	About 12 V $0 - 1 \text{ V}$	Ignition switch ON Engine idling and turned steering wheel to the right or left until it stops
E52-15	—	—	—	—
E52-16	YEL	Torque sensor failure signal	0 V	Ignition switch ON
E52-17	—	—	—	—
E52-18	WHT	Torque sensor (Main)	About 0 – 2.5 V	- Steering wheel with left turn - Out put voltage varies linearly depending on steering force
			About 2.5 V	Steering wheel at free
			About 2.5 – 6 V	- Steering wheel with right turn - Out put voltage varies linearly depending on steering force
E52-19	GRY	Shield (GND)	—	—
E52-20	RED	5 V power supply for torque sensor	About 5 V	- Ignition switch ON - Check voltage between "E52-20" and "E52-9" terminals

Reference waveform No.1

Motor output signal 1(1), Motor output signal 2(2), with engine idling

Measurement terminal	CH1: "E51-1" to vehicle body ground CH2: "E51-2" to vehicle body ground
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 20 μs /DIV
Measurement condition	Engine is idling and steering wheel at straight position



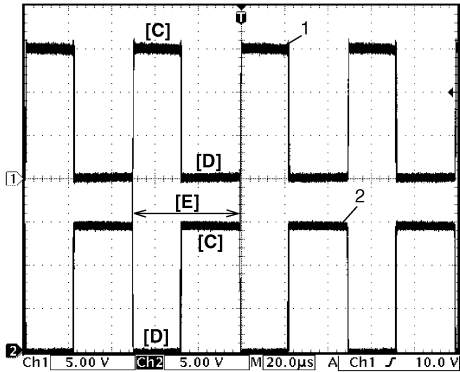
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Reference waveform No.2

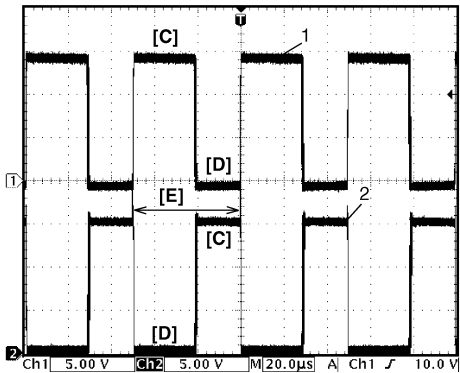
Motor output signal 1(1), Motor output signal 2(2), with engine idling

Measurement terminal	CH1: "E51-1" to vehicle body ground CH2: "E51-2" to vehicle body ground
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 20 μ s/DIV
Measurement condition	• Engine is idling and steering wheel is turned to left or right at turning speed of 90° /sec

[A]



[B]



I6RS0B630018-01

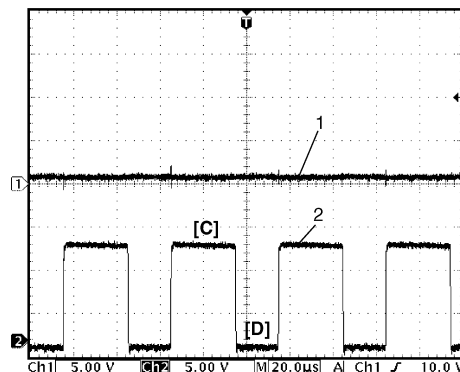
[A]:	Steering wheel is turned left at turning speed of 90° /sec
[B]:	Steering wheel is turned right at turning speed of 90° /sec
[C]:	12 V ON
[D]:	GND ON
[E]:	1 duty cycle

Reference waveform No.3

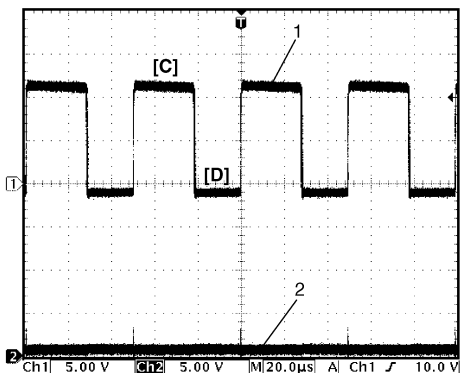
Motor output signal 1(1), Motor output signal 2(2), with engine idling

Measurement terminal	CH1: "E51-1" to vehicle body ground CH2: "E51-2" to vehicle body ground
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 20 μ s/DIV
Measurement condition	• Engine is idling and steering wheel is kept fully turned to left or right until it stops

[A]



[B]



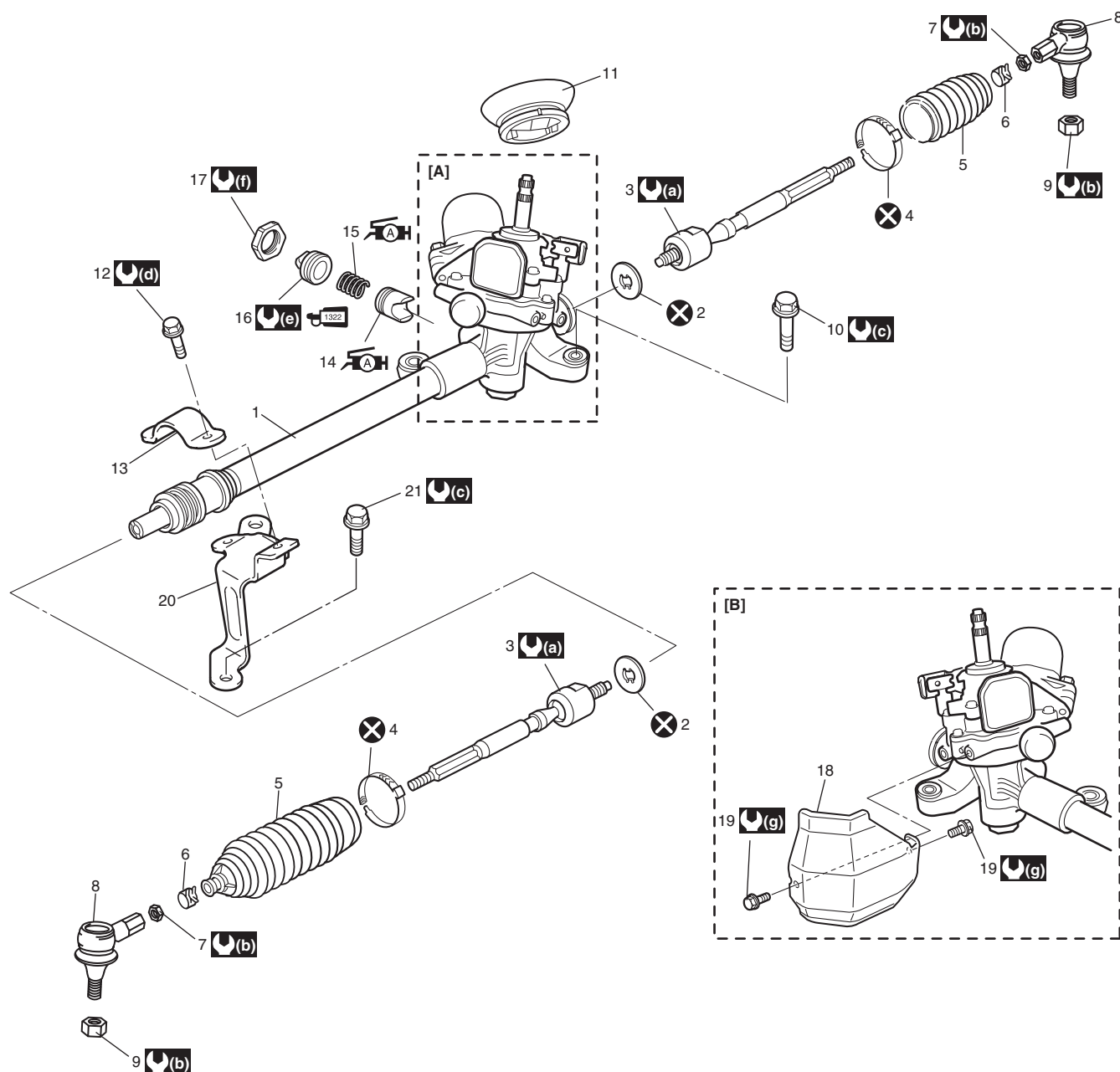
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[A]:	Steering wheel is kept fully turned left until it stops
[B]:	Steering wheel is kept fully turned right until it stops
[C]:	12 V ON
[D]:	GND ON

Repair Instructions

Steering Gear Case Assembly Components

S6RS0B6306001



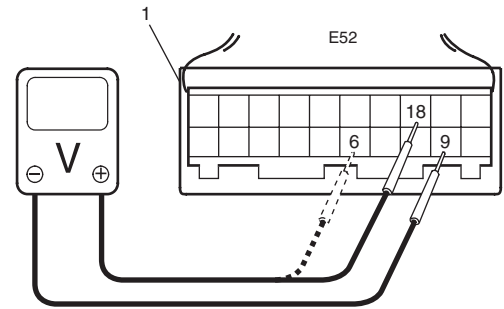
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[A]: For LH steering vehicle	10. Steering gear case mounting No.1 bolt	21. Steering gear case mounting No.2 bolt
[B]: For RH steering vehicle	11. Steering gear case grommet	⚙️(a) : 93 N·m (9.3 kgf-m, 67.5 lb-ft)
1. Steering gear case	12. Steering gear case mounting No.3 bolt	⚙️(b) : 45 N·m (4.5 kgf-m, 32.5 lb-ft)
2. Tie-rod lock washer	13. Gear rack side No.1 bracket	⚙️(c) : 55 N·m (5.5 kgf-m, 40.0 lb-ft)
3. Tie-rod	⚙️ 14. Steering rack plunger : Apply grease 99000-25010 to rack plunger.	⚙️(d) : 40 N·m (4.0 kgf-m, 29.0 lb-ft)
4. Band	⚙️ 15. Steering rack plunger spring : Apply grease 99000-25010 to spring end.	⚙️(e) : Refer to "Steering Rack Plunger Removal and Installation in related manual".
5. Boot	⚙️ 16. Steering rack damper screw : Apply thread lock 99000-32110 to all around thread part of rack damper screw.	⚙️(f) : 64 N·m (6.4 kgf-m, 46.5 lb-ft)
6. Rack boot clip	17. Steering rack damper lock nut	⚙️(g) : 9.5 N·m (0.95 kgf-m, 7.0 lb-ft)
7. Tie-rod end lock nut	18. Heat insulator	⊗ : Do not reuse.
8. Tie-rod end	19. Heat insulator bolt	
9. Tie-rod end nut	20. Gear rack side No.2 bracket	

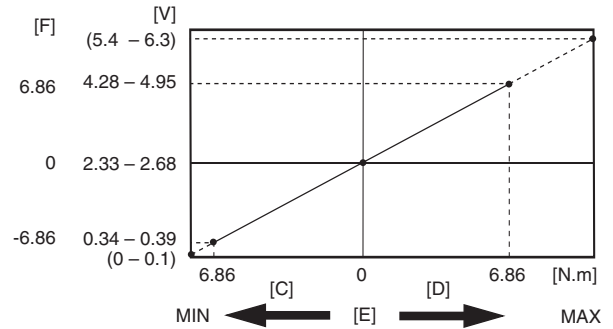
Torque Sensor Inspection

S6RS0B6306012

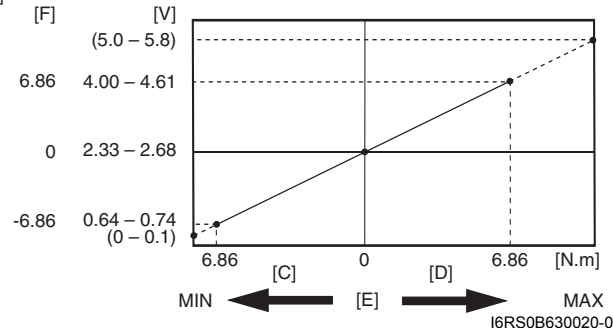
- 1) Remove console box.
- 2) With ignition switch turned OFF, connect scan tool to DLC or connect voltage tester between "E52-18" – "E52-9" (main sensor) or "E52-6" – "E52-9" (sub sensor) with connected connector to P/S control module.
- 3) Set torque wrench to steering wheel referring to "Steering Force Check in related manual" for checking steering force.
- 4) Turn ON ignition switch without engine running and select scan tool "Data list" mode due to check of "TQS Main Torque", "TQS Sub Torque" and "Assist Torque" display on scan tool when steering wheel turned left and right (if used).
- 5) Check that characteristic of torque sensor (main and sub) output voltage or scan tool data and steering force is as following graph when steering wheel is turned left and right. If sensor voltage or scan tool data is out of specified value or does not vary linearly as the following graph, check EPS control module and its circuit.
If they are OK, replace steering gear case assembly.



[A]



[B]



16RS0B630020-04

[A]: For other than M16 engine models

[B]: For M16 engine model

[C]: Steering force at left turn

[D]: Steering force at right turn

[E]: Steering wheel at free

[F]: "TQS Main Torque", "TQS Sub Torque" and "Assist Torque" in "Data List" displayed on scan tool

Motor Assembly Inspection

S6RS0B6306013

- 1) Remove console box.
- 2) Disconnect motor connector ("E51") from P/S control module with ignition switch OFF.
- 3) Check for resistance between terminals of motor connector ("E51").
If check result is not as specified, replace steering gear case assembly.

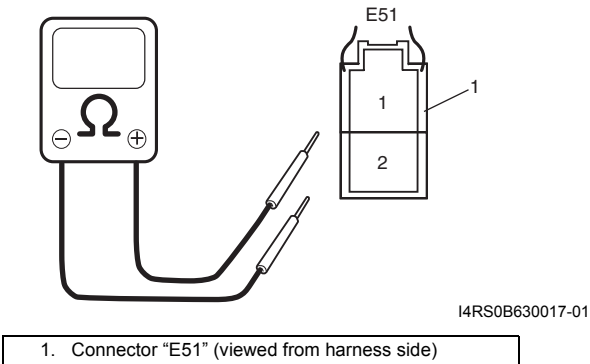
Motor circuit resistance

"E51-1" and "E51-2" (For motor)	About 1 Ω
---------------------------------	-----------

- 4) Check for continuity between terminal of motor connector ("E51") and body ground.
If check result is not as specified, replace steering gear case assembly.

Motor circuit resistance

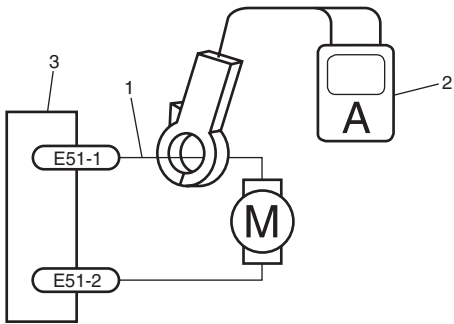
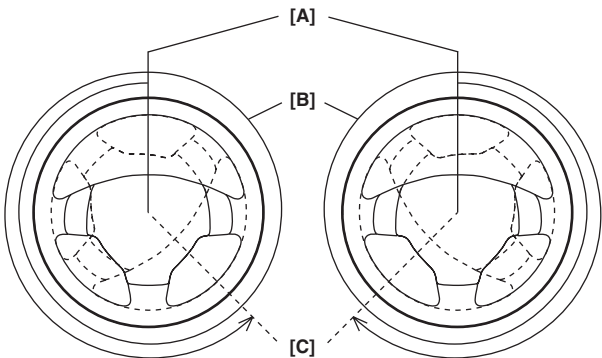
"E51-2" and body ground	No continuity
-------------------------	---------------



- 5) Hoist vehicle.
- 6) Connect "E51" connector to P/S control module with ignition switch OFF position.
- 7) Using ammeter (2), check that P/S motor (1) current is as following table with idling engine. If check result is not satisfactory, check P/S control module referring to "Inspection of P/S Control Module and Its Circuits". If OK, replace steering gear case assembly.

Motor current at hoisted vehicle

Condition	When steering wheel is left at straight position: [A]	When steering wheel is turned left or right by turning speed with 90° /sec: [B]	When steering wheel is kept fully turned left or right until it stops.: [C]
Motor current	Approx. 0 A	Approx. 2 – 4 A	Approx. 30 – 45 A



Specifications

Tightening Torque Specifications

S6RS0B6307001

NOTE

The specified tightening torque is also described in the following.

“Steering Gear Case Assembly Components: ”

Reference:

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

Special Tools and Equipment

Recommended Service Material

S6RS0B6308001

NOTE

Required service material is also described in the following.

“Steering Gear Case Assembly Components: ”

Section 7

HVAC

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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 on HVAC

S6RS0B7000001

Air Bag Warning

Refer to “Air Bag Warning in Section 00 in related manual”.

A/C System Caution

Refer to “A/C System Caution: Manual Type in Section 7B in related manual” and “A/C System Caution: Automatic Type in Section 7B”.

Precautions on Servicing A/C System

Refer to “Precautions on Servicing A/C System: Manual Type in Section 7B in related manual” and “Precautions on Servicing A/C System: Automatic Type in Section 7B”.

Precautions in Diagnosing Trouble

Refer to “Precautions in Diagnosing Trouble: Automatic Type in Section 7B”.

Heater and Ventilation

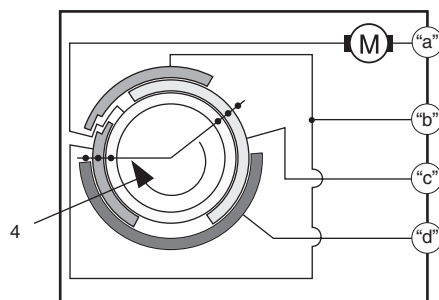
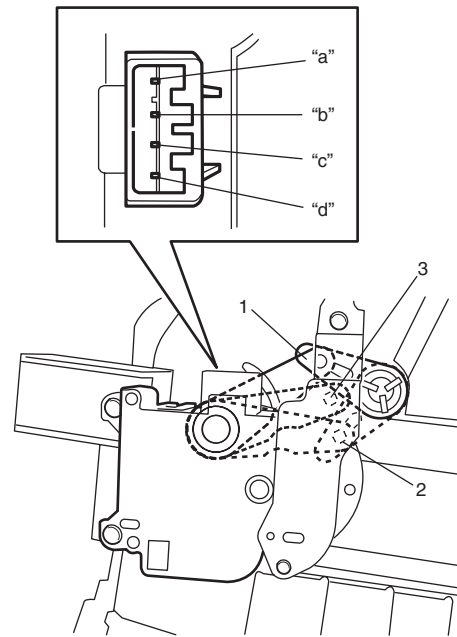
Repair Instructions

Air Intake Control Actuator Inspection

S6RS0B7106013

Check air intake control actuator as follows:

- 1) Using service wire, connect battery positive terminal to "a" terminal and battery negative terminal to "c" terminal. And, check if air intake selector link operates smoothly and it stops at fresh position (1).
 - 2) Using service wire, connect battery positive terminal to "a" terminal and battery negative terminal to "d" terminal. And, check if air intake selector link operates smoothly and it stops at recirculation position (2).
 - 3) For auto A/C model, using service wire, connect battery positive terminal to "a" terminal and battery negative terminal to "b" terminal. And, check air intake selector link operates smoothly and it stops at mix position (3).
- If malfunction is found, replace air intake control actuator.



I6RS0B710001-01

4. Motor rotation direction

Air Conditioning System

Automatic Type

Precautions

A/C System Caution

S6RS0B7220001

Refer to "A/C System Caution: Manual Type in related manual".

Precautions in Diagnosing Trouble

S6RS0B7220004

- Do not disconnect couplers from HVAC control module, battery cable from battery, HVAC control module ground wire harness from body or main fuse before confirming diagnostic information (diagnostic trouble code) stored in HVAC control module memory.
- Diagnostic information (diagnostic trouble code) stored in HVAC control module can be checked by display of HVAC control module. Also, it can be checked by using SUZUKI scan tool. Before checking diagnostic information (diagnostic trouble code), read this manual and operator's manual for SUZUKI scan tool to know how to read diagnostic information (diagnostic trouble code).
- When trouble is diagnosed using diagnostic information (diagnostic trouble code) on display of HVAC control module, keep in your mind that each diagnostic information (diagnostic trouble code) has priority, and only diagnostic information (diagnostic trouble code) which has the highest priority is indicated. Therefore, after troubleshooting the malfunction, make sure if there exists any other diagnostic information (diagnostic trouble code).
- Be sure to read "Precautions for Electrical Circuit Service in Section 00 in related manual" before inspection.

Precautions on Servicing A/C System

S6RS0B7220005

Refer to "Precautions on Servicing A/C System: Manual Type in related manual".

General Description

Auto A/C System Description

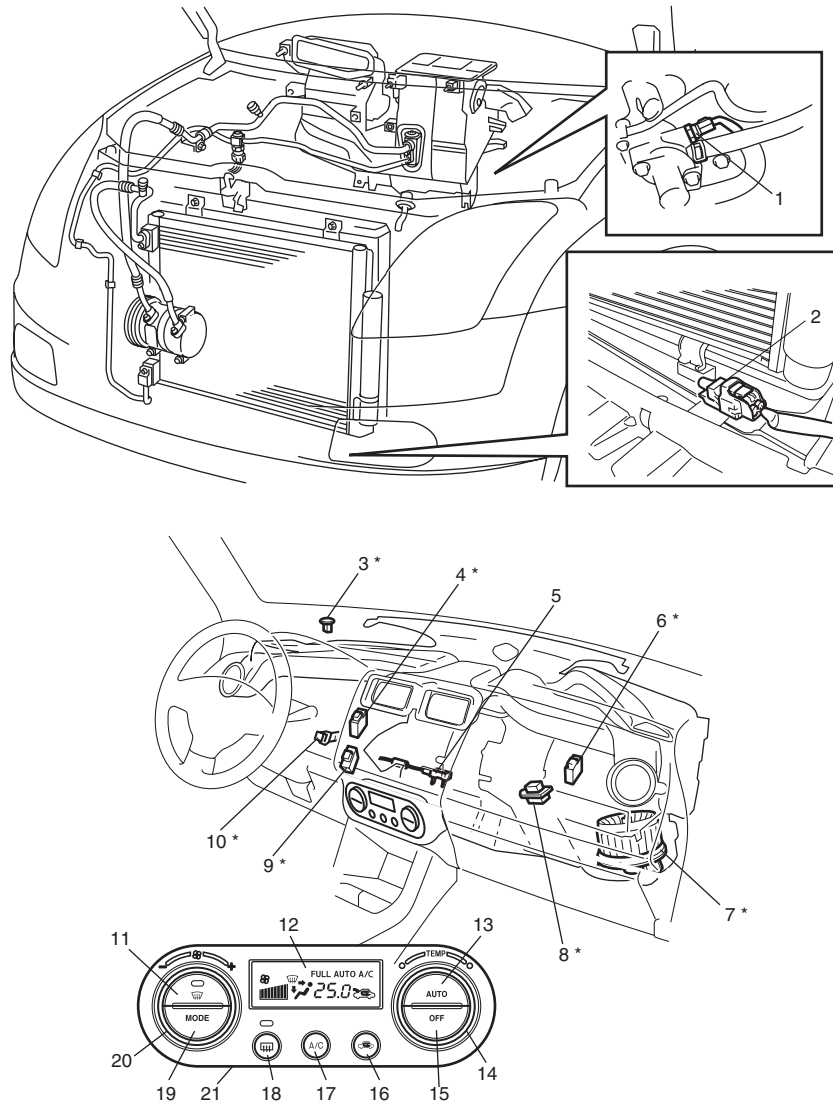
S6RS0B7221001

The automatic type air conditioning system (auto A/C) is provided with the function to automatically control the inside air temperature, fan speed, air flow outlet direction and air intake position by HVAC control module in addition to functions of the manual type air conditioning system (manual A/C). Once the inside air temperature is set using the temperature selector, HVAC control module automatically controls the inside air temperature at the constant level at all times based on the inside air temperature, outside air temperature, amount of sunlight and engine coolant temperature detected respectively by the inside air temperature sensor, outside air temperature sensor, sunload sensor and ECT sensor. At this time, "FULL AUTO A/C" appears on the display of HVAC control module. With the air intake selector pushed in the above state, it is possible to select any position of the air intake actuator. Then, "FULL AUTO A/C" on the display changes to "AUTO A/C".

Electronic Control System Location

NOTE

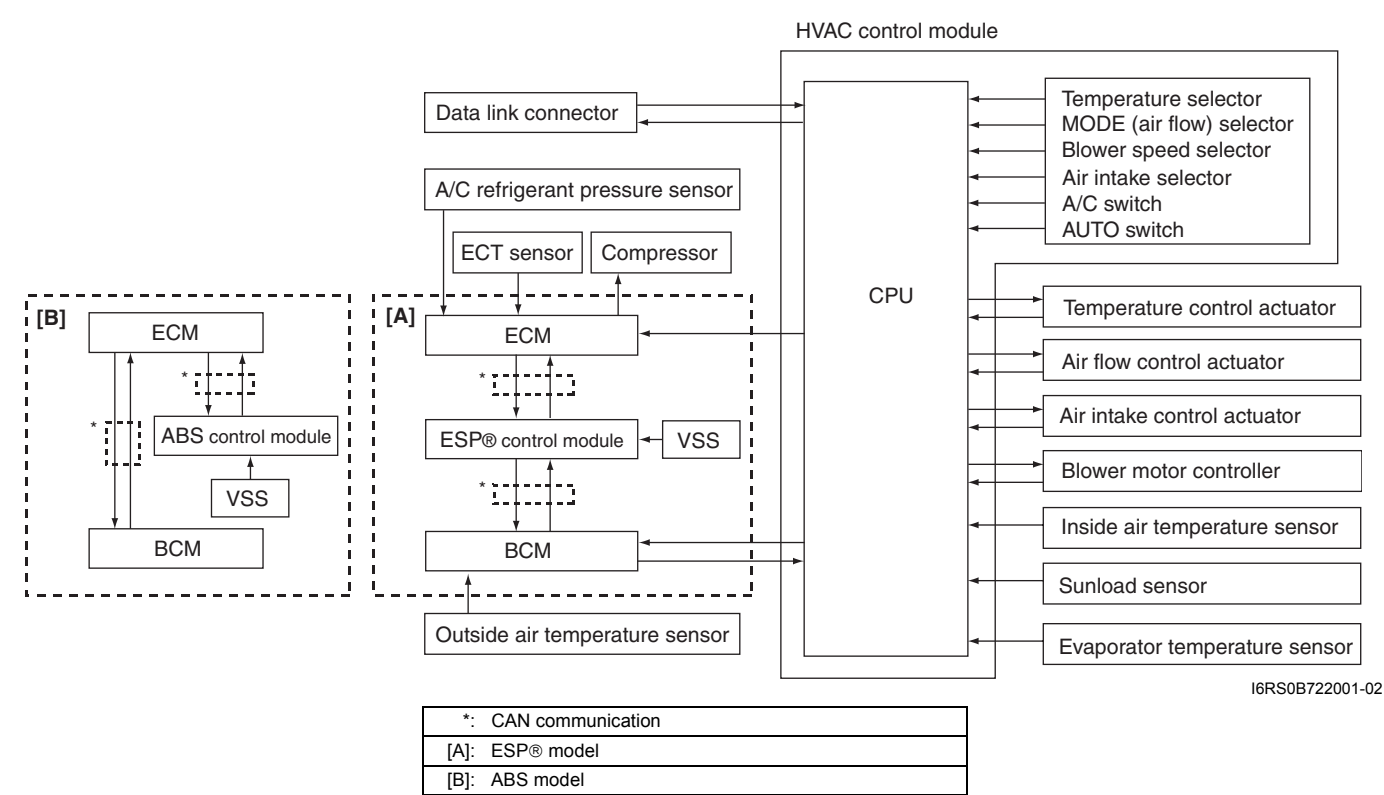
The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



I5RS0C722001-01

1. ECT sensor	7. Blower motor	13. AUTO switch	19. MODE (air flow) selector
2. Outside air temperature sensor	8. Blower motor controller	14. Temperature selector	20. Blower speed selector
3. Sunload sensor	9. Temperature control actuator	15. OFF switch	21. HVAC control module
4. Air flow control actuator	10. Inside air temperature sensor	16. Air intake selector	
5. Evaporator temperature sensor	11. Defroster switch	17. A/C switch	
6. Air intake actuator	12. Display	18. Rear defogger switch	

Auto A/C Electronic Control Input / Output Table



HVAC Control Module Operation Description
S6RS0B7221005

Temperature Control
HVAC control module calculates the target temperature control door position based on signals from the temperature selector, inside air temperature sensor, outside air temperature sensor and sunload sensor and controls the temperature control actuator so that the current position of the temperature control door matches its target position.

Fan Speed Control
HVAC control module calculates the target blower fan speed based on signals from the temperature selector, inside air temperature sensor, outside air temperature sensor and sunload sensor, compares it with the current blower fan speed inputted from the blower motor controller to control the current blower fan speed to the target level.

Air Flow Outlet Control
HVAC control module calculates the target temperature control door position based on signals from the temperature selector, inside air temperature sensor, outside air temperature sensor and sunload sensor. Using thus obtained target temperature control door position, it further calculates the target air flow control door position and controls the air flow control actuator so that the current air flow control door position becomes the target position.

Air Intake Position Control
HVAC control module determines the air intake position based on signals from the temperature selector, inside air temperature sensor, outside air temperature sensor and sunload sensor and controls the air intake actuator.

Refrigerant Type Identification
S6RS0B7221006
Refer to “Refrigerant Type Identification: Manual Type in related manual”.

Sub-Cool A/C System Description
S6RS0B7221003
Refer to “Sub-Cool A/C System Description: Manual Type in related manual”.

A/C Operation Description
S6RS0B7221007
Refer to “A/C Operation Description: Manual Type in related manual”.

On-Board Diagnostic System Description

S6RS0B7221004

NOTE

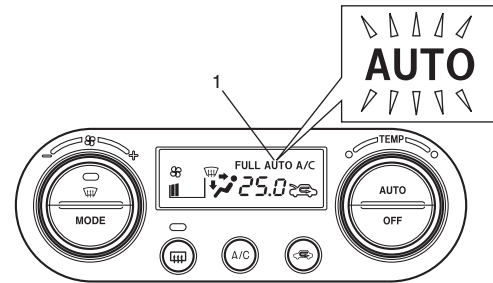
The diagnostic information as diagnostic trouble code (DTC) can be known by using SUZUKI scan tool. For further details, refer to “DTC Check: Automatic Type”.

HVAC control module detects malfunctions, which may occur in the following area.

- Outside air temperature sensor
- Inside air temperature sensor
- Evaporator temperature sensor
- Sunload sensor
- ECT sensor
- Temperature control actuator of HVAC unit
- Air flow control actuator of HVAC unit
- A/C refrigerant pressure sensor

- HVAC control module
- VSS
- Serial Communication line
- CAN communication line

When HVAC control module detects malfunction, the “AUTO” indicator lamp (1) flashes to warn and the diagnostic trouble code (DTC) is stored in the memory of the module. When diagnosing trouble, the DTC can be checked according to “DTC Check: Automatic Type”.



I5RS0A722003-01

Schematic and Routing Diagram

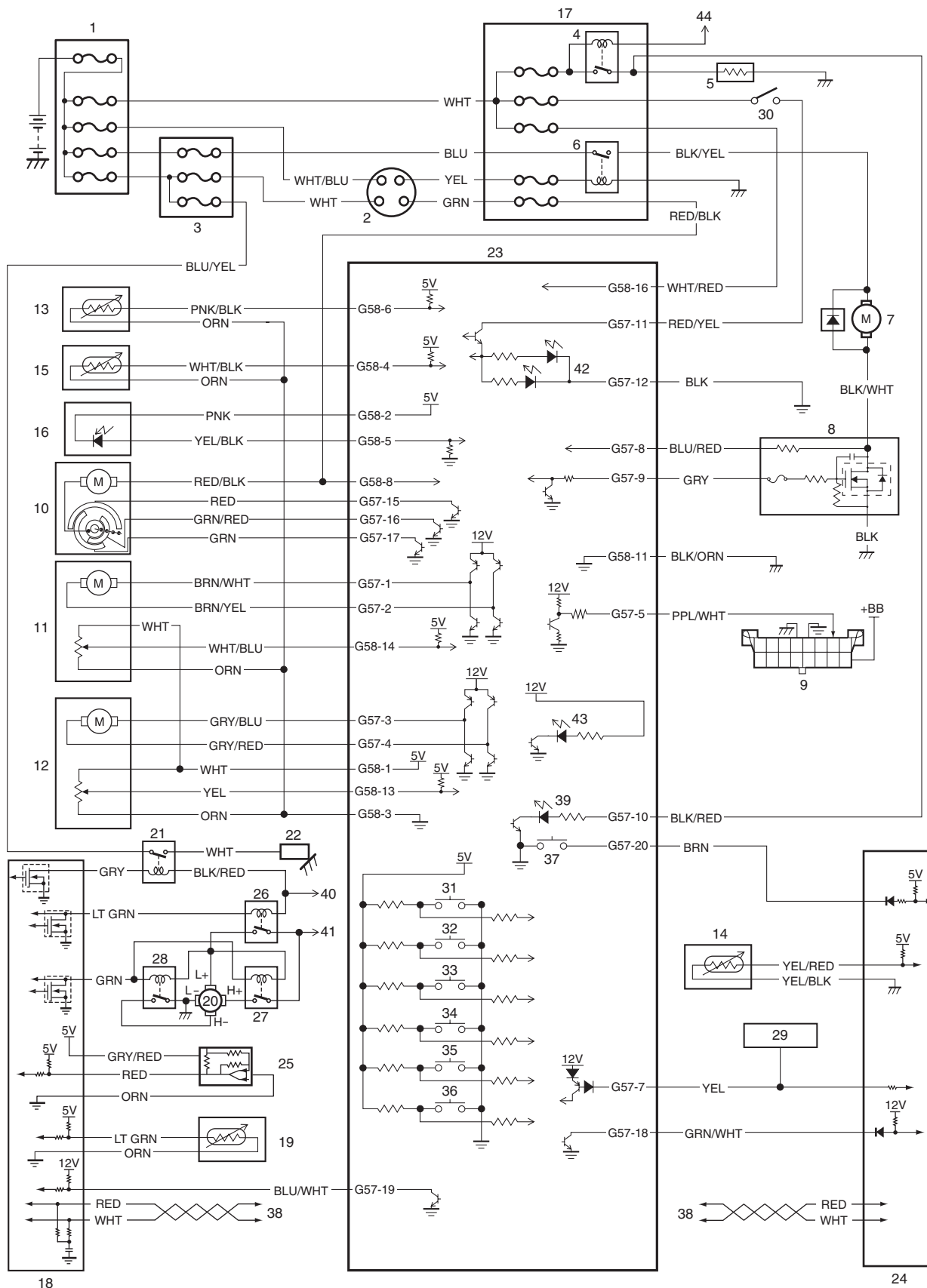
Major Components of A/C System

S6RS0B7222001

Refer to “Major Components of A/C System: Manual Type in related manual”.

A/C System Wiring Diagram

S6RS0B7222002



I6RS0B7222002-02

1. Main fuse box	12. Temperature control actuator	23. HVAC control module	34. Defroster switch
2. Ignition switch	13. Inside air temperature sensor	24. BCM	35. AUTO switch
3. Individual circuit fuse box No.1 box	14. Outside air temperature sensor	25. A/C refrigerant pressure sensor	36. OFF switch

4. Rear defogger relay	15. Evaporator temperature sensor	26. Radiator cooling fan relay No.1	37. Rear defogger switch
5. Rear defogger	16. Sunload sensor	27. Radiator cooling fan relay No.2	38. To ESP® control module
6. Blower motor relay	17. Junction block assembly	28. Radiator cooling fan relay No.3	39. Rear defogger indicator
7. Blower motor	18. ECM	29. Information display	40. To main relay
8. Blower motor controller	19. ECT sensor	30. Lighting switch	41. To main fuse
9. DLC	20. Radiator cooling fan motor	31. A/C switch	42. Back-light
10. Air intake actuator	21. Compressor relay	32. MODE (air flow) selector	43. Defroster indicator
11. Air flow control actuator	22. Compressor	33. Air intake selector	44. To BCM

Diagnostic Information and Procedures

A/C System Symptom Diagnosis

S6RS0B7224001

Condition	Possible cause	Correction / Reference Item
No cool air comes out (A/C system does not operate)	No refrigerant	Perform recovery, evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual Type in related manual".
	Fuse blown	Check related fuses, and then check for short circuit to ground.
	A/C switch faulty	Check A/C switch referring to "Inspection of HVAC Control Module and Its Circuit: Automatic Type".
	Evaporator temperature sensor faulty	Check evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual Type 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: Manual Type in related manual" (petrol engine model). Replace A/C refrigerant pressure sensor (diesel engine model).
	Wiring or grounding faulty	Repair as necessary.
	ECT sensor faulty	Check ECT sensor referring to "Engine Coolant Temperature (ECT) Sensor Inspection: For M13, M15 and M16 Engines in Section 1C in related manual" (petrol engine model). Replace ECT sensor (diesel engine model).
	ECM faulty	Check ECM referring to "Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines in Section 1A" (petrol engine model). Replace ECM (diesel engine model).
	HVAC control module faulty	Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Automatic Type".
	Magnet clutch faulty	Check magnet clutch referring to "Magnet Clutch Inspection (Petrol Engine Model): Manual Type in related manual".
	Compressor drive belt loosened or broken	Adjust or replace drive belt.
	Compressor faulty	Check compressor.
	Compressor relay faulty	Check compressor relay referring to "Compressor Relay Inspection: Manual Type in related manual".
	Temperature selector, blower speed selector, and/or air flow selector faulty	Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Automatic Type".
	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: For M13, M15 and M16 Engines in Section 1F in related manual".
	Radiator cooling fan motor faulty	Check radiator cooling fan motor referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: For M13, M15 and M16 Engines in Section 1F in related manual" (petrol engine model) or "Radiator Cooling Fan Assembly On-Vehicle Inspection: For Z13DT Engine in Section 1F in related manual" (diesel engine model).
	ECM faulty	Check ECM referring to "A/C System Inspection at ECM: Automatic Type".
	HVAC control module faulty	Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Automatic Type".
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: Automatic Type".
	Blower speed selector faulty	Check blower speed selector referring to "Inspection of HVAC Control Module and Its Circuit: Automatic Type".
	HVAC control module faulty	Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Automatic Type".
	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 and Supplementary Heater Relay (If Equipped) Inspection in Section 7A in related manual".

7B-9 Air Conditioning System: Automatic Type

Condition	Possible cause	Correction / Reference Item
Cool air does not come out or insufficient cooling (A/C system normal operation)	Insufficient or excessive charge of refrigerant	Check the amount of refrigerant and system for leaks.
	Condenser clogged	Check condenser referring to "Condenser Assembly On-Vehicle Inspection: Manual Type in related manual".
	A/C evaporator clogged or frosted	Check A/C evaporator and evaporator temperature sensor referring to "Evaporator Inspection: Manual Type in related manual" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual Type in related manual".
	Evaporator temperature sensor faulty	Check evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual Type in related manual".
	Expansion valve faulty	Check expansion valve referring to "Expansion Valve Inspection: Manual Type 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 Inspection (Petrol Engine Model): Manual Type in related manual".
	Compressor faulty	Check compressor.
	Air in A/C system	Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual Type in related manual".
	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 "Inspection of HVAC Control Module and Its Circuit: Automatic Type".
	HVAC control module faulty	Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Automatic Type".
	Temperature control actuator faulty	Check temperature control actuator referring to "Temperature Control Actuator Inspection: Automatic Type".
Cool air does not come out only intermittently	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.
	Wiring connection faulty	Repair as necessary.
	Expansion valve faulty	Check expansion valve referring to "Expansion Valve Inspection: Manual Type in related manual".
	Excessive moisture in A/C system	Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual Type in related manual".
	Magnet clutch faulty	Check magnet clutch referring to "Magnet Clutch Inspection (Petrol Engine Model): Manual Type in related manual".
	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 "Condenser Assembly On-Vehicle Inspection: Manual Type 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 Refrigerant Charge: Manual Type in related manual".
	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 "Evaporator Inspection: Manual Type in related manual" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual Type 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 "Evaporator Inspection: Manual Type in related manual" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual Type 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.

Abnormal Noise Symptom Diagnosis of A/C System

S6RS0B7224002

Refer to "Abnormal Noise Symptom Diagnosis of A/C System: Manual Type in related manual".

DTC Check

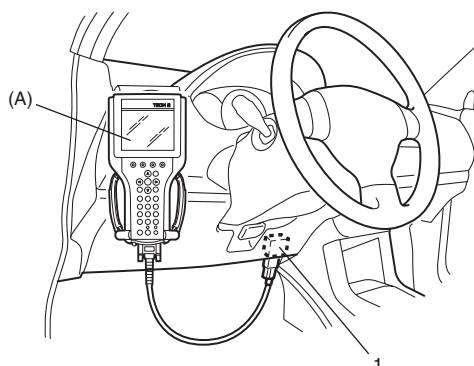
S6RS0B7224003

Using SUZUKI Scan Tool

- 1) Turn ignition switch to OFF position.
- 2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool

(A): SUZUKI scan tool



I5RS0A722005-01

- 3) Light over sunload sensor vertically with an incandescent lamp of approximately 100 W apart from about 100 mm (3.94 in.).

NOTE

If sunload sensor is not lighted over with an incandescent lamp, DTC B1504 is detected even though there is not any malfunction.

- 4) Turn ignition switch to ON position.
- 5) Read DTC displayed on SUZUKI scan tool.

NOTE

To know how to use SUZUKI scan tool, refer to operator's manual for SUZUKI scan tool.

- 6) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC).

Not Using SUZUKI Scan Tool

Current DTC mode

- 1) Light over sunload sensor vertically with an incandescent lamp of approximately 100 W apart from about 100 mm (3.94 in.).

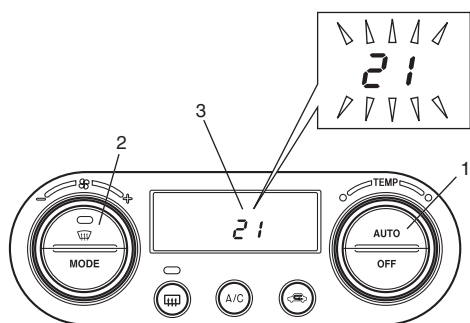
NOTE

If sunload sensor is not lighted over with an incandescent lamp, DTC B1504 is detected as current DTC even though there is not any malfunction.

- 2) Start engine.
- 3) Wait for 20 seconds or more after engine started and set temperature selector to 25 °C (77 °F).
- 4) Push AUTO switch (1) and defroster switch (2) at the same time.
- 5) Check DTC (3).

NOTE

- DTC flashes for 15 seconds. After that, the normal display is restored. To have DTC displayed again, repeat the procedure from Step 4.
- When more than two DTCs are detected, only DTC having the highest priority is indicated. Therefore, after troubleshooting the malfunction, DTC check has to be performed again to see if any other DTC(s) is detected.



I5RS0A722006-02

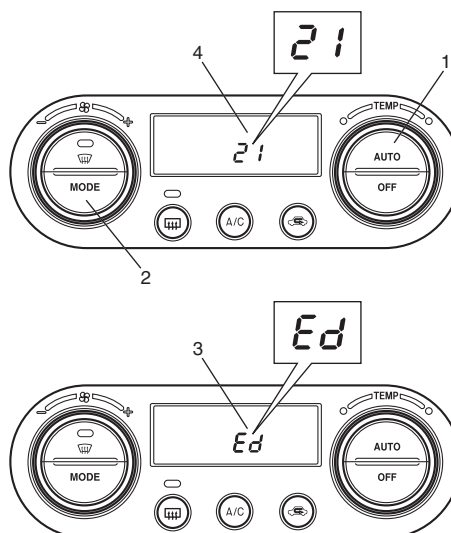
History DTC mode

- 1) Turn ignition switch to ON position.
- 2) Set temperature selector to 25 °C (77 °F).
- 3) Push AUTO switch (1) and MODE (air flow) selector (2) at the same time.
- 4) Check DTC (4).

NOTE

Each DTC item is displayed (lights up) for 4 seconds.

When HVAC control module detects 2 or more DTC items, each one is displayed once starting from the one of higher priority order. After all DTC items being detected have been displayed, "Ed" (3) appears on display of HVAC control module and normal display is restored. "Ed" means that all DTC items have been displayed.



I5RS0A722007-02

DTC Clearance

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NOTE

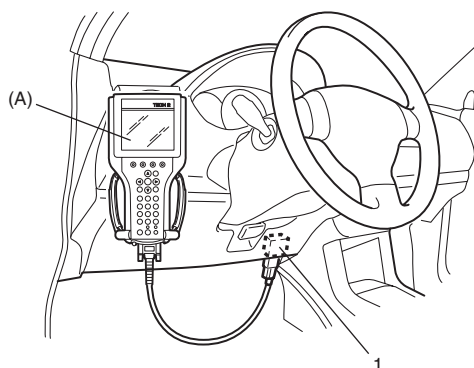
Only history DTC(s) can be cleared. Current DTC(s) can not be cleared unless the problem(s) is fixed.

Using SUZUKI Scan tool

- 1) Turn ignition switch to OFF position.
- 2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool

(A): SUZUKI scan tool



I5RS0A722005-01

- 3) Light over sunload sensor vertically with an incandescent lamp approximately 100 W apart from about 100 mm (3.94 in.).

NOTE

If sunload sensor is not lighted over with an incandescent lamp, DTC B1504 is detected as current DTC even though there is not any malfunction.

- 4) Turn ignition switch to ON position.

- 5) Erase DTC according to instructions displayed on SUZUKI scan tool.

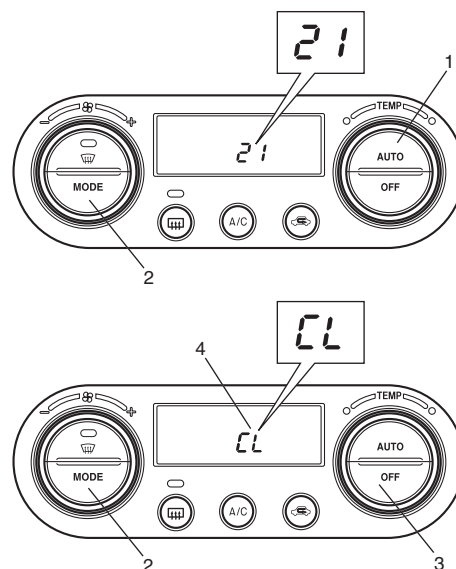
NOTE

To know how to use SUZUKI scan tool, refer to operator's manual for SUZUKI scan tool.

- 6) After completing the clearance, turn ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Not Using SUZUKI Scan Tool

- 1) Turn ignition switch to ON position.
- 2) Set temperature selector to 25 °C (77 °F).
- 3) Push AUTO switch (1) and MODE (air flow) selector (2) at the same time to have history DTC displayed.
- 4) Push MODE (air flow) selector (2) and OFF switch (3) at the same time while history DTC is displayed.
- 5) Check that "CL" (4) appears on display. "CL" means that DTC has been cleared.



I5RS0A722008-01

DTC Table

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⚠ CAUTION

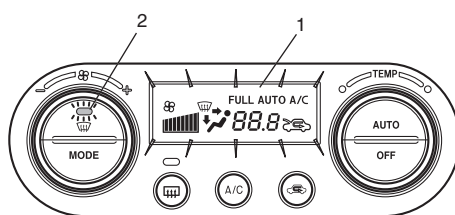
Be sure to perform "Air Conditioning System Check: Automatic Type" before starting diagnosis.

DTC No. (displayed on SUZUKI scan tool)	DTC (indicated on display of HVAC control module)	Priority of display (current DTC)	Priority of display (history DTC)	Diagnosis		"AUTO" indicator lamp
B1502	21	1	1	Inside air temperature sensor and/or its circuit malfunction	Open	Flashed
	22	2	2		Short	
B1503	31	3	3	Evaporator temperature sensor and/or its circuit malfunction	Open	Flashed
	32	4	4		Short	
B1504	41	21	—	Sunload sensor and/or its circuit malfunction	Open	—
	42	5	5		Short	

DTC No. (displayed on SUZUKI scan tool)	DTC (indicated on display of HVAC control module)	Priority of display (current DTC)	Priority of display (history DTC)	Diagnosis		“AUTO” indicator lamp
B1511	61	6	6	Temperature control actuator (position sensor) and/or its circuit malfunction	Open	Flashed
	62	7	7		Short	
B1512	71	8	8	Air flow control actuator (position sensor) and/or its circuit malfunction	Open	Flashed
	72	9	9		Short	
B1513	63	10	10	Temperature control actuator and/or its circuit malfunction		Flashed
B1514	73	11	11	Air flow control actuator and/or its circuit malfunction		Flashed
B1541	E1	12	—	HVAC control module back-up power supply malfunction		—
B1546	d5	22	—	A/C refrigerant pressure malfunction		—
B1551	91	13	12	Serial communication circuit malfunction	Open	Flashed
	92	14	13		Short	
B1552	94	15	14	Serial communication signal malfunction		Flashed
B1553	A4	16	15	CAN communication signal malfunction		Flashed
B1557	b4	19	16	Vehicle speed sensor signal malfunction		—
B1561	54	17	17	Engine coolant temperature sensor signal malfunction		Flashed
B1562	14	18	18	Outside air temperature sensor signal malfunction		Flashed
B1563	d4	20	19	A/C refrigerant pressure sensor signal malfunction		—
—	SeeNOTE below (current DTC)	—	—	Normal		—
	00 (history DTC)					

NOTE

When no current DTC is detected, all contents displayed on display (1) of HVAC control module and defroster indicator (2) flash at the same time.



I5RS0A722009-01

Fail-Safe Table

S6RS0B7224006

When any of the following malfunctions (DTCs) is detected, fail-safe mode is activated.

However, when HVAC control module detects normal operation of A/C system, fail-safe mode is cancelled.

DTC No.	Trouble Area	Fail-Safe Operation
B1502	Inside air temperature sensor and/or its circuit	HVAC control module controls actuators assuming that inside air temperature is 25 °C (77 °F).
B1503	A/C evaporator temperature sensor and its circuit	- HVAC control module turns off A/C switch signal. - HVAC control module controls actuators assuming that evaporator temperature is 0 °C (32 °F).
B1504	Sunload sensor and/or its circuit	HVAC control module controls actuators assuming that amount of sunlight is 0 W/m ² .

DTC No.	Trouble Area	Fail-Safe Operation
B1551	Serial communication circuit	HVAC control module controls actuators assuming that outside air temperature is 20 °C (68 °F), engine coolant temperature is 80 °C (176 °F), and vehicle speed is 40 km/h (25 mph).
B1552	Serial communication circuit	
B1553	CAN communication circuit	
B1557	Vehicle speed sensor and/or its circuit	HVAC control module controls actuators assuming that vehicle speed is 40 km/h (25 mph).
B1561	Engine coolant temperature sensor and/or its circuit	HVAC control module controls actuators assuming that engine coolant temperature is 80 °C (176 °F).
B1562	Outside air temperature sensor and/or its circuit	HVAC control module controls actuators assuming that outside air temperature is 20 °C (68 °F).

Scan Tool Data

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As the data values given in the following are standard values estimated on the basis of values obtained from the normally operation vehicles by using a scan tool, use them as reference values. Even when the vehicles are in good condition, there may be cases where the checked values do not fall within each specifies data range. Therefore, judgement as abnormal should not be made by checking with these data alone.

Scan Tool Data	Condition	Normal Condition / Reference Value
TEMP CONT SWITCH	Each reference value is relative to the position of temperature selector of HVAC control module.	Max Cool, 15 °C (59 °C) – 29 °C (84 °F), Max Hot
CABIN TEMPERATURE	Reference value is relative to in-car temperature.	–6.5 °C – 57.25 °C (20.3 °F – 135.05 °F)
OUTSIDE AIR TEMP	Reference value is relative to outside air temperature.	–23.3 °C – 65.95 °C (–9.94 °F – 150.71 °F)
EVAPORATOR TEMP	Reference value is relative to temperature of evaporator.	–29.7 °C – 59.55 °C (–21.46 °F – 139.19 °F)
COOLANT TEMP	At specified idle speed after warming up.	80 °C – 100 °C (176 °F – 212 °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 air flow selector of HVAC control module.	AUTO, FACE, B/L, FOOT, D/F, DER
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 DESIRED VOLT	Reference value is relative to the position of blower speed selector of HVAC control module.	0 – 16.0 V
AIR MIX POS SEN	Reference value is relative to the position of temperature selector of HVAC control module.	about 2.0 V (Max Hot) about 4.0 V (Max Cool)
MODE POS SENSOR	Reference value is relative to the position of air flow selector of HVAC control module.	about 1.6 V (DEF) about 4.0 V (VENT)
A/C CONT SIG	A/C system is ON.	ON
	A/C system is OFF.	OFF
BLOWER LOAD SIG	Position of blower speed selector is 1st position or more.	ON
	Position of blower speed selector is OFF position.	OFF
AIR INTAKE MODE	Fresh air (FRE) mode is activated.	FRE
	Recirculation air (REC) mode is activated.	REC
	AUTO mode is activated.	AUTO

Scan Tool Data	Condition		Normal Condition / Reference Value
REFRIGERANT PRESSURE	Engine running.	A/C ON (A/C is operating) at ambient temperature: 30 °C (86 °F)	1420 – 1830 kPa (petrol engine model), 1370 – 1690 kPa (diesel engine model) For more details, refer to pressure of high pressure gauge under “A/C System Performance Inspection: Manual Type in related manual”
		A/C OFF (A/C is not operating) at ambient temperature: 30 °C (86 °F) and engine coolant temperature: 90 ° – 100 °C	600 – 1000 kPa After longer than 10 min from A/C switch turned off
A/C COMP CLUTCH	Engine running.	A/C switch and blower motor switch turned ON	ON
		A/C switch and/or blower motor switch turned OFF	OFF
DFR INDICATOR	Defroster indicator lamp is lighted.		ON
	Defroster indicator lamp is not lighted.		OFF
VEHICLE SPEED	At stop.		OFF
			0 km/h (0 mph)

Scan Tool Data Definitions**TEMP CONT SWITCH (TEMPERATURE**

SELECTOR): 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 (EVAPORATOR

TEMPERATURE): Temperature of air passed through evaporator

COOLANT TEMP (ENGINE COOLANT

TEMPERATURE): 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 (MODE (AIR FLOW)

SELECTOR): Position of air flow selector of HVAC control module

FAN CONT SWITCH (BLOWER SPEED SELECTOR):

Position of blower speed selector of HVAC control module

FAN DESIRED VOLT: Voltage for blower motor

AIR MIX POS SEN (TEMPERATURE CONTROL

ACTUATOR POSITION SENSOR): Input signal from position sensor in temperature control actuator

MODE POS SENSOR (AIR FLOW CONTROL

ACTUATOR POSITION SENSOR): Input signal from position sensor in air flow control actuator

A/C CONT SIG (A/C SWITCH SIGNAL, ON or OFF):

State of A/C switch

BLOWER LOAD SIG (BLOWER FAN LOAD SIGNAL, ON or OFF): ON: Position of blower speed selector is 1st position or more / OFF: Position of blower speed selector is OFF position.

AIR INTAKE MODE (AUTO, FRE or REC): State of air intake mode

REFRIGERANT PRESSURE (A/C REFRIGERANT

ABSOLUTE PRESSURE): This parameter indicates A/C refrigerant absolute pressure calculated by ECM

A/C COMP CLUTCH (A/C COMPRESSOR MAGNET

CLUTCH, ON or OFF): This parameter indicates the state of the A/C switch

DFR INDICATOR (DEFROSTER INDICATOR LAMP,

ON or OFF): State of defroster indicator lamp

VEHICLE SPEED:

It is computed based on pulse signals from vehicle speed sensor

Air Conditioning System Check

S6RS0B7224008

Step	Action	Yes	No
1	Customer complaint analysis 1) Perform ☞ "Customer complaint analysis". <i>Was customer complaint analysis performed?</i>	Go to Step 2.	Perform customer complaint analysis.
2	Visual inspection 1) Perform ☞ "Visual inspection". <i>Is there any faulty condition?</i>	Repair or replace malfunction part.	Go to Step 3.
3	DTC check 1) Perform ☞ "DTC check". <i>Is there any DTC code?</i>	Go to Step 4.	Go to Step 5.
4	Troubleshooting malfunction 1) Perform ☞ "Troubleshooting malfunction". <i>Is there any faulty condition?</i>	Repair or replace malfunction part, and go to Step 7.	Go to Step 5.
5	Perform A/C system symptom diagnosis 1) Inspect and repair referring to "A/C System Symptom Diagnosis: Automatic Type". <i>Is there any faulty condition?</i>	Repair or replace malfunction part, and go to Step 7.	Go to Step 6.
6	Check for intermittent problem 1) Check for intermittent troubles referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". <i>Is there any faulty condition?</i>	Repair or replace malfunction part, and go to Step 7.	Go to Step 7.
7	Final confirmation test 1) Perform ☞ "Final confirmation test". <i>Is there any malfunction code?</i>	Go to Step 4.	End.

Description for Each Step**Step 1. Customer complaint analysis**

Talk to customer, and then record details of the problem.

Customer questionnaire (Example)

Customer's Name:	Model:	VIN:	
Date of Issue:	Date of Reg:	Date of Problem:	Mileage:

Problem Symptoms	● A/C switch indicator lamp abnormal: fails to turn on/fails to turn off/flashes ● Abnormal noise while A/C compressor is working: from compressor/ from condenser fan motor other _____ ● Chattering from A/C compressor: ● Condenser fan motor does not work: ● A/C compressor does not work: ● Other:
Frequency of Occurrence	● Continuous/Intermittent (_____ times a day, a month)/ other _____
Conditions for Occurrence of Problem	● Vehicle at stop & A/C compressor is working: ● For some time after A/C switch is ON: ● When outside air temperature is high: ● When outside air temperature is low: ● All the time:
Environmental Condition	● Weather: fair/cloudy/rain/snow/other _____ ● Temperature: °F (_____ °C)
Diagnostic Trouble Code	● First check: _____ Normal code/malfunctional code (_____) ● Second check after test drive: _____ Normal code/malfunctional 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 air conditioning referring to "Visual Inspection: Automatic Type".

Step 3. DTC check

Check DTC referring to "DTC Check: Automatic Type".

Step 4. Troubleshooting malfunction

Based on the DTC, perform an applicable DTC diagnostic flow and locate the cause of the trouble, namely in a sensor, wire harness, connector, actuator, HVAC control module or other part and repair faulty parts.

Step 5. A/C system symptom diagnosis

Check any part or system suspected to be a possible cause referring to "A/C System Symptom Diagnosis: Automatic Type".

Step 6. Check for intermittent problem

Check any part 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 cord recorded.

Step 7. Final confirmation test

Confirm if the problem symptom is troubleshoot and the A/C system is free from any abnormal conditions. If there existed DTC, clear the DTC. Then, check if the DTC is still detected and if there is any other DTC.

Visual Inspection

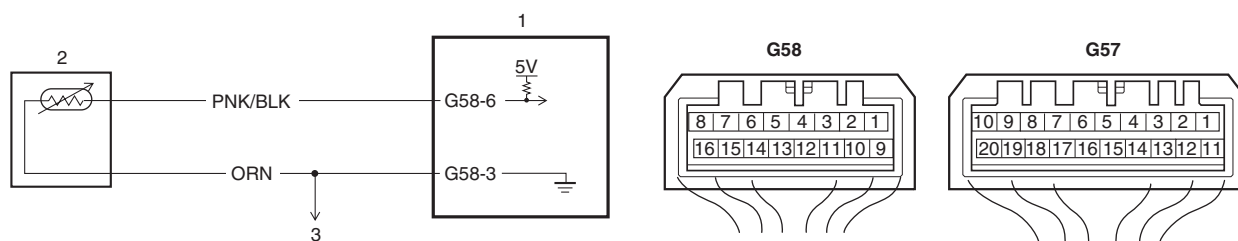
S6RS0B7224009

Check visually the following parts and systems.

Inspection item	Correction
- Refrigerant ---- leakage and amount - A/C pipe or hose ---- disconnection, looseness and deterioration - A/C compressor drive belt ---- looseness and damage - Battery ---- fluid level and corrosion of terminal - Connectors of electric wire harness ---- disconnection and friction - Fuses ---- burning - Parts ---- installation and damage - Other parts that can be checked visually	Refer to “Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual Type in related manual”.

DTC B1502: Inside Air Temperature Sensor and/or Its Circuit Malfunction

S6RS0B7224012

Wiring Diagram

I6RS0A722003-01

1. HVAC control module	2. Inside air temperature sensor	3. To other sensors
------------------------	----------------------------------	---------------------

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Inside air temperature sensor signal voltage is higher than or lower than specified value for specified time continuously.	- Inside air temperature sensor circuit - Inside air temperature sensor - HVAC control module

DTC Troubleshooting

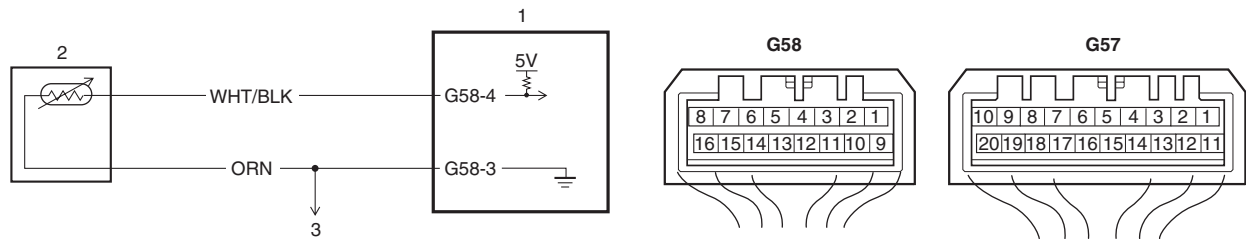
NOTE

When DTC B1503, B1513 and B1514 are indicated together, it is possible that "ORN" wire circuit open.

Step	Action	Yes	No
1	Inside air temperature sensor signal circuit check 1) Disconnect inside air temperature sensor connector. 2) Check for proper connection to inside air temperature sensor at "PNK/BLK" and "ORN" wire terminals. 3) If OK, measure voltage between "PNK/BLK" wire terminal of inside air temperature sensor connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 5.	Go to Step 2.
2	Inside air temperature sensor signal circuit check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G58-6" and "G58-3" terminals. 3) If OK, measure resistance between "PNK/BLK" wire terminal of inside air temperature sensor connector and "G58-6" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 3.	"PNK/BLK" wire open or high resistance circuit.
3	Inside air temperature sensor signal circuit check 1) Measure resistance between "PNK/BLK" wire terminal of inside air temperature sensor connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 4.	"PNK/BLK" wire shorted to ground circuit.
4	Inside air temperature sensor signal circuit check 1) Measure voltage between "PNK/BLK" wire terminal of inside air temperature sensor connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 5.	"PNK/BLK" wire shorted to other circuit.
5	Inside air temperature sensor ground circuit check 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between "ORN" wire terminal of inside air temperature sensor connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	Go to Step 7.	Go to Step 6.
6	Inside air temperature sensor ground circuit check 1) Measure resistance between "G58-3" terminal of HVAC control module connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	"ORN" wire open or high resistance circuit.	HVAC control module faulty.
7	Inside air temperature sensor check 1) Check inside air temperature sensor referring to "Inside Air Temperature Sensor Inspection: Automatic Type". <i>Is it in good condition?</i>	HVAC control module faulty.	Inside air temperature sensor faulty.

DTC B1503: A/C Evaporator Air Temperature Sensor and/or Its Circuit Malfunction

S6RS0B7224013

Wiring Diagram

I6RS0A722004-01

1. HVAC control module	2. Evaporator temperature sensor	3. To other sensors
------------------------	----------------------------------	---------------------

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Evaporator temperature sensor signal voltage is higher than or lower than specified value for specified time continuously.	- Evaporator temperature sensor circuit - Evaporator temperature sensor - HVAC control module

DTC Troubleshooting**NOTE**

When DTC B1502, B1513 and B1514 are indicated together, it is possible that “ORN” wire circuit open.

Step	Action	Yes	No
1	Evaporator temperature sensor signal circuit check 1) Disconnect evaporator temperature sensor connector. 2) Check for proper connection to evaporator temperature sensor at “WHT/BLK” and “ORN” wire terminals. 3) If OK, measure voltage between “WHT/BLK” wire terminal of evaporator temperature sensor connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 5.	Go to Step 2.
2	Evaporator temperature sensor signal circuit check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G58-4” and “G58-3” terminals. 3) If OK, measure resistance between “WHT/BLK” wire terminal of evaporator temperature sensor connector and “G58-4” terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 3.	“WHT/BLK” wire open or high resistance circuit.
3	Evaporator temperature sensor signal circuit check 1) Measure resistance between “WHT/BLK” wire terminal of evaporator temperature sensor connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 4.	“WHT/BLK” wire shorted to ground circuit.
4	Evaporator temperature sensor signal circuit check 1) Measure voltage between “WHT/BLK” wire terminal of evaporator temperature sensor connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 5.	“WHT/BLK” wire shorted to other circuit.

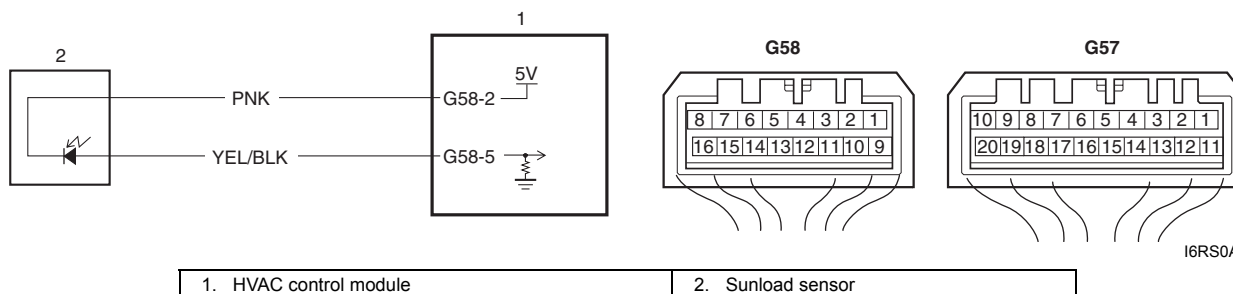
7B-21 Air Conditioning System: Automatic Type

Step	Action	Yes	No
5	Evaporator temperature sensor ground circuit check 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between "ORN" wire terminal of evaporator temperature sensor connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	Go to Step 7.	Go to Step 6.
6	Evaporator temperature sensor ground circuit check 1) Measure resistance between "G58-3" terminal of HVAC control module connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	"ORN" wire open or high resistance circuit.	HVAC control module faulty.
7	Evaporator temperature sensor check 1) Check evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual Type in related manual". <i>Is it in good condition?</i>	HVAC control module faulty.	Evaporator temperature sensor faulty.

DTC B1504: Sunload Sensor and/or Its Circuit Malfunction

S6RS0B7224014

Wiring Diagram



DTC Detecting Condition and Trouble Area

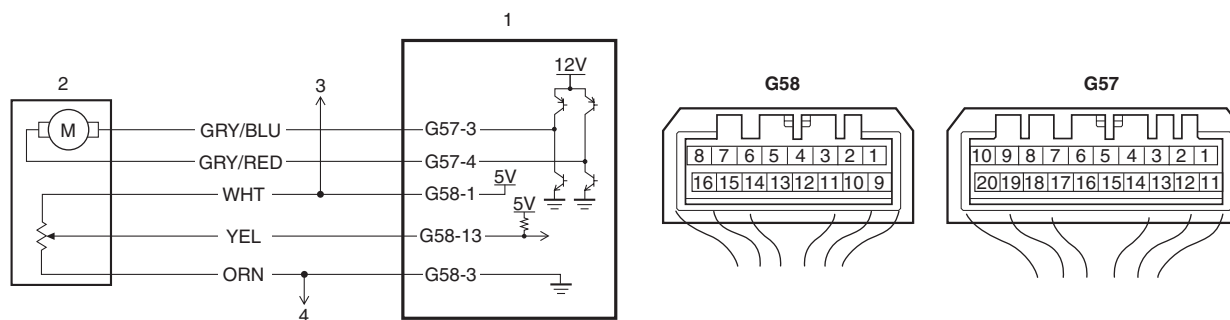
DTC Detecting Condition	Trouble Area
Sunload sensor signal voltage is higher than or lower than specified value for specified time continuously.	- Sunload sensor circuit - Sunload sensor - HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	Sunload sensor power supply circuit check 1) Disconnect sunload sensor connector. 2) Check for proper connection to sunload sensor at "PNK" and "YEL/BLK" wire terminals. 3) If OK, measure voltage between "PNK" wire terminal of sunload sensor connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 5.	Go to Step 2.
2	Sunload sensor power supply circuit check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G58-2" and "G58-5" terminals. 3) If OK, measure resistance between "PNK" wire terminal of sunload sensor connector and "G58-2" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 3.	"PNK" wire open or high resistance circuit.
3	Sunload sensor power supply circuit check 1) Measure resistance between "PNK" wire terminal of sunload sensor connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 4.	"PNK" wire shorted to ground circuit.
4	Sunload sensor power supply circuit check 1) Measure voltage between "PNK" wire terminal of sunload sensor connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 5.	"PNK" wire shorted to other circuit.
5	Sunload sensor signal circuit check 1) Disconnect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between "YEL/BLK" wire terminal of sunload sensor connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 6.	"YEL/BLK" wire shorted to ground circuit.
6	Sunload sensor signal circuit check 1) Measure resistance between "G58-5" terminal of HVAC control module connector and "YEL/BLK" wire terminal of sunload sensor connector. <i>Is resistance below 5 Ω?</i>	Go to Step 7.	"YEL/BLK" wire open or high resistance circuit.
7	Sunload sensor signal circuit check 1) Measure voltage between "YEL/BLK" wire terminal of sunload sensor connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 8.	"YEL/BLK" wire shorted to other circuit.
8	Sunload sensor check 1) Check sunload sensor referring to "Sunload Sensor Inspection: Automatic Type". <i>Is it in good condition?</i>	HVAC control module faulty.	Sunload sensor faulty.

DTC B1511: Temperature Control Actuator (Position Sensor) and/or Its Circuit Malfunction

S6RS0B7224016

Wiring Diagram

I6RS0A722006-01

1. HVAC control module	2. Temperature control actuator	3. To air flow control actuator	4. To other sensors
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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Temperature control actuator position sensor signal voltage is higher than or lower than specified value for specified time continuously.	- Temperature control actuator circuit - Temperature control actuator - HVAC control module

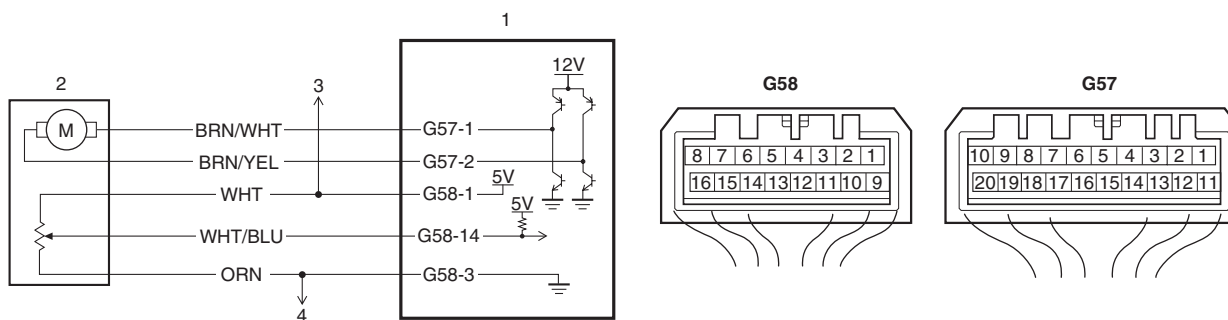
DTC Troubleshooting

Step	Action	Yes	No
1	Position sensor power supply circuit check 1) Disconnect temperature control actuator connector. 2) Check for proper connection to temperature control actuator at "WHT", "YEL" and "ORN" wire terminals. 3) If OK, measure voltage between "WHT" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 2.
2	Position sensor power supply circuit check 1) Disconnect air flow control actuator connector with ignition switch turned OFF. 2) Measure voltage between "WHT" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Air flow control actuator faulty.	Go to Step 3.
3	Position sensor power supply circuit check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G58-1", "G58-3" and "G58-13" terminals. 3) If OK, measure resistance between "WHT" wire terminal of temperature control actuator connector and "G58-1" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 4.	"WHT" wire open or high resistance circuit.
4	Position sensor power supply circuit check 1) Measure resistance between "WHT" wire terminal of temperature control actuator connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 5.	"WHT" wire shorted to ground circuit.

Step	Action	Yes	No
5	Position sensor power supply circuit check 1) Measure voltage between "WHT" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 6.	"WHT" wire shorted to other circuit.
6	Position sensor signal circuit check 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure voltage between "YEL" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 10.	Go to Step 7.
7	Position sensor signal circuit check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Measure resistance between "YEL" wire terminal of temperature control actuator connector and "G58-13" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 8.	"YEL" wire open or high resistance circuit.
8	Position sensor signal circuit check 1) Measure resistance between "YEL" wire terminal of temperature control actuator connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 9.	"YEL" wire shorted to ground circuit.
9	Position sensor signal circuit check 1) Measure voltage between "YEL" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 10.	"YEL" wire shorted to other circuit.
10	Position sensor ground circuit check 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between "ORN" wire terminal of temperature control actuator connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	Go to Step 12.	Go to Step 11.
11	Position sensor ground circuit check 1) Measure resistance between "G58-3" terminal of HVAC control module connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	"ORN" wire open or high resistance circuit.	HVAC control module faulty.
12	Temperature control actuator check 1) Check temperature control actuator referring to "Temperature Control Actuator Inspection: Automatic Type". <i>Is it in good condition?</i>	HVAC control module faulty.	Temperature control actuator faulty.

DTC B1512: Air flow Control Actuator (Position Sensor) and/or Its Circuit Malfunction

S6RS0B7224017

Wiring Diagram

I6RS0A722007-01

1. HVAC control module	2. Air flow control actuator	3. To temperature control actuator	4. To other sensors
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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Air flow control actuator position sensor signal voltage is higher than or lower than specified value for specified time continuously.	- Air flow control actuator circuit - Air flow control actuator - HVAC control module

DTC Troubleshooting

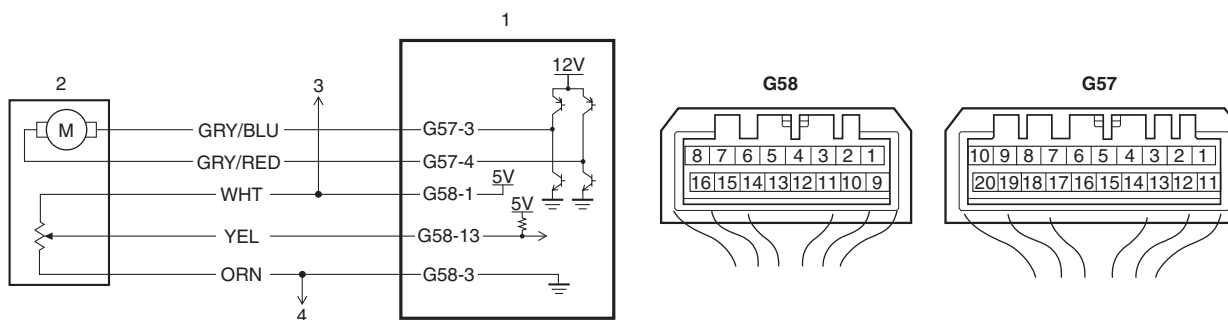
Step	Action	Yes	No
1	Position sensor power supply circuit check 1) Disconnect air flow control actuator connector. 2) Check for proper connection to air flow control actuator at "WHT", "WHT/BLU" and "ORN" wire terminals. 3) If OK, measure voltage between "WHT" wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 2.
2	Position sensor power supply circuit check 1) Disconnect temperature control actuator connector with ignition switch turned OFF. 2) Measure voltage between "WHT" wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Temperature control actuator faulty.	Go to Step 3.
3	Position sensor power supply circuit check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G58-1", "G58-3" and "G58-14" terminals. 3) If OK, measure resistance between "WHT" wire terminal of air flow control actuator connector and "G58-1" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 4.	"WHT" wire open or high resistance circuit.
4	Position sensor power supply circuit check 1) Measure resistance between "WHT" wire terminal of air flow control actuator connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 5.	"WHT" wire shorted to ground circuit.

Step	Action	Yes	No
5	Position sensor power supply circuit check 1) Measure voltage between “WHT” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 6.	“WHT” wire shorted to other circuit.
6	Position sensor signal circuit check 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure voltage between “WHT/BLU” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 10.	Go to Step 7.
7	Position sensor signal circuit check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Measure resistance between “WHT/BLU” wire terminal of air flow control actuator connector and “G58-14” terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 8.	“WHT/BLU” wire open or high resistance circuit.
8	Position sensor signal circuit check 1) Measure resistance between “WHT/BLU” wire terminal of air flow control actuator connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 9.	“WHT/BLU” wire shorted to ground circuit.
9	Position sensor signal circuit check 1) Measure voltage between “WHT/BLU” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 10.	“WHT/BLU” wire shorted to other circuit.
10	Position sensor ground circuit check 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between “ORN” wire terminal of air flow control actuator connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	Go to Step 12.	Go to Step 11.
11	Position sensor ground circuit check 1) Measure resistance between “G58-3” terminal of HVAC control module connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	“ORN” wire open or high resistance circuit.	HVAC control module faulty.
12	Air flow control actuator check 1) Check air flow control actuator referring to “Air Flow Control Actuator Inspection: Automatic Type”. <i>Is it in good condition?</i>	HVAC control module faulty.	Air flow control actuator faulty.

DTC B1513: Temperature Control Actuator and/or Its Circuit Malfunction

S6RS0B7224018

Wiring Diagram



I6RS0A722006-01

1. HVAC control module	2. Temperature control actuator	3. To air flow control actuator	4. To other sensors
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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Difference between target opening and actual opening is higher than specified value even though temperature control actuator has operated for 16 seconds.	- Temperature control actuator circuit - Temperature control linkage - Temperature control actuator - HVAC unit - HVAC control module

DTC Troubleshooting

NOTE

- When DTC B1502, B1503 and B1514 are indicated together, it is possible that “ORN” wire circuit open.
- When DTC B1514 is indicated together, it is possible that “WHT” wire circuit open.

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. <i>Is there DTC B1511?</i>	Go to applicable DTC diag. flow.	Go to Step 2.
2	Visual check 1) Check if there is any obstruction in operating range of actuator linkage and if actuator linkage operates smoothly. <i>Is it in good condition?</i>	Go to Step 3.	Obstruction in operating range of actuator linkage, actuator linkage faulty and/or internal fault of HVAC unit.
3	Wire harness check 1) Disconnect connector from temperature control actuator with ignition switch turned OFF. 2) Check for proper connection to temperature control actuator connector at “GRY/BLU” and “GRY/RED” wire terminals. 3) If OK, measure voltage between “GRY/BLU” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON when temperature selector is operation to COOL direction. <i>Is voltage 10 – 14 V?</i>	Go to Step 7.	Go to Step 4.

Step	Action	Yes	No
4	Wire harness check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G57-3" and "G57-4" terminals. 3) If OK, measure resistance between "GRY/BLU" wire terminal of temperature control actuator connector and "G57-3" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 5.	"GRY/BLU" wire open or high resistance circuit.
5	Wire harness check 1) Measure resistance between "GRY/BLU" wire terminal of temperature control actuator connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 6.	"GRY/BLU" wire shorted to ground circuit.
6	Wire harness check 1) Measure voltage between "GRY/BLU" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 7.	"GRY/BLU" wire shorted to other circuit.
7	Wire harness check 1) Connect connector to HVAC control module with ignition switch turned OFF. 2) Measure voltage between "GRY/RED" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON when temperature selector is operation to HOT direction. <i>Is voltage 10 – 14 V?</i>	Go to Step 11.	Go to Step 8.
8	Wire harness check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G57-3" and "G57-4" terminals. 3) If OK, measure resistance between "GRY/RED" wire terminal of temperature control actuator connector and "G57-4" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 9.	"GRY/RED" wire open or high resistance circuit.
9	Wire harness check 1) Measure resistance between "GRY/RED" wire terminal of temperature control actuator connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 10.	"GRY/RED" wire shorted to ground circuit.
10	Wire harness check 1) Measure voltage between "GRY/RED" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 11.	"GRY/RED" wire shorted to other circuit.

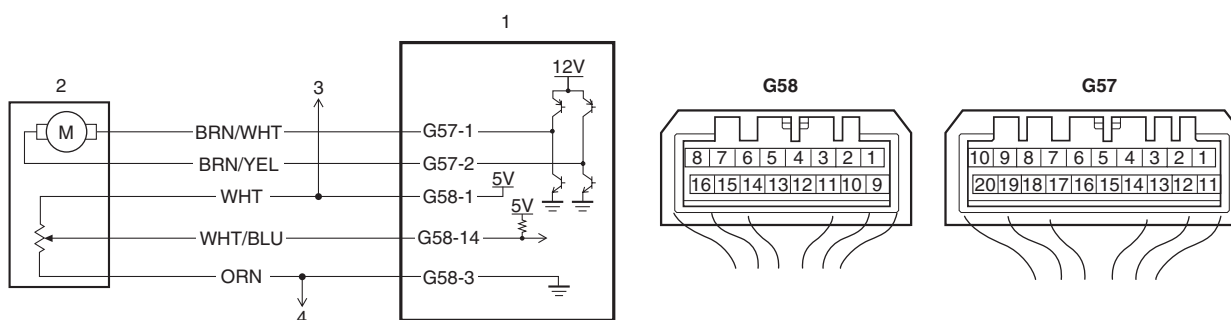
7B-29 Air Conditioning System: Automatic Type

Step	Action	Yes	No
11	Position sensor circuit check 1) Check temperature control actuator position sensor circuit referring to Step 1 to Step 5 and Step 10 to Step 11 of "DTC B1511: Temperature Control Actuator (Position Sensor) and/or Its Circuit Malfunction: Automatic Type". <i>Is it in good condition?</i>	Go to Step 12.	Repair circuit.
12	Temperature control actuator check 1) Check temperature control actuator referring to "Temperature Control Actuator Inspection: Automatic Type". <i>Is it in good condition?</i>	HVAC control module faulty.	Temperature control actuator faulty.

DTC B1514: Air Flow Control Actuator and/or Its Circuit Malfunction

S6RS0B7224019

Wiring Diagram



I6RS0A722007-01

1. HVAC control module	2. Air flow control actuator	3. To temperature control actuator	4. To other sensors
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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Difference between target opening and actual opening is higher than specified value even though air flow control actuator has operated for 16 seconds.	- Air flow control actuator circuit - Air flow control linkage - Air flow control actuator - HVAC unit - HVAC control module

DTC Troubleshooting

NOTE

- When DTC B1502, B1503 and B1513 are indicated together, it is possible that "ORN" wire circuit open.
- When DTC B1513 is indicated together, it is possible that "WHT" wire circuit open.

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. <i>Is there DTC B1512?</i>	Go to applicable DTC diag. flow.	Go to Step 2.

Step	Action	Yes	No
2	Visual check 1) Check if there is any obstruction in operating range of actuator linkage and if actuator linkage operates smoothly. <i>Is it in good condition?</i>	Go to Step 3.	Obstruction in operating range of actuator linkage, actuator linkage faulty and/or internal fault of HVAC unit.
3	Wire harness check 1) Disconnect connector from air flow control actuator with ignition switch turned OFF. 2) Check for proper connection to air flow control actuator connector at "BRN/WHT" and "BRN/YEL" wire terminals. 3) If OK, measure voltage between "BRN/WHT" wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON when air flow selector is operation to DEF direction. <i>Is voltage 10 – 14 V?</i>	Go to Step 7.	Go to Step 4.
4	Wire harness check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G57-1" and "G57-2" terminals. 3) If OK, measure resistance between "BRN/WHT" wire terminal of air flow control actuator connector and "G57-1" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 5.	"BRN/WHT" wire open or high resistance circuit.
5	Wire harness check 1) Measure resistance between "BRN/WHT" wire terminal of air flow control actuator connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 6.	"BRN/WHT" wire shorted to ground circuit.
6	Wire harness check 1) Measure voltage between "BRN/WHT" wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 7.	"BRN/WHT" wire shorted to other circuit.
7	Wire harness check 1) Connect connector to HVAC control module with ignition switch turned OFF. 2) Measure voltage between "BRN/YEL" wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON when air flow selector is operation to FACE direction. <i>Is voltage 10 – 14 V?</i>	Go to Step 11.	Go to Step 8.
8	Wire harness check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G57-1" and "G57-2" terminals. 3) If OK, measure resistance between "BRN/YEL" wire terminal of air flow control actuator connector and "G57-2" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 9.	"BRN/YEL" wire open or high resistance circuit.

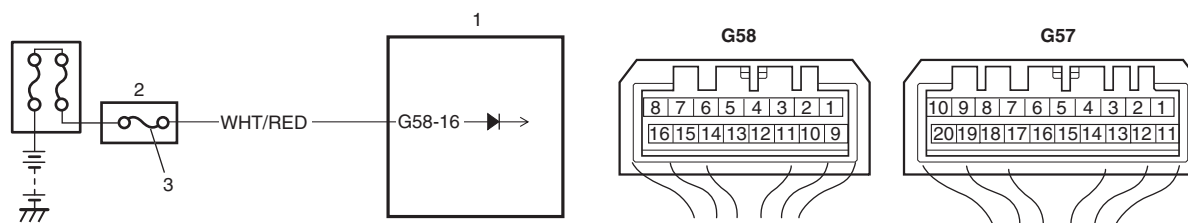
7B-31 Air Conditioning System: Automatic Type

Step	Action	Yes	No
9	Wire harness check 1) Measure resistance between "BRN/YEL" wire terminal of air flow control actuator connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 10.	"BRN/YEL" wire shorted to ground circuit.
10	Wire harness check 1) Measure voltage between "BRN/YEL" wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 11.	"BRN/YEL" wire shorted to other circuit.
11	Position sensor circuit check 1) Check air flow control actuator position sensor circuit referring to Step 1 to Step 5 and Step 10 to Step 11 of "DTC B1512: Air flow Control Actuator (Position Sensor) and/or Its Circuit Malfunction: Automatic Type". <i>Is it in good condition?</i>	Go to Step 12.	Repair circuit.
12	Air flow control actuator check 1) Check air flow control actuator referring to "Air Flow Control Actuator Inspection: Automatic Type". <i>Is it in good condition?</i>	HVAC control module faulty.	Air flow control actuator faulty.

DTC B1541: HVAC Control Module Back-Up Power Supply Malfunction

S6RS0B7224026

Wiring Diagram



I6RS0A722008-01

1. HVAC control module	2. Junction block assembly	3. Circuit fuse
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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Back-up power supply voltage is lower than specified value continuously.	- Battery voltage supply circuit - HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Turn ON ignition switch for 20 sec. or more. 2) Ignition switch turned OFF and connect scan tool to DLC. 3) Turn ON ignition switch and check DTC. <i>Is there DTC B1541?</i>	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".

Step	Action	Yes	No
2	Battery voltage supply circuit check 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G58-16" terminal. 3) If OK, measure voltage between "G58-16" terminal of HVAC control module connector and vehicle body ground. <i>Is voltage 10 – 14 V?</i>	HVAC control module faulty.	Circuit fuse blown and/or "WHT/RED" wire circuit open or short.

DTC B1546: A/C Refrigerant Pressure Malfunction

S6RS0B7224027

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is lower than specified value even though outside air temperature is higher than specified value for specified time continuously.	• Insufficient of refrigerant • A/C refrigerant pressure sensor • Outside air temperature sensor • HVAC control module

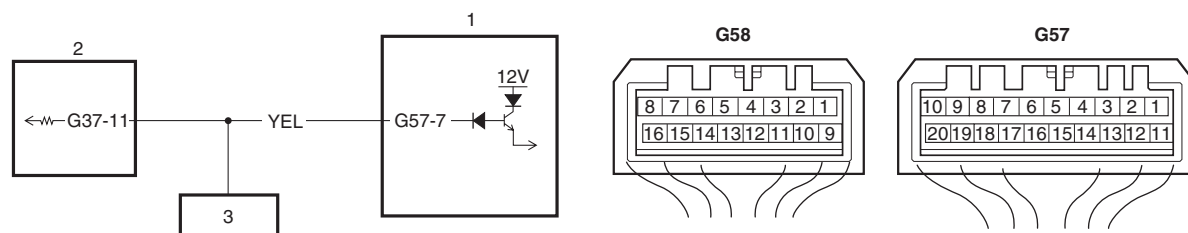
DTC Troubleshooting

Step	Action	Yes	No
1	A/C refrigerant pressure and outside air temperature check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Check "Refrigerant Pressure" and "Outside Air Temp" varies displayed on scan tool. <i>Are values of A/C refrigerant pressure sensor and outside air temperature within specified ranges indicated in "Scan Tool Data: Automatic Type"?</i>	Go to Step 2.	Check the amount of refrigerant and system for leaks.
2	A/C system performance check 1) Check A/C system performance referring to "A/C System Performance Inspection: Manual Type in related manual". <i>Is check result satisfactory?</i>	Go to Step 3.	Repair or replace defective part.
3	A/C refrigerant pressure sensor check 1) Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual Type in related manual". <i>Is check result satisfactory?</i>	Go to Step 4.	A/C refrigerant pressure sensor faulty.
4	Outside air temperature sensor check 1) Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped) in Section 9C in related manual". <i>Is check result satisfactory?</i>	HVAC control module faulty.	Outside air temperature sensor faulty.

DTC B1551: Serial Communication Circuit Malfunction

S6RS0B7224028

Wiring Diagram



I6RS0A722009-01

1. HVAC control module

2. BCM

3. Information display

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Serial communication signal is higher than or lower than specified value for specified time continuously.	- Serial communication line of BCM - BCM (included in junction block assembly) - Information display - HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Disconnect connector from information display. 3) Turn ignition switch ON and check DTC. <i>Is there DTC B1551?</i>	Go to Step 2.	Information display faulty.
2	Wire harness check 1) Disconnect connectors from BCM and HVAC control module. 2) Measure resistance between "G37-11" terminal of BCM connector and "G57-7" terminal of HVAC control module connector. <i>Is resistance below 5 Ω?</i>	Go to Step 3.	"YEL" wire open or high resistance circuit.
3	Wire harness check 1) Measure resistance between "G57-7" terminal of HVAC control module connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 4.	"YEL" wire shorted to ground circuit.
4	Wire harness check 1) Measure voltage between "G57-7" terminal of HVAC control module connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 5.	"YEL" wire shorted to other circuit.

Step	Action	Yes	No
5	Serial communication signal check 1) Connect connectors to BCM and HVAC control module. 2) Using oscilloscope, check that serial communication signal is outputted referring to "Reference waveform No.8" of "Inspection of BCM and its Circuits in Section 10B". <i>Is serial communication signal outputted at "G37-11" terminal of BCM connector?</i>	HVAC control module faulty.	BCM (included in junction block assembly) faulty.

DTC B1552: Serial Communication Signal Malfunction

S6RS0B7224029

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Data received by HVAC control module from BCM is erroneous continuously.	• BCM (included in junction block assembly) • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	Serial communication signal data check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Check "Refrigerant Pressure", "Vehicle Speed", "Coolant Temp" and "Outside Air Temp" varies displayed on scan tool. <i>Are values of A/C refrigerant pressure sensor, vehicle speed, coolant temperature and outside air temperature within specified ranges indicated in "Scan Tool Data: Automatic Type"?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 2.
2	Serial communication signal check 1) Connect connectors to BCM and HVAC control module. 2) Using oscilloscope, check that serial communication signal is outputted referring to "Reference waveform No.8" of "Inspection of BCM and its Circuits in Section 10B". <i>Is serial communication signal outputted at "G37-11" terminal of BCM connector?</i>	HVAC control module faulty.	BCM (included in junction block assembly) faulty.

DTC B1553: CAN Communication Signal Malfunction

S6RS0B7224030

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• CAN communication circuit • BCM (included in junction block assembly) • ECM • 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 and BCM for DTC. <i>Is there DTC(s)?</i>	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

DTC B1557: Vehicle Speed Sensor Signal Malfunction

S6RS0B7224031

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• VSS circuit • VSS • 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. <i>Is there DTC P0500?</i>	Go to "DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: For M13, M15 and M16 Engines in Section 1A".	Substitute a known-good HVAC control module and recheck.

DTC B1561: Engine Coolant Temperature Sensor Signal Malfunction

S6RS0B7224032

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. <i>Are there DTC P0116, P0117 or P0118?</i>	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

DTC B1562: Outside Air Temperature Sensor Signal Malfunction

S6RS0B7224033

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• Outside air temperature sensor circuit • Outside air temperature 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 BCM for DTC. <i>Are there DTC B1141, B1142 or B1143?</i>	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

DTC B1563: A/C Refrigerant Pressure Sensor Signal Malfunction

S6RS0B7224034

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

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. <i>Are there DTC P0532 or P0533?</i>	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

Inspection of HVAC Control Module and Its Circuit

HVAC control module and its circuits can be checked at HVAC control module wiring couplers by measuring voltage.

⚠ CAUTION

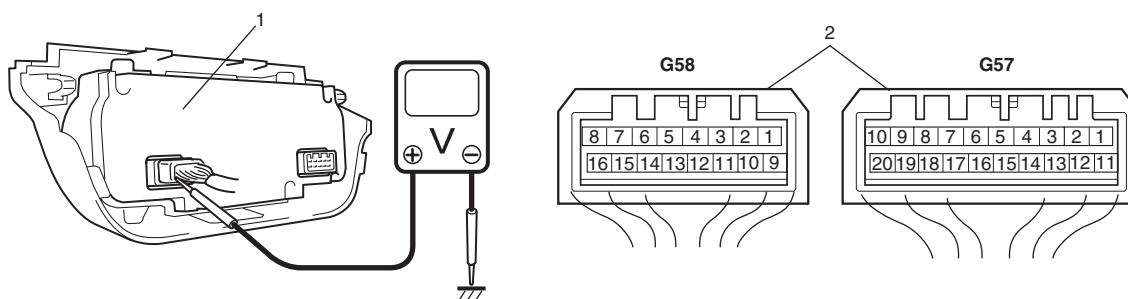
HVAC control module can not be checked by itself. It is strictly prohibited to connect voltmeter to HVAC control module with couplers disconnected from it.

Voltage Check

- 1) Remove HVAC control module referring to “HVAC Control Module Removal and Installation: Automatic Type”.
- 2) Check voltage at each terminal.

NOTE

As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.



I6RS0A722010-01

1. HVAC control module	2. HVAC control module connector (viewed from harness side)
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Terminal	Wire Color	Circuit	Normal Voltage	Condition
G57-1	BRN/WHT	Air flow control actuator (DEF)	10 – 14 V	Ignition switch turned ON, air flow control actuator is working in operation from VENT to DEF position
			0 – 1 V	Ignition switch turned ON, except the above condition
G57-2	BRN/YEL	Air flow control actuator (FACE)	10 – 14 V	Ignition switch turned ON, air flow control actuator is working in operation from DEF to VENT position
			0 – 1 V	Ignition switch turned ON, except the above condition
G57-3	GRY/BLU	Temperature control actuator (COOL)	10 – 14 V	Ignition switch turned ON, temperature control actuator is working in operation from HOT to COOL position
			0 – 1 V	Ignition switch turned ON, except the above condition
G57-4	GRY/RED	Temperature control actuator (HOT)	10 – 14 V	Ignition switch turned ON, temperature control actuator is working in operation from COOL to HOT position
			0 – 1 V	Ignition switch turned ON, except the above condition
G57-5	PPL/WHT	Serial communication line of data link connector	10 – 14 V	Ignition switch turned ON
G57-6	—	—	—	—
G57-7	YEL	Serial communication line of BCM	Refer to “Inspection of BCM and its Circuits in Section 10B”	

Terminal	Wire Color	Circuit	Normal Voltage	Condition
G57-8	BLU/RED	Blower motor control voltage feedback	10 – 14 V	Ignition switch turned ON, blower speed selector OFF
			About 8.5 V	Ignition switch turned ON, blower speed selector 1st position
			About 6.5 V	Ignition switch turned ON, blower speed selector 2nd position
			About 5.5 V	Ignition switch turned ON, blower speed selector 3rd position
			About 4.0 V	Ignition switch turned ON, blower speed selector 4th position
			About 3.0 V	Ignition switch turned ON, blower speed selector 5th position
			About 2.0 V	Ignition switch turned ON, blower speed selector 6th position
			About 1.0 V	Ignition switch turned ON, blower speed selector 7th position
			Below 1.0 V	Ignition switch turned ON, blower speed selector HIGH position
G57-9	GRY	Blower motor controller	0 – 1 V	Ignition switch turned ON, blower speed selector OFF position
			2 – 3 V	Ignition switch turned ON, blower speed selector between 1st and HIGH position
G57-10	BLK/RED	Rear defogger indicator	0 – 1 V	Ignition switch turned ON, rear defogger switch OFF
			10 – 14 V	Ignition switch turned ON, rear defogger switch ON
G57-11	RED/YEL	Illumination switch	0 – 1 V	Ignition switch turned ON, lighting switch OFF position
			10 – 14 V	Ignition switch turned ON, lighting switch ON position
G57-12	BLK	Illumination ground	0 – 1 V	Full-time
G57-13	—	—	—	—
G57-14	—	—	—	—
G57-15	RED	Air intake actuator (RECIRCULATION AIR)	0 – 1 V	Ignition switch turned ON, air intake selector ON (RECIRCULATION) position
			10 – 14 V	Ignition switch turned ON, air intake selector OFF (FRESH) position
G57-16	GRN/RED	Air intake actuator (MIX AIR)		
G57-17	GRN	Air intake actuator (FRESH AIR)	0 – 1 V	Ignition switch turned ON, air intake selector OFF (FRESH) position
			10 – 14 V	Ignition switch turned ON, air intake selector ON (RECIRCULATION) position
G57-18	GRN/WHT	A/C switch signal	Refer to “Inspection of BCM and its Circuits in Section 10B”	
G57-19	BLU/WHT	Electric load signal for blower motor	10 – 14 V	Ignition switch turned ON, blower speed selector OFF or between 1st and 5th position
			0 – 2 V	Ignition switch turned ON, blower speed selector between 6th and HIGH position
G57-20	BRN	Rear defogger switch	0 – 1 V	Ignition switch turned ON, rear defogger switch ON (rear defogger switch is kept in push) position
			4 – 6 V	Ignition switch turned ON, rear defogger switch OFF position

7B-39 Air Conditioning System: Automatic Type

Terminal	Wire Color	Circuit	Normal Voltage	Condition
G58-1	WHT	Output of 5 V power source for air flow control actuator position sensor and temperature control actuator position sensor	4 – 6 V	Ignition switch turned ON
G58-2	PNK	Output of 5 V power source for sunload sensor	4 – 6 V	Ignition switch turned ON
G58-3	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
G58-4	WHT/BLK	Evaporator temperature sensor signal	3.45 – 3.65 V	Ignition switch turned ON, evaporator temperature 0 °C (32 °F)
			2.55 – 2.85 V	Ignition switch turned ON, evaporator temperature 15 °C (59 °F)
			1.7 – 2.1 V	Ignition switch turned ON, evaporator temperature 30 °C (86 °F)
G58-5	YEL/BLK	Sunload sensor signal		
G58-6	PNK/BLK	Inside air temperature sensor signal	About 2.0 V	Ignition switch turned ON, room temperature 25 °C (77 °F)
			About 2.8 V	Ignition switch turned ON, room temperature 0 °C (32 °F)
G58-7	—	—	—	—
G58-8	RED/BLK	Electric power source	10 – 14 V	Ignition switch turned ON
G58-9	—	—	—	—
G58-10	—	—	—	—
G58-11	BLK/ORN	Ground for HVAC control module	Below 0.3 V	Ignition switch turned ON
G58-12	—	—	—	—
G58-13	YEL	Temperature control actuator position sensor signal	About 4.0 V	Ignition switch turned ON, temperature selector MAX COOL position
			About 2.0 V	Ignition switch turned ON, temperature selector MAX HOT position
G58-14	WHT/BLU	Air flow control actuator position sensor signal	About 4.0 V	Ignition switch turned ON, air flow selector VENT position
			About 1.6 V	Ignition switch ON, air flow selector DEF position
G58-15	—	—	—	—
G58-16	WHT/RED	Electric power source for back-up	10 – 14 V	Full-time

A/C System Performance Inspection

S6RS0B7224024

Refer to “A/C System Performance Inspection: Manual Type in related manual”.

A/C System Inspection at ECM

S6RS0B7224025

When checking voltage at ECM terminals related to A/C system, refer to “Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines in Section 1A”.

Repair Instructions**Operation Procedure for Refrigerant Charge**

S6RS0B7226002

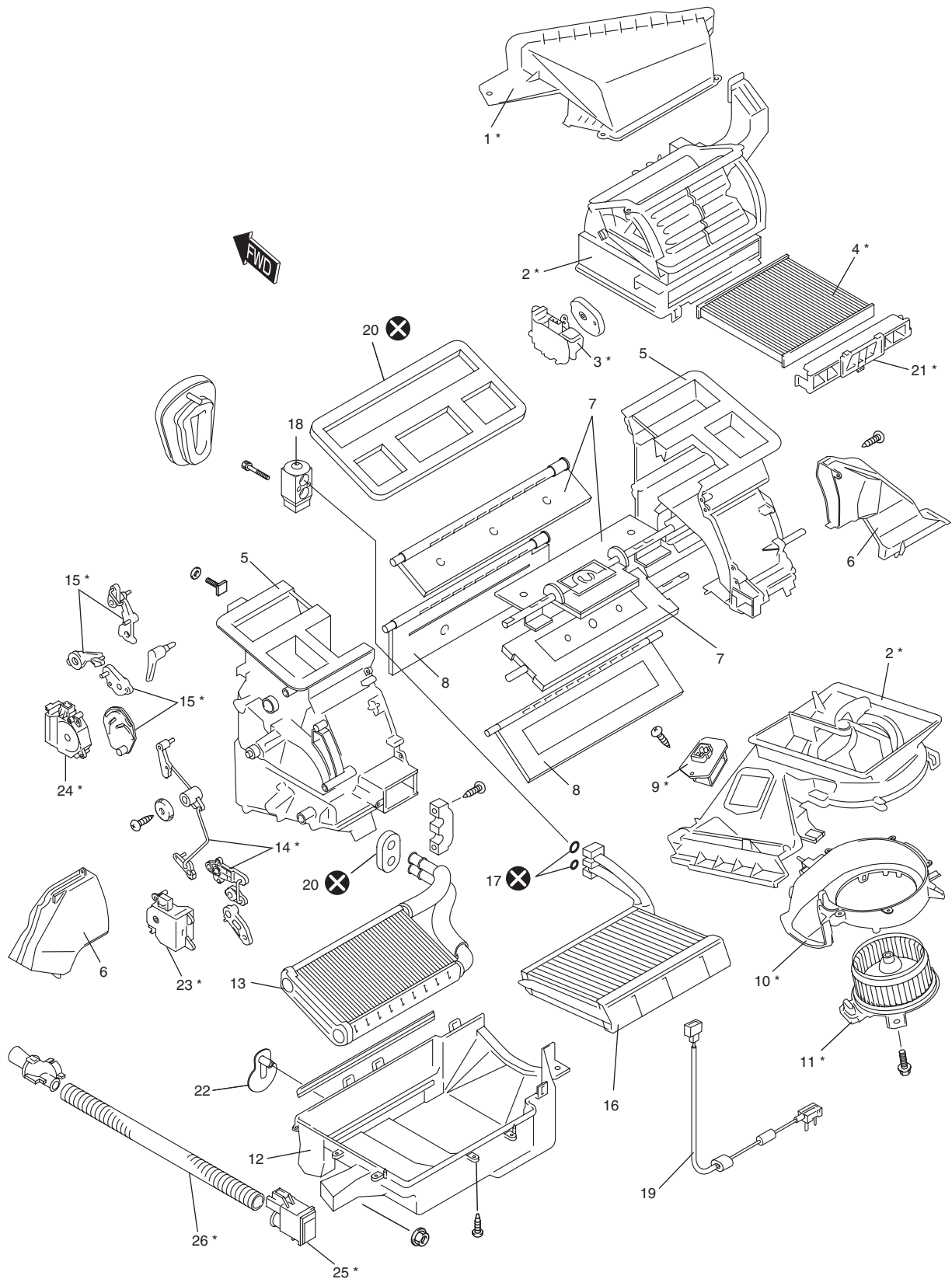
Refer to “Operation Procedure for Refrigerant Charge: Manual Type in related manual”.

HVAC Unit Components

S6RS0B7226003

NOTE

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



15RSOC722003-01

1. Fresh air inlet duct	8. Temperature control door assembly	15. Air flow control links	22. Drain hose
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7B-41 Air Conditioning System: Automatic Type

2. Blower upper case	9. Blower motor controller	16. Evaporator	23. Temperature control actuator
3. Air intake control actuator	10. Blower lower case	17. O-ring	24. Air flow control actuator
4. Air filter (if equipped)	11. Blower motor	18. Expansion valve	25. Inside air temperature sensor
5. Heater unit upper case	12. Heater unit lower case	19. Evaporator temperature sensor	26. Aspirator hose
6. Foot duct	13. Heater core	20. Packing	⊗ : Do not reuse.
7. Air flow control door assembly	14. Temperature control links	21. Filter cover	

HVAC Unit Removal and Installation

S6RS0B7226004

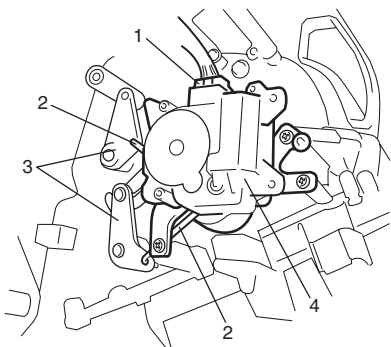
Refer to "HVAC Unit Removal and Installation: Manual Type in related manual".

Temperature Control Actuator Removal and Installation

S6RS0B7226044

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove steering column hole cover from instrument panel.
- 3) Remove foot duct from HVAC unit.
- 4) Disconnect temperature control actuator connector (1).
- 5) Detach temperature control actuator rods (2) from linkage (3).
- 6) Remove temperature control actuator (4) from HVAC unit.



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Installation

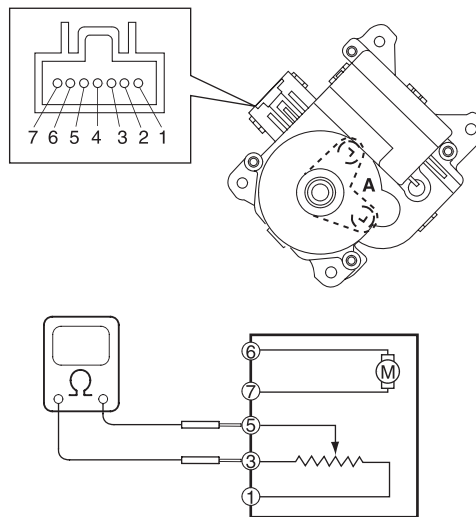
Reverse removal procedure.

Temperature Control Actuator Inspection

S6RS0B7226045

- 1) Remove temperature control actuator from HVAC unit referring to "Temperature Control Actuator Removal and Installation: Automatic Type".
- 2) Connect connector to temperature control actuator.
- 3) Set temperature selector of HVAC control module to MAX HOT position with ignition switch ON, and make sure if the position of actuator lever is MAX HOT position (A).
- 4) Turn ignition switch OFF, and then disconnect connector from temperature control actuator.
- 5) Measure resistance between terminal "3" and "5".

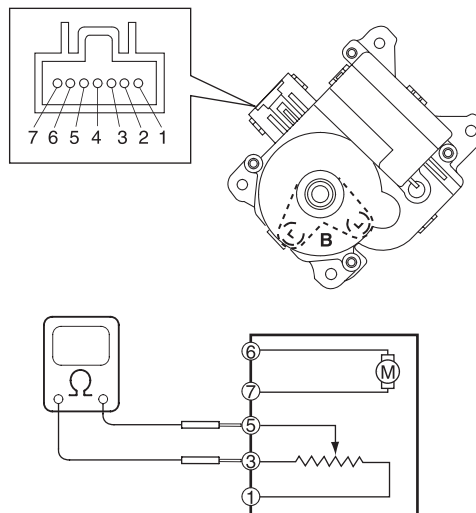
Temperature control actuator resistance between terminal "3" and "5" (MAX HOT position)
Approximately 2.5 kΩ at 25°C (77°F)



I5RS0A722021-03

- 6) Connect connector to temperature control actuator.
- 7) Set temperature selector of HVAC control module to MAX COOL position with ignition switch ON, and make sure if the position of actuator lever is MAX COOL position (B).
- 8) Turn ignition switch OFF, and then disconnect connector from temperature control actuator.
- 9) Measure resistance between terminal "3" and "5"

Temperature control actuator resistance between terminal "3" and "5" (MAX COOL position)
Approximately 4.8 kΩ at 25°C (77°F)



I5RS0A722022-03

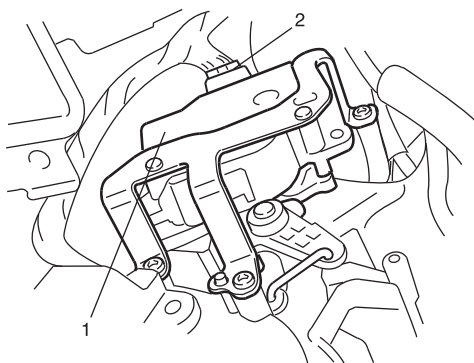
If check result is not satisfactory, replace the actuator with new one.

Air Flow Control Actuator Removal and Installation

S6RS0B7226046

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove steering column hole cover from instrument panel.
- 3) Remove foot duct from HVAC unit.
- 4) Disconnect air flow control actuator connector (2).
- 5) Remove air flow control actuator (1) from HVAC unit, and then detach air flow actuator rod from linkage.



I5RS0A722023-03

Installation

Reverse removal procedure.

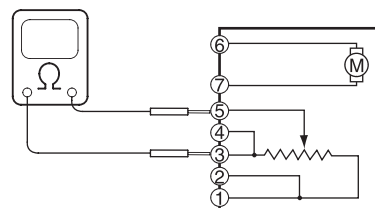
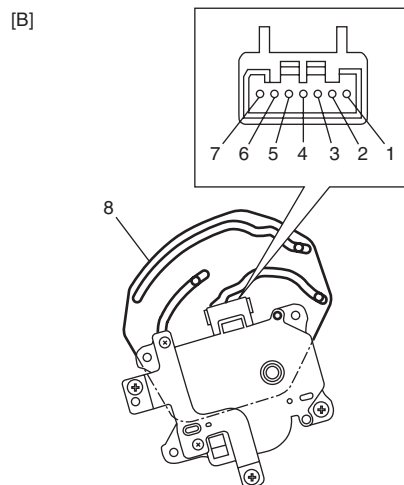
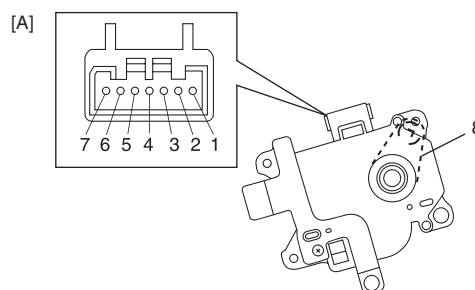
Air Flow Control Actuator Inspection

S6RS0B7226047

- 1) Remove air flow control actuator from HVAC unit referring to “Air Flow Control Actuator Removal and Installation: Automatic Type”.
- 2) Connect actuator connector to the actuator.
- 3) Set air flow selector of HVAC control module to DEF position with ignition switch ON, and make sure if the position of actuator lever is DEF position (8).
- 4) Turn ignition switch OFF, and then disconnect connector from air flow control actuator.
- 5) Measure resistance between terminal “3” and “5”

Air flow control actuator resistance between terminal “3” and “5” (DEF position)

Approximately 4.8 kΩ at 25 °C (77 °F)



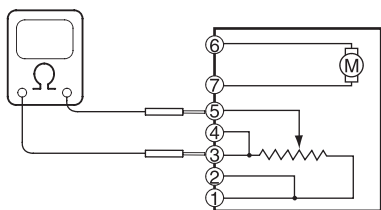
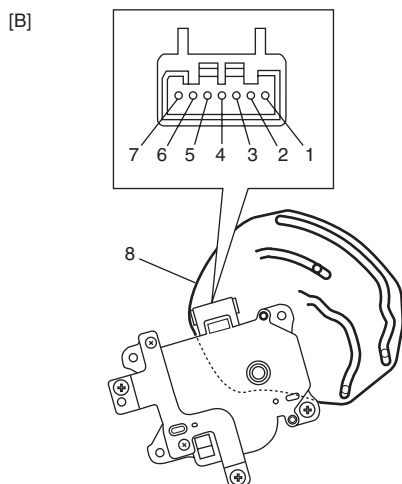
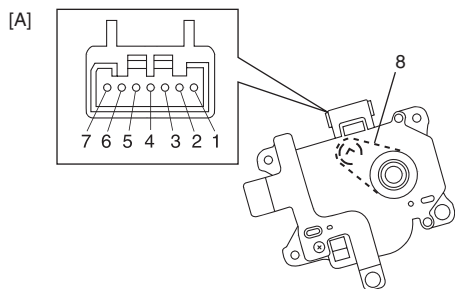
I5RS0C722004-01

[A]: LH steering vehicle

[B]: RH steering vehicle

- 6) Connect connector to air flow control actuator.
- 7) Set air flow selector of HVAC control module to VENT position with ignition switch ON, and make sure if the position of actuator lever is VENT position (8).
- 8) Turn ignition switch OFF, and then disconnect connector from air flow control actuator.
- 9) Measure resistance between terminal "3" and "5".

Air flow control actuator resistance between terminal "3" and "5" (VENT position)
Approximately 2.0 k Ω at 25 °C (77 °F)



15RS0C722005-02

[A]: LH steering vehicle

[B]: RH steering vehicle

If check result is not satisfactory, replace the actuator with new one.

Air Intake Control Actuator Removal and Installation

S6RS0B7226059

Refer to "Air Intake Control Actuator Removal and Installation in Section 7A in related manual".

Air Intake Control Actuator Inspection

S6RS0B7226060

Refer to "Air Intake Control Actuator Inspection in Section 7A".

Actuator Linkage Inspection

S6RS0B7226048

- Check if each actuator linkage operates smoothly.
 - Check actuator rod for bend.
 - Check each actuator linkage for breakage.
 - Make sure if there is not any obstruction in operating range of actuator linkage.
- If any malfunction is found, repair or replace faulty part(s).

Blower Motor Controller Removal and Installation

S6RS0B7226049

Refer to "Blower Motor Resistor Removal and Installation in Section 7A in related manual".

Blower Motor Controller Inspection

S6RS0B7226050

- 1) Check internal circuit of controller for resistance as follows.
 - a) Measure resistance between "1" terminal and "2" terminal of blower motor controller.

Blower motor controller resistance

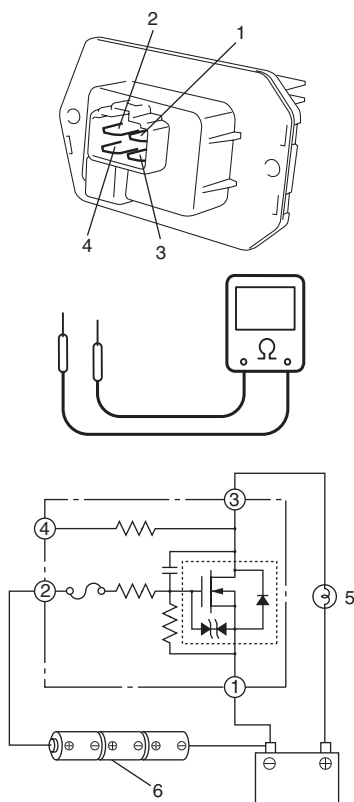
"1" – "2": approximately 10 k Ω at 25°C (77°F)

If resistance does not meet above specification, replace blower motor controller.

- b) Using ohmmeter, connect its positive terminal to "3" terminal of blower motor controller and negative terminal to "1" terminal of blower motor controller and check that there is no continuity.

2) Check controller for operation as follows.

- a) Using bulb (3.4 W) (5) and service wire, connect battery positive terminal to "3" terminal of blower motor controller as shown figure.
 - b) Using service wire, connect battery negative terminal to "1" terminal of blower motor controller.
 - c) Arrange 3 new 1.5 V batteries (6) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to "2" terminal of blower motor controller and negative terminal to "1" terminal of blower motor controller.
- Then, check that bulb lights. If bulb does not light under the above conditions, replace blower motor controller.



I5RS0A722026-01

HVAC Control Module Removal and Installation

S6RS0B7226051

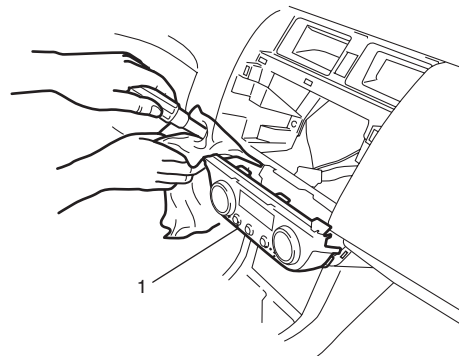
Removal

- 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 passenger air bag module from instrument panel referring to "Passenger Air Bag (Inflator) Module Removal and Installation in Section 8B in related manual".
- 4) Remove radio assembly from instrument panel referring to "Audio Unit Removal and Installation in Section 9C in related manual".
- 5) Remove two connectors from HVAC control module.

- 6) Remove HVAC control module (1) from instrument panel.

NOTE

Be careful not to damage HVAC control module and instrument panel by using rag.



I5RS0A722030-01

Installation

Reverse removal procedure noting the following instructions.

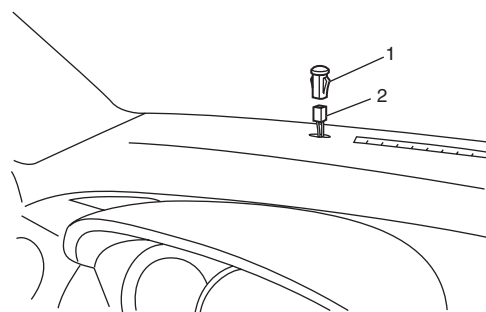
Enable air bag system referring to "Enabling Air Bag System in Section 8B in related manual".

Sunload Sensor Removal and Installation

S6RS0B7226011

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove combination meter referring to "Combination Meter Removal and Installation in Section 9C in related manual".
- 3) Remove sunload sensor (1) from instrument panel by depressing tab and pushing sensor upward from underneath.
- 4) Disconnect sunload sensor connector (2).



I5RS0A722027-01

Installation

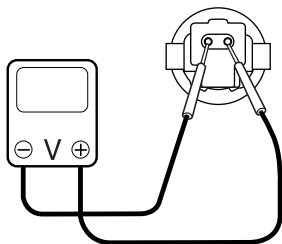
Reverse removal procedure.

Sunload Sensor Inspection

S6RS0B7226012

- 1) Light over sunload sensor vertically with an incandescent lamp of approximately 100 W. The distance between sunload sensor and lamp should be approximately 100 mm (3.94 in.).
- 2) Measure voltage between terminals of sunload sensor as shown.
If check result is not satisfactory, replace sunload sensor with new one.

Sunload sensor voltage specification
0.4 V or more



I4RH01722036-01

Outside Air Temperature Sensor Removal and Installation

S6RS0B7226013

Refer to "Outside Air Temperature Sensor Removal and Installation (If Equipped) in Section 9C in related manual".

Outside Air Temperature Sensor Inspection

S6RS0B7226052

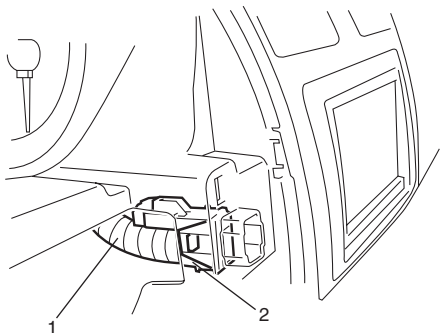
Refer to "CAN Communication System Description: For M13, M15 and M16 Engines in Section 1A".

Inside Air Temperature Sensor Removal and Installation

S6RS0B7226042

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove steering column hole cover.
- 3) Remove connector and aspirator hose (1) from inside air temperature sensor (2).
- 4) Remove inside air temperature sensor from instrument panel while releasing lock of both sides of inside air temperature sensor.



I5RS0A722028-01

Installation

Reverse removal procedure.

Inside Air Temperature Sensor Inspection

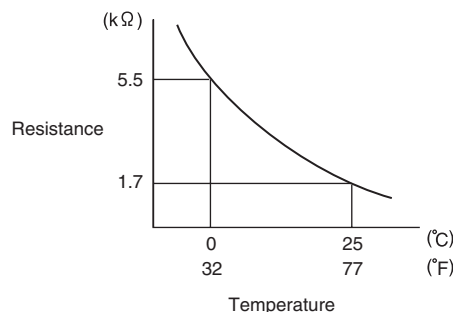
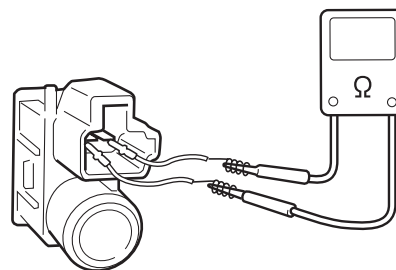
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Measure resistance between each connector terminal with an ohmmeter.

If resistance is incorrect, replace inside air temperature sensor with new one.

Inside air temperature sensor resistance

1.7 kΩ ± 0.085 kΩ at 25 °C (77 °F)



I5RS0A722029-01

Condenser Assembly On-Vehicle Inspection

S6RS0B7226023

Refer to "Condenser Assembly On-Vehicle Inspection: Manual Type in related manual".

Condenser Assembly Removal and Installation

S6RS0B7226022

Refer to "Condenser Assembly Removal and Installation: Manual Type in related manual".

Desiccant Removal and Installation

S6RS0B7226024

Refer to "Desiccant Removal and Installation: Manual Type in related manual".

Evaporator Inspection

S6RS0B7226028

Refer to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual Type in related manual".

Evaporator Temperature Sensor Removal and Installation

S6RS0B7226053

Refer to "Evaporator Thermistor (Evaporator Temperature Sensor) Removal and Installation: Manual Type in related manual".

Evaporator Temperature Sensor Inspection

S6RS0B7226054

Refer to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual Type in related manual".

Expansion Valve Removal and Installation

S6RS0B7226031

Refer to "Expansion Valve Removal and Installation: Manual Type in related manual".

Expansion Valve Inspection

S6RS0B7226032

Refer to "Expansion Valve Inspection: Manual Type in related manual".

A/C Refrigerant Pressure Sensor and Its Circuit Inspection

S6RS0B7226034

Refer to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual Type in related manual".

A/C Refrigerant Pressure Sensor Removal and Installation

S6RS0B7226033

Refer to "A/C Refrigerant Pressure Sensor Removal and Installation: Manual Type in related manual".

Compressor Relay Inspection

S6RS0B7226035

Refer to "Compressor Relay Inspection: Manual Type in related manual".

Compressor Drive Belt Inspection and Adjustment

S6RS0B7226037

Refer to "Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual Type in related manual".

Compressor Drive Belt Removal and Installation

S6RS0B7226036

Refer to "Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual Type in related manual".

Compressor Assembly Removal and Installation

S6RS0B7226038

Refer to "Compressor Assembly Removal and Installation (Petrol Engine Model): Manual Type in related manual".

Compressor Assembly Components

S6RS0B7226040

Refer to "Compressor Assembly Components: Manual Type in related manual".

Magnet Clutch Removal and Installation

S6RS0B7226041

Refer to "Magnet Clutch Removal and Installation: Manual Type in related manual".

Magnet Clutch Inspection

S6RS0B7226055

Refer to "Magnet Clutch Inspection (Petrol Engine Model): Manual Type in related manual".

Thermal Switch Inspection

S6RS0B7226056

Refer to "Thermal Switch Inspection: Manual Type in related manual".

Thermal Switch Removal and Installation

S6RS0B7226057

Refer to "Thermal Switch Removal and Installation: Manual Type in related manual".

Relief Valve Inspection

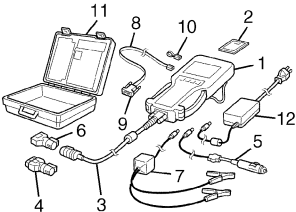
S6RS0B7226058

Refer to "Relief Valve Inspection (Petrol Engine Model): Manual Type in related manual".

Special Tools and Equipment

Special Tool

S6RS0B7228001

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 loop back 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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Section 9

Body, Cab and Accessories

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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Precautions

Precautions

Precautions on Body, Cab and Accessories

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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”.

Precautions for Body Service

Refer to “Precautions for Body Service”.

Fastener Caution for Body Service:

Refer to “Fastener Caution for Body Service”.

Cautions in Body Electrical System Servicing

Refer to “Cautions in Body Electrical System Servicing in Section 9A in related manual”.

Precautions for Wiring System

Refer to “Precautions for Wiring System in Section 9A in related manual”.

Precautions for Body Service

S6RS0B9000002

⚠ WARNING

For vehicles equipped with a Supplemental Restraint (Air Bag) System:
When servicing vehicle body, if shock may be applied to air bag system component parts, remove those parts beforehand.

Fastener Caution for Body Service

S6RS0B9000003

⚠ CAUTION

-
- Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement become necessary.
 - Do not use a replacement part of lesser quality or substitute a design. Torque values must be used as specified during reassembly to assure proper retention of these parts.
-

Wiring Systems

General Description

Abbreviations

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Abbreviation	Full term	Abbreviation	Full term
2WD	2 wheel drive vehicles	IG	Ignition
4WD	4 wheel drive vehicles	IG COIL	Ignition coil
A/B	Air bag	ILL	Illumination
A/C	Air conditioning	IND	Indicator
A/LEV	Auto leveling	INT	Intermittent
A/T	Automatic transaxle	ISC	Idle speed control
ACC	Accessory	J/B	Junction block
BCM	Body control module	J/C	Joint connector
CAN	Controller area network	KLS	Keyless start system
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 ^R	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
IF EQPD	If equipped		

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Harness Routing and Connector Layout Diagram

Connector Layout Diagram

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Refer to "Engine Compartment".

Refer to "Instrument Panel".

Refer to "Door, Roof".

Refer to "Floor".

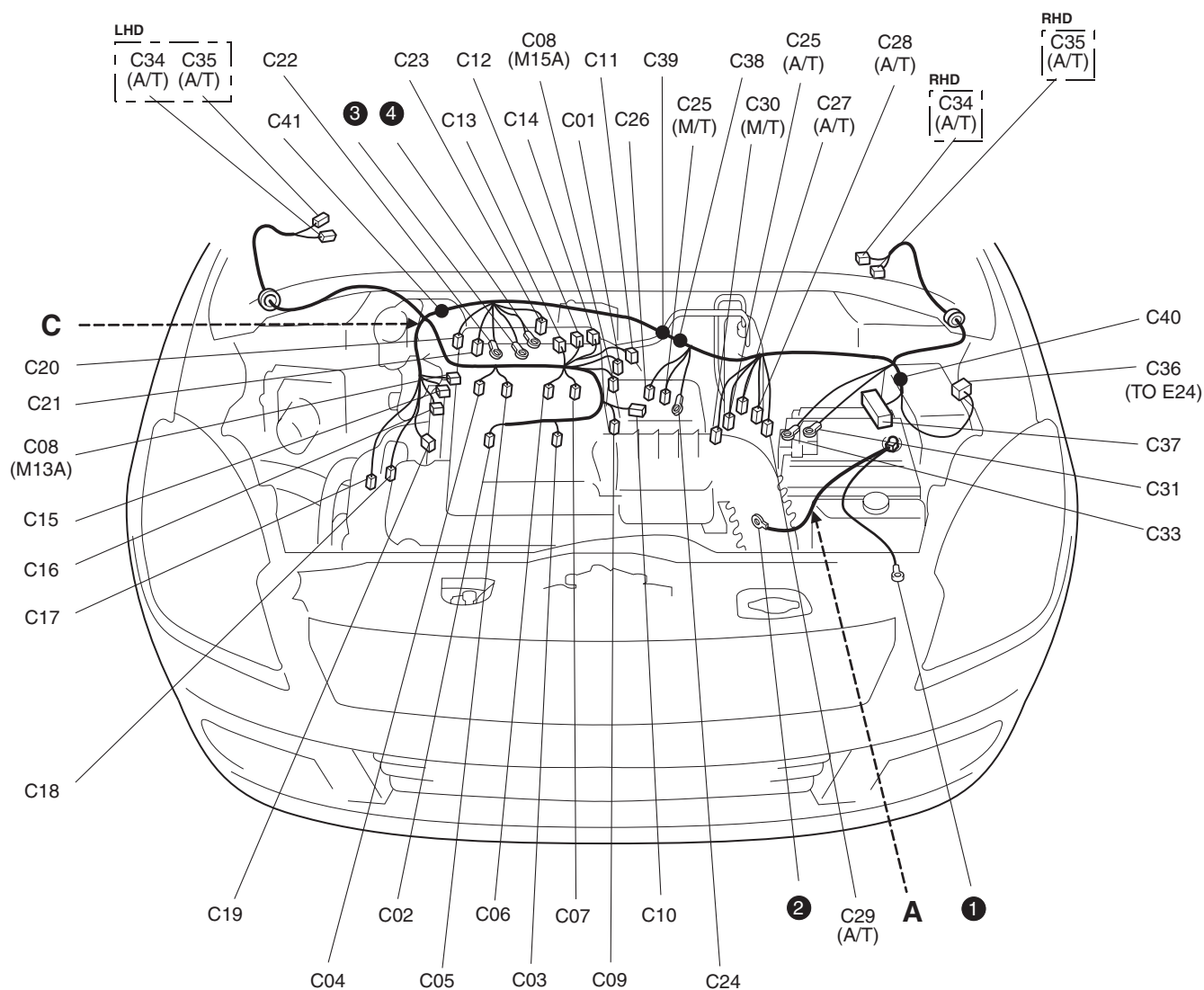
Refer to "Rear".

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Engine Compartment

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A: Battery cable / C: Engine harness (M13A, M15A)

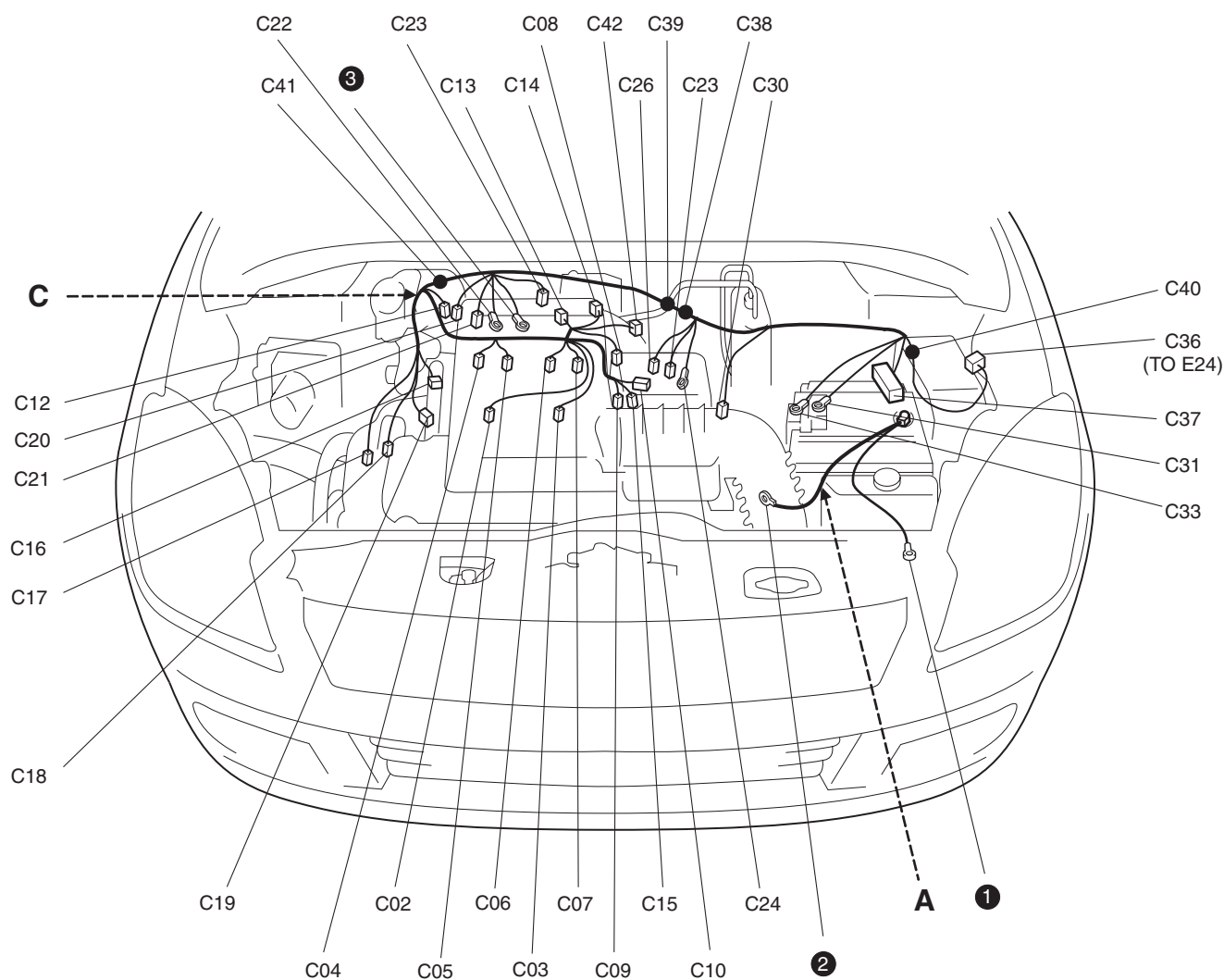


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C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/GRY	IAC valve	C21/GRY	Generator #1
C02/GRY	IG Coil #1	C22/-	Generator #2
C03/GRY	IG Coil #2	C23/BLK	Starting motor #1
C04/GRY	Injector #1	C24/-	Starting motor #2
C05/GRY	Injector #2	C25/GRY	Vehicle speed sensor
C06/GRY	Injector #3	C26/GRY	Knock sensor
C07/GRY	Injector #4	C27/BLU (A/T)	Input sensor

No./Color	Connective position	No./Color	Connective position
C08/BLK or GRY	CMP sensor	C28/GRY (A/T)	Trans axle range sensor
C09/GRN	ECT sensor	C29/GRY (A/T)	Shift solenoid
C10/GRY	EGR stepper motor	C30/BLK (M/T)	Back-up light switch
C11/BLK	Throttle position sensor	C31/-	Main fuse box
C12/BLK	MAP sensor	C33/-	Main fuse box
C13/BLK	MAF sensor	C34/N (A/T)	TCM
C14/BLK	EVAP canister vent valve	C35/N (A/T)	TCM
C15/GRY	Heated oxygen sensor #1	C36/N	Main harness (To E24)
C16/GRN	Heated oxygen sensor #2	C37/GRY	ECM
C17/BLK	A/C compressor	C38/-	Weld splice
C18/N	Oil pressure sensor	C39/-	Weld splice
C19/BLU	VVT solenoid	C40/-	Weld splice
C20/GRY	CKP sensor	C41/-	Weld splice

A: Battery cable / C: Engine harness (M16A)


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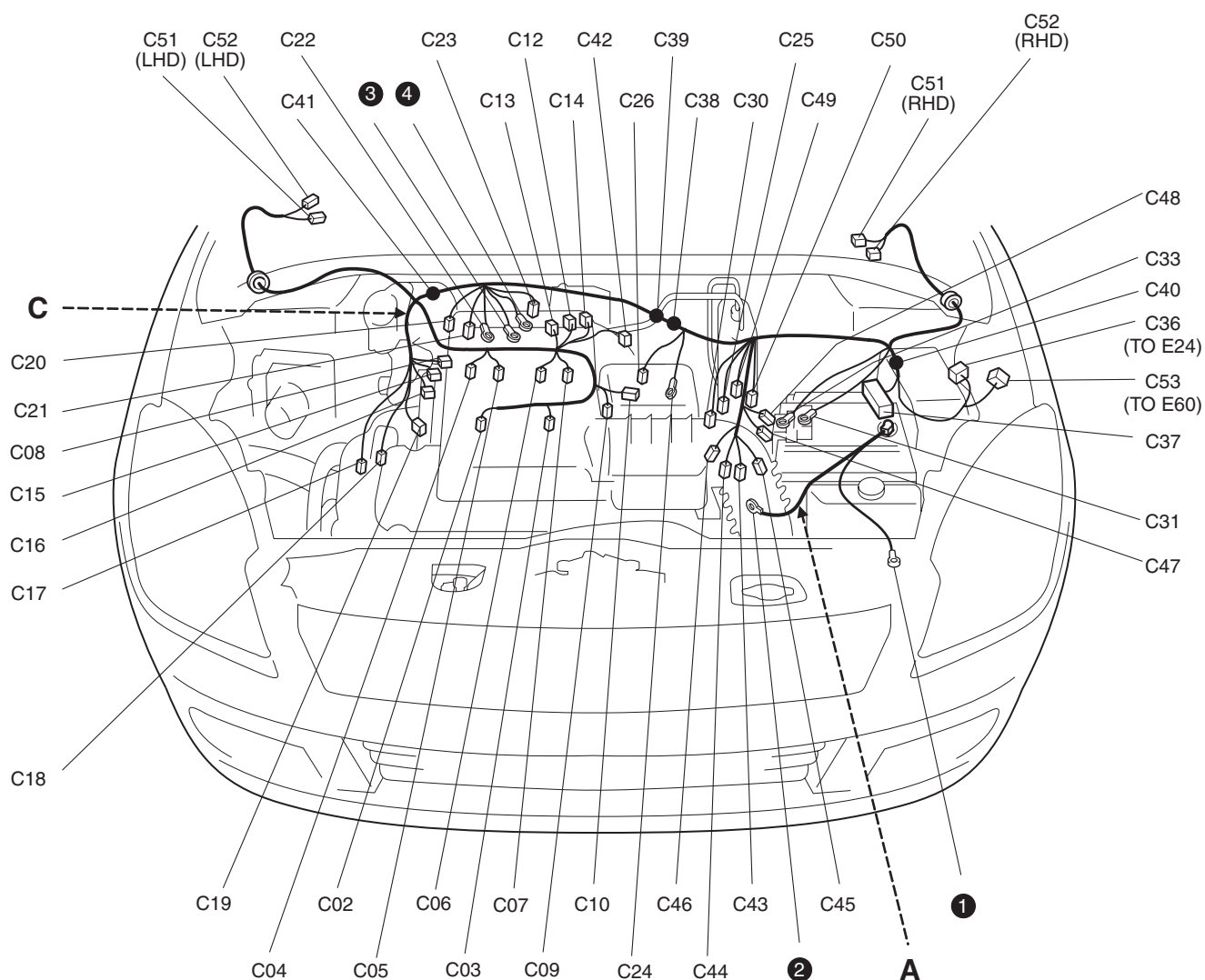
C: Engine harness

No./Color	Connective position	No./Color	Connective position
C02/GRY	IG Coil #1	C20/GRY	CKP sensor
C03/GRY	IG Coil #2	C21/BLK	Generator #1
C04/GRY	Injector #1	C22/-	Generator #2
C05/GRY	Injector #2	C23/BLK	Starting motor #1

9A-4 Wiring Systems:

No./Color	Connective position	No./Color	Connective position
C06/GRY	Injector #3	C24/-	Starting motor #2
C07/GRY	Injector #4	C26/GRY	Knock sensor
C08/BLK	CMP sensor	C30/BLK	Back-up light switch
C09/GRN	ECT sensor	C31/-	Main fuse box
C10/GRY	EGR stepper motor	C33/-	Main fuse box
C12/BLK	MAP sensor	C36/N	Main harness (To E24)
C13/BLK	MAF sensor	C37/GRY	ECM
C14/BLK	EVAP canister vent valve	C38/-	Weld splice
C15/BLK	Heated oxygen sensor #1	C39/-	Weld splice
C16/GRN	Heated oxygen sensor #2	C40/-	Weld splice
C17/BLK	A/C compressor	C41/-	Weld splice
C18/GRY	Oil pressure sensor	C42/BLK	Throttle position sensor
C19/BLU	VVT solenoid		

A: Battery cable / C: Engine harness (Automated Manual Transaxle)

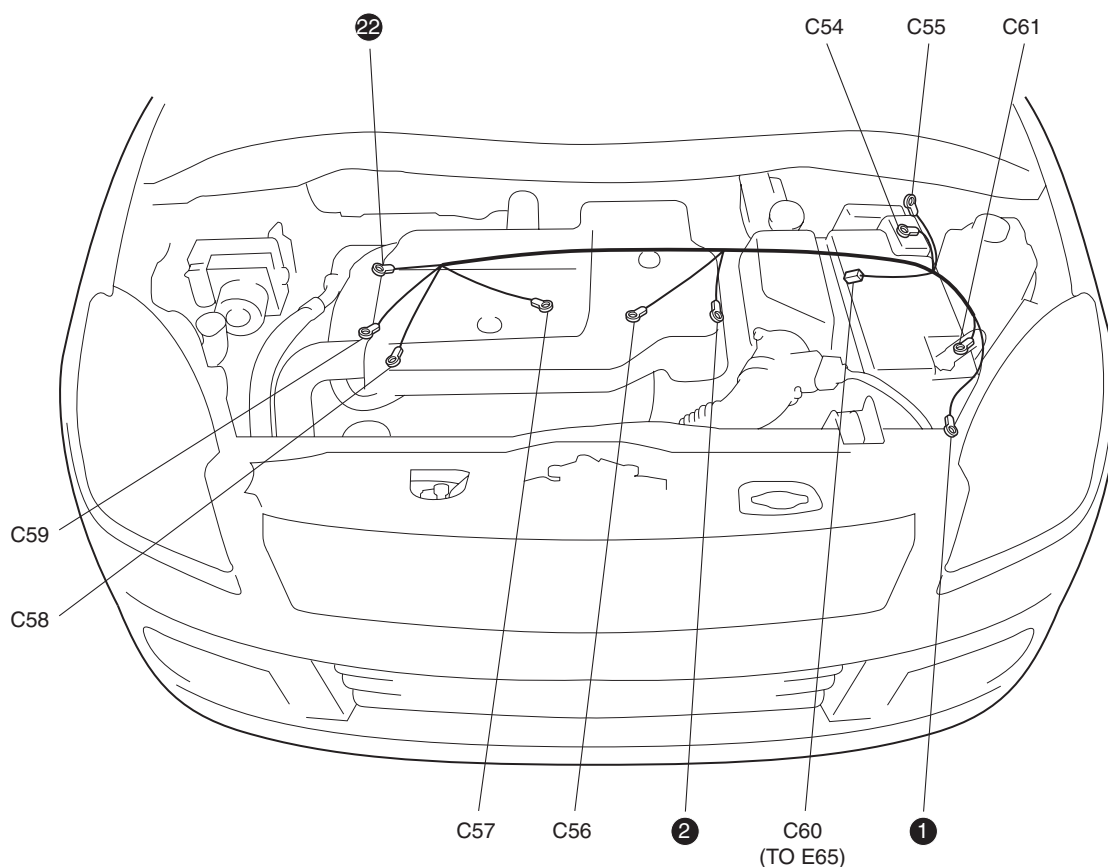


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C: Engine harness

No./Color	Connective position	No./Color	Connective position
C02/GRY	IG Coil #1	C26/GRY	Knock sensor
C03/GRY	IG Coil #2	C30/GRY	Back-up light switch
C04/GRY	Injector #1	C31/-	Main fuse box
C05/GRY	Injector #2	C33/-	Main fuse box
C06/GRY	Injector #3	C36/N	Main harness (To E24)
C07/GRY	Injector #4	C37/GRY	ECM

No./Color	Connective position	No./Color	Connective position
C08/GRY	CMP sensor	C38/-	Weld splice
C09/GRN	ECT sensor	C39/-	Weld splice
C10/GRY	EGR stepper motor	C40/-	Weld splice
C12/BLK	MAP sensor	C41/-	Weld splice
C13/BLK	MAF sensor	C42/BLK	Throttle position sensor
C14/BLK	EVAP canister vent valve	C43/BLK	Select stroke sensor
C15/GRY	Heated oxygen sensor #1	C44/BLK	Shift stroke sensor
C16/GRN	Heated oxygen sensor #2	C45/BLK	Clutch stroke sensor
C17/BLK	A/C compressor	C46/GRY	Clutch motor
C18/N	Oil pressure sensor	C47/GRY	Shift motor
C20/GRY	CKP sensor	C48/GRY	Select motor
C21/GRY	Generator #1	C49/BLK	Neutral switch
C22/-	Generator #2	C50/N	Rotation sensor
C23/BLK	Starting motor #1	C51/GRY	Automated Manual Transaxle control module
C24/-	Starting motor #2	C52/N	Automated Manual Transaxle control module
C25/GRY	Vehicle speed sensor	C53/N	Main harness (To E60)

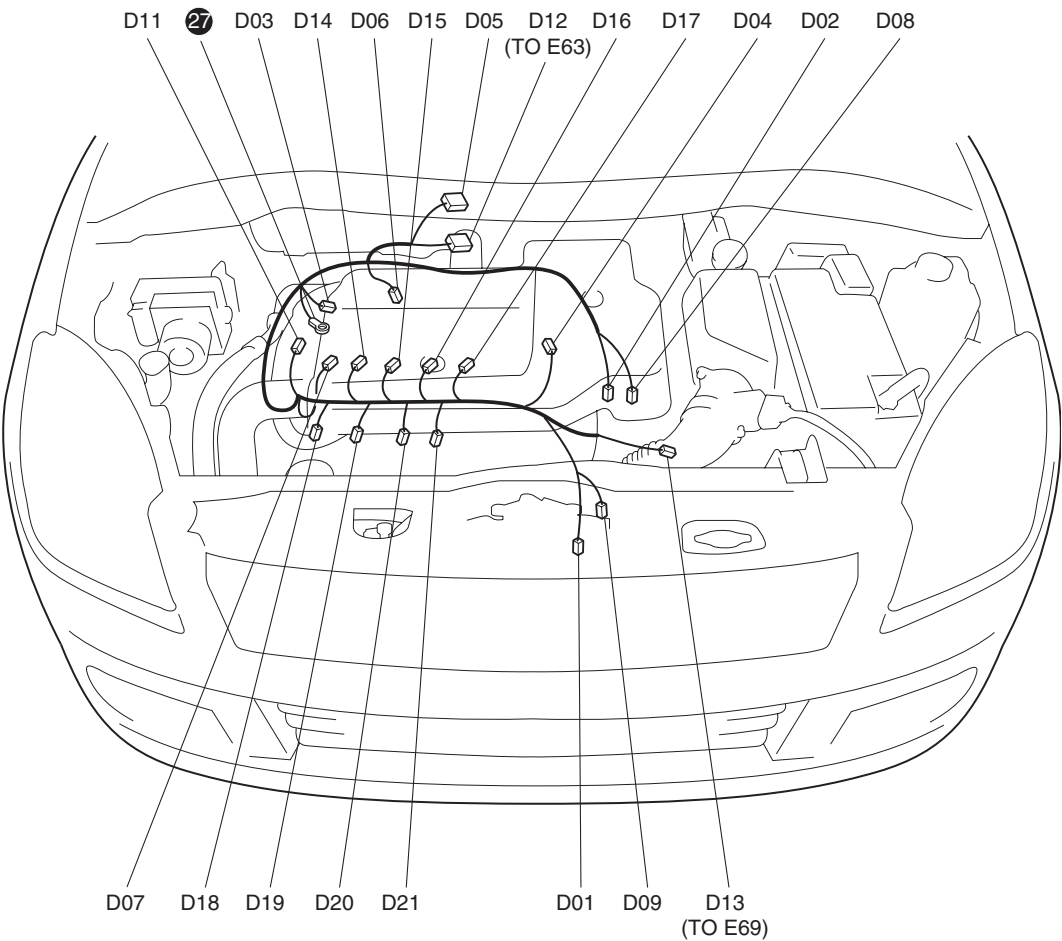
C: Engine harness (DSL)

I5RS0B910901-01

C: Engine harness

No./Color	Connective position	No./Color	Connective position
C54/-	Main fuse box	C58/-	Generator
C55/-	Main fuse box	C59/-	Generator
C56/-	Starting motor	C60/GRY	Main harness (To E65)
C57/-	Starting motor	C61/-	Battery (-)

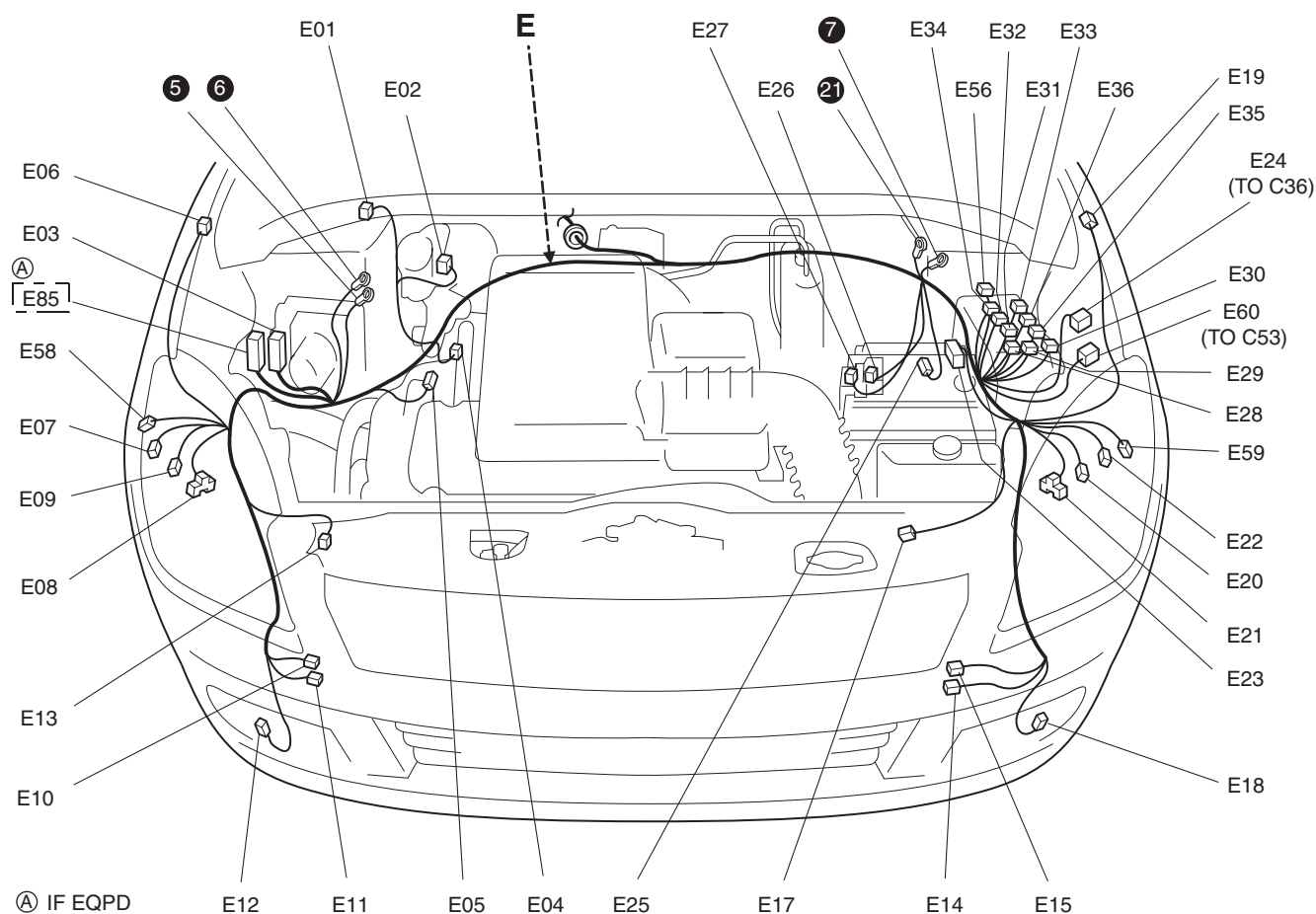
D: Injector harness (DSL)



I5RS0B910902-02

D: Injector harness

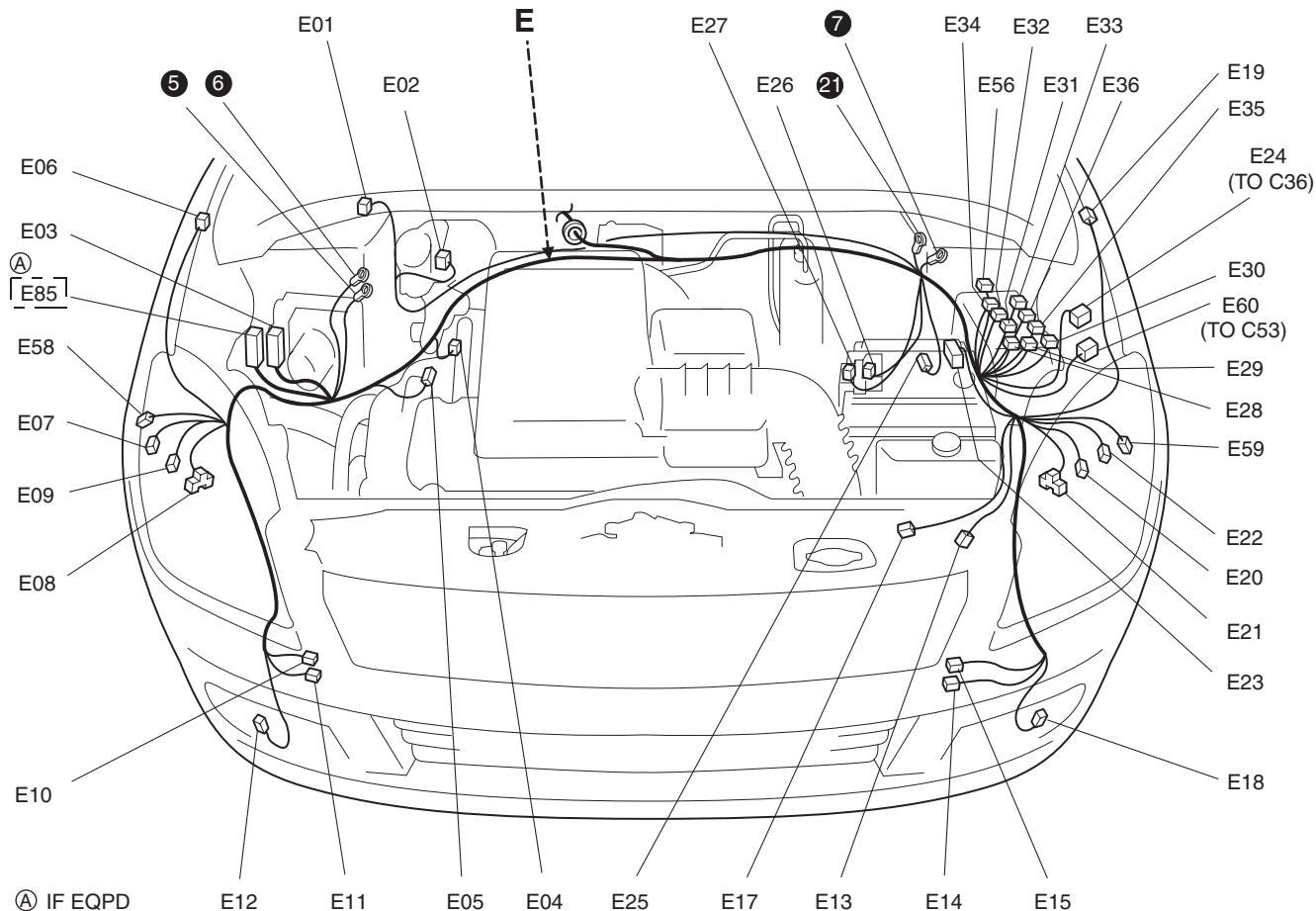
No./Color	Connective position	No./Color	Connective position
D01	ECT sensor	D12	Main harness (To E63)
D02	Fuel pressure regulator	D13	Main harness (To E69)
D03	Fuel pressure sensor	D14	Injector #1
D04	Oil level switch	D15	Injector #2
D05	ECM	D16	Injector #3
D06	Boost pressure sensor	D17	Injector #4
D07	CMP sensor	D18	Glow plug #1
D08	EGR valve	D19	Glow plug #2
D09	CKP sensor	D20	Glow plug #3
D11	Compressor	D21	Glow plug #4

E: Main harness (RHD) (Petrol)

16RS0B910904-02

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E22/N	Front position light (L)
E02/BRN	Brake fluid level switch	E23/GRY	ECM
E03/BLK	ABS control module	E24/N	Engine Harness (To C36)
E04/BLK	A/C pressure sensor	E25/BLK	Wheel speed sensor (FL)
E05/BLK	Wheel speed sensor (FR)	E26/GRY	Main fuse box
E06/N	Side turn signal light (R)	E27/BRN	Main fuse box
E07/N	Front position light (R)	E28/BLK	Radiator fan relay #1
E08/BLK	Head light (R)	E29/BLK	Radiator fan relay #2
E09/GRY	Front turn signal light (R)	E30/BLK	Radiator fan relay #3
E10/GRN	Rear washer motor	E31/BLK	Starting motor relay
E11/BLU	Windshield washer motor	E32/BLK	Main relay
E12/BLK	Front fog light (R)	E33/BLK	A/T relay or Automated Manual Transaxle relay
E13/YEL	Forward sensor	E34/BLK	Front fog light relay
E14/BLK	Ambient temperature sensor	E35/BLK	Fuel pump relay
E15/BLK	Horn	E36/BLK	A/C compressor relay
E17/BLK	Radiator fan motor	E56/BLK	Throttle motor relay
E18/BLK	Front fog light (L)	E58/GRY	Headlight beam leveling actuator (R)
E19/N	Side turn signal light (L)	E59/GRY	Headlight beam leveling actuator (L)
E20/GRY	Front turn signal light (L)	E60/N	Engine harness (To C53)
E21/BLK	Head light (L)	E85/BLK (IF EQPD)	ESPR control module

E: Main harness (LHD) (Petrol)

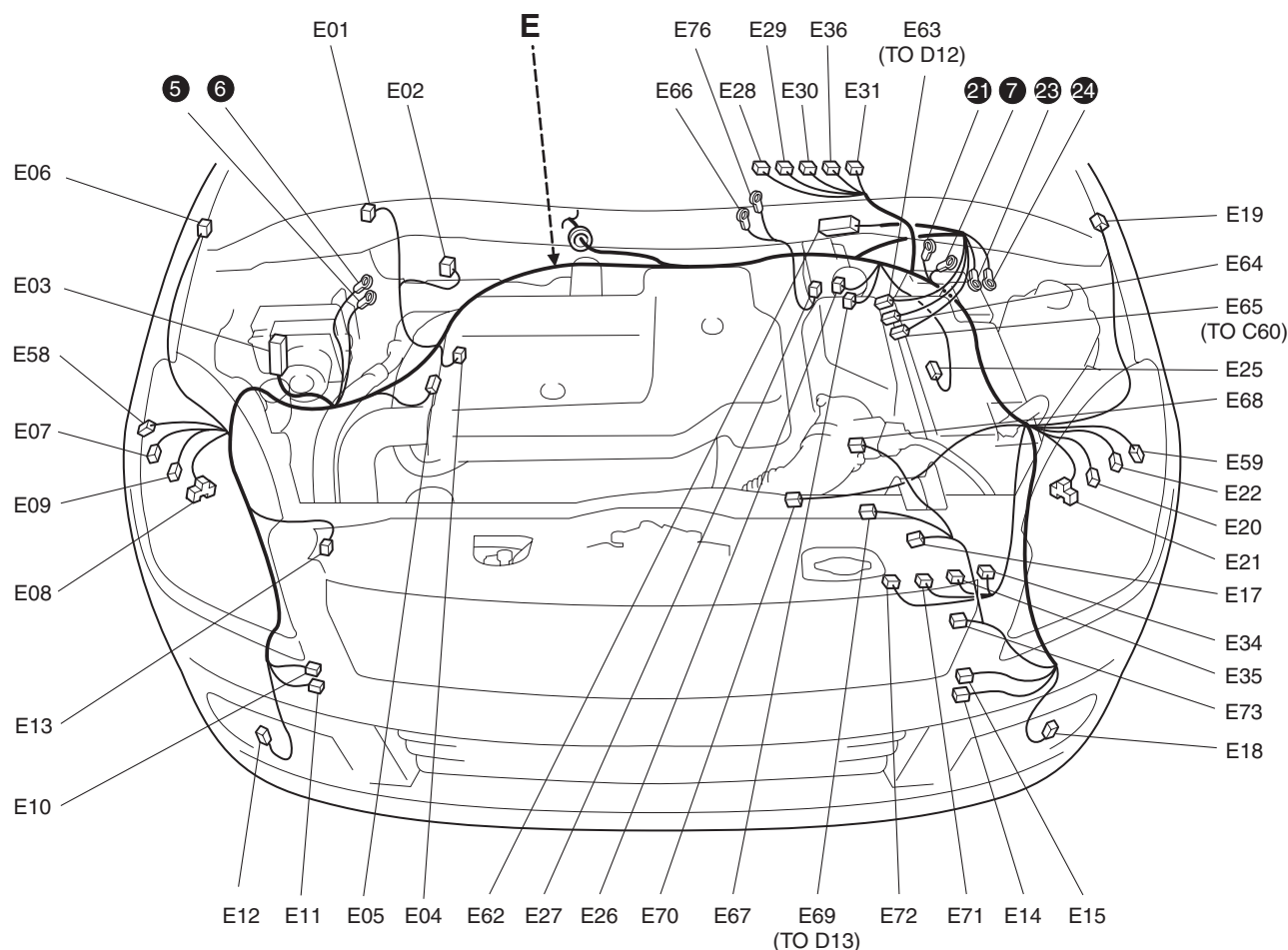
I6RS0B910905-02

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E22/N	Front position light (L)
E02/BRN	Brake fluid level switch	E23/GRY	ECM
E03/BLK	ABS control module	E24/N	Engine Harness (To C36)
E04/BLK	A/C pressure sensor	E25/BLK	Wheel speed sensor (FL)
E05/BLK	Wheel speed sensor (FR)	E26/GRY	Main fuse box
E06/N	Side turn signal light (R)	E27/BRN	Main fuse box
E07/N	Front position light (R)	E28/BLK	Radiator fan relay #1
E08/BLK	Head light (R)	E29/BLK	Radiator fan relay #2
E09/GRY	Front turn signal light (R)	E30/BLK	Radiator fan relay #3
E10/GRN	Rear washer motor	E31/BLK	Starting motor relay
E11/BLU	Windshield washer motor	E32/BLK	Main relay
E12/BLK	Front fog light (R)	E33/BLK	A/T relay or Automated Manual Transaxle relay
E13/YEL	Forward sensor	E34/BLK	Front fog light relay
E14/BLK	Ambient temperature sensor	E35/BLK	Fuel pump relay
E15/BLK	Horn	E36/BLK	A/C compressor relay
E17/BLK	Radiator fan motor	E56/BLK	Throttle motor relay
E18/BLK	Front fog light (L)	E58/GRY	Headlight beam leveling actuator (R)
E19/N	Side turn signal light (L)	E59/GRY	Headlight beam leveling actuator (L)
E20/GRY	Front turn signal light (L)	E60/N	Engine harness (To C53)
E21/BLK	Head light (L)	E85/BLK (IF EQPD)	ESPR control module

E: Main harness (RHD) (DSL)

S6RS0B910A007



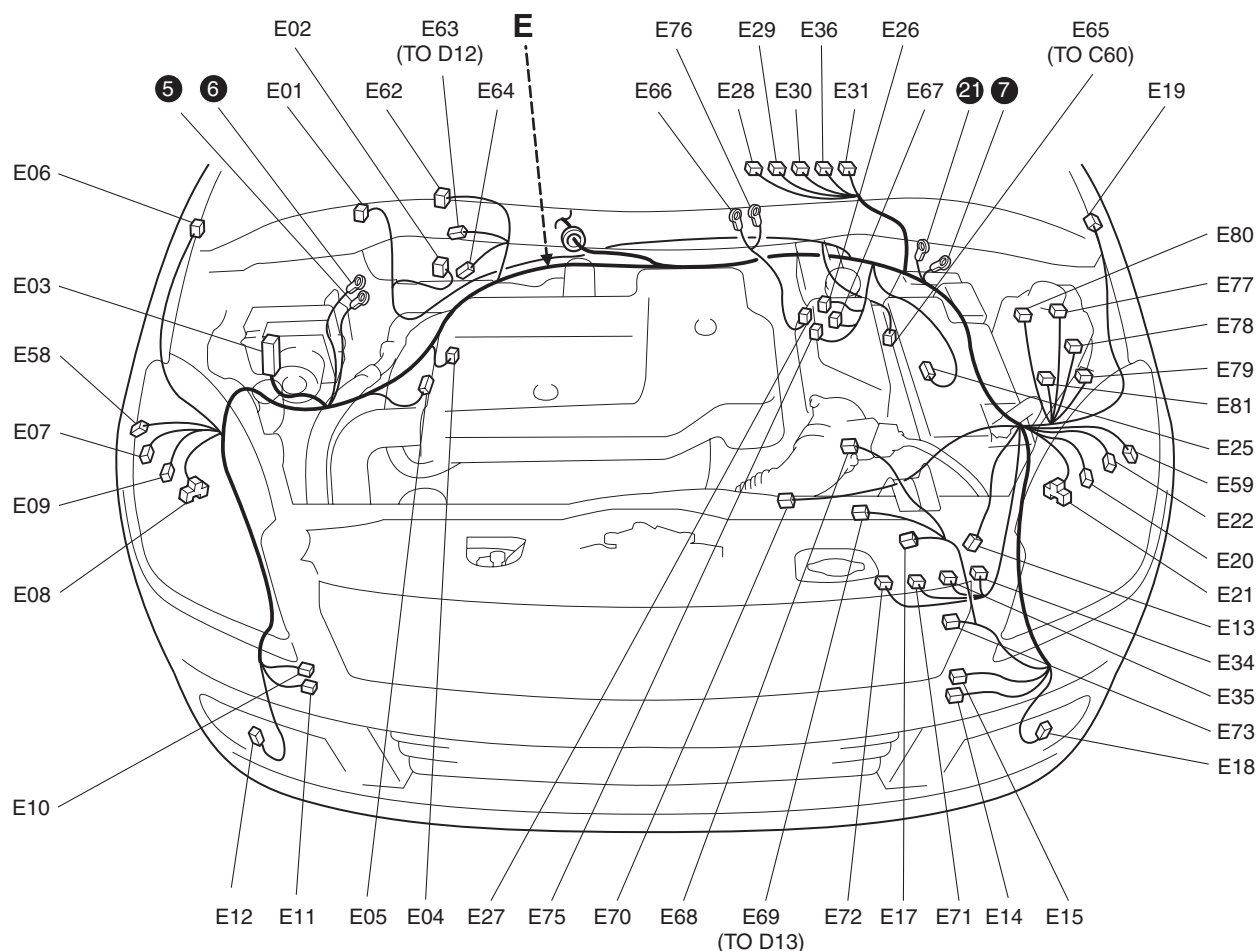
I6RS0B910912-01

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E27/BRN	Main fuse box
E02/BRN	Brake fluid level switch	E28/BLK	Radiator fan relay #1
E03/BLK	ABS control module	E29/BLK	Radiator fan relay #2
E04/BLK	A/C pressure sensor	E30/BLK	Radiator fan relay #3
E05/BLK	Wheel speed sensor (FR)	E31/BLK	Starting motor relay
E06/N	Side turn signal light (R)	E34/BLK	Front fog light relay
E07/N	Front position light (R)	E35/BLK	Fuel pump relay
E08/BLK	Head light (R)	E36/BLK	A/C compressor relay
E09/GRY	Front turn signal light (R)	E58/GRY	Headlight beam leveling actuator (R)
E10/GRN	Rear washer motor	E59/GRY	Headlight beam leveling actuator (L)
E11/BLU	Windshield washer motor	E62/BLK	ECM
E12/BLK	Front fog light (R)	E63/BLK	Injector harness (To D12)
E13/YEL	Forward sensor	E64/GRN	Fuel temperature & Heater
E14/BLK	Ambient temperature sensor	E65/GRY	Engine harness (To C60)
E15/BLK	Horn	E66/-	Individual circuit fuse box
E17/BLK	Radiator fan motor	E67/GRY	Main fuse box
E18/BLK	Front fog light (L)	E68/BLK	Air flow meter
E19/N	Side turn signal light (L)	E69/BLK	Injector harness (To D13)
E20/GRY	Front turn signal light (L)	E70/BLK	Back-up light switch
E21/BLK	Head light (L)	E71/BLK	Fuel heating relay
E22/N	Front position light (L)	E72/BLU	Main relay
E25/BLK	Wheel speed sensor (FL)	E73/BLK	Glow controller
E26/GRY	Main fuse box	E76/-	Individual circuit fuse box

E: Main harness (LHD) (DSL)

S6RS0B910A008



16RS0B910913-01

E: Main harness

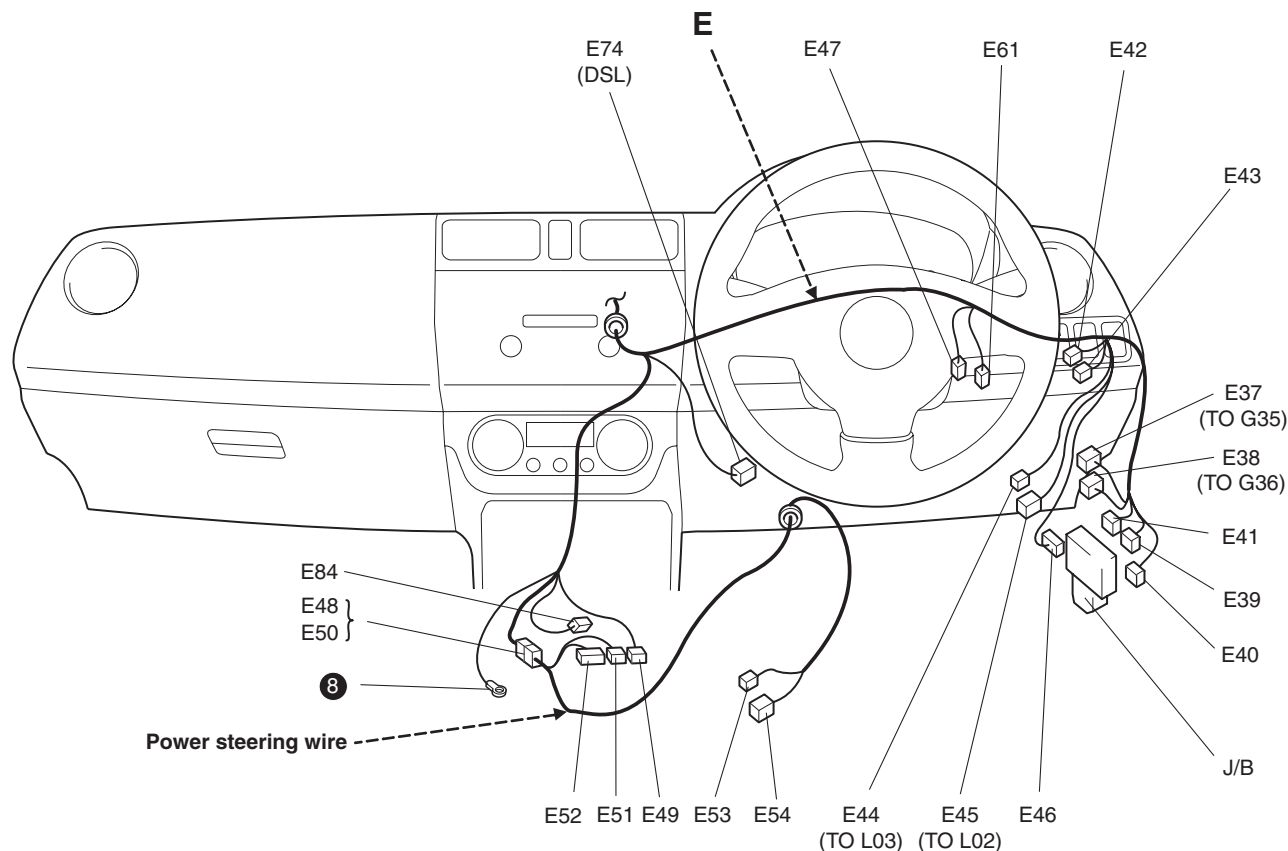
No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E30/BLK	Radiator fan relay #3
E02/BRN	Brake fluid level switch	E31/BLK	Starting motor relay
E03/BLK	ABS control module	E34/BLK	Front fog light relay
E04/BLK	A/C pressure sensor	E35/BLK	Fuel pump relay
E05/BLK	Wheel speed sensor (FR)	E36/BLK	A/C compressor relay
E06/N	Side turn signal light (R)	E58/GRY	Headlight beam leveling actuator (R)
E07/N	Front position light (R)	E59/GRY	Headlight beam leveling actuator (L)
E08/BLK	Head light (R)	E62/BLK	ECM
E09/GRY	Front turn signal light (R)	E63/BLK	Injector harness (To D12)
E10/GRN	Rear washer motor	E64/GRN	Fuel temperature & Heater
E11/BLU	Windshield washer motor	E65/GRY	Engine harness (To C60)
E12/BLK	Front fog light (R)	E66/-	Individual circuit fuse box
E13/YEL	Forward sensor	E67/GRY	Main fuse box
E14/BLK	Ambient temperature sensor	E68/BLK	Air flow meter
E15/BLK	Horn	E69/BLK	Injector harness (To D13)
E17/BLK	Radiator fan motor	E70/BLK	Back-up light switch
E18/BLK	Front fog light (L)	E71/BLK	Fuel heating relay
E19/N	Side turn signal light (L)	E72/BLU	Main relay
E20/GRY	Front turn signal light (L)	E73/BLK	Glow controller
E21/BLK	Head light (L)	E75/GRY	Main fuse box
E22/N	Front position light (L)	E76/-	Individual circuit fuse box
E25/BLK	Wheel speed sensor (FL)	E77/BLK	PTC relay #1
E26/GRY	Main fuse box	E78/BLK	PTC relay #2
E27/BRN	Main fuse box	E79/BLK	PTC relay #3

No./Color	Connective position	No./Color	Connective position
E28/BLK	Radiator fan relay #1	E80/-	BLANK
E29/BLK	Radiator fan relay #2	E81/-	BLANK

Instrument Panel

S6RS0B910A003

E: Main harness and power steering wire (RHD)



I6RS0B910906-01

E: Main harness

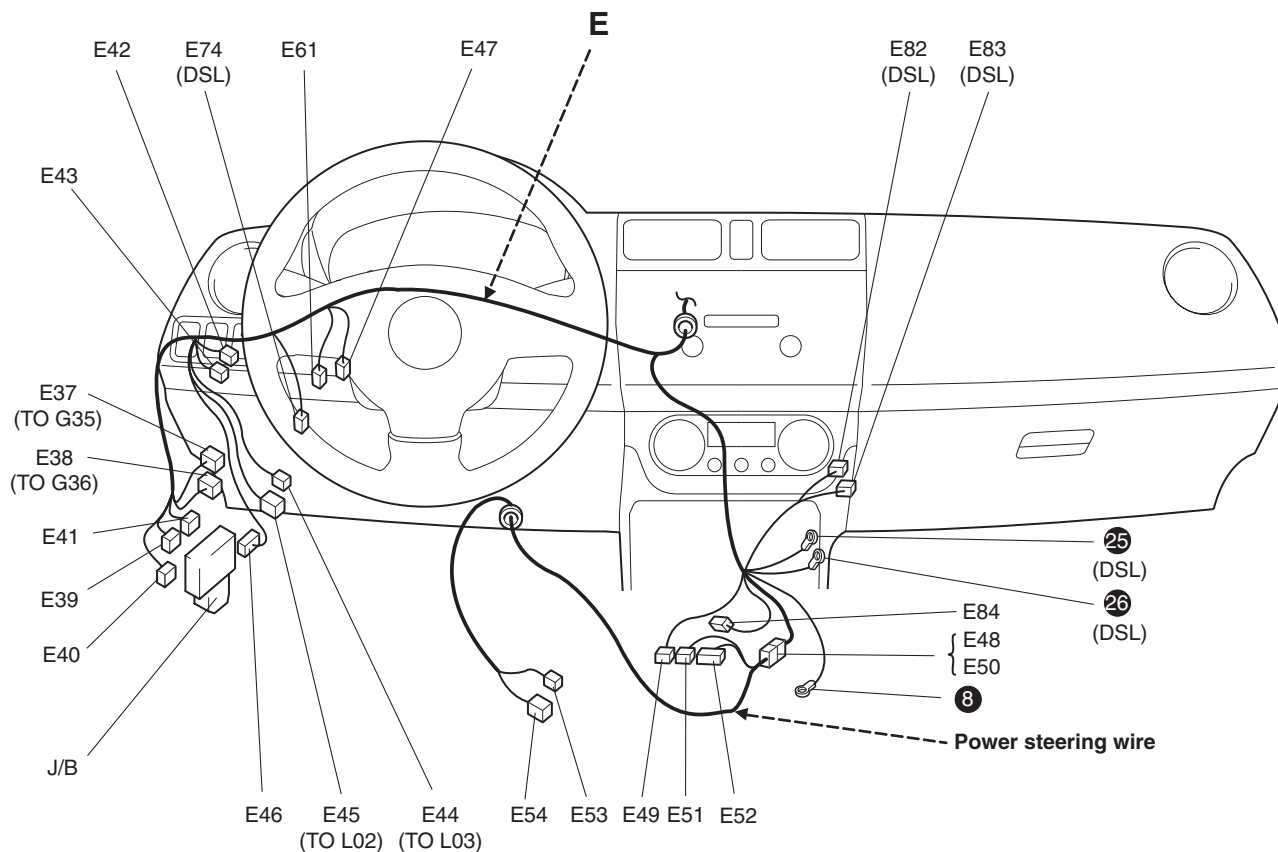
No./Color	Connective position	No./Color	Connective position
E37/GRY	Instrument panel harness (To G35)	E45/N	Floor harness (To L02)
E38/N	Instrument panel harness (To G36)	E46/BLU	BCM
E39/BRN	J/B	E47/N	Brake light switch
E40/N	J/B	E48/BLU	Power steering wire (To E50)
E41/N	J/B	E49/BLK	P/S control module
E42/N	J/C	E61/BLK	Acceleration pedal sensor
E43/N	J/C	E74/BRN (DSL)	Clutch switch
E44/YEL	Floor harness (To L03)	E84/BLK (IF EQPD)	YAW/G sensor

E: Power steering wire

No./Color	Connective position	No./Color	Connective position
E50/BLU	Main harness (To E48)	E53/BLK	P/S torque sensor
E51/BLU	P/S control module	E54/GRY	P/S motor
E52/BLK	P/S control module		

9A-12 Wiring Systems:

E: Main harness and power steering wire (LHD)



I6RS0B910907-01

E: Main harness

No./Color	Connective position	No./Color	Connective position
E37/GRY	Instrument panel harness (To G35)	E46/BLU	BCM
E38/N	Instrument panel harness (To G36)	E47/N	Brake light switch
E39/BRN	J/B	E48/BLU	Power steering wire (To E50)
E40/N	J/B	E49/BLK	P/S control module
E41/N	J/B	E61/BLK	Acceleration pedal sensor
E42/N	J/C	E74/BRN (DSL)	Clutch switch
E43/N	J/C	E82/N (DSL)	PTC heater #1
E44/YEL	Floor harness (To L03)	E83/N (DSL)	PTC heater #2, 3
E45/N	Floor harness (To L02)	E84/BLK (IF EQPD)	YAW/G sensor

E: Power steering wire

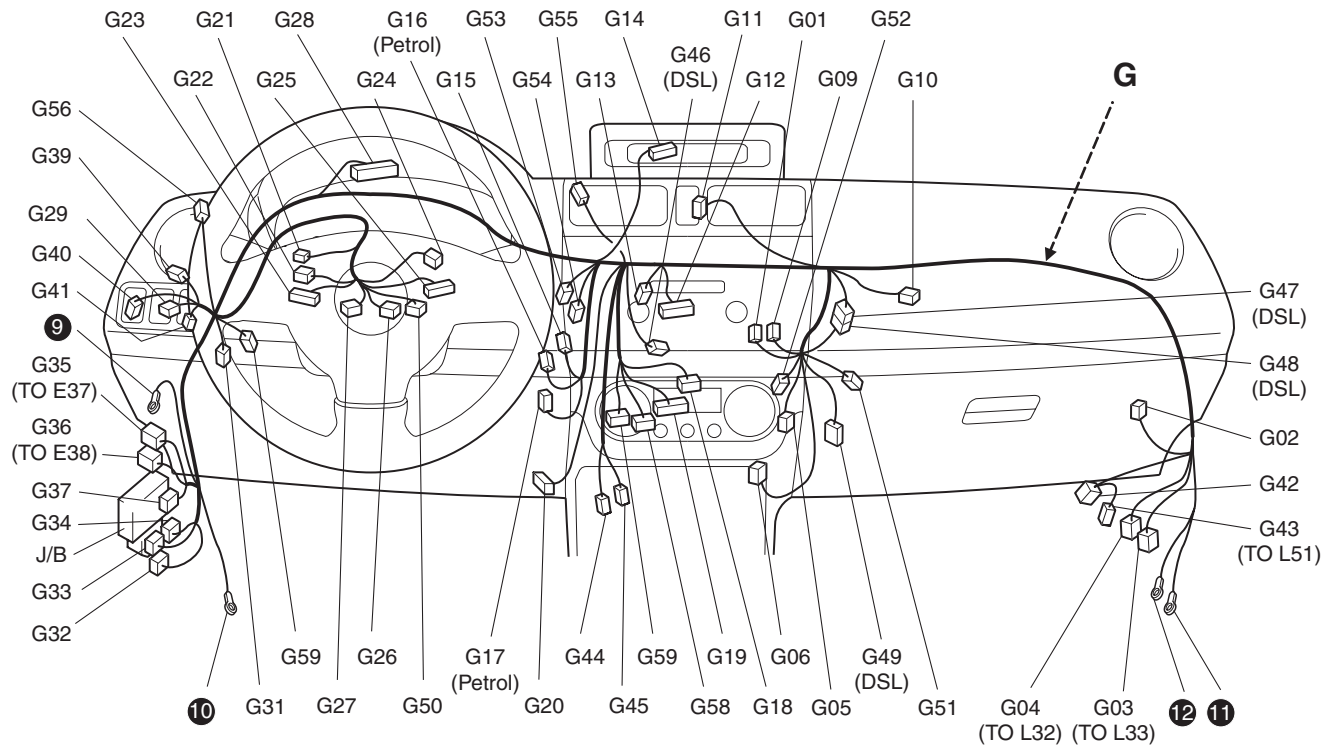
No./Color	Connective position	No./Color	Connective position
E50/BLU	Main harness (To E48)	E53/BLK	P/S torque sensor
E51/BLU	P/S control module	E54/GRY	P/S motor
E52/BLK	P/S control module		

No./Color	Connective position	No./Color	Connective position
G01/YEL	Fresh / Recircle actuator	G28/GRY	COMB meter
G02/N	Keyless receiver	G29/GRN	Front fog light switch
G03/N	Floor harness (To L33)	G31/N	J/C
G04/YEL	Floor harness (To L32)	G32/N	J/B
G05/N	Blower fan motor	G33/N	J/B
G06/N	Heater resister	G34/N	J/B
G09/N	EVAP thermistor	G35/GRY	Main harness (To E37)
G10/BLK	Passenger inflator	G36/N	Main harness (To E38)
G11/N	Hazard switch	G37/BLU	BCM
G12/BLU	Audio	G40/N	Headlight leveling switch
G13/N	Navigation	G41/GRY (IF EQPD)	ILL cancel switch
G14/GRN	Multi information display	G42/N	KLS ECM
G15/GRY	J/C	G43/GRY	Floor harness (To L51)
G16/BLU (Petrol)	J/C	G44/BLK	Cigar lighter
G17/N (Petrol)	J/C	G45/BLK	Cigar lighter ILL
G18/GRN	Mode control switch	G50/N (IF EQPD)	Steering angle sensor
G19/BRN	Heater fan switch	G51/N (IF EQPD)	Fan driver
G20/BLK	DLC	G52/BLK (IF EQPD)	Diode
G21/N	IG switch	G53/YEL (IF EQPD)	Mode selecting actuator
G22/N	Main switch (Key switch)	G54/N (IF EQPD)	Temperature control actuator
G23/BLK	COMB switch	G55/N (IF EQPD)	Room temperature sensor
G24/BLK	ICM	G56/N (IF EQPD)	Sunlight sensor

9A-14 Wiring Systems:

No./Color	Connective position	No./Color	Connective position
G25/N	COMB switch	G57/GRY (IF EQPD)	Auto A/C
G26/YEL	Driver inflator	G58/GRY (IF EQPD)	Auto A/C
G27/N	COMB switch	G59/N (IF EQPD)	J/C

G: Instrument panel harness (LHD)



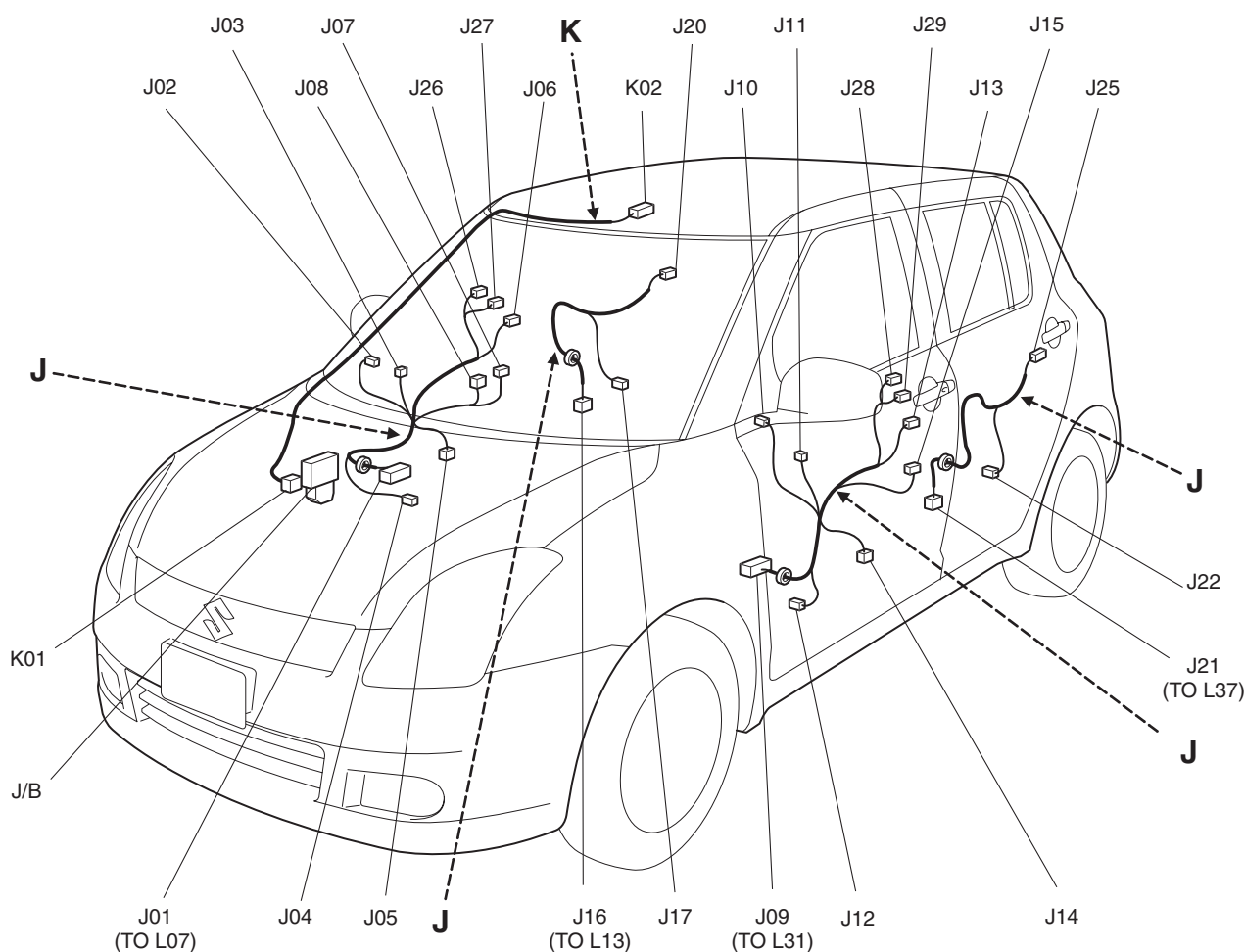
G: Instrument panel harness

No./Color	Connective position	No./Color	Connective position
G01/YEL	Fresh / Recircle actuator	G32/N	J/B
G02/N	Keyless receiver	G33/N	J/B
G03/N	Floor harness (To L33)	G34/N	J/B
G04/YEL	Floor harness (To L32)	G35/GRY	Main harness (To E37)
G05/N	Blower fan motor	G36/N	Main harness (To E38)
G06/N	Heater resister	G37/BLU	BCM
G09/N	EVAP thermistor	G39/N	DRL controller
G10/YEL	Passenger inflator	G40/N	Headlight leveling switch
G11/N	Hazard switch	G41/GRY	ILL cancel switch
G12/BLU	Audio	G42/N	KLS ECM
G13/N	Navigation	G43/GRY	Floor harness (To L51)
G14/GRN	Multi information display	G44/BLK	Cigar lighter
G15/GRY	J/C	G45/BLK	Cigar lighter ILL
G16/BLU (Petrol)	J/C	G46/N (DSL)	Max hot switch
G17/N (Petrol)	J/C	G47/N (DSL)	Instrument panel harness (To G48)
G18/GRN	Mode control switch	G48/N (DSL)	Instrument panel harness (To G47)
G19/BRN	Heater fan switch	G49/N (DSL)	PTC control module
G20/BLK	DLC	G50/N (IF EQPD)	Steering angle sensor
G21/N	IG switch	G51/N (IF EQPD)	Fan driver
G22/N	Main switch (Key switch)	G52/BLK (IF EQPD)	Diode
G23/BLK	COMB switch	G53/YEL (IF EQPD)	Mode selecting actuator
G24/BLK	ICM	G54/N (IF EQPD)	Temperature control actuator
G25/N	COMB switch	G55/N (IF EQPD)	Room temperature sensor
G26/YEL	Driver inflator	G56/N (IF EQPD)	Sunlight sensor
G27/N	COMB switch	G57/GRY (IF EQPD)	Auto A/C
G28/GRY	COMB meter	G58/GRY (IF EQPD)	Auto A/C
G29/GRN	Front fog light switch	G59/N (IF EQPD)	J/C
G31/N	J/C		

Door, Roof

S6RS0B910A004

J: Front and rear door wire and rear door joint wire / K: Roof wire (RHD)



I6RS0B910914-01

J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/N	Floor harness (To L07)	J06/N	Front door lock switch (Driver side)
J02/BLK	Tweeter (Driver side)	J07/N	Power mirror switch (Driver side)
J03/N	Power mirror motor (Driver side)	J08/BLU	Power window main switch
J04/N	Front speaker (Driver side)	J26/N	Door antenna (Driver side)
J05/GRY	Front power window motor (Driver side)	J27/N	Request switch (Driver side)

J: Front door wire (Passenger side)

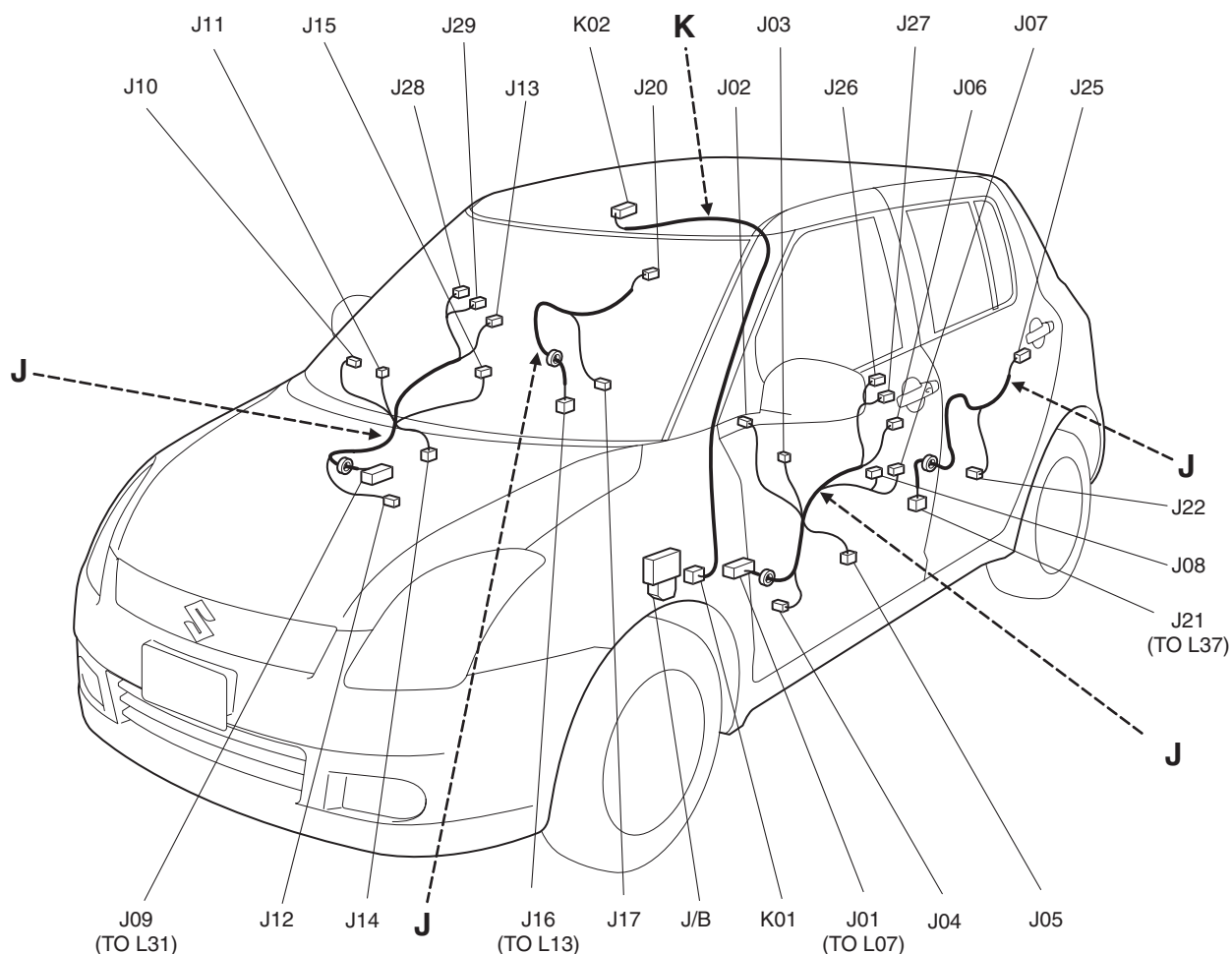
No./Color	Connective position	No./Color	Connective position
J09/N	Floor harness (To L03)	J14/GRY	Front power window motor (Passenger side)
J10/BLK	Tweeter (Passenger side)	J15/N	Power window sub switch
J11/N	Power mirror motor (Passenger side)	J28/N	Door antenna (Passenger side)
J12/N	Front speaker (Passenger side)	J29/N	Request switch (Passenger side)
J13/N	Front door lock motor (Passenger side)		

J: Rear door wire

No./Color	Connective position	No./Color	Connective position
J16/N	Floor harness (To L13)	J21/N	Floor harness (To L37)
J17/N	Rear speaker (R)	J22/N	Rear speaker (L)
J20/N	Rear door lock motor (R)	J25/N	Rear door lock motor (L)

K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/GRY	Interior light

J: Front and rear door wire and rear door joint wire / K: Roof wire (LHD)

I6RS0B910915-01

J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/N	Floor harness (To L07)	J06/N	Front door lock switch (Driver side)
J02/BLK	Tweeter (Driver side)	J07/N	Power mirror switch (Driver side)
J03/N	Power mirror motor (Driver side)	J08/BLU	Power window main switch
J04/N	Front speaker (Driver side)	J26/N	Door antenna (Driver side)
J05/GRY	Front power window motor (Driver side)	J27/N	Request switch (Driver side)

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J09/N	Floor harness (To L03)	J14/GRY	Front power window motor (Passenger side)
J10/BLK	Tweeter (Passenger side)	J15/N	Power window sub switch
J11/N	Power mirror motor (Passenger side)	J28/N	Door antenna (Passenger side)
J12/N	Front speaker (Passenger side)	J29/N	Request switch (Passenger side)
J13/N	Front door lock motor (Passenger side)		

J: Rear door wire

No./Color	Connective position	No./Color	Connective position
J16/N	Floor harness (To L13)	J21/N	Floor harness (To L37)
J17/N	Rear speaker (R)	J22/N	Rear speaker (L)
J20/N	Rear door lock motor (R)	J25/N	Rear door lock motor (L)

K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/GRY	Interior light

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L27/BLK	Parking brake switch
L02/N	Main harness (To E45)	L29/PNK	A/B SDM
L03/YEL	Main harness (To E44)	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L04/YEL	J/B	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L05/N	J/B	L31/N	Front door wire (Passenger side) (To J09)
L06/N	J/B	L32/YEL	Instrument panel harness (To G04)
L07/N	Front door wire (Driver side) (To J01)	L33/N	Instrument panel harness (To G03)
L08/N	J/C	L34/N	Front door switch (Passenger side)
L09/N	J/C	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L10/BLK	Pretensioner (Driver side)	L36/BLK	Pretensioner (Passenger side)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L37/N	Rear door wire (L) (To J21)
L12/N	Front door switch (Driver side)	L38/N	Wheel speed sensor (RL)
L13/N	Rear door wire (R) (To J16)	L40/N	Rear door switch (L)
L14/N	Wheel speed sensor (RR)	L41/BLK (IF EQPD)	Side curtain air-bag (L)
L15/GRY	Fuel pump wire (To R01)	L42/N	Rear end door wire (To O01)
L16/N	Rear door switch (R)	L43/N	Rear combination lamp (L)
L17/N	High mounted stop lamp	L51/GRY	Instrument panel harness (To G43)
L18/BLK (IF EQPD)	Side curtain air-bag (R)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L19/GRY	Luggage compartment light	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L20/N	Rear combination lamp (R)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L21/N	License plate wire (To L22)	L59/GRY	Rear end antenna
L23/N (A/T)	A/T shift lever	L60/GRY	Rear fog light
L24/GRY	J/C	L65/BRN	Inside antenna
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L66/BRN	Luggage antenna
L26/N	Seat belt switch		

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

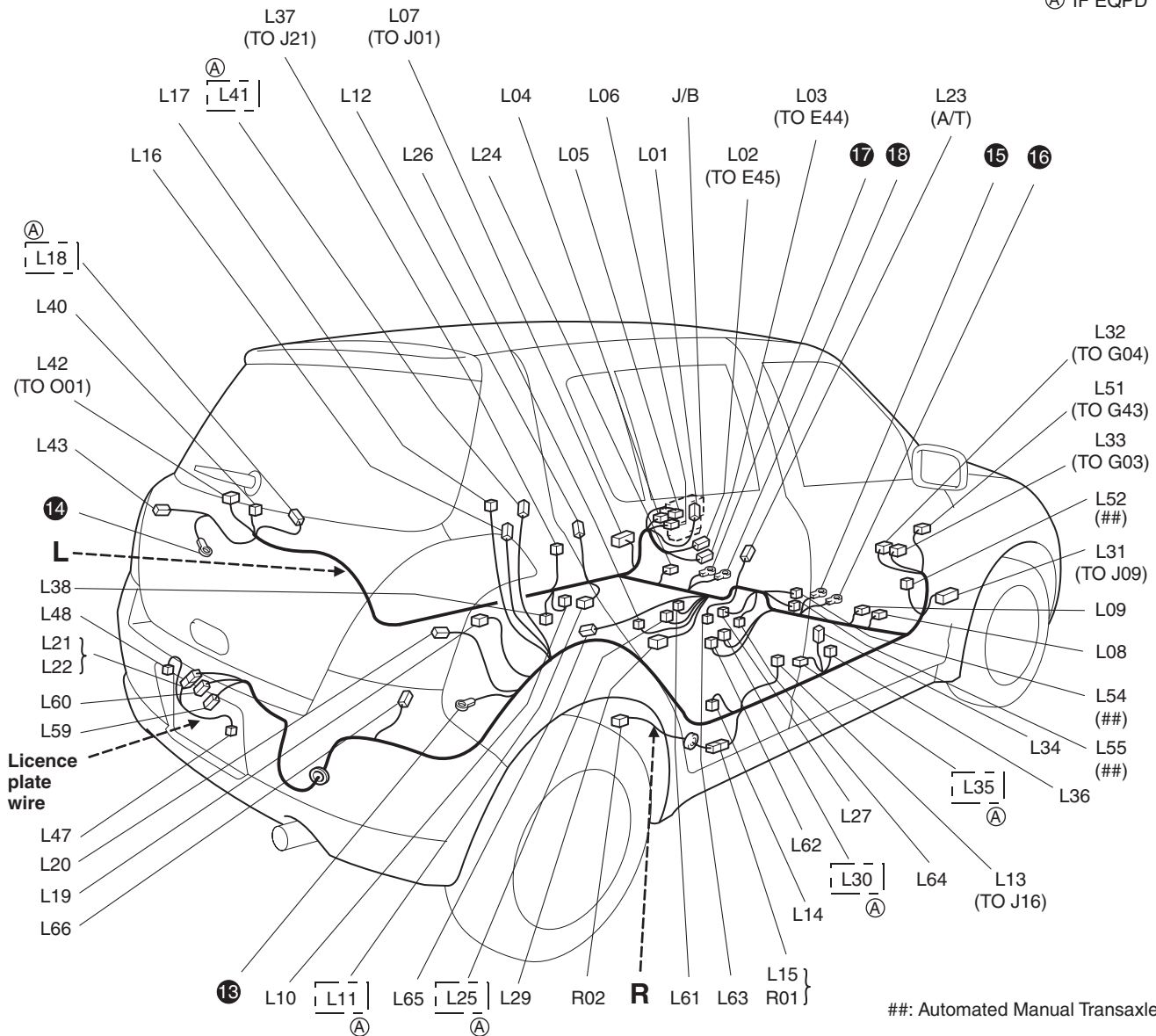
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

9A-20 Wiring Systems:

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (LHD, 5dr)

Ⓐ IF EQPD



I6RS0B910917-01

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L02/N	Main harness (To E45)	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L03/YEL	Main harness (To E44)	L31/N	Front door wire (Passenger side) (To J09)
L04/YEL	J/B	L32/YEL	Instrument panel harness (To G04)
L05/N	J/B	L33/N	Instrument panel harness (To G03)
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L08/N	J/C	L36/BLK	Pretensioner (Passenger side)
L09/N	J/C	L37/N	Rear door wire (L) (To J21)
L10/BLK	Pretensioner (Driver side)	L38/N	Wheel speed sensor (RL)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L40/N	Rear door switch (L)
L12/N	Front door switch (Driver side)	L41/BLK (IF EQPD)	Side curtain air-bag (L)
L13/N	Rear door wire (R) (To J16)	L42/N	Rear end door wire (To O01)
L14/N	Wheel speed sensor (RR)	L43/N	Rear combination lamp (L)
L15/GRY	Fuel pump wire (To R01)	L51/GRY	Instrument panel harness (To G43)
L16/N	Rear door switch (R)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L17/N	High mounted stop lamp	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L18/BLK (IF EQPD)	Side curtain air-bag (R)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L19/GRY	Luggage compartment light	L59/GRY	Rear end antenna
L20/N	Rear combination lamp (R)	L60/GRY	Rear fog light
L21/N	License plate wire (To L22)	L61/N	Seat heater (Driver side) and seat belt switch
L23/N (A/T)	A/T shift lever	L62/N	Seat heater (Passenger side)
L24/GRY	J/C	L63/YEL	Seat heater switch (Driver side)
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L64/GRN	Seat heater switch (Passenger side)
L26/N	Seat belt switch	L65/BRN	Inside antenna
L27/BLK	Parking brake switch	L66/BRN	Luggage antenna
L29/PNK	A/B SDM		

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

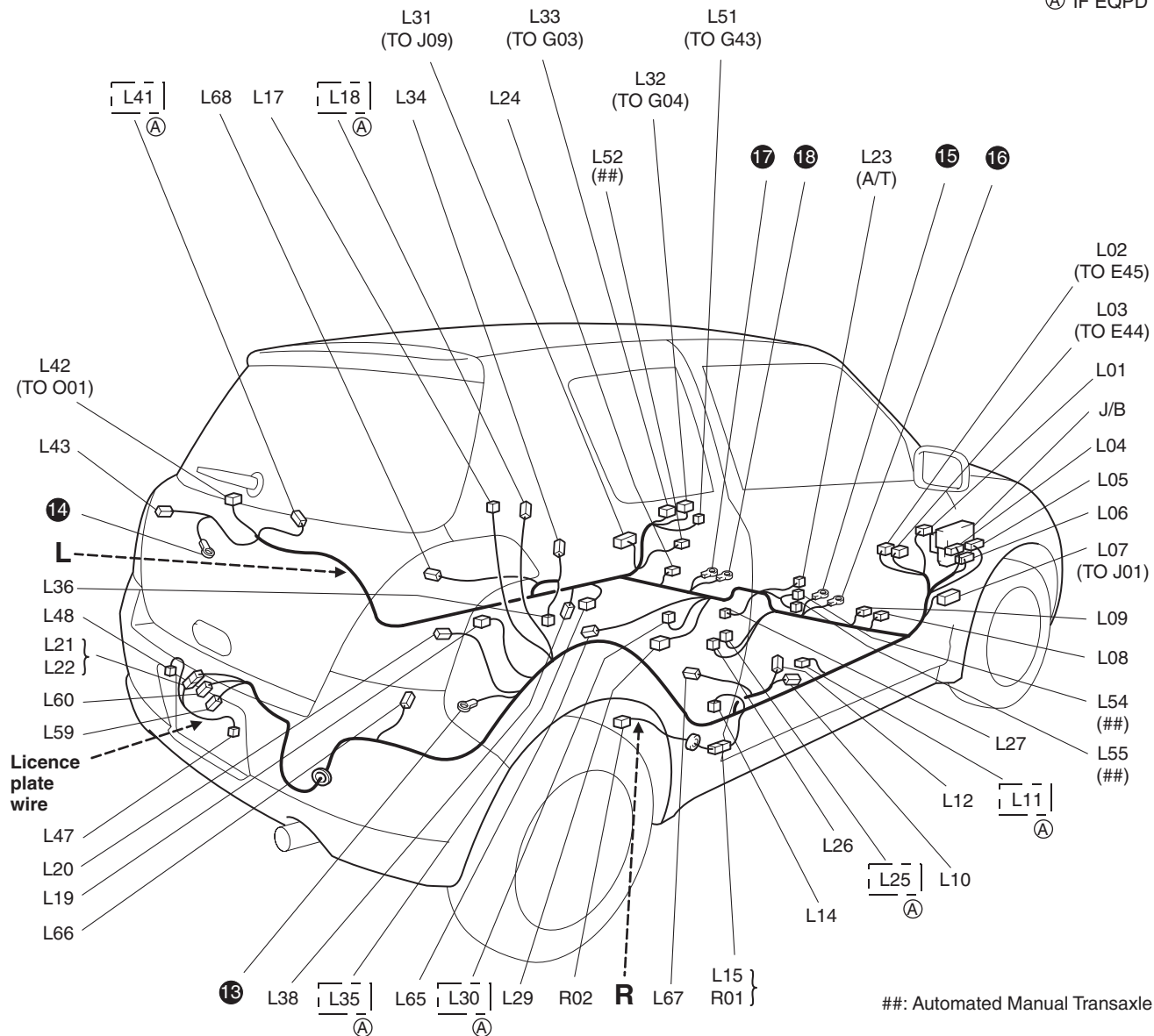
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

9A-22 Wiring Systems:

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (NORMAL RHD, 3dr)

Ⓐ IF EQPD



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L29/PNK	A/B SDM
L02/N	Main harness (To E45)	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L03/YEL	Main harness (To E44)	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L04/YEL	J/B	L31/N	Front door wire (Passenger side) (To J09)
L05/N	J/B	L32/YEL	Instrument panel harness (To G04)
L06/N	J/B	L33/N	Instrument panel harness (To G03)
L07/N	Front door wire (Driver side) (To J01)	L34/N	Front door switch (Passenger side)
L08/N	J/C	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L09/N	J/C	L36/BLK	Pretensioner (Passenger side)
L10/BLK	Pretensioner (Driver side)	L38/N	Wheel speed sensor (RL)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L12/N	Front door switch (Driver side)	L42/N	Rear end door wire (To O01)
L14/N	Wheel speed sensor (RR)	L43/N	Rear combination lamp (L)
L15/GRY	Fuel pump wire (To R01)	L51/GRY	Instrument panel harness (To G43)
L17/N	High mounted stop lamp	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L19/GRY	Luggage compartment light	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L20/N	Rear combination lamp (R)	L59/GRY	Rear end antenna
L21/N	License plate wire (To L22)	L60/GRY	Rear fog light
L23/N (A/T)	A/T shift lever	L65/BRN	Inside antenna
L24/GRY	J/C	L66/BRN	Luggage antenna
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L67/N	Rear speaker (R)
L26/N	Seat belt switch	L68/N	Rear speaker (L)
L27/BLK	Parking brake switch		

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (NORMAL LHD, 3dr)

I6RS0B910919-01

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L02/N	Main harness (To E45)	L31/N	Front door wire (Passenger side) (To J09)
L03/YEL	Main harness (To E44)	L32/YEL	Instrument panel harness (To G04)
L04/YEL	J/B	L33/N	Instrument panel harness (To G03)
L05/N	J/B	L34/N	Front door switch (Passenger side)
L06/N	J/B	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L36/BLK	Pretensioner (Passenger side)
L08/N	J/C	L38/N	Wheel speed sensor (RL)
L09/N	J/C	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L10/BLK	Pretensioner (Driver side)	L42/N	Rear end door wire (To O01)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L43/N	Rear combination lamp (L)
L12/N	Front door switch (Driver side)	L51/GRY	Instrument panel harness (To G43)
L14/N	Wheel speed sensor (RR)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L15/GRY	Fuel pump wire (To R01)	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L17/N	High mounted stop lamp	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L59/GRY	Rear end antenna
L19/GRY	Luggage compartment light	L60/GRY	Rear fog light
L20/N	Rear combination lamp (R)	L61/N	Seat heater (Driver side) and seat belt switch
L21/N	License plate wire (To L22)	L62/N	Seat heater (Passenger side)
L23/N (A/T)	A/T shift lever	L63/YEL	Seat heater switch (Driver side)
L24/GRY	J/C	L64/GRN	Seat heater switch (Passenger side)
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L65/BRN	Inside antenna
L26/N	Seat belt switch	L66/BRN	Luggage antenna
L27/BLK	Parking brake switch	L67/N	Rear speaker (R)
L29/PNK	A/B SDM	L68/N	Rear speaker (L)
L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM		

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

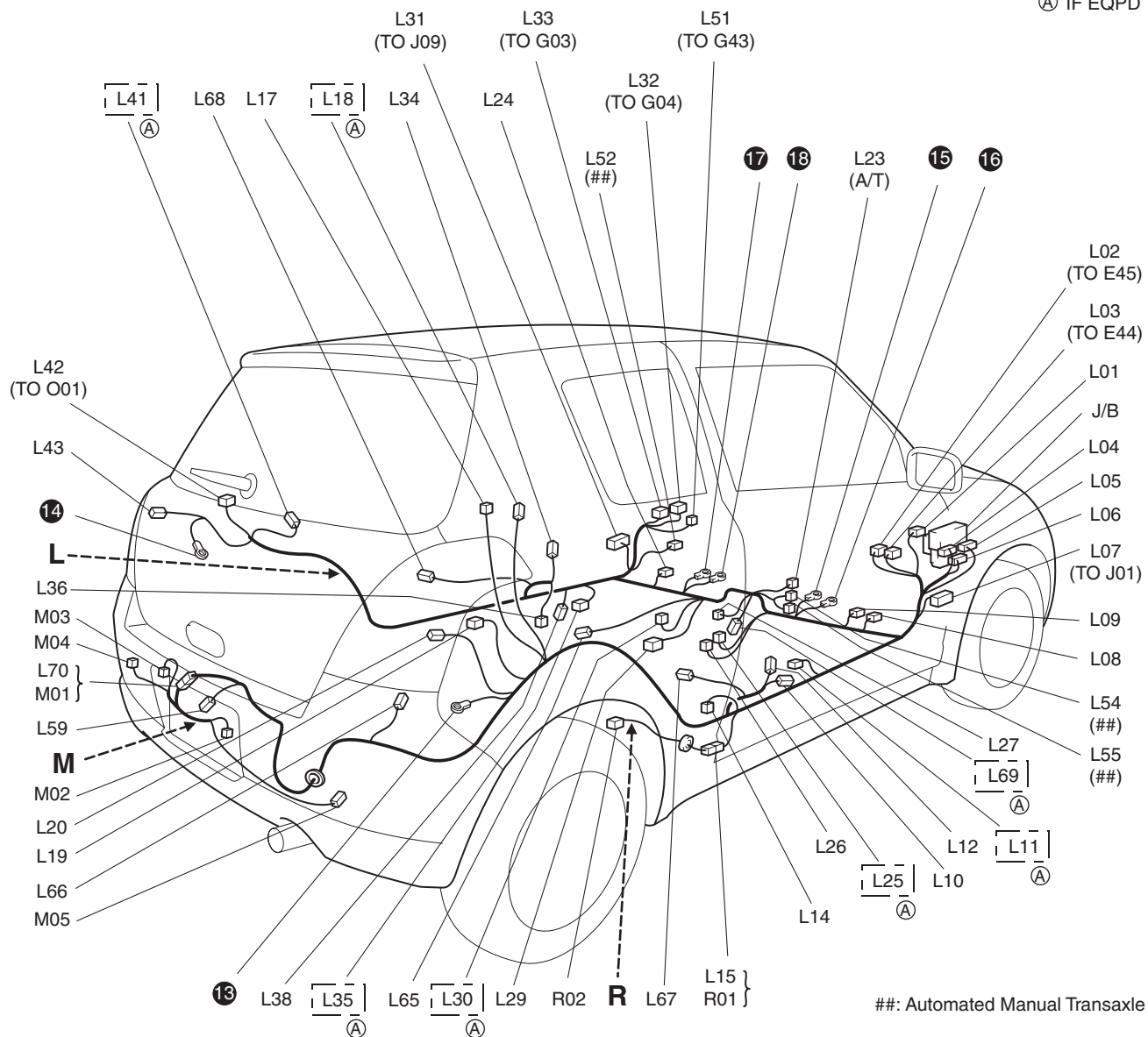
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

9A-26 Wiring Systems:

L: Floor harness, ACC socket wire / M: Rear bumper wire / R: Fuel pump wire (SPORT RHD, 3dr)

Ⓐ IF EQPD



16RS0B910910-02

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L02/N	Main harness (To E45)	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L03/YEL	Main harness (To E44)	L31/N	Front door wire (Passenger side) (To J09)
L04/YEL	J/B	L32/YEL	Instrument panel harness (To G04)
L05/N	J/B	L33/N	Instrument panel harness (To G03)
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L08/N	J/C	L36/BLK	Pretensioner (Passenger side)
L09/N	J/C	L38/N	Wheel speed sensor (RL)
L10/BLK	Pretensioner (Driver side)	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L42/N	Rear end door wire (To O01)
L12/N	Front door switch (Driver side)	L43/N	Rear combination lamp (L)
L14/N	Wheel speed sensor (RR)	L51/GRY	Instrument panel harness (To G43)
L15/GRY	Fuel pump wire (To R01)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L17/N	High mounted stop lamp	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L19/GRY	Luggage compartment light	L59/GRY	Rear end antenna
L20/N	Rear combination lamp (R)	L65/BRN	Inside antenna
L23/N (A/T)	A/T shift lever	L66/BRN	Luggage antenna
L24/GRY	J/C	L67/N	Rear speaker (R)
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L68/N	Rear speaker (L)
L26/N	Seat belt switch	L69/N (IF EQPD)	ESP ^R off switch
L27/BLK	Parking brake switch	L70/GRY	Rear bumper wire (To M01)
L29/PNK	A/B SDM		

M: Rear bumper wire

No./Color	Connective position	No./Color	Connective position
M01/GRY	Floor harness (To L70)	M04/N	Back-up light
M02/N	License plate light (R)	M05/N	Rear fog light
M03/N	License plate light (L)		

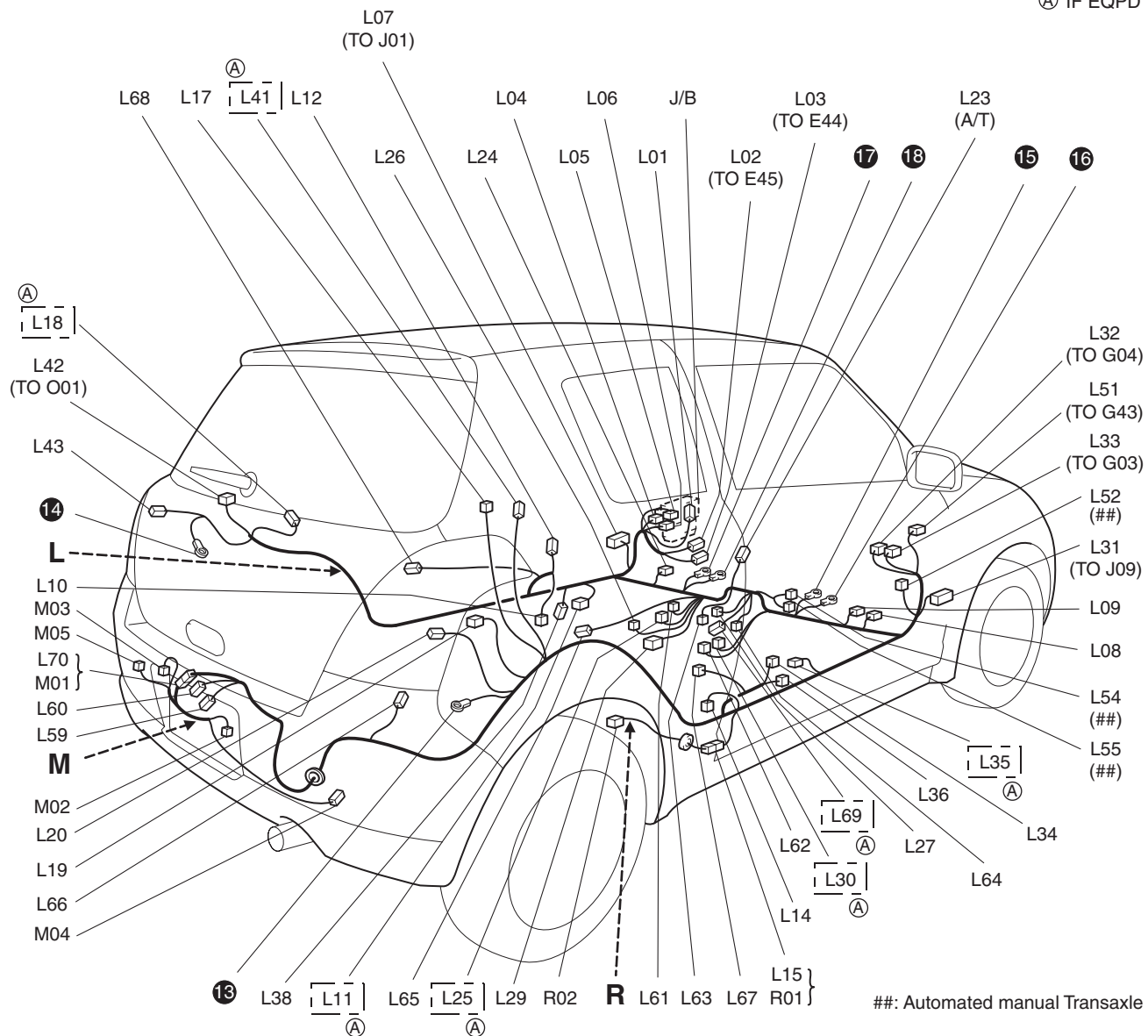
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

9A-28 Wiring Systems:

L: Floor harness, ACC socket wire / M: Rear bumper wire / R: Fuel pump wire (SPORT LHD, 3dr)

Ⓐ IF EQPD



L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L31/N	Front door wire (Passenger side) (To J09)
L02/N	Main harness (To E45)	L32/YEL	Instrument panel harness (To G04)
L03/YEL	Main harness (To E44)	L33/N	Instrument panel harness (To G03)
L04/YEL	J/B	L34/N	Front door switch (Passenger side)
L05/N	J/B	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L06/N	J/B	L36/BLK	Pretensioner (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L38/N	Wheel speed sensor (RL)
L08/N	J/C	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L09/N	J/C	L42/N	Rear end door wire (To O01)
L10/BLK	Pretensioner (Driver side)	L43/N	Rear combination lamp (L)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L51/GRY	Instrument panel harness (To G43)
L12/N	Front door switch (Driver side)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L14/N	Wheel speed sensor (RR)	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L15/GRY	Fuel pump wire (To R01)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L17/N	High mounted stop lamp	L59/GRY	Rear end antenna
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L61/N	Seat heater (Driver side) and seat belt switch
L19/GRY	Luggage compartment light	L62/N	Seat heater (Passenger side)
L20/N	Rear combination lamp (R)	L63/YEL	Seat heater switch (Driver side)
L23/N (A/T)	A/T shift lever	L64/GRN	Seat heater switch (Passenger side)
L24/GRY	J/C	L65/BRN	Inside antenna
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L66/BRN	Luggage antenna
L26/N	Seat belt switch	L67/N	Rear speaker (R)
L27/BLK	Parking brake switch	L68/N	Rear speaker (L)
L29/PNK	A/B SDM	L69/N (IF EQPD)	ESP ^R off switch
L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM	L70/GRY	Rear bumper wire (To M01)
L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)		

M: Rear bumper wire

No./Color	Connective position	No./Color	Connective position
M01/GRY	Floor harness (To L70)	M04/N	Back-up light
M02/N	License plate light (R)	M05/N	Rear fog light
M03/N	License plate light (L)		

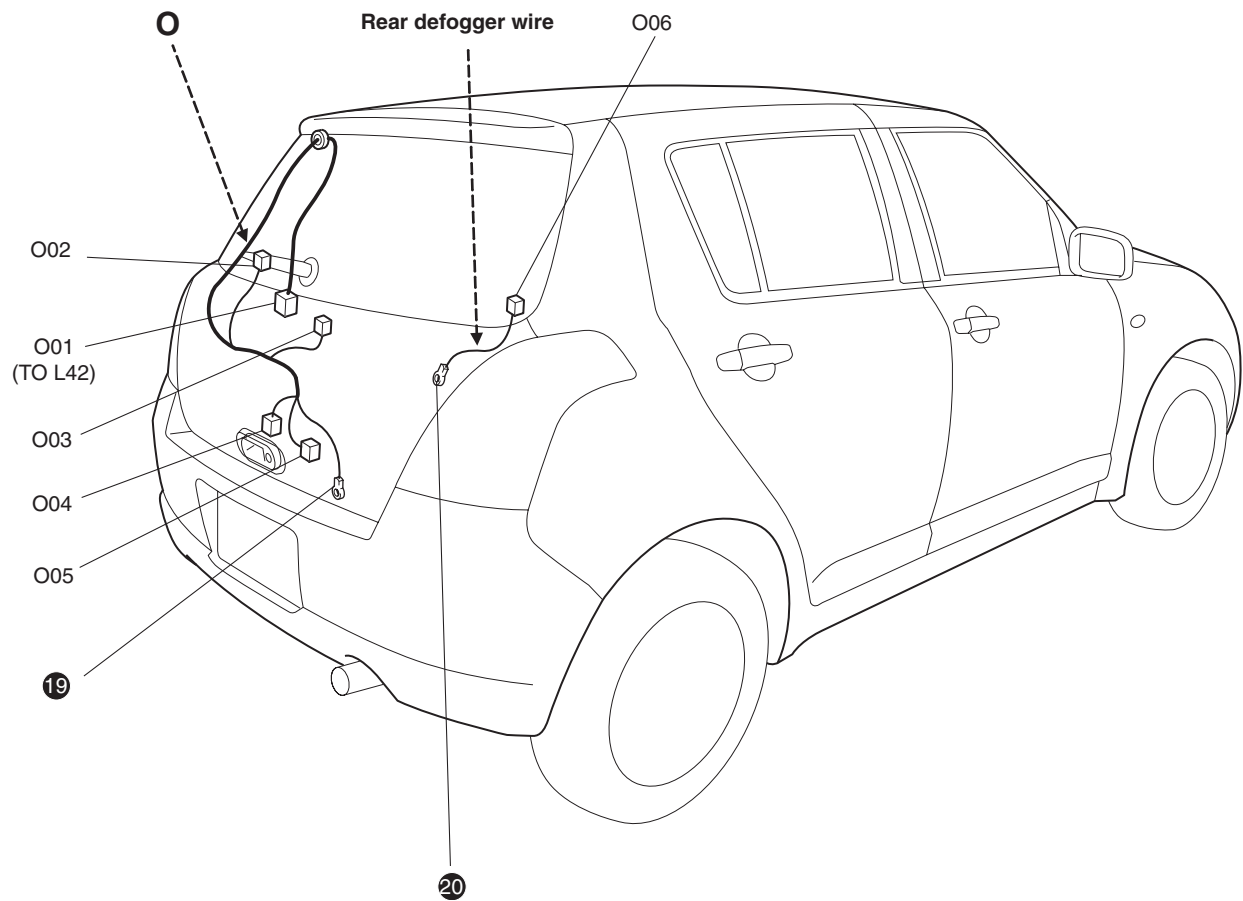
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

Rear

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O: Rear end door harness, Rear defogger wire



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O: Rear end door harness

No./Color	Connective position	No./Color	Connective position
O01/N	Floor harness (To L42)	O04/N	Rear end door lock solenoid
O02/BLK	Rear defogger (+)	O05/GRN	Rear end door lock switch
O03/N	Rear wiper motor		

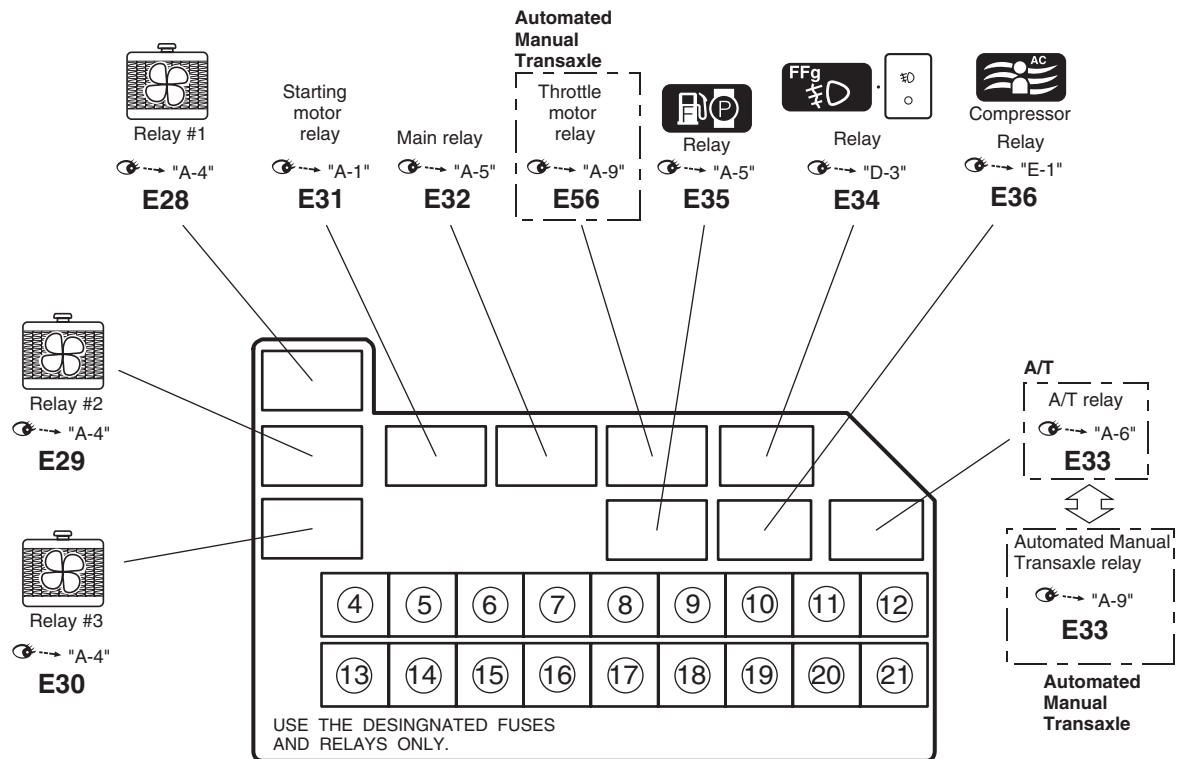
O: Rear defogger wire

No./Color	Connective position	No./Color	Connective position
O06/BLK	Rear defogger (-)		

Power Supply Diagram

Individual Circuit Fuse Box No. 1 (Petrol)

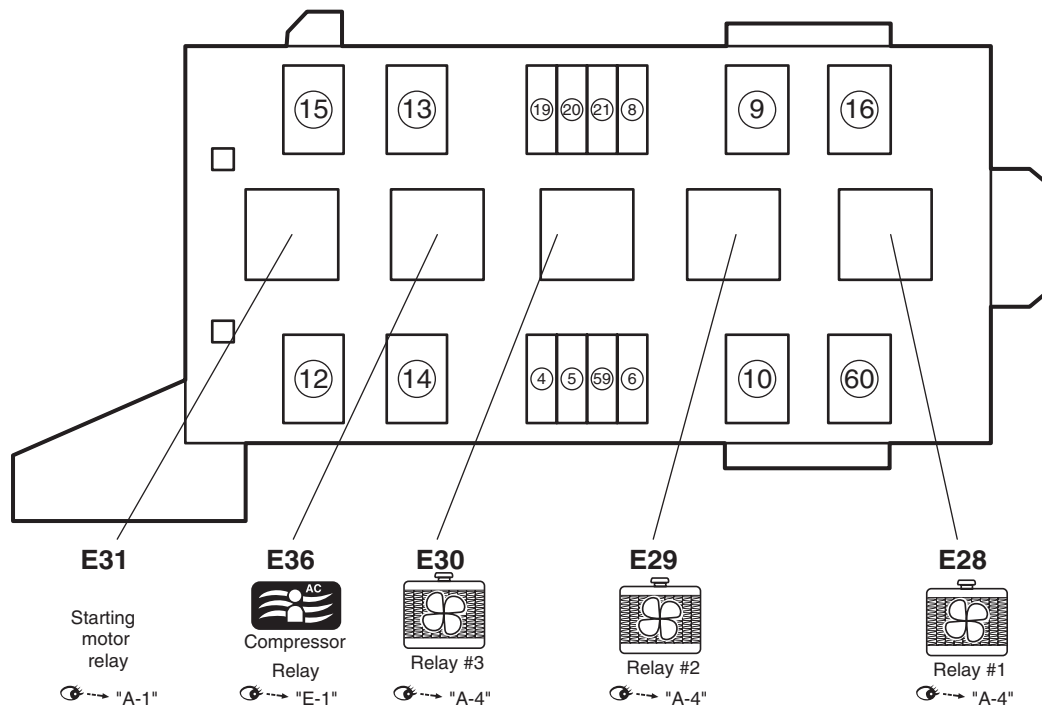
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Individual Circuit Fuse Box No. 1 (DSL)

S6RS0B910D011



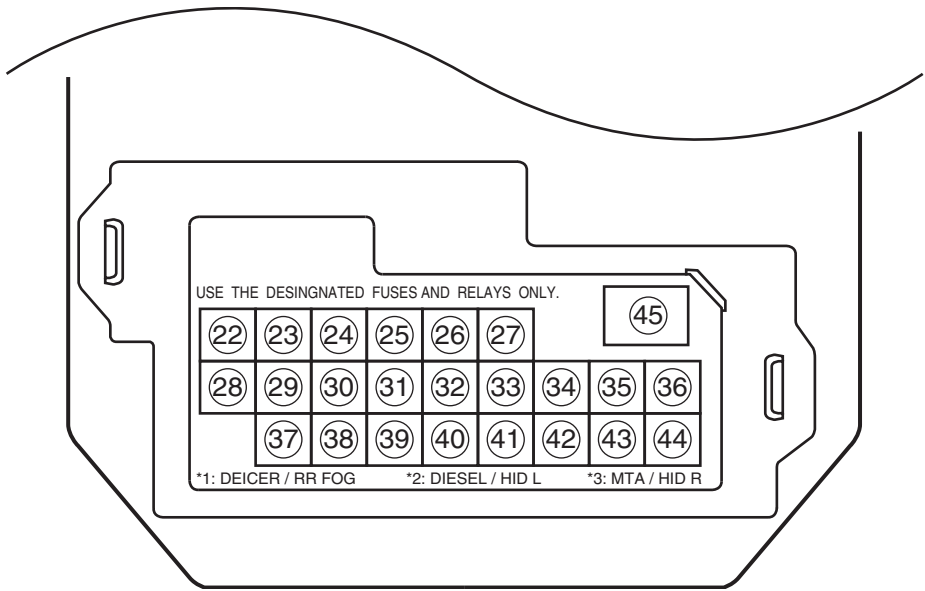
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No.	Fuse	Description on the cover	Protected circuit
④	30 A	HTR FAN	Heater relay
⑤	15 A (Petrol), 20 A (DSL)	FI	Main relay
⑥	10 A	A/C CPRSR	A/C compressor relay
⑦	15 A	AT ETM	A/T relay
⑧	15 A	STOP LAMP	Brake light switch
⑨	30 A	ABS MOT	ABS control module ESPR control module
⑩	30 A	ST MOT	Starting motor relay
⑪	50 A	MTA	Automated Manual Transaxle relay
⑫	50 A	EPS	Power steering control module
⑬	30 A	IG ACC	IG switch
⑭	30 A	RDTR FAN	Radiator fan relay #1 Radiator fan relay #2 Radiator fan relay #3
⑮	50 A	IG	IG switch
⑯	30 A	ABS SOL	ABS control module ESPR control module
⑰	BLANK	BLANK	BLANK
⑱	15 A	THR MOT	Throttle motor relay
⑲	15 A	FR FOG	Front fog light relay
⑳	15 A	H/L L	Headlight (L)
㉑	15 A	H/L R	Headlight (R)
㉓	15 A	FUEL PUMP	Fuel pump relay
⑥①	BLANK	BLANK	BLANK

“MTA” is shown on the fuse box cover for the Automated Manual Transaxle.

Individual Circuit Fuse Box No. 2 (In J/B)

S6RS0B910D005



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No.	Fuse	Description on the cover	Protected circuit
②②	BLANK	BLANK	BLANK
②③	15 A	IG COIL	ECM
			Fuel pump relay
			Generator
			Heated oxygen relay #1
			Heated oxygen relay #2
			ICM
			IG coil #1
			IG coil #2
			Glow controller
			Fuel heating relay
			Clutch switch
			A/C compressor relay
			Air flow meter
②④	10 A	BACK	Back-up light switch (M/T)
			Fresh / Recircle actuator
			Mode control switch
			A/C Panel (Auto / Manual)
			Auto A/C unit
			Transaxle range sensor (A/T)
			Headlight beam leveling actuator (L)
			Headlight beam leveling actuator (R)
			Headlight leveling switch
			KLS ECM
			PTC control module
②⑤	10 A	METER	BCM
			COMB meter
			Flasher relay
②⑥	15 A	ACC 1	BCM
			Power mirror
②⑦	15 A	ACC 2	Cigar lighter
			Audio
			Multi information display
			KLS ECM
②⑧	15 A	WIPER	COMB switch
			Rear washer motor
			Rear wiper motor
			Rear wiper relay
			Windshield washer motor
			Windshield wiper motor
			DRL controller
②⑨	10 A	IG1 SIG	A/T relay (A/T)
			Power steering control module
			Automated Manual Transaxle control module
			Brake light switch
③⑩	15 A	A/BAG	A/B SDM
③①	10 A	ABS	ABS control module
			ESP ^R control module
			Steering angle sensor
③②	10 A	TAIL	COMB switch
③③	BLANK	BLANK	BLANK
③④	20 A	D/L	BCM
③⑤	10 A	(*2 DIESEL / HID L)	ECM
			ICM
③⑥	10 A	ST SIG	Starting motor relay
			Neutral switch
③⑦	15 A	SEAT HTR	Seat heater switch (Driver side)
			Seat heater switch (Passenger side)
③⑧	10 A	IG2 SIG	Heater relay

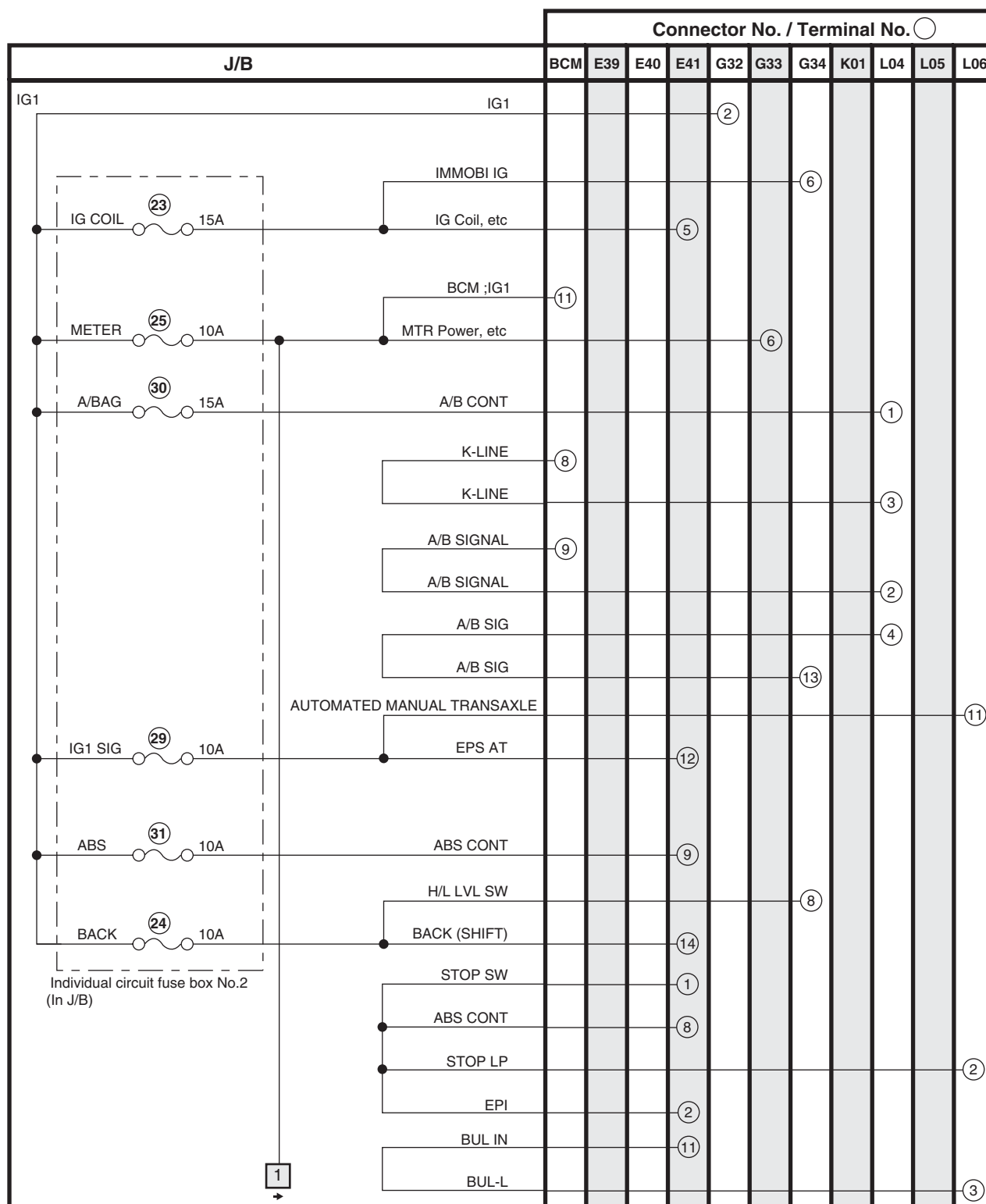
9A-34 Wiring Systems:

No.	Fuse	Description on the cover	Protected circuit
③⑨	15 A	(*1 DEICER / RR FOG)	Rear fog light switch
④⑩	15 A	RADIO	Audio
			BCM
			COMB meter
			DLC
			ECM
			Interior light
			Luggage compartment light
			Main switch (Key switch)
			Multi information display
			TCM
			KLS ECM
			Steering angle sensor
④①	20 A	RR DEF	Rear defogger relay
④②	15 A	HAZ-HORN	Horn relay
			Flasher relay
④③	10 A	(*3 MTA / HID R)	Automated Manual Transaxle control module
			Automated Manual Transaxle shift lever switch
④④	20 A	P/WT	BLANK
④⑤	30 A	P/W	Front power window main switch
			Front power window sub switch
			Rear power window sub switch (R)
			Rear power window sub switch (L)

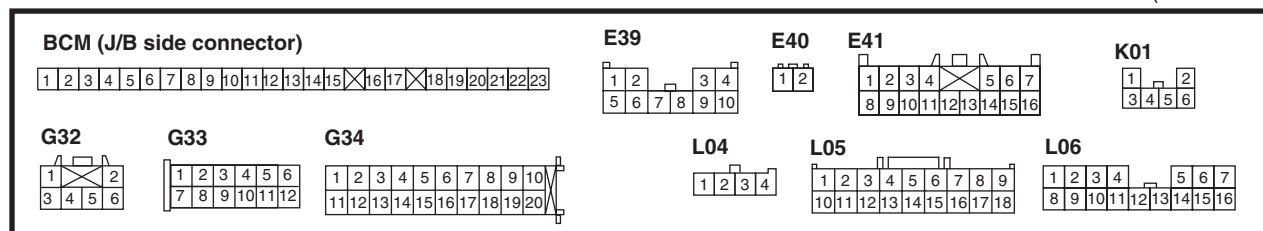
“MTA” is shown on the fuse box cover for the Automated Manual Transaxle.

Junction Block Inner Circuit (Detail)

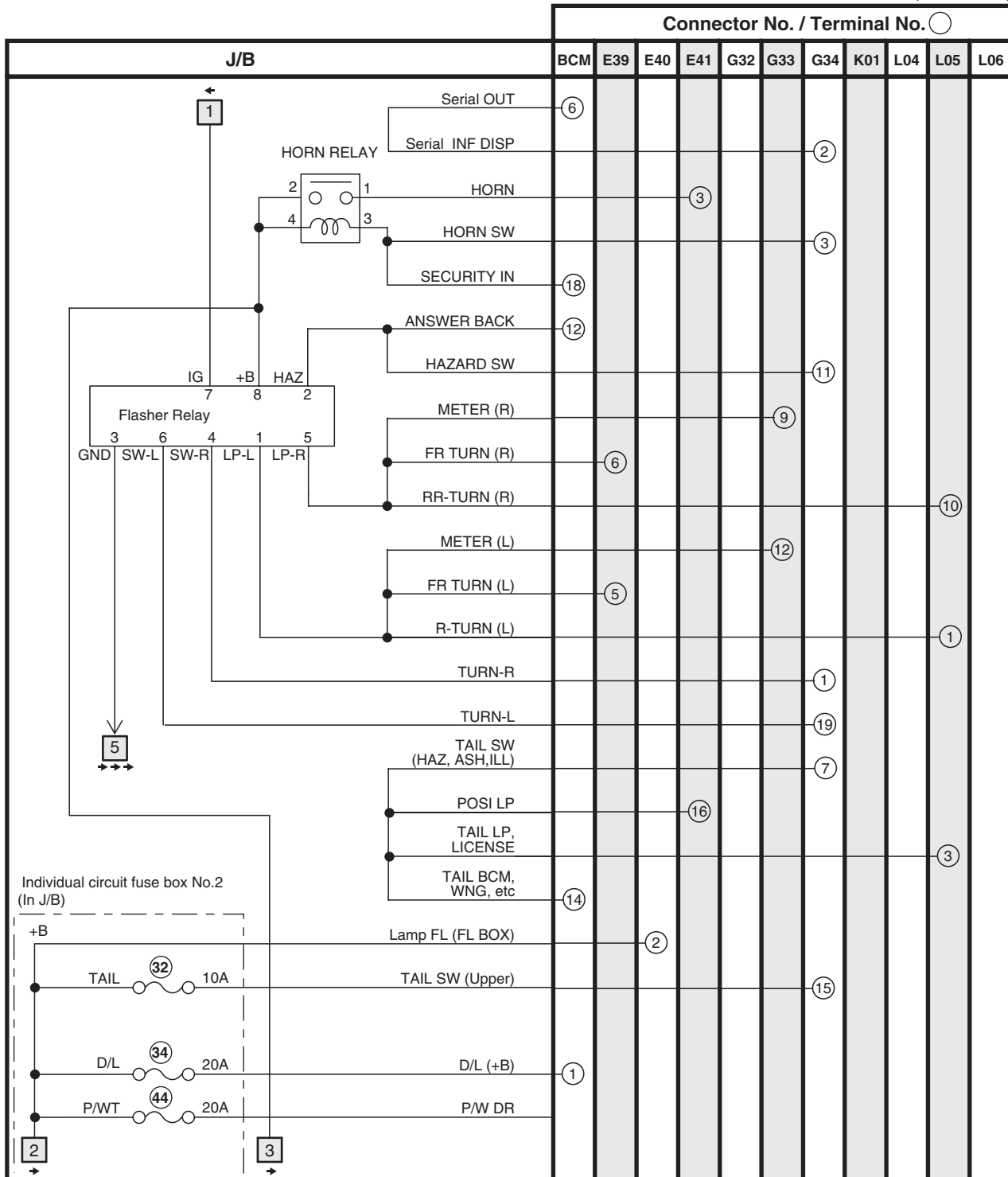
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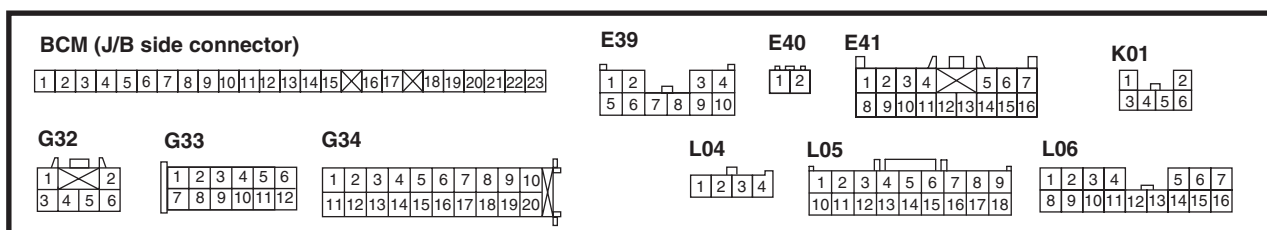
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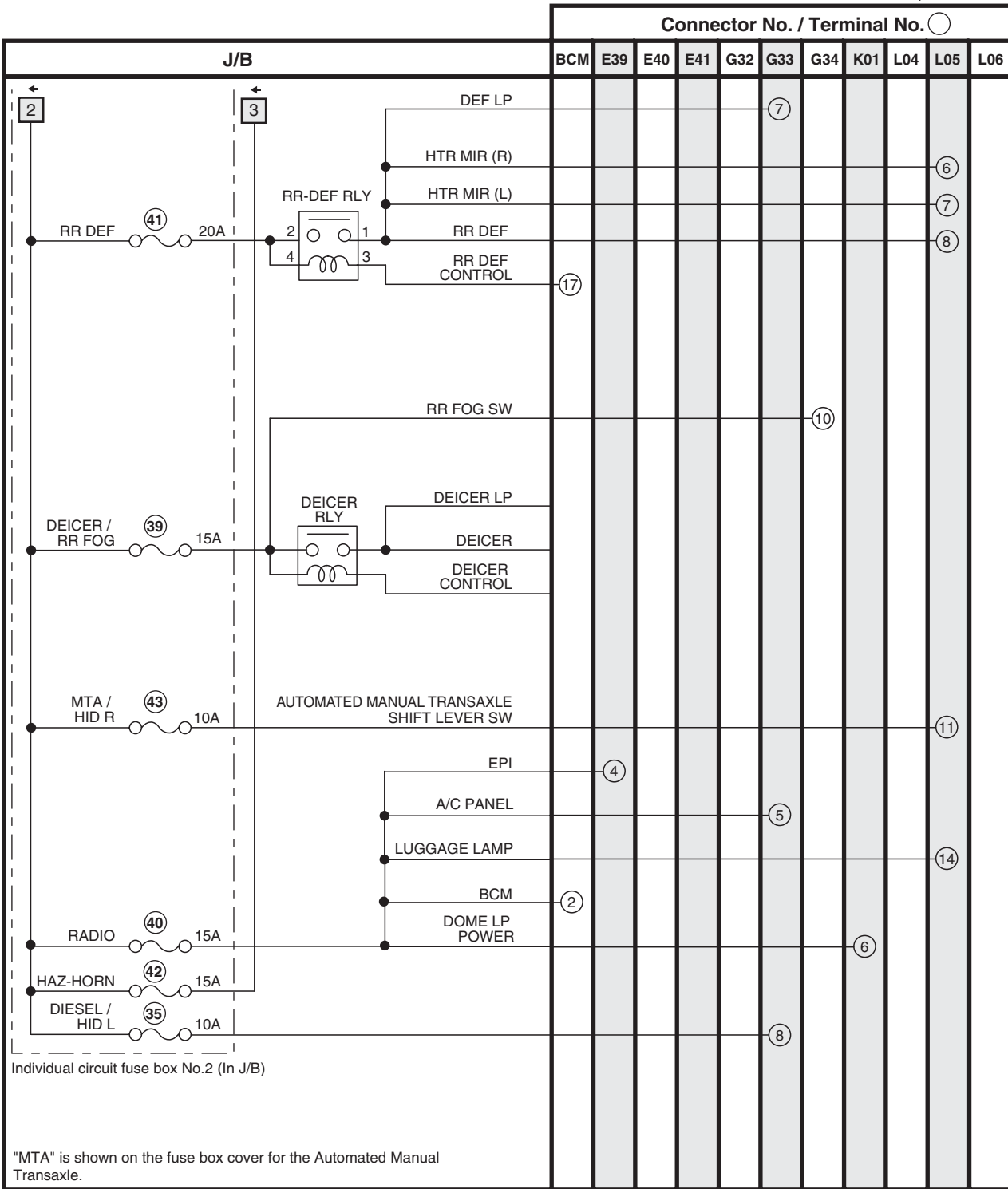
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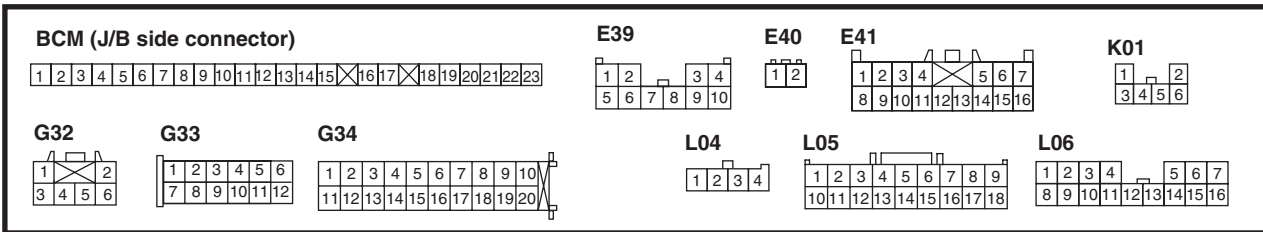
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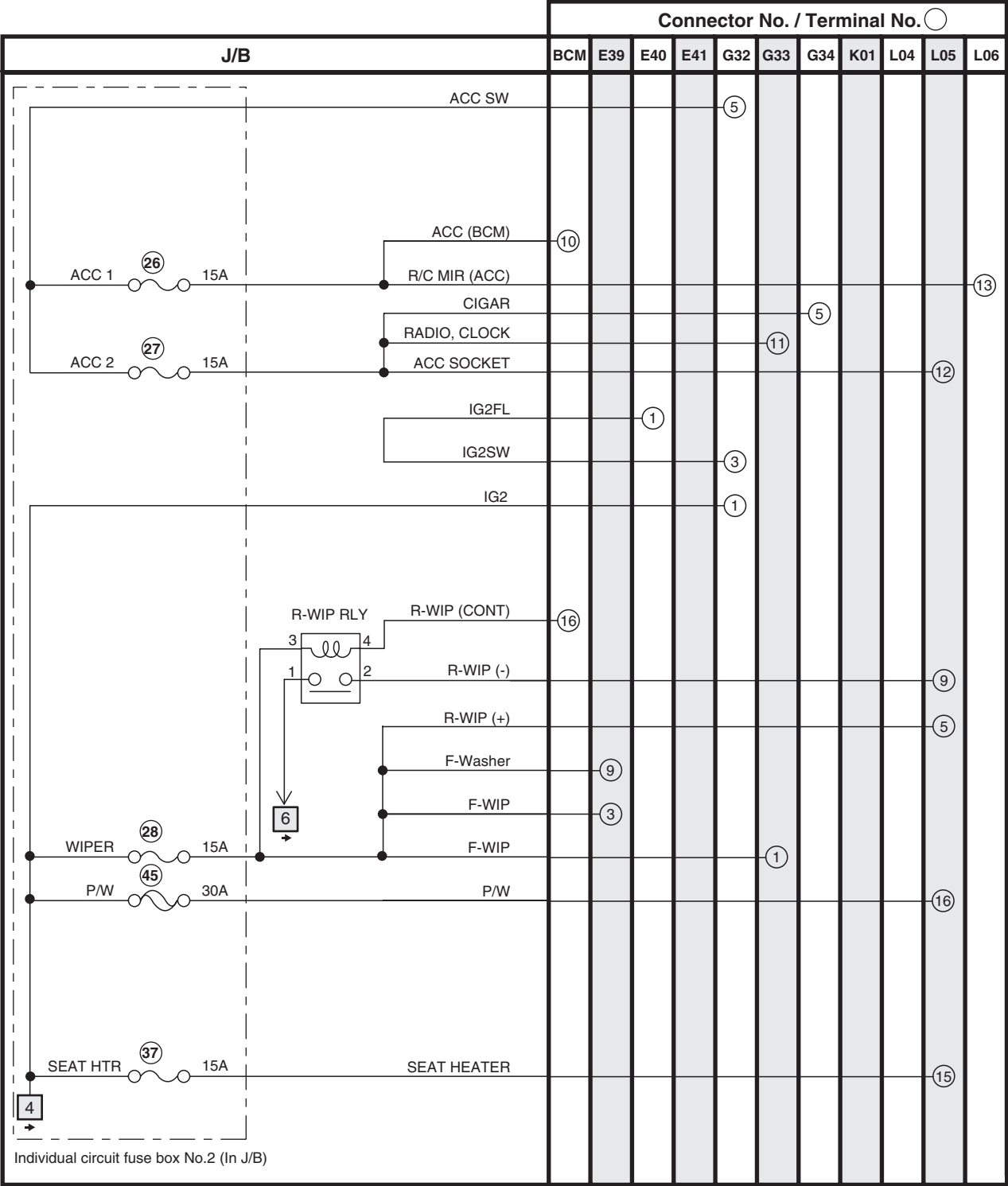
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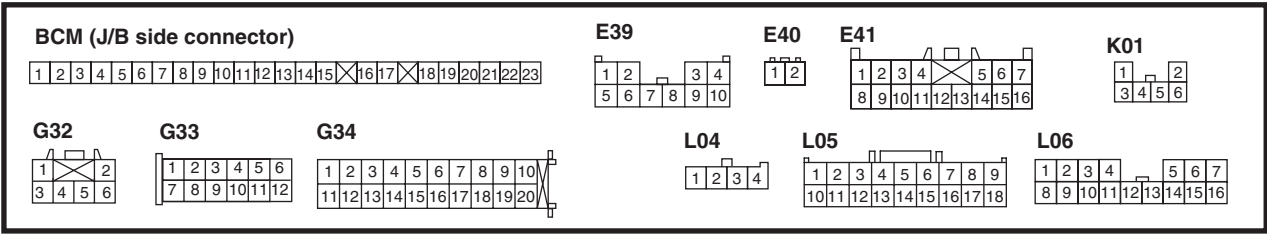
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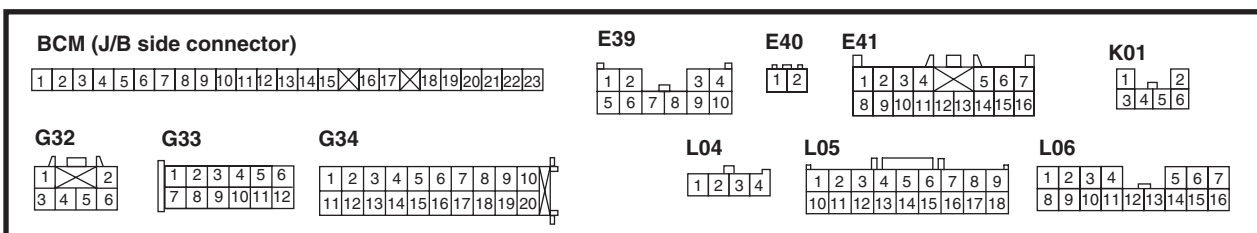
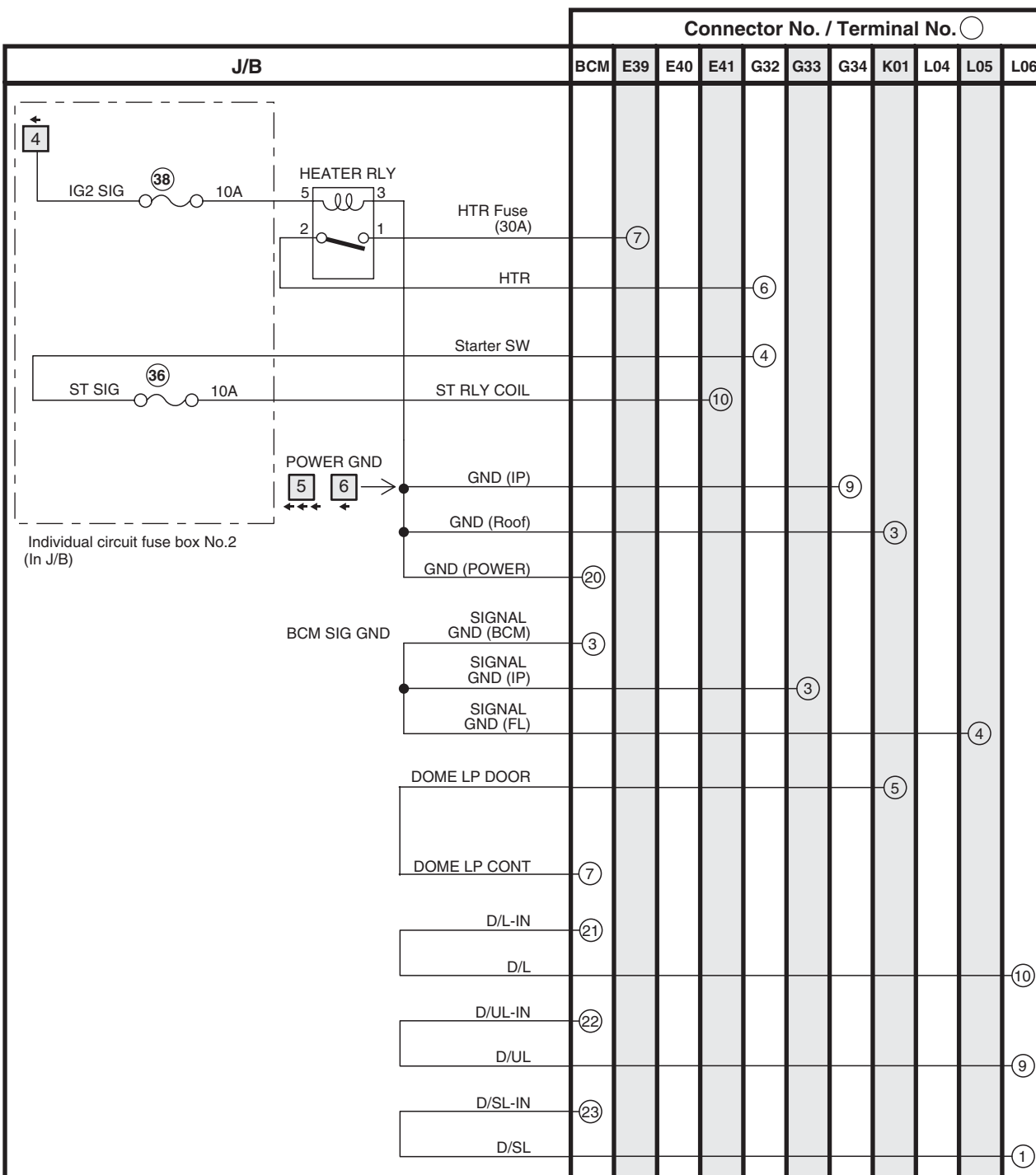
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System Circuit Diagram

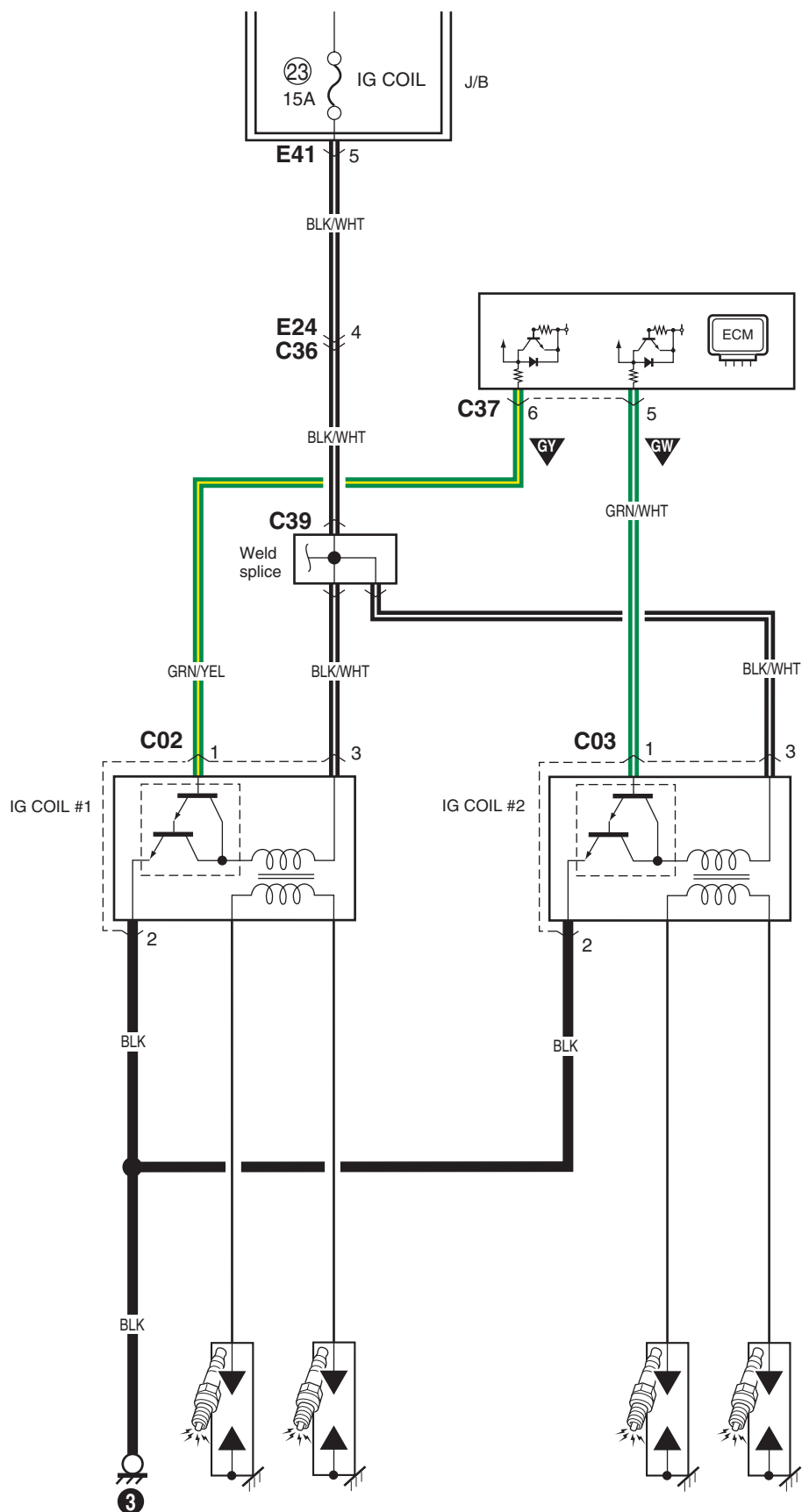
System Circuit Diagram

S6RS0B910E001

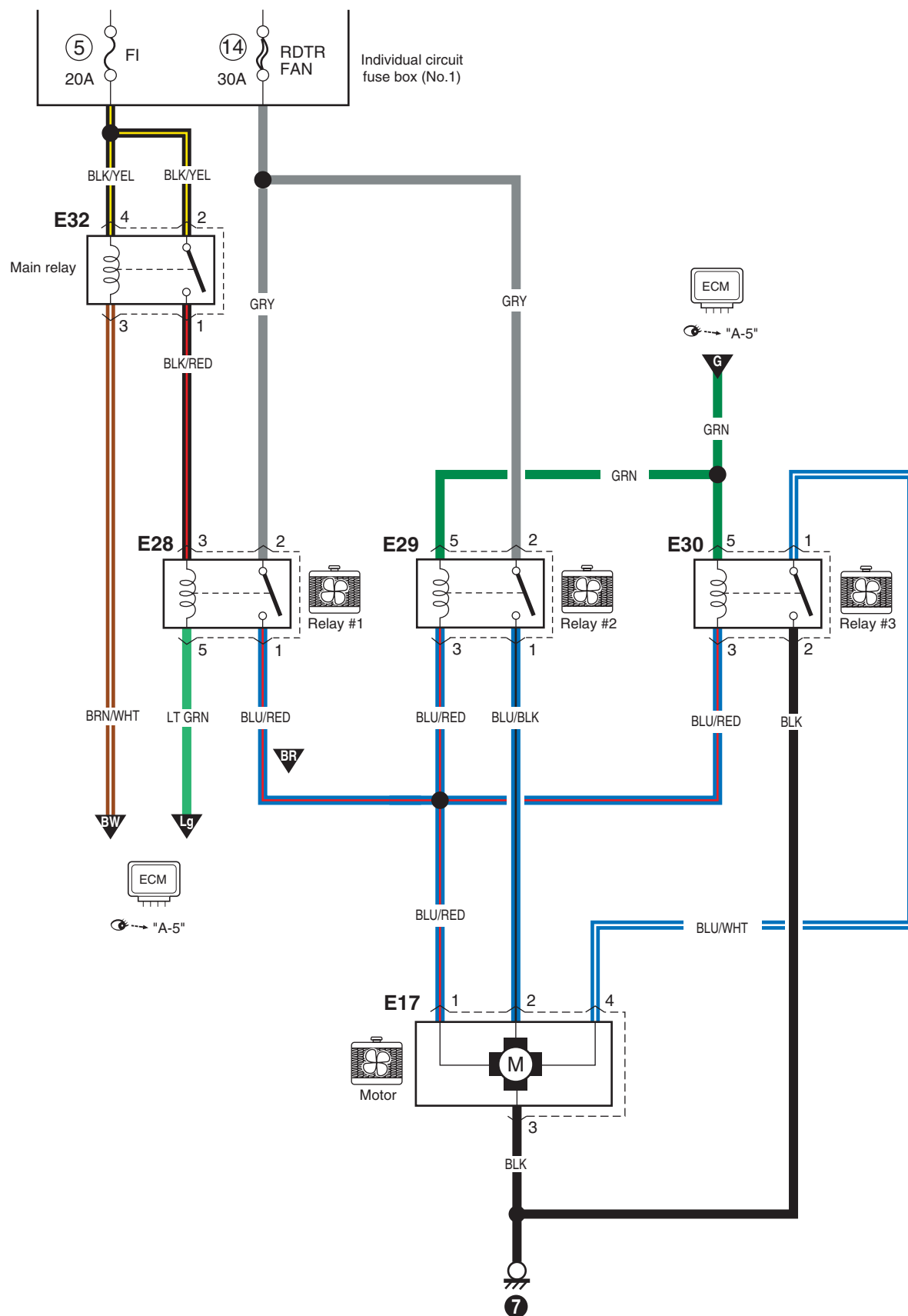
Refer to "A-1 Cranking System Circuit Diagram (Petrol) in related manual".
Refer to "A-1 Cranking System Circuit Diagram (DSL)".
Refer to "A-2 Charging System Circuit Diagram (Petrol)".
Refer to "A-2 Charging System Circuit Diagram (DSL) in related manual".
Refer to "A-3 Ignition System Circuit Diagram (Petrol)".
Refer to "A-4 Cooling System Circuit Diagram (Petrol)".
Refer to "A-4 Cooling System Circuit Diagram (DSL)".
Refer to "A-5 Engine and A/C Control System Circuit Diagram (Petrol)".
Refer to "A-5 Engine and A/C Control System (DSL)".
Refer to "A-6 A/T Control System Circuit Diagram".
Refer to "A-7 Immobilizer System Circuit Diagram (Petrol)".
Refer to "A-7 Immobilizer System Circuit Diagram (DSL)".
Refer to "A-8 Body Control System Circuit Diagram".
Refer to "A-9 Automated Manual Transaxle Control System Circuit Diagram (Petrol)".
Refer to "B-1 Windshield Wiper and Washer Circuit Diagram".
Refer to "B-2 Rear Wiper and Washer Circuit Diagram in related manual".
Refer to "B-3 Rear Defogger Circuit Diagram in related manual".
Refer to "B-4 Power Window Circuit Diagram in related manual".
Refer to "B-5 Power Door Lock Circuit Diagram".
Refer to "B-6 Power Mirror Circuit Diagram in related manual".
Refer to "B-7 Horn Circuit Diagram in related manual".
Refer to "B-8 Seat Heater Circuit Diagram in related manual".
Refer to "B-9 Keyless Start System Circuit Diagram".
Refer to "C-1 Combination Meter Circuit Diagram (Meter)".
Refer to "C-2 Combination Meter Circuit Diagram (Indicator)".
Refer to "C-3 Combination Meter Circuit Diagram (Warning Light)".
Refer to "D-1 Headlight System Circuit Diagram".
Refer to "D-2 Position, Tail and Licence Plate Light System Circuit Diagram".
Refer to "D-3 Front Fog Light System Circuit Diagram in related manual".
Refer to "D-4 Illumination Light System Circuit Diagram".
Refer to "D-5 Interior Light System Circuit Diagram in related manual".
Refer to "D-6 Turn Signal and Hazard Warning Light System Circuit Diagram in related manual".
Refer to "D-7 Brake Light System Circuit Diagram".
Refer to "D-8 Back-Up Light System Circuit Diagram".
Refer to "D-9 Headlight Beam Leveling System Circuit Diagram".
Refer to "D-10 Rear Fog Light Circuit Diagram".
Refer to "E-1 Heater System Circuit Diagram".
Refer to "E-2 Auto A/C System Circuit Diagram".
Refer to "E-3 PTC Heater Circuit Diagram (DSL)".
Refer to "F-1 Air-Bag System Circuit Diagram in related manual".
Refer to "F-2 Anti-Lock Brake System Circuit Diagram".
Refer to "F-3 Electronic Stability Program System Circuit Diagram".
Refer to "F-4 Power Steering System Circuit Diagram".
Refer to "G-1 Audio System Circuit Diagram".
Refer to "G-2 Multi Information Display / Accessory Socket System Circuit Diagram".
Refer to "G-4 Navigation System Circuit Diagram in related manual".

A-3 Ignition System Circuit Diagram (Petrol)

S6RS0B910E004

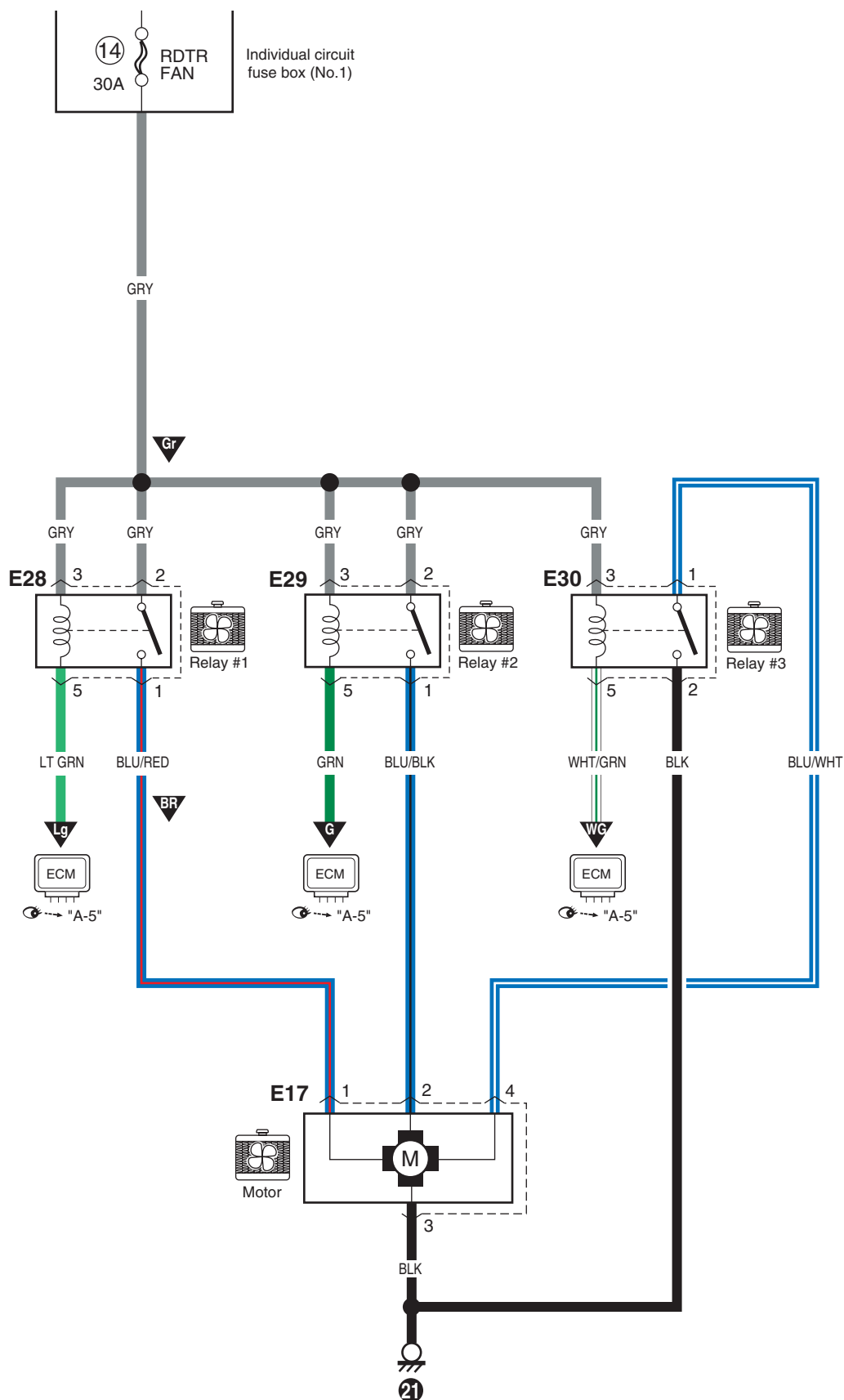


I6RS0B910924-01



A-4 Cooling System Circuit Diagram (DSL)

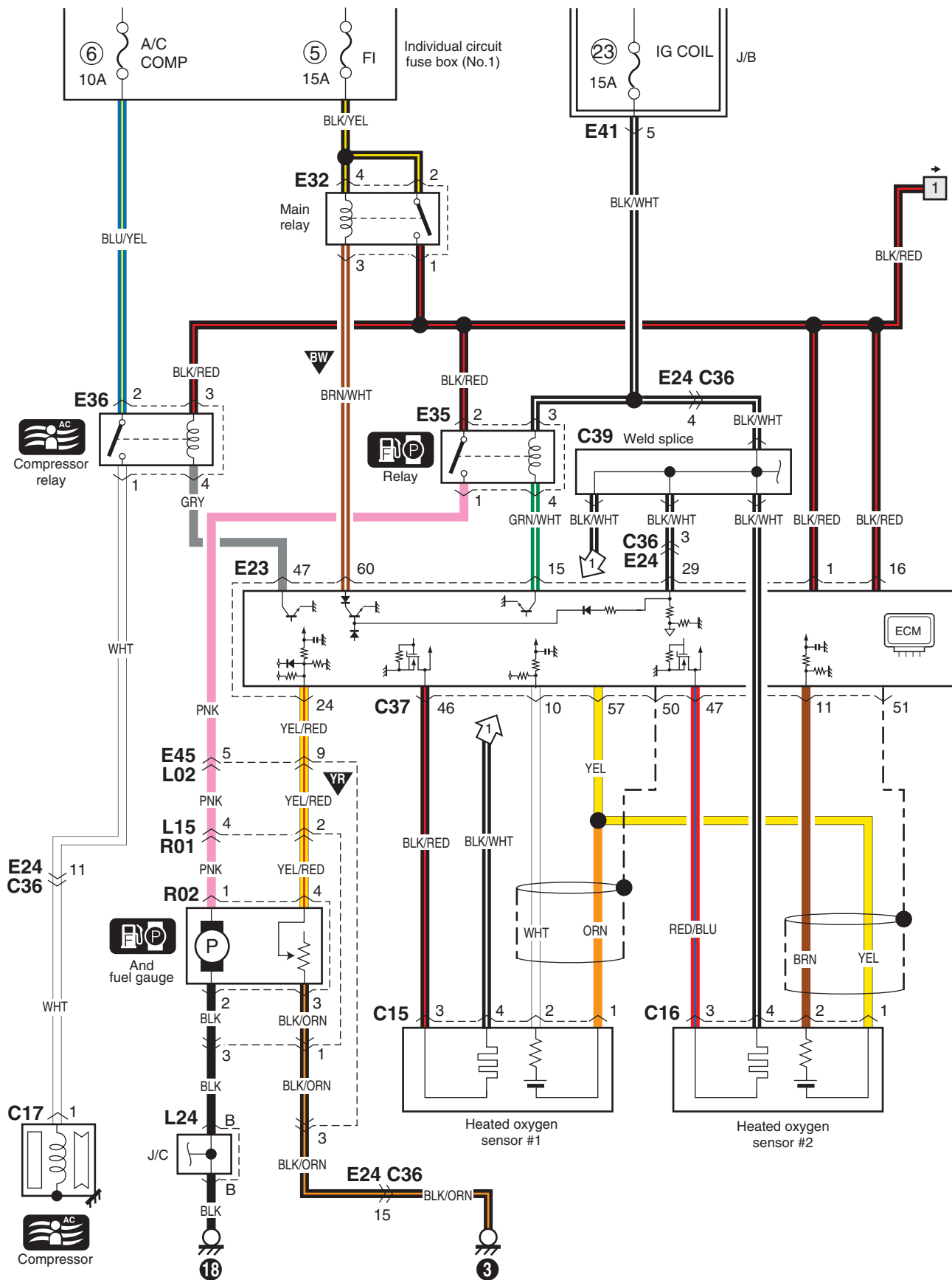
S6RS0B910E042



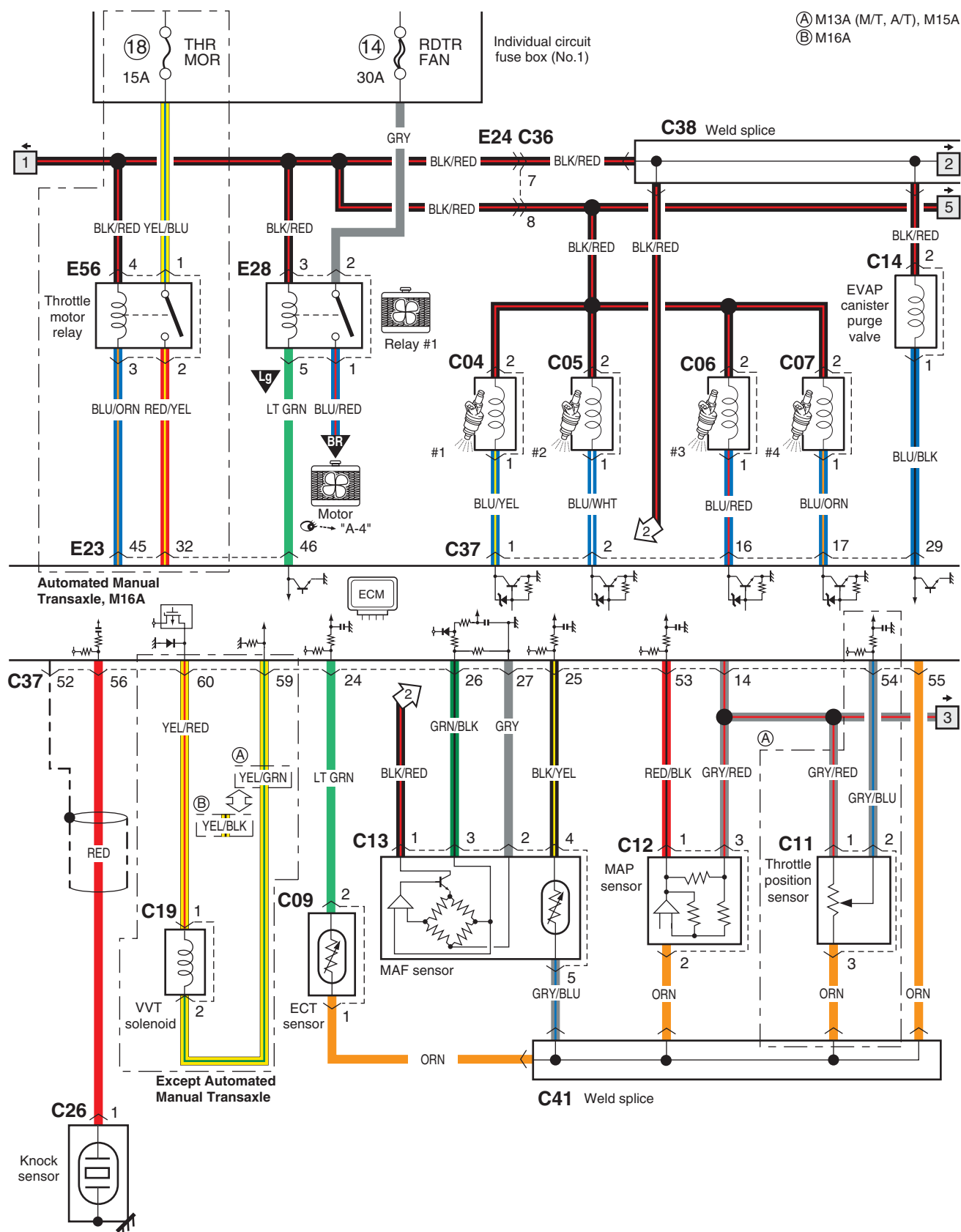
I6RS0B910926-01

A-5 Engine and A/C Control System Circuit Diagram (Petrol)

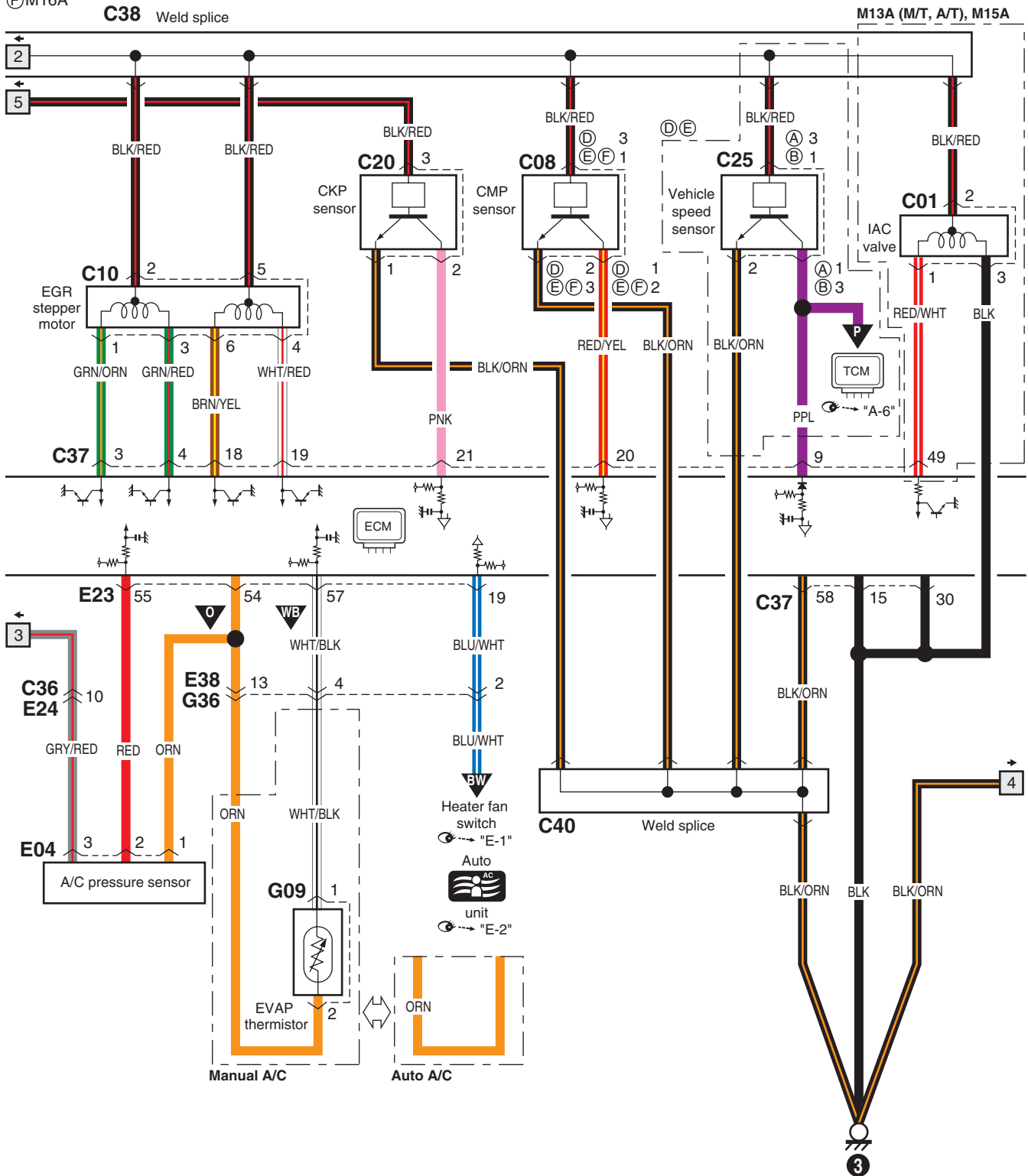
S6RS0B910E006

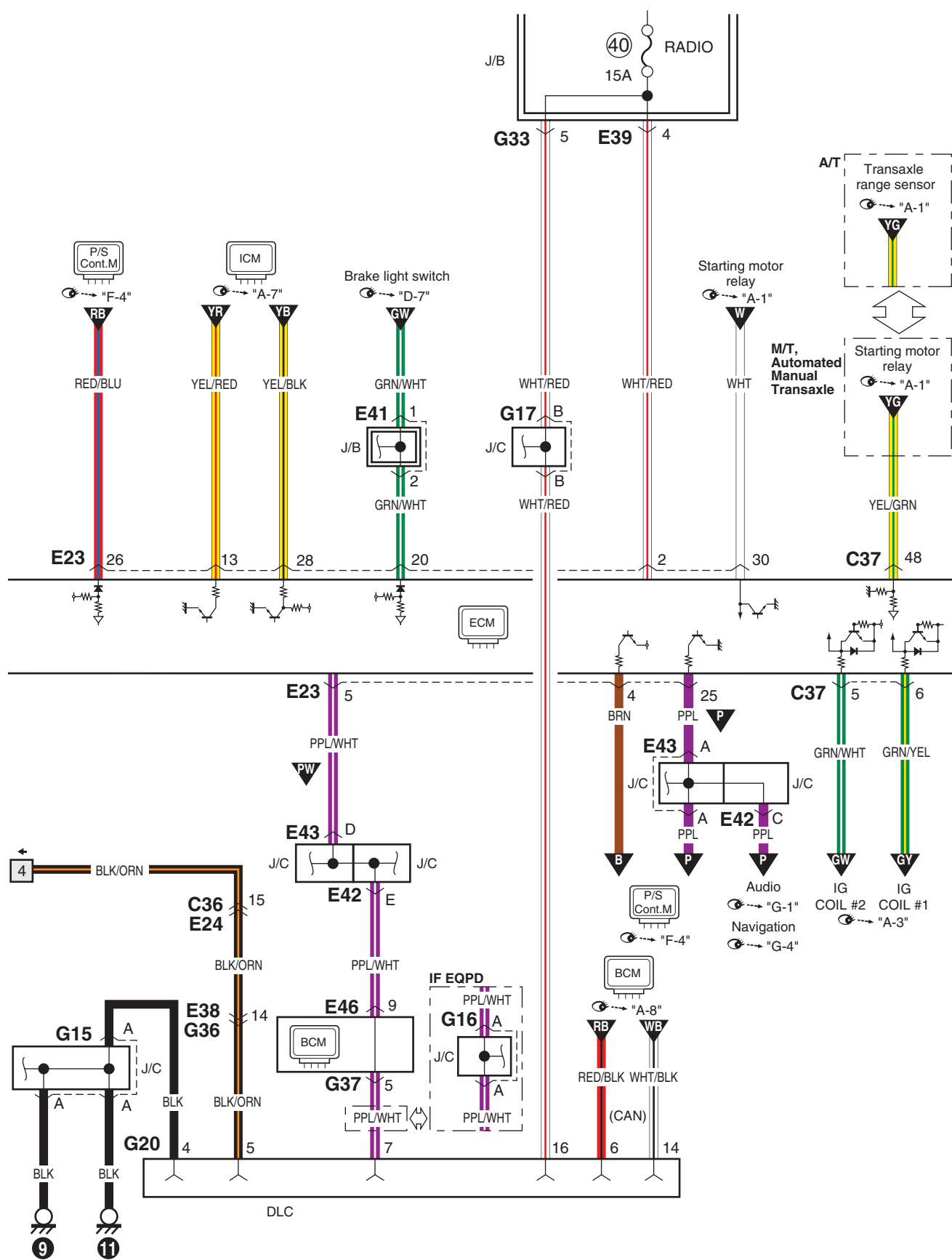


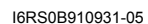
I6RS0B910927-02



- Ⓐ M/T
- Ⓑ A/T
- Ⓒ Automated Manual Transaxle
- Ⓓ M13A
- Ⓔ M15A
- Ⓕ M16A

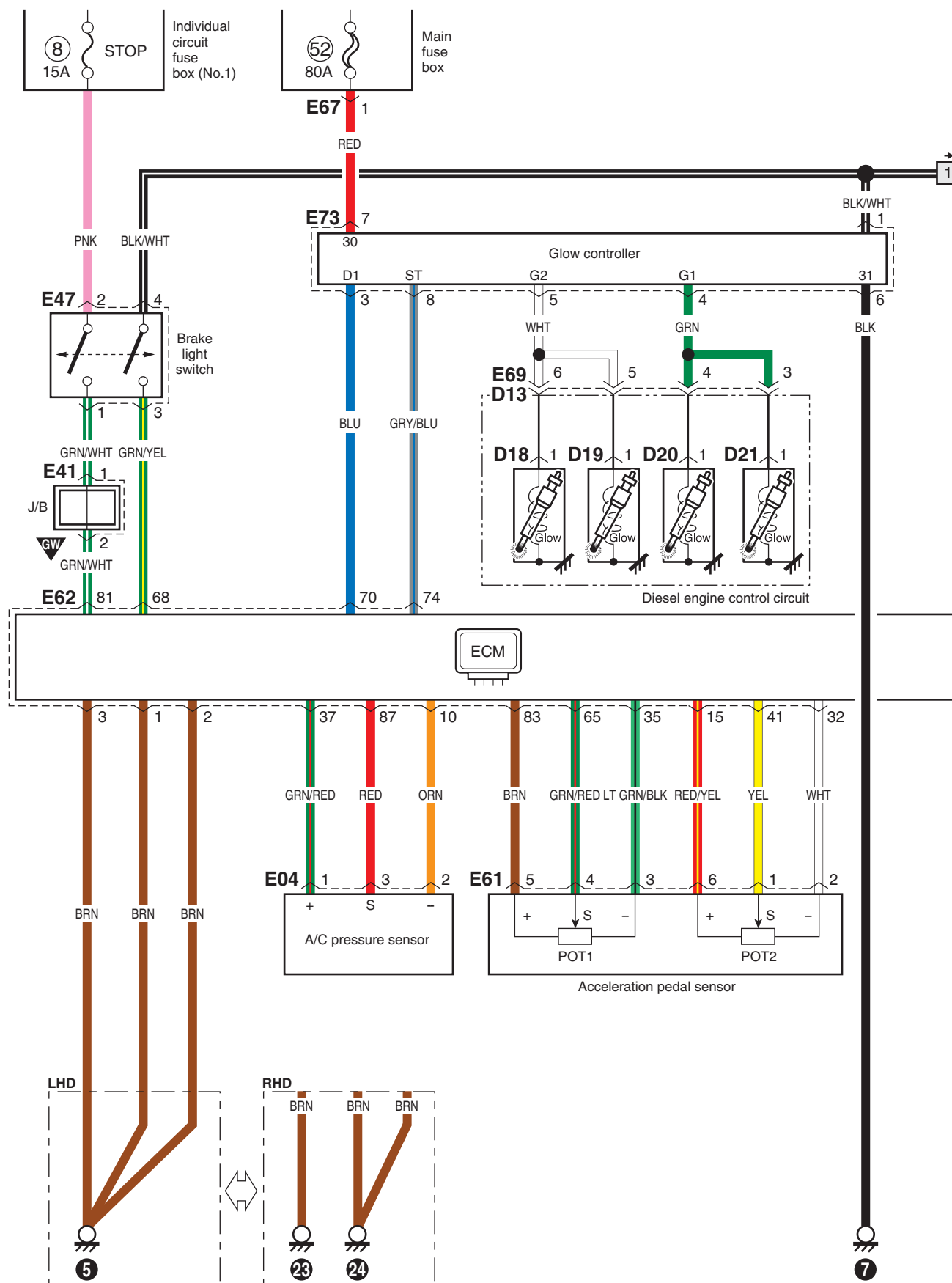




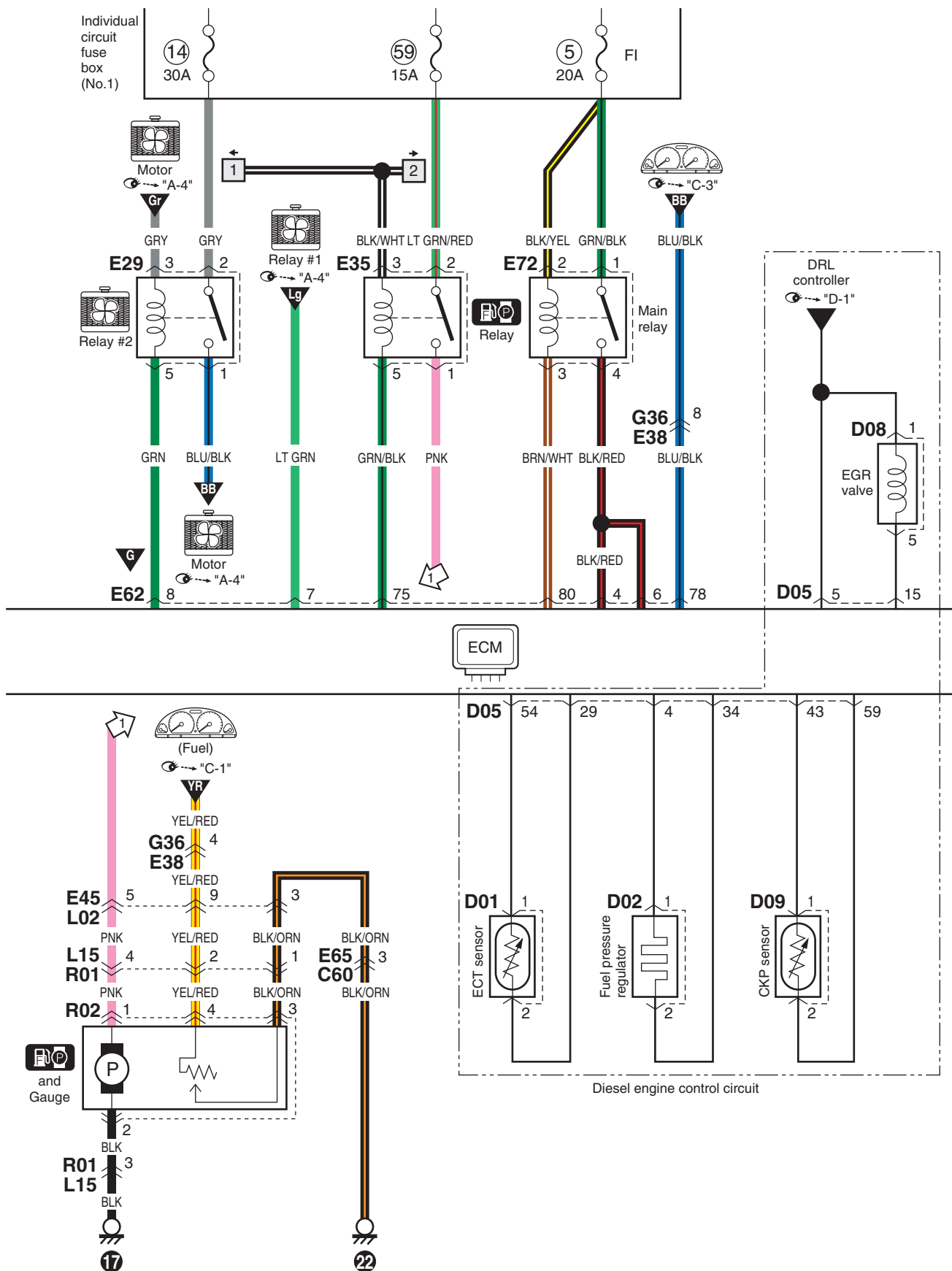


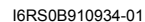
A-5 Engine and A/C Control System (DSL)

S6RS0B910E043

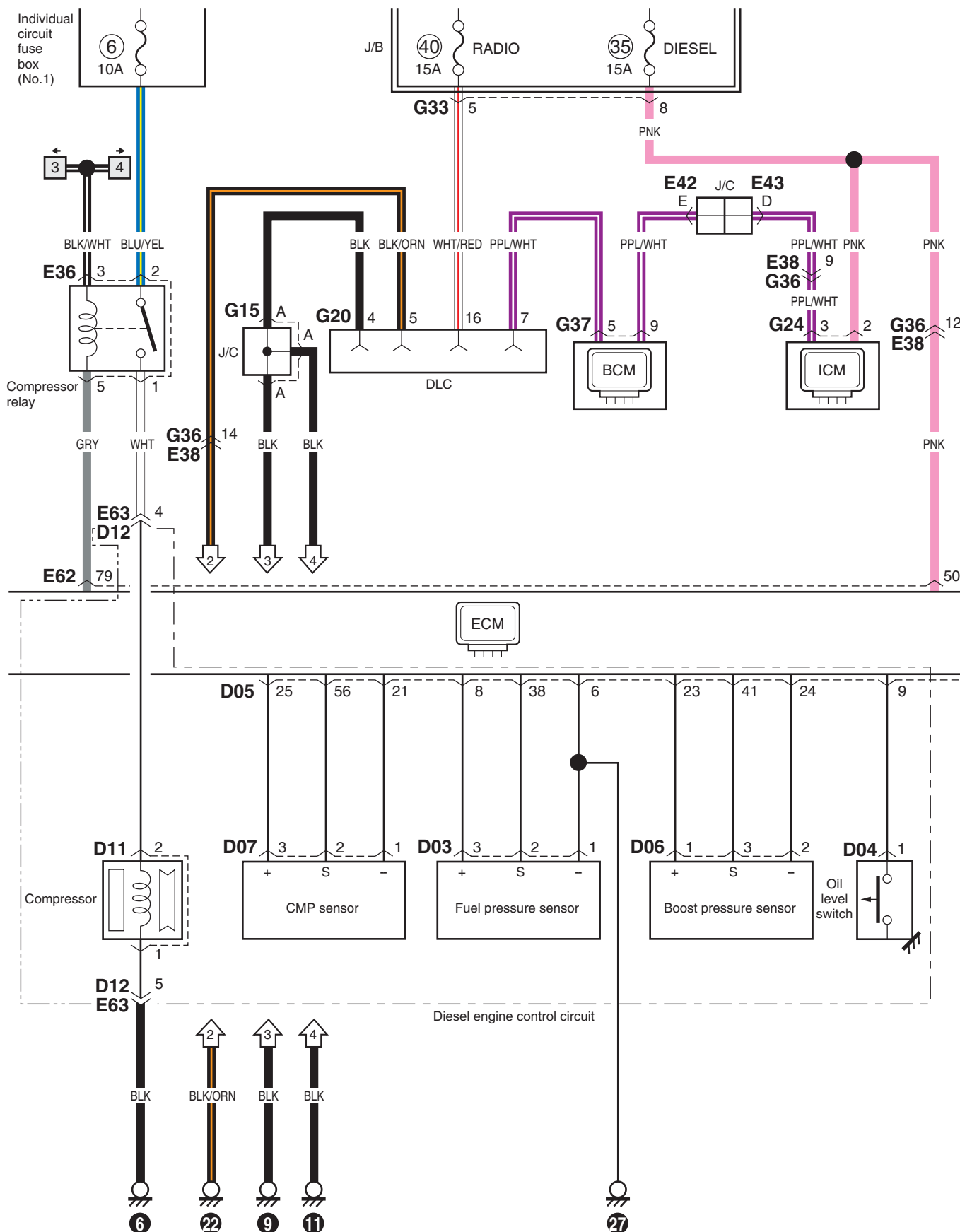


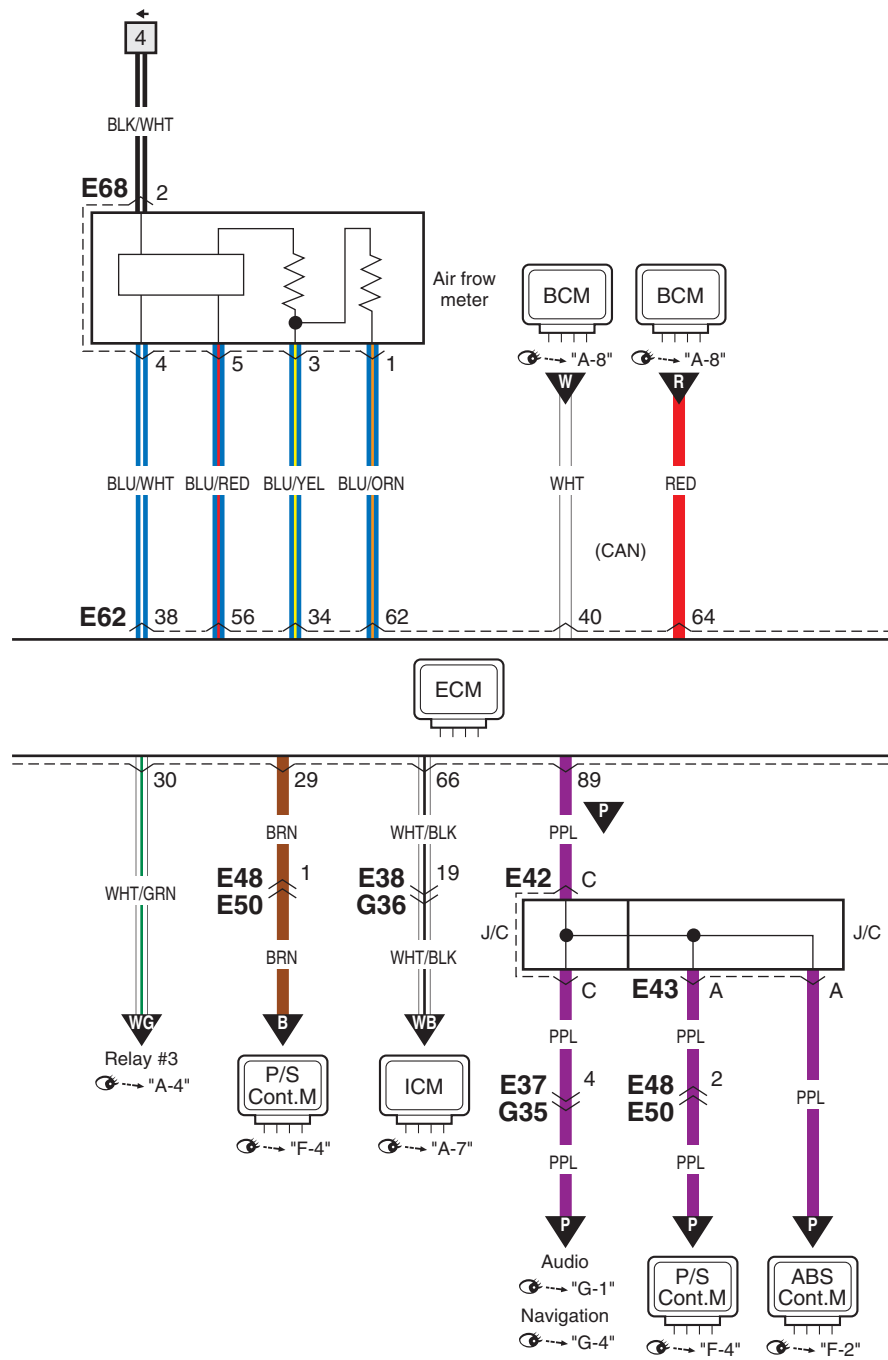
I6RS0B910932-03





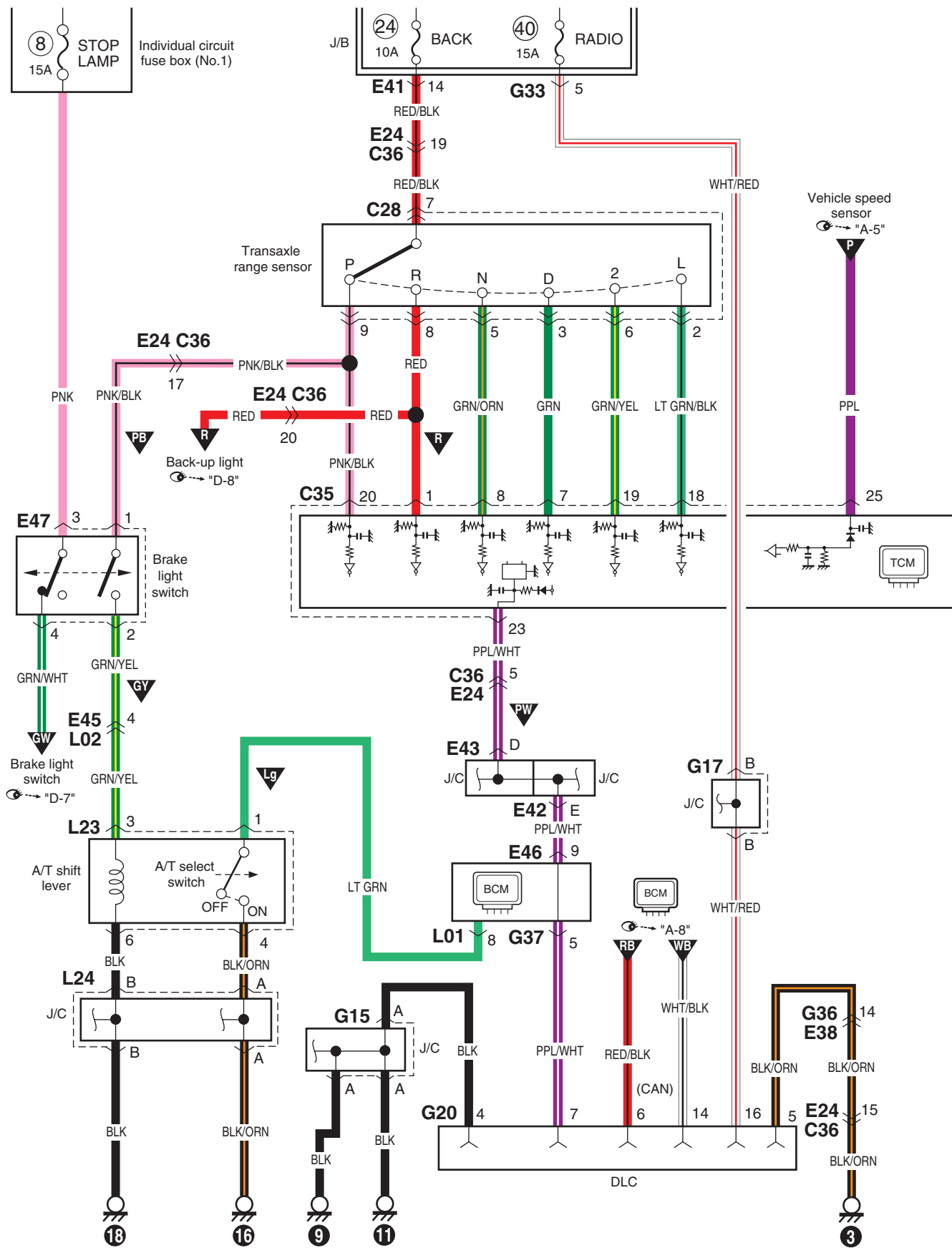
9A-54 Wiring Systems:



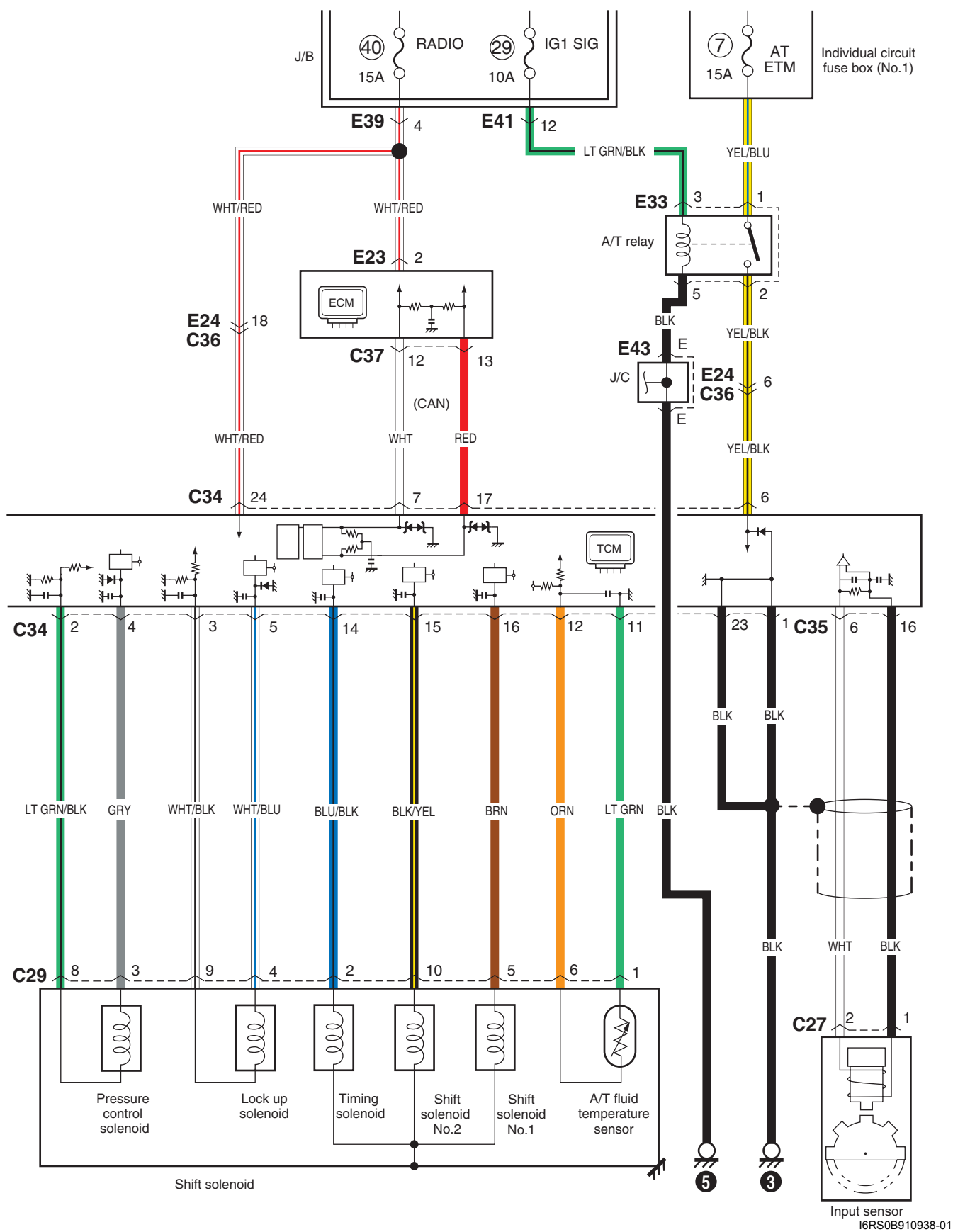


A-6 A/T Control System Circuit Diagram

S6RS0B910E007

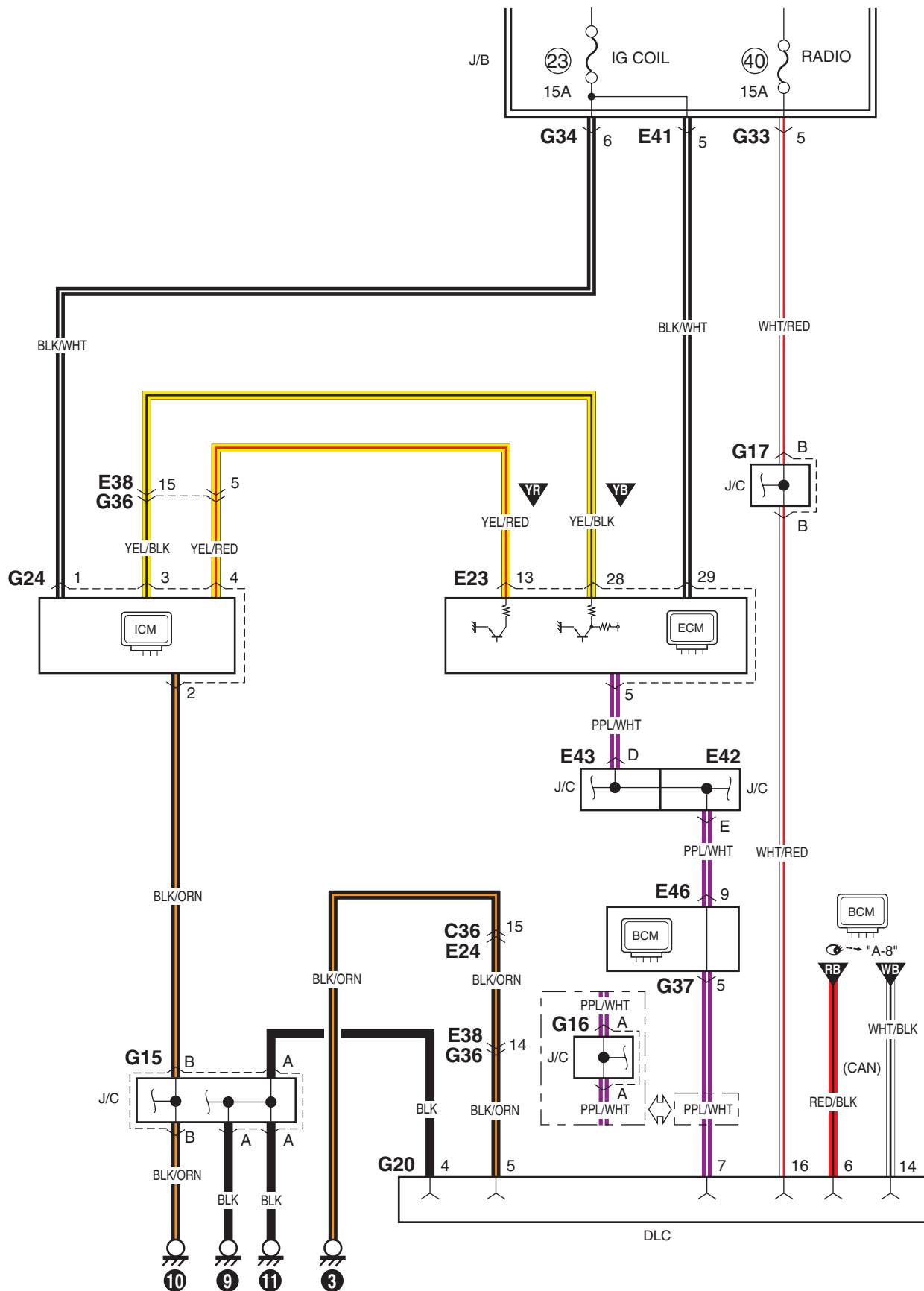


16RS0B910937-01



A-7 Immobilizer System Circuit Diagram (Petrol)

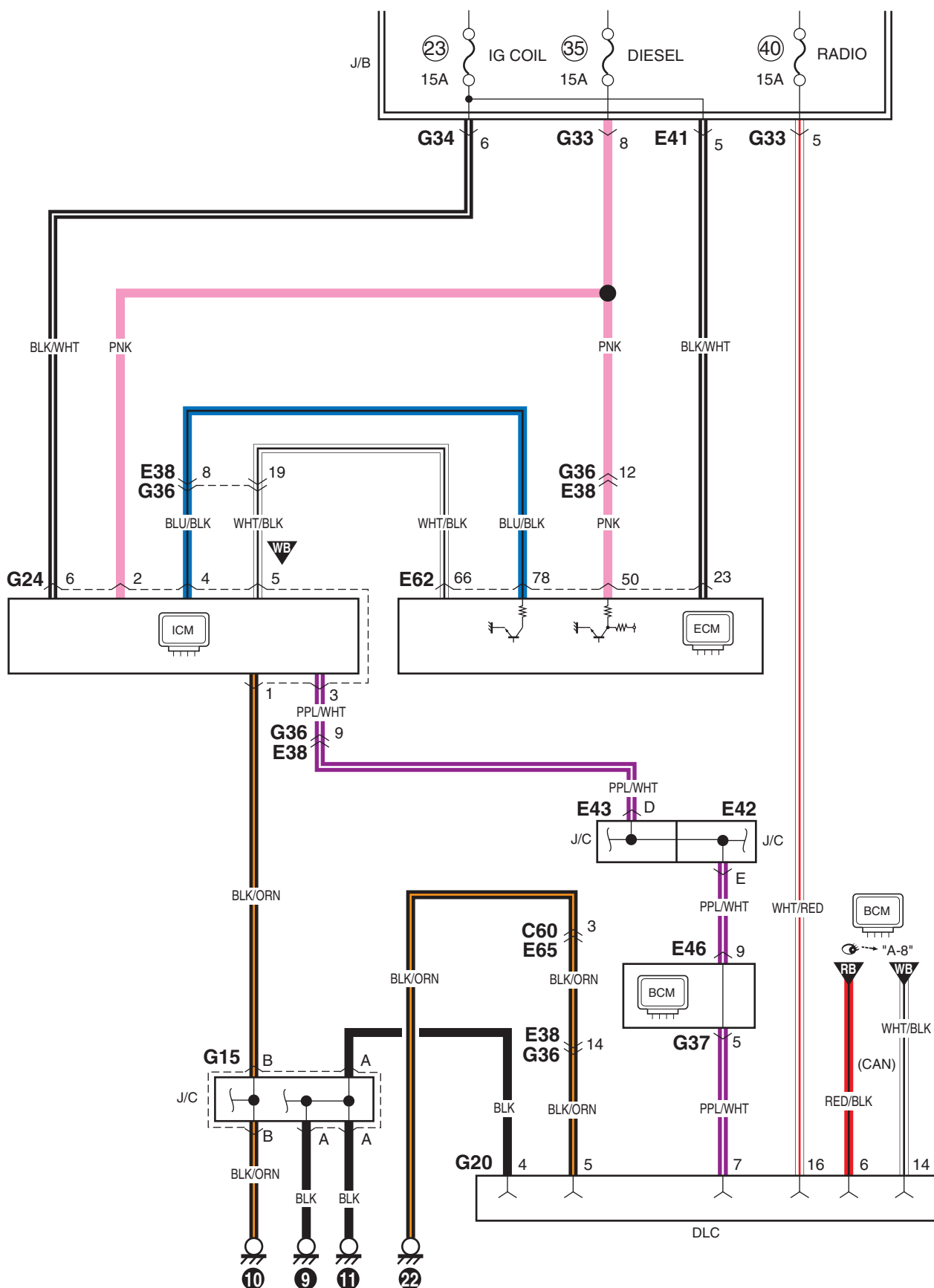
S6RS0B910E008



I6RS0B910939-01

A-7 Immobilizer System Circuit Diagram (DSL)

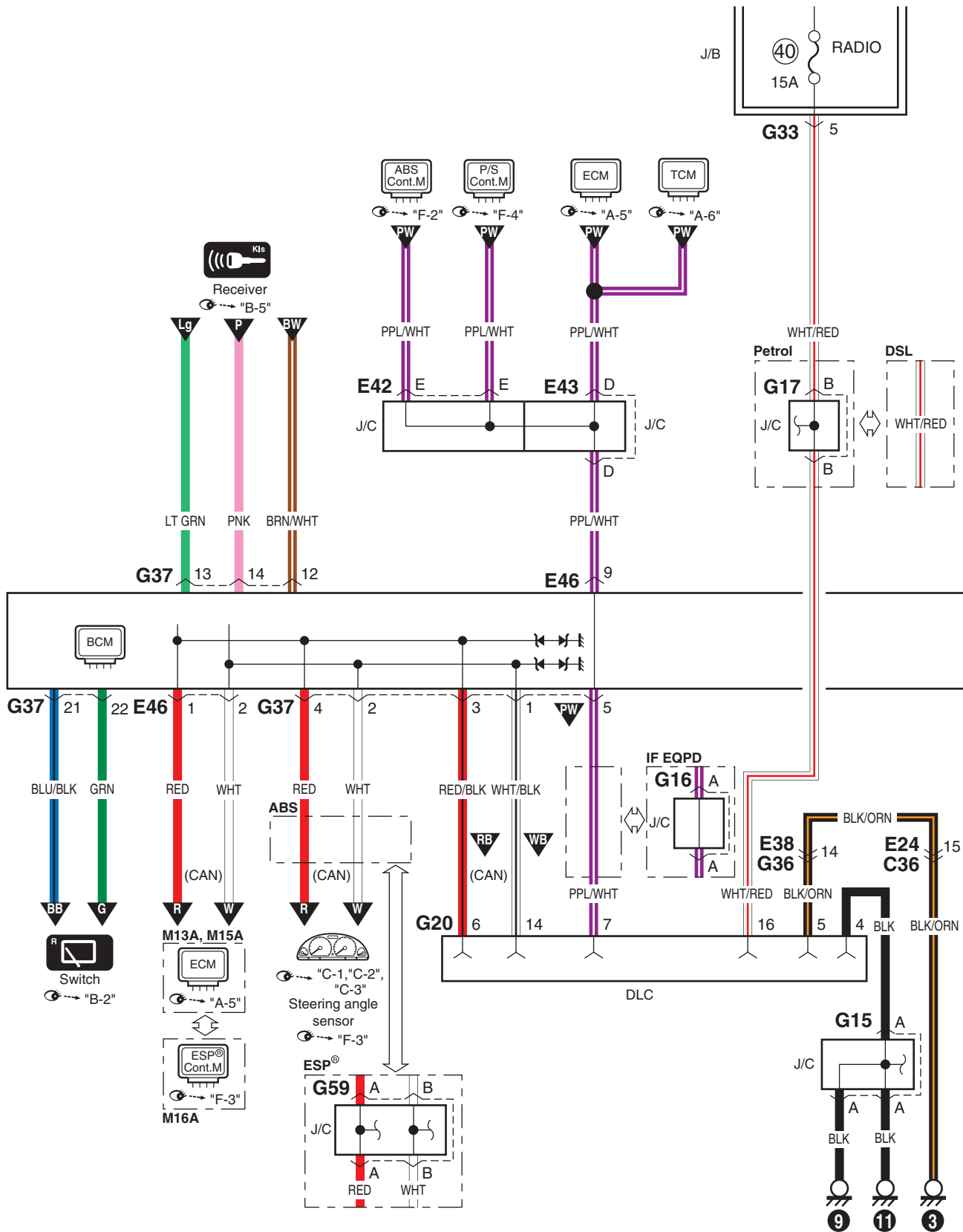
S6RS0B910E044



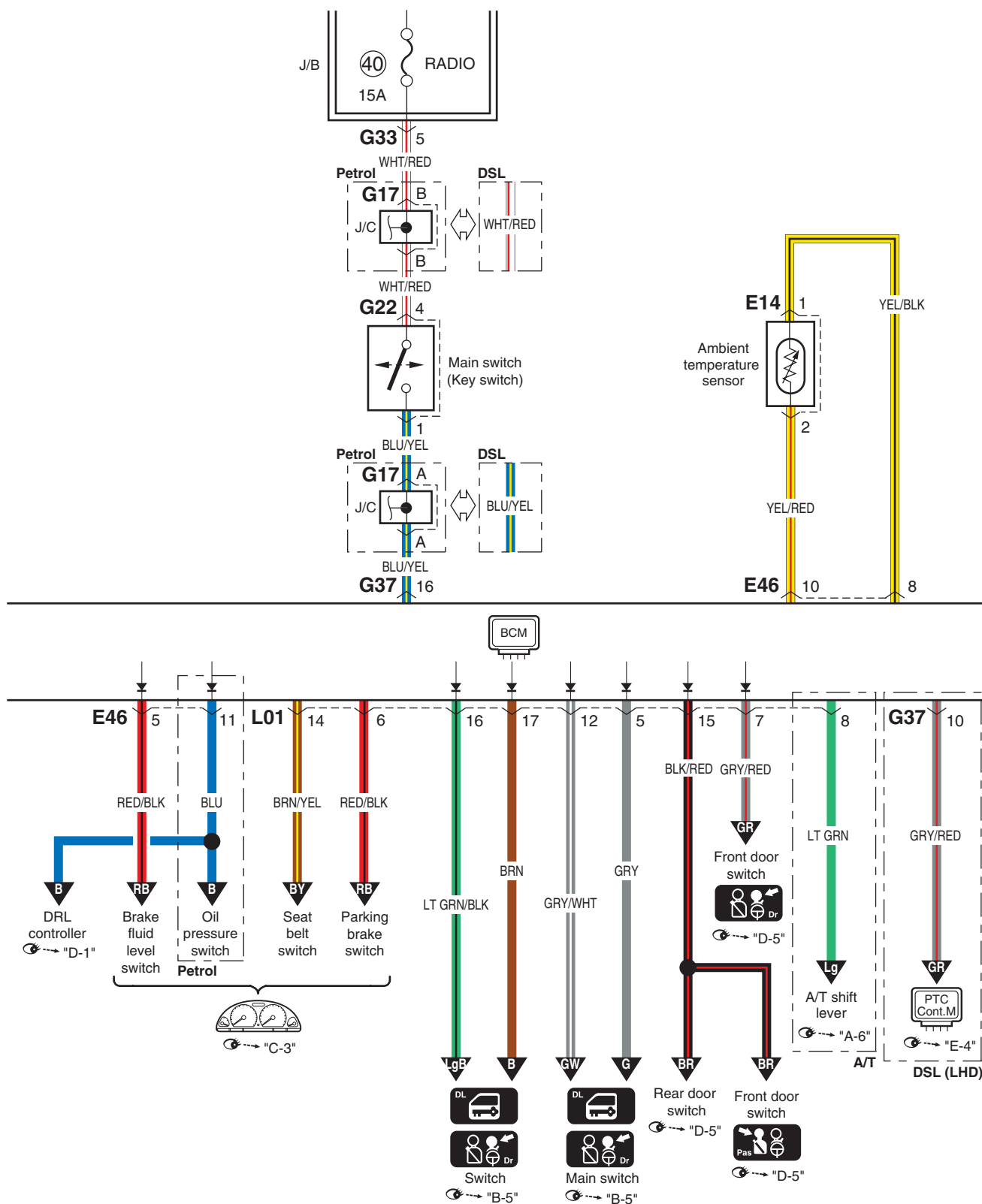
I6RS0B910940-01

A-8 Body Control System Circuit Diagram

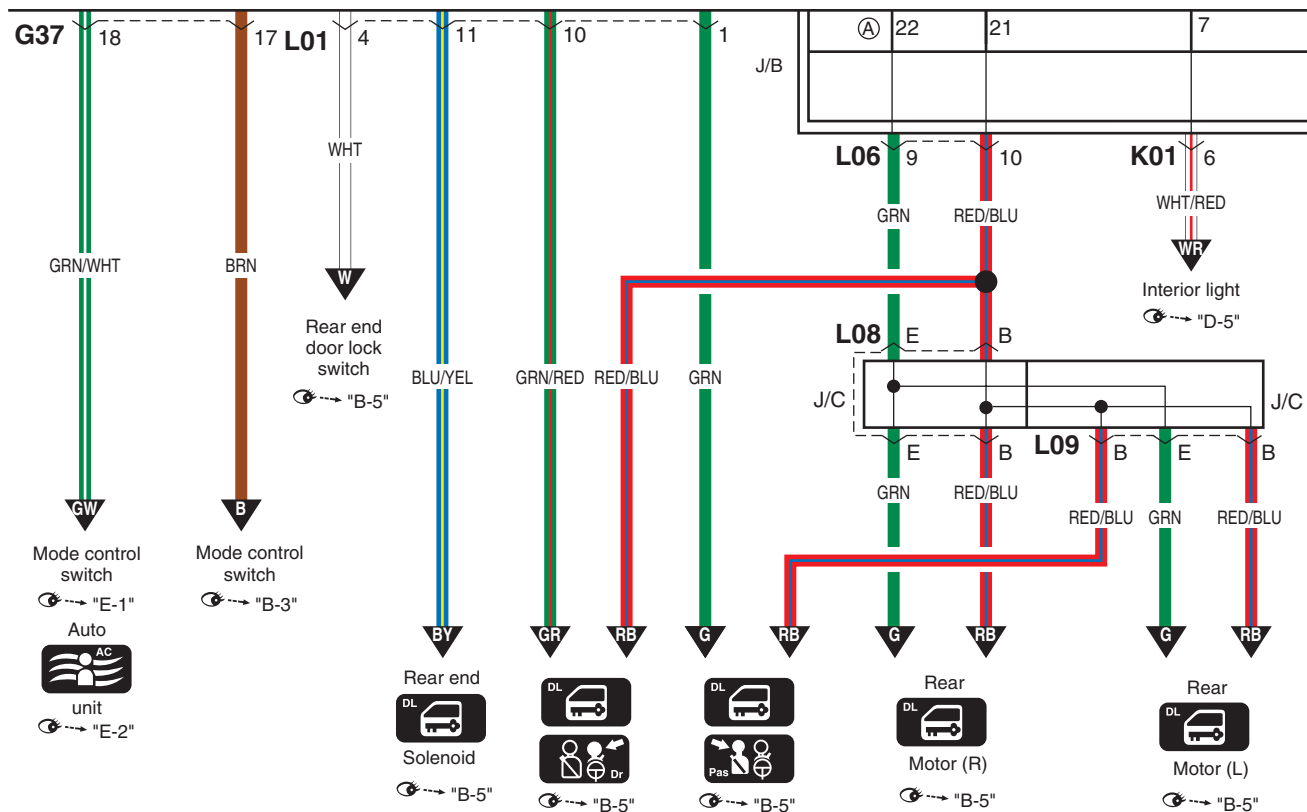
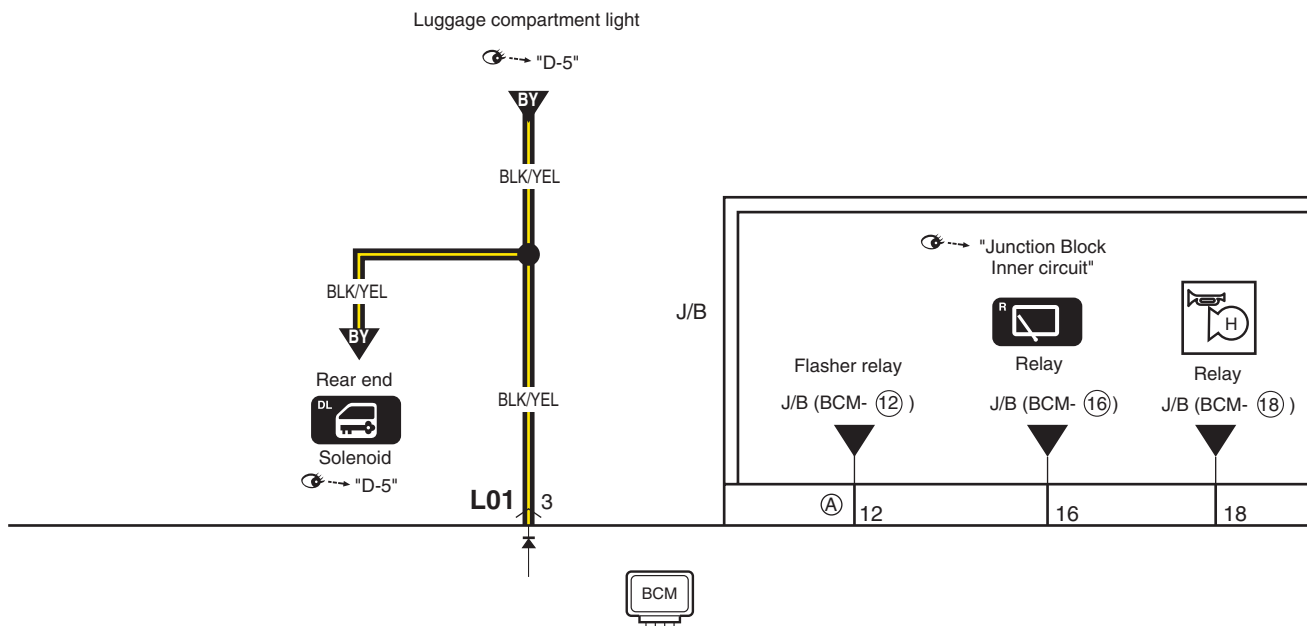
S6RS0B910E009

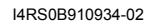


16RS0B910941-04



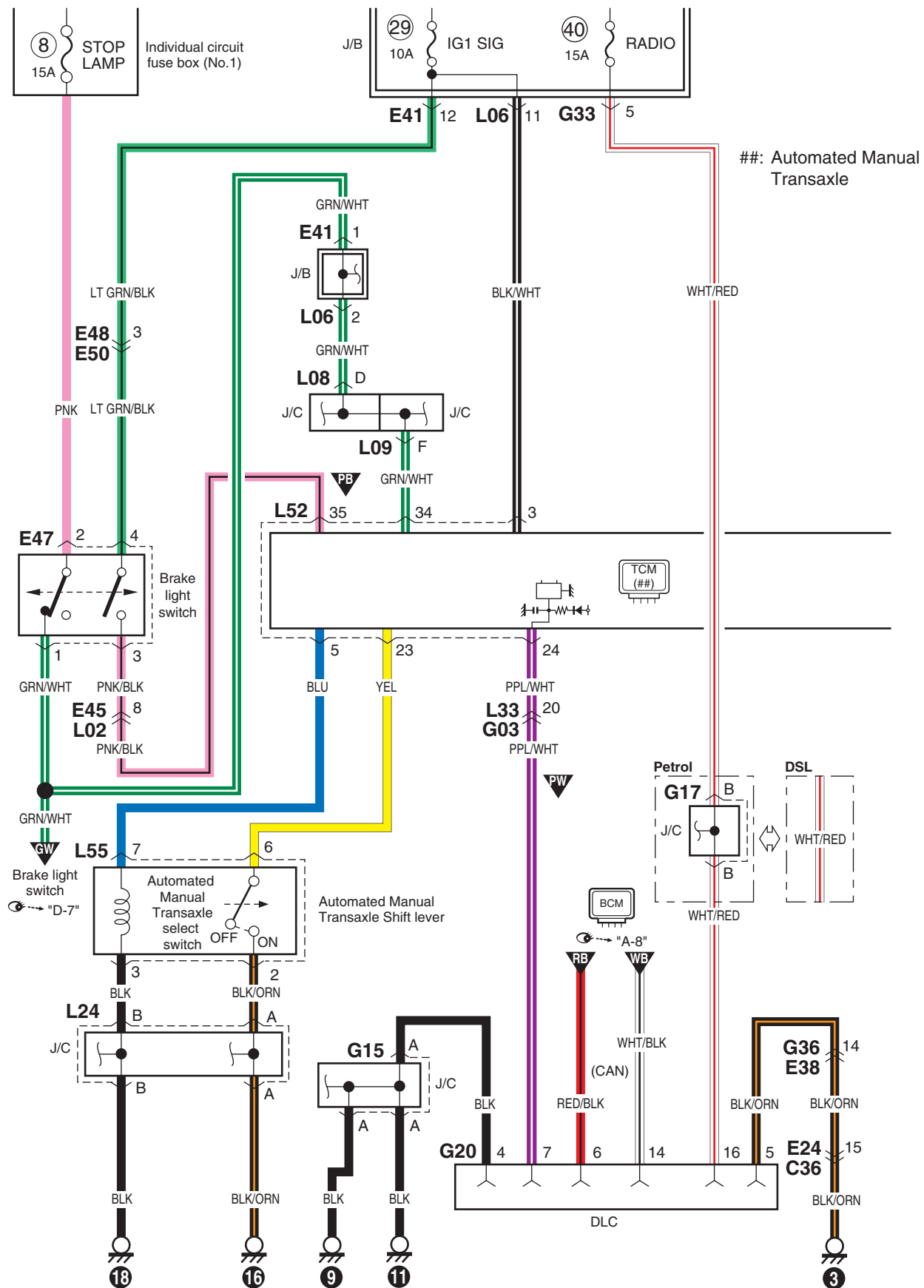
Ⓐ J/B side connector (BCM)



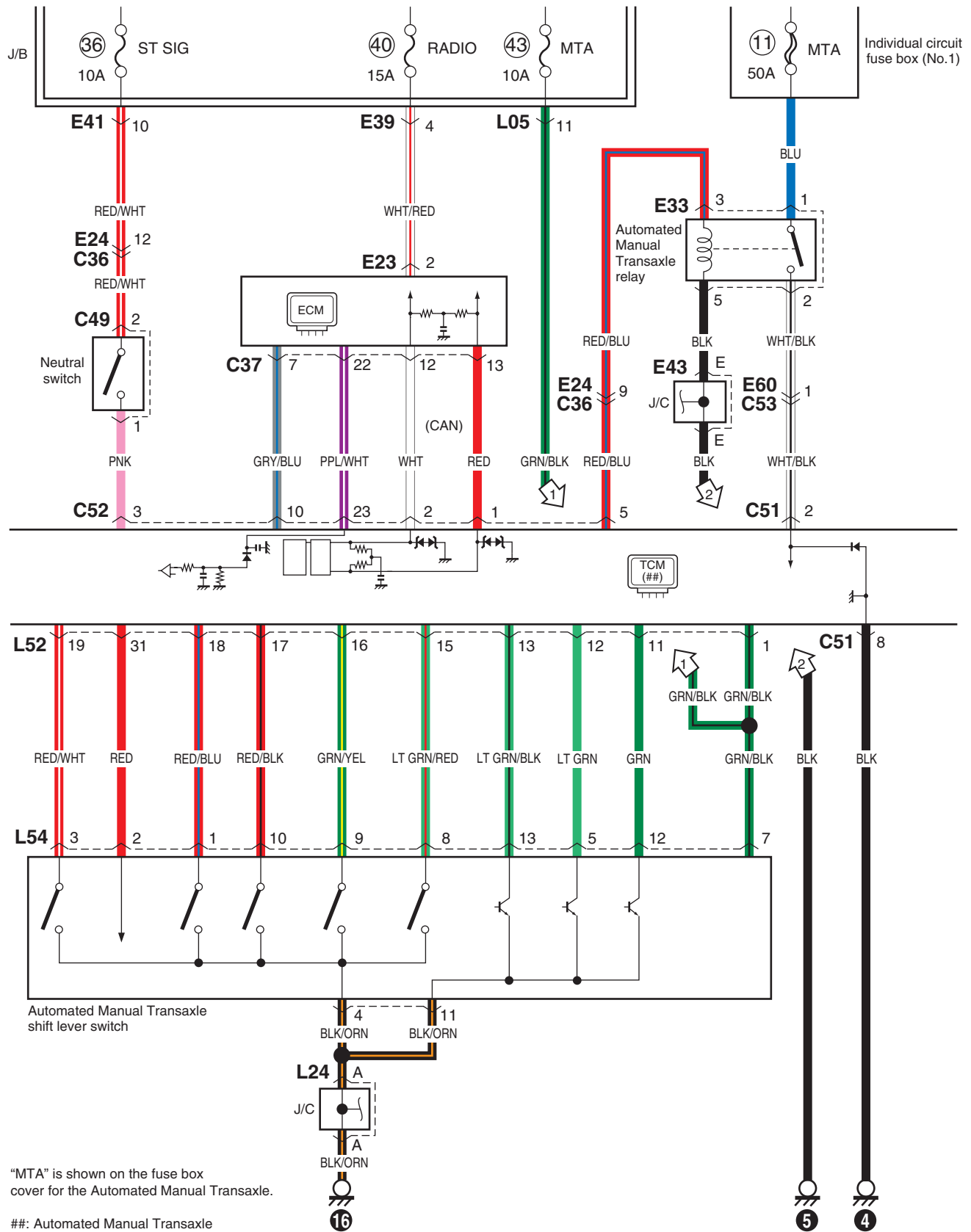


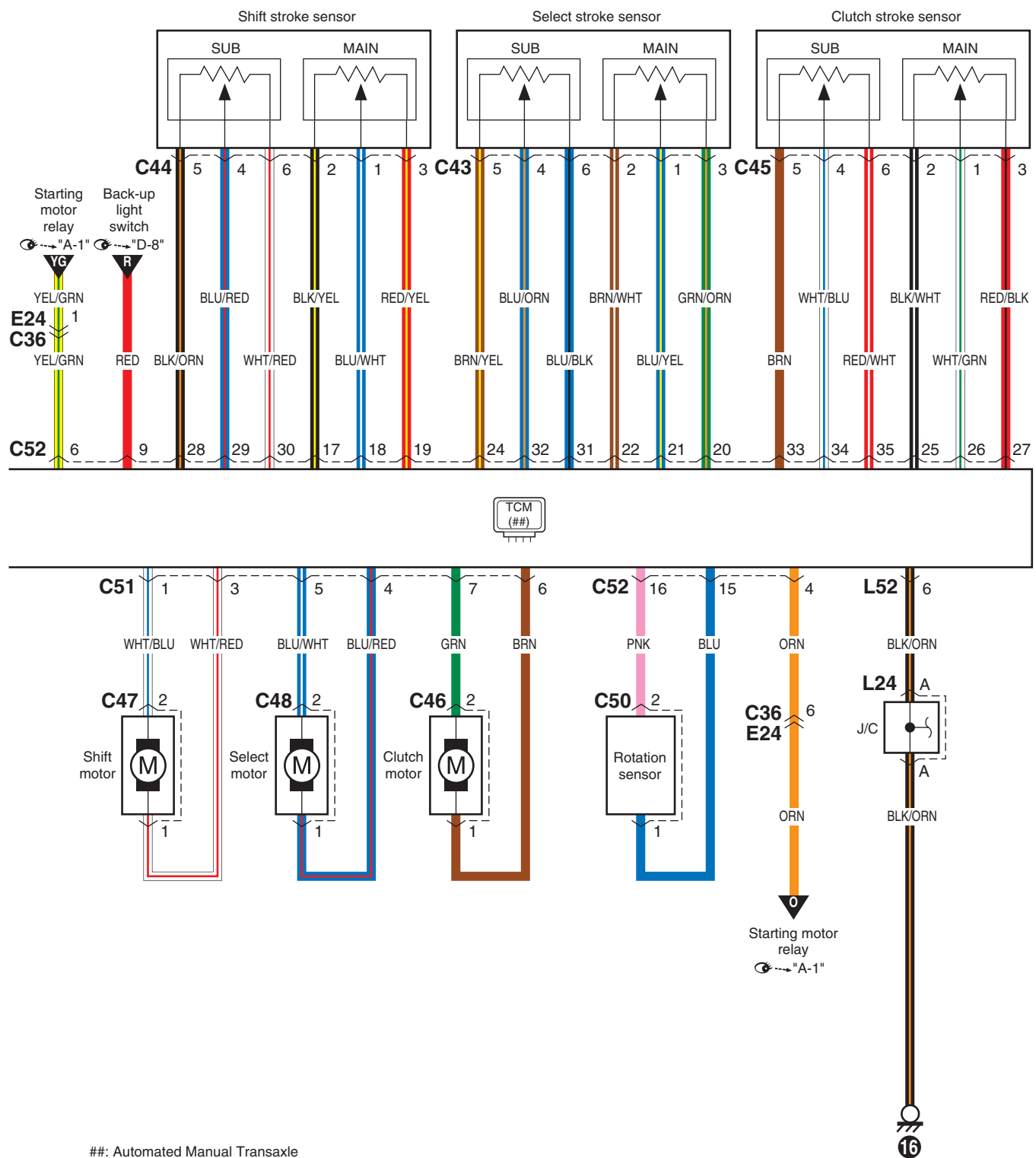
A-9 Automated Manual Transaxle Control System Circuit Diagram (Petrol)

S6RS0B910E010



I6RS0B910943-02

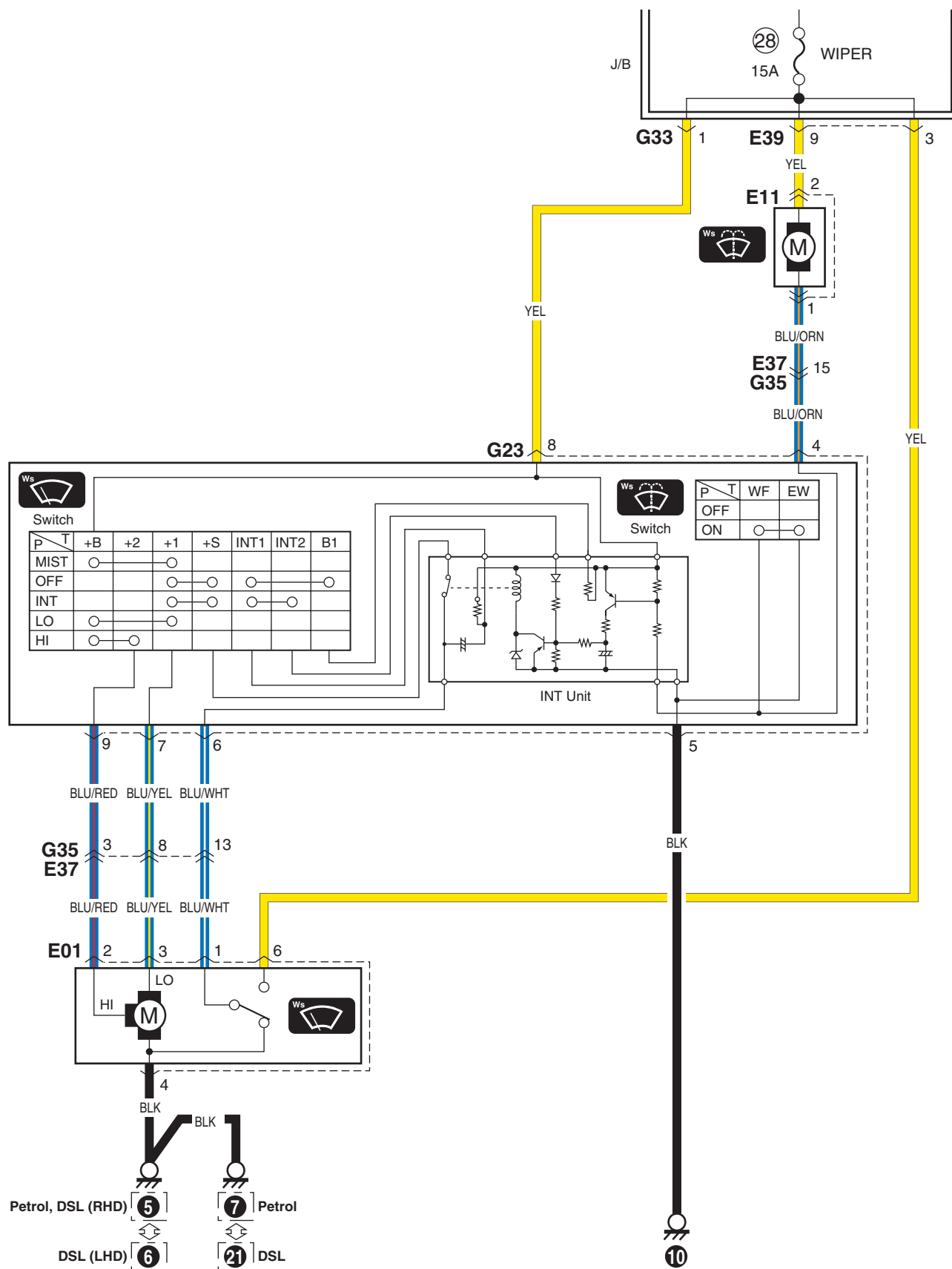




##: Automated Manual Transaxle

B-1 Windshield Wiper and Washer Circuit Diagram

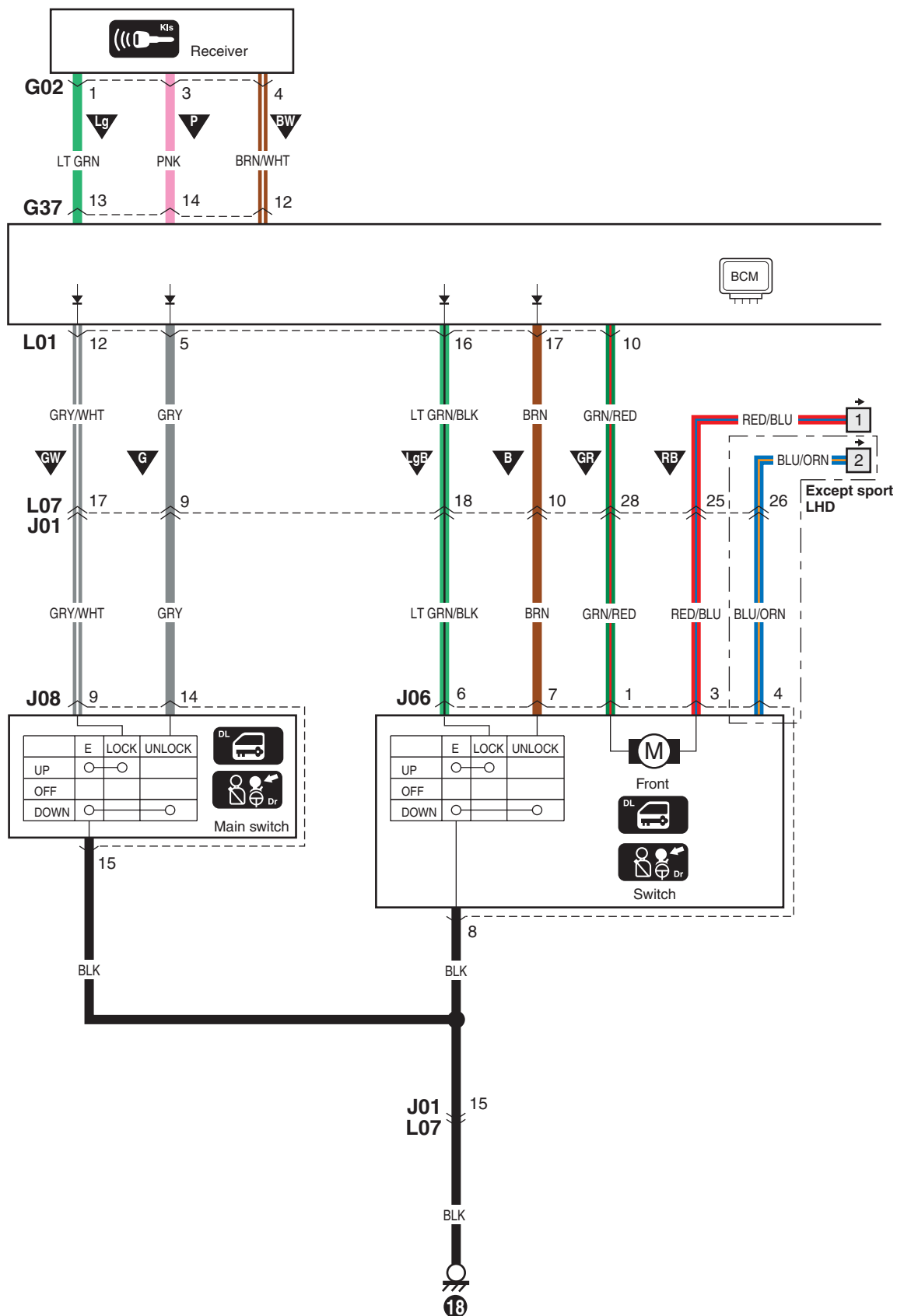
S6RS0B910E011



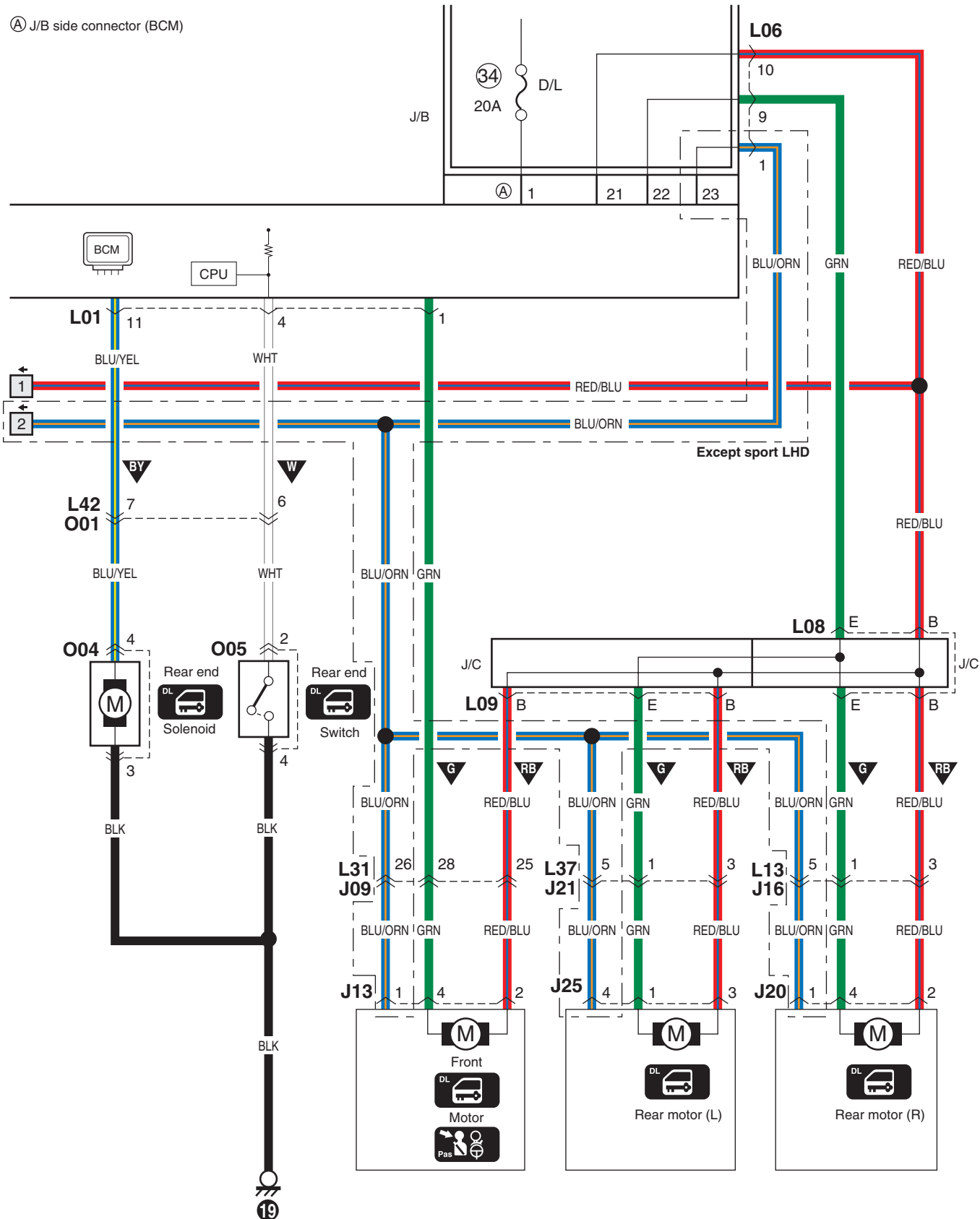
I6RS0B910945-01

B-5 Power Door Lock Circuit Diagram

S6RS0B910E015

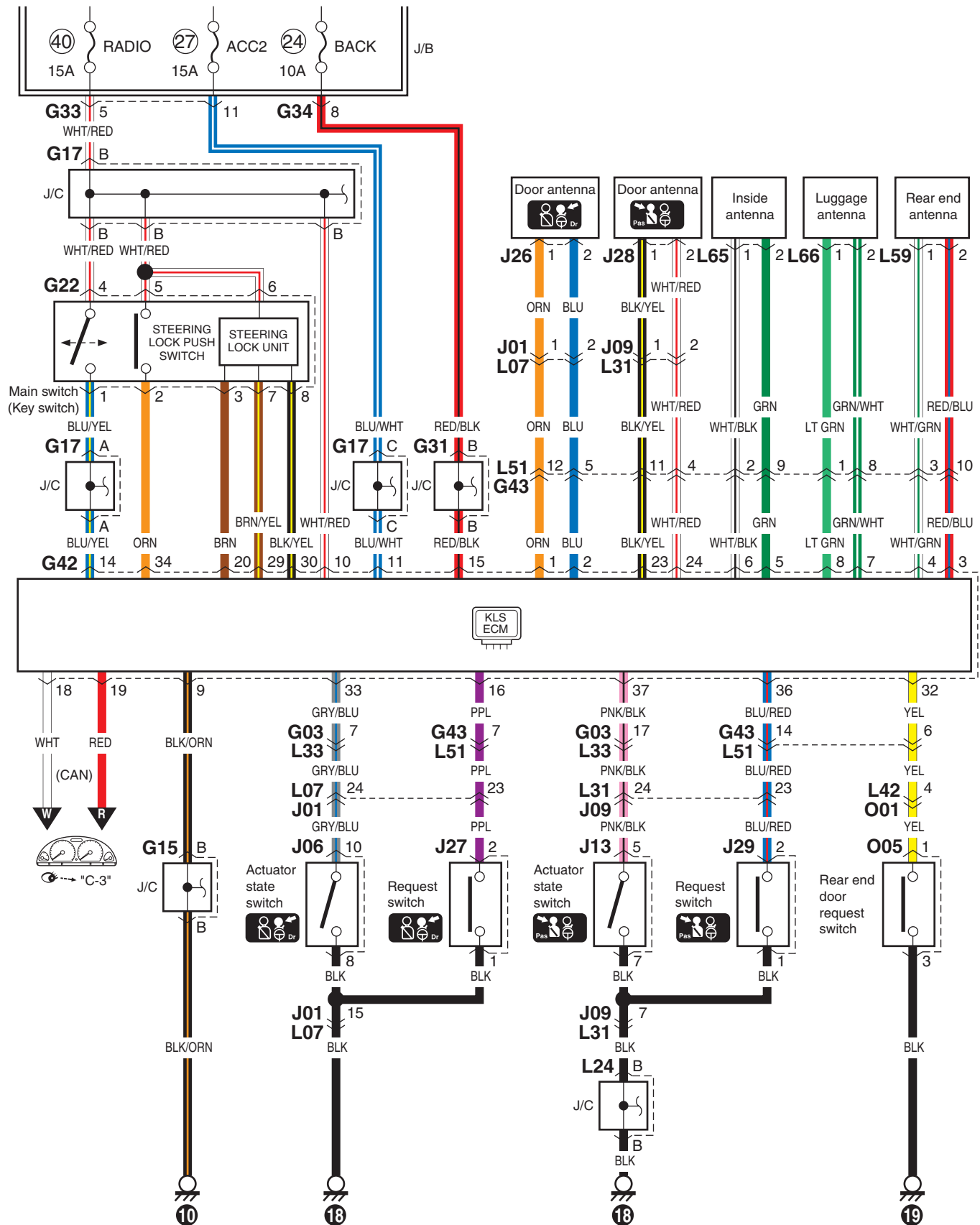


④ J/B side connector (BCM)



B-9 Keyless Start System Circuit Diagram

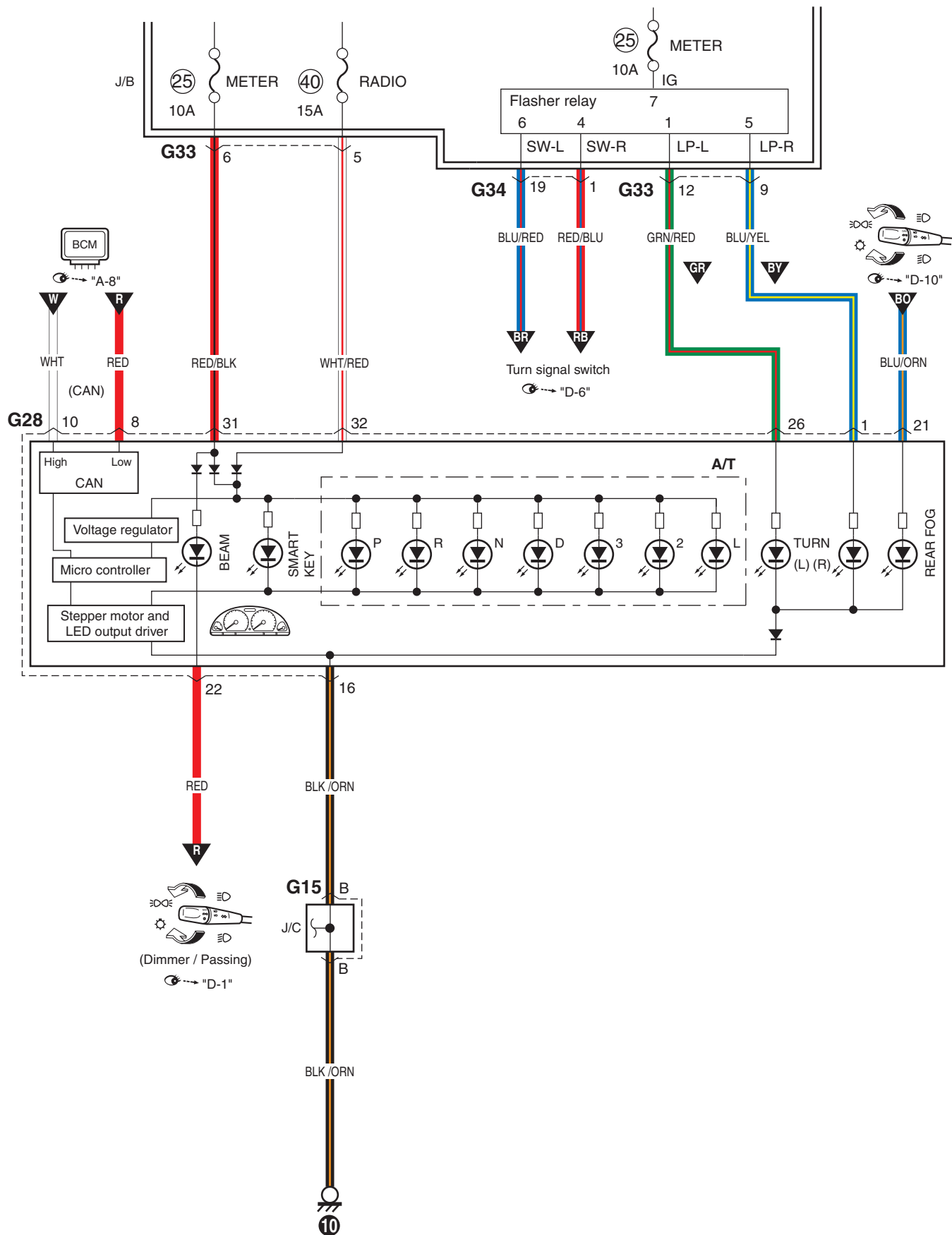
S6RS0B910E019



I6RS0B910948-01

C-2 Combination Meter Circuit Diagram (Indicator)

S6RS0B910E021

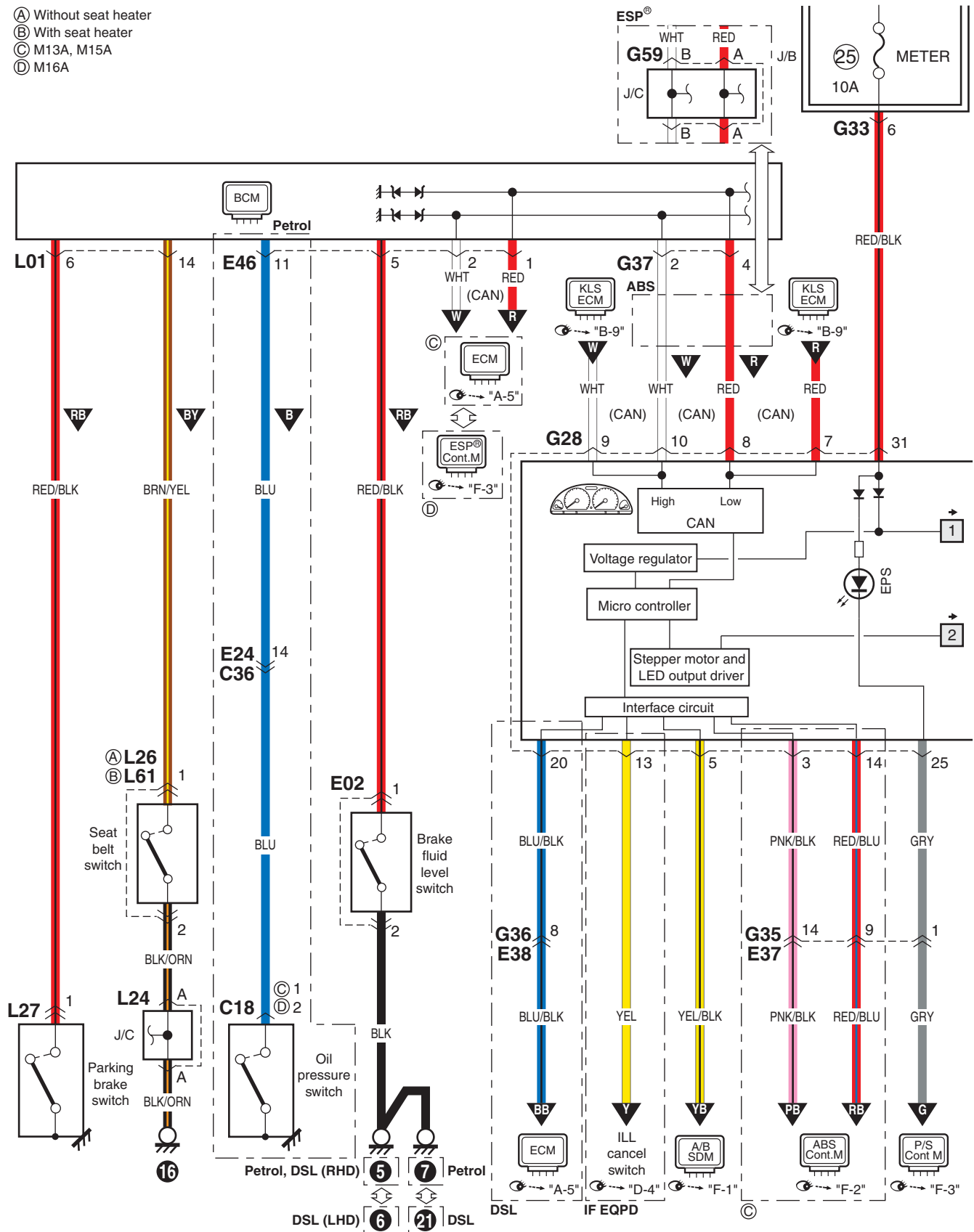


I6RS0B910950-01

C-3 Combination Meter Circuit Diagram (Warning Light)

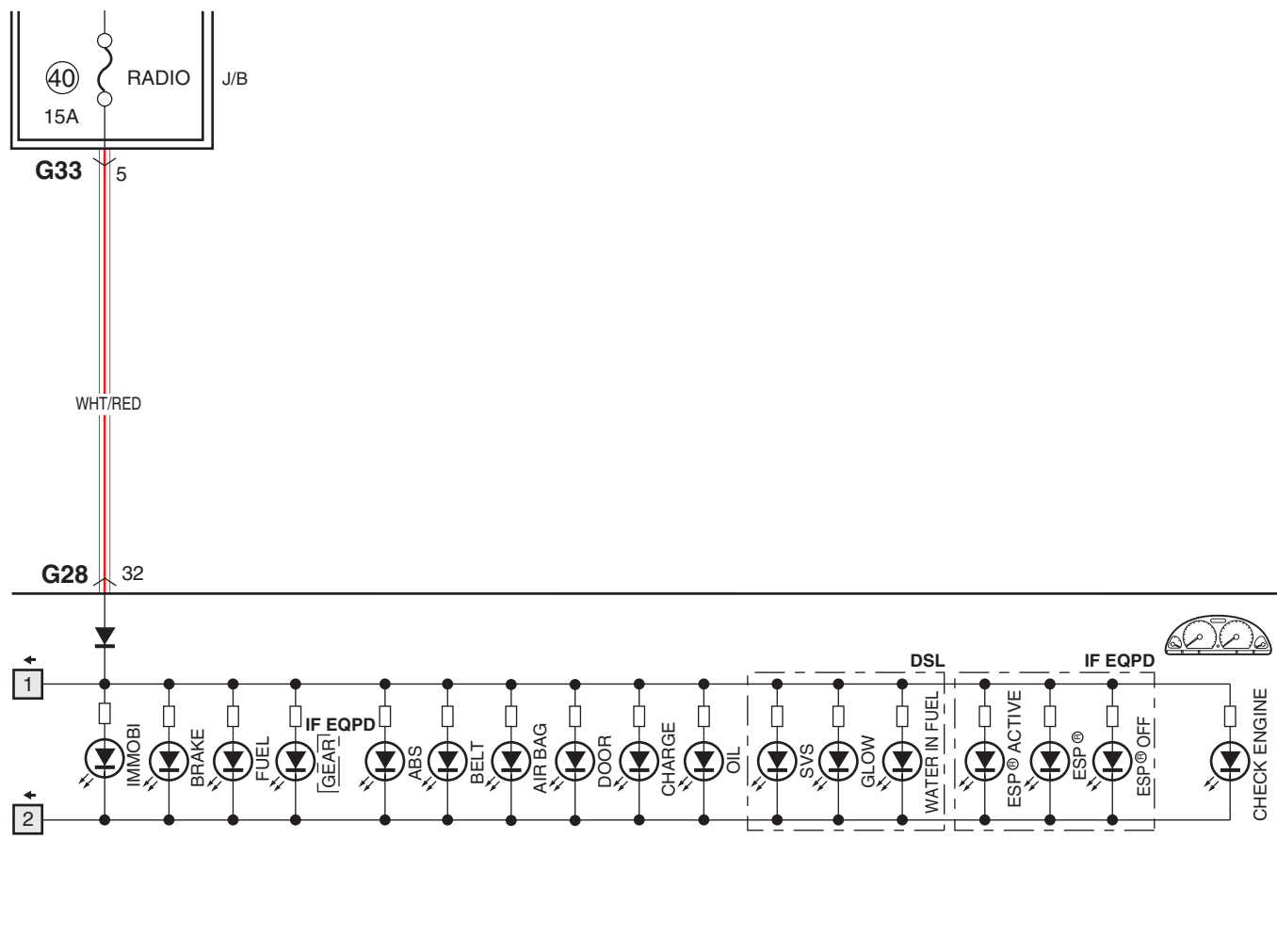
S6RS0B910E022

- (A) Without seat heater
 (B) With seat heater
 (C) M13A, M15A
 (D) M16A



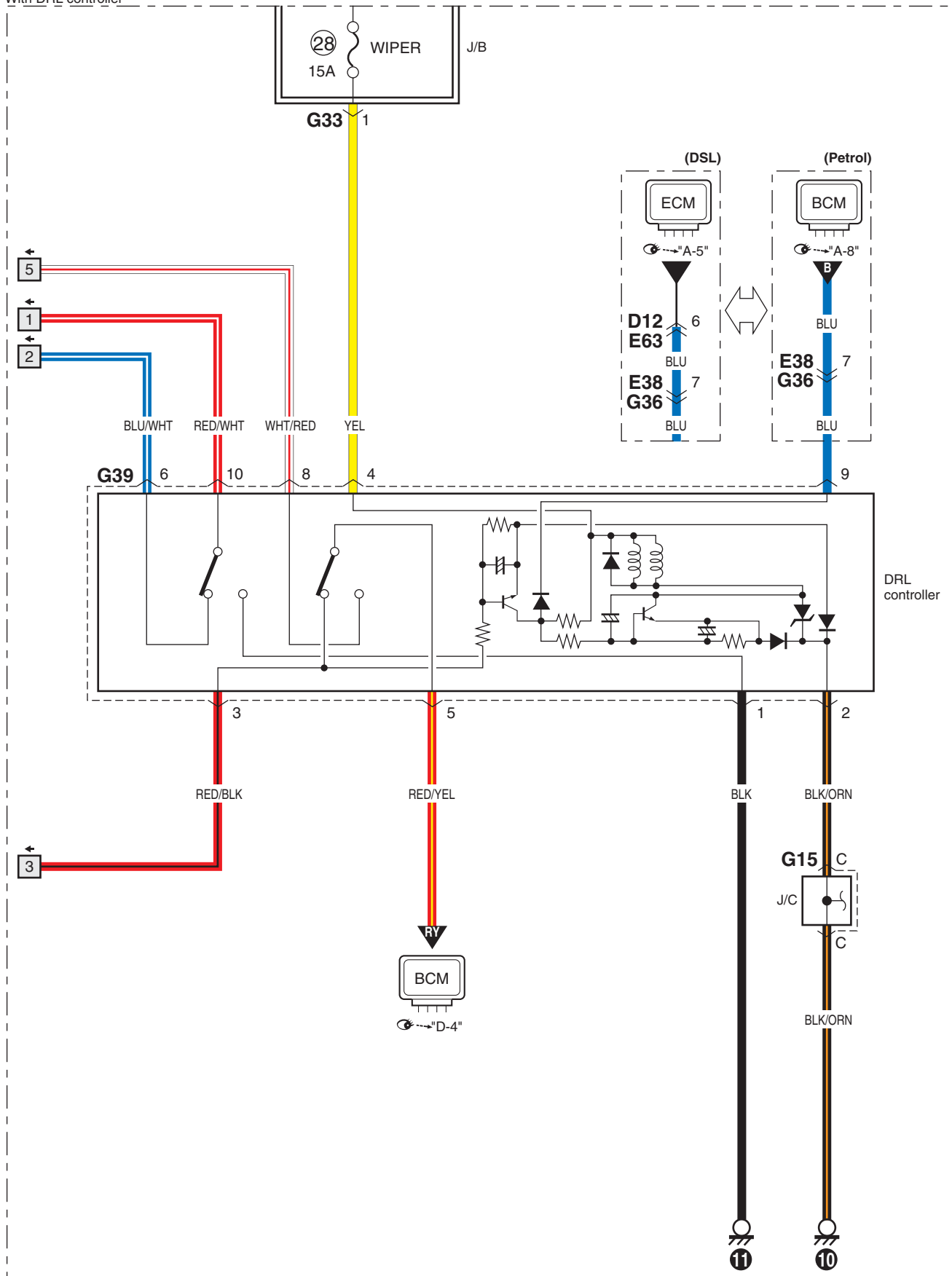
I6RS0B910951-03

9A-74 Wiring Systems:



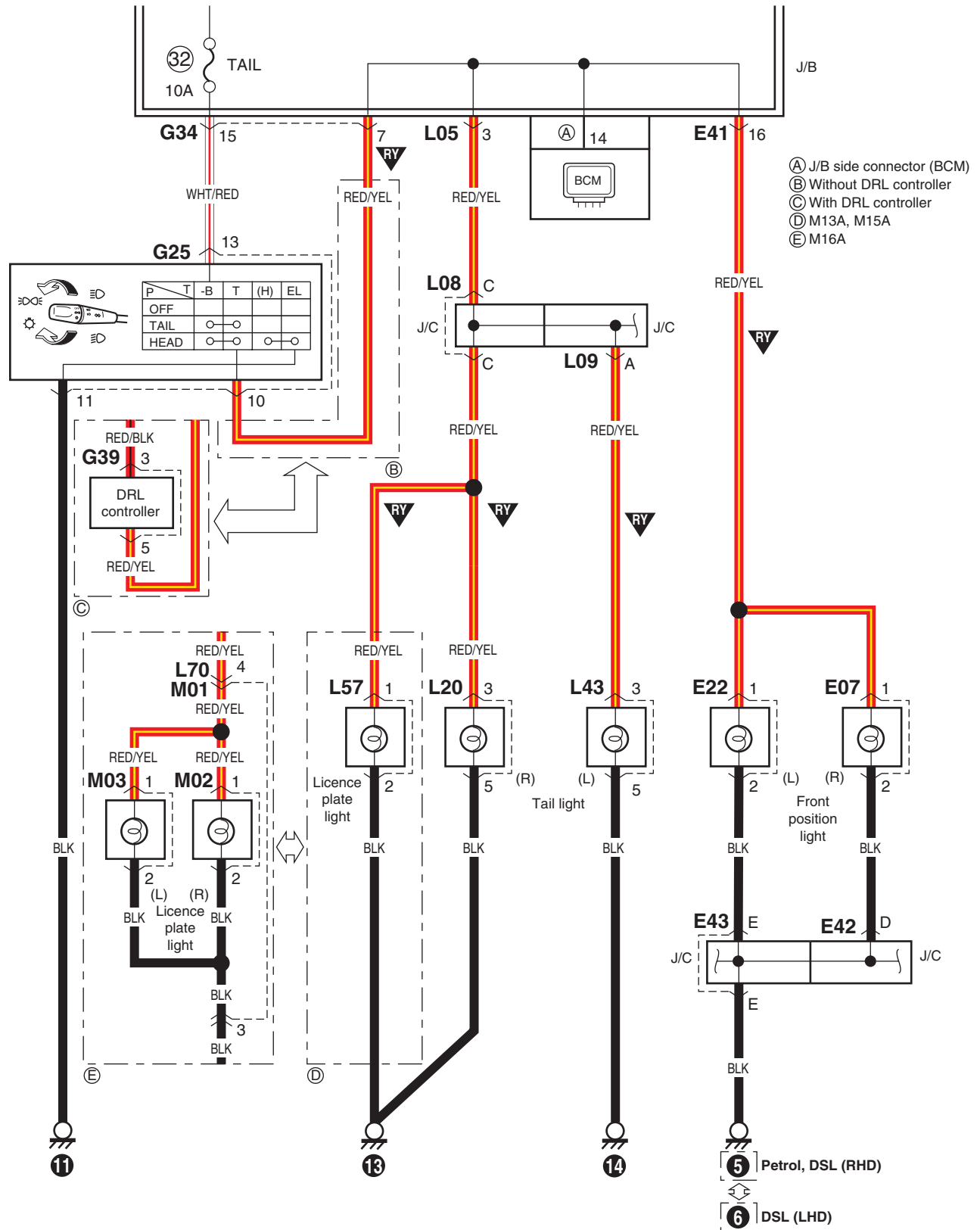
ESP® is a registered trademark of Daimler Chrysler AG.
16RS0B910952-02

With DRL controller

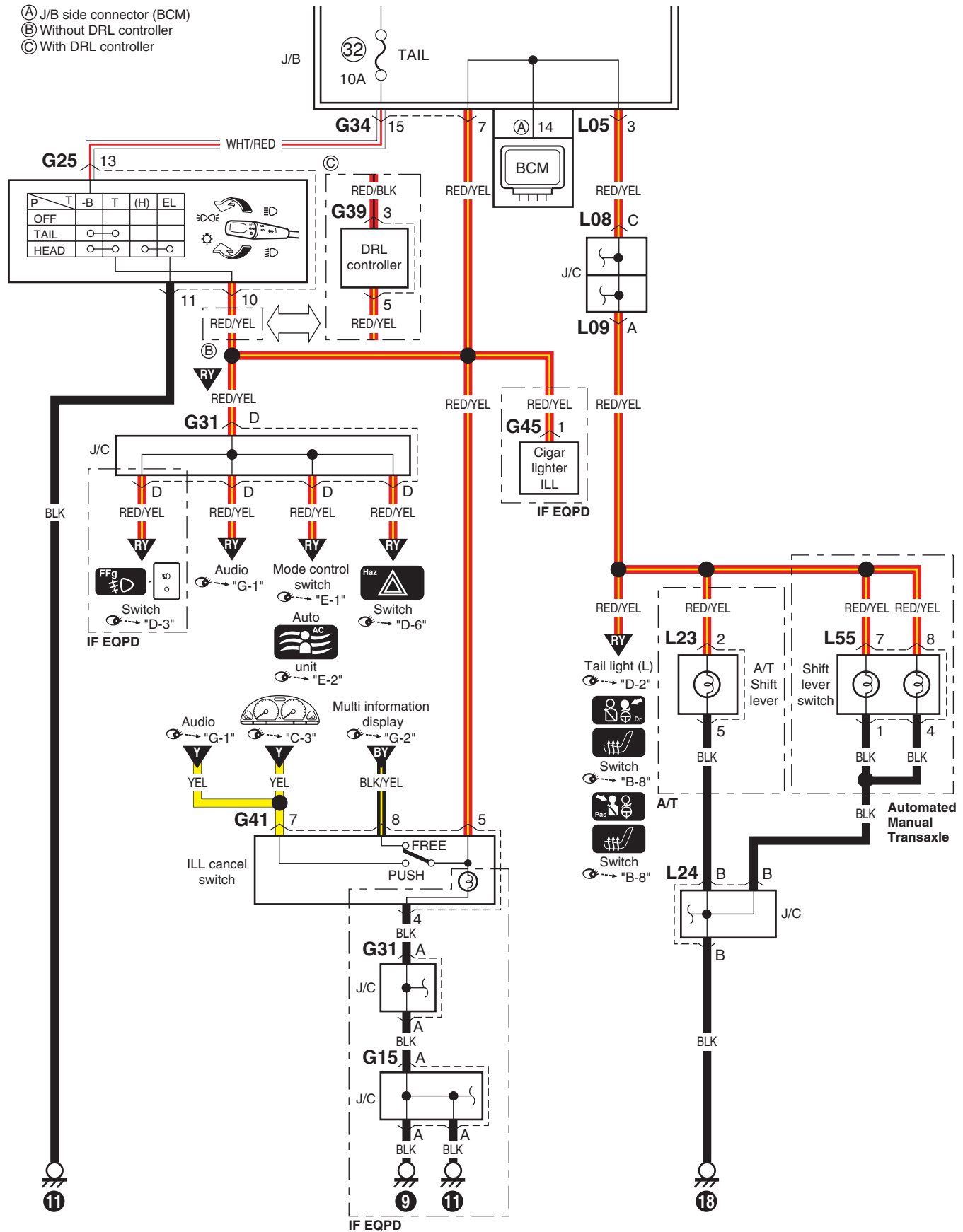


D-2 Position, Tail and Licence Plate Light System Circuit Diagram

S6RS0B910E024

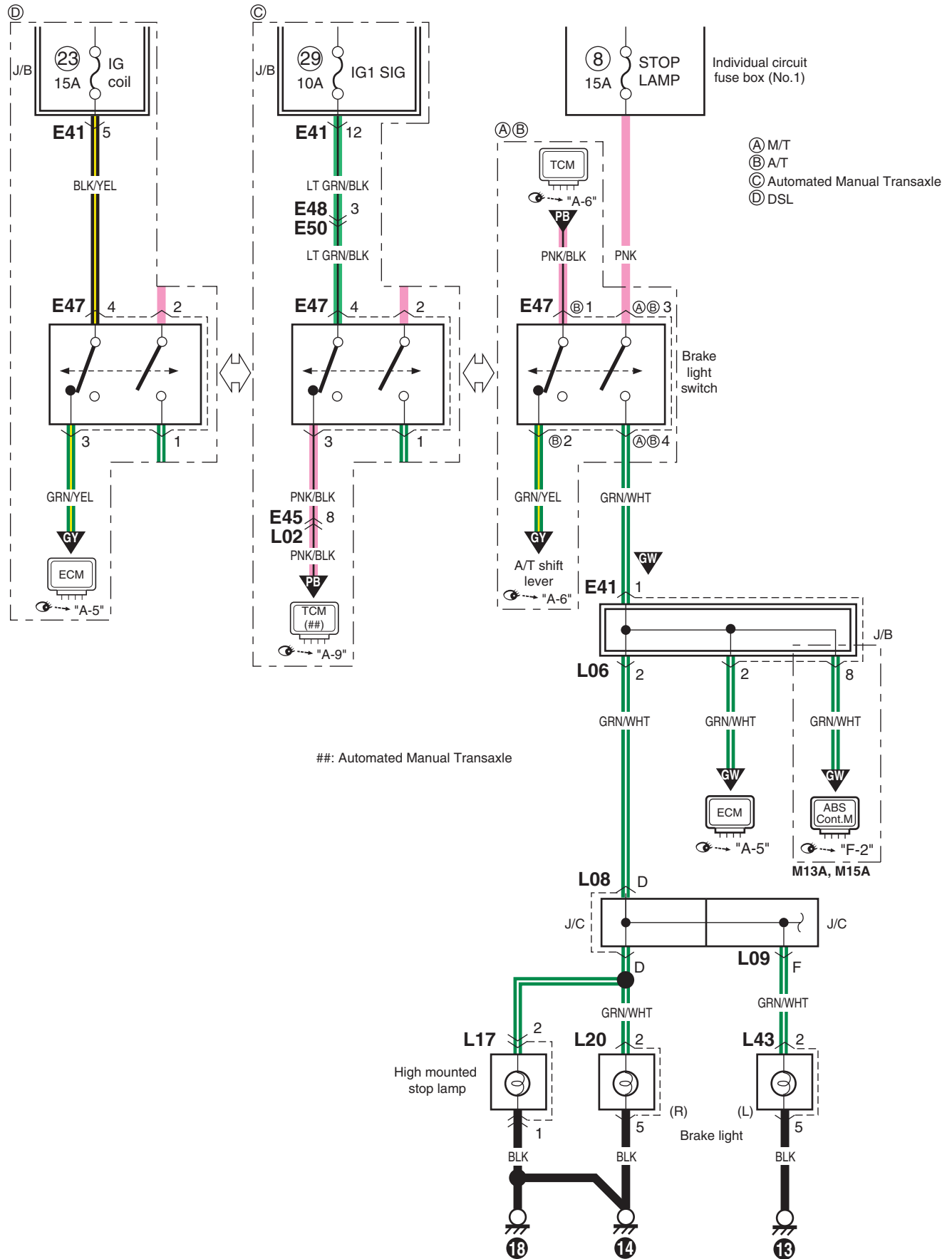


I6RS0B910953-01



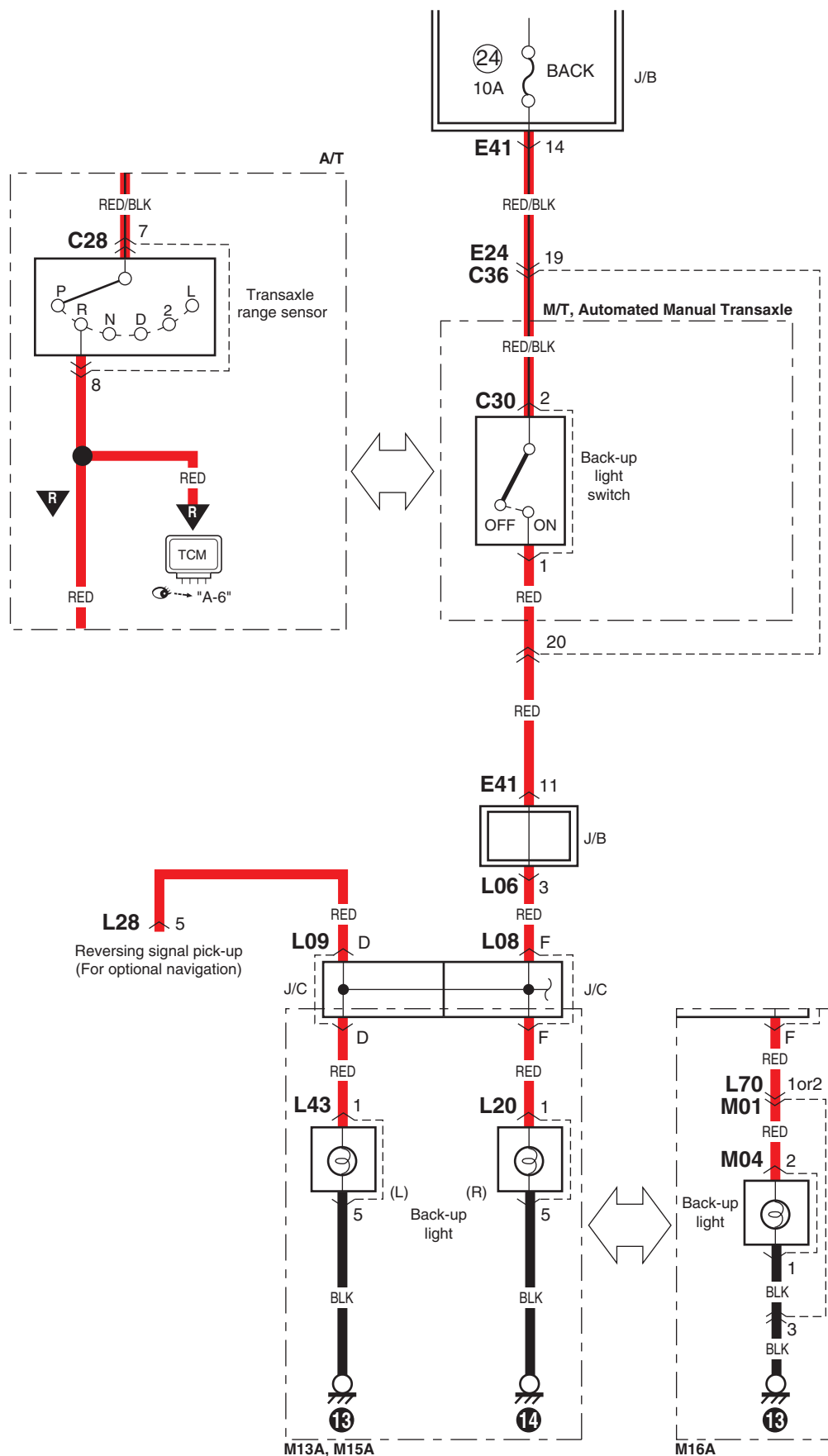
D-7 Brake Light System Circuit Diagram

S6RS0B910E029



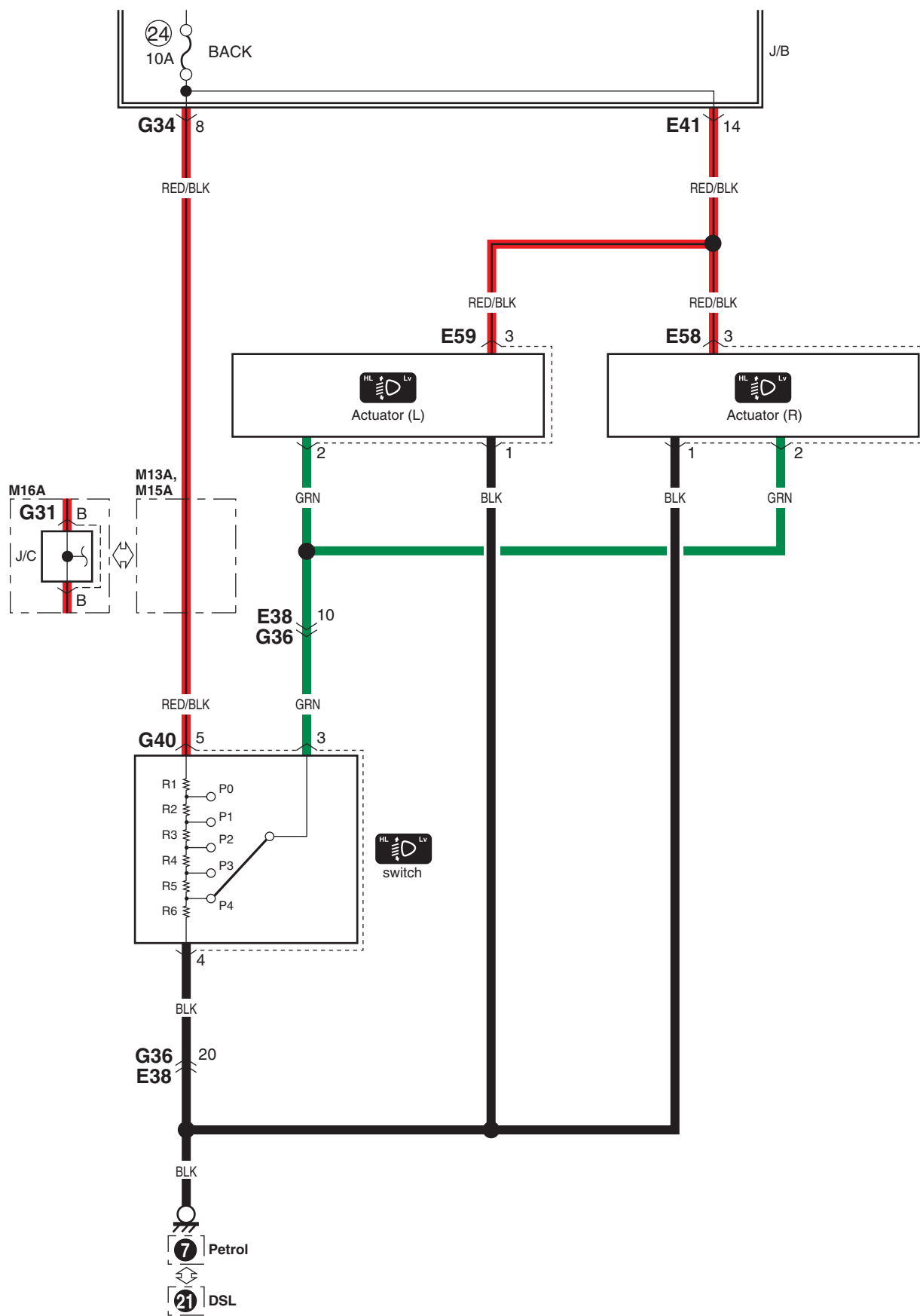
D-8 Back-Up Light System Circuit Diagram

S6RS0B910E030



D-9 Headlight Beam Leveling System Circuit Diagram

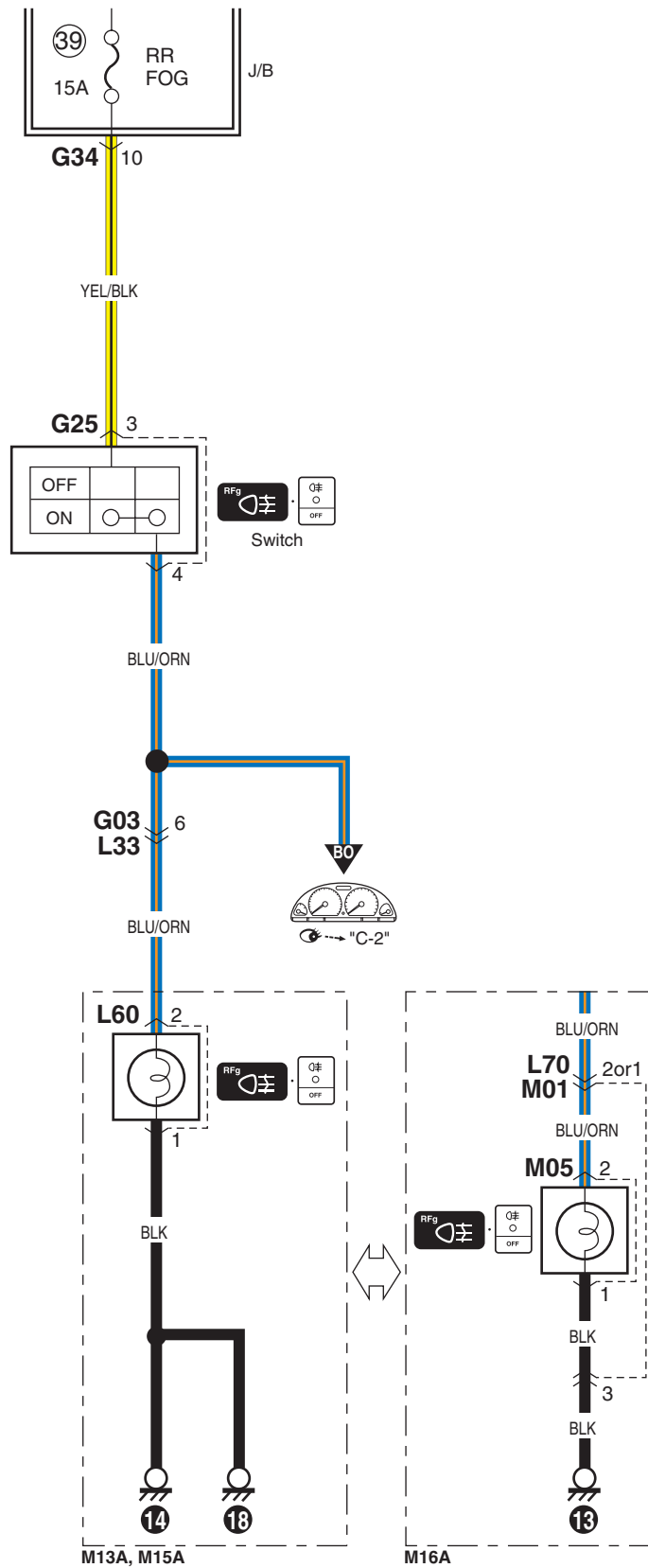
S6RS0B910E031



I6RS0B910957-01

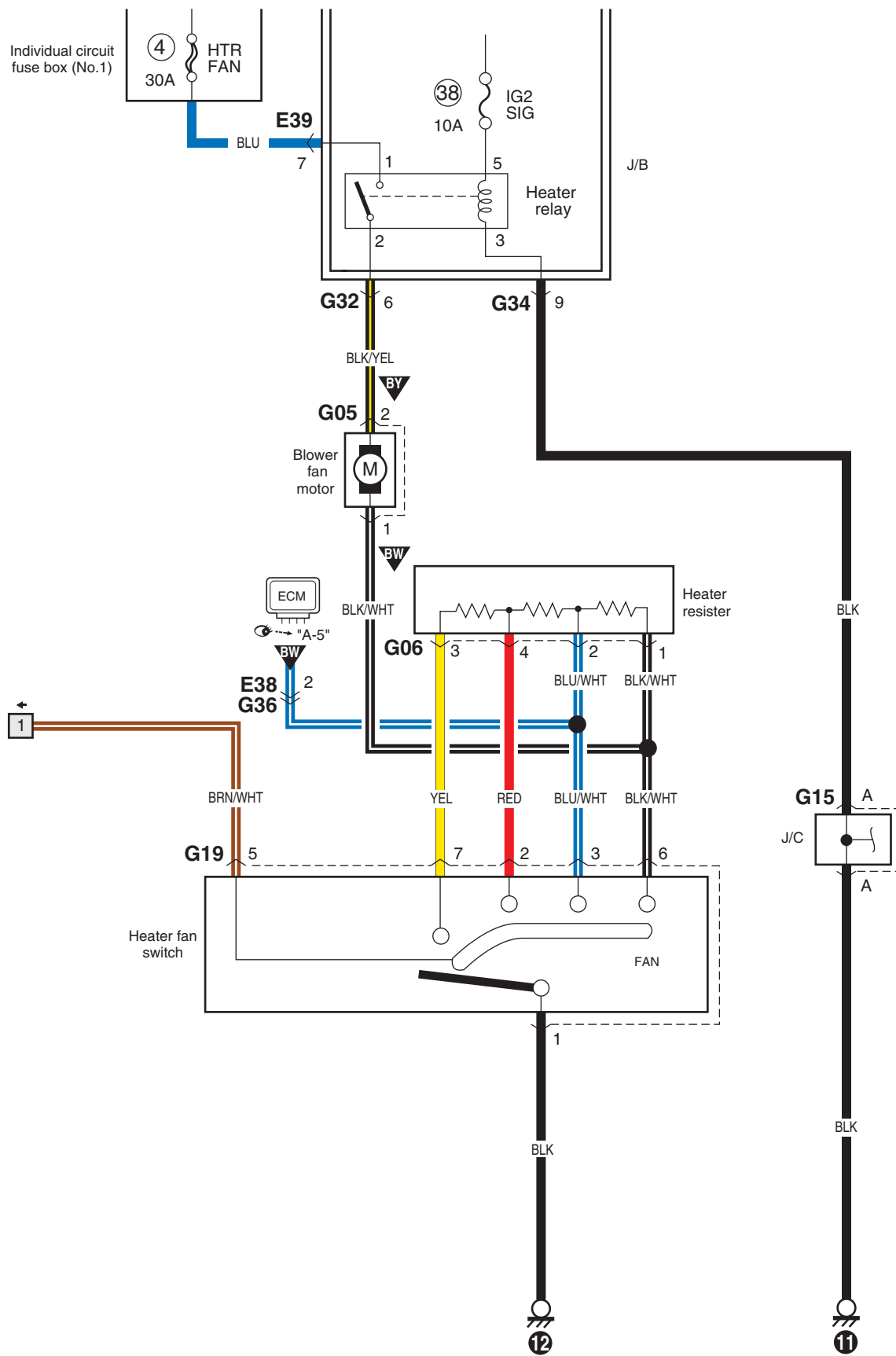
D-10 Rear Fog Light Circuit Diagram

S6RS0B910E032



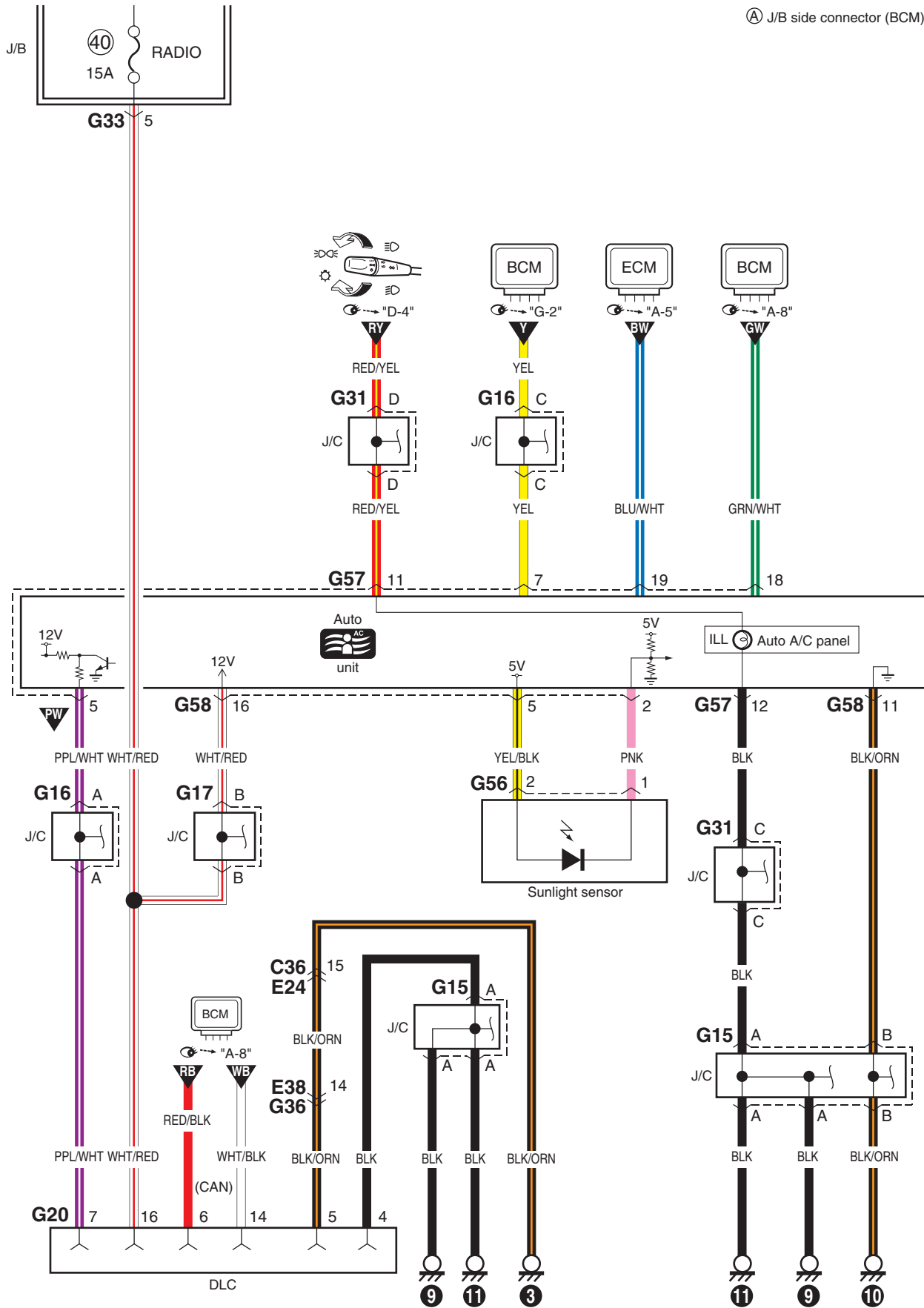
I6RS0B910958-01

9A-84 Wiring Systems:

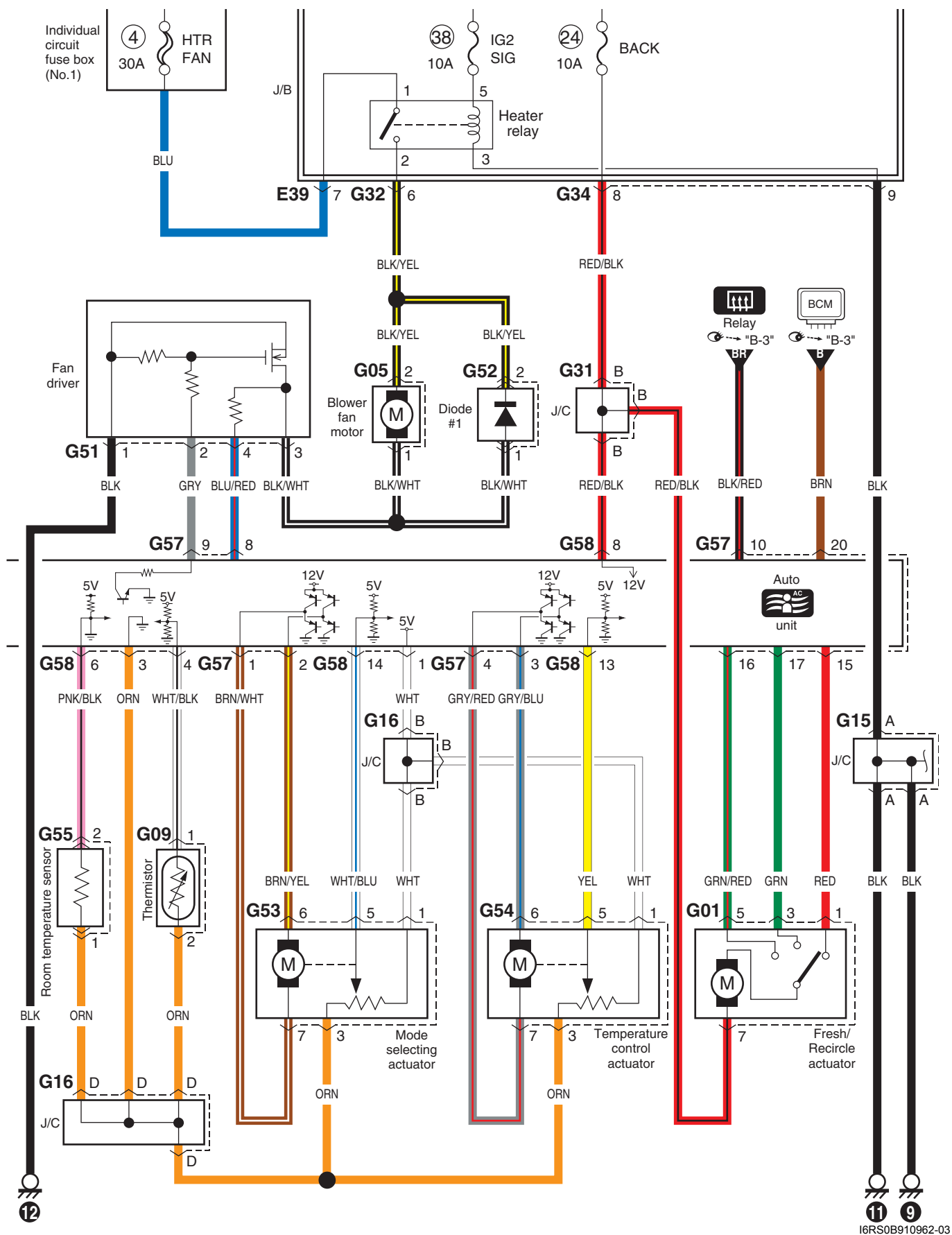


E-2 Auto A/C System Circuit Diagram

S6RS0B910E046

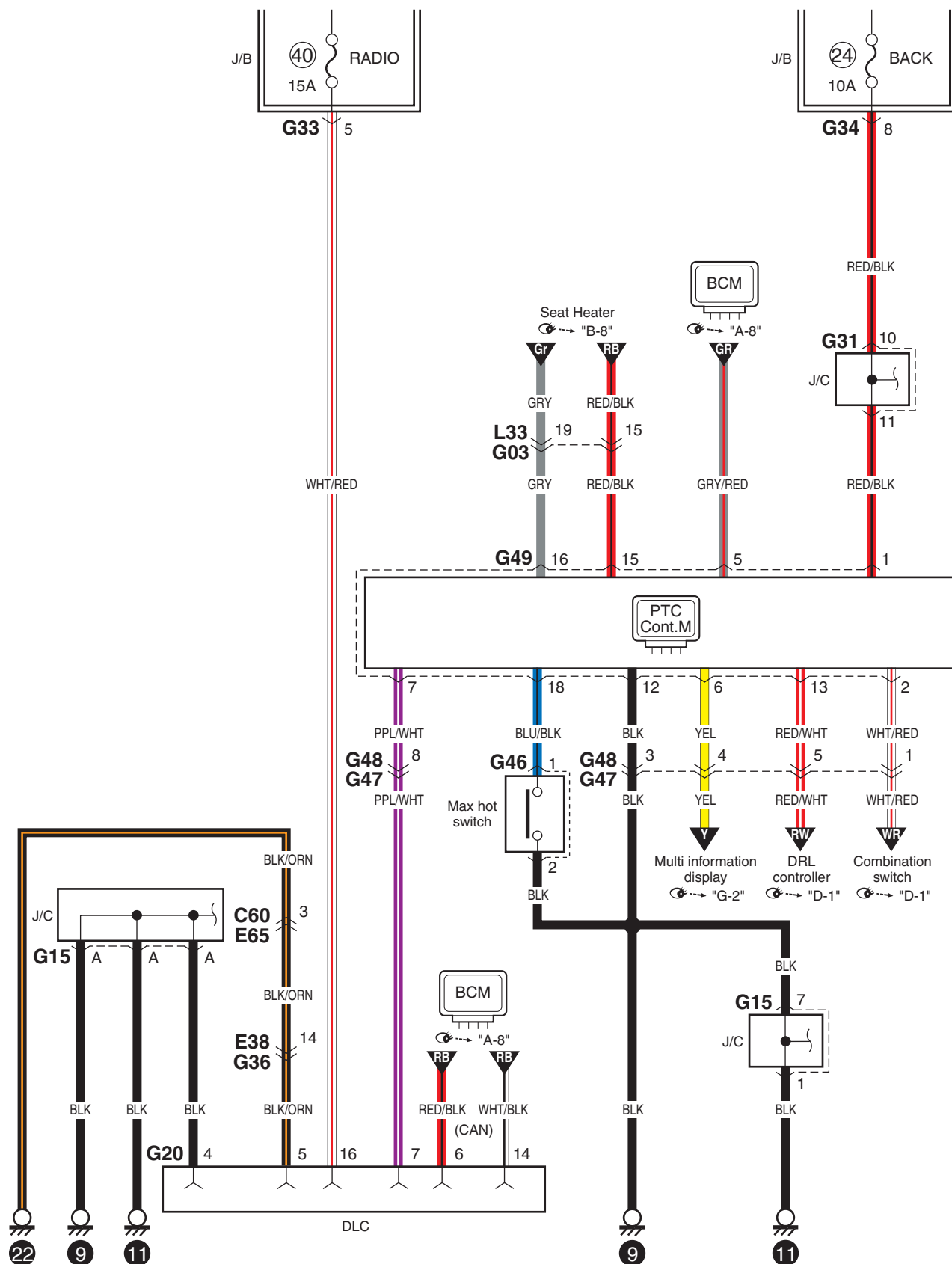


I6RS0B910961-02

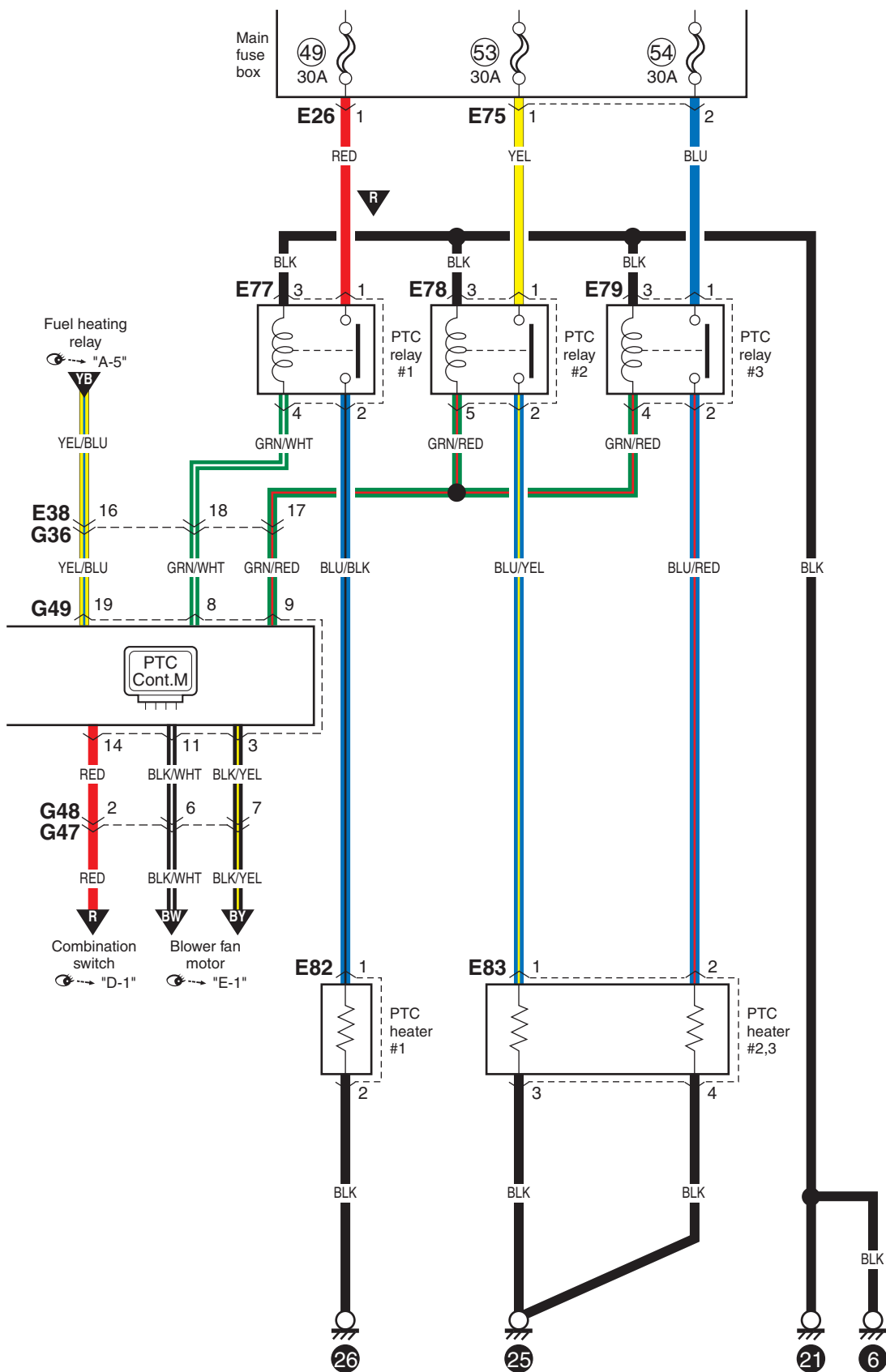


E-3 PTC Heater Circuit Diagram (DSL)

S6RS0B910E045

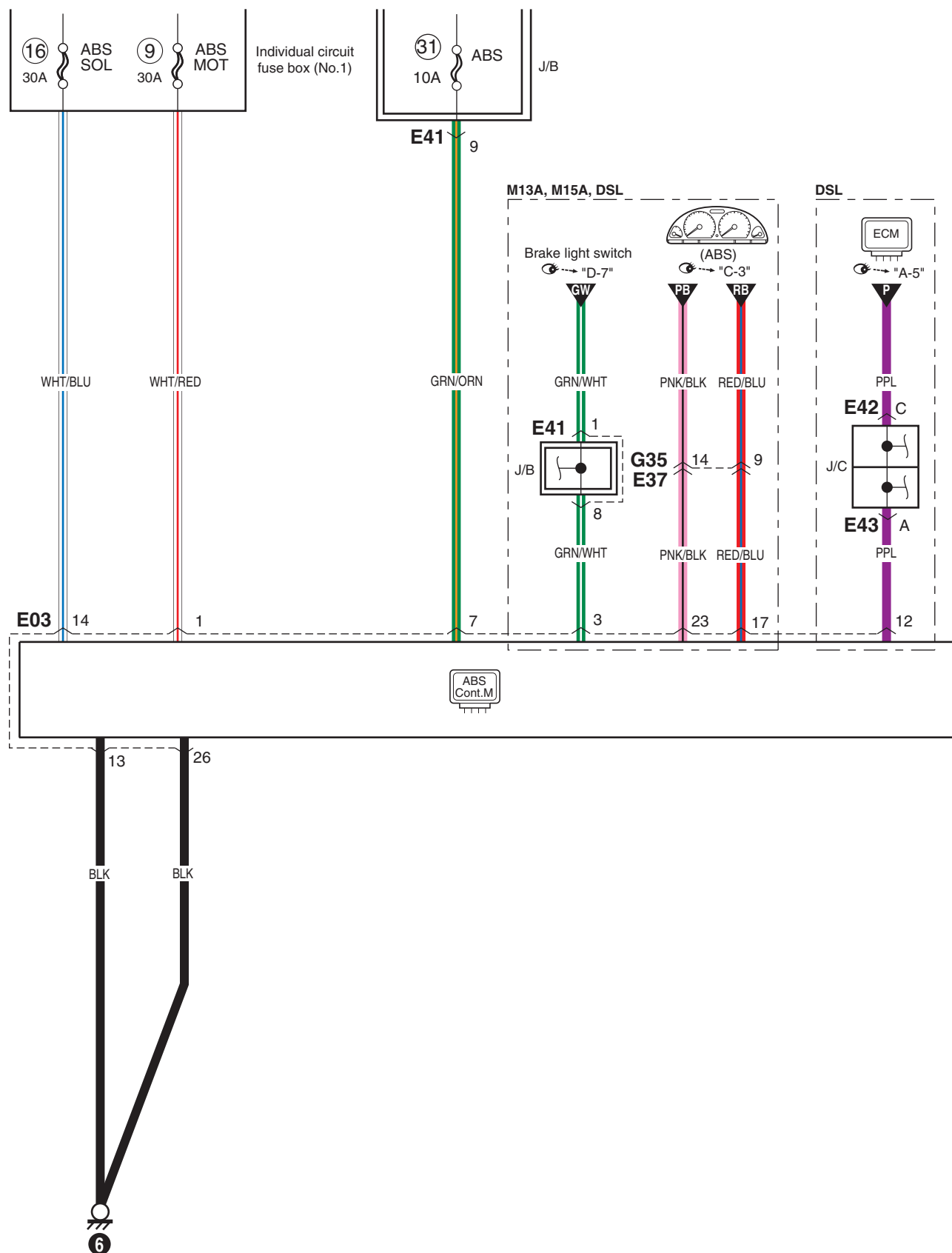


I6RS0B910963-02



F-2 Anti-Lock Brake System Circuit Diagram

S6RS0B910E035

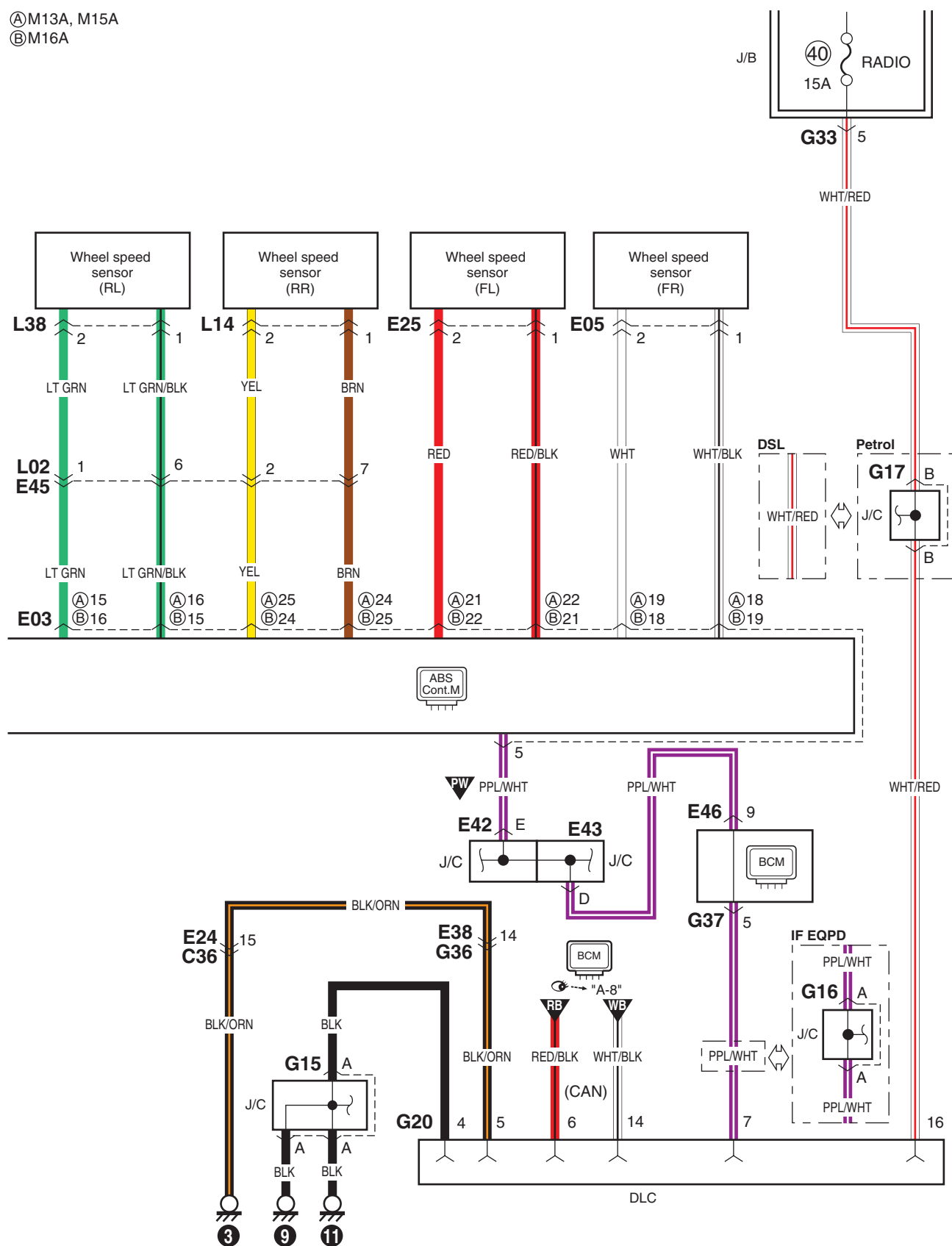


I6RS0B910965-03

9A-90 Wiring Systems:

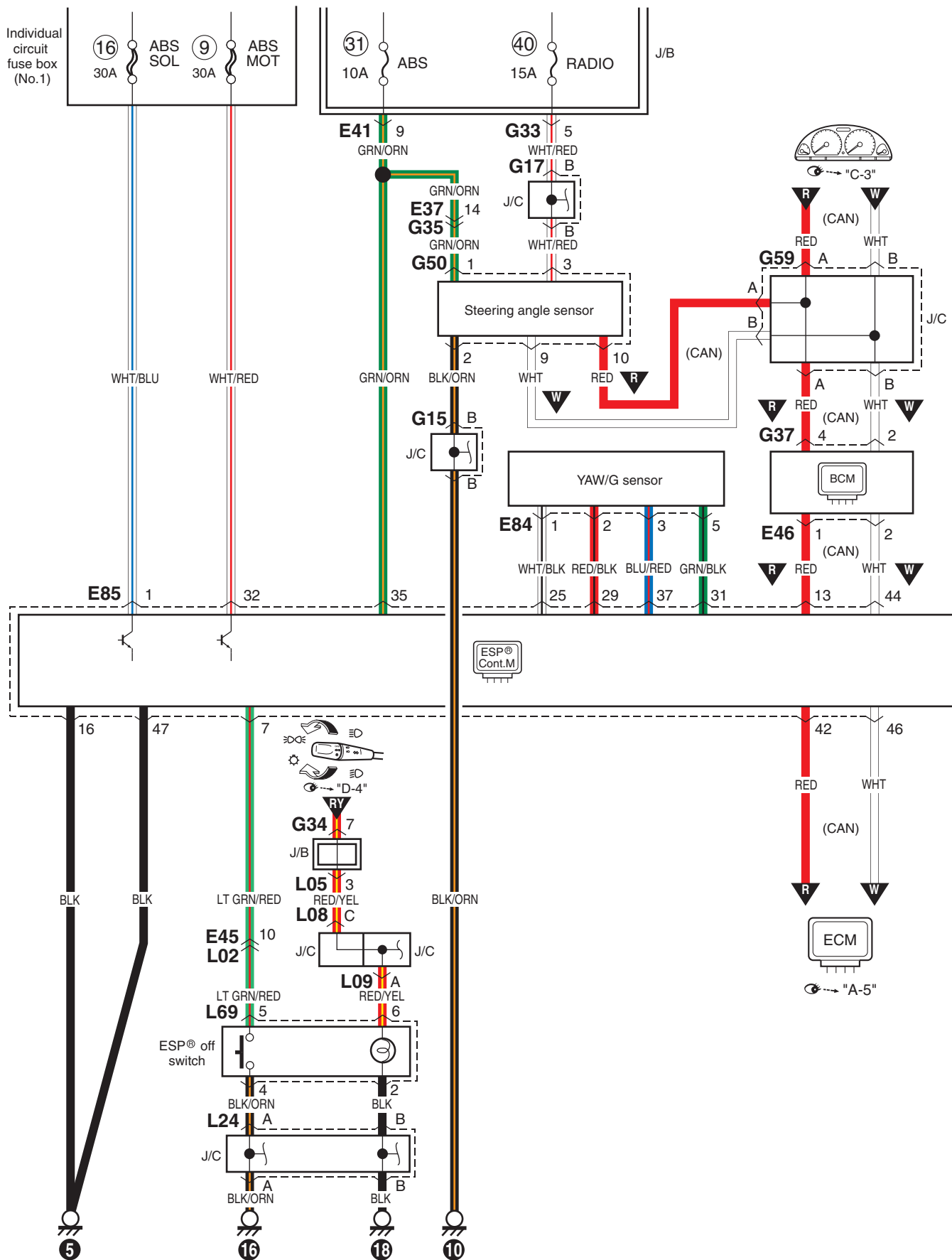
Ⓐ M13A, M15A

Ⓑ M16A

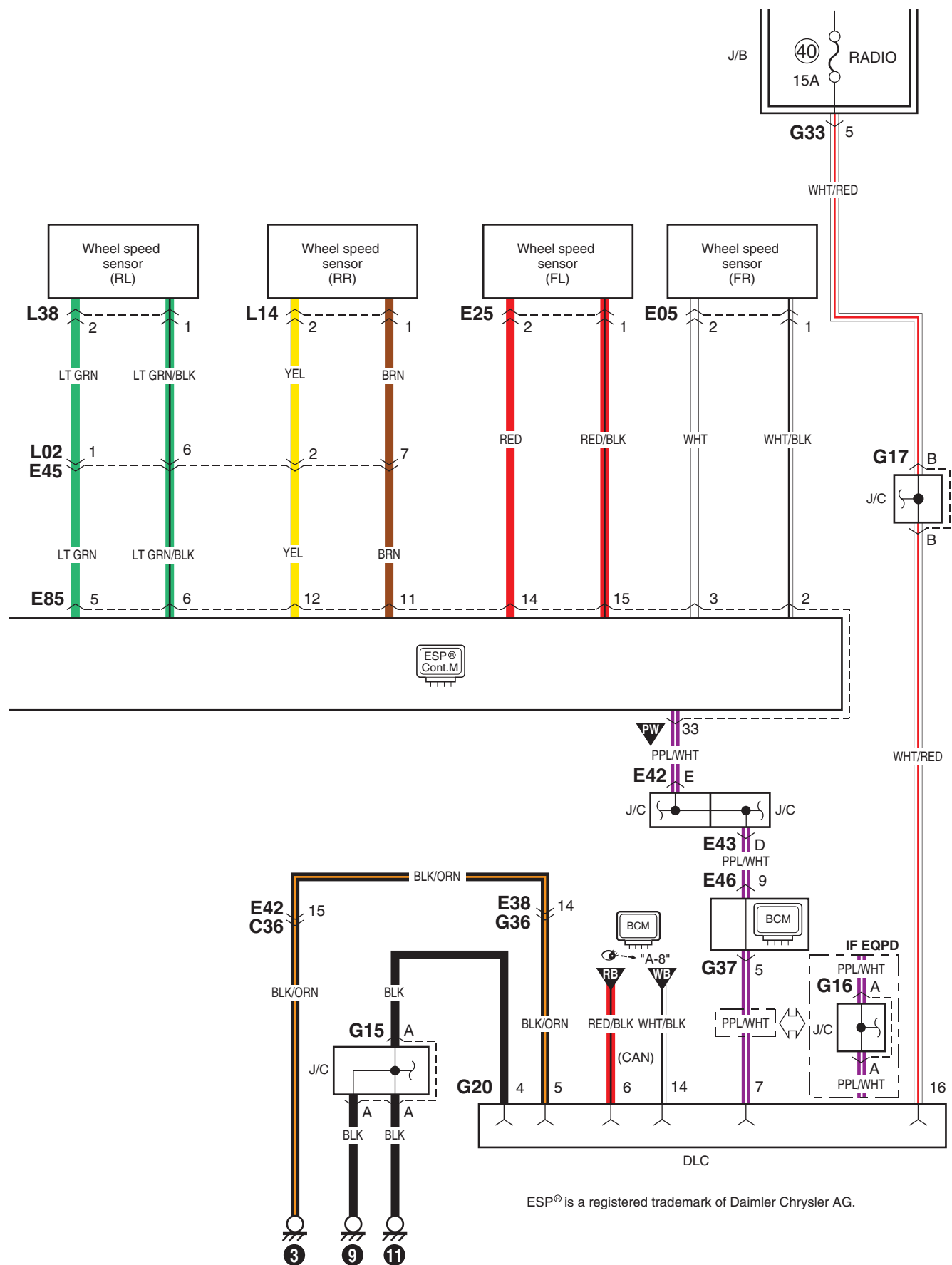


F-3 Electronic Stability Program System Circuit Diagram

S6RS0B910E047

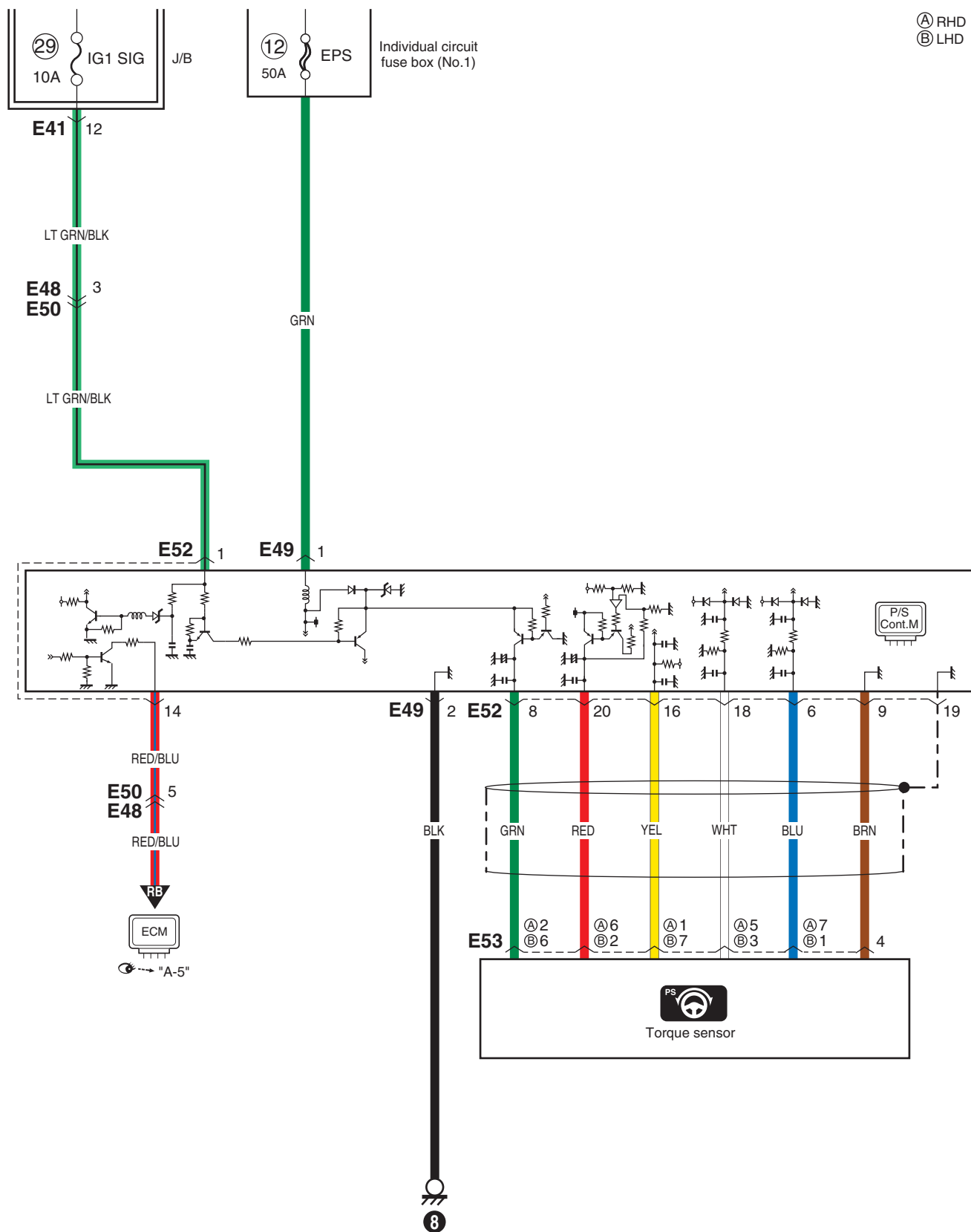


I6RS0B910967-03



F-4 Power Steering System Circuit Diagram

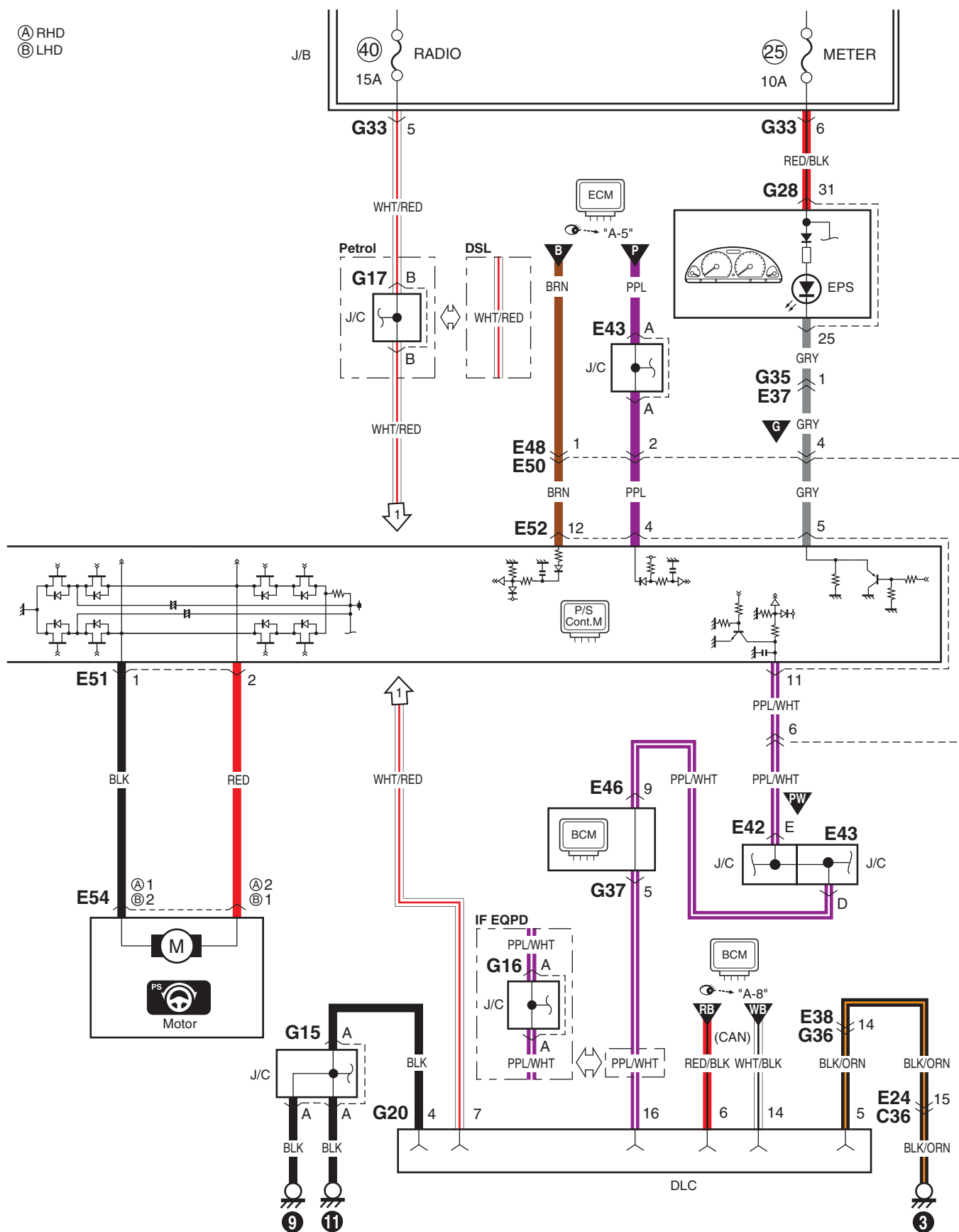
S6RS0B910E036



I4RS0B910965-02

9A-94 Wiring Systems:

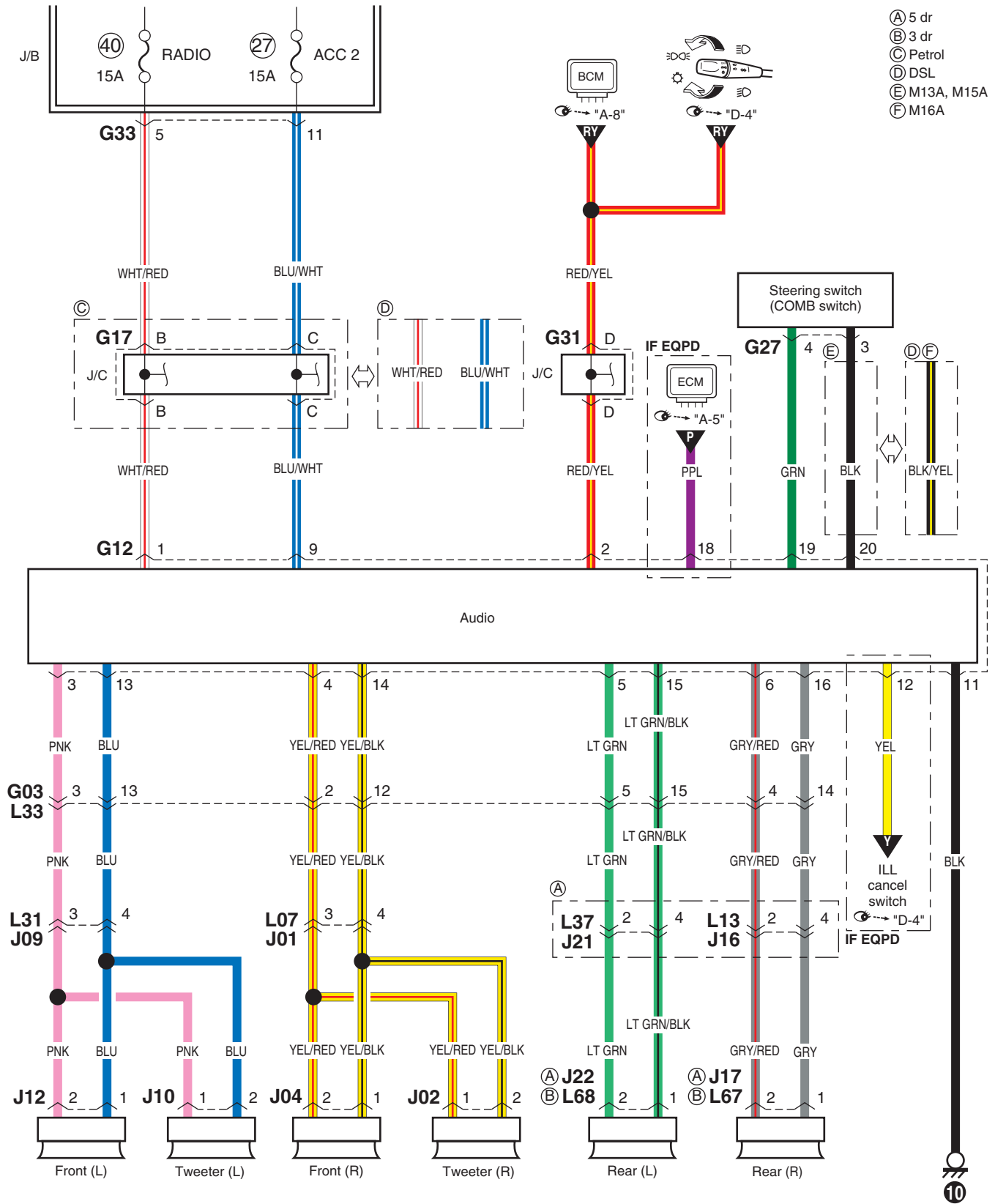
(A) RHD
 (B) LHD



I6RS0B910969-02

G-1 Audio System Circuit Diagram

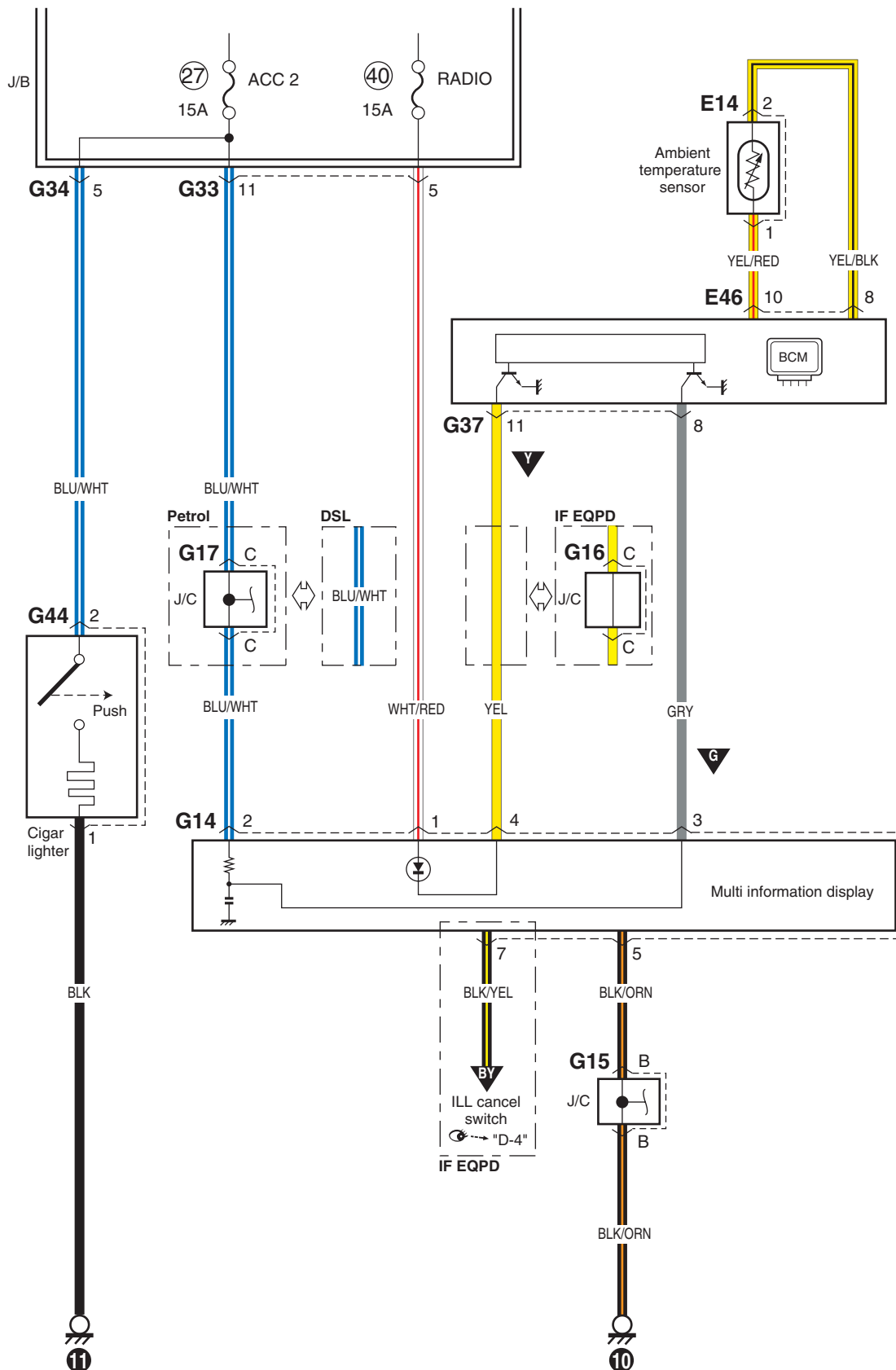
S6RS0B910E037



I6RS0B910970-03

G-2 Multi Information Display / Accessory Socket System Circuit Diagram

S6RS0B910E038



I6RS0B910971-03

List of Connectors

List of Connectors

S6RS0B910F001

Refer to "C Connector".

Refer to "D Connector (DSL) in related manual".

Refer to "E Connector".

Refer to "G Connector".

Refer to "J Connector in related manual".

Refer to "K Connector in related manual".

Refer to "L Connector".

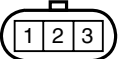
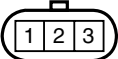
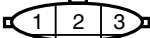
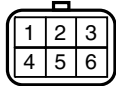
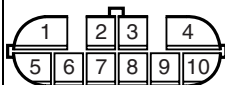
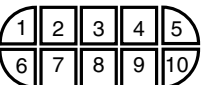
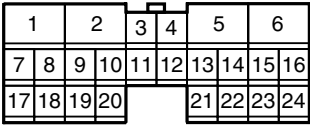
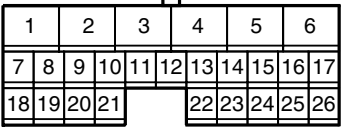
Refer to "M Connector (SPORT)".

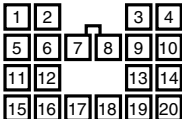
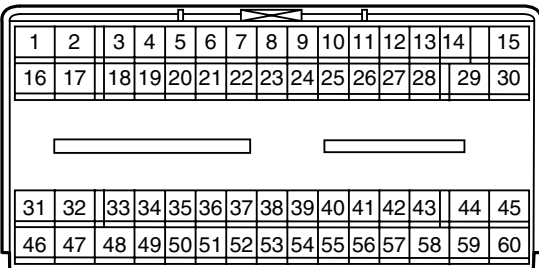
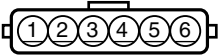
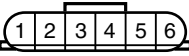
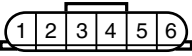
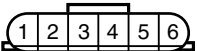
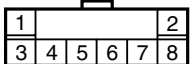
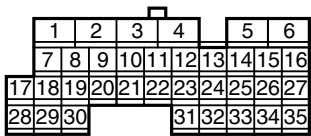
Refer to "O Connector in related manual".

Refer to "R Connector".

C Connector

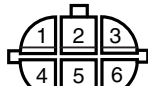
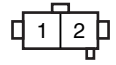
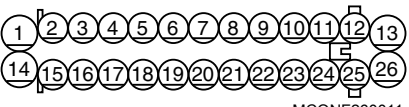
S6RS0B910F002

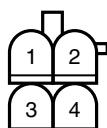
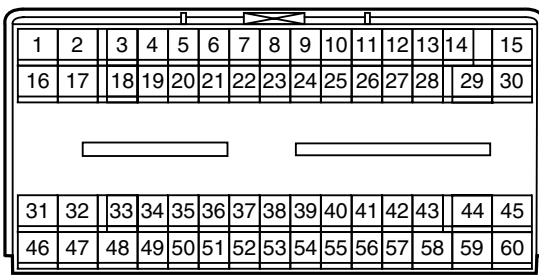
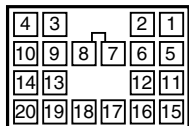
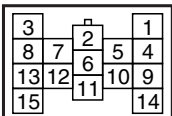
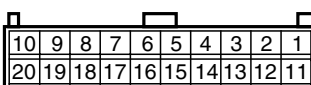
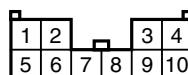
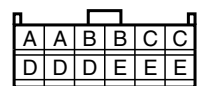
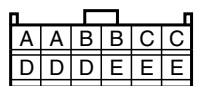
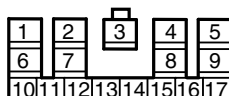
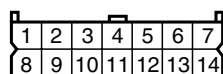
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C12  MCONF030084-01	C13  MCONF050025-01	C14  MCONF020156-01	C15  MCONF040008-01	C16  MCONF040024-01	C17  MCONF010076-01
C18  MCONF010027-01 M13A, M15A	C18  MCONF020240-01 M16A	C19  MCONF020042-01	C20  MCONF030052-01	C21  MCONF020194-01 M13A, M15A	C21  MCONF040127-01 M16A
C22  MCONF010057-03	C23  MCONF010019-01	C24  MCONF010077-03	C25  MCONF030052-01 M13A, M15A	C26  MCONF010054-01	C27  MCONF020064-01 A/T
C28  MCONF100053-01 A/T	C29  MCONF100048-01 A/T	C30  MCONF020156-01 M/T	C30  MCONF020186-01 Automated Manual Transaxle	C31  MCONF010078-01	
C33  MCONF010047-01 M13A, M15A	C33  MCONF010082-01 M16A	C34  MCONF240011-01 A/T	C35  MCONF260014-01 A/T		

C36 (TO E24)  MCONF200011-01	C37  MCONF600002-01	C38  MCONN000002-01			
C39  MCONN000002-01	C40  MCONN000002-01	C41  MCONN000002-01	C42  MCONF060068-01 M16A, Automated Manual Transaxle	C43  MCONF060069-01 Automated Manual Transaxle	C44  MCONF060069-01 Automated Manual Transaxle
C45  MCONF060069-01 Automated Manual Transaxle	C46  MCONF020226-01 Automated Manual Transaxle	C47  MCONF020226-01 Automated Manual Transaxle	C49  MCONF020060-01 Automated Manual Transaxle	C50  MCONF020227-01 Automated Manual Transaxle	C51  MCONF080034-01 Automated Manual Transaxle
C52  MCONF350004-01 Automated Manual Transaxle	C53 (TO E60)  MCONF010081-01 Automated Manual Transaxle	C54  MCONM010019-03 DSL	C55  MCONF010074-01 DSL	C56  MCONF010072-03 DSL	
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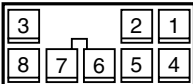
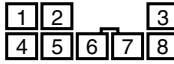
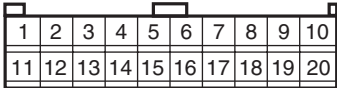
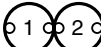
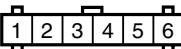
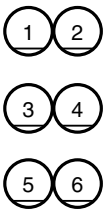
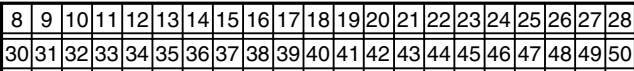
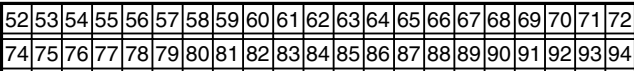
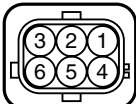
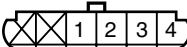
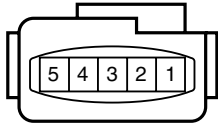
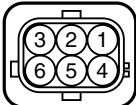
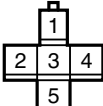
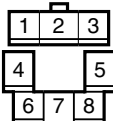
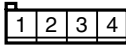
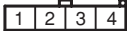
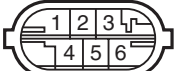
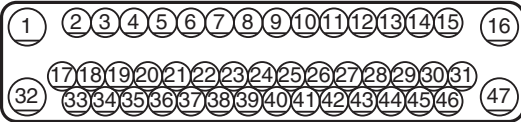
E Connector

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MCONF060062-01	MCONF020184-01	MCONF260011-01		MCONF030062-01	MCONF030097-01
				Petrol	DSL
E05	E06	E07	E08	E09	E10
					
MCONM020043-01	MCONF020196-01	MCONF020013-01	MCONF030101-01	MCONF020197-01	MCONF020008-01

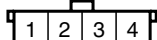
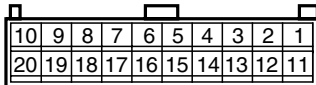
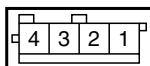
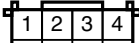
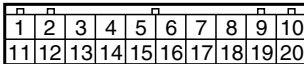
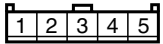
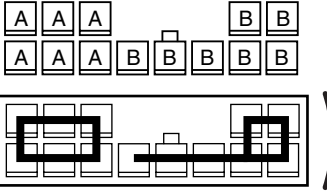
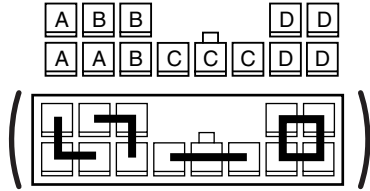
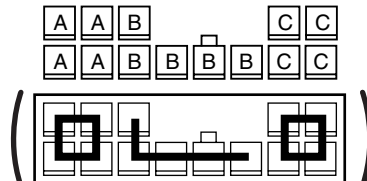
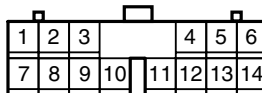
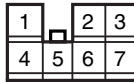
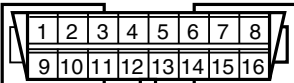
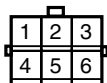
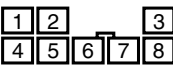
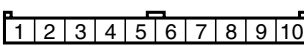
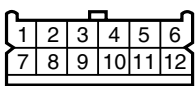
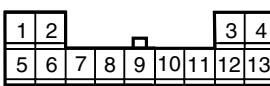
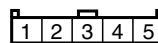
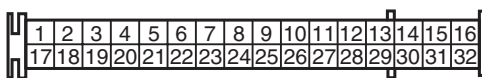
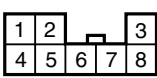
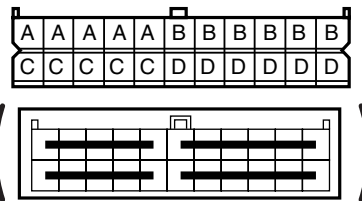
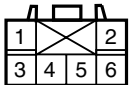
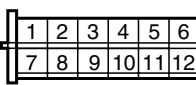
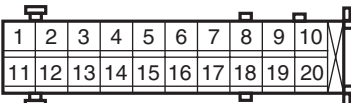
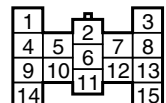
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E18  MCONF020198-01	E19  MCONF020196-01	E20  MCONF020197-01	E21  MCONF030101-01	E22  MCONF020013-01	
E23  MCONF600003-01 Petrol			E24 (TO C36)  MCONF200005-01 Petrol		E25  MCONM020043-01
E26  MCONF020170-01					
E27  MCONF020169-01	E28  MCONF050015-01	E29  MCONF050015-01	E30  MCONF050015-01	E31  MCONF040004-01	E32  MCONF040004-01 Petrol
E33  MCONF040004-01 Petrol	E34  MCONF040004-01	E35  MCONF040004-01	E36  MCONF040004-01	E37 (TO G35)  MCONM150001-01	
E38 (TO G36)  MCONM200008-01		E39  MCONF100003-01	E40  MCONF020202-01	E41  MCONF160034-01	
E42  MCONF120027-01	E43  MCONF120027-01				
E44 (TO L03)  MCONF040095-01					
E45 (TO L02)  MCONF170005-01		E46  MCONF140012-01		E47  MCONF040016-01 M/T, A/T	E47  MCONF040045-01 Automated Manual Transaxle, DSL

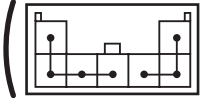
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E53  MCONF070015-01	E54  MCONF020205-01	E56  MCONF040004-01 Petrol	E58  MCONF030096-01	E59  MCONF030096-01	
E60 (TO C53)  MCONM010032-02 Petrol	E61  MCONF060068-01 Petrol	E61  MCONF060057-01 DSL			
E62   7 29  8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50  51 73  52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 MCONF940001-01 DSL	E63 (TO D12)  MCONM060024-01 DSL	E64  MCONF040085-01 DSL			
E65 (TO C60)  MCONF040045-01 DSL	E66  MCONF010074-01 DSL	E67  MCONF020204-01 DSL	E68  MCONM050007-01 DSL	E69 (TO D13)  MCONM060024-01 DSL	E70  MCONF020181-01 DSL
E71  MCONF050029-01 DSL	E72  MCONF040007-01 DSL	E73  MCONF080023-01 DSL	E74  MCONF040084-01 DSL	E75  MCONF020148-01 DSL	E76  MCONF010074-01 DSL
E77  MCONF040004-01 DSL	E78  MCONF050015-01 DSL	E79  MCONF040004-01 DSL	E80  MCONF040004-01 DSL	E81  MCONF040004-01 DSL	E82  MCONF020189-01 DSL
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G Connector

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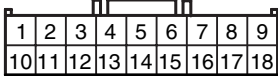
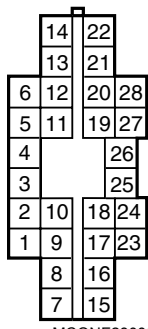
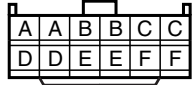
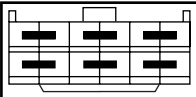
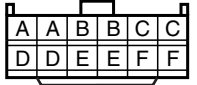
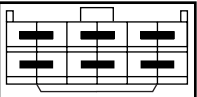
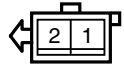
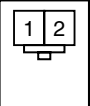
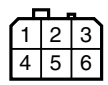
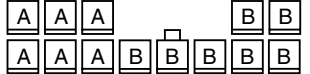
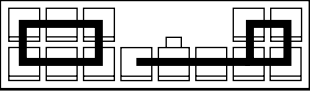
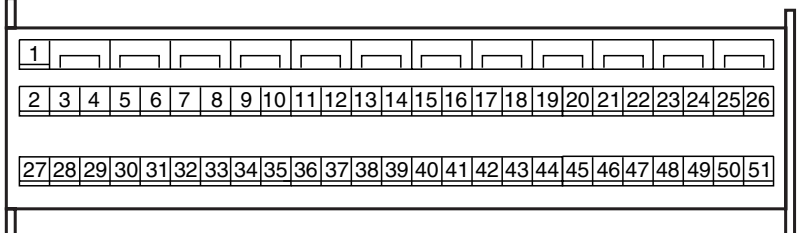
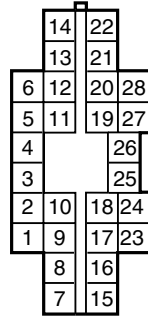
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G06  MCONF040097-01	G09  MCONF020112-01	G10  MCONF020212-01	G11  MCONF040098-01	G12  MCONF200014-01
G13  MCONF050021-01	G14  MCONF070004-01	G15  MCONF130007-01	G16  MCONF130008-01	
G17  MCONF130009-01 Petrol	G18  MCONF140018-01	G19  MCONF070016-01		
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G24  MCONF120026-01	G25  MCONF130010-01	G26  MCONF020212-01	G27  MCONF050021-01	
G28  MCONF320005-01	G29  MCONF080002-01	G31  MCONF220011-01		
G32  MCONF060064-01	G33  MCONF120028-01	G34  MCONF200020-01	G35 (TO E37)  MCONF150002-01	

G36 (TO E38) <table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr></table> MCONF200021-01		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	G37 <table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr><tr><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td></tr></table> MCONF220009-01		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	G39 <table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr></table> MCONF100060-01		1	2	3	4	5	6	7	8	9	10	G40 <table><tr><td>1</td><td></td><td></td><td>2</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td></tr></table> MCONF060025-01		1			2	3	4	5	6				
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G53 <table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr></table> MCONF060080-01 IF EQPD		1	2	3	4	5	6	G54 <table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr></table> MCONF060053-01 IF EQPD		1	2	3	4	5	6	G55 <table><tr><td>1</td><td>2</td></tr></table> MCONF020151-01 IF EQPD		1	2	G56 <table><tr><td>1</td><td>2</td></tr></table> MCONF020148-01 IF EQPD		1	2																																																
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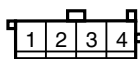
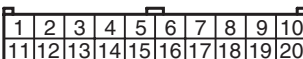
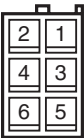
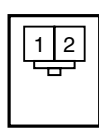
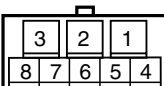
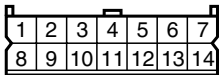
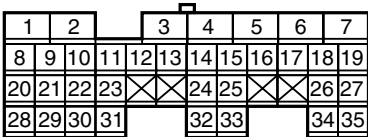
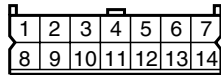
L Connector

S6RS0B910F007

L01 MCONF180012-01	L02 (TO E45) MCONM170001-01		L03 (TO E44) MCONM040022-01	L04 MCONF040033-01
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L05  MCONF180013-01	L06  MCONF160014-01	L07 (TO J01)  MCONF280006-01	L08  () MCONF120029-01	L09  () MCONF120029-01	L10  MCONF020209-01 L11  MCONF020210-01 IF EQPD
L12  MCONF010060-01	L13 (TO J16)  MCONM060032-01	L14  MCONM020044-01	L15 (TO R01)  MCONF040123-01	L16  MCONF010060-01	L17  MCONM020045-01
L18  MCONF020207-01 IF EQPD	L19  MCONF020211-01	L20  MCONF060044-01	L21 (TO L22)  MCONF020060-01	L22 (TO L21)  MCONM020043-01	L23  MCONF060044-01 A/T
L24  () MCONF130007-01	L25  MCONF020212-01 IF EQPD	L26  MCONF020151-01	L27  MCONF010030-01	L29  MCONF510002-01	L30  MCONF020212-01 IF EQPD L31 (TO J09)  MCONF280006-01

9A-104 Wiring Systems:

L32 (TO G04)	L33 (TO G03)	L34	L35	L36	
 MCONF040099-01	 MCONF200003-01	 MCONF010060-01	 MCONF020210-01 IF EQPD	 MCONF020209-01	
L37 (TO J21)	L38	L40	L41	L42 (TO O01)	L43
 MCONM060032-01	 MCONM020044-01	 MCONF010060-01	 MCONF020207-01 IF EQPD	 MCONM080013-01	 MCONF060044-01
L47	L48	L51 (TO G43)		L52	
 MCONF020013-01	 MCONF020013-01	 MCONF140012-01		 MCONF350005-01 Automated Manual Transaxle	
L54		L55	L59	L60	L61
 MCONF140012-01 Automated Manual Transaxle		 MCONF080035-01 Automated Manual Transaxle	 MCONF020197-01	 MCONF020060-01	 MCONF040095-01
L62	L63	L64	L65	L66	L67
 MCONF040095-01	 MCONF060025-01	 MCONF060025-01	 MCONF020228-01	 MCONF020228-01	 MCONF020008-01
L68	L69	L70 (TO M01)			
 MCONF020008-01	 MCONF060025-01 IF EQPD	 MCONM040027-01 SPORT			

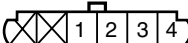
M Connector (SPORT)

S6RS0B910F011

M01 (TO L70)  MCONF040123-01	M02  MCONF020013-01	M03  MCONF020013-01	M04  MCONF020277-01	M05  MCONF020277-01	
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R Connector

S6RS0B910F009

R01 (TO L15)  MCONM040027-01	R02  MCONF040085-01
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Lighting Systems

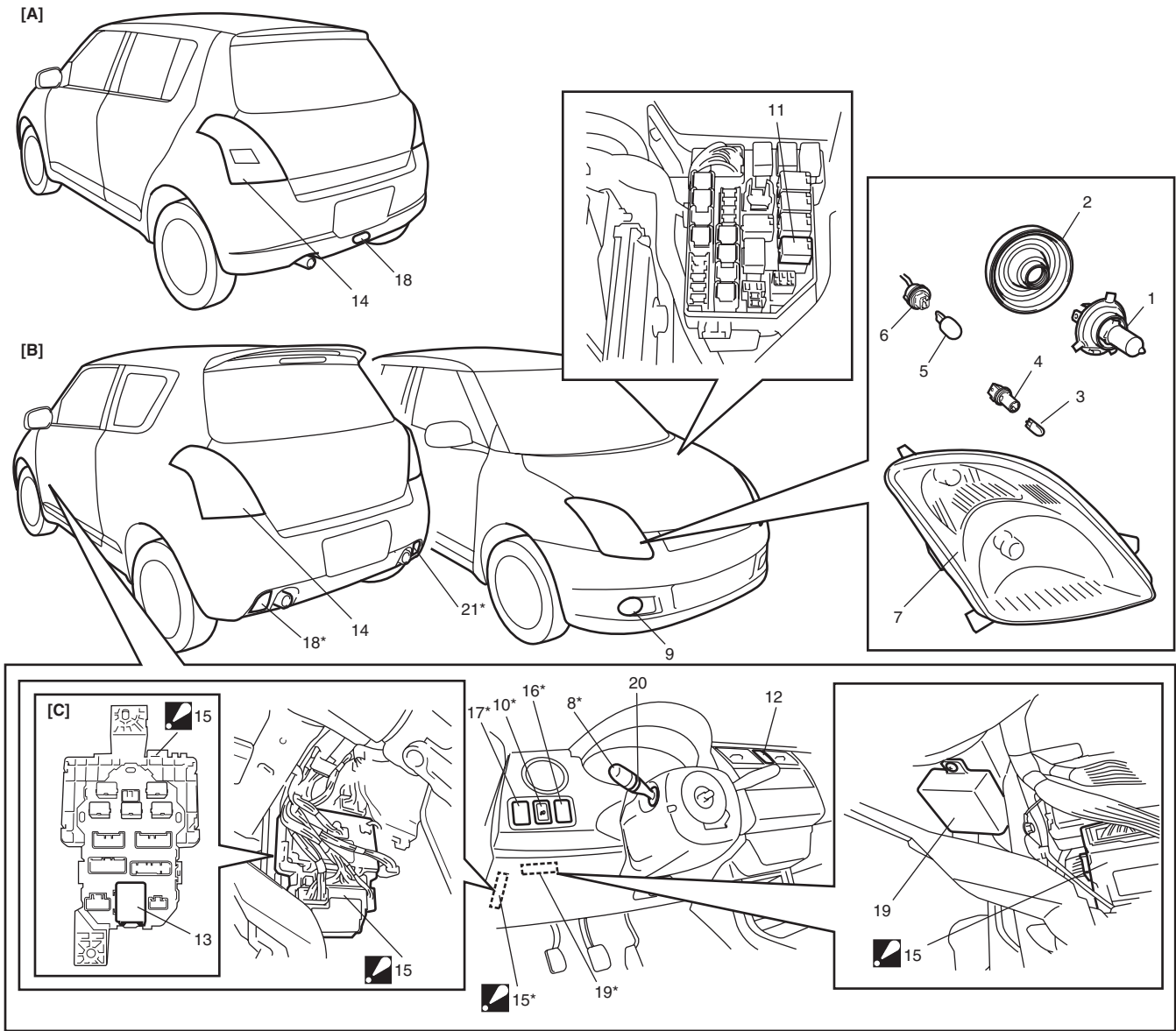
Component Location

Lighting System Components Location

S6RS0B9203001

NOTE

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



I6RS0B920001-02

[A]: Type A	6. Turn signal light bulb socket	14. Rear combination light
[B]: Type B	7. Headlight unit	15. BCM (included in junction block assembly : BCM cannot be removed from junction block.)
[C]: Junction block assembly viewed from relay side	8. Lighting switch	16. Illumination cancel switch (if equipped)
1. Headlight bulb	9. Front fog light (if equipped)	17. Headlight leveling switch (if equipped)
2. Socket cover	10. Front fog light switch (if equipped)	18. Rear fog light
3. Clearance light bulb	11. Front fog light relay (if equipped)	19. DRL controller (if equipped)
4. Clearance light bulb socket	12. Hazard warning switch	20. Rear fog light switch
5. Turn signal light bulb	13. Turn signal / hazard warning relay	21. Back-up light

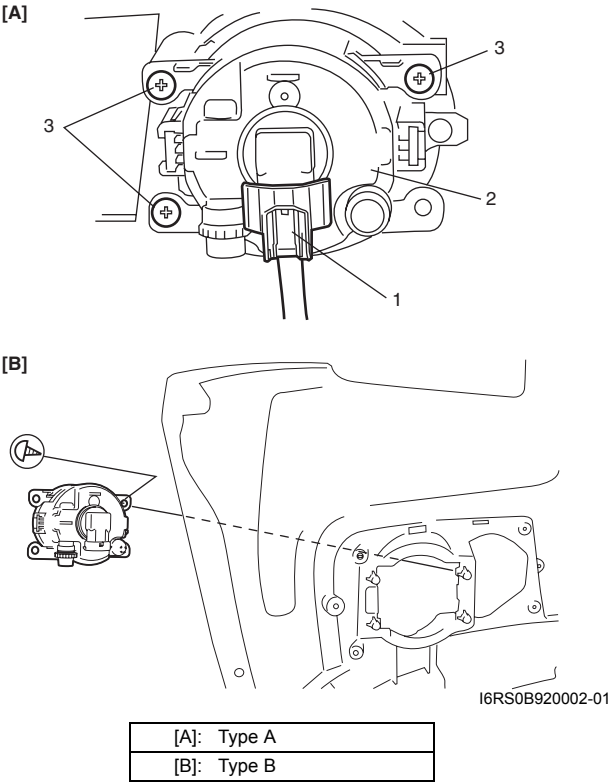
Repair Instructions

Front Fog Light Assembly Removal and Installation (If Equipped)

S6RS0B9206014

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove front bumper, and then remove front bumper guard from front bumper (if equipped) referring to “Front Bumper and Rear Bumper Components in Section 9K”.
- 3) Disconnect coupler (1) from fog light (2).
- 4) Remove fog light screws (3), and remove front fog light assembly (2).



Installation

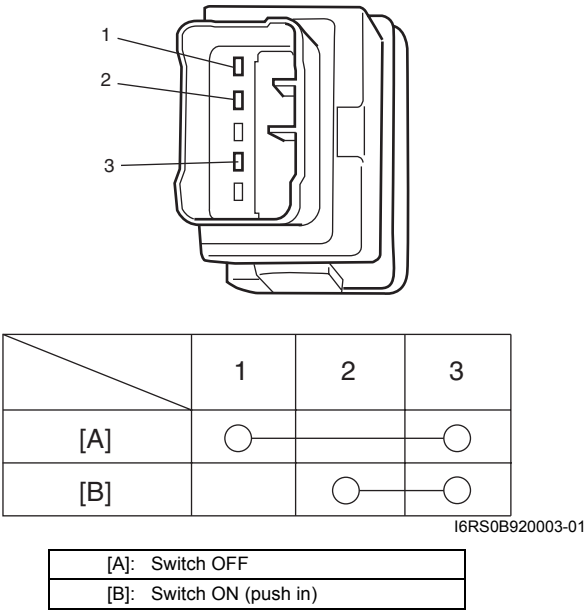
Reverse removal procedure for installation nothing the following:

- After installing, adjust aiming referring to “Front Fog Light Aiming Adjustment with Screen (If Equipped) in related manual”.

Illumination Cancel Switch (If Equipped) Inspection

S6RS0B9206022

Check for continuity between terminals at each switch position.
If check result is not as specified, replace switch.



Instrumentation / Driver Info. / Horn

General Description

CAN Communication Data of Combination Meter

S6RS0B9301001

Combination meter communicates with each control module about the following information. For details of CAN communication, refer to “CAN Communication System Description: For M13, M15 and M16 Engines in Section 1A” (petrol engine model) or “CAN Communication System Description: For Z13DT Engine in Section 1A in related manual” (diesel engine model).

Combination Meter Reception Data

		ECM	TCM (A/T model)	TCM (Automated Manual Transaxle model)	BCM	Keyless Start Control Module (if equipped)	ESP® Control Module (if equipped)
Combination Meter	← DATA Receive	Engine revolution speed signal	○				
		Engine coolant temperature signal	○				
		Vehicle speed signal	○				
		Glow plug indicator light control signal	○ *2				
		Service vehicle soon (SVS) lamp control signal	○ *2				
		Immobilizer indicator light control signal	○ *1				
		Malfunction indicator lamp (MIL) control signal	○ *1	○	○		
		Oil pressure warning light control signal	○ *2		○ *1		
		Transmission shift position signal		○	○		
		Transaxle warning light control signal			○		
		Automated Manual Transaxle mode indicator signal			○		
		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)			○		
		Lighting switch signal			○		
		Door switch signal (open door warning light control signal)			○		
		Diagnostic trouble code (DTC)			○		
		Key indicator light control signal				○	
		ABS warning light control signal					○
		EBD warning light control signal (brake warning light control signal)					○
		ESP® status signal					○

I6RS0B930001-01

NOTE

*1: Petrol engine model

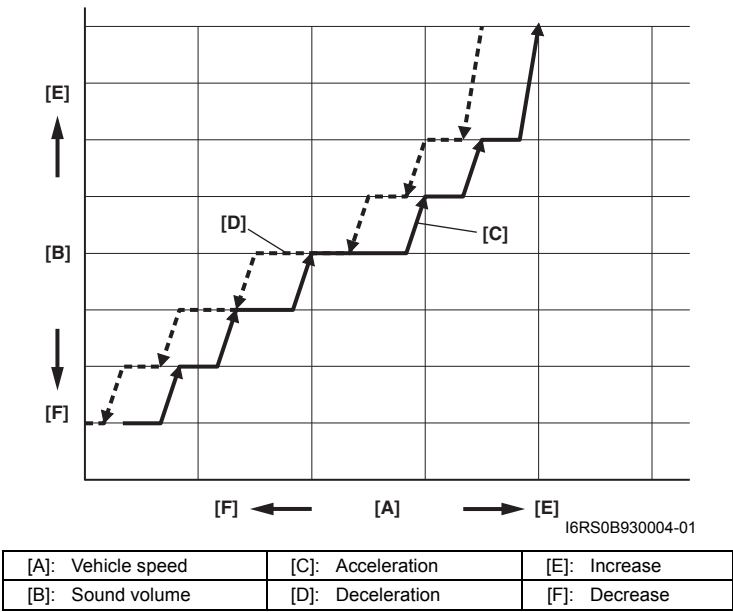
*2: Diesel engine model

Auto Volume Control System Description (If Equipped)

S6RS0B9301002

Function of auto volume control system is to vary sound volume according to changes of vehicle speed. How much sound volume varies depends on selected level.

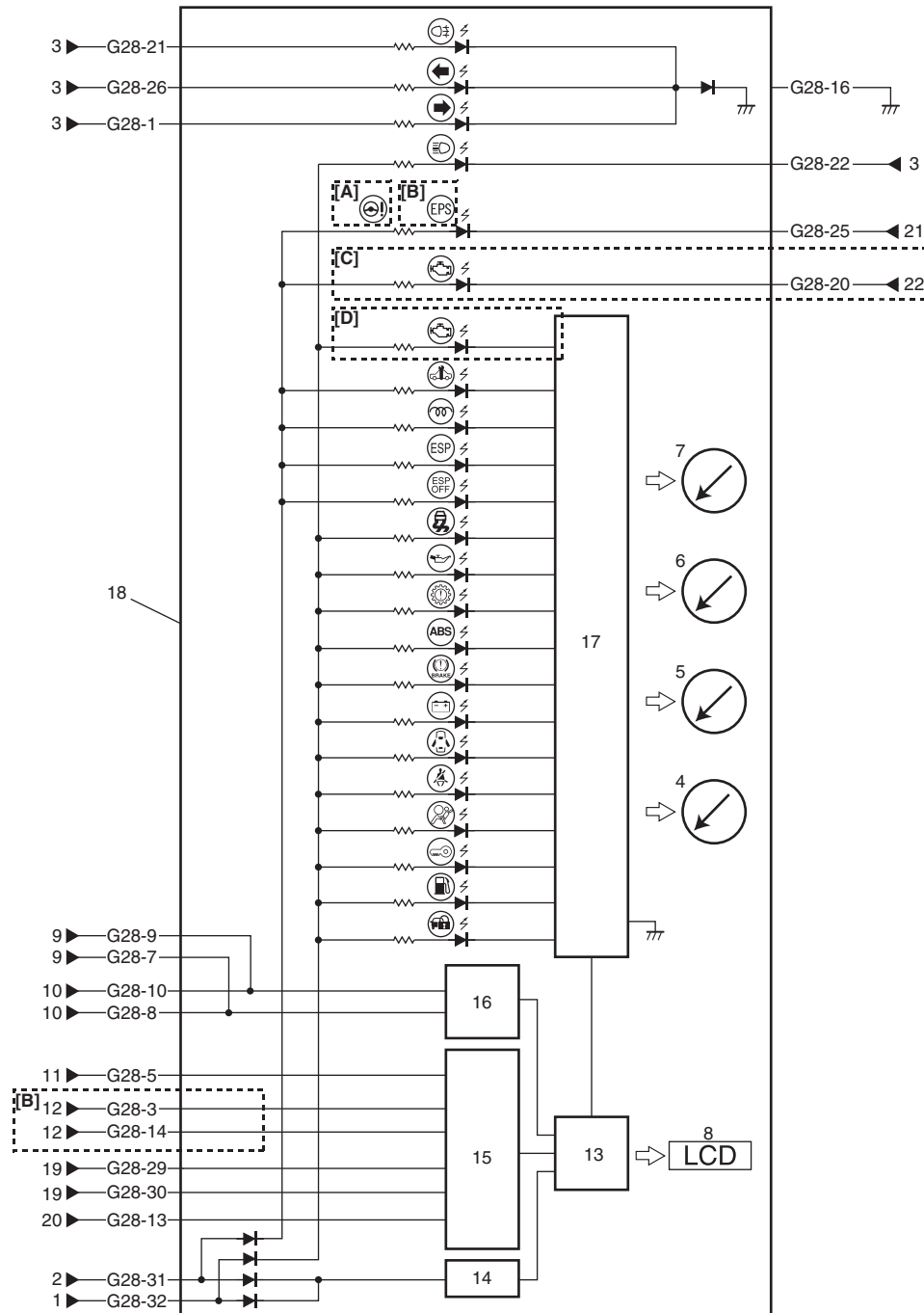
Reference Correlation Chart of Vehicle Speed and Sound Volume



Schematic and Routing Diagram

Combination Meter Circuit Diagram

S6RS0B9302001



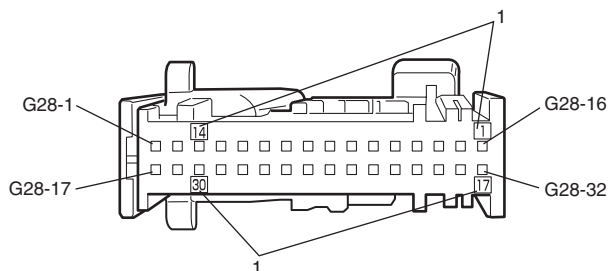
I6RS0B930002-02

[A]: With ESP® model	4. Tachometer	11. SDM	18. Combination meter
[B]: Without ESP® model	5. Speedometer	12. ABS control module	19. Fuel level sensor
[C]: Diesel engine model	6. Fuel meter	13. CPU	20. Illumination cancel switch (if equipped)
[D]: Petrol engine model	7. ECT meter	14. Power supply	21. P/S control module
1. RADIO fuse	8. ODO-TRIP	15. Interface circuit	22. ECM
2. METER fuse	9. Keyless start control module (if equipped)	16. CAN driver	
3. Combination switch	10. Each control module	17. Stepper motor and LED output driver	

Terminal arrangement of coupler viewed from terminal side

NOTE

Molded numbers (1) have no relation to the terminal numbers.



I4RS0A930003-02

Terminal	Circuit	Terminal	Circuit
G28-1	To turn signal light switch (turn R)	G28-17	—
G28-2	—	G28-18	—
G28-3	To ABS control module (EBD warning lamp control signal) (without ESP® model)	G28-19	—
G28-4	—	G22-20	To ECM (MIL control signal) (diesel engine model)
G28-5	To SDM (air bag indicator control signal)	G28-21	To rear fog light switch
G28-6	—	G28-22	To lighting switch (high beam)
G28-7	CAN communication line (Active High Signal)	G28-23	—
G28-8	CAN communication line (Active High Signal)	G28-24	—
G28-9	CAN communication line (Active Low Signal)	G28-25	To P/S control module (EPS warning light control signal)
G28-10	CAN communication line (Active Low Signal)	G28-26	To turn signal light switch (turn L)
G28-11	—	G28-27	—
G28-12	—	G28-28	—
G28-13	To illumination cancel switch	G28-29	To fuel level sensor ground
G28-14	To ABS control module (ABS warning lamp control signal) (without ESP® model)	G28-30	To fuel level sensor
G28-15	—	G28-31	To METER fuse
G28-16	GND	G28-32	To RADIO fuse

Diagnostic Information and Procedures

Speedometer and VSS Symptom Diagnosis

S6RS0B9304001

NOTE

Make sure that any DTC is not detected by all of ECM and TCM (A/T and Automated Manual Transaxle models), ABS control module (diesel engine model) or ESP® control module (with ESP® model) before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Speedometer shows no operation or incorrect operation	Circuit fuse blown	Replace fuse and check for short circuit.
	VSS faulty (M/T model without ESP® and Automated Manual Transaxle model)	Check VSS referring to "Vehicle Speed Sensor (VSS) Inspection (If Equipped): For M13, M15 and M16 Engines in Section 1C".
	Output shaft speed sensor / VSS faulty (A/T model)	Check output shaft speed sensor / VSS referring to "Output Shaft Speed Sensor (VSS) Inspection in Section 5A in related manual".
	Front wheel speed sensor or sensor encoder faulty (M/T model with ESP® and diesel engine model)	Check front wheel speed sensor or sensor encoder. Refer to "Front / Rear Wheel Speed Sensor On-Vehicle Inspection in Section 4F" or "Front Wheel Encoder On-Vehicle Inspection in Section 4F" (with ESP® model). Refer to "Front Wheel Speed Sensor On-Vehicle Inspection in Section 4E in related manual" or "Front Wheel Speed Sensor Ring On-Vehicle Inspection in Section 4E in related manual" (diesel engine model).
	Wiring or ground faulty	Repair circuit.
	Combination meter faulty	Replace combination meter.

Oil Pressure Warning Light Symptom Diagnosis

S6RS0B9304006

NOTE

Make sure that any DTC is not detected by ECM (diesel engine model) or BCM (petrol engine model) before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Oil pressure warning light does not light up when ignition switch is turned to ON position at engine off	Circuit fuse blown	Replace fuse and check for short circuit.
	Oil pressure switch faulty	Check oil pressure switch referring to "Oil Pressure Switch Inspection in related manual".
	Wiring or ground faulty	Repair circuit.
	Combination meter faulty	Replace combination meter.
Oil pressure warning light stays ON	Oil pressure switch faulty	Check oil pressure switch referring to "Oil Pressure Switch Inspection in related manual".
	Wiring or ground faulty	Repair circuit.
	Combination meter faulty	Replace combination meter.

Brake and Parking Brake Warning Light Symptom Diagnosis

S6RS0B9304007

NOTE

Make sure that any DTC is not detected by both BCM and ABS (ESP®) control module before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Brake warning light does not light up when brake fluid level is low or parking brake is pulled up or for 5 seconds after turning ON ignition switch (with ABS vehicle only)	Circuit fuse blown	Replace fuse and check for short circuit.
	Brake fluid level switch faulty	Check brake fluid level switch referring to "Brake Fluid Level Switch Inspection in related manual".
	Parking brake switch faulty	Check parking brake switch referring to "Parking Brake Switch Inspection in related manual".
	ABS (ESP®) system faulty	Refer to "ABS Check in Section 4E in related manual" (without ESP® model) or "Electronic Stability Program Check in Section 4F" (with ESP® model).
	Wiring or ground faulty	Repair circuit.
	Combination meter faulty	Replace combination meter.
Brake warning light stays ON	Brake fluid level switch faulty	Check brake fluid level switch referring to "Brake Fluid Level Switch Inspection in related manual".
	Parking brake switch faulty	Check parking brake switch referring to "Parking Brake Switch Inspection in related manual".
	EBD system faulty	Refer to "EBD Warning Lamp (Brake Warning Lamp) Check in Section 4E in related manual" (without ESP® model) or "EBD Warning Lamp (Brake Warning Lamp) Check (with ESP® Model) in Section 4F" (with ESP® model).
	Wiring or ground faulty	Repair circuit.
	Combination meter faulty	Replace combination meter.

Information Display Symptom Diagnosis (If Equipped)

S6RS0B9304016

NOTE

- This thermometer indicates the ambient temperature in back of front bumper member. Under any one of the following listed conditions, however, even when the ambient temperature goes up, the thermometer display does not rise so as to correct the rise of the ambient temperature caused by the radiant heat of the engine. When the ambient temperature drops, the thermometer reading follows the change in the temperature.
Be sure to bear this in mind when diagnosing trouble.
 - The vehicle speed is 30 km/h (18 m.p.h.) or lower.
 - Vehicle speed signal is faulty.
 - The ignition switch is turned on again within 2 hours.
- Make sure that any DTC is not detected by all of BCM, ECM and TCM (A/T and Automated Manual Transaxle models), ABS control module (diesel engine model) or ESP® control module (with ESP® model) before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
No displaying of information display	Circuit fuse Blown	Replace fuse and check for short circuit.
	Wiring and/or grounding faulty	Repair as necessary.
	Information display unit faulty	Replace unit.
Incorrect thermometer display	Outside air temperature sensor faulty	Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped) in related manual".
	Vehicle speed signal faulty	Check VSS or vehicle speed signal referring to "VSS Inspection".
	Wiring and/or grounding faulty	Repair as necessary.
	BCM faulty	Replace after making sure that none of above parts is faulty.
Display does not change at -30 °C	Outside air temperature is -30 °C (-22 °F) or less	—
	Outside air temperature sensor faulty	Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped) in related manual".
	BCM faulty	Replace after making sure that none of above parts is faulty.
Display does not change at 50 °C	Outside air temperature is 50 °C (122 °F) or more	—
	Outside air temperature sensor faulty	Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped) in related manual".
	BCM faulty	Replace after making sure that none of above parts is faulty.
Display of thermometer does not change at "- - - °C"	Outside air temperature sensor faulty	Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped) in related manual".
	Outside air temperature sensor circuit is open or short	Repair circuit.
	Wiring or grounding faulty	Repair circuit.
	BCM faulty	Replace after making sure that none of above parts is faulty.
Display of fuel consumption does not change at "- - - l / 100 km (km/l, MPG)"	Vehicle is not running (instantaneous fuel consumption mode)	—
	Fuel consumption was reset (average fuel consumption mode, if equipped)	Vehicle runs for a while.
	Vehicle speed signal faulty	Check VSS or vehicle speed signal referring to "VSS Inspection".
	Wiring or grounding faulty	Repair circuit.
	ECM faulty	Check input and output signal of ECM referring to "Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines in Section 1A" (petrol engine model) or "B-02, Data List: For Z13DT Engine in Section 1A in related manual" (diesel engine model).
	BCM faulty	Replace after making sure that none of above parts is faulty.

Audio System Symptom Diagnosis (If Equipped)

S6RS0B9304018

Radio

NOTE

Electronic part / system with undiagnosed problem may cause electromagnetic interference. Electromagnetic interference condition may have poor radio reception. To test for presence of electromagnetic interference in part / system, perform the following procedures.

1. Turn ignition switch to OFF.
2. Systematically disconnect the electronic part / system connector(s) one at a time.
3. Turn ignition switch to ON.
4. Check any improvement in radio reception.

Condition	Possible cause	Correction / Reference Item
Poor radio reception	Out of service area (Poor location)	—
	Antenna faulty	<i>Replace antenna.</i>
	Electrical part / system faulty	<i>Repair or replace electrical part / system referring to after-mentioned NOTE.</i>
	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
Radio does not operate and speaker does not sound	Circuit fuse(s) blown	<i>Replace fuse(s) and check for short circuit.</i>
	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
Radio does not operate, but speaker sound	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
Radio is operative, but all speakers does not sound	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
Individual speaker is noisy or inoperative	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Speaker faulty	<i>Replace speaker.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
Sound quality is poor	Out of service area (Poor location)	—
	Speaker installed incorrectly	<i>Install correctly.</i>
	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Speaker faulty	<i>Replace speaker.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>

CD Player

Condition	Possible cause	Correction / Reference Item
CD-ROM does not insert	Another CD-ROM already inserted	<i>Eject CD-ROM.</i>
	Circuit fuse blown	<i>Replace fuse and check for short circuit.</i>
	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Extraneous material come to be mixed CD player	<i>Clear extraneous material from CD player or replace radio assembly.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
CD-ROM does not eject	Circuit fuse blown	<i>Replace fuse and check for short circuit.</i>
	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Extraneous material come to be mixed in CD player	<i>Clear extraneous material from CD player or replace radio assembly.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
CD player does not load CD-ROM	CD-ROM faulty	—
	CD-ROM inserted with incorrect side up	<i>Insert correctly.</i>
	Temperature in cabin is too hot	—
	Water droplets form on internal lens	<i>Dry about 1 hour with power on.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
Sound skips or is noisy	CD-ROM faulty	—
	Driving vibration	—
	Water droplets form on internal lens	<i>Dry about 1 hour with power on.</i>
	Radio assembly installed incorrectly	<i>Install correctly.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
CD player is operative, but all speakers does not sound	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
Individual speaker is noisy or inoperative	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Speaker faulty	<i>Replace speaker.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>
Sound quality or volume is poor	CD-ROM faulty	—
	Wiring and/or grounding faulty	<i>Repair as necessary.</i>
	Speaker installed incorrectly	<i>Install correctly.</i>
	Speaker faulty	<i>Replace speaker.</i>

Auto Volume Control System

Condition	Possible cause	Correction / Reference Item
Sound volume does not vary according to changes of vehicle speed	Auto volume control system is "OFF" mode	<i>Select auto volume control.</i>
	Vehicle speed signal faulty	<i>Check vehicle speed signal referring to "Vehicle Speed Signal Inspection (For Audio Unit) (If Equipped)".</i>
	Wiring or grounding faulty	<i>Repair circuit.</i>
	ECM faulty	<i>Check input and output signal of ECM.</i>
	Radio assembly faulty	<i>Replace radio assembly.</i>

Repair Instructions

VSS Removal and Installation

S6RS0B9306008

For removal and installation, refer to "Vehicle Speed Sensor (VSS) Removal and Installation: For M13 Engine Model in Section 5B in related manual", "Vehicle Speed Sensor (VSS) Removal and Installation (If Equipped): For M15 and M16 Engines Model in Section 5B in related manual" (M/T model without ESP® and Automated Manual Transaxle model), "Output Shaft Speed Sensor (VSS) Removal and Installation in Section 5A in related manual" (A/T model), "Front Wheel Speed Sensor Removal and Installation in Section 4E in related manual" (diesel engine model) or "Front Wheel Speed Sensor Removal and Installation in Section 4F" (with ESP® model).

VSS Inspection

S6RS0B9306009

Refer to "Vehicle Speed Sensor (VSS) Inspection (If Equipped): For M13, M15 and M16 Engines in Section 1C" (M/T model without ESP® and Automated Manual Transaxle model), "Output Shaft Speed Sensor (VSS) Inspection in Section 5A in related manual" (A/T model), "Front Wheel Speed Sensor On-Vehicle Inspection in Section 4E in related manual" (diesel engine model) or "Front / Rear Wheel Speed Sensor On-Vehicle Inspection in Section 4F" (with ESP® model).

Remote Audio Control Switch Inspection

S6RS0B9306028

- 1) Remove driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation in Section 8B in related manual".
- 2) Disconnect remote audio control switch connector from contact coil.
- 3) Check switch for resistance between "a" and "b" terminals under each condition below.
If check result is not satisfactory, replace remote audio control switch.

Remote audio control switch resistance

All switches released (OFF): 5119 – 5223 Ω

Switch "1" pushing on (ON): 55 – 57 Ω

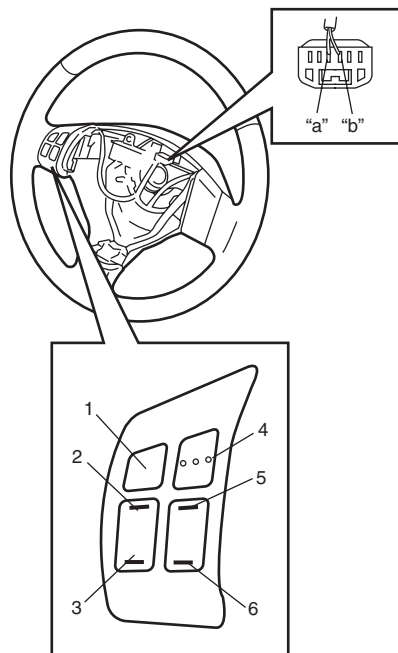
Switch "2" pushing on (ON): 129 – 133 Ω

Switch "3" pushing on (ON): 238 – 244 Ω

Switch "4" pushing on (ON): 416 – 426 Ω

Switch "5" pushing on (ON): 743 – 759 Ω

Switch "6" pushing on (ON): 1555 – 1587 Ω



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Vehicle Speed Signal Inspection (For Audio Unit) (If Equipped)

S6RS0B9306029

Check vehicle speed pulse output signal of ECM referring to "Reference waveform No.8" under "Inspection of ECM and Its Circuits: For M13, M15 and M16 Engines in Section 1A".

Glass / Windows / Mirrors

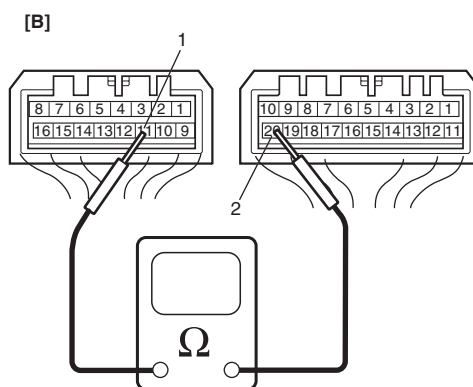
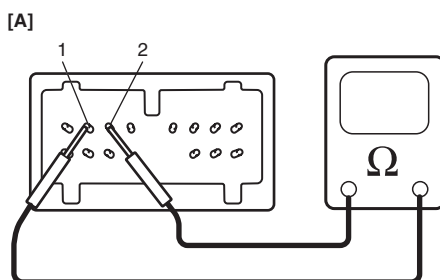
Repair Instructions

Rear End Door Window Defogger Switch Inspection

S6RS0B9506013

- 1) Check rear end door window defogger switch for operation as follows.
 - a) Rear end door window defogger switch is built in HVAC control unit.
Remove HVAC control unit referring to "HVAC Control Unit Removal and Installation in Section 7A in related manual" (manual A/C) or "HVAC Control Module Removal and Installation: Automatic Type in Section 7B" (automatic A/C).
 - b) Check that there is continuity between terminal (1) and terminal (2) of HVAC control unit when rear end door window defogger switch is at ON position. (Rear end door window defogger switch is kept in push.)
 - c) Check that there is no continuity between terminal (1) and terminal (2) of HVAC control unit when rear end door window defogger switch is at OFF position.

If check result does not meet the above conditions, replace HVAC control unit.



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[A]: Manual A/C

[B]: Automatic A/C

Security and Locks

Diagnostic Information and Procedures

Power Door Lock System Operation Inspection

S6RS0B9604002

- 1) Check the following operation:
- a) Turn the driver side key cylinder is turned LOCK once, check all doors lock.

b) Turn the driver side door key cylinder is turned UNLOCK position with door key twice, check all doors unlock.

c) With all doors unlocked, insert key in key cylinder of driver side door and turn it to lock side, turn it again to lock side within 3 seconds and check that no door can be opened even when door lock knob is moved to unlock side (deadlock function, if equipped).
- If malfunction is found, go to “Power Door Lock System Symptom Diagnosis in related manual”.

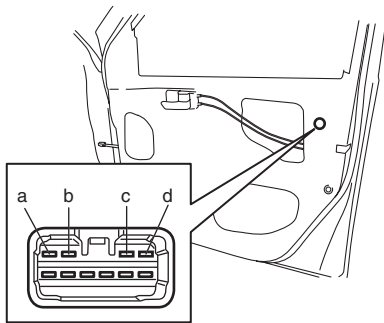
Repair Instructions

Power Door Lock Actuator Inspection (If Equipped)

S6RS0B9606006

- 1) Remove door trim from door panel.
- For front door, refer to Step 1) to 3) of “Front Door Glass Removal and Installation in Section 9E in related manual”.
- For rear door, refer to Step 1) to 3) of “Rear Door Glass Removal and Installation in Section 9E in related manual”.
- For rear end door, refer to Step 1) of “Rear End Door Assembly Removal and Installation in Section 9J in related manual”.
- 2) Disconnect power door lock actuator coupler.
- 3) Connect battery positive (+) and negative (–) terminals to the door lock actuator terminals (a, b, c, d) as shown in figure.
- If it does not operate as specified in the following table, replace door lock assembly.

For front door



[A]

Right side switch terminals	d	b
Left side switch terminals	a	c
Lock → Unlock	+	–
Unlock → Lock	–	+

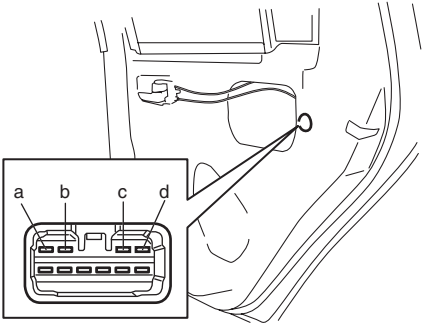
[B]

Right side switch terminals	d	b	a
Left side switch terminals	a	c	d
Unlock → Lock	–	+	–
Lock → Deadlock	–	+	+
Lock → Unlock	+	–	–
Deadlock → Unlock	+	–	–

I5RW0C960002-03

[A]: Without deadlock
[B]: With deadlock

For rear door



[A]

Right side switch terminals		a	c
Left side switch terminals		d	b
Lock	→	Unlock	$\oplus$ $\ominus$
Unlock	→	Lock	$\ominus$ $\oplus$

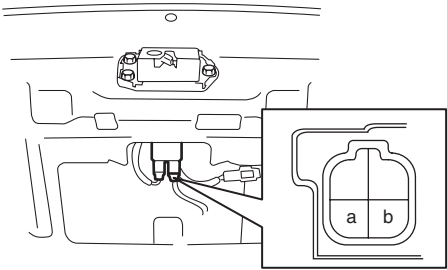
[B]

Right side switch terminals		a	c	d	
Left side switch terminals		d	b	a	
Unlock	→	Lock	⊖	⊕	⊖
Lock	→	Deadlock	⊖	⊕	⊕
Lock	→	Unlock	⊕	⊖	⊖
Deadlock	→	Unlock			

I5RW0C960001-03

[A]: Without deadlock
[B]: With deadlock

For rear end door



	a	b
Lock → Unlock	$\oplus$	$\ominus$

I5RW0C960003-03

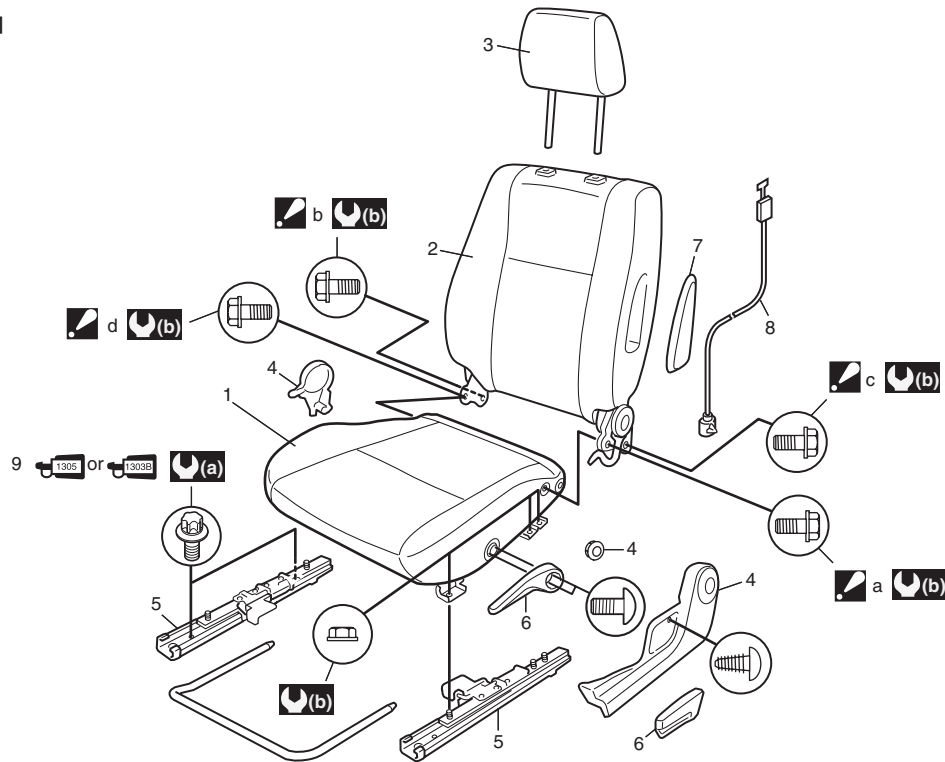
Seats

Repair Instructions

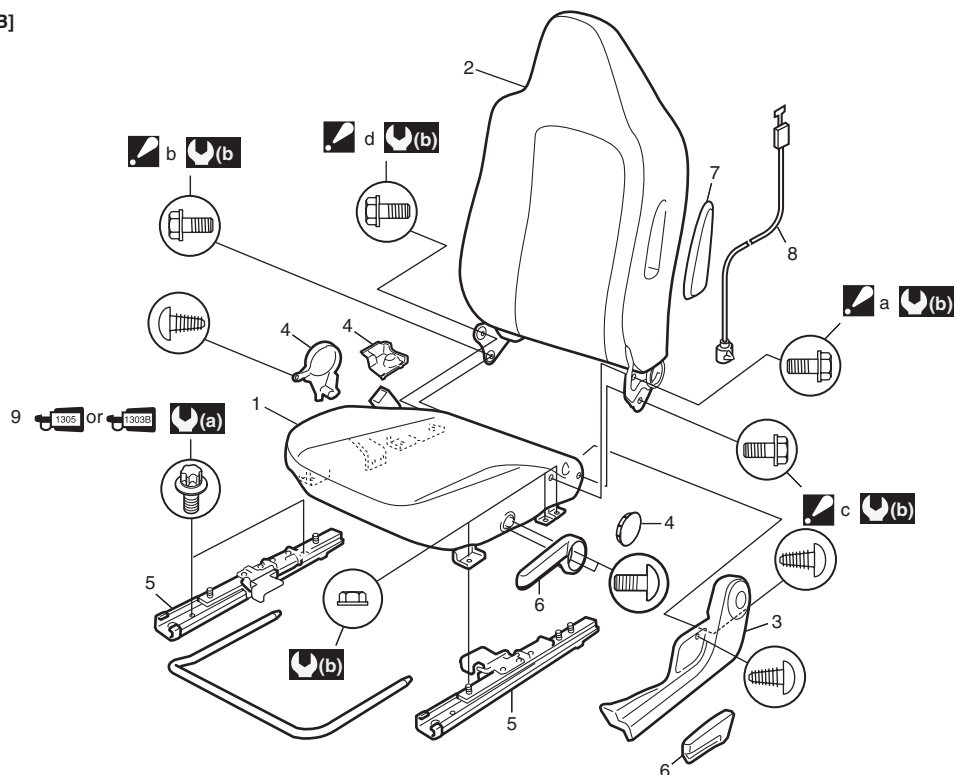
Front Seat Components

S6RS0B9706001

[A]



[B]



I6RS0B970002-02

[A]: Type A	3. Headrest	7. Side air bag module (if equipped)	(b) : 35 N·m (3.5 kgf·m, 25.5 lb·ft)
-------------	-------------	--------------------------------------	--------------------------------------

[B]: Type B	4. Cover	8. Side air bag harness (if equipped)	 a, b, c, d: Seat back mounting bolt Tightening order: a → b → c → d
1. Seat cushion	5. Seat adjuster	 1305 or  1303B 9. Seat mounting bolt : Apply thread lock 99000–32100 or 99000–32030 to all around thread part of bolt.	
2. Seat back	6. Knob	 (a) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)	

Front Seat Removal and Installation

S6RS0B9706002

Removal

- 1) Disable air bag system referring to “Disabling Air Bag System in Section 8B in related manual”.
- 2) Disconnect seat harness coupler, seat heater coupler and side air bag coupler, if equipped.
- 3) Remove 4 mounting bolts to remove seat assembly.
- 4) Disassemble and repair seat as necessary.

Installation

Reverse removal procedure to install front seat.

- Apply thread lock cement to seat mounting bolt.

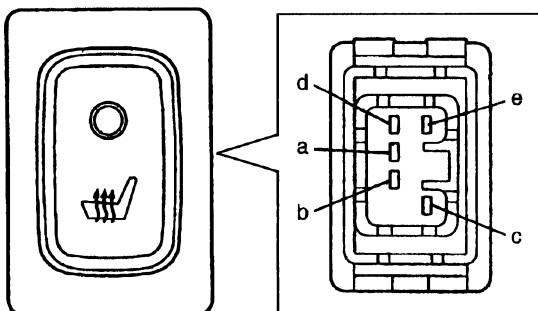
:Thread lock cement 99000–32100 or 99000–32030

- Torque to specifications as shown in “Front Seat Components”.
- Enable air bag system referring to “Enabling Air Bag System in Section 8B in related manual”.

Front Seat Heater Switch (Driver and Passenger Side) Inspection (If Equipped)

S6RS0B9706005

- 1) Confirm that ignition switch is OFF position.
- 2) Remove rear console box.
- 3) Disconnect seat heater switch coupler.
- 4) Check for continuity between terminals at each switch position as shown below. If check result is not as specified, replace.



TERMINAL POSITION	a	b	c	d	e
OFF					
ON					

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Front Seat Heater Wire Inspection (If Equipped)

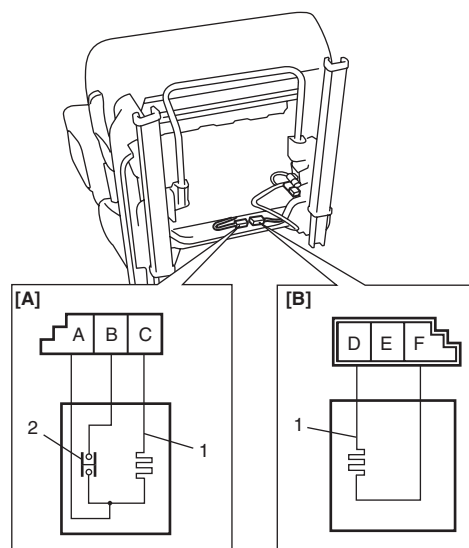
S6RS0B9706006

- 1) Confirm that seat heater switch is OFF position.
- 2) Disconnect coupler of seat heater under the seat cushion.
- 3) Measure resistance between terminals as shown below. If resistance is out of specification, replace faulty seat cushion and/or seat back including seat heater.

Seat heater circuit resistance

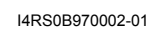
Seat cushion side [A] (between terminal “B” and “C”, between terminal “A” and “C”): 4.7 – 5.7 Ω (at 20 °C, 68 °F)

Seat back side [B] (between terminal “F” and “D”): 10.7 – 13.1 Ω (at 20 °C, 68 °F)



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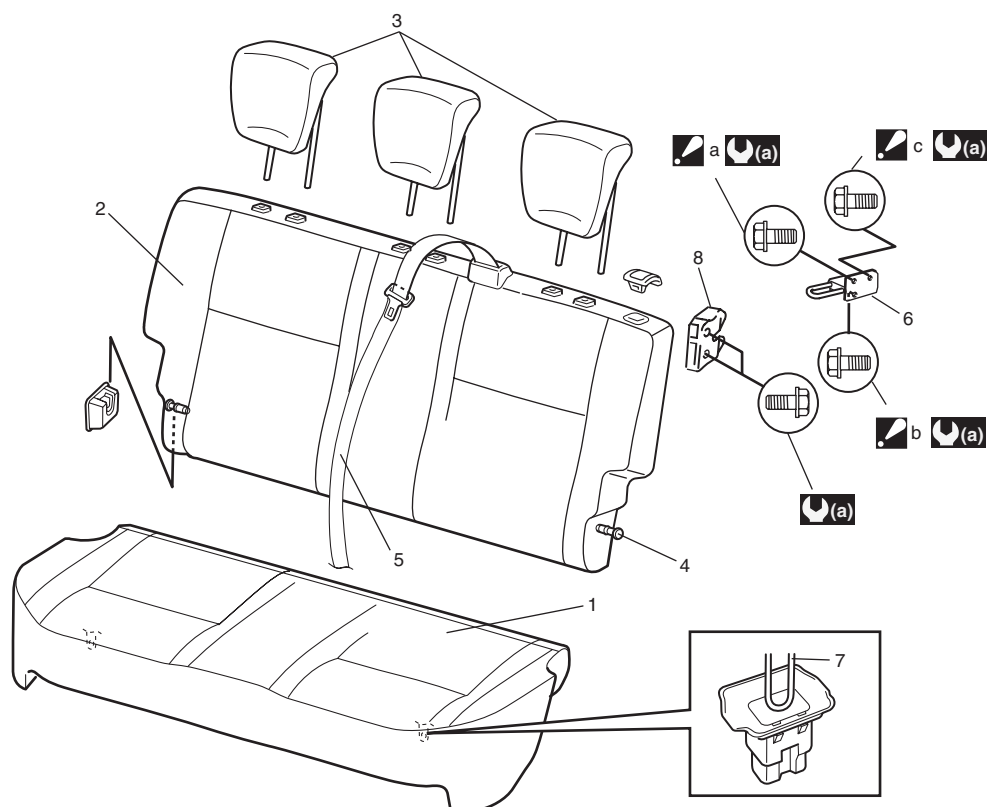
1. Heater wire	[A]: Seat cushion side
2. Thermostat	[B]: Seat back side



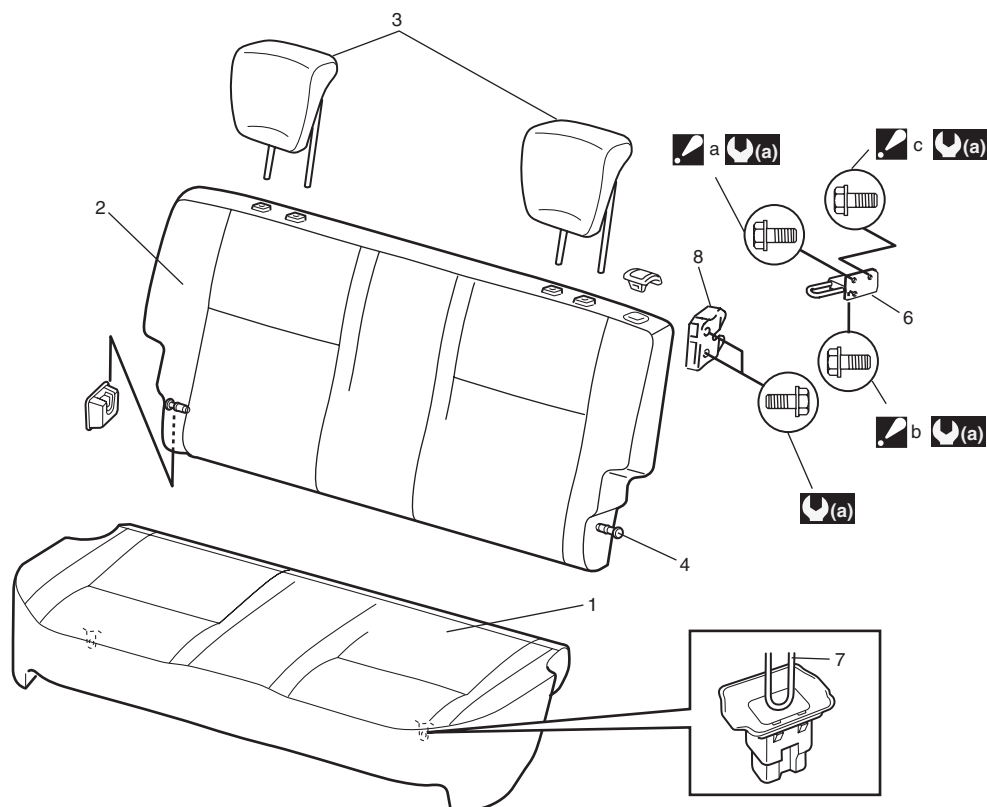
1. Seat cushion	5. Rear center seat belt (if equipped)	 (a) : 35 N·m (3.5 kgf-m, 25.5 lb-ft)	 a, b, c: Seat back striker mounting bolt : Tightening order (Left side): a→b→c : Tightening order (Right side): b→a→c
2. Seat back	6. Seat back striker	 (b) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)	
3. Head rest	7. Seat back lock	 (c) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)	
4. Cover	8. Seat cushion lock		

Bench Type

[A]



[B]



I6RS0B970003-01

[A]: Type A	3. Head rest	7. Front end hook	 a, b, c: Seat back striker mounting bolt : Tightening order (Left side): a→b→c : Tightening order (Right side): b→a→c
[B]: Type B	4. Seat back hinge	8. Seat back lock	
1. Seat cushion	5. Rear center seat belt (if equipped)	 (a) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)	
2. Seat back	6. Seat back striker		

Specifications

Tightening Torque Specifications

S6RS0B9707001

NOTE

The specified tightening torque is also described in the following.

“Front Seat Components: ”

“Rear Seat Components: ”

Reference:

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

Special Tools and Equipment

Recommended Service Material

S6RS0B9708001

NOTE

Required service material is also described in the following.

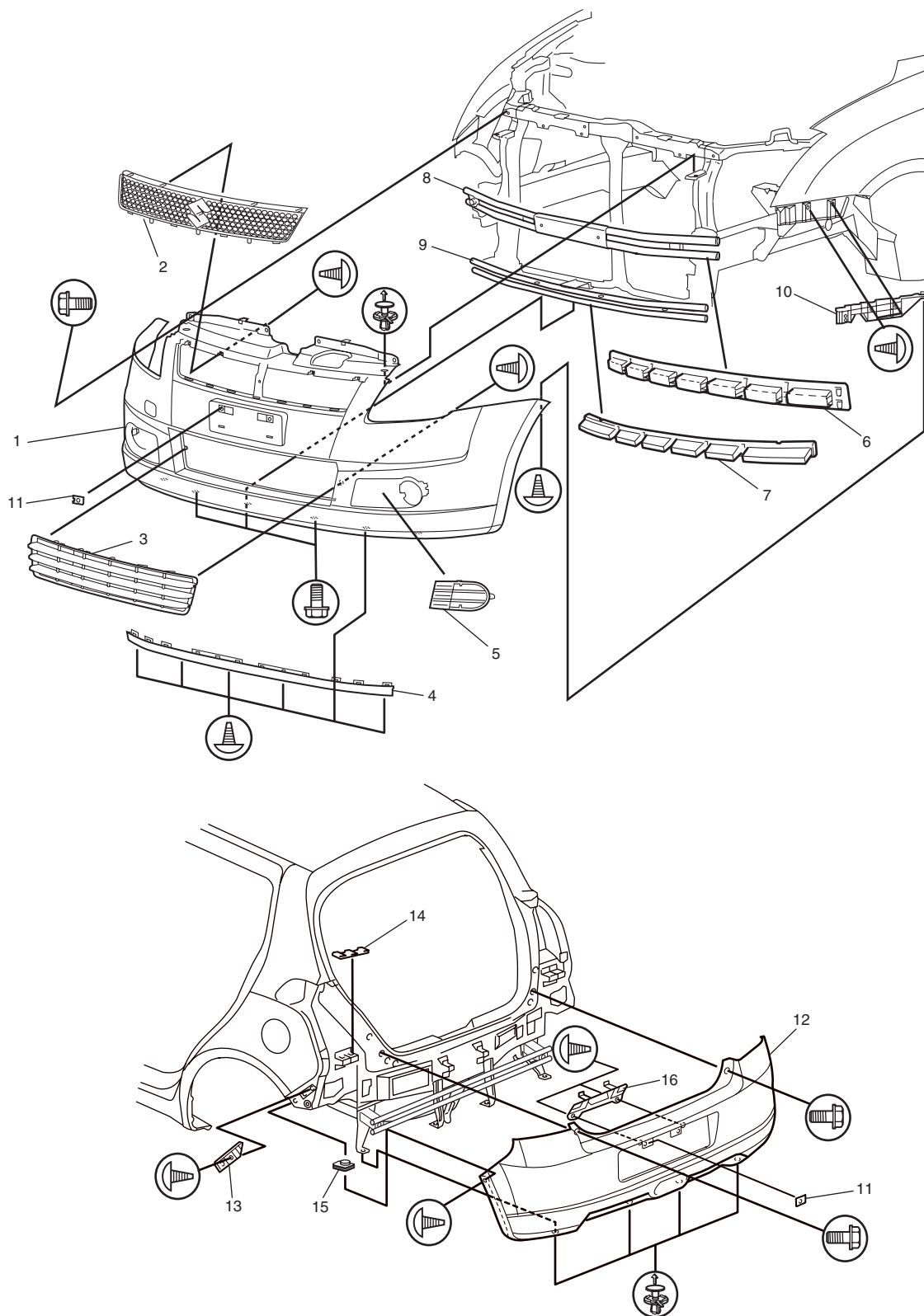
“Front Seat Components: ”

Body Structure

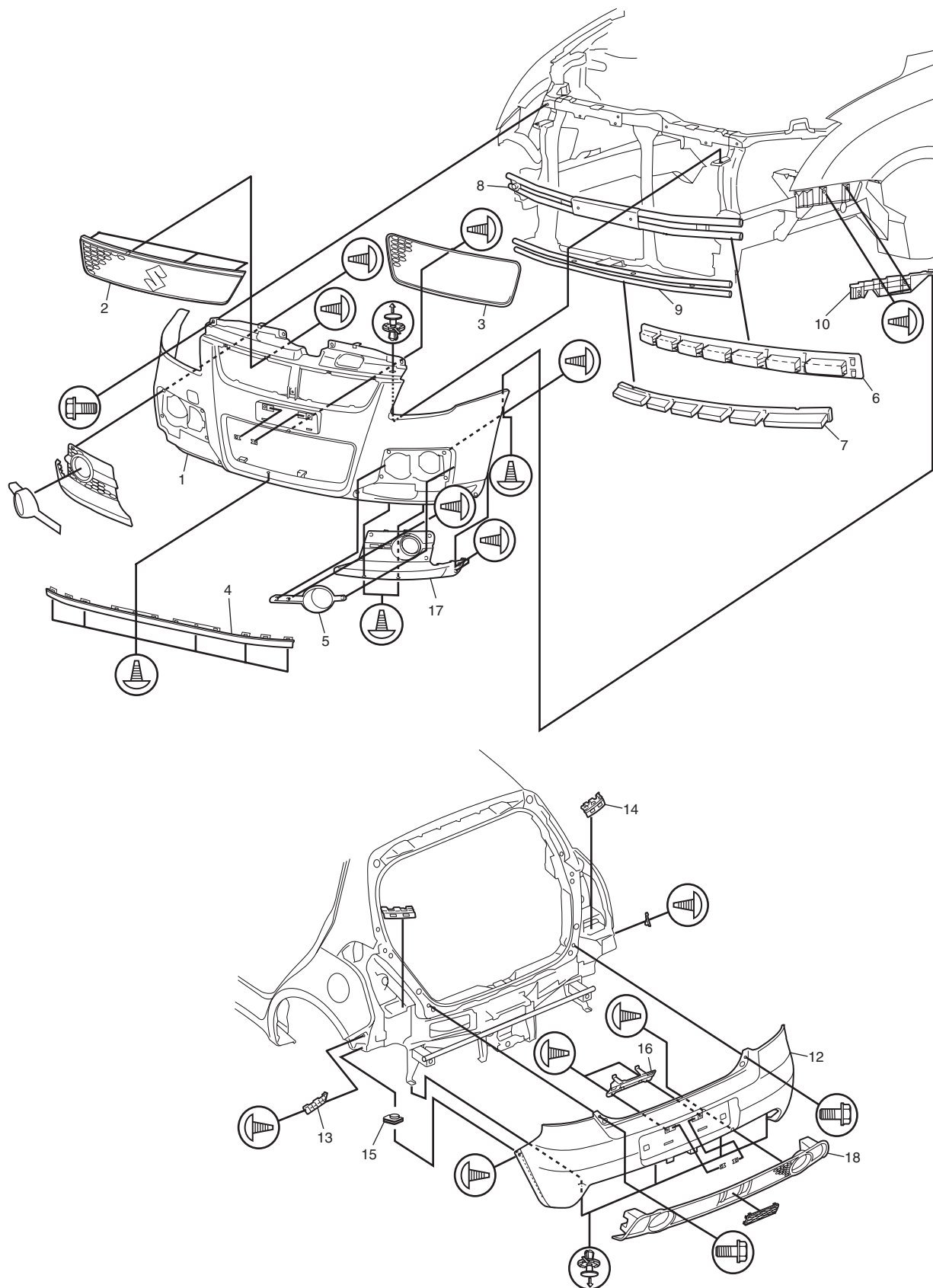
Repair Instructions

Front Bumper and Rear Bumper Components

S6RS0B9B06001



I6RS0B9B0001-02

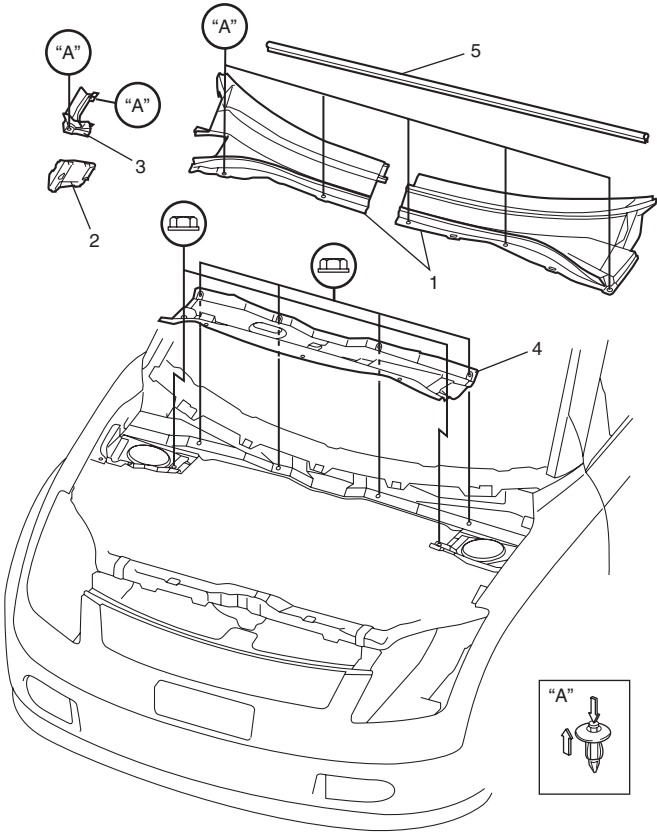


I6RS0B9B0002-02

[A]: Type A	4. Front air dam skirt	9. Front bumper lower member	14. Rear lamp holder
[B]: Type B	5. Front fog lamp cap	10. Front bumper holder	15. Plastic nut
1. Front bumper	6. Front bumper upper absorber	11. License plate nut	16. Rear license lamp stay
2. Radiator upper grill	7. Front bumper lower absorber	12. Rear bumper	17. Front bumper guard
3. Radiator lower grill	8. Front bumper upper member	13. Rear bumper holder	18. Rear bumper guard

Cowl Top Components

S6RS0B9B06002



I4RS0B9B0002-02

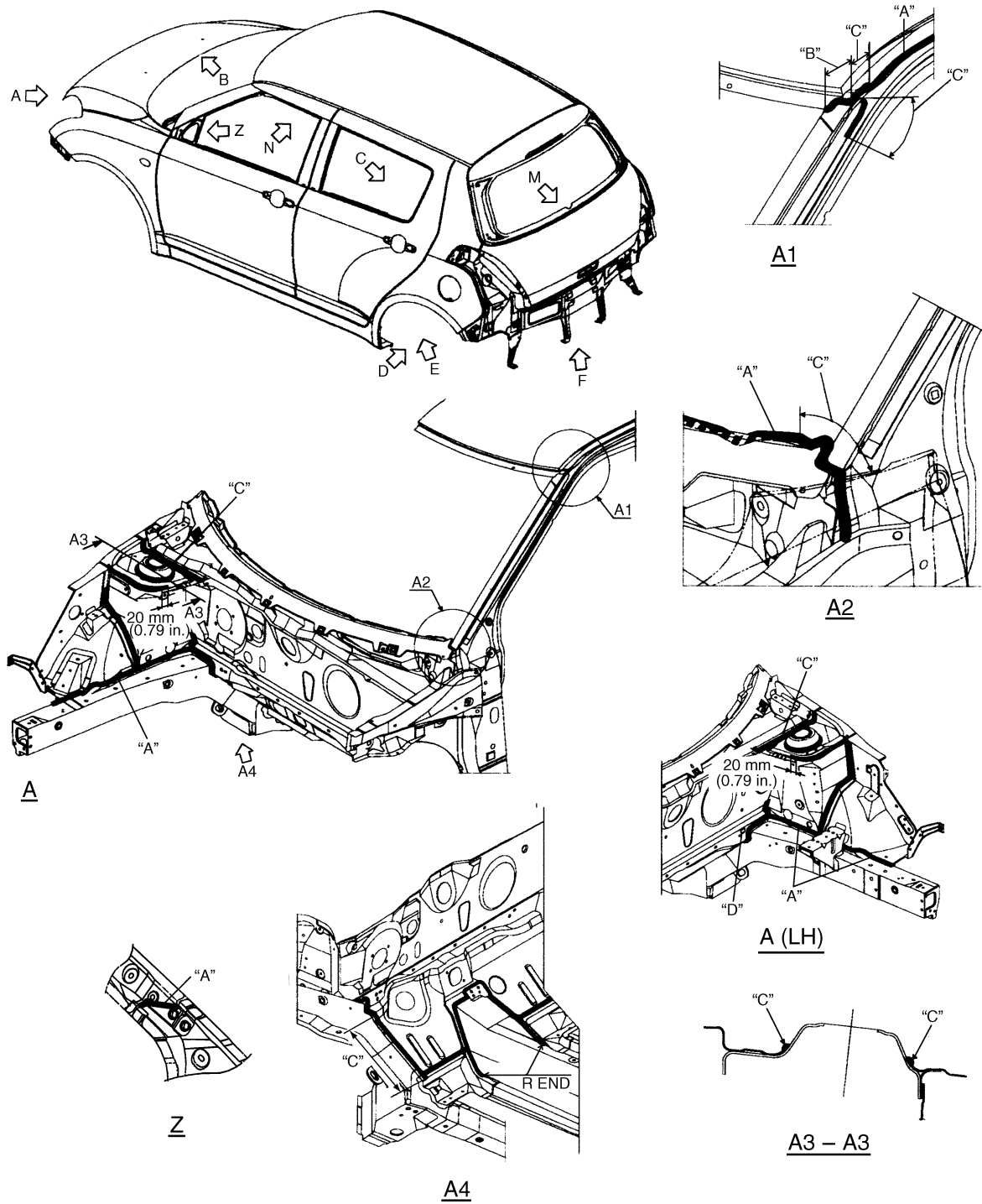
1. Cowl top cover	3. Cowl top side garnish	5. Hood rear seal
2. Cowl top cover lid (if equipped)	4. Cowl top panel	

Paint / Coatings

Component Location

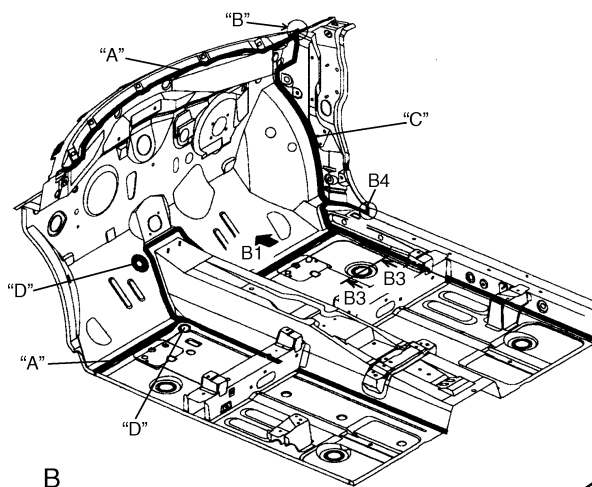
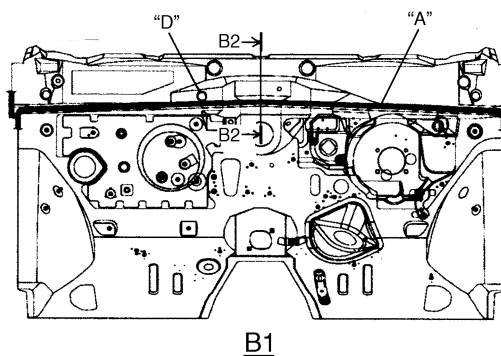
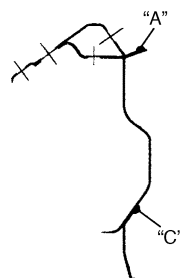
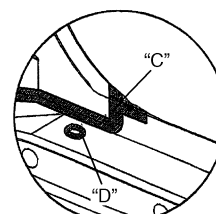
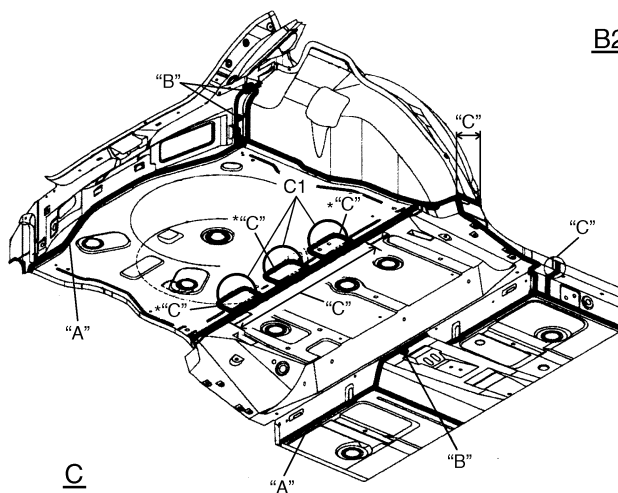
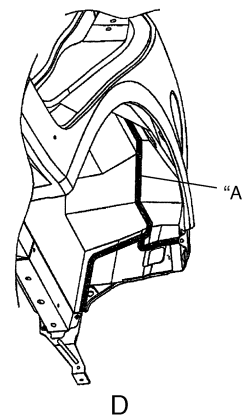
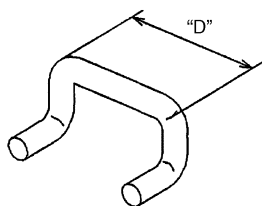
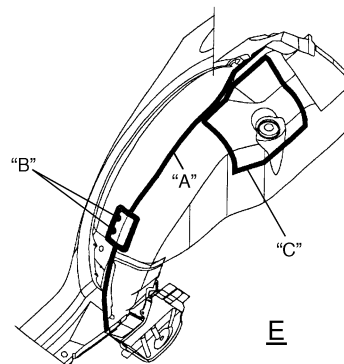
Sealant Application Areas

S6RS0B9C03001



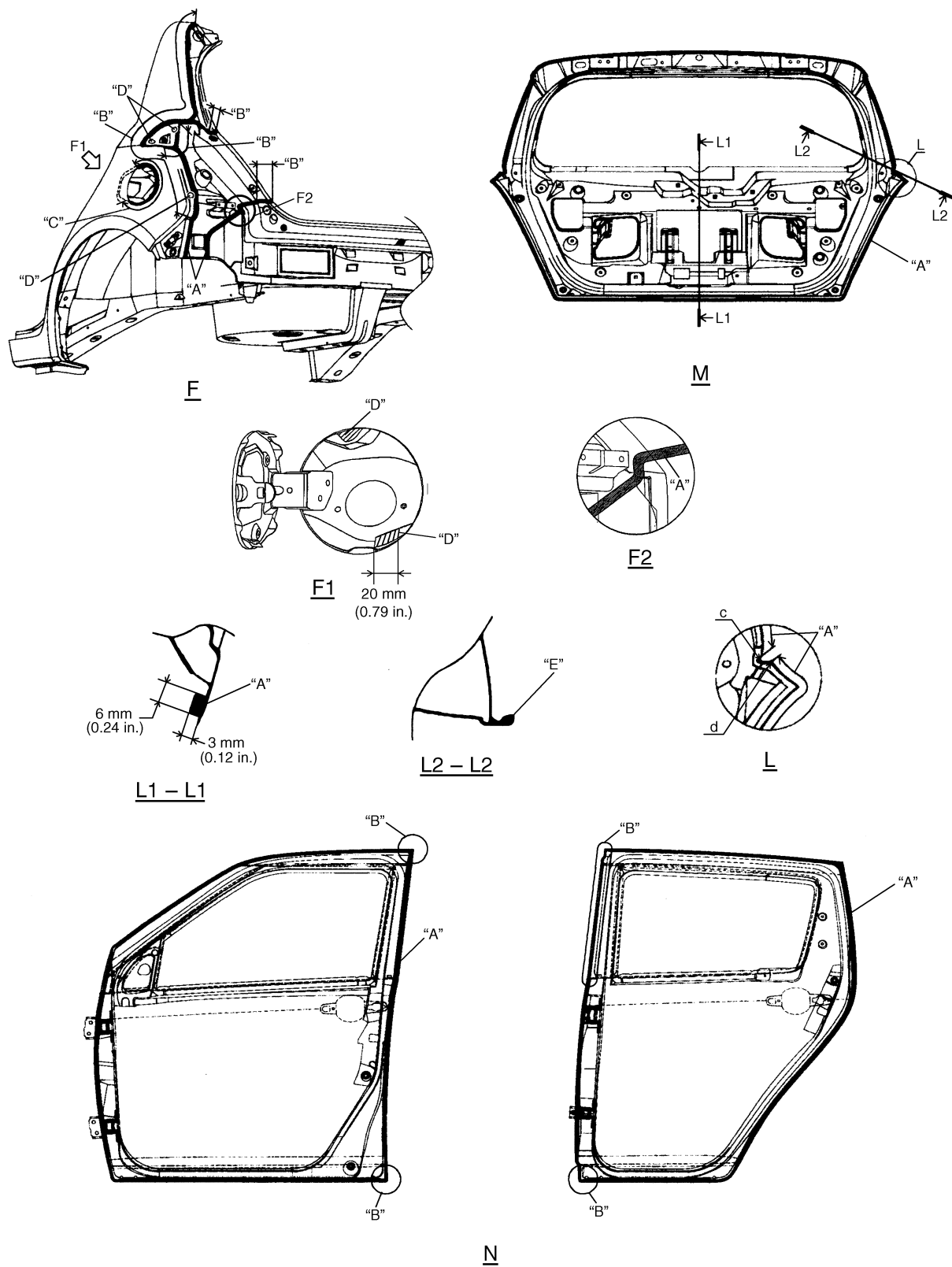
I4RS0B9C0001-01

"A": Apply sealant.	"C": Smooth out sealant with a brush.
"B": Wipe off excess sealant after application.	"D": Do not apply sealant

BB1B3 - B3B2 - B2B4CDC1E

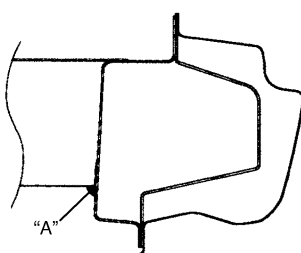
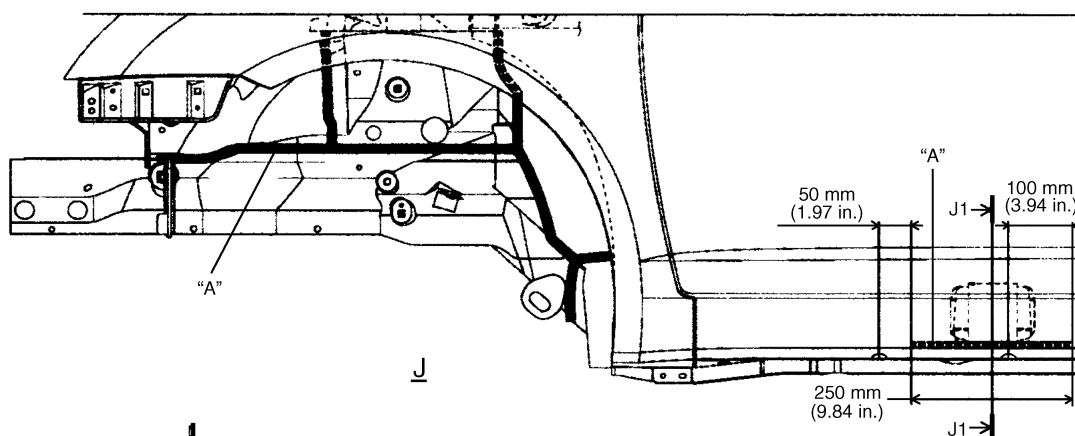
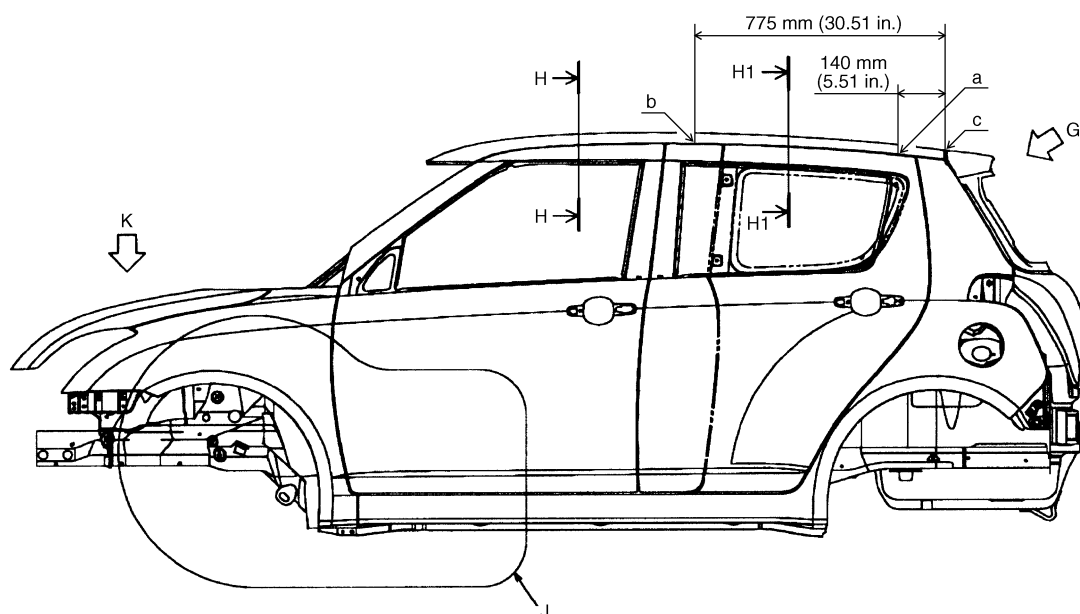
I4RS0B9C0002-01

"A": Apply sealant.	"C": Smooth out sealant with a brush.
"B": Fill gap / hole with sealant.	"D": Do not apply sealant.
*: Vehicle with separate type rear seat	

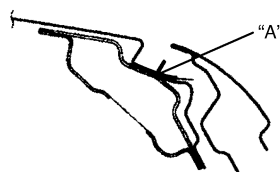


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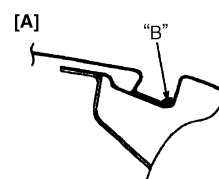
"A": Apply sealant.	"C": Smooth out sealant with a brush.	"E": Apply sealant covering flange end (between "c" and "d").
"B": Wipe off excess sealant after application.	"D": Do not apply sealant.	



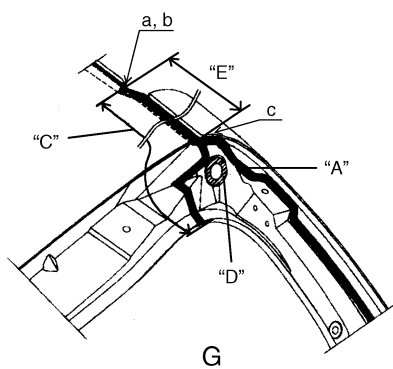
J1 - J1



H - H



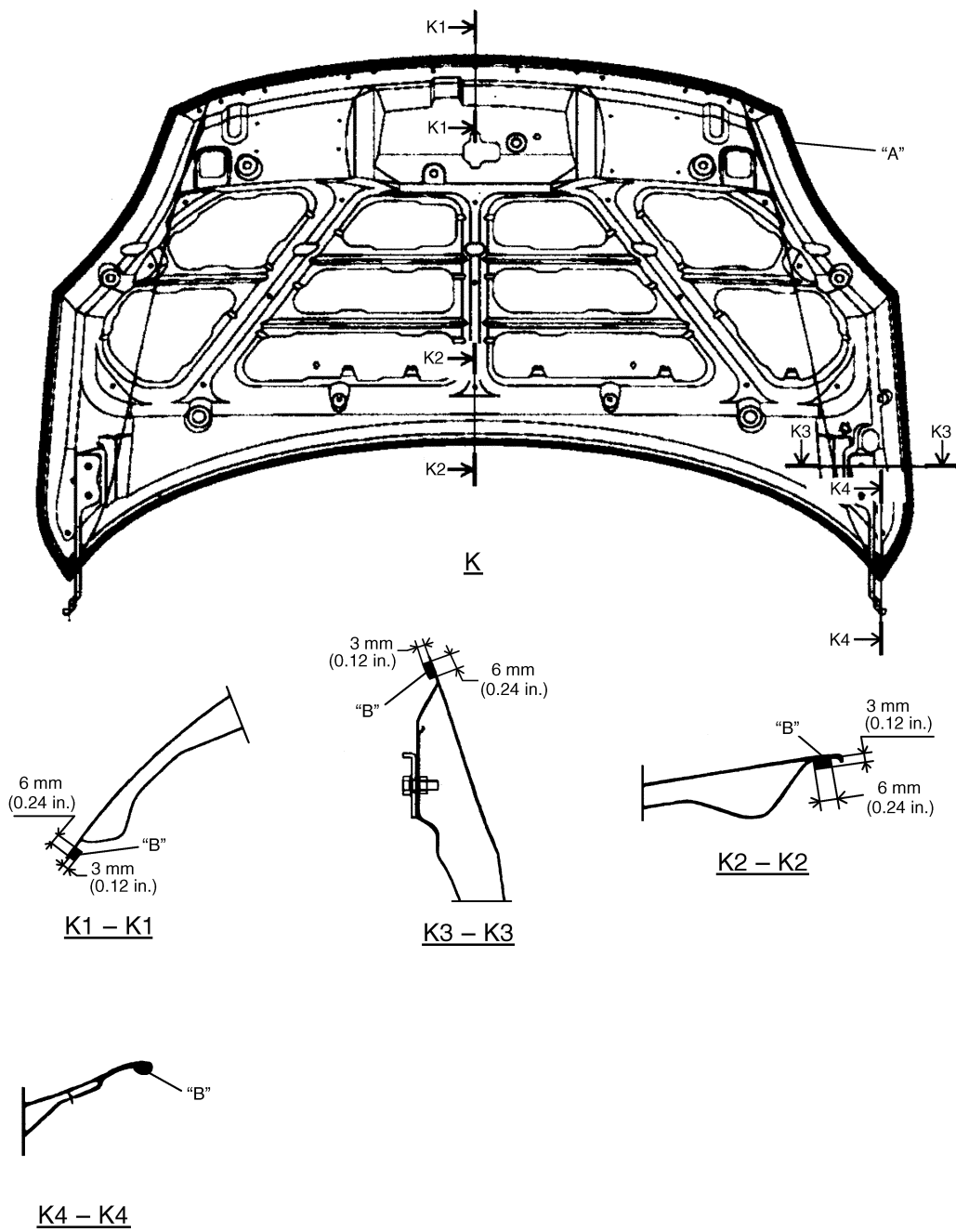
H1 - H1



G

I6RS0B9C0002-03

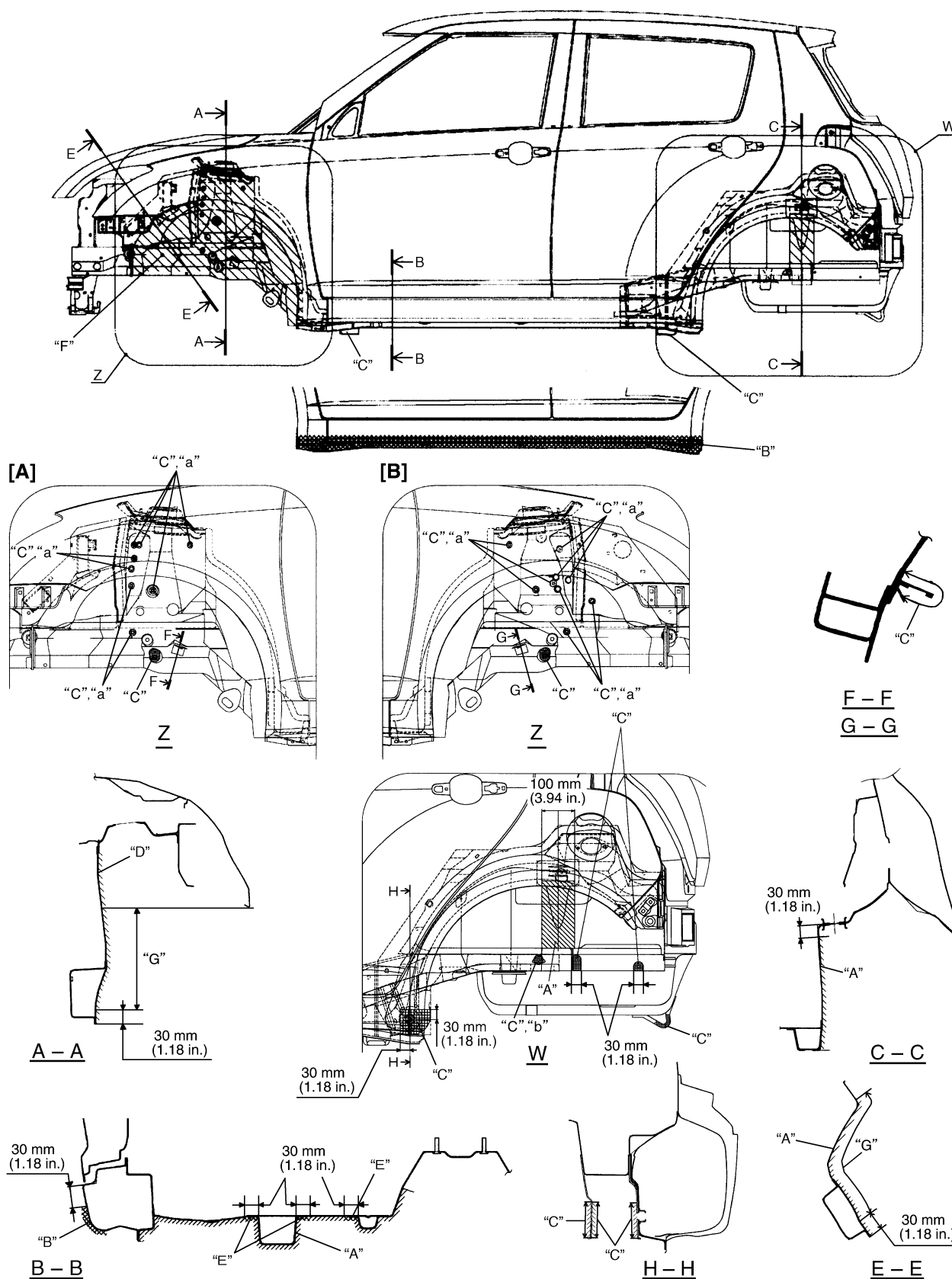
[A]: 3 door model	"C": Wipe off excess sealant after application.
"A": Apply sealant	"D": Do not apply sealant.
"B": Smooth out sealant with a brush (between "b" and "c").	"E": Sealant application area 3 door model 775 mm (30.51 in.) (between "b" and "c") 5 door model 140 mm (5.51 in.) (between "a" and "c")



"A": Apply sealant.
"B": Apply sealant covering flange end.

Under Coating Application Areas

S6RS0B9C03002

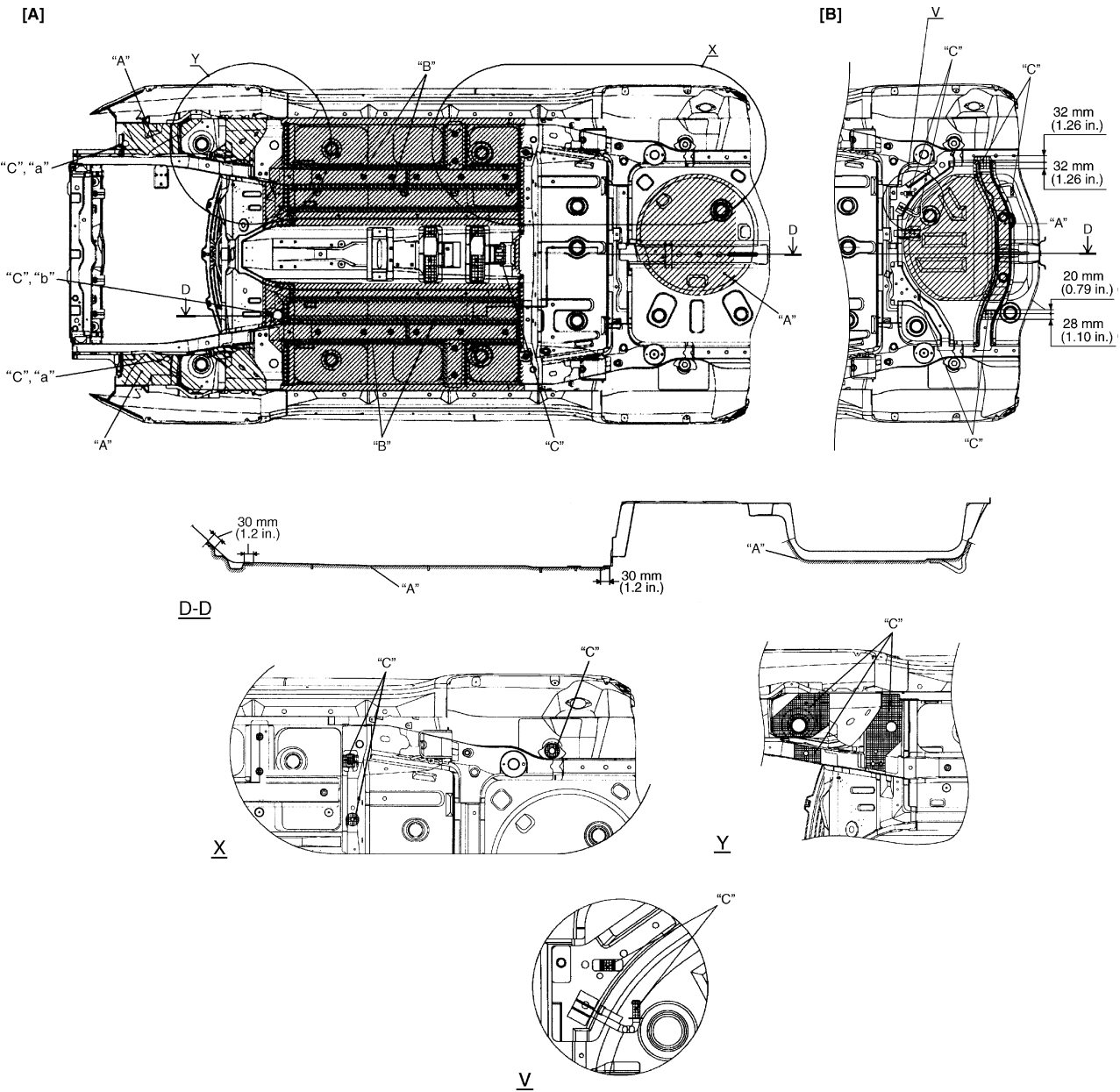


I6RS0B9C0004-02

[A]: LH side	"E": Apply undercoating (PVC, 600 μ m or more).
[B]: RH side	"F": After applying undercoating (PVC, 400 μ m or more), paint black color
"A": Apply undercoating (PVC, 400 μ m or more).	"G": Paint black color
"B": Apply anti-chip coat (300 μ m or more).	"a": ϕ 20 mm, (0.79 in.)

9L-7 Paint / Coatings:

"C": Do not apply undercoating.	"b": ϕ 30 mm, (1.18 in.)
"D": Apply undercoating (PVC, 400 μ m or more) covering flange end.	



I6RS0B9C0005-03

[A]: Other than M16 engine model	"C": Do not apply undercoating.
[B]: M16 engine model	"a": ϕ 30 mm (1.18 in.)
"A": Apply undercoating (PVC, 400 μ m or more).	"b": ϕ 50 mm (1.97 in.)
"B": Apply undercoating (PVC, 600 μ m or more).	

Section 10

Control systems

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Precautions

Precautions

Precautions for Control Systems

S6RS0BA000001

Air Bag Warning

Refer to “Air Bag Warning in Section 00 in related manual”.

Precautions in Diagnosing Trouble

Refer to “Precautions in Diagnosing Trouble in Section 10B”.

Precautions in Diagnosing Troubles

Refer to “Precautions in Diagnosing Troubles: For Petrol Engine Model in Section 10C” and “Precautions in Diagnosing Troubles: For Diesel Engine Model in Section 10C in related manual”.

Precaution in Replacing ECM

Refer to “Precaution in Replacing ECM: For Petrol Engine Model in Section 10C in related manual”.

Precautions in Handling Immobilizer Control System

Refer to “Precautions in Handling Immobilizer Control System: For Petrol Engine Model in Section 10C in related manual” and “Precautions in Handling Immobilizer Control System: For Diesel Engine Model in Section 10C in related manual”.

Precautions after Replacing ECM or Immobilizer Control Module

Refer to “Precautions after Replacing ECM or Immobilizer Control Module: For Diesel Engine Model in Section 10C in related manual”.

Precautions in Diagnosing Trouble

Refer to “Precautions in Diagnosing Trouble: For M13, M15 and M16 Engines in Section 1A in related manual” and “Precautions in Diagnosing Trouble: For Z13DT Engine in Section 1A in related manual”.

Body Electrical Control System

Precautions

Precautions in Diagnosing Trouble

S6RS0BA200001

- 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, TCM (if equipped), ESP® control module (if equipped), keyless start control module (if equipped) combination meter, steering angle sensor (if equipped) and BCM is established by CAN (Controller Area Network). For detail of CAN communication for BCM, 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".

General Description

CAN Communication System Description

S6RS0BA201003

Refer to "CAN Communication System Description: For M13, M15 and M16 Engines in Section 1A" or "CAN Communication System Description: For Z13DT Engine in Section 1A in related manual" for CAN communication system description.

BCM communication control data with each control module as follows.

BCM Transmission Data

			ECM	TCM (A/T model)	ESP® Control Module (if equipped)	Combination Meter	Keyless Start Control Module (if equipped)
BCM	Transmit	DATA	A/C switch ON signal	○			
			Electric load signal	○ *1			
			Ignition switch signal	○ *1			
			"3" position switch signal		○		
			Brake fluid level switch signal		○	○	
			Parking brake switch signal		○	○	
			Diagnostic trouble code (DTC)			○	
			Illumination ON signal			○	
			Seat belt buckle switch signal			○	
			Charging system signal			○	○
			Engine oil pressure switch signal			○ *1	○
			Door switch status			○	○
			Door lock status				○

I6RS0BA20001-01

10B-2 Body Electrical Control System:

BCM Reception Data

				ECM	TCM (A/T model)	TCM (Automated Manual Transaxle model)	Keyless Start Control Module (if equipped)
BCM		DATA	Engine speed signal	○			
			Engine coolant temp. signal	○			
			Vehicle speed signal	○			
			Magnet clutch signal	○			
			A/C refrigerant pressure signal	○			
			Fuel consumption signal	○			
			Stop (brake) lamp switch signal	○ *2			
			Fuel heater signal	○ *2			
			Transmission range sensor signal		○		
			Transmission shift position signal			○	
			Buzzer request signal			○	○
			Door lock/unlock request signal				○
			Ignition knob switch signal				○
			Answer back request signal				○

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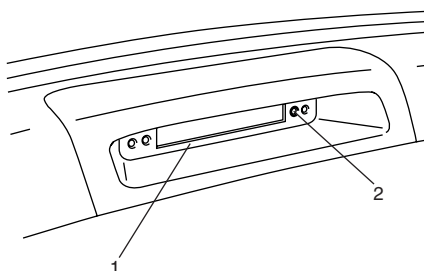
NOTE

*1: Petrol engine model.

*2: Diesel engine model.

Alarm Indicator Lamp

The information display or clock (1) of this vehicle includes an alarm indicator lamp (2) for the theft preventive purpose. The BCM makes the alarm indicator lamp flash at certain intervals after the ignition switch is turned off until it is turned on again. Also, to check DTCs stored in BCM without using a SUZUKI scan tool when diagnosing troubles, it is possible to identify them by flashing patterns of the alarm indicator lamp.



I4RS0AA20031-01

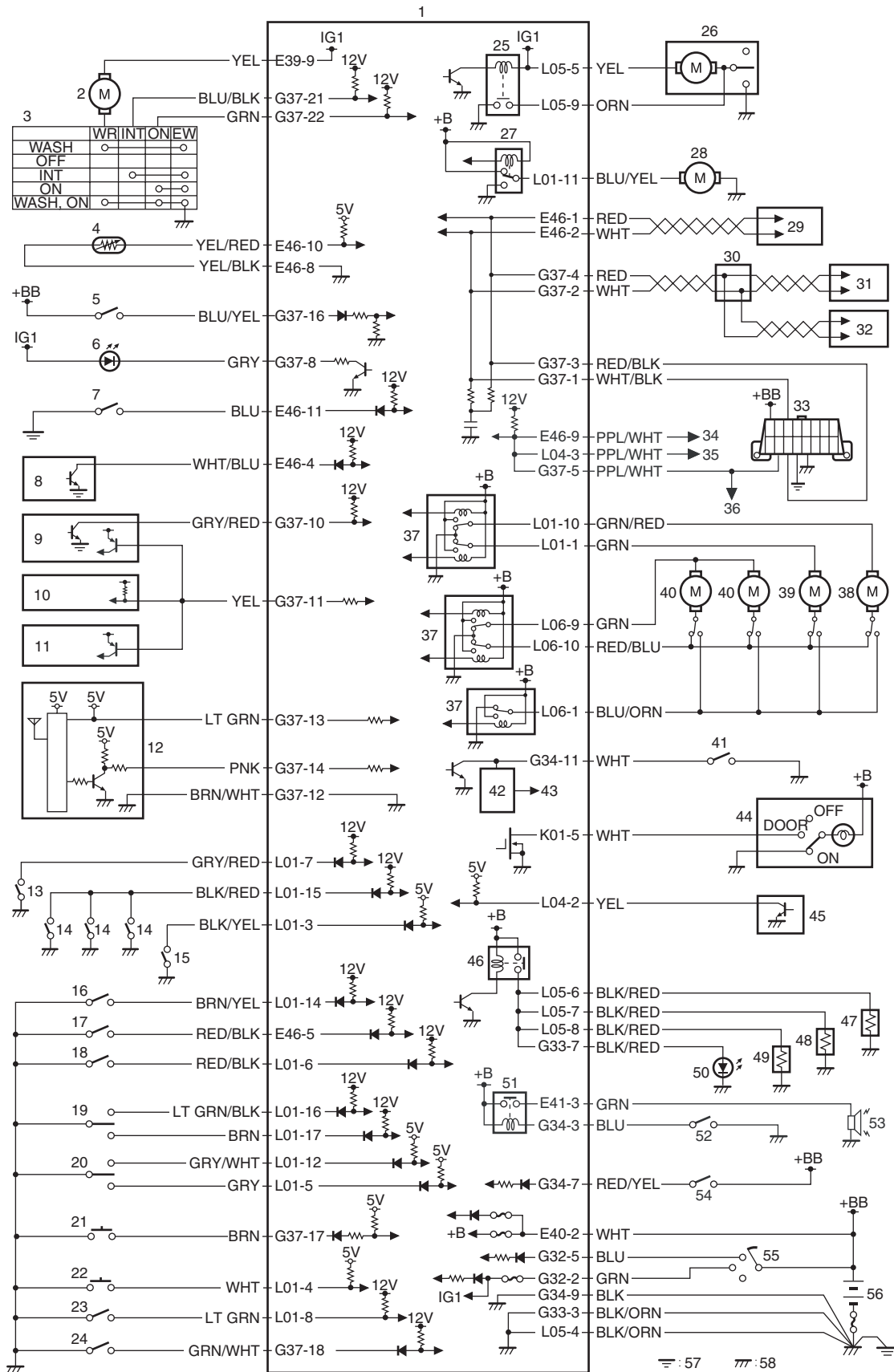
Schematic and Routing Diagram

Body Electrical Control System Wiring Circuit Diagram

S6RS0BA202001

NOTE

This wiring diagram shows circuits related to only BCM, not the entire circuits of BCM and junction block. Refer to “Power Supply Diagram (Petrol) in Section 9A in related manual” or “Power Supply Diagram (DSL) in Section 9A in related manual” for wiring circuits other than the figure below.



16RS0BA20003-02

1. BCM (included in junction block)	21. Rear end door window defogger switch	41. Hazard warning switch
2. Rear washer motor	22. Rear end door opener switch	42. Turn signal and hazard warning relay
3. Rear wiper and washer switch	23. "3" position switch (A/T model)	43. To turn signal light
4. Outside air temperature sensor (if equipped)	24. A/C switch (if equipped)	44. Interior light
5. Key reminder switch	25. Rear wiper relay	45. SDM

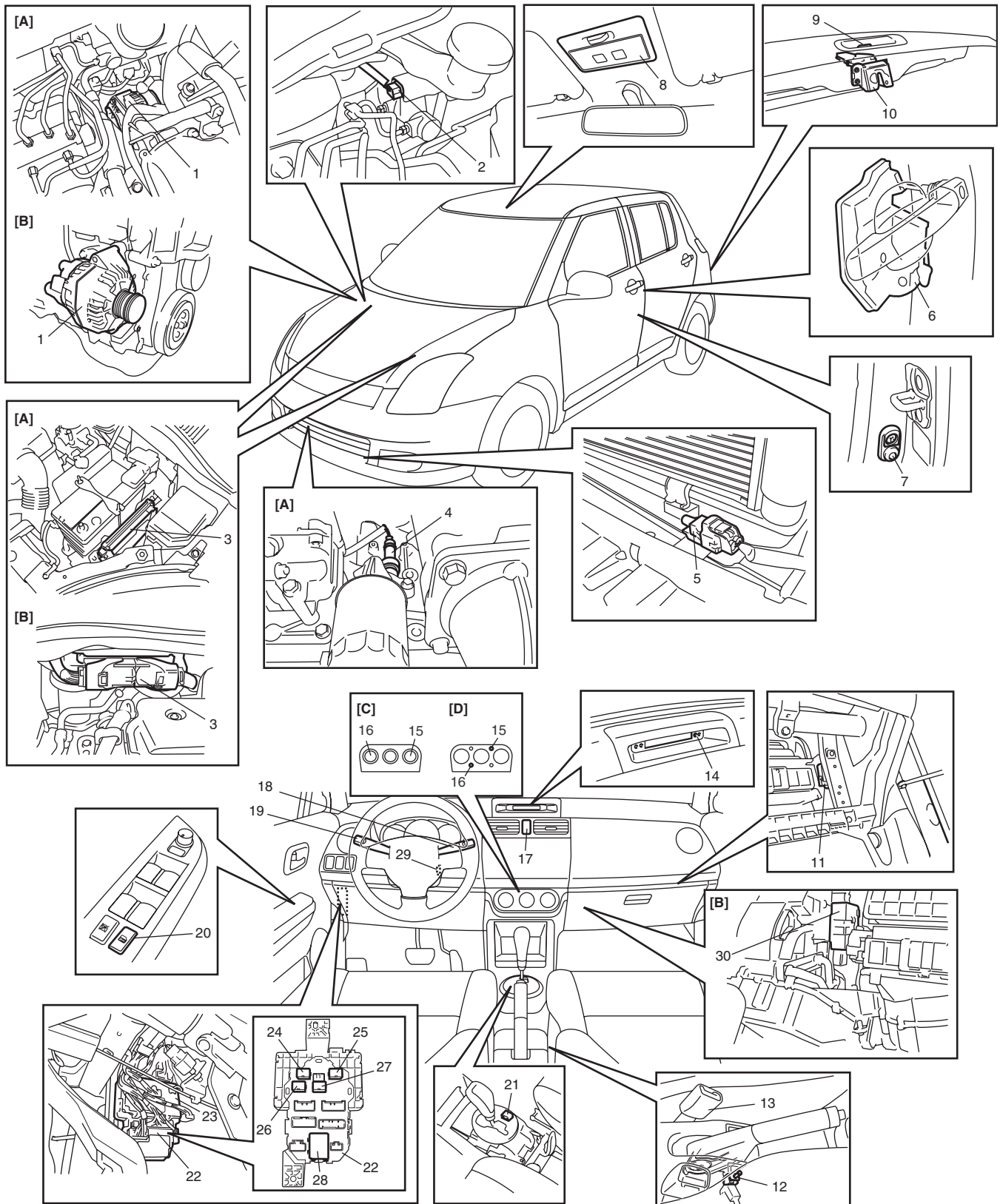
10B-4 Body Electrical Control System:

6. Alarm indicator lamp	26. Rear wiper motor	46. Rear end door window defogger relay
7. Oil pressure switch (petrol engine model)	27. Rear end door opener relay	47. Right side door mirror heater (if equipped)
8. Generator	28. Rear end door opener actuator	48. Left side door mirror heater (if equipped)
9. Supplementary heater controller (if equipped)	29. ECM or ESP® control module	49. Rear end door window defogger
10. Information display (if equipped)	30. CAN junction connector (if equipped)	50. Rear end door window defogger indicator light
11. HVAC control module (if equipped)	31. Combination meter	51. Horn relay
12. Keyless entry receiver (if equipped)	32. Steering angle sensor (if equipped)	52. Horn switch
13. Driver side door switch	33. Data link connector (DLC)	53. Horn
14. Other than driver side door switch	34. To ECM, ABS or ESP® control module, P/S control module and TCM (A/T model)	54. Lighting switch
15. Rear end door switch	35. To SDM	55. Ignition switch
16. Driver side seat belt switch	36. To HVAC control module (if equipped) and TCM (Automated Manual Transaxle model)	56. Battery
17. Brake fluid level switch	37. Door lock actuator relay	57. Engine ground
18. Parking brake switch	38. Driver side door lock actuator	58. Body ground
19. Door key cylinder switch (included in door lock actuator)	39. Passenger side door lock actuator	
20. Manual door lock switch	40. Rear door lock actuator (if equipped)	

Component Location

BCM and Related System Component Location

S6RS0BA203001



I6RS0BA20004-01

[A]: Petrol engine model	9. Rear end door opener switch	21. "3" position switch
[B]: Diesel engine model	10. Rear end door lock actuator (incorporated in door switch)	22. Junction block

10B-6 Body Electrical Control System:

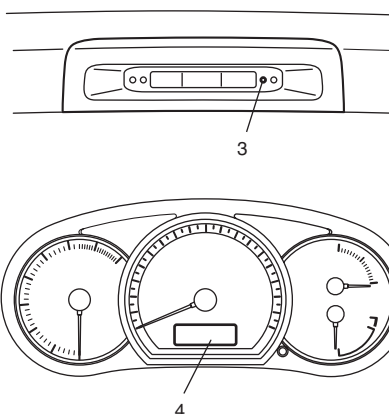
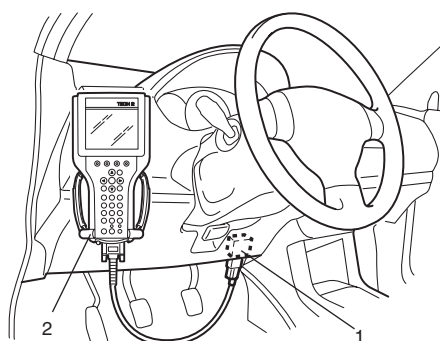
[C]: Automatic A/C	11. Keyless entry receiver or keyless start control module	23. BCM
[D]: Manual A/C	12. Parking brake switch	24. Heater relay
1. Generator	13. Seat belt buckle switch	25. Horn relay
2. Brake fluid level switch	14. Alarm indicator lamp	26. Rear wiper relay
3. ECM	15. Rear end door window defogger switch	27. Rear end door window defogger relay
4. Oil pressure switch	16. A/C switch	28. Turn signal and hazard warning relay
5. Outside air temperature sensor	17. Hazard warning switch	29. Key reminder switch (included in ignition switch)
6. Door lock actuator (incorporated in key cylinder switch)	18. Rear wiper switch	30. Supplementary heater controller
7. Door switch	19. Lighting switch	
8. Interior light	20. Manual door lock switch	

Diagnostic Information and Procedures

BCM Self-Diagnosis Function

S6RS0BA204001

- BCM monitors conditions of the system components and its circuit with ignition switch turned to ON position. When an abnormality in the system occurs, the area where that abnormality lies is stored in the memory of EEPROM in BCM.
- DTC can be checked in either one of following ways.
 - DTC can be checked by SUZUKI scan tool (2) connected to DTC (1).
 - DTC can be read from flashing pattern of alarm indicator lamp (3). Also, DTC is displayed on combinations meter (4) at the same time.



I4RS0BA20004-03

BCM input / output table

Control	Input	Output
Power door lock system	• Key cylinder switch • Manual door lock switch	• Each door lock actuator
Keyless entry system	• Key reminder switch • Keyless entry receiver • Driver side door switch	• Each door lock actuator • Turn signal and hazard warning relay • Interior light
Keyless start system (Door lock function)	• Keyless start control module	• Each door lock actuator • Turn signal and hazard warning relay • Interior light
Rear wiper	• Rear wiper INT switch • Rear wiper LO switch	• Rear wiper relay

Control	Input	Output
Combination meter	• Tail light switch • Oil pressure switch (petrol engine model) • Parking brake switch • Driver side seat belt switch • Brake fluid level switch • Generator • Each door switch	• Combination meter
Interior light	• Each door switch • Key reminder switch	• Interior light
Warning buzzer	• Key reminder switch • Tail light switch • Driver side door switch • TCM (Automated Manual Transaxle model) • Keyless start control module (if equipped)	• Warning buzzer (located in BCM)
Rear end door window defogger	• Rear end door window defogger switch • Generator	• Rear end door window defogger relay
Rear end door opener	• Manual door lock switch (unlock signal) • Key cylinder switch (unlock signal) • Keyless entry transmitter (unlock signal) • Rear end door opener switch	• Rear end door opener relay
Alarm indicator lamp	• Key reminder switch	• Alarm indicator lamp (located in information display or clock)

Scan Tool Data

S6RS0BA204003

Scan tool Data	Condition	Normal condition / reference value
Vehicle Speed	At stop with ignition switch turned ON	0 km/h
Outside air Temp	Reference value is relative to outside air temperature	–40 °C – 70 °C (–40 °F – 158 °F)
Battery Voltage	At specified idle speed after warming up	10 – 14 V
Coolant Temp	At specified idle speed after warming up	80 °C – 100 °C (176 °F – 212 °F)
Engine Speed	Engine idling with no load applied after warming up	Desired idle speed ± 50 rpm
Fuel Consumption	At specified idle speed after warming up	0.0 km/l
Key Reminder Sw	Ignition key inserted in ignition key cylinder	Key in
	Ignition key pulled out from ignition key cylinder	Pulled
Rear Wiper Sw	Rear wiper switch at ON position and ignition switch turned ON	ON
	Rear wiper switch at INT position and ignition switch turned ON	INT
	Rear wiper switch at OFF position and ignition switch turned ON	OFF
Door key Sw	Key cylinder switch of driver side door at lock position	LOCK
	Key cylinder switch of driver side door not turned	Neutral
	Key cylinder switch of driver side door at unlock position	Unlock
Door Lock Sw	Lock side of manual door lock switch pressed	LOCK
	Manual door lock switch not pressed	Neutral
	Unlock side of manual door lock switch pressed	Unlock
Driv Door Sw	Driver side door open	Open
	Driver side door closed	Close
Pass Door Sw	Doors other than driver side door open	Open
	Doors other than driver side door closed	Close
Brake Fluid Level	Brake fluid level at MIN level or higher	Normal
	Brake fluid level lower than MIN level	Low
Parking Brake Sw	Parking brake lever pulled	ON
	Parking brake lever released	OFF

10B-8 Body Electrical Control System:

Scan tool Data	Condition	Normal condition / reference value
Rear Defogger Sw	Rear end door window defogger switch pressed with engine running	ON
	Rear end door window defogger switch not pressed with engine running	OFF
Tail Light Sw	Lighting switch at HEAD or CLEARANCE position	ON
	Lighting switch at OFF position	OFF
Driv Seatbelt Sw	Driver side seat belt fastened	Fasten
	Driver side seat belt unfastened	Unfasten
Rear end door opener	Rear end door opener switch pressed	ON
	Rear end door opener switch not pressed	OFF
“3” Position Sw	A/T select lever at 2nd or 3rd position with ignition switch turned ON	ON
	A/T select lever at other than 2nd or 3rd position with ignition switch turned ON	OFF
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

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): It is detected by engine coolant temperature sensor.

Engine Speed (RPM): It is computed by reference pulse signals from CMP sensor.

Fuel Consumption (km/l): This parameter indicates the fuel consumption computed by ECM.

Key Reminder Sw (Key remainder switch) (Pulled / Key in): This parameter indicates the state of the key reminder switch.

Rear Wiper Sw (Rear wiper switch) (ON / INT / OFF): This parameter indicates the state of the rear wiper switch.

Door key Sw (Door key cylinder switch) (Lock / Neutral / Unlock): This parameter indicates the state of the door key cylinder switch.

Door lock Sw (Manual door lock switch) (Lock / Neutral / Unlock): This parameter indicates the state of the manual door lock switch.

Driv Door Sw (Driver side door switch) (Open / Close): This parameter indicates the state of the driver side door switch.

Pass Door Sw (Other than driver side door switch) (Open / Close): This parameter indicates the state of the door switches other than driver side door switch.

Brake Fluid Level (Low / Normal): Low: Brake fluid level is lower than specified level.

Normal: Brake fluid level is higher than MIN level.

Parking Brake Sw (Parking brake switch) (ON / OFF): ON: Parking brake lever is pulled up.

OFF: Parking lever is released.

Rear Defogger Sw (Rear end door window defogger switch) (ON / OFF): This parameter indicates the state of the rear end door window defogger switch.

Tail Light Sw (Lighting switch) (ON / OFF): This parameter indicates the state of the lighting switch.

Driv Seatbelt Sw (Driver seat belt switch) (Fasten / Unfasten): This parameter indicates the state of the driver side seat belt buckle switch.

Rear end Door Opener (Rear end door opener switch) (ON / OFF): This parameter indicates the state of the rear end door opener switch.

“3” position Sw (ON/OFF) (A/T model): This parameter indicates the state of the “3” position switch included in A/T manual selector assembly.

Charge lamp (ON / OFF): This parameter indicates the state of the charge system monitor switch.

Oil pressure switch (ON / OFF) (petrol engine model): 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.

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)
Door	Each door lock actuator
Rear end door open	Rear end door opener relay
Dead Lock	Each door lock actuator
Warning buzzer	Warning buzzer (in BCM)
Rear wiper	Rear wiper relay
Alarm indicator	Alarm indicator lamp (in information display or clock)
Rear defogger	Rear end door window defogger relay

DTC B1133 (DTC No. 1133): Battery Voltage Too High

S6RS0BA204008

Wiring Diagram

Refer to "BCM Power Circuit and Ground Circuit Check in related manual".

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
Power voltage supplied from battery to BCM is higher than 16V.	- Charging system malfunction - BCM malfunction

Flow Test Description**Step 1: Check charging system****DTC Troubleshooting**

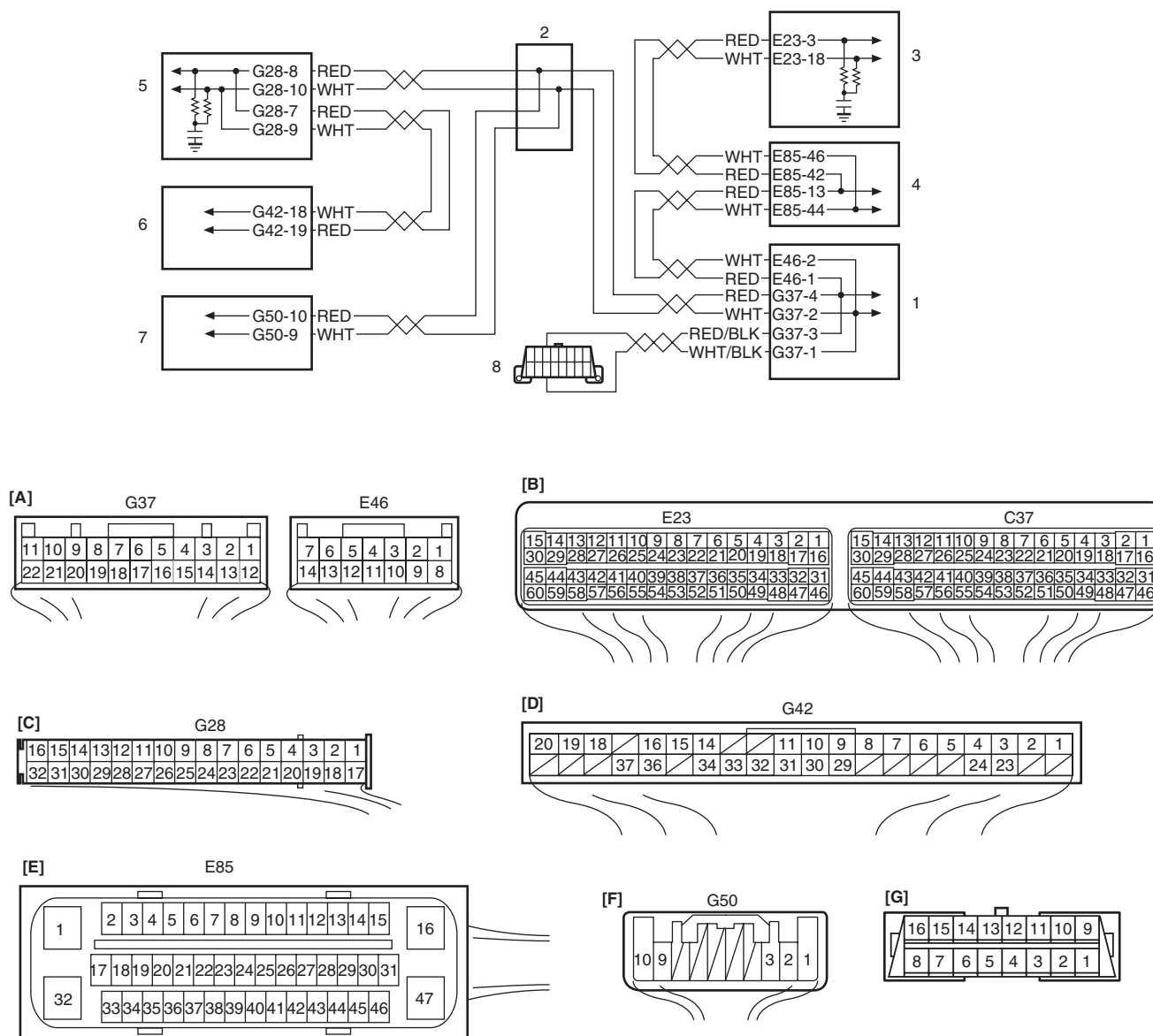
Step	Action	Yes	No
1	Charging system operation check 1) Measure generator "B" terminal voltage at engine 2000 rpm. <i>Is voltage lower than 16 V?</i>	Substitute a known-good BCM (included in junction block assembly) and recheck.	Repair charging system.

DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)

S6RS0BA204013

Wiring Diagram

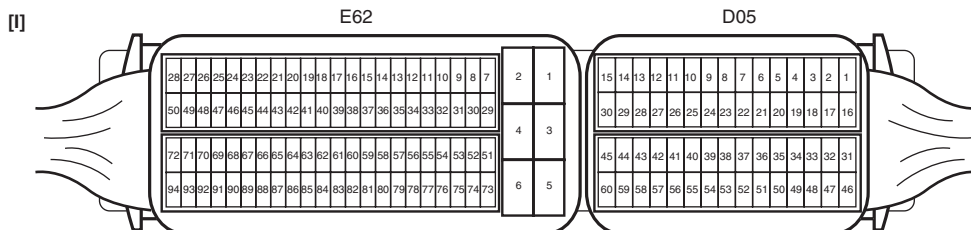
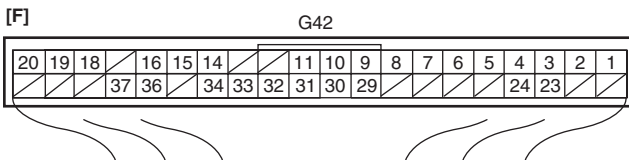
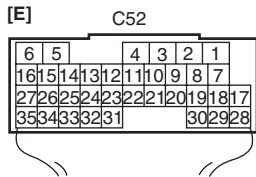
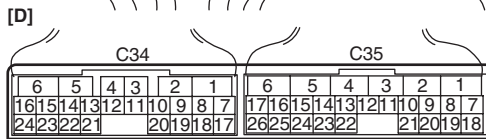
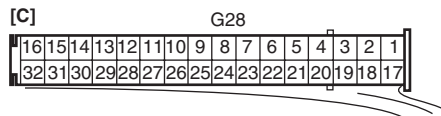
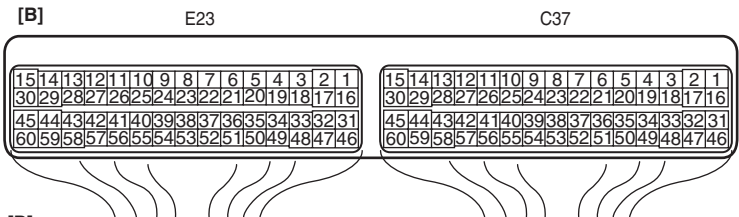
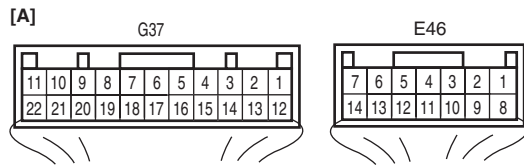
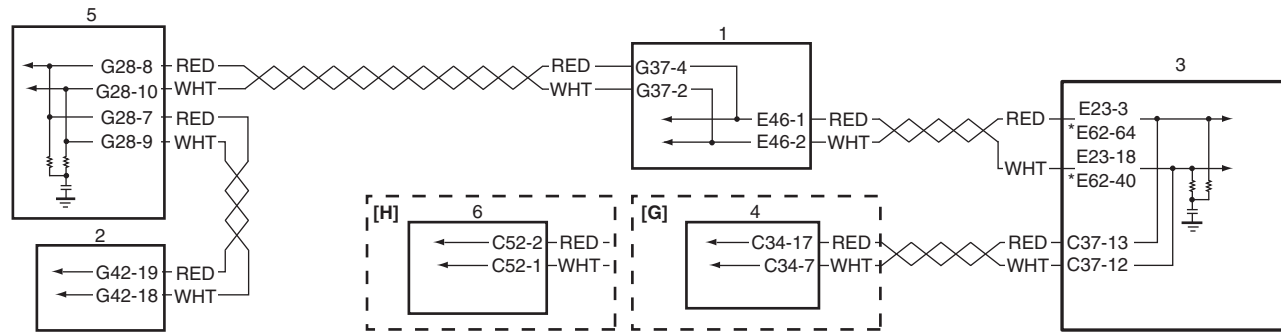
With ESP® model



I6RS0BA20005-01

[A]: BCM connector (viewed from harness side)	2. CAN junction connector
[B]: ECM connector (viewed from harness side)	3. ECM
[C]: Combination meter connector (viewed from harness side)	4. ESP® control module
[D]: Keyless start control module connector (viewed from harness side)	5. Combination meter
[E]: ESP® control module connector (viewed from terminal side)	6. Keyless start control module (if equipped)
[F]: Steering angle sensor connector (viewed from harness side)	7. Steering angle sensor
[G]: DLC (viewed from terminal side)	8. DLC
1. BCM	

Without ESP® model



16RS0BA20006-01

[A]: BCM connector (viewed from harness side)	[I]: ECM connector (diesel engine model) (viewed from harness side)
[B]: ECM connector (petrol engine model) (viewed from harness side)	1. BCM
[C]: Combination meter connector (viewed from harness side)	2. Keyless start control module (if equipped)
[D]: TCM connector (A/T model) (viewed from harness side)	3. ECM
[E]: TCM connector (Automated Manual Transaxle model) (viewed from harness side)	4. TCM (A/T model)
[F]: Keyless start control module connector (viewed from harness side)	5. Combination meter
[G]: A/T model	6. TCM (Automated Manual Transaxle model)
[H]: Automated Manual Transaxle model	*: Diesel engine model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for BCM is detected for longer than specified time continuously.	- CAN communication circuit - Combination meter - BCM (included in junction block assembly) - TCM (A/T or Automated Manual Transaxle model) - ECM - Keyless start control module (if equipped) - ESP® control module (if equipped) - Steering angle sensor (if equipped)

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.

DTC Troubleshooting

Step	Action	Yes	No
1	Control module connector check 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. <i>Is DTC U1001 (No. 1001) detected?</i>	Go to Step 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. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 3.	Repair circuit.
3	DTC check of 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 BCM for DTC. <i>Is DTC U1001 (No.1001) detected?</i>	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 3) one by one and check that DTC U1001 is detected by BCM each time connector is disconnected. When DTC U1001 is not detected by BCM while checking in this way, go to description under "NO" below. If DTC U1001 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 U1073 (No. 1073): Control Module Communication Bus Off

S6RS0BA204014

Wiring Diagram

Refer to "DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)".

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 communication circuit • Combination meter • BCM • TCM (A/T or Automated Manual Transaxle model) • Keyless start control module (if equipped) • ECM • ESP® control module (if equipped) • Steering angle sensor (if equipped)

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.

DTC Troubleshooting

Step	Action	Yes	No
1	Control module connector check 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck DTC. <i>Is DTC U1073 (No. 1073) detected?</i>	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. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 3.	Repair circuit.
3	DTC check of 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 BCM for DTC. <i>Is DTC U1073 (No. 1073) detected?</i>	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 (Petrol Engine Model with ESP®)

S6RS0BA204019

Wiring Diagram

Refer to "DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from ECM for longer than specified time continuously.	- CAN communication circuit - BCM (included in junction block assembly) - ECM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it for 1 min. or more.
- 4) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check of BCM <i>Is DTC U1100 (No. 1100) and DTC U1073 (No. 1073) detected together?</i>	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	DTC check of ECM 1) Check ECM for DTC. <i>Is DTC P1674 detected?</i>	Go to "DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines in Section 1A".	Go to Step 3.
3	DTC check of ESP® control module 1) Check ESP® for DTC. <i>Is DTC U1073 detected?</i>	Go to "DTC U1073: Control Module Communication Bus Off in Section 4F".	Go to Step 4.
4	Control module connector check 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. <i>Is DTC U1100 (No. 1100) detected?</i>	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
5	DTC check of ESP® control module 1) Check DTC for ESP® control module. <i>Is DTC U1100 detected?</i>	Go to Step 6.	Go to Step 7.
6	CAN communication circuit check 1) Disconnect connectors from ECM and ESP® control module. 2) Check CAN communication circuit between ECM and ESP® control module for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.	Repair circuit.
7	CAN communication circuit check 1) Disconnect connectors from BCM and ESP® control module. 2) Check CAN communication circuit between BCM and ESP® control module for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 8.	Repair circuit.

Step	Action	Yes	No
8	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 7 for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 9.	Repair circuit.
9	DTC check of BCM 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect connector of any one of control module other than BCM. 3) Recheck BCM for DTC. <i>Is DTC U1100 (No.1100) detected?</i>	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 disconnected in Step 2). If circuit is OK, substitute a known-good control module disconnected in Step 2) and recheck.

DTC U1100 (No. 1100): Lost Communication with ECM (Petrol Engine Model without ESP®)

S6RS0BA204015

Wiring Diagram

Refer to "DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from ECM for longer than specified time continuously.	- CAN communication circuit - BCM (included in junction block assembly) - ECM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it for 1 min. or more.
- 4) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check of BCM <i>Is DTC U1100 (No. 1100) and DTC U1073 (No. 1073) detected together?</i>	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	DTC check of ECM 1) Check ECM for DTC. <i>Is DTC P1674 detected?</i>	Go to "DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines in Section 1A".	Go to Step 3.
3	Control module connector check 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. <i>Is DTC U1100 (No. 1100) detected?</i>	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
4	CAN communication circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and BCM. 3) Check CAN communication circuit between ECM and BCM for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	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. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 6.	Repair circuit.
6	DTC check of BCM 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect connector of any one of control module other than BCM. 3) Recheck BCM for DTC. <i>Is DTC U1100 (No.1100) detected?</i>	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 disconnected in Step 2). If circuit is OK, substitute a known-good control module disconnected in Step 2) and recheck.

DTC U1100 (No. 1100): Lost Communication with ECM (Diesel Engine Model)

S6RS0BA204020

Wiring Diagram

Refer to "DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from ECM for longer than specified time continuously.	- CAN communication circuit - BCM (included in junction block assembly) - ECM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it for 1 min. or more.
- 4) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check of BCM <i>Is DTC U1100 (No. 1100) and DTC U1073 (No. 1073) detected together?</i>	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	DTC check of ECM 1) Check ECM for DTC. <i>Is DTC P2104 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Control module connector check 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. <i>Is DTC U1100 (No. 1100) detected?</i>	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
4	CAN communication circuit check 1) Disconnect connectors from BCM and ECM. 2) Check CAN communication circuit between BCM and ECM for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	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. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 6.	Repair circuit.

10B-18 Body Electrical Control System:

Step	Action	Yes	No
6	DTC check of BCM 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect connector of any one of control module other than BCM. 3) Recheck BCM for DTC. <i>Is DTC U1100 (No. 1100) detected?</i>	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 disconnected in Step 2). If circuit is OK, substitute a known-good control module disconnected in Step 2) and recheck.

DTC U1101 (No. 1101): Lost Communication with TCM

S6RS0BA204016

Wiring Diagram

Refer to "DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from TCM (A/T or Automated Manual Transaxle model) for longer than specified time continuously.	- CAN communication circuit - BCM (included in junction block assembly) - TCM (A/T or Automated Manual Transaxle model)

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.

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check of BCM <i>Is DTC U1101 (No. 1101) and DTC U1073 (No. 1073) detected together?</i>	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	DTC check of TCM (A/T or Automated Manual Transaxle model) 1) Check TCM for DTC. <i>Is DTC P1774 detected?</i>	Go to "DTC P1774: Control Module Communication Bus Off in Section 5A in related manual" or "DTC P1774: Control Module Communication Bus Off in Section 5D in related manual".	Go to Step 3.

Step	Action	Yes	No
3	DTC check of ECM 1) Check ECM for DTC. <i>Is DTC P1674 detected?</i>	Go to "DTC P1674: CAN Communication (Bus Off Error): For M13, M15 and M16 Engines in Section 1A".	Go to Step 4.
4	Control module connector check 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. <i>Is DTC U1101 (No. 1101) detected?</i>	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
5	DTC check of ECM 1) Check ECM for DTC. <i>Is DTC P1676 detected?</i>	Go to Step 6.	Go to Step 7.
6	CAN communication circuit check 1) Disconnect connectors from ECM and TCM. 2) Check CAN communication circuit between ECM and TCM for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Check TCM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.	Repair circuit.
7	CAN communication circuit check 1) Disconnect connectors from BCM and ECM. 2) Check CAN communication circuit between BCM and ECM for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 8.	Repair circuit.
8	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 7 for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 9.	Repair circuit.
9	DTC check of BCM 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect connector of any one of control module other than BCM. 3) Recheck BCM for DTC. <i>Is DTC U1101 (No. 1101) detected?</i>	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 2) one by one and check that DTC U1101 is detected by BCM each time connector is disconnected. When DTC U1101 is not detected by BCM while checking in this way, go to description under "NO" below. If DTC U1101 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 disconnected in Step 2). If circuit is OK, substitute a known-good control module disconnected in Step 2) and recheck.

DTC U1144 (No. 1144): Lost Communication with Keyless Start Control Module

S6RS0BA204017

Wiring Diagram

Refer to "DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from keyless start control module for longer than specified time continuously.	- CAN communication circuit - Combination meter - Keyless start control module - BCM (included in junction block assembly)

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.

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check of BCM <i>Is DTC U1144 (No. 1144) and DTC U1073 (No. 1073) detected together?</i>	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	DTC check of keyless start control module 1) Check keyless start control module for DTC. <i>Is DTC No. 33 detected?</i>	Go to "DTC No. 33: Control Module Communication Bus Off in Section 10E".	Go to Step 3.
3	Control module connector check 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. <i>Is DTC U1144 (No. 1144) detected?</i>	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) Disconnect connectors from BCM, combination meter and keyless start control module. 2) Check CAN communication circuit for open, short and high resistance. - Between BCM and combination meter - Between combination meter and keyless start control module <i>Is each CAN communication circuit in good condition?</i>	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. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 6.	Repair circuit.

Step	Action	Yes	No
6	Combination meter operation check 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Turn ignition switch to ON position. 3) Check combination meter operation for seat belt reminder light (fastening and unfastening driver side seat belt). <i>Are they OK?</i>	Go to Step 7.	Check combination meter power and ground circuit. If circuit is OK, substitute a known-good combination meter and recheck.
7	Key indicator light operation check 1) Turn ignition switch to OFF position. 2) Push ignition knob switch of steering lock unit. <i>Does key indicator light turn ON?</i>	Go to Step 8.	Check keyless start control module power and ground circuit. If circuit is OK, substitute a known-good keyless start control module and recheck.
8	DTC check of BCM 1) Disconnect connector of any one of control module other than BCM. 2) Recheck BCM for DTC. <i>Is DTC U1144 (No.1144) detected?</i>	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 1) one by one and check that DTC U1144 is detected by BCM each time connector is disconnected. When DTC U1144 is not detected by BCM while checking in this way, go to description under "NO" below. If DTC U1144 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 disconnected in Step 1). If circuit is OK, substitute a known-good control module disconnected in Step 1) and recheck.

Inspection of BCM and its Circuits

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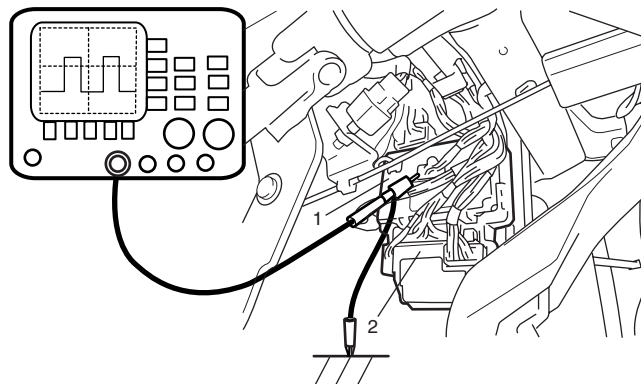
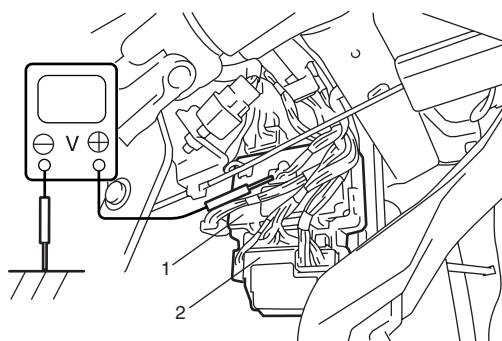
BCM and its circuits can be checked at BCM wiring couplers by measuring voltage and resistance.

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 BCM (included in junction block assembly) referring to "BCM (Included in Junction Block Assembly) Removal and Installation in related manual".
- 3) Connect connectors to BCM (1) and junction block assembly (2).
- 4) Check voltage at each terminal number of couplers connected.
For connector and terminal number, refer to "Connector Layout Diagram of BCM and Junction Block Assembly in related manual".



I4RS0AA20030-01

NOTE

- As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.
- Voltage with asterisk (*) can not be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.

BCM connector “L01”

Terminal	Circuit	Normal voltage	Condition
L01-1	Passenger side door lock actuator 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.
L01-2	—	—	—
L01-3	Rear end door switch	4 – 6 V	Rear end door is closed
		0 V	Rear end door is opened
L01-4	Rear end door opener switch	4 – 6 V	Rear end door switch is not pushed
		0 V	Rear end door switch is pushed
L01-5	Manual door lock switch (Unlock)	4 – 6 V	Manual door lock switch is at any position other than unlock position
		0 V	Manual door lock switch is at unlock position
L01-6	Parking brake switch	*0 – 3 V ↑↓	Refer to “Reference waveform No. 1:”
		10 – 14 V 0 V	Ignition switch is at ON position and parking brake lever is pulled up
L01-7	Driver side door switch	10 – 14 V	Driver side door is closed
		0 V	Driver side door is opened
L01-8	“3” position switch (A/T model)	*0 – 1 V ↑↓	Refer to “Reference waveform No. 2:”
		10 – 14 V 0 V	Ignition switch is at ON position and A/T select lever is at “2” or “3” position
L01-9	—	—	—
L01-10	Driver side door lock actuator 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.
L01-11	Rear end door actuator motor	0 V	Rear end door actuator motor is not in operation
		10 – 14 V	Rear end door actuator motor is in operation
L01-12	Manual door lock switch (Lock)	4 – 6 V	Manual door lock switch is at any position other than lock position
		0 V	Manual door lock switch is at lock position
L01-13	—	—	—

Terminal	Circuit	Normal voltage	Condition
L01-14	Driver seat belt switch	*0 – 3 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 3: ”
		0 V	Ignition switch is at ON position and driver side seat belt is unfastened
L01-15	Door switch (other than driver side door and rear end door)	10 – 14 V	Rear right and left side door and passenger side door are closed
		0 V	Any one of the door is opened (except driver side door and rear end door)
L01-16	Driver side door key cylinder switch (Lock)	10 – 14 V	Driver side door key cylinder switch is at any position other than lock position
		0 V	Driver side door key cylinder switch is at lock position
L01-17	Driver side door key cylinder switch (Unlock)	10 – 14 V	Driver side door key cylinder switch is at any position other than unlock position
		0 V	Driver side door key cylinder switch is at unlock position
L01-18	—	—	—

BCM connector “E46”

Terminal	Circuit	Normal voltage	Condition
E46-1	CAN communication line (high) for ECM or ESP® control module	*2.5 – 3.6 V	Refer to “Reference waveform No. 4: ”
E46-2	CAN communication line (low) for ECM or ESP® control module	*1.6 – 2.5 V	
E46-3	—	—	—
E46-4	Generator “L” terminal	10 – 14 V	Engine is running
		0 V	Ignition switch is at ON position
E46-5	Brake fluid level switch	*0 – 3 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 1: ”
		0 V	Ignition switch is at ON position, parking brake lever is released and brake fluid level is lower than MIN level
E46-6	—	—	—
E46-7	—	—	—
E46-8	Sensor ground for outside air temperature sensor (if equipped)	0 V	—
E46-9	Serial communication line of data link connector for ECM, ABS or ESP® control module, P/S control module and TCM (A/T model)	8 – 12 V	Ignition switch is at ON position
E46-10	Outside air temperature sensor (if equipped)	About 1.5 V	Ignition switch is at ON position and outside air temperature approx. 20 °C (68 °F)
E46-11	Oil pressure switch (petrol engine model)	*3 – 14 V	Refer to “Reference waveform No. 5: ”
		0 V	Ignition switch is at ON position and engine is at stop
E46-12	—	—	—
E46-13	—	—	—
E46-14	—	—	—

10B-24 Body Electrical Control System:**BCM connector “G37”**

Terminal	Circuit	Normal voltage	Condition
G37-1	CAN communication line (low) for DLC	*1.6 – 2.5 V	Refer to “Reference waveform No. 4: ”
G37-2	CAN communication line (low) for each control module		
G37-3	CAN communication line (high) for DLC	*2.5 – 3.6 V	
G37-4	CAN communication line (high) for each control module		
G37-5	Serial communication line of data link connector	8 – 12 V	Ignition switch is at ON position
G37-6	—	—	—
G37-7	—	—	—
G37-8	Alarm indicator lamp	10 – 14 V	Alarm indicator lamp is not lit up
		0 V	Alarm indicator lamp is lit up
G37-9	—	—	—
G37-10	Serial communication line for supplementary heater controller (diesel engine model) (if equipped)	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 6: ”
G37-11	Serial communication line for information display (if equipped)	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 7: ”
G37-12	Ground for keyless entry receiver (if equipped)	0 V	—
G37-13	Power supply for keyless entry receiver (if equipped)	4 – 6 V	Ignition switch is at all positions
G37-14	Signal for keyless entry receiver (if equipped)	*0 – 1 V ↑↓ 4 – 6 V	Refer to “Reference waveform No. 8: ”
G37-15	—	—	—
G37-16	Key reminder switch	10 – 14 V	Ignition key is inserted to ignition key cylinder
		0 V	Ignition key is pulled out from ignition key cylinder
G37-17	Rear end door window defogger switch	0 V	Ignition switch is at ON position and rear end door window defogger switch is at ON position
		4 – 6 V	Ignition switch is at ON position and rear end door window defogger switch is at any position other than ON position
G37-18	A/C switch (if equipped)	*3 – 14 V	Refer to “Reference waveform No. 9: ”
		0 V	Ignition switch is at ON position, blower speed selector is at any position other than OFF position and A/C switch is at ON position
G37-19	—	—	—
G37-20	—	—	—
G37-21	Rear wiper INT switch	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 10: ”
		0 V	Ignition switch is at ON position and rear wiper switch is at INT position
G37-22	Rear wiper low switch	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 10: ”
		0 V	Ignition switch is at ON position and rear wiper switch is at LOW position

Junction block connector “E40”

Terminal	Circuit	Normal voltage	Condition
E40-2	Backup power source	10 – 14 V	Ignition switch is at all positions

Junction block connector “E41”

Terminal	Circuit	Normal voltage	Condition
E41-3	Horn	10 – 14 V	Horn switch is at ON position
		0 V	Horn switch is at OFF position

Junction block connector “G32”

Terminal	Circuit	Normal voltage	Condition
G32-2	Power source (IG)	10 – 14 V	Ignition switch is at ON position
		0 V	Ignition switch is at any position other than ON position
G32-5	Power source (ACC)	10 – 14 V	Ignition switch is at ACC or ON position
		0 V	Ignition switch is at any position other than ACC or ON position

Junction block connector “G33”

Terminal	Circuit	Normal voltage	Condition
G33-3	Ground for BCM	0 V	Ignition switch is at all positions
G33-7	Rear end door window defogger switch indication	10 – 14 V	Engine is running and defogger switch indication is lit up
		0 V	Engine is running and defogger switch indication is not lit up

Junction block connector “G34”

Terminal	Circuit	Normal voltage	Condition
G34-3	Horn switch	10 – 14 V	Horn switch is not pushed
		0 V	Horn switch is pushed
G34-7	Lighting switch	10 – 14 V	Engine is running (equipped with DRL) or lighting switch is at any position other than OFF position
		0 V	Lighting switch is at OFF position
G34-9	Ground for BCM	0 V	Ignition switch is at all positions
G34-11	Hazard switch	0 V	Hazard switch is at ON position or lock or unlock button of keyless entry transmitter (answer back control) is pushed
		10 – 14 V	Hazard switch is at OFF position

Junction block connector “K01”

Terminal	Circuit	Normal voltage	Condition
K01-5	Interior light	10 – 14 V	Interior light switch is at DOOR position and interior light is not lit up
		0 V	Interior light switch is at DOOR position and interior light is lit up

Junction block connector “L04”

Terminal	Circuit	Normal voltage	Condition
L04-2	Air bag communication line	*0 – 1 V ↑↓ 4 – 6 V	Refer to “Reference waveform No. 11: ”
L04-3	Serial communication line of data link connector for SDM	8 – 12 V	Ignition switch is at ON position

Junction block connector “L05”

Terminal	Circuit	Normal voltage	Condition
L05-4	Ground for BCM	0 V	Ignition switch is at all positions
L05-5	Power supply for rear wiper motor	10 – 14 V	Ignition switch is at ON position
L05-6	Right side door mirror heater (if equipped)	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L05-7	Left side door mirror heater (if equipped)	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L05-8	Rear end door window defogger wire	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L05-9	Rear wiper control	10 – 14 V	Ignition switch is at ON position and rear wiper is not in operation
		0 V	Ignition switch is at ON position and rear wiper is in operation

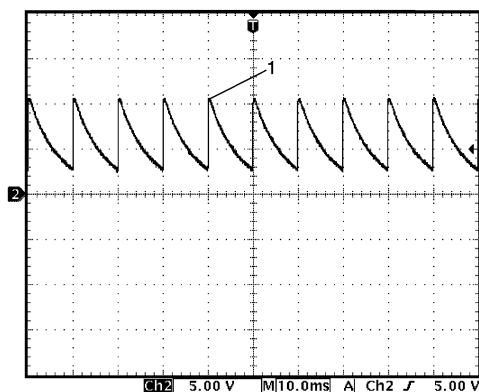
Junction block connector “L06”

Terminal	Circuit	Normal voltage	Condition
L06-1	Door lock actuator control (Dead lock) (if equipped)	10 – 14 V	Driver side key cylinder is turned to lock twice with in 3 seconds.
		0 V	Manual door lock switch is at any position other than LOCK position and driver side door key cylinder switch is at any position other than LOCK position
L06-9	Rear right and left door lock actuator control (Unlock)	10 – 14 V	Rear right and left door lock actuator motor is operated (Unlock)
		0 V	Rear right and left door lock actuator motor is not operated
L06-10	Door lock actuator control (Lock)	10 – 14 V	Manual door lock switch is at LOCK position or driver side door key cylinder switch is at LOCK position
		0 V	Manual door lock switch is at any position other than LOCK position or driver side door key cylinder switch is at any position other than LOCK position

Reference waveform No. 1

Parking brake or brake fluid level switch signal (1)

Measurement terminal	Parking brake switch CH2: "L01-6" to "G33-3" Brake fluid level switch CH2: "E46-5" to "G33-3"
Oscilloscope setting	CH1: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Parking brake switch: - Ignition switch is at ON position, parking brake lever is released Brake fluid level switch - Ignition switch is at ON position, brake fluid level is in normal

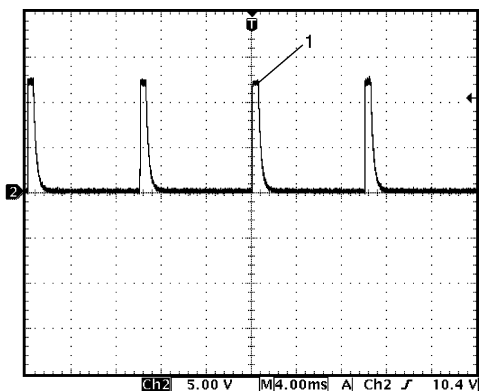


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Reference waveform No. 2

"3" position switch signal (1) for TCM

Measurement terminal	CH2: "L01-8" to "G33-3"
Oscilloscope setting	CH2: 5 V/DIV TIME: 4 ms/DIV
Measurement condition	Ignition switch is at ON position and A/T selector lever is at any position other than "2" or "3" position

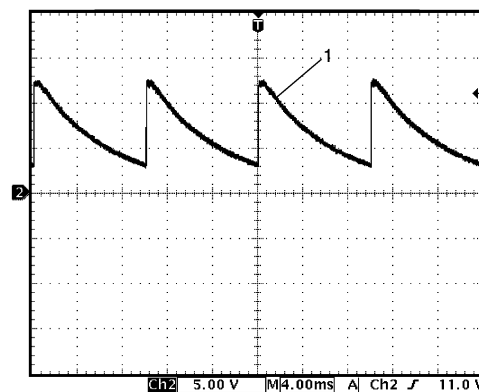


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Reference waveform No. 3

Driver seat belt switch signal (1)

Measurement terminal	CH2: "L01-14" to "G33-3"
Oscilloscope setting	CH2: 5 V/DIV TIME: 4 ms/DIV
Measurement condition	Ignition switch is at ON position and driver side seat belt is fastened

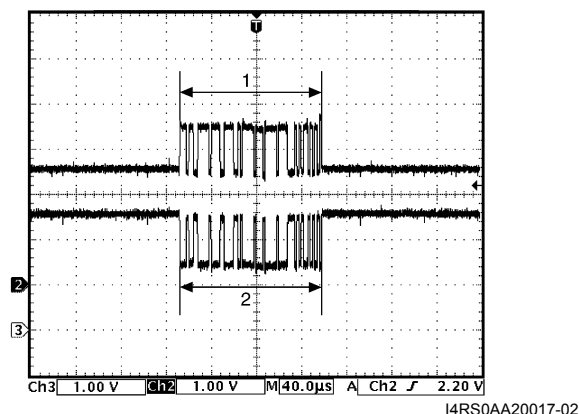


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Reference waveform No. 4

CAN communication signal

Measurement terminal	CAN communication signal for ECM or ESP® control module CH2: "E46-1" to "G33-3" CH3: "E46-2" to "G33-3" CAN communication signal for DLC CH2: "G37-3" to "G33-3" CH3: "G37-1" to "G33-3" CAN communication signal for each control module CH2: "G37-4" to "G33-3" CH3: "G37-2" to "G33-3"
Oscilloscope setting	CH2: 1 V/DIV CH3: 1 V/DIV TIME: 40 μ s / DIV
Measurement condition	Ignition switch is at ON position

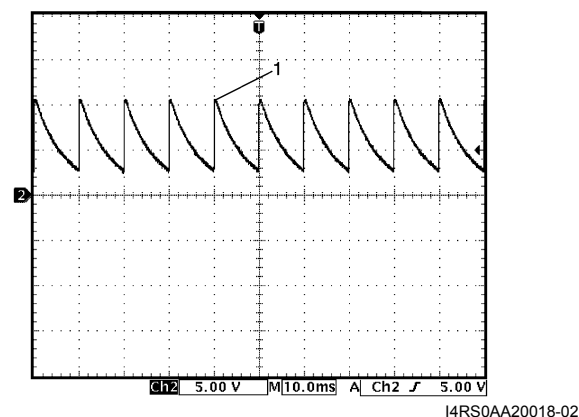


1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No. 5

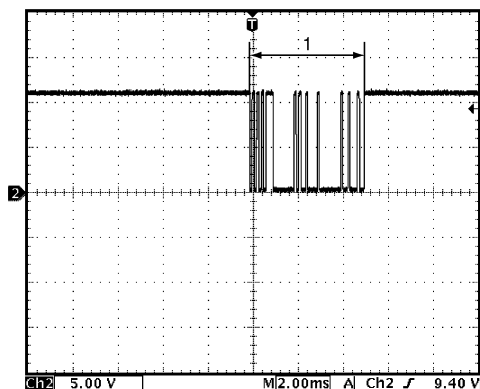
Oil pressure switch signal (1)

Measurement terminal	CH2: "E46-11" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Engine is running and oil pressure is in normal condition

**Reference waveform No. 6**

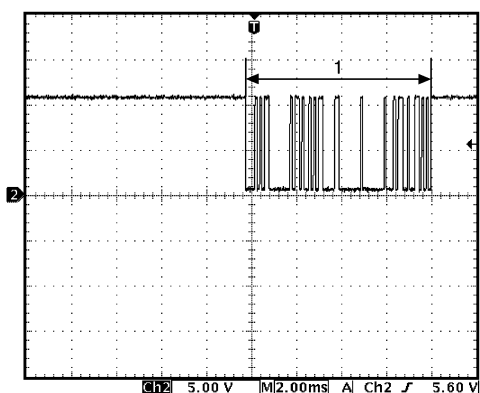
Supplementary heater controller serial communication signal (1)

Measurement terminal	CH2: "G37-10" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position

**Reference waveform No. 7**

Information display serial communication signal (1)

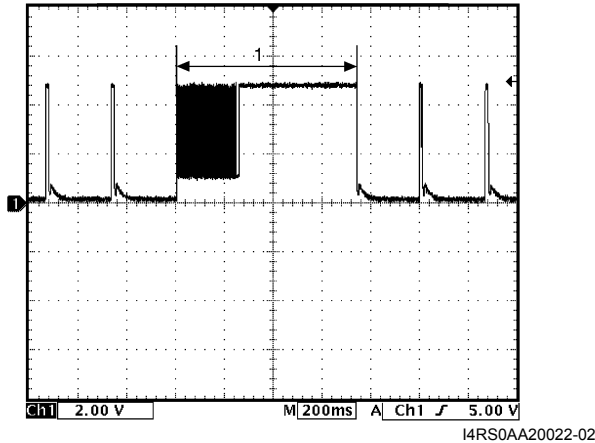
Measurement terminal	CH2: "G37-11" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position



Reference waveform No. 8

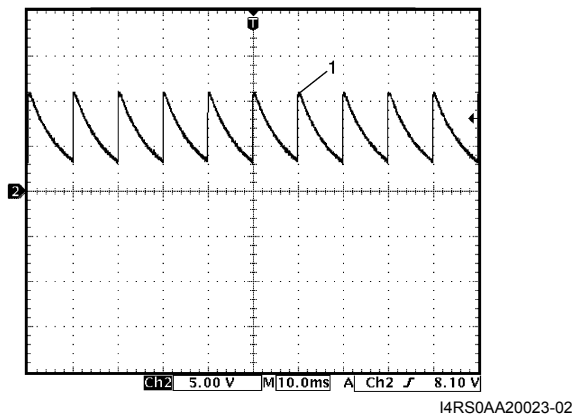
Keyless entry receiver signal (1)

Measurement terminal	CH2: "G37-14" to "G33-3"
Oscilloscope setting	CH2: 2 V / DIV TIME: 200 ms / DIV
Measurement condition	Lock or unlock button of keyless entry transmitter is pushed

**Reference waveform No. 9**

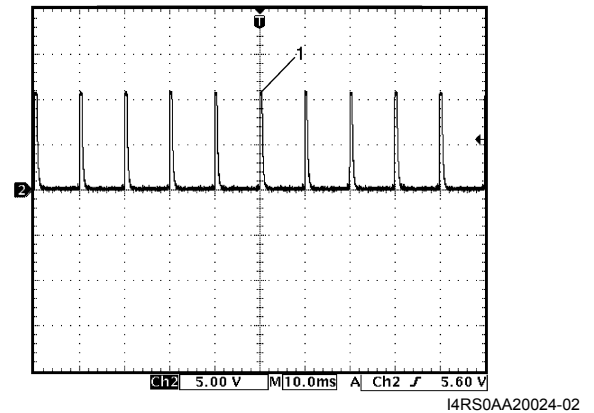
A/C switch signal (1)

Measurement terminal	CH2: "G37-18" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position, A/C switch or blower speed selector is at OFF position

**Reference waveform No. 10**

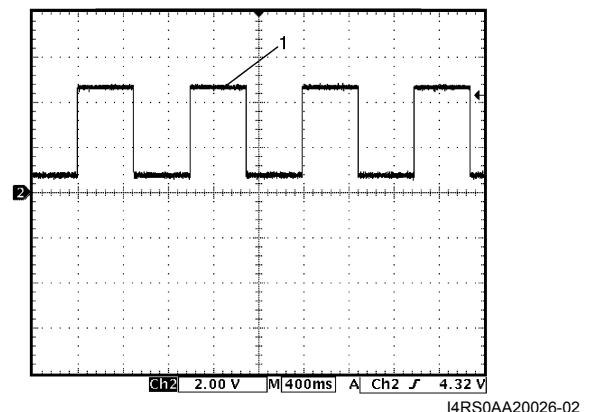
Rear wiper switch signal (1)

Measurement terminal	Rear wiper INT switch CH2: "G37-21" to "G33-3" Rear wiper LOW switch CH2: "G37-22" to "33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Rear wiper INT switch: - Ignition switch is at ON position and rear wiper switch is at any position other than INT position Rear wiper LOW switch: - Ignition switch is at ON position and rear wiper switch is at any position other than LOW position

**Reference waveform No. 11**

SDM communication signal (1)

Measurement terminal	CH2: "L04-2" to "G33-3"
Oscilloscope setting	CH2: 2 V / DIV TIME: 400 ms / DIV
Measurement condition	Ignition switch is at ON position



Immobilizer Control System

For Petrol Engine Model

Precautions

Precautions in Diagnosing Troubles

S6RS0BA310001

- Before confirming the diagnostic trouble code (DTC), do not disconnect connector from ECM, battery cable from battery, ground wire harness, or main fuse. Such disconnection will erase DTC stored in ECM.
- DTC stored in ECM 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, ESP® control module (if equipped), TCM (for A/T model), 4WD control module (if equipped), keyless start control module (if equipped), combination meter, steering angle sensor (if equipped) and DLC is established by CAN (Computer Area Network). Therefore, handle CAN communication lines with care referring to "Precaution for CAN Communication System in Section 00 in related manual".
For CAN communication system, refer to description on "CAN Communication System Description: For M13, M15 and M16 Engines in Section 1A".

Schematic and Routing Diagram

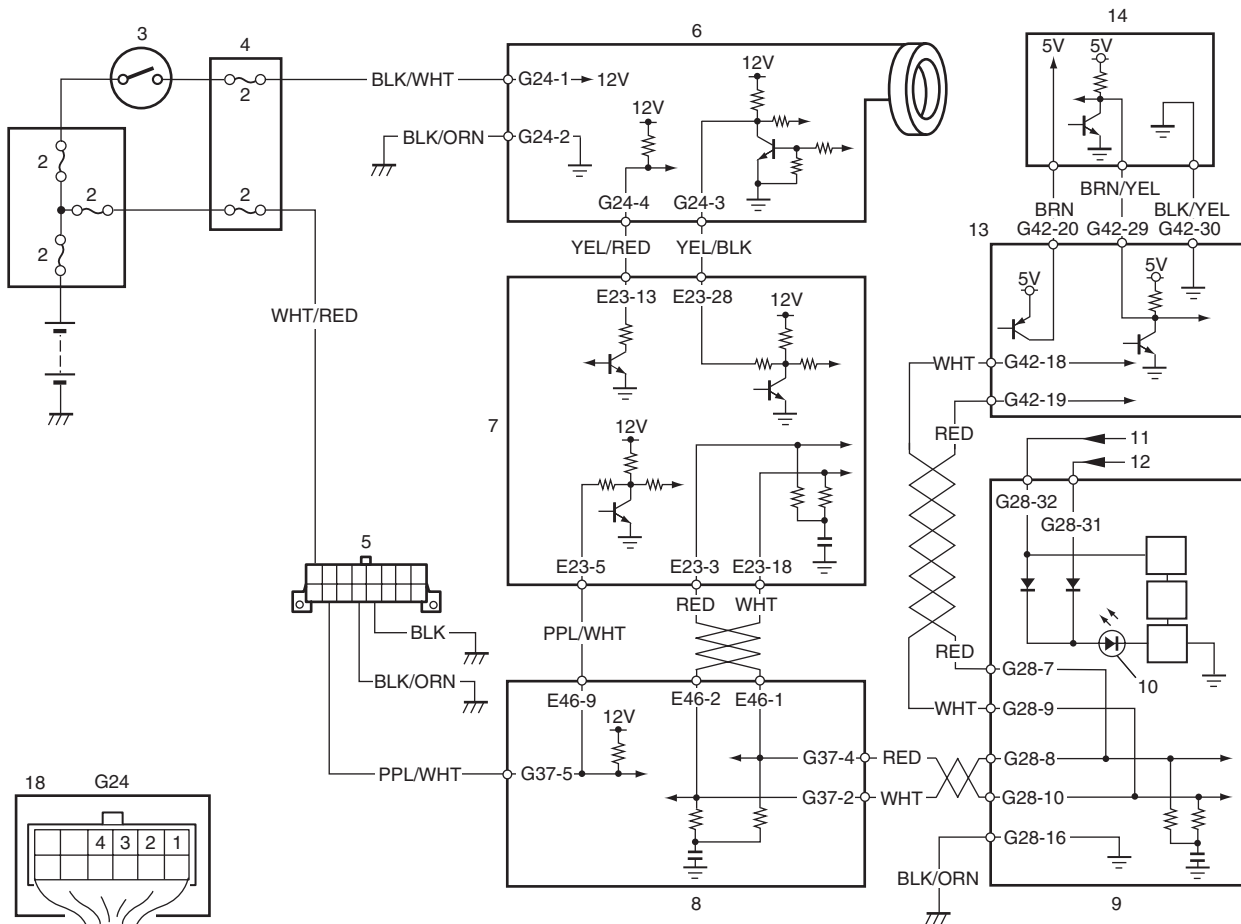
Immobilizer Control System Wiring Circuit Diagram

S6RS0BA312001

NOTE

For more details about power supply and ground circuits for ECM, BCM, ESP® control module, keyless start control module and combination meter, refer to “System Circuit Diagram in Section 9A”.

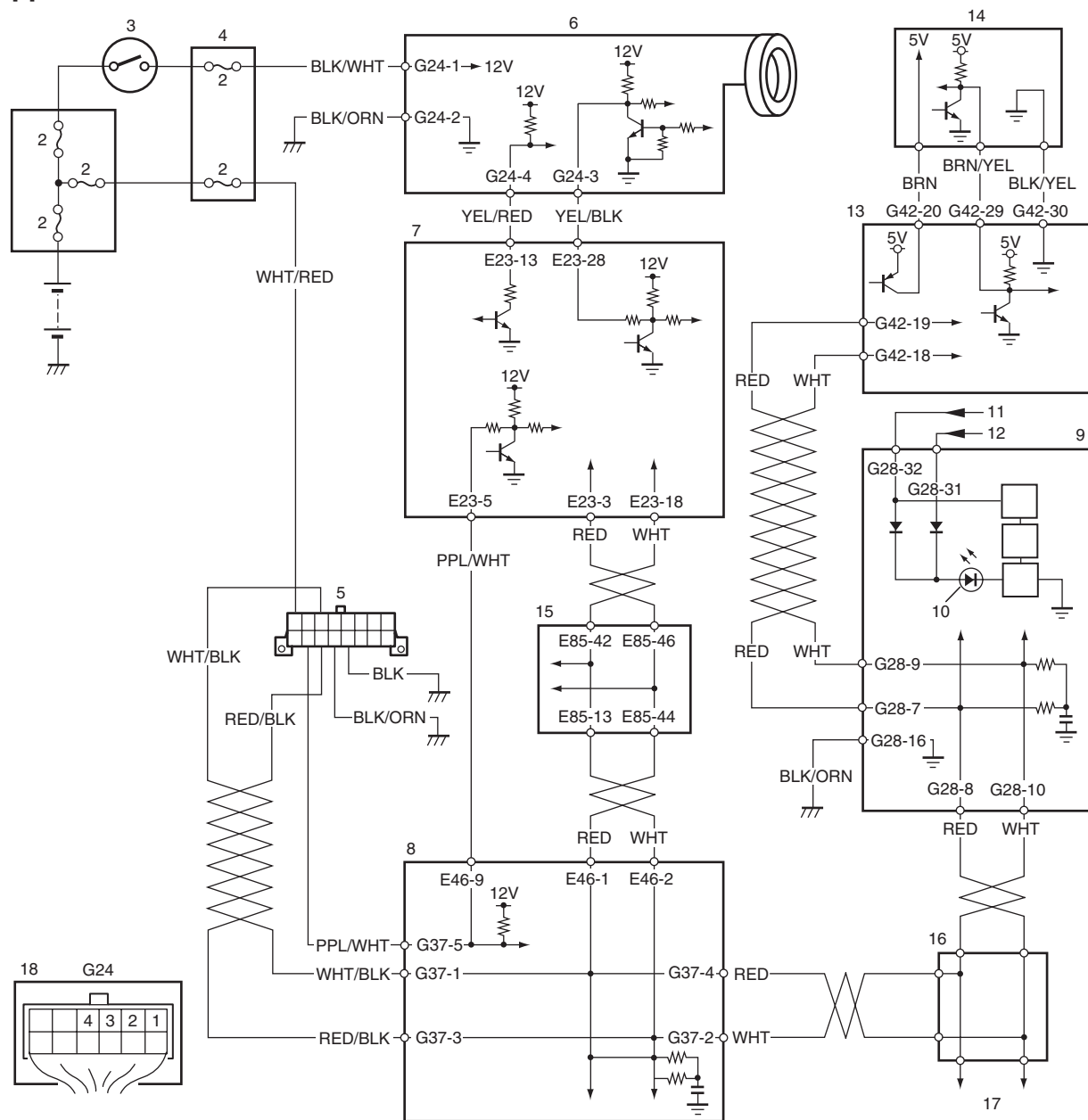
[A]



I6RS0BA31001-01

10C-3 Immobilizer Control System: For Petrol Engine Model

[B]



I6RS0BA31002-01

[A]: Non ESP® model	4. Junction block assembly	9. Combination meter	14. Steering lock unit
[B]: ESP® model	5. Data link connector (DTC)	10. Immobilizer indicator lamp	15. ESP® control module
1. Battery	6. Immobilizer control module (ICM)	11. From "MAIN" fuse	16. Junction connector
2. Fuse	7. ECM	12. From "METER" fuse	17. To steering angle sensor
3. Ignition switch	8. BCM	13. Keyless start control module	

Diagnostic Information and Procedures

Immobilizer Control System Check

S6RS0BA314001

Step	Action	Yes	No
1	Immobilizer Indicator Lamp Check Turn ignition switch to ON position using ignition key. <i>Does it immobilizer indicator lamp (1) come on?</i> I4RS0AA30004-01	Go to Step 2.	Go to "Immobilizer Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop: For Petrol Engine Model in related manual".
2	Immobilizer Indicator Lamp Flash On and Off Check <i>Does it immobilizer indicator lamp flashes on and off continuously in Step 1?</i>	Check what DTC is detected by ECM referring to "Diagnostic Trouble Code (DTC) Check: For Petrol Engine Model in related manual". Then, perform the troubleshooting referring to the corresponding flowchart in this section.	Go to Step 3.
3	Engine Start Check Start engine using ignition key. <i>Does engine start?</i>	Go to Step 4.	Perform "Engine and Emission Control System Check: For M13, M15 and M16 Engines in Section 1A in related manual".
4	Immobilizer Indicator Lamp Remain ON Check Check Immobilizer Lamp remains ON after engine start. <i>Does immobilizer indicator lamp remains ON after engine start?</i>	Go to "Immobilizer Indicator Lamp Remains ON after Engine Starts: For Petrol Engine Model in related manual".	Immobilizer system is good condition. Then go to "Keyless Start System Check in Section 10E in related manual". (Vehicle equipped with keyless start system only)

Diagnostic Trouble Code (DTC) Table

S6RS0BA314004

NOTE

ECM detects diagnostic trouble code (DTC). ICM does not.

DTC No.	Detecting Item	Detecting Condition	Immobilizer Indicator Lamp
P1614	Transponder response error	Transponder code in transponder built in ignition key cannot be read through ICM.	Flash

10C-5 Immobilizer Control System: For Petrol Engine Model

DTC No.	Detecting Item	Detecting Condition	Immobilizer Indicator Lamp
P1615	Steering lock unit communication error (for vehicle with keyless start system)	- While registering the transponder code in the transponder built in the ignition key in ECM, the keyless start control module sent a signal to ECM indicating that the ID code could not be registered. - The ID code could not be registered in the keyless start control module or ECM.	Flash
P1616	Unregistered keyless start control module (for vehicle with keyless start system)	ECM detects different ID codes registered in ECM and keyless start control module.	Flash
P1618	Keyless start control module CAN communication error (for vehicle with keyless start system)	Reception error of communication data for keyless start control module is detected for longer than specified time continuously.	Flash
P1621	Immobilizer communication line error	Communication error between ICM and ECM.	Flash
P1622	EEPROM reading / writing error	EEPROM in ECM is corrupted.	Flash
P1623	Unregistered transponder	Transponder code in the transponder built in the ignition key is invalid.	Flash
P1625	Immobilizer antenna error	ICM is faulty.	Flash
P1636	Immobilizer information registration failure	Communication error between ECM and BCM.	No operation
P1638	Immobilizer information mismatched	- Communication error between ECM and BCM. - Wrong ECM or BCM is used.	No operation

NOTE

If any DTC other than the above DTCs is detected, refer to “DTC Table: For M13, M15 and M16 Engines in Section 1A”.

DTC P1614: Transponder Response Error

S6RS0BA314008

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: For Petrol Engine Model”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Transponder code in the transponder built in the ignition key cannot be read through immobilizer control module (ICM).	- Communication among each component - Ignition key - Transponder - Immobilizer control module (ICM) - ECM

Troubleshooting

Step	Action	Yes	No
1	Was “Immobilizer Control System Check” performed?	Go to Step 2.	Go to “Immobilizer Control System Check: For Petrol Engine Model”.
2	Diagnostic Trouble Code (DTC) check 1) Check if any DTC other than P1614 is detected referring to “Diagnostic Trouble Code (DTC) Check: For Petrol Engine Model in related manual”. Is DTC other than P1614 is detected?	Go to applicable DTC diag. flow.	Go to Step 3.

Step	Action	Yes	No
3	Registration of ignition key in use with ECM 1) Register ignition key in use with ECM referring to "Registration of the Ignition Key: For Petrol Engine Model in related manual". <i>Was registration of ignition key completed?</i>	Recheck DTC for ECM. If DTC P1614 is still detected, go to Step 4.	Go to Step 4.
4	Registration of the spare ignition key 1) Register the spare ignition key with ECM referring to "Registration of the Ignition Key: For Petrol Engine Model in related manual". <i>Was registration of spare ignition key completed?</i>	Replace ignition key which can not be registered.	Substitute a known-good ECM and recheck.

DTC P1615: ID Code Does Not Registered (Vehicle equipped with keyless start system only)

S6RS0BA314009

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: For Petrol Engine Model".

Circuit Description

When the transponder code of the ignition key is registered in ECM, the ID code is also registered in ECM and keyless start control module at the same time. This DTC code P1615 is detected only when the ID code cannot be registered in both ECM and keyless start control module when the transponder code in the ignition key is registered in ECM.

NOTE

- Perform troubleshooting of DTC P1618 if both DTC P1615 and P1618 have been detected.
- After replacing ECM, be sure to register the transponder code in the ignition key with ECM referring to "Registration of the Ignition Key: For Petrol Engine Model in related manual". After replacing the keyless start control module of the vehicle equipped with the keyless start system, be sure to register referring to "Registration of the Ignition Key: For Petrol Engine Model in related manual".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
• While registering the transponder code in ECM, the keyless start control module sent a signal to ECM indicating that the ID code could not be registered. • The ID code could not be registered in the keyless start control module or ECM.	• Wire circuits between steering lock unit and keyless start control module • CAN communication circuit • Steering lock unit • Keyless start control module • ECM

Troubleshooting

Step	Action	Yes	No
1	<i>Was "Immobilizer Control System Check" performed?</i>	Go to Step 2.	Go to "Immobilizer Control System Check: For Petrol Engine Model".
2	Registration of ignition key 1) Register ignition key in use with ECM referring to "Registration of the Ignition Key: For Petrol Engine Model in related manual". <i>Was registration of ignition key completed?</i>	Recheck ECM for DTC. If DTC P1615 is still detected, go to Step 3.	Go to Step 3.
3	DTC check <i>Is DTC other than P1615 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 5.

10C-7 Immobilizer Control System: For Petrol Engine Model

Step	Action	Yes	No
4	DTC check for keyless start control module 1) Check Keyless start control module for DTC referring to "DTC Check in Section 10B in related manual". <i>Is DTC detected?</i>	Go to applicable DTC diag. flow.	Go to Step 5.
5	Check for communication circuit between steering lock unit and keyless start control module 1) With the ignition switch at OFF position, disconnect steering lock unit connector and keyless start control module connector. 2) Check for proper connection at terminals and wires of each connector referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". 3) If OK, check for open, short, and high resistance in each circuit between steering lock unit and keyless start control module. Refer to Step 2 in "DTC No. 11: Communication Error with Steering Lock Unit in Section 10E in related manual". <i>Is each circuit in good condition?</i>	Go to Step 6.	Repair malfunction part and recheck.
6	Steering lock unit power supply check 1) Connect keyless start control module connector. 2) With ignition switch at ON position, check power supply terminal voltage of steering lock unit connector. Refer to "Keyless Start Control Module Power and Ground Circuit Check in Section 10E in related manual". <i>Is voltage 4 – 6 V?</i>	Replace steering lock unit and recheck.	Substitute a known-good keyless start control module and recheck. If DTC P1615 is still detected, substitute a known-good ECM and recheck.

DTC P1616: Different Registration ID Codes (Vehicle equipped with keyless start system only)

S6RS0BA314010

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: For Petrol Engine Model".

Circuit Description

P1616 is detected when ECM detects different ID codes registered in ECM and keyless control module after turning engine start knob to ON position.

Normally, when keyless start control module is replaced with new one, ECM automatically registers blank ID code of keyless control module to applicable one after turning ignition switch to ON position.

However, when keyless start control module is replaced with used one, ECM does not automatically register old ID code of keyless control module to applicable one even if ignition switch is turned to ON position.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
ECM detects different ID codes registered in ECM and keyless start control module.	• Keyless start control module • ECM

Troubleshooting

Step	Action	Yes	No
1	Was "Immobilizer Control System Check" performed?	Go to Step 2.	Go to "Immobilizer Control System Check: For Petrol Engine Model".

Step	Action	Yes	No
2	Registration of the Ignition Key 1) Clear DTC referring to "Diagnostic Trouble Code (DTC) Clearance: For Petrol Engine Model in related manual". 2) Register the transponder code in the transponder in the ignition key with ECM referring to "Registration of the Ignition Key: For Petrol Engine Model in related manual". <i>Is ignition key able to be registered?</i>	Recheck ECM for DTC. If DTC P1616 is still detected, go to Step 3.	Go to Step 3.
3	DTC check Check ECM for DTC. <i>Is DTC P1618 and/or P1615 detected other than P1616?</i>	Go to DTC P1618 troubleshooting.	Go to DTC P1615 troubleshooting.

DTC P1618: CAN Communication Error (Reception Error for Keyless Start Control Module) (Vehicle equipped with keyless start system only)

S6RS0BA314011

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: For Petrol Engine Model".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Reception error of communication data for keyless start control module is detected for longer than specified time continuously.	• CAN communication circuit • Steering angle sensor (if equipped) • Combination meter • Keyless start control module • TCM (for A/T model) • 4WD control module (if equipped) • BCM • ESP® control module (if equipped) • ECM

Troubleshooting

Step	Action	Yes	No
1	<i>Was "Immobilizer Control System Check" performed?</i>	Go to Step 2.	Go to "Immobilizer Control System Check: For Petrol Engine Model".
2	DTC check for ECM <i>Is DTC other than P1618 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Control module connector check 1) With the ignition switch at OFF position, check intermittent and poor connection of following each connector referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". • ECM • ABS / ESP® control module • BCM • TCM (for A/T model) • 4WD control module (if equipped) • Keyless start control module • Combination meter • Steering angle sensor (if equipped) <i>Are all connectors in good condition?</i>	Go to Step 4.	Repair malfunction part and recheck.

10C-9 Immobilizer Control System: For Petrol Engine Model

Step	Action	Yes	No
4	CAN communication circuit check 1) Check for open, short and high resistance in CAN communication circuit between ECM and keyless start control module. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 5.	Repair circuit.
5	Check of keyless start control module power and ground wire circuits 1) Check keyless start control module power and ground wire circuits referring to "Keyless Start Control Module Power and Ground Circuit Check in Section 10E in related manual". <i>Are they in normal?</i>	Substitute a known-good keyless start control module and module.	Repair malfunctioning wire circuit.

DTC P1621: Immobilizer Communication Line Error

S6RS0BA314012

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: For Petrol Engine Model".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Communication error between immobilizer control module (ICM) and ECM is detected by ECM.	• Related fuse(s) blown • Poor connection at ICM connector • Power and ground circuit of ICM • Communication circuit between ICM and ECM • ICM • ECM

Troubleshooting

Step	Action	Yes	No
1	<i>Was "Immobilizer Control System Check" performed?</i>	Go to Step 2.	Go to "Immobilizer Control System Check: For Petrol Engine Model".
2	Fuse check 1) Check fuse for ICM circuit. <i>Is fuse in good condition?</i>	Replace blown fuse(s) and then, check for short to power circuit.	Go to Step 3.
3	Voltage check at power and ground terminal 1) Check power and ground terminal voltage of ICM connector referring to "Inspection of Immobilizer Control Module (ICM) and Its Circuit: For Petrol Engine Model in related manual". <i>Is each terminal voltage in good condition?</i>	Go to Step 4.	Repair circuit.
4	ICM and ECM connector check 1) With the ignition switch at OFF position, check intermittent and poor connection of ICM connector and ECM connectors referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". <i>Is each connector in good condition?</i>	Go to Step 5.	Repair poor connection.

Step	Action	Yes	No
5	Communication circuit check between ICM and ECM 1) Check for open, short and high resistance in serial communication and clock circuit between ICM and ECM. <i>Is each communication circuit in good condition?</i>	Substitute a known-good ICM and recheck. If DTC P1621 is still detected, substitute a known-good ECM and recheck.	Repair circuit.

DTC P1622: EEPROM Error

S6RS0BA314013

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
EEPROM in ECM is corrupted.	ECM

Troubleshooting

- 1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: For Petrol Engine Model in related manual".
- 2) Turn the ignition switch to OFF position.
- 3) Check if DTC P1622 is still detected referring to "Diagnostic Trouble Code (DTC) Check: For Petrol Engine Model in related manual". If still detected, go to the next step. If not, the troubleshooting is completed.
- 4) Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: For M13, M15 and M16 Engines in Section 1C in related manual".
- 5) Perform "Procedure after ECM Replacement: For Petrol Engine Model in related manual".

DTC P1623: Unregistered Transponder

S6RS0BA314014

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Transponder code in the transponder built in the ignition key is invalid.	• Transponder in the ignition key • Immobilizer control module (ICM) • ECM

Troubleshooting

Step	Action	Yes	No
1	<i>Was "Immobilizer Control System Check" performed?</i>	Go to Step 2.	Go to "Immobilizer Control System Check: For Petrol Engine Model".
2	DTC check for ECM <i>Is DTC other than P1623 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Registration of unregistered ignition key with ECM 1) Register the unregistered ignition key with ECM referring to "Registration of the Ignition Key: For Petrol Engine Model in related manual". <i>Was registration of ignition key completed?</i>	Recheck DTC for ECM. If DTC P1623 is still detected, go to Step 4.	Go to Step 3.
4	Registration of the spare ignition key 1) Register the spare ignition key referring to "Registration of the Ignition Key: For Petrol Engine Model in related manual". <i>Was registration of spare ignition key completed?</i>	Replace ignition key which cannot be registered.	Substitute a known-good ECM and recheck.

DTC P1625: Immobilizer Antenna Error

S6RS0BA314015

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: For Petrol Engine Model”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Immobilizer control module (ICM) is faulty.	• ICM • ECM

Troubleshooting

Step	Action	Yes	No
1	<i>Was “Immobilizer Control System Check” performed?</i>	Go to Step 2.	Go to “Immobilizer Control System Check: For Petrol Engine Model”.
2	Diagnostic Trouble Code (DTC) confirmation 1) Clear DTC(s) referring to “Diagnostic Trouble Code (DTC) Clearance: For Petrol Engine Model in related manual”. 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to “Diagnostic Trouble Code (DTC) Check: For Petrol Engine Model in related manual”. <i>Is DTC P1625 still detected?</i>	Substitute a known-good ICM and recheck DTC. If DTC P1625 is detected, substitute a known- good ECM and recheck.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual”.

DTC P1636: Immobilizer Information Registration Failure

S6RS0BA314017

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: For Petrol Engine Model”.

DTC Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
The registration of the immobilizer control system information in ECM is failed.	• CAN communication circuit • Steering angle sensor (if equipped) • Combination meter • Keyless start control module (if equipped) • TCM (for A/T model) • 4WD control module (if equipped) • BCM • ESP® control module (if equipped) • ECM

Troubleshooting

Step	Action	Yes	No
1	Was "Immobilizer Control System Check" performed?	Go to Step 2.	Go to "Immobilizer Control System Check: For Petrol Engine Model".
2	DTC Check for ECM 1) Check ECM for DTC referring to "DTC Check: For M13, M15 and M16 Engines in Section 1A in related manual". <i>Is DTC P1674, P1675, P1676 and/or U1678 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	DTC check for BCM 1) Check BCM for DTC referring to "DTC Check in Section 10B in related manual". <i>Is DTC U1073, U1100, U1101 and/or U1144 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 4.
4	CAN communication circuit check 1) Check for open, short and high resistance in CAN communication circuits between ECM and BCM. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 5.	Repair circuit.
5	Replacement of BCM 1) Replace BCM with new one referring to "BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B in related manual". 2) Check ECM for DTC referring to "Diagnostic Trouble Code (DTC) Check: For Petrol Engine Model in related manual". <i>Is DTC P1636 still detected?</i>	Substitute a known-good ECM and recheck.	BCM faulty.

DTC P1638: Immobilizer Information Mismatched

S6RS0BA314018

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: For Petrol Engine Model".

DTC Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
- The immobilizer control system information in ECM and the one in BCM does not match. - The registration of the immobilizer control system information in ECM is failed.	- Use of the wrong ECM - CAN communication circuit - Steering angle sensor (if equipped) - Combination meter - Keyless start control module (if equipped) - TCM (for A/T model) 4WD control module (if equipped) - BCM - ESP® control module (if equipped) - ECM

10C-13 Immobilizer Control System: For Petrol Engine Model**Troubleshooting**

Step	Action	Yes	No
1	Was "Immobilizer Control System Check" performed?	Go to Step 2.	Go to "Immobilizer Control System Check: For Petrol Engine Model".
2	Diagnostic Trouble Code (DTC) confirmation 1) Disconnect negative (–) cable from battery for more than 5 seconds. 2) Connect negative (–) cable to battery. 3) Check if any DTC is detected referring to "Diagnostic Trouble Code (DTC) Check: For Petrol Engine Model in related manual". <i>Is DTC P1638 still detected?</i>	Go to Step 3.	Intermittent trouble check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
3	ECM specification check 1) Check ECM part number to see if ECM is applicable to the vehicle in service. <i>Is a correct ECM used for the vehicle in service?</i>	Go to Step 4.	Replace ECM with the correct one and recheck if DTC P1638 is still detected by ECM.
4	DTC check for ECM 1) Check ECM for DTC referring to "DTC Check: For M13, M15 and M16 Engines in Section 1A in related manual". <i>Is DTC P1674, P1675 and/or P1678 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 5.
5	DTC check for BCM 1) Check BCM for DTC referring to "DTC Check in Section 10B in related manual". <i>Is DTC U1073, U1100, U1101 and/or U1144 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 6.
6	CAN communication circuit check 1) Check for open, short and high resistance in CAN communication circuits between ECM and BCM. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 7.	Repair circuit.
7	Replacement of BCM 1) Replace BCM with new one referring to "BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B in related manual". 2) Check ECM for DTC referring to "Diagnostic Trouble Code (DTC) Check: For Petrol Engine Model in related manual". <i>Is DTC P1638 still detected?</i>	Substitute a known-good ECM and recheck.	BCM faulty.

Keyless Start System

General Description

CAN Communication of Keyless Start System

S6RS0BA501007

Refer to “CAN Communication System Description: For M13, M15 and M16 Engines in Section 1A” for CAN communication system description.

Keyless start control module communicates control data with each control module as follows.

Keyless Start Control Module Transmission Data

				ECM	BCM	Combination Meter
Keyless Start Control Module		DATA	ID code of keyless start control module	○		
			ECM-keyless start control module code	○		
			Ignition knob switch signal		○	
			Door lock/unlock request signal		○	
			Buzzer request signal		○	
			Answer back request signal		○	
			Key indicator lamp control signal			○

I5RW0AA50005-04

Keyless Start Control Module Reception Data

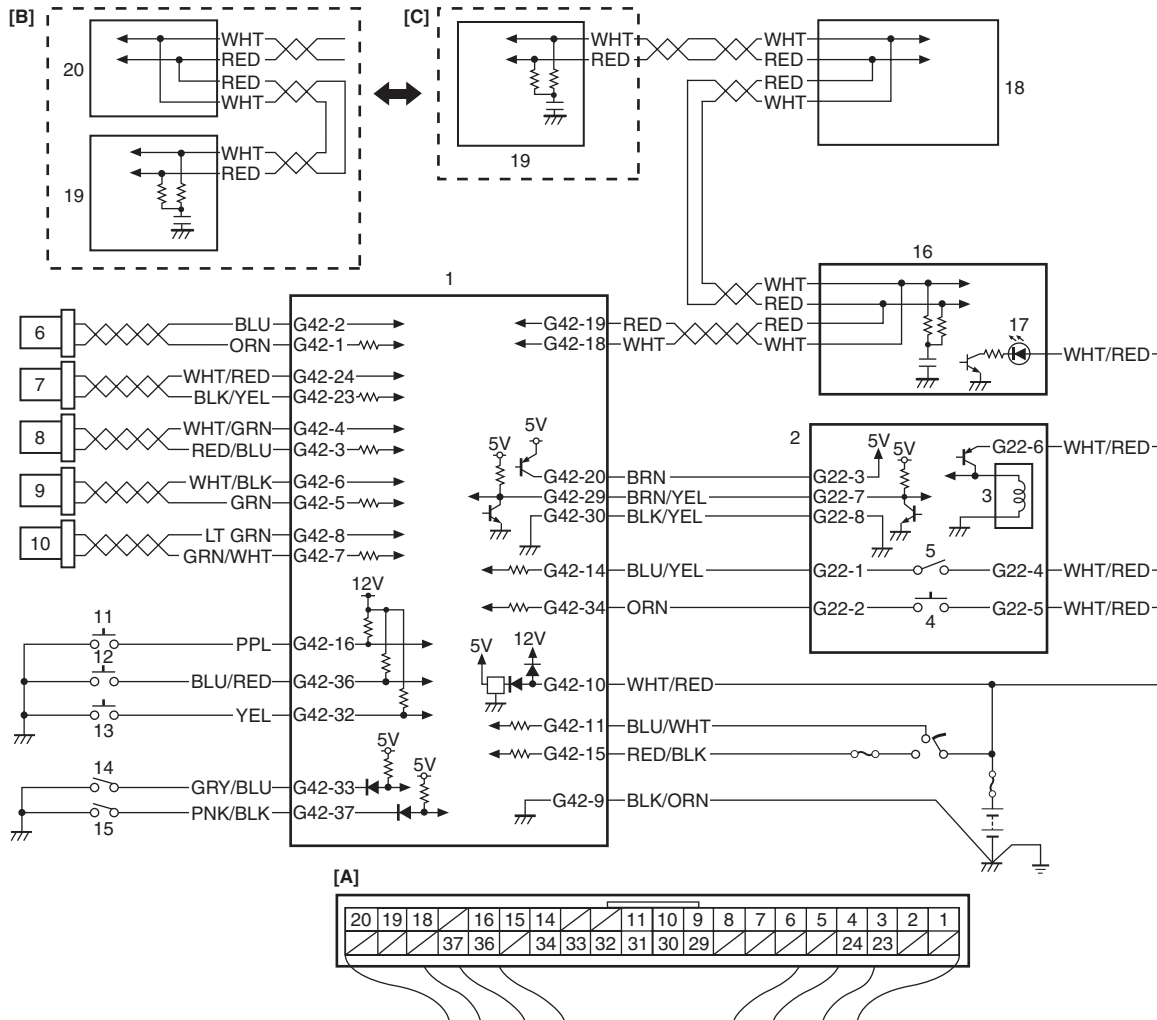
				ECM	BCM
Keyless Start Control Module		DATA	Vehicle speed signal	○	
			ECM-keyless start control module code	○	
			Door switch status		○
			Door lock status		○
			Charing system signal		○
			Engine oil pressure switch signal		○

I5RW0CA50001-01

Schematic and Routing Diagram

Keyless Start System Electric Wiring Circuit Diagram

S6RS0BA502001



I6RS0BA50002-01

[A]: Keyless start control module connector (viewed from harness side)	6. Driver side door antenna	14. Driver side door lock switch
[B]: Vehicle equipped with ESP®	7. Passenger side door antenna	15. Passenger side door lock switch
[C]: Vehicle not equipped with ESP®	8. Rear end door antenna	16. Combination meter
1. Keyless start control model	9. Center antenna	17. Key indicator lamp
2. Steering Lock unit	10. Luggage room antenna	18. BCM
3. Steering lock solenoid	11. Driver side door request switch	19. ECM
4. Ignition knob switch	12. Passenger side door request switch	20. ESP® control module
5. Key reminder switch	13. Rear end door request switch	

Diagnostic Information and Procedures

Precautions in Diagnosing Troubles

S6RS0BA504001

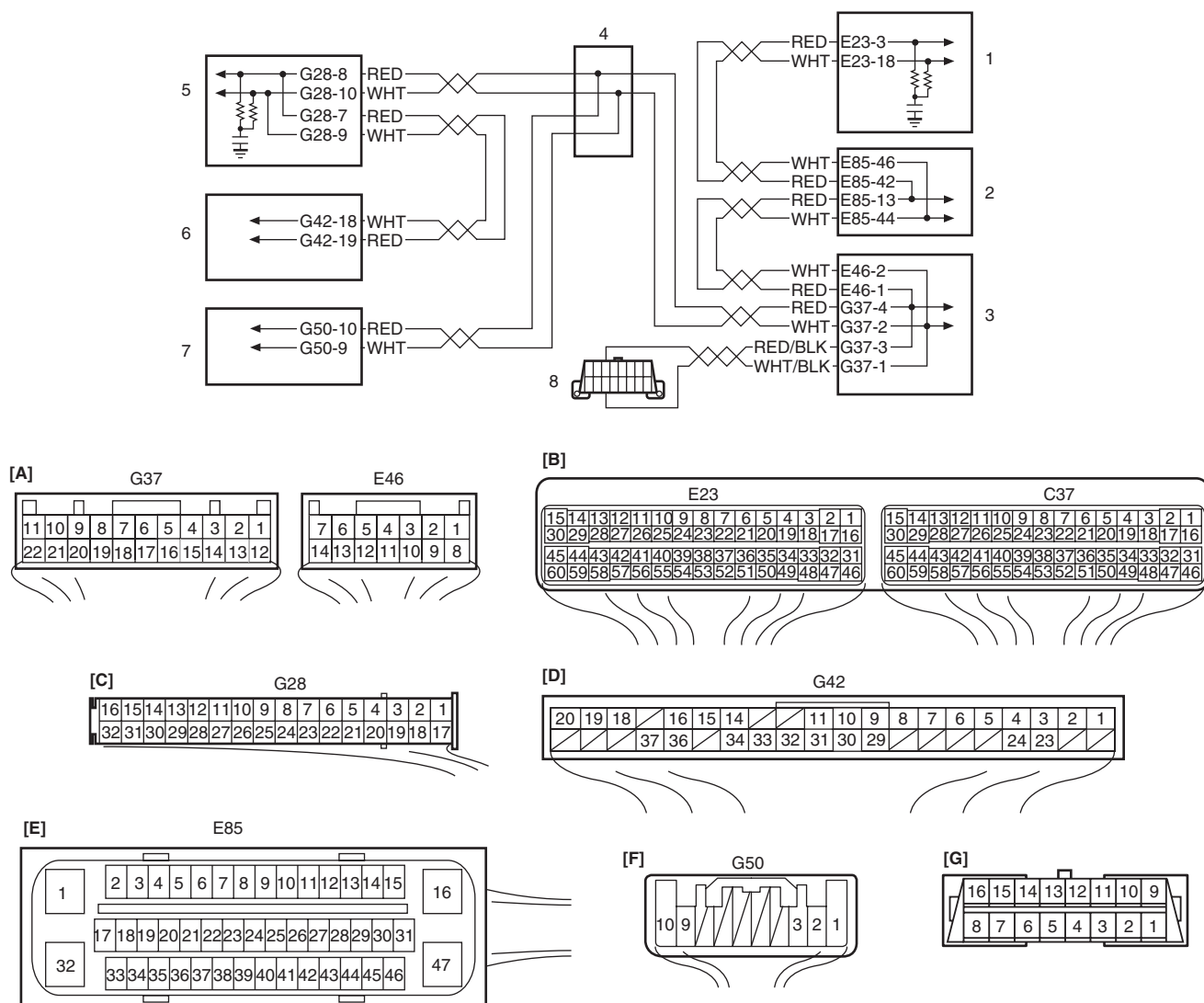
- The keyless start system executes data transmission/reception by means of the radio wave. Therefore, proper operation may not be obtained if use of the door lock function and engine start function of the keyless start system is attempted near the place where strong radio wave is emitted (TV and radio broadcasting stations, etc.).
- Diagnostic information stored in keyless start control module memory can be checked only by key indicator lamp.
- Be sure to use the trouble diagnosis procedure as described in "Keyless Start System Check in related manual". Failure to follow it may result in incorrect diagnosis. (Some other DTC may be stored by mistake in the memory of keyless start control module during inspection.)
- 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, TCM (A/T or Automated Manual Transaxle model), ESP® control module (if equipped), keyless start control module, steering angle sensor (if equipped) and combination meter is established by CAN (Controller Area Network). (For detail of CAN communication for keyless start control module, refer to "CAN Communication of Keyless Start System"). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00 in related manual".
- Replacement of the keyless start control module
When keyless start control module is replaced with new one, make sure that register remote controller ID code to Keyless start control module correctly according to "Registration Procedure for Remote Controller ID Code in related manual".
- Keyless start control module substitution
When the keyless start control module used in another vehicle was installed in the vehicle, register the ID code of the remote controller in the keyless start control module as well as the ignition key transponder code for the immobilizer control system in ECM. For the registration procedure of the ignition key transponder code, refer to "Registration of the Ignition Key: For Petrol Engine Model in Section 10C in related manual".

DTC No. 31: Lost Communication with BCM

S6RS0BA504020

Wiring Diagram

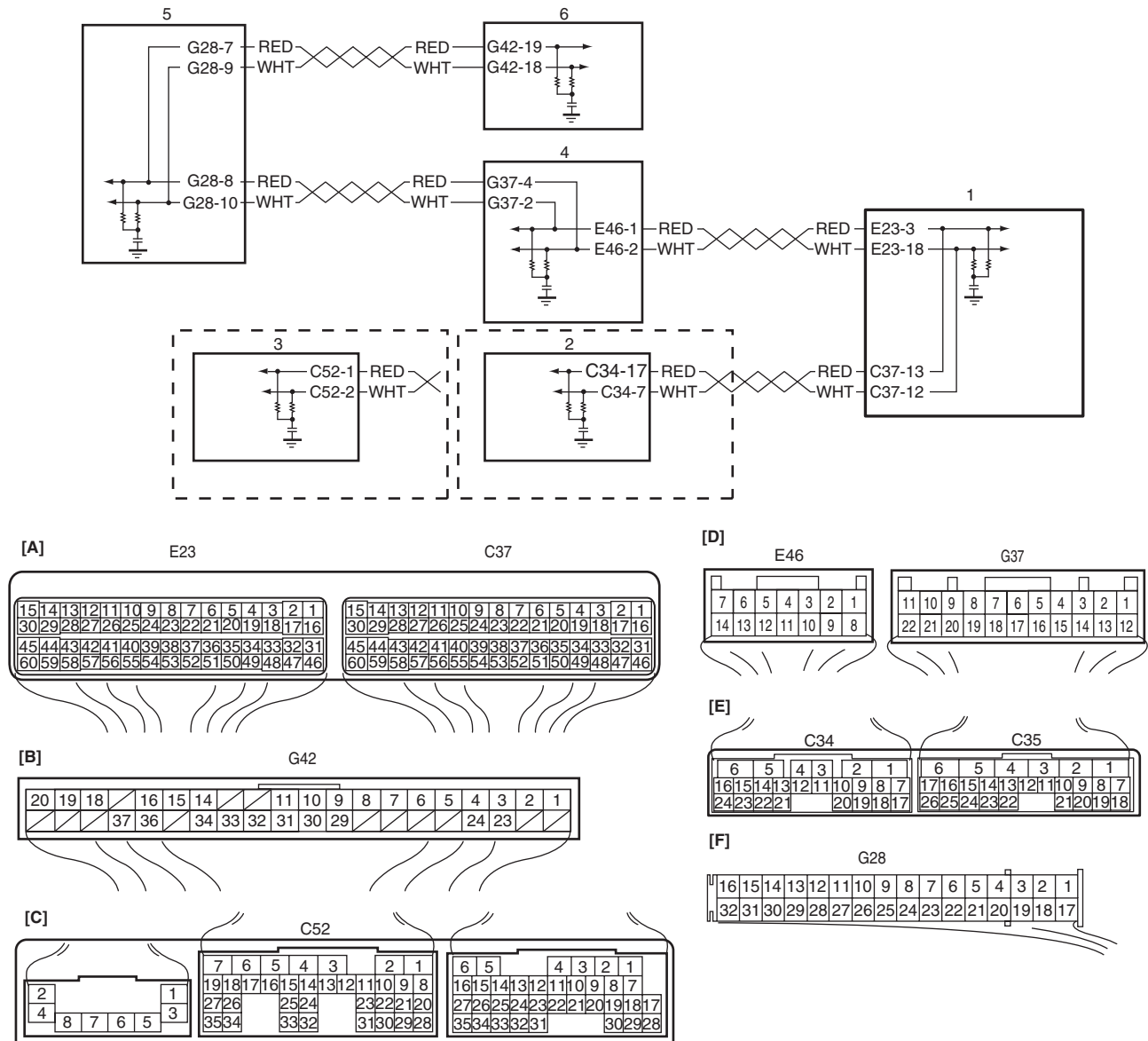
Vehicle equipped with ESP®



I6RS0BA50001-01

[A]: BCM connector (viewed from harness side)	2. ESP® control module
[B]: ECM connector (viewed from harness side)	3. BCM
[C]: Combination meter connector (viewed from harness side)	4. CAN junction connector
[D]: Keyless start control module connector (viewed from harness side)	5. Combination meter
[E]: ESP® control module connector (viewed from terminal side)	6. Keyless start control module
[F]: Steering angle sensor connector (viewed from harness side)	7. Steering angle sensor
[G]: DLC (viewed from terminal side)	8. DLC
1. ECM	

Vehicle not equipped with ESP®



14RS0BA50025-01

[A]: ECM connector (viewed from harness side)	1. ECM
[B]: Keyless start control module connector (viewed from harness side)	2. TCM (A/T model)
[C]: TCM connector (Automated Manual Transaxle model) (viewed from harness side)	3. TCM (Automated Manual Transaxle model)
[D]: BCM connector (viewed from harness side)	4. BCM
[E]: TCM connector (A/T model) (viewed from harness side)	5. Combination meter
[F]: Combination meter connector (viewed from harness side)	6. Keyless start control module

DTC Detecting condition and trouble area

DTC detecting condition	Trouble area
Keyless start control module cannot receive data sent by CAN from BCM	- CAN communication circuit - Keyless start control module - Combination meter - BCM

DTC Confirmation Procedure

- 1) Clear DTC referring to "DTC Clearance in related manual".
- 2) Turn ignition key knob by pushing ignition key knob.
- 3) Check DTC referring to "DTC Check in related manual".

10E-6 Keyless Start System:**Troubleshooting**

Step	Action	Yes	No
1	Was "Keyless Start System Check" performed?	Go to Step 2.	Go to "Keyless Start System Check in related manual".
2	DTC check of keyless start control module <i>Is DTC No. 33 detected?</i>	Go to "DTC No. 33: Control Module Communication Bus Off".	Go to Step 3.
3	DTC check of BCM 1) Check BCM for DTC. <i>Is DTC U1073, DTC U1100 or DTC U1101 detected?</i>	Go to applicable DTC diag flow.	Go to Step 4.
4	Control module connector check 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck keyless start control module for DTC. <i>Is DTC No.31 detected?</i>	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) Disconnect connectors from BCM, combination meter and keyless start control module. 2) Check CAN communication circuit for open, short and high resistance. • Between BCM and combination meter • Between combination meter and keyless start control module <i>Is each CAN communication circuit in good condition?</i>	Go to Step 6.	Repair circuit.
6	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 5 for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 7.	Repair circuit.
7	DTC check of ECM 1) Connect connectors disconnected control module communications by means of CAN. 2) Check ECM for DTC. <i>Is DTC P1678 detected?</i>	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM and recheck.	Go to Step 8.

Step	Action	Yes	No
8	DTC check of keyless start control module 1) Turn ignition switch to OFF position. 2) Disconnect connector of any one of control module other than keyless start control module. 3) Recheck keyless start control module for DTC. <i>Is DTC No.31 detected?</i>	Using same method, disconnect connectors of control module other than keyless start control module one by one to check if DTC No.31 is detected. If DTC No.31 is detected even through connector of control module other than keyless start control module is disconnected, substitute a known-good keyless start control module and recheck.	Check power and ground circuit of disconnected control module and recheck. If circuit is OK, substitute a known-good disconnected control module and recheck.

DTC No. 33: Control Module Communication Bus Off

S6RS0BA504021

Wiring Diagram

Refer to "DTC No. 31: Lost Communication with BCM".

DTC Detecting condition and trouble area

DTC detecting condition	Trouble area
Communication is not available with all control modules connected by CAN	• CAN communication circuit • Combination meter • Keyless start control module • BCM • TCM (A/T or Automated Manual Transaxle model) • ECM • ESP® control module (if equipped) • Steering angle sensor (if equipped)

DTC Confirmation Procedure

- 1) Clear DTC referring to "DTC Clearance in related manual".
- 2) Start engine and run it for 1 min. or more.
- 3) Check DTC referring to "DTC Check in related manual".

10E-8 Keyless Start System:**Troubleshooting**

Step	Action	Yes	No
1	<i>Was "Keyless Start System Check" performed?</i>	Go to Step 2.	Go to "Keyless Start 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 keyless start control module for DTC. <i>Is DTC No. 33 detected?</i>	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. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 4.	Repair circuit.
4	DTC check of keyless start control module 1) Turn ignition switch to OFF position. 2) Connect connectors of disconnected control modules communicating by means of CAN. 3) Disconnect connector of any one control module other than keyless start control module. 4) Recheck keyless start control module for DTC. <i>Is DTC No.33 detected?</i>	Using same method, disconnect connectors of control module other than keyless start control module one by one to check if DTC No.33 is detected. If DTC No.33 is detected even through connector of control module other than keyless start control module is disconnected, substitute a known-good keyless start control module and recheck.	Check power and ground circuit of disconnect control module. If circuit is OK, substitute a known-good disconnected control module and recheck.

Prepared by
MAGYAR SUZUKI CORPORATION LTD.

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