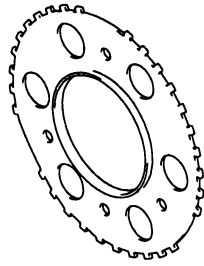


### Sensor Plate Inspection

S4RS0B1406040

Check sensor plate for crack damage. If malcondition is found, replace it.

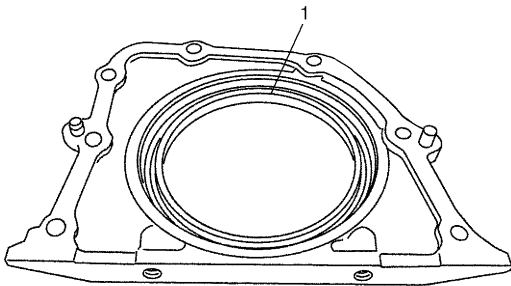


I2RH0B140151-01

### Rear Oil Seal Inspection

S4RS0B1406041

Carefully inspect oil seal (1) for wear or damage. If its lip is worn or damaged, replace it.



I4RS0A140020-01

### Flywheel Inspection

S4RS0B1406042

#### Visual Inspection

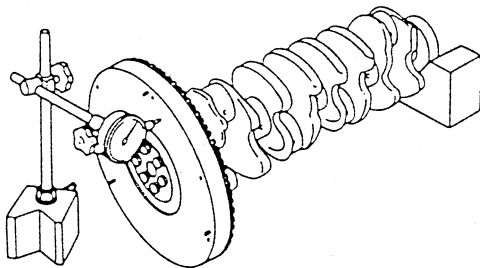
- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.

#### Flywheel Face Runout

Check flywheel face runout with a dial gauge. If runout exceeds its limit, replace flywheel.

#### Flywheel face runout

Limit: 0.2 mm (0.0079 in.)



I2RH01140198-01

### Cylinder Block Inspection

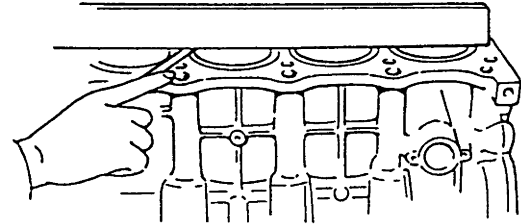
S4RS0B1406043

#### 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.

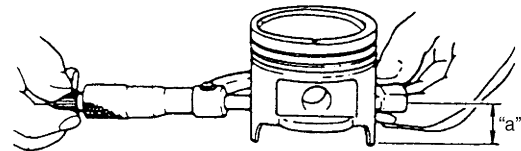
#### Oversize piston specification

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.)



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

S4RS0B1407001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Camshaft housing bolts	8	0.8	6.0	(for tightening of special tool) 
Camshaft housing bolt	11	1.1	8.0	 /  / 
Cylinder head cover bolt	8	0.8	6.0	
Accelerator cable locking nut	12	1.2	9.0	
EVAP canister purge valve bracket bolt	5	0.5	4.0	
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	
Timing chain cover bolt	25	2.5	18.0	
Timing chain cover nut	25	2.5	18.0	
Cap bolt	25	2.5	18.0	
Oil gallery pipe No.2 and No.3 bolt	11	1.1	8.0	
Crankshaft pulley bolt	150	15.0	108.5	
Oil control valve mounting nut	11	1.1	8.0	
Oil gallery pipe No.1 bolt	30	3.0	21.5	
Timing chain No.1 guide bolt	11	1.1	8.0	
Timing chain tensioner bolt	25	2.5	18.0	
Timing chain tensioner adjuster bolt	11	1.1	8.0	
Intake cam timing sprocket bolt	60	6.0	43.5	
Venturi plug	5	0.5	3.5	
Cylinder head bolt for M8	25	2.5	18.0	
Cylinder head bolt for M10	20 N·m (2.0 kgf·m, 14.5 lb·ft), 40 N·m (4.0 kgf·m, 29.0 lb·ft) and then retighten by turning through to 60° 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			 / 
Sensor plate bolt	11	1.1	8.0	
Main bearing cap No.1 bolt ((1) – (10))	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 ((11) – (20))	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	

#### NOTE

The specified tightening torque is also described in the following.

“Throttle Body Components: ”

“Throttle Body and Intake Manifold Components: ”

“Engine Mountings Components: ”

“Timing Chain Cover Components: ”

“Timing Chain and Chain Tensioner Components: ”

“Camshaft, Tappet and Shim Components: ”

“Valves and Cylinder Head Components: ”

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

“Main Bearings, Crankshaft and Cylinder Block Components: ”

#### Reference:

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

## Special Tools and Equipment

### Recommended Service Material

S4RS0B1408001

Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1207B	P/No.: 99000-31140	
	SUZUKI Bond No.1217G	P/No.: 99000-31260	
Water tight sealant	SUZUKI Bond No.1207F	P/No.: 99000-31250	/  /

#### NOTE

Required service material is also described in the following.

“Timing Chain Cover Components: ”

“Timing Chain and Chain Tensioner Components: ”

“Camshaft, Tappet and Shim Components: ”

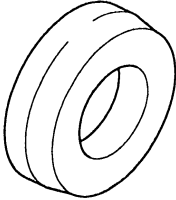
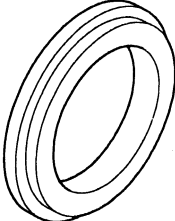
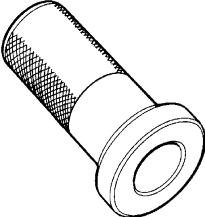
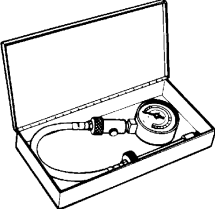
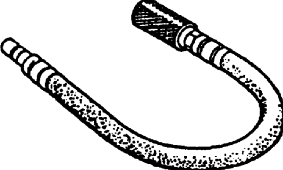
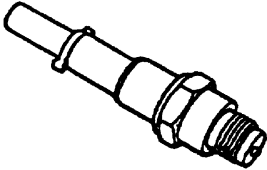
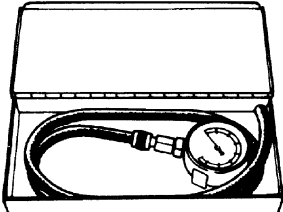
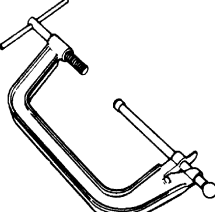
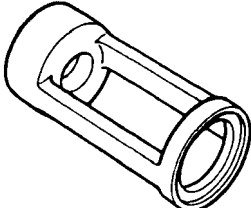
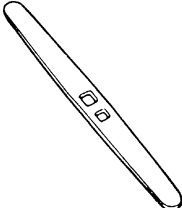
“Valves and Cylinder Head Components: ”

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

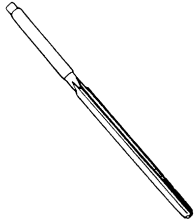
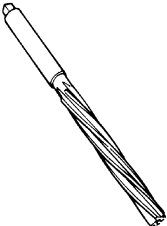

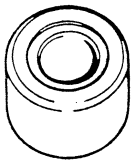
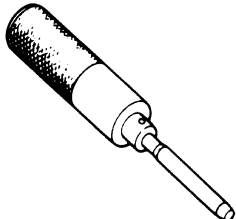
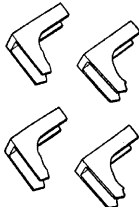
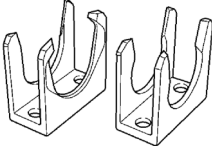
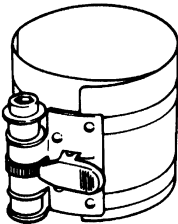
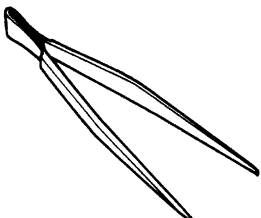
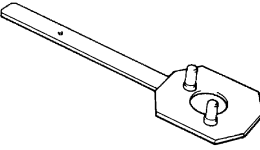

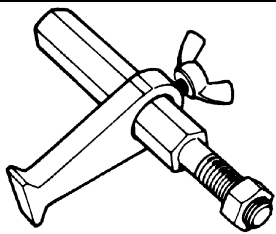

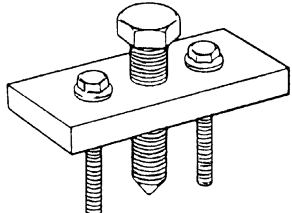
“Main Bearings, Crankshaft and Cylinder Block Components: ”

### Special Tool

S4RS0B1408002

09911-97720 Oil seal installer 		09911-97820 Oil seal installer 	
09913-75810 Bearing installer 		09915-64512 Compression gauge 	
09915-64530 Compression gauge hose 		09915-67010 Compression gauge attachment (C) 	
09915-67311 Vacuum gauge 		09916-14510 Valve lifter /	
09916-14521 Valve spring compressor attachment /		09916-34542 Reamer handle /	

**1D-69 Engine Mechanical:**

<p>09916-34550 Reamer handle</p>  <p>☞</p>	<p>09916-37320 Valve guide outer reamer (10.5 mm)</p>  <p>☞</p>
<p>09916-44910 Valve guide installer &amp; remover</p>  <p>☞</p>	<p>09916-56011 Valve guide installer attachment (protrusion: 11.5 mm)</p>  <p>☞</p>
<p>09916-58210 Valve guide installer handle</p>  <p>☞ / ☞</p>	<p>09916-67020 Tappet holder (Overseas)</p>  <p>☞ / ☞</p>
<p>09916-67021 Tappet holder</p>  <p>☞ / ☞</p>	<p>09916-77310 Piston ring compressor (50- 125 mm)</p>  <p>☞</p>
<p>09916-84511 Forceps</p>  <p>☞ / ☞</p>	<p>09917-68221 Camshaft pulley holder</p>  <p>☞ / ☞</p>
<p>09917-98221 Valve guide stem attachment</p>  <p>☞</p>	<p>09924-17810 Flywheel holder (drive plate stopper)</p>  <p>☞ / ☞</p>
<p>09926-58010 Bearing remover attachment</p>  <p>☞</p>	<p>09944-36011 Steering wheel remover</p>  <p>☞</p>

# Engine Lubrication System

## General Description

### Engine Lubrication Description

S4RS0B1501001

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.

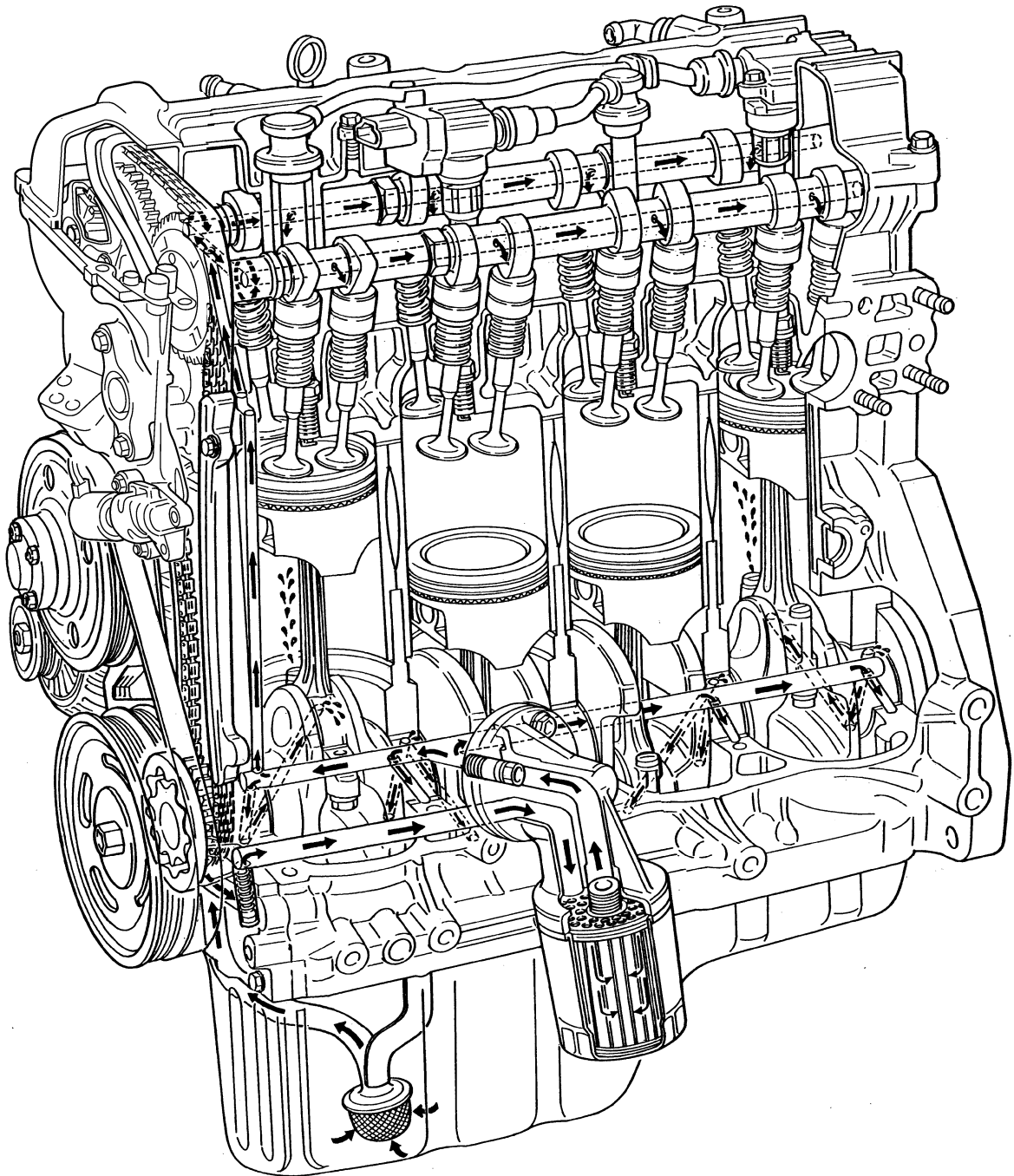
The filtered oil flows into two paths in cylinder block.

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/cm<sup>2</sup>, 49.8 psi).

1E-2 Engine Lubrication System:



I3RH0B150001-01

## Diagnostic Information and Procedures

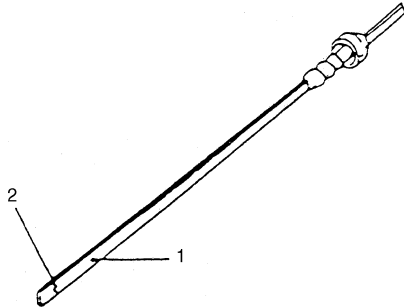
### Oil Pressure Check

S4RS0B1504001

#### NOTE

Prior to checking oil pressure, check the following.

- **Oil level in oil pan**  
If oil level is low, add oil up to Full level mark (hole) (1) on oil level gauge referring to “Engine Oil and Filter Change: in Section 0B”.

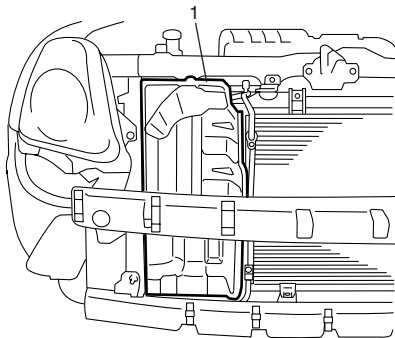


I2RH0B150002-01

2. Low level mark (hole)

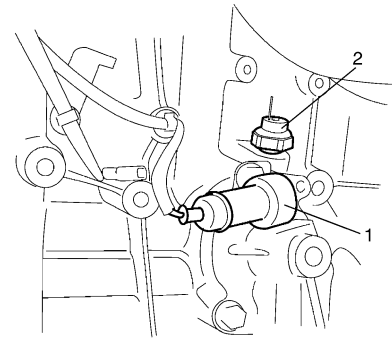
- **Oil quality**  
If oil is discolored or deteriorated, change it. For particular oil to be used, refer to “Engine Oil and Filter Change: in Section 0B”.
- **Oil leaks**  
If leak is found, repair it.

- 1) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
- 2) Remove engine front cover (1).



I4RS0A150001-01

- 3) Disconnect oil pressure switch coupler (1).
- 4) Remove oil pressure switch (2) from cylinder block.

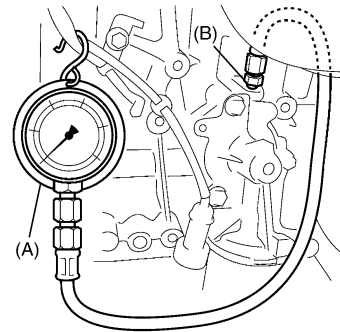


I2RH0B150003-01

- 5) Install special tools (oil pressure gauge) to vacated threaded hole of oil pressure switch.

#### Special tool

- (A): 09915-77310  
(B): 09915-78211



I2RH0B150004-01

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

#### NOTE

Be sure to shift transaxle gear shift lever in “Neutral” (shift select lever in “P” range for A/T vehicle), set parking brake and block drive wheels.

- 7) After warming up, raise engine speed to 4,000 r/min. and measure oil pressure.

#### Oil pressure specification

More than 270 kPa (2.7 kg/cm<sup>2</sup>, 39.8 psi) at 4,000 r/min. (rpm)

- 8) After checking oil pressure, stop engine and remove oil pressure gauge and attachment.
- 9) Before reinstalling oil pressure switch (2), be sure to wrap its screw threads with sealing tape (1) and tighten switch to specified torque.

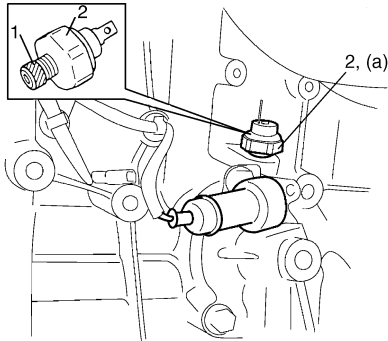
## 1E-4 Engine Lubrication System:

### NOTE

If sealing tape edge is bulged out from screw threads of switch, cut it off.

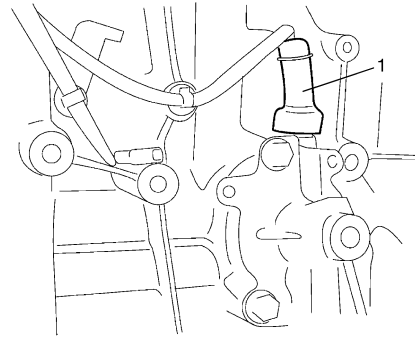
### Tightening torque

Oil pressure switch (a): 13 N·m (1.3 kgf-m, 9.5 lb-ft)



I2RHOB150005-01

- 10) Start engine and check oil pressure switch for oil leakage. If oil leakage is found, repair it.
- 11) Connect oil pressure switch coupler (1).

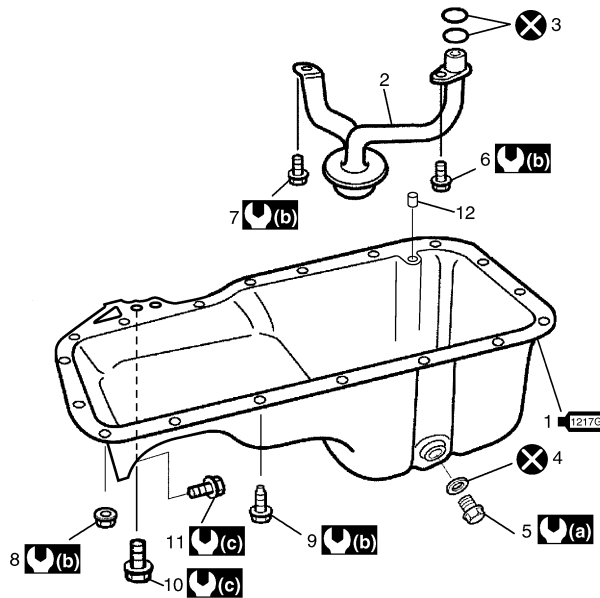


I2RHOB150006-01

## Repair Instructions

### Oil Pan and Oil Pump Strainer Components

S4RS0B1506001



I4RS0A150002-01

1. Oil pan : Apply sealant 99000-31260 to mating surface.	6. Strainer bolt	11. Transaxle stiffener bolt
2. Strainer	7. Bracket bolt	: 35 N·m (3.5 kgf-m, 25.5 lb-ft)
3. O-ring	8. Oil pan nut	: Tighten 11 N·m (1.1 kgf-m, 8.0 lb-ft) by the specified procedure.
4. Gasket	9. Oil pan bolt (M6)	: 55 N·m (5.5 kgf-m, 40.0 lb-ft)
5. Drain plug	10. Oil pan bolt (M10)	: Do not reuse.

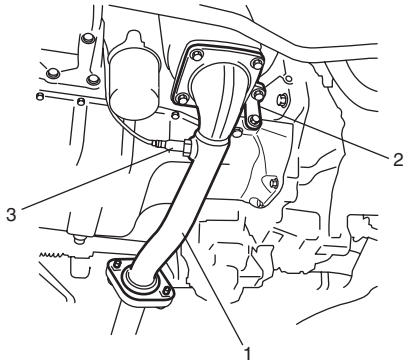


## Oil Pan and Oil Pump Strainer Removal and Installation

S4RS0B1506002

### Removal

- 1) Remove oil level gauge.
- 2) Drain engine oil by removing drain plug.
- 3) Remove exhaust No.1 pipe (1), exhaust manifold stiffener (2) and heated oxygen sensor No.1 (connector color: green) (3) referring to "Exhaust System Components: in Section 1K".



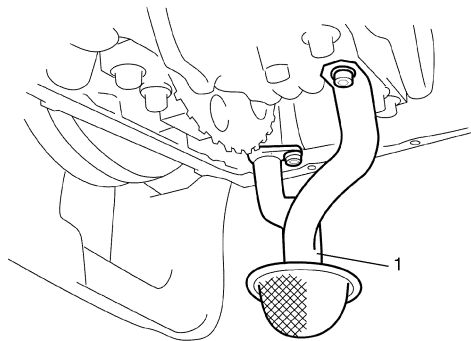
I4RS0A150003-01

- 4) Remove clutch housing lower plate (1).



I4RS0A150004-01

- 5) Remove oil pan and then oil pump strainer (1) from cylinder block.



I2RH0B150010-01

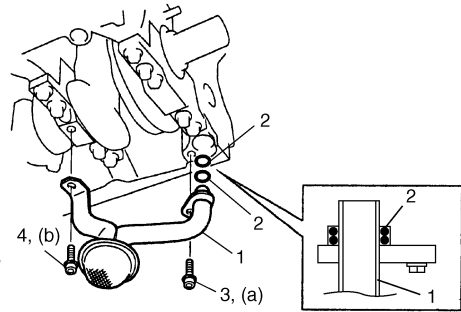
### Installation

- 1) Install new O-rings (2) in the position as shown in the figure and install oil pump strainer (1). Tighten strainer bolt (3) first and then bracket bolt (4) to specified torque.

### Tightening torque

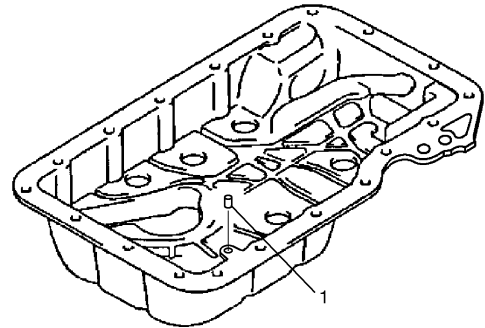
Oil pump strainer bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

Oil pump strainer bracket bolt (b): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



I2RH0B150012-01

- 2) Install dowel pin (1) to oil pan.



I4RS0A150005-01

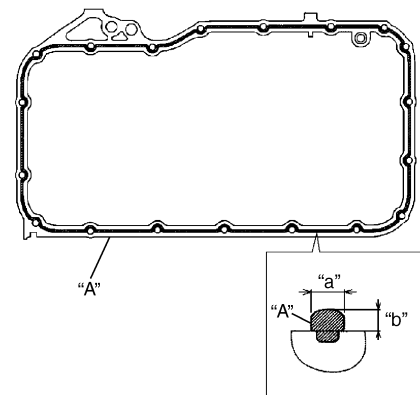
- 3) Apply sealant continuously to oil pan mating surface as shown in the figure.

**"A": Sealant 99000-31260**

**Sealant amount for oil pan**

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

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

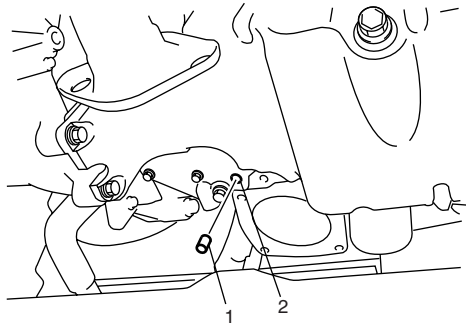


I4RS0A150006-01

- 4) Install oil pan to cylinder block temporarily.
- 5) Insert knock pin (1) in hole (2) of oil pan in order to locate oil pan precisely.

**NOTE**

Knock pin is available as a spare part (part number: 04211-13189).



I4RS0A150007-01

- 6) After fitting oil pan to cylinder block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time. Tighten bolts and nuts to specified torque.

**Tightening torque**

**Oil pan bolt (M6) (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)**

**Oil pan bolt (M10) (c): 55 N·m (5.5 kgf-m, 40.0 lb-ft)**

**Oil pan nut (e): 11 N·m (1.1 kgf-m, 8.0 lb-ft)**

- 7) Install new gasket and drain plug to oil pan. Tighten drain plug to specified torque.

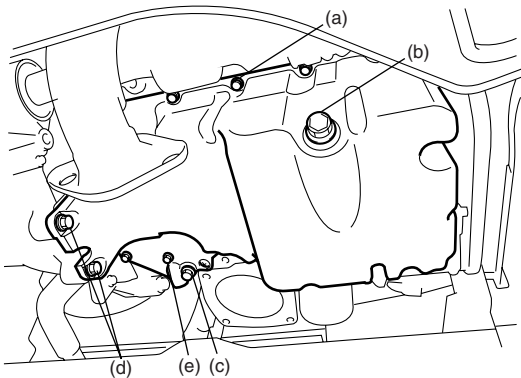
**Tightening torque**

**Oil pan drain plug (b): 35 N·m (3.5 kgf-m, 25.5 lb-ft)**

- 8) Tighten transaxle stiffener bolts to specified torque.

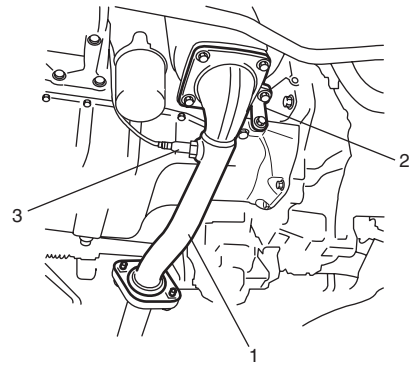
**Tightening torque**

**Transaxle stiffener bolt (d): 55 N·m (5.5 kgf-m, 40.0 lb-ft)**



I4RS0A150008-01

- 9) Install exhaust manifold stiffener (2) and exhaust No.1 pipe (1) and heated oxygen sensor No.1 (connector color: green) (3) referring to "Exhaust System Components: in Section 1K".



I4RS0A150003-01

- 10) Install clutch housing lower plate (1).



I4RS0A150004-01

- 11) Install oil level gauge.

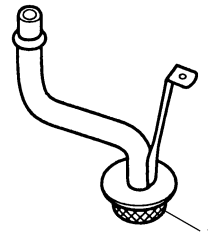
- 12) Refill engine with engine oil referring to "Engine Oil and Filter Change: in Section 0B".

- 13) Verify that there is no engine oil leakage and exhaust gas leakage at each connection.

**Oil Pan and Oil Pump Strainer Cleaning**

S4RS0B1506003

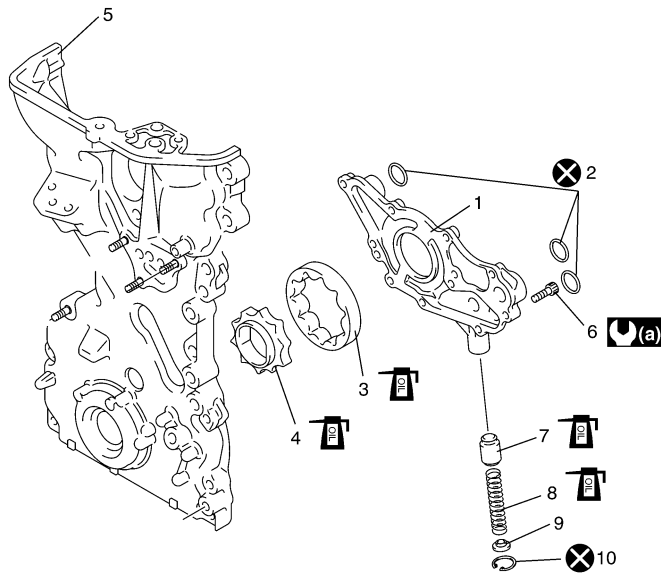
- Clean sealing surface between oil pan and cylinder block. Remove oil, old sealant, and dust from sealing surface.
- Clean oil pump strainer screen (1).



I2RH0B150016-01

Oil Pump Components

S4RS0B1506004



I4RS0A150010-01

1. Rotor plate	6. Rotor plate bolt	10. Circlip
2. O-ring	7. Relief valve	: 11 N·m (1.1 kgf·m 8.0 lb·ft)
3. Outer rotor	8. Spring	⊗ : Do not reuse.
4. Inner rotor	9. Retainer	: Apply thin coat of engine oil to sliding surface.
5. Timing chain cover	10. Circlip	

Oil Pump Removal and Installation

S4RS0B1506005

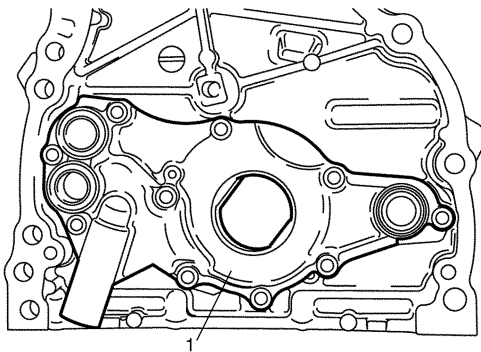
Oil pump is incorporated with timing chain cover. For removal and installation, refer to "Timing Chain Cover Removal and Installation: in Section 1D".

Oil Pump Disassembly and Reassembly

S4RS0B1506006

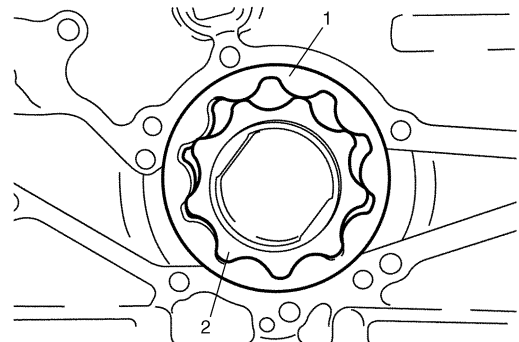
Disassembly

- 1) Remove rotor plate (1) by removing its mounting bolts.



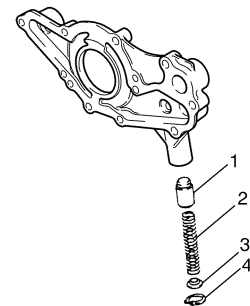
I2RH0B150018-01

- 2) Remove outer rotor (1) and inner rotor (2).



I2RH0B150019-01

- 3) Remove relief valve (1), spring (2) and retainer (3) by removing circlip (4).

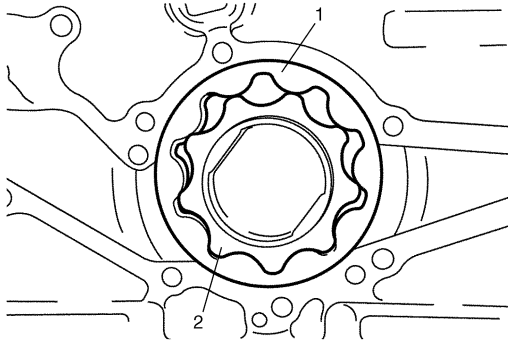


I2RH0B150020-01

## 1E-8 Engine Lubrication System:

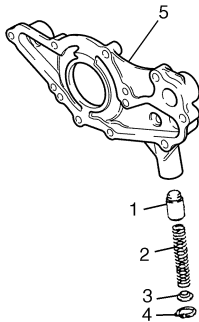
### Reassembly

- 1) Wash, clean and then dry all disassembled parts.
- 2) Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, inside surfaces of oil pump case and plate.
- 3) Install outer (1) and inner rotors (2) to oil pump case.



I2RH0B150019-01

- 4) Apply engine oil to relief valve (1) and spring (2), and install them with retainer (3) and new circlip (4) to rotor plate (5).

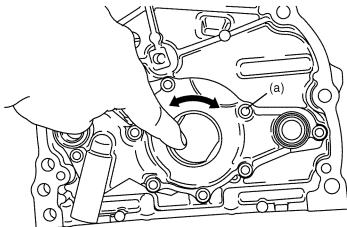


I3RM0A150005-01

- 5) Install rotor plate and tighten all bolts to specified torque. After installing plate, check to be sure that rotors turn smoothly by hand (0.3 N·m (0.03 kgf·m, 0.25 lb-ft) torque or below).

### Tightening torque

**Oil pump rotor plate bolt (a): 11 N·m (1.1 kgf·m, 8.0 lb-ft)**



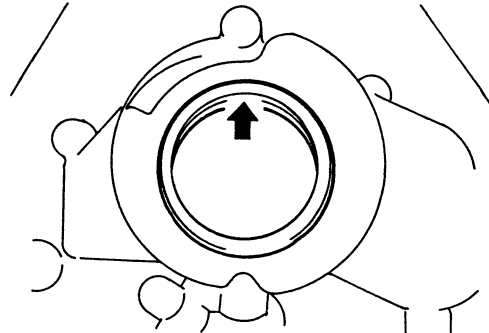
I2RH0B150022-01

### Oil Pump Inspection

S4RS0B1506007

#### Oil Seal

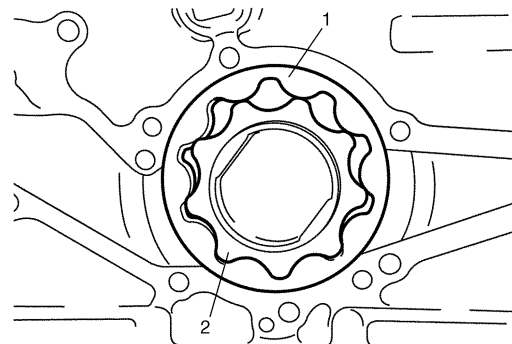
Check oil seal lip for fault or other damage. Replace as necessary.



I2RH0B150023-01

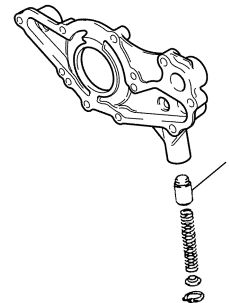
#### Oil Pump

- Check outer (1) and inner rotors (2), rotor plate, and oil pump case for excessive wear or damage.



I2RH0B150019-01

- Check relief valve (1) for excessive wear or damage and operates smoothly.



I2RH0B150025-01

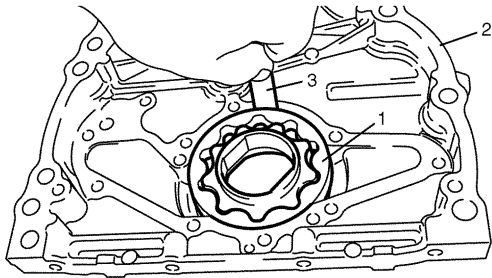
#### Radial clearance

Check radial clearance between outer rotor (1) and case (2) using thickness gauge (3).

If clearance exceeds its limit, replace outer rotor or case.

#### Radial clearance between outer rotor and case for oil pump

**Limit: 0.310 mm (0.0122 in.)**



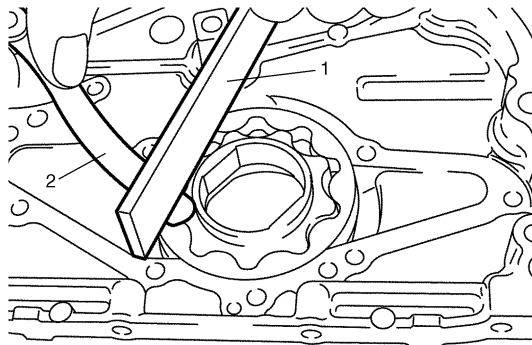
I2RH0B150026-01

**Side clearance**

Using straightedge (1) and thickness gauge (2), measure side clearance. If side clearance exceeds its limit, replace oil pump assembly.

**Side clearance for oil pump inner rotor**

**Limit: 0.15 mm (0.0059 in.)**



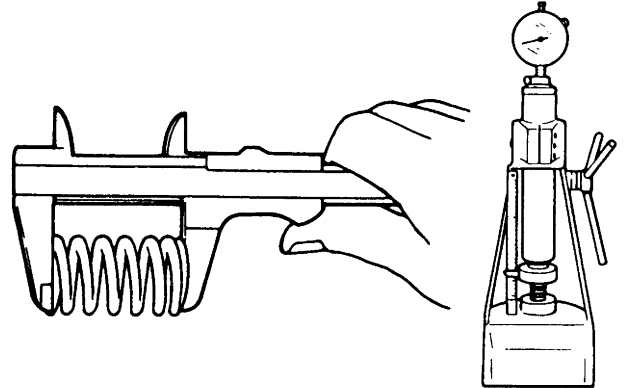
I2RH0B150027-01

**Relief valve spring free length and load**

Check relief valve spring free length and load as shown in the figure. If the measured valve spring length is lower than the specification, replace relief valve spring.

**Relief valve spring free length and load**

	Standard	Limit
Free length	52.4 mm (2.06 in.)	—
Load at spring length 38.5 mm (1.52 in.)	77 N (7.7 kgf, 17.0 lb)	69 N (6.9 kgf, 15.0 lb)



I2RH01150023-01

**Specifications**

**Tightening Torque Specifications**

S4RS0B1507001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Oil pressure switch	13	1.3	9.5	☞
Oil pump strainer bolt	11	1.1	8.0	☞
Oil pump strainer bracket bolt	11	1.1	8.0	☞
Oil pan bolt (M6)	11	1.1	8.0	☞
Oil pan bolt (M10)	55	5.5	40.0	☞
Oil pan nut	11	1.1	8.0	☞
Oil pan drain plug	35	3.5	25.5	☞
Transaxle stiffener bolt	55	5.5	40.0	☞
Oil pump rotor plate bolt	11	1.1	8.0	☞

**NOTE**

The specified tightening torque is also described in the following.

“Oil Pan and Oil Pump Strainer Components: ”

“Oil Pump Components: ”

**Reference:**

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

## Special Tools and Equipment

### Recommended Service Material

S4RS0B1508001

Material	SUZUKI recommended product or Specification	Note
Sealant	SUZUKI Bond No.1217G	P/No.: 99000-31260

**NOTE**

Required service material is also described in the following.

“Oil Pan and Oil Pump Strainer Components: ”

“Oil Pump Components: ”

### Special Tool

S4RS0B1508002

<p>09915-77310 Oil pressure gauge (0-10kg/cm<sup>2</sup>) </p> 	<p>09915-78211 Oil pressure gauge attachment </p> 
---	--

# Engine Cooling System

## General Description

### Cooling System Description

S4RS0B1601001

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

### Coolant Description

S4RS0B1601002

#### **▲ WARNING**

- Do not remove radiator cap to check engine coolant level; check coolant visually at the see-through coolant reservoir. Coolant should be added only to reservoir as necessary.
- As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.
- Check to make sure that engine coolant temperature is cold before removing any part of cooling system.
- Also be sure to disconnect negative cable from battery terminal before removing any part.

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the coolant is overflowed to the reservoir.

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

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

This 50/50 mixture coolant solution provides freezing protection to  $-36\text{ }^{\circ}\text{C}$  ( $-33\text{ }^{\circ}\text{F}$ ).

- Maintain cooling system freeze protection at  $-36\text{ }^{\circ}\text{C}$  ( $-33\text{ }^{\circ}\text{F}$ ) to ensure protection against corrosion and loss of coolant from boiling. This should be done even if freezing temperatures are not expected.
- Add ethylene glycol base coolant when coolant has to be added because of coolant loss or to provide added protection against freezing at temperature lower than  $-36\text{ }^{\circ}\text{C}$  ( $-33\text{ }^{\circ}\text{F}$ ).

### NOTE

- Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.
- Coolant must be mixed with demineralized water or distilled water.

### Anti-freeze proportioning table

		For M/T and Automated Manual Transaxle models	For A/T model
Freezing temperature	$^{\circ}\text{C}$	-36	-36
	$^{\circ}\text{F}$	-33	-33
Anti-freeze / Anti-corrosion coolant concentration	%	50	50
Ratio of compound to cooling water	ltr.	3.10/3.10	3.05/3.05
	US pt.	6.55/6.55	6.44/6.44
	Imp pt.	5.46/5.46	5.37/5.37

### Coolant capacity

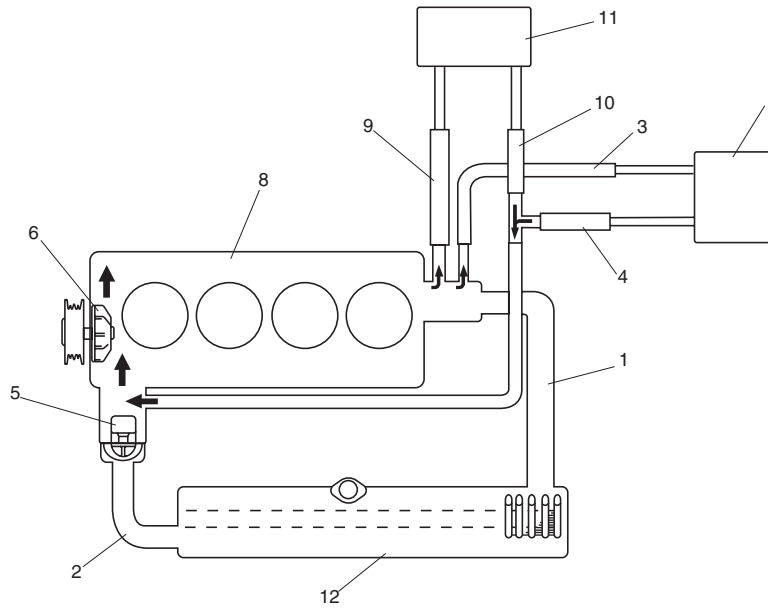
- For M/T and Automated Manual Transaxle models  
 Engine, radiator and heater: 5.5 liters (11.62/9.68 US/Imp pt.)  
 Reservoir: 0.7 liters (1.48/1.23 US/Imp pt.)  
 Total: 6.2 liters (13.10/10.91 US/Imp pt.)
- For A/T model  
 Engine, radiator and heater: 5.4 liters (11.41/9.50 US/Imp pt.)  
 Reservoir: 0.7 liters (1.48/1.23 US/Imp pt.)  
 Total: 6.1 liters (12.89/10.74 US/Imp pt.)

## Schematic and Routing Diagram

### Coolant Circulation

S4RS0B1602001

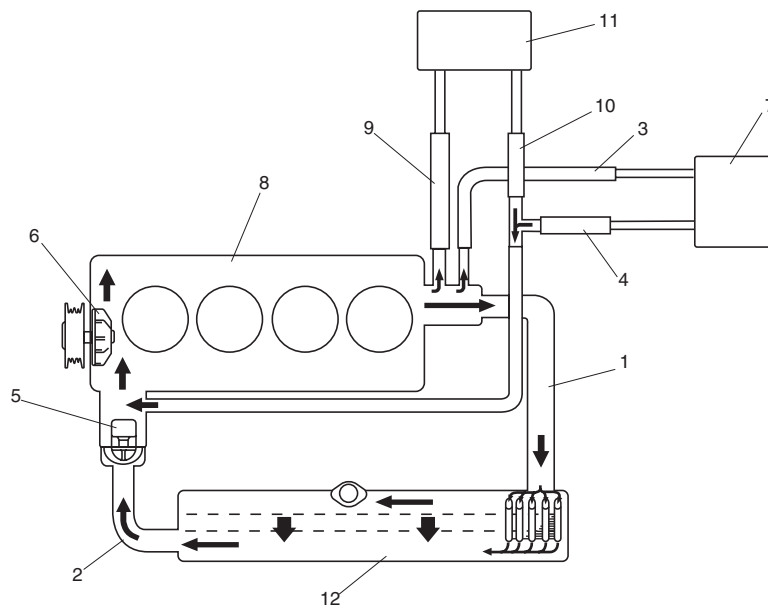
While the engine is warmed up (thermostat closed), coolant circulates as follows.



I3RM0A160001-01

1. Radiator inlet hose	5. Thermostat	9. Heater core inlet hose
2. Radiator outlet hose	6. Water pump	10. Heater core outlet hose
3. Throttle body inlet hose	7. Throttle body	11. Heater core
4. Throttle body outlet hose	8. Engine	12. Radiator

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



I3RM0A160002-01

1. Radiator inlet hose	5. Thermostat	9. Heater core inlet hose
2. Radiator outlet hose	6. Water pump	10. Heater core outlet hose
3. Throttle body inlet hose	7. Throttle body	11. Heater core
4. Throttle body outlet hose	8. Engine	12. Radiator



## Diagnostic Information and Procedures

### Engine Cooling Symptom Diagnosis

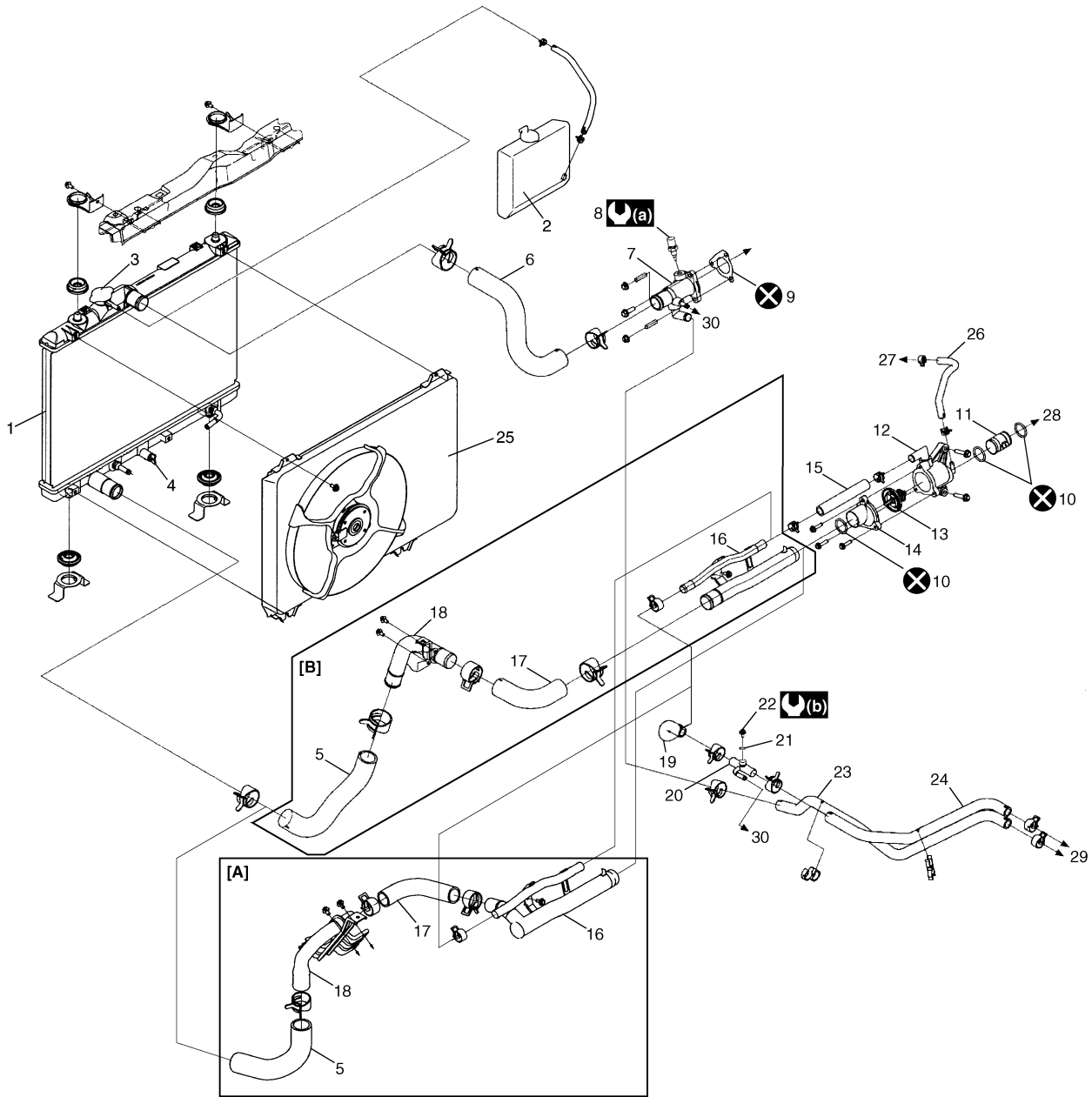
S4RS0B1604001

Condition	Possible cause	Correction / Reference Item
<b>Engine overheats (Radiator fan operates)</b>	Loose or broken water pump belt	<i>Adjust or replace.</i>
	Not enough coolant	<i>Check coolant level and add as necessary.</i>
	Faulty thermostat	<i>Replace.</i>
	Faulty water pump	<i>Replace.</i>
	Dirty or bent radiator fins	<i>Clean or remedy.</i>
	Coolant leakage on cooling system	<i>Repair.</i>
	Clogged radiator	<i>Check and replace radiator as necessary.</i>
	Faulty radiator cap	<i>Replace.</i>
	Improper ignition timing	<i>Adjust.</i>
	Dragging brakes	<i>Adjust brake.</i>
	Slipping clutch	<i>Adjust or replace.</i>
	Poor charge battery	<i>Check and replace as necessary.</i>
	Poor generation generator	<i>Check and repair.</i>
	ECT sensor faulty	<i>Check and replace as necessary.</i>
	Radiator cooling fan relay No.2 and/or No.3 faulty	<i>Check and replace as necessary.</i>
	Radiator fan motor faulty	<i>Check and replace as necessary.</i>
	ECM faulty	<i>Check and replace as necessary.</i>
	Wiring or grounding faulty	<i>Repair as necessary.</i>
Equipped with too much electric load part(s)	<i>Dismount.</i>	
<b>Engine overheats (Radiator fan does not operate)</b>	Fuse blown	<i>Check 30 A fuse of relay/fuse box and check for short circuit to ground.</i>
	Radiator cooling fan relay No.1 faulty	<i>Check and replace as necessary.</i>
	ECT sensor faulty	<i>Check and replace as necessary.</i>
	Radiator cooling fan motor faulty	<i>Check and replace as necessary.</i>
	Wiring or grounding faulty	<i>Repair as necessary.</i>
ECM faulty	<i>Check and replace as necessary.</i>	

# Repair Instructions

## Cooling System Components

S4RS0B1606001



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	

## Coolant Level Check

S4RS0B1606002

### **▲ WARNING**

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if radiator cap is taken off too soon.

To check level, lift hood and look at “see-through” coolant reservoir.

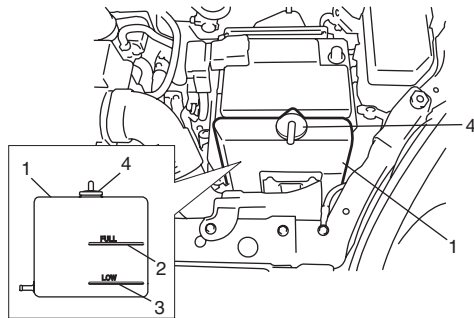
It is not necessary to remove radiator cap to check coolant level.

When engine is cool, check coolant level in reservoir (1). A normal coolant level should be between FULL mark (2) and LOW mark (3) on reservoir (1).

If coolant level is below LOW mark (3), remove reservoir cap (4) and add proper coolant to reservoir to bring coolant level up to FULL mark (2).

### **NOTE**

If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.



I4RS0B160002-01

## Engine Cooling System Inspection and Cleaning

S4RS0B1606003

### **▲ WARNING**

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

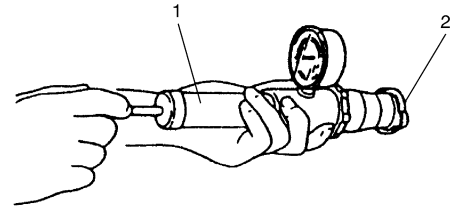
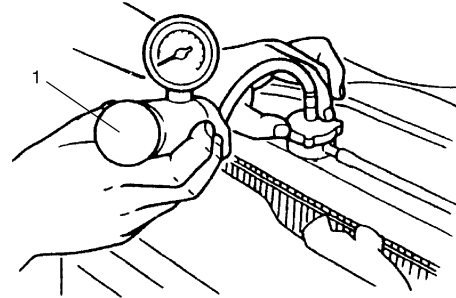
- 1) Check cooling system for leakage or damage.
- 2) Wash radiator cap and filler neck with clean water by removing radiator cap when engine is cold.
- 3) Check coolant for proper level and freeze protection.
- 4) Using a pressure tester (1), check system and radiator cap (2) for proper pressure holding capacity. If replacement of cap is required, use a proper cap for this vehicle.

### **NOTE**

After installing radiator cap to radiator, make sure that the ear of cap lines is parallel to radiator.

### **Cooling system and radiator cap holding pressure (for inspection)**

110 kPa (1.1 kg/cm<sup>2</sup>, 15.6 psi)



I5RH01160001-01

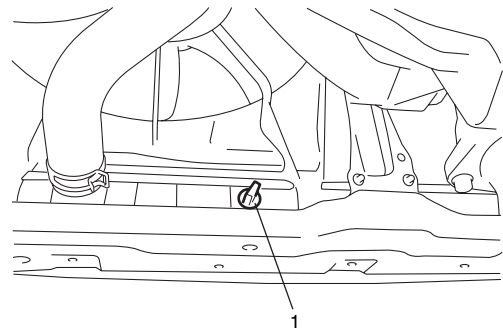
- 5) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.

- 6) Clean frontal area of radiator core.

## Cooling System Draining

S4RS0B1606004

- 1) Remove radiator cap.
- 2) Drain coolant from radiator drain plug (1).
- 3) After draining coolant, be sure to tighten drain plug (1) securely.



I4RS0A160003-01

Cooling System Flush and Refill

S4RS0B1606005

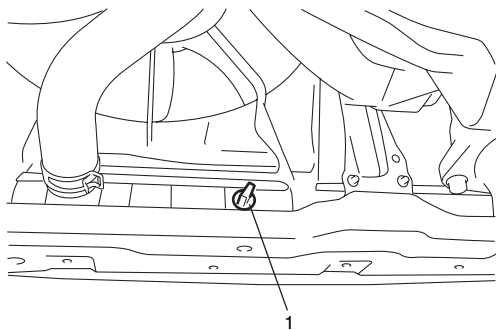
**▲ WARNING**

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

**NOTE**

For detail of coolant specification, refer to "Coolant Description: ".

- 1) Remove radiator cap when engine is cool as follows.
  - a) Turn cap counterclockwise slowly until it reaches a "stop" (Do not press down while turning it).
  - b) Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it counterclockwise.
- 2) With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
- 3) Stop engine and drain coolant from radiator drain plug (1).
- 4) Close radiator drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
- 5) Repeat Steps 3) and 4) several times until drained liquid is nearly colorless.
- 6) Close radiator drain plug (1) tightly.



I4RS0A160003-01

- 7) Remove reservoir (1) and remove cap (2) from reservoir (1).
- 8) Pour out any fluid, scrub and clean inside of reservoir with soap and water. Flush it well with clean water and drain, Reinstall reservoir.
- 9) Fill reservoir with coolant up to "Full" level mark (3).
- 10) Install reservoir cap (2) on reservoir.
- 11) Loosen air ventilation bolt (4) one and a half turns.
- 12) Fill radiator with coolant up to spilling coolant from air ventilation bolt (4).
- 13) Tighten air ventilation bolt (4) to specified torque.

**Tightening torque**

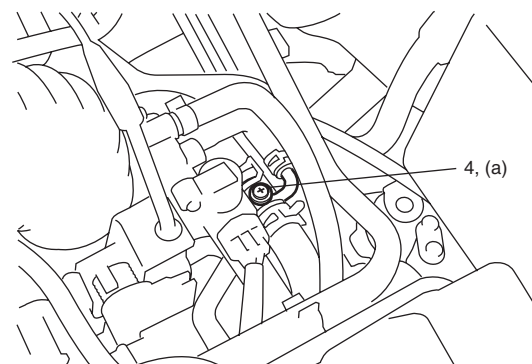
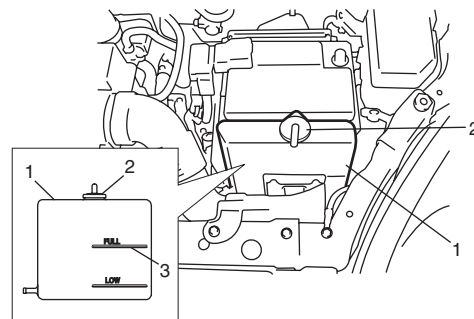
**Air ventilation bolt (a): 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)**

- 14) Fill radiator with coolant up to bottom of radiator filler neck and install radiator cap, making sure that the ear of cap lines is parallel to radiator.
- 15) Run engine at idle speed.
- 16) Loosen air ventilation bolt (4) one and a half turns.
- 17) Run engine at 2000 – 3000 rpm, and tighten air ventilation bolt (4) to specified torque after spilling coolant from air ventilation bolt (4).

**Tightening torque**

**Air ventilation bolt (a): 4.5 N·m (0.45 kgf-m, 3.5 lb-ft)**

- 18) Run engine until radiator fan motor is operated.
- 19) Stop engine and wait until engine comes cooled down to help avoid danger of being burned.
- 20) Add coolant to radiator up to bottom of radiator filler neck, and install radiator cap, making sure that the ear of cap lines is parallel to radiator.
- 21) Repeat Step 15) through 20).
- 22) Confirm that reservoir coolant level is "Full" level mark (3). If coolant is insufficient, repeat Step 9) and 10).



I4RS0B160003-02

## Cooling Water Pipes or Hoses Removal and Installation

S4RS0B1606006

### Removal

- 1) Drain coolant referring to “Cooling System Draining: ”.
- 2) To remove these pipes or hoses, loosen clamp on each hose and pull hose end off.

### Installation

Install removed parts in reverse order of removal procedure, noting the following.

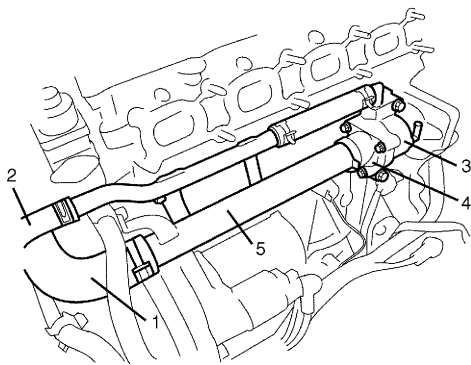
- Tighten each clamp securely referring to “Cooling System Components: ”.
- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.

## Thermostat Removal and Installation

S4RS0B1606007

### Removal

- 1) Drain coolant referring to “Cooling System Draining: ”.
- 2) Remove intake manifold referring to “Intake Manifold Removal and Installation: in Section 1D”.
- 3) Remove generator referring to “Generator Dismounting and Remounting: 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).

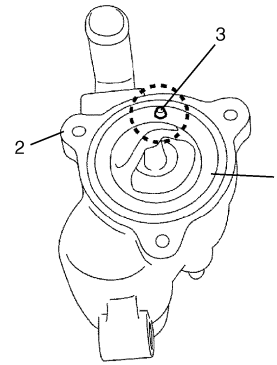


I3RM0A160007-01

### Installation

Reverse removal procedure for installation noting the following points.

- When positioning thermostat (1) on thermostat case (2), be sure to position it so that air bleed valve (3) comes at position as shown in the figure.



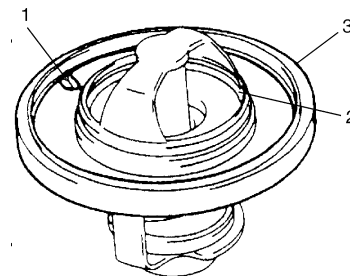
I2RH0B160006-01

- Use new O-rings when installing.
- Adjust water pump belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: ”.
- Adjust A/C compressor belt tension referring to “Compressor Drive Belt Inspection and Adjustment: in Section 7B”.
- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
- Verify that there is no coolant leakage at each connection.

## Thermostat Inspection

S4RS0B1606008

- Make sure that air bleed valve (1) of thermostat is clean. Should this valve be clogged, engine would tend to overheat.
- Check to make sure that valve seat (2) is free from foreign matters which would prevent valve from seating tight.
- Check thermostat seal (3) for breakage, deterioration or any other damage.



I3RM0A160008-01

- Check thermostatic movement of wax pellet as follows:
  - a. Immerse thermostat (1) in water, and heat water gradually.
  - b. Check that valve starts to open at specific temperature.

**Temperature at which valve begins to open**  
80 – 84 °C (176 – 183 °F)

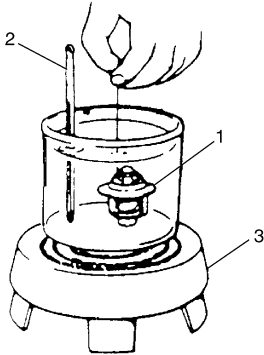
**Temperature at which valve become fully open**  
95 – 97 °C (203 °F)

## 1F-8 Engine Cooling System:

### Valve lift

More than 8 mm at 95 °C (203 °F)

If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if reused, will bring about overcooling or overheating tendency.



I2RH01160012-01

2. Thermometer

3. Heater

### Radiator Cooling Fan Motor On-Vehicle Inspection

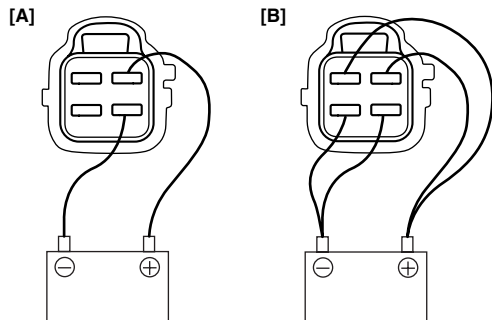
S4RS0B1606009

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

**Reference: Fan motor specified current at 12 V**

**Low speed operation: 14.0 A maximum**

**High speed operation: 18.0 A maximum**



I4RS0A160006-01

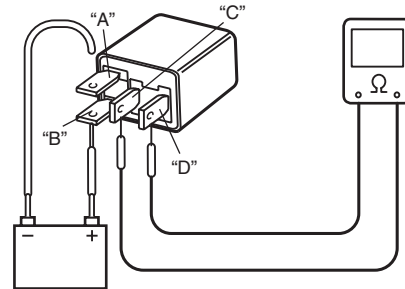
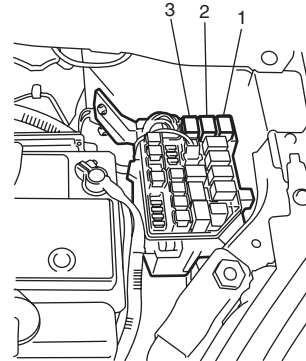
[A]: Low speed operation

[B]: High speed operation

### Radiator Cooling Fan Relay Inspection

S4RS0B1606010

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



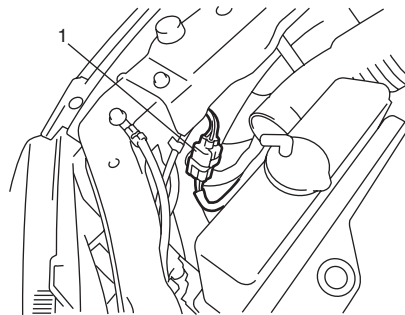
I4RS0B160004-01

### Radiator Cooling Fan Removal and Installation

S4RS0B1606011

#### Removal

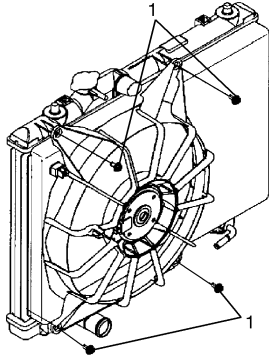
- 1) Disconnect negative (-) cable at battery.
- 2) Disconnect connector (1) of cooling fan motor.



I4RS0B160005-01

- 3) Drain coolant.

- 4) Remove front bumper, front bumper upper absorber and upper member referring to "Front Bumper and Rear Bumper Components: in Section 9K".
- 5) Remove radiator inlet hose and reservoir hose.
- 6) Remove cooling fan mounting bolts (1).



I4RS0A160009-01

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

**⚠ CAUTION**

**Be sure not to damage condenser outlet pipe.**

**Installation**

Reverse removal procedure for installation noting the following.

- Refill cooling system referring to Step 7) to 22) of "Cooling System Flush and Refill: ".
- After installation, verify there is no coolant leakage at each connection.

**Radiator On-Vehicle Inspection and Cleaning**

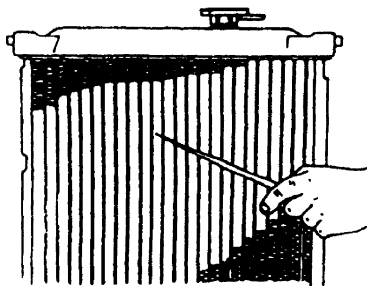
S4RS0B1606012

**Inspection**

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

**Cleaning**

Clean frontal area of radiator cores.



I2RH01160014-01

**Radiator Removal and Installation**

S4RS0B1606013

**Removal**

- 1) Disconnect negative cable at battery.
- 2) Drain A/T fluid.
- 3) Drain coolant.
- 4) Remove cooling fan assembly referring to "Radiator Cooling Fan Removal and Installation: ".
- 5) Remove A/T fluid cooler inlet and outlet hoses.
- 6) Remove radiator outlet hose from radiator.
- 7) Remove radiator from vehicle.

**Installation**

Reverse removal procedures, noting the following.

- Refill cooling system referring to Step 7) to 22) of "Cooling System Flush and Refill: ".
- After installation, verify there is no coolant leakage each connection.
- Refill A/T fluid referring to "A/T Fluid Change: in Section 5A".

**Water Pump / Generator Drive Belt Tension Inspection and Adjustment**

S4RS0B1606014

**⚠ WARNING**

- **Disconnect negative cable at battery before checking and adjusting belt tension.**
- **To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

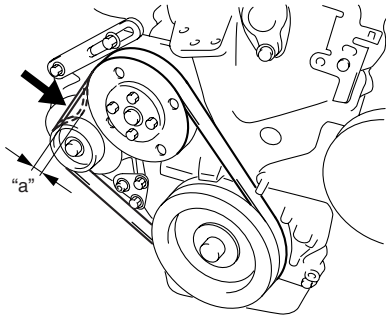
- 1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to "Water Pump / Generator Drive Belt Removal and Installation: ".
- 2) Check belt for tension. Belt is in proper tension when it deflects the following specification under thumb pressure (about 10 kg or 22 lb.).

**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.).



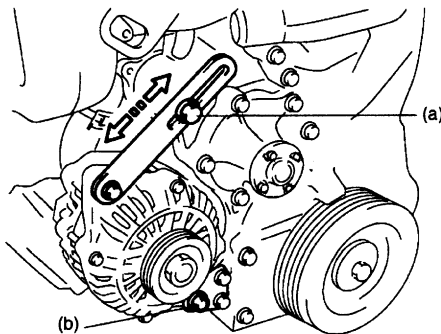
I2RH0B160012-01

- 3) If belt is too tight or too loose, adjust it to proper tension by displacing generator position.
- 4) 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)**



I2RH0B160013-01

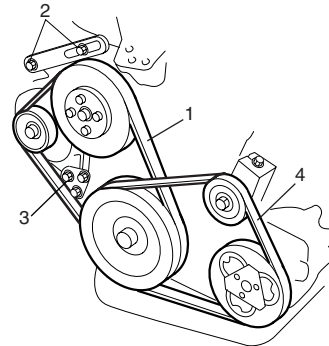
- 5) Connect negative cable at battery.

**Water Pump / Generator Drive Belt Removal and Installation**

S4RS0B1606015

**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: in Section 7B".
- 3) Loosen drive belt adjusting bolt (2) and generator pivot bolt (3).

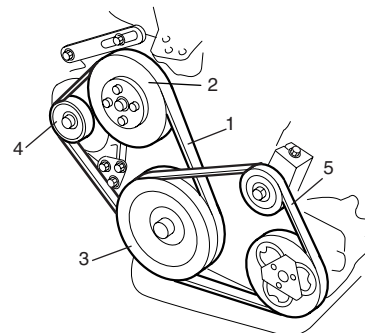


I3RM0A160014-01

- 4) Slacken belt by displacing generator and then remove it.

**Installation**

- 1) Install belt (1) to water pump pulley (2), crankshaft pulley (3) and generator pulley (4).
- 2) Adjust belt tension by referring to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment: ".
- 3) If vehicle equipped with A/C, install compressor drive belt (5) referring to "Compressor Drive Belt Removal and Installation: in Section 7B".



I3RM0A160015-01

- 4) Connect negative cable at battery.

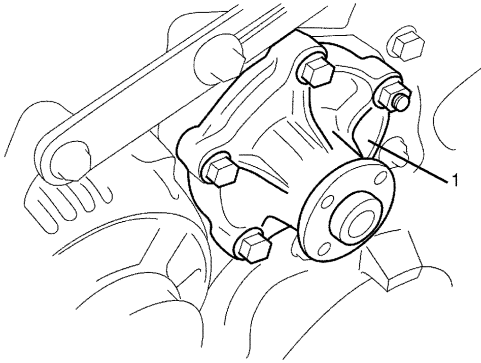


## Water Pump Removal and Installation

S4RS0B1606016

### Removal

- 1) Disconnect negative cable at battery.
- 2) Drain coolant.
- 3) Remove water pump / generator drive belt referring to "Water Pump / Generator Drive Belt Removal and Installation: ".
- 4) Remove water pump assembly (1).



I2RH0B160016-01

### Installation

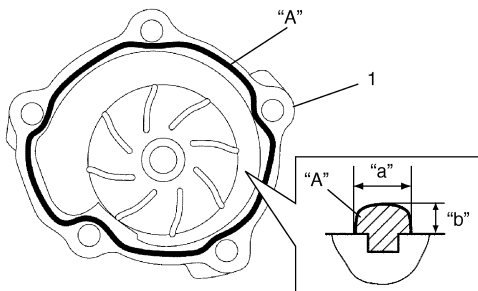
- 1) Apply sealant to mating surface of water pump (1) as shown in the figure.

**"A": Water tight sealant 99000-31250**

**Sealant quantity (to mating surface of water pump)**

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

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

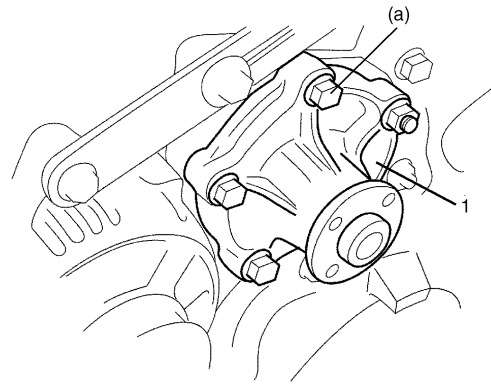


I3RM0A160016-01

- 2) Install water pump assembly (1) to cylinder block and tighten bolts and nut to specified torque.

**Tightening torque**

**Water pump bolt and nut (a): 25 N·m (2.5 kgf·m, 18.0 lb-ft)**



I2RH0B160018-01

- 3) Install water pump pulley.
- 4) Install water pump / generator drive belt referring to "Water Pump / Generator Drive Belt Removal and Installation: ".
- 5) Install A/C compressor belt (if equipped) referring to "Compressor Drive Belt Removal and Installation: in Section 7B".
- 6) Refill cooling system referring to Step 7) to 22) of "Cooling System Flush and Refill: ".
- 7) Connect negative cable at battery.
- 8) Check each part for leakage.

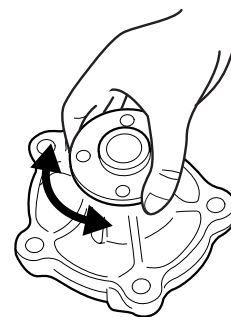
### Water Pump Inspection

S4RS0B1606017

#### ⚠ CAUTION

**Do not disassemble water pump.  
If any repair is required on pump, replace it as assembly.**

Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.



I2RH0B160019-01

## Specifications

### Tightening Torque Specifications

S4RS0B1607001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Air ventilation bolt	4.5	0.45	3.5	⌀ / ⌀
Generator adjusting bolt	23	2.3	17.0	⌀
Generator pivot bolt	50	5.0	36.0	⌀
Water pump bolt and nut	25	2.5	18.0	⌀

#### NOTE

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

#### Reference:

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

## Special Tools and Equipment

### Recommended Service Material

S4RS0B1608001

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

# Fuel System

## Precautions

### Precautions on Fuel System Service

S4RS0B1700001

#### **▲ WARNING**

Before attempting service of any type on fuel system, the following should be always observed in order to reduce the risk of fire and personal injury.

- Disconnect negative cable at battery.
- Do not smoke, and place no smoking signs near work area.
- Be sure to have CO<sub>2</sub> fire extinguisher handy.
- Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).
- Wear safety glasses.
- To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.
- As fuel feed line is still under high fuel pressure even after stopping engine, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel. Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure referring to “Fuel Pressure Relief Procedure: ”.
- A small amount of fuel may be released when the fuel line is disconnected. In order to reduce the risk of personal injury, cover a shop cloth to the fitting to be disconnected. Be sure to put that cloth in an approved container after disconnecting.
- Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.
- Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to “Fuel Hose Disconnecting and Reconnecting: ”. After connecting, make sure that it has no twist or kink.
- When installing injector or fuel feed pipe, lubricate its O-ring with gasoline.
- When servicing the fuel tank, it should be treated with respect, with no contact with sharp edges or hot surfaces. In addition, the fuel tank should not be dropped since fuel tank, fuel pump and other components can be damaged by the impact. If dropped, all components should be replaced because there is a risk of damage.
- The fuel tank is made of resin.  
Be sure not to allow solvent (chemical article such as grease and sealant) to attach to the fuel tank as some chemical reaction may occur, causing the fuel tank to be swollen, hardened or distorted leakage and resulting in fuel leakage from the fuel tank.

## General Description

### Fuel System Description

S4RS0B1701001

#### **▲ CAUTION**

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

The main components of the fuel system are fuel tank, fuel pump assembly (with fuel filter, fuel level gauge, fuel pressure regulator), fuel feed line and fuel vapor line. For the details of fuel flow, refer to “Fuel Delivery System Diagram: ”.

### Fuel Delivery System Description

S4RS0B1701002

The fuel delivery system consists of the fuel tank, fuel pump assembly (with built-in fuel filter and fuel pressure regulator), delivery pipe, injectors and fuel feed line. The fuel in the fuel tank is pumped up by the fuel pump, sent into delivery pipe and injected by the injectors. As the fuel pump assembly is equipped with built-in fuel filter and fuel pressure regulator, the fuel is filtered and its pressure is regulated before being sent to the feed pipe. The excess fuel at fuel pressure regulation process is returned back into the fuel tank.

## 1G-2 Fuel System:

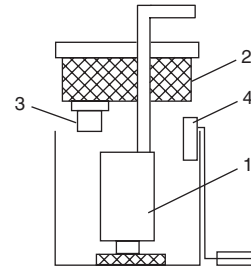
Also, fuel vapor generated in fuel tank is led through the fuel vapor line into the EVAP canister.  
For system diagram, refer to "Fuel Delivery System Diagram: ".

### Fuel Pump Description

The fuel pump (1) is an in-tank type electric pump. Incorporated in the pump assembly are; a fuel filter (2), a fuel pressure regulator (3) and a fuel level gauge (4).

S4RS0B1701003

Addition of the fuel pressure regulator to the fuel pump makes it possible to maintain the fuel pressure at constant level and ECM controls compensation for variation in the intake manifold pressure.

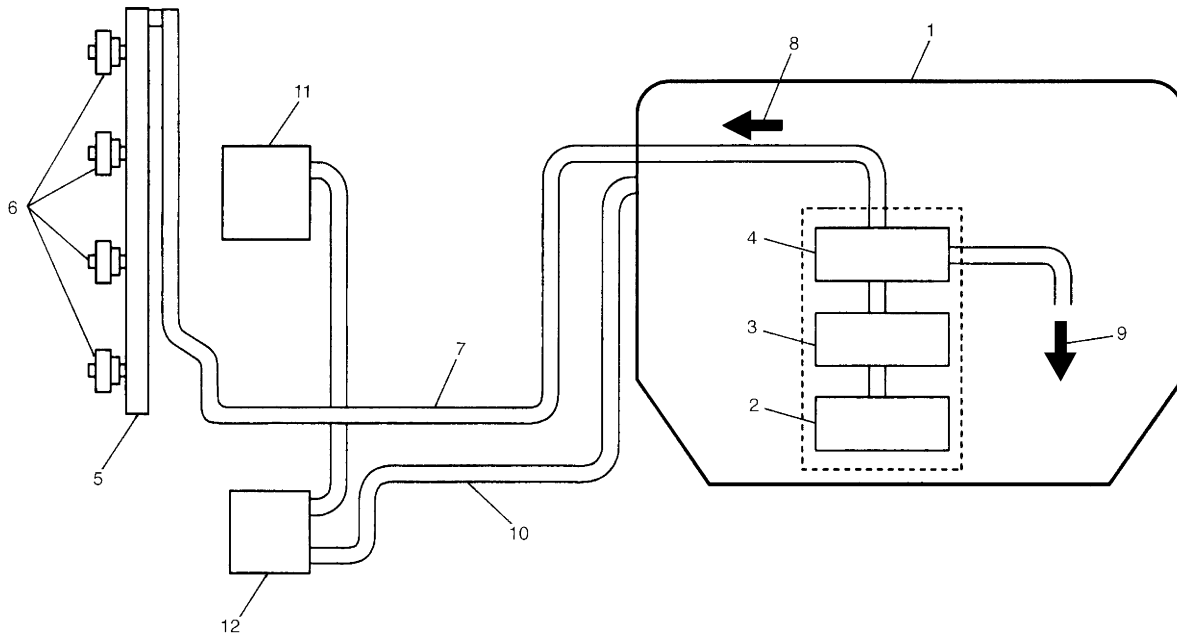


I4RS0B170001-01

## Schematic and Routing Diagram

### Fuel Delivery System Diagram

S4RS0B1702001



I4RS0A170002-01

1. Fuel tank	5. Delivery pipe	9. Returned back fuel
2. Fuel pump	6. Fuel injector	10. Fuel vapor line
3. Fuel filter	7. Fuel feed line	11. Intake manifold
4. Fuel pressure regulator	8. Fuel	12. EVAP canister

## Diagnostic Information and Procedures

### Fuel Pressure Inspection

S4RS0B1704001

#### **⚠ WARNING**

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

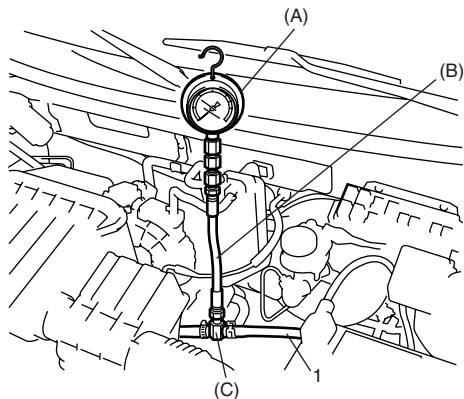
- 1) Relieve fuel pressure in fuel feed line referring to "Fuel Pressure Relief Procedure: ".
- 2) Disconnect fuel feed hose from fuel delivery pipe.
- 3) Connect special tools and hose between fuel feed hose (1) and fuel delivery pipe as shown in the figure, and clamp hoses securely in order to ensure that no leaks occur during checking.

**Special tool**

(A): 09912-58442

(B): 09912-58432

(C): 09912-58490



I3RM0A170004-01

- 4) Check that battery voltage is 11 V or more.
- 5) Measure fuel pressure at each condition.  
If measured pressure is out of specification, refer to "Fuel Pressure Check: in Section 1A" and check each possibly defective part. Replace if found defective.
  - a) Turn ignition switch ON to operate fuel pump and after 2 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.

**Fuel pressure specification**

**With fuel pump operating and engine stopped: 270 – 310 kPa (2.7 – 3.1 kg/cm<sup>2</sup>, 38.4 – 44.0 psi)**

- b) Start engine and warm it up to normal operating temperature, and measure fuel pressure at idling.

**Fuel pressure specification**

**At specified idle speed: 270 – 310 kPa (2.7 – 3.1 kg/cm<sup>2</sup>, 38.4 – 44.0 psi)**

- c) Stop engine, and measure fuel pressure at one minute after stopping.

**Fuel pressure specification**

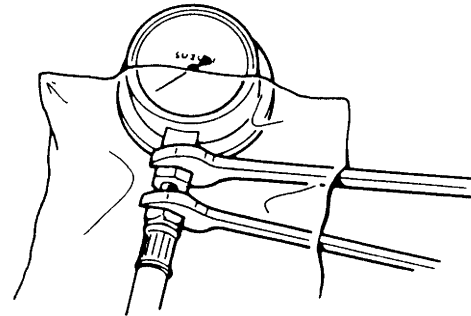
**With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes): Over 250 kPa (2.5 kg/cm<sup>2</sup>, 35.6 psi)**

- 6) After checking fuel pressure, remove fuel pressure gauge.

**▲ WARNING**

As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to the following procedures.

- Place fuel container under joint.
- Cover joint with rag and loosen joint nut slowly in order to release fuel pressure gradually.



I2RH01170032-01

- 7) Remove special tools from fuel delivery pipe and fuel feed hose.
- 8) Connect fuel feed hose to fuel delivery pipe and clamp it securely.
- 9) With engine OFF and ignition switch ON, check for fuel leaks.

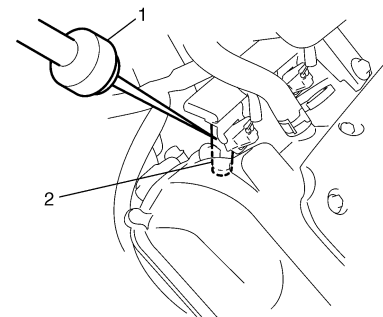
**Fuel Cut Operation Inspection**

S4RS0B1704002

**NOTE**

**Before inspection, make sure that gear shift lever is in neutral position (shift select lever is "P" range for A/T vehicle), A/C is OFF and parking brake lever is pulled all the way up.**

- 1) Warm engine up to normal operating temperature.
- 2) While listening to sound of injector (2) by using sound scope (1) or such, increase engine speed to higher than 3,000 r/min.



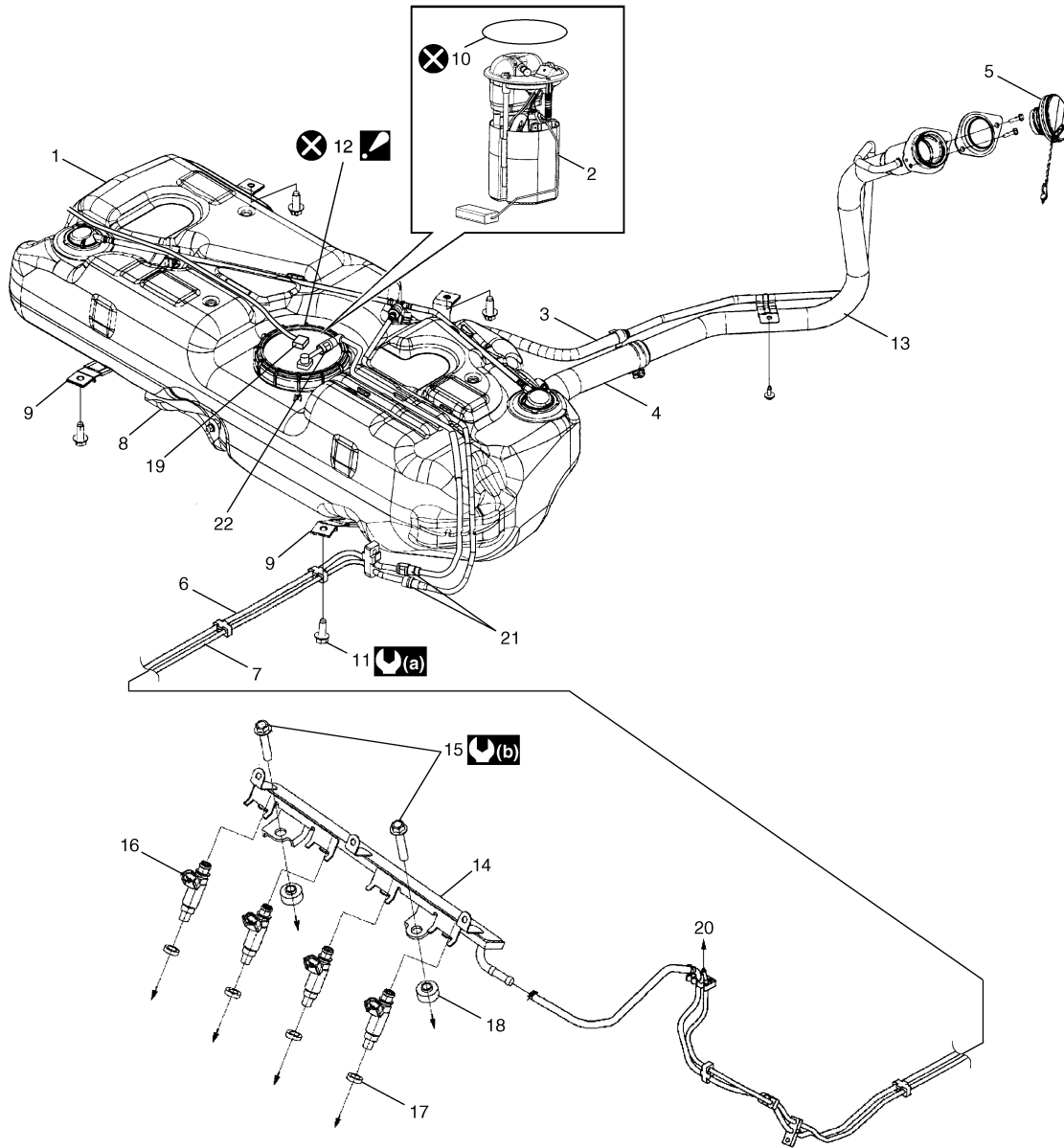
I2RH0B170004-01

- 3) Check to make sure that injector operation sound is stop when throttle valve is closed instantly and it is heard again when engine speed is reduced to approx. 2,000 r/min or less.

# Repair Instructions

## Fuel System Components

S4RS0B1706001



I4RS0B170002-03

1. Fuel tank	10. O-ring	19. Wire harness for fuel pump
2. Fuel pump assembly	11. Fuel tank bolt	20. To canister
3. Breather hose	12. Fuel pump lock nut : For tightening procedure, refer to "Fuel Pump Assembly Removal and Installation: ".	21. Quick joint (fuel pipe)
4. Fuel tank filler hose	13. Fuel filler neck	22. Quick joint (fuel pump)
5. Fuel filler cap	14. Fuel delivery pipe	⊗ : Do not reuse.
6. Fuel feed line	15. Fuel delivery pipe bolt	ⓐ : 50 N·m (5.0 kgf-m, 36.5 lb-ft)
7. Fuel vapor line	16. Fuel injector	ⓑ : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
8. Fuel tank protector	17. Injector cushion	
9. Fuel tank belt	18. Fuel delivery pipe insulator	

## Fuel Hose Disconnecting and Reconnecting

### **▲ WARNING**

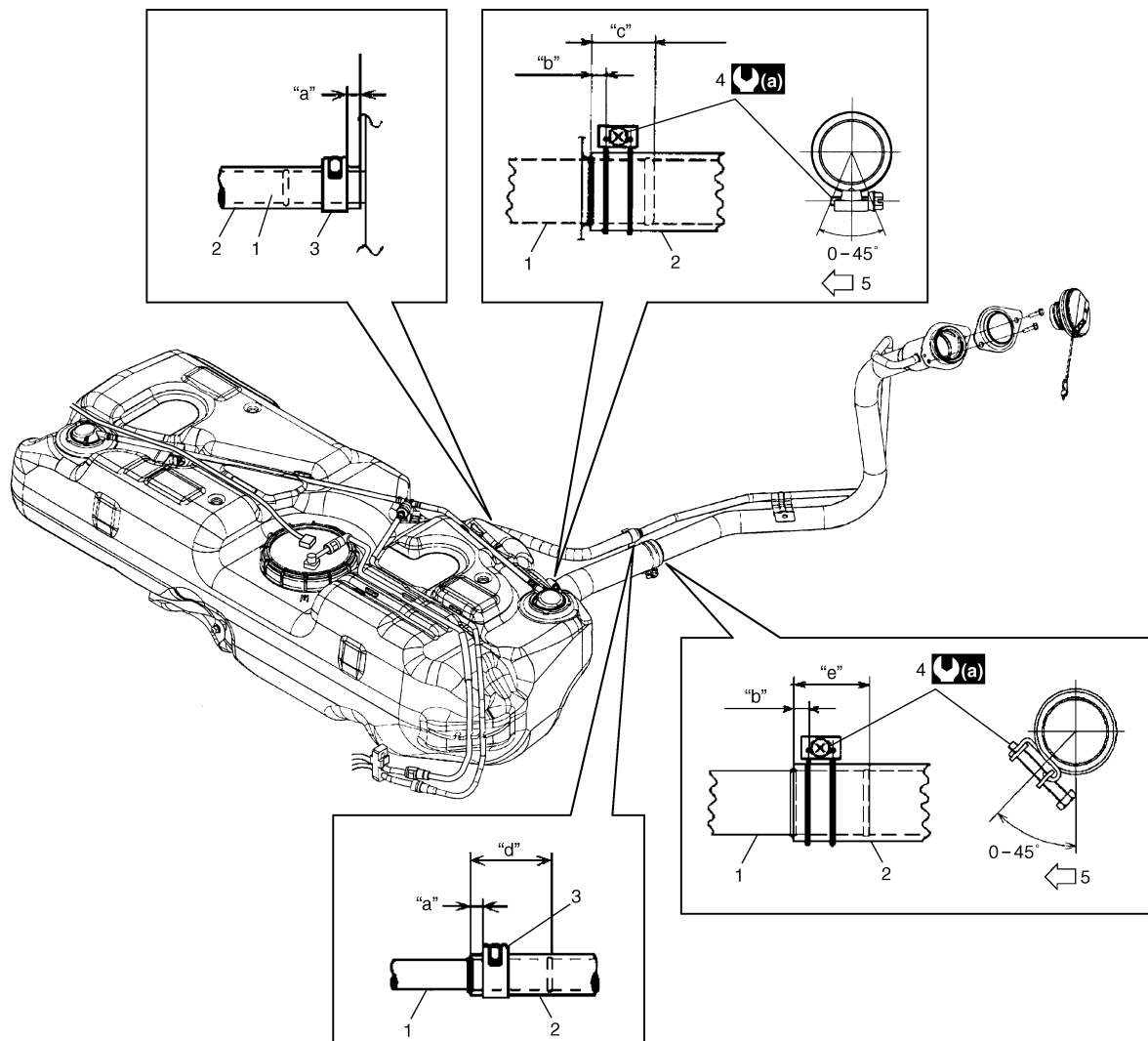
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service:" in order to reduce the risk of fire and personal injury.

### For Conventional Clamp

### Fuel tank system

#### NOTE

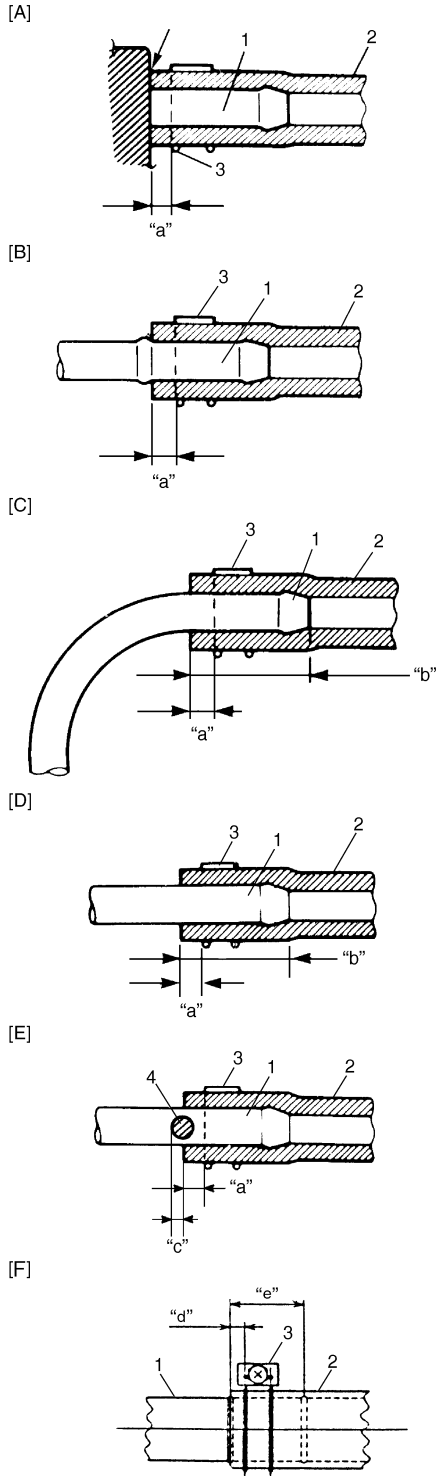
Be sure to install hose to spool of pipe surely.



I4RS0B170003-02

1. Pipe	5. Vehicle leftward	"d" 30 mm (1.18 in.)
2. Hose	"a" 3 – 7 mm (0.12 – 0.28 in.)	"e" 38 mm (1.50 in.)
3. Clamp	"b" 5 – 12 mm (0.20 – 0.48 in.)	<b>U(a)</b> : 2 N·m (0.2 kgf·m, 1.5 lb-ft)
4. Fuel filler hose clamp screw	"c" 33 mm (1.30 in.)	

The other than fuel tank system



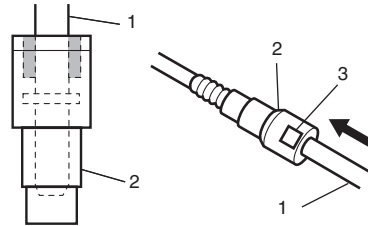
I3RM0A170001-01

[A]:	With short pipe, fit hose as far as it reaches pipe joint as shown.
[B]:	With the following type pipe, fit hose as far as its peripheral projection as shown.
[C]:	With bent pipe, fit hose as its bent part as shown or till depth "b".
[D]:	With straight pipe, fit hose till depth "b".
[E]:	With red marked pipe, fit hose end reaches red mark on pipe.
[F]:	For fuel tank filler hose, insert it to spool or welding-bead.
"a":	Clamp securely at a position 3 – 7 mm (0.12 – 0.27 in.) from hose end.
"b":	20 – 30 mm (0.79 – 1.18 in.)
"c":	0 – 5 mm (0 – 0.19 in.)
"d":	5 – 12 mm (0.2 – 0.47 in.)
"e":	40 mm (1.57 in.)
4.	Red mark

For Quick Joint (Fuel Pipe)

Disconnecting

- 1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (fuel pipe) (2) by blowing compressed air.
- 2) Disconnect quick joint (fuel pipe) while pushing lock button.



I4RS0B170004-01

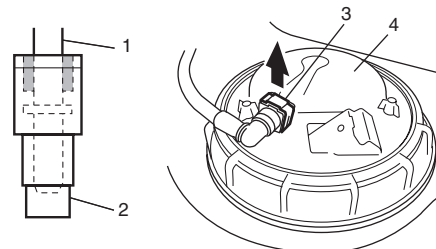
Reconnecting

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

For Quick Joint (Fuel Pump)

Disconnecting

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

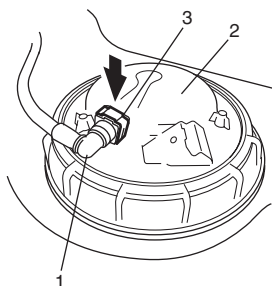


I4RS0B170019-01

Reconnecting

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





I4RS0B170020-01

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

### Fuel Pressure Relief Procedure

S4RS0B1706003

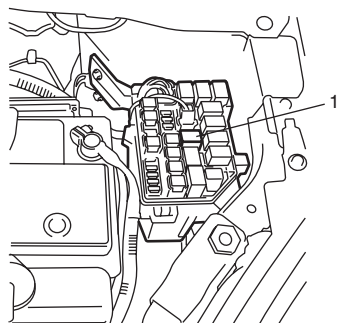
#### **⚠ CAUTION**

**This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.**

#### **NOTE**

**If ECM detects DTC(s) after servicing, clear DTC(s) referring to “DTC Clearance: in Section 1A”.**

- 1) Make sure that engine is cold.
- 2) Shift transaxle gear shift lever in “Neutral” (shift select lever in “P” range for A/T model), set parking brake and block drive wheels.
- 3) Remove relay / fuse box cover.
- 4) Disconnect fuel pump relay (1) from relay / fuse box (2).
- 5) Remove fuel filter cap in order to release fuel vapor pressure in fuel tank, and then reinstall it.
- 6) Start engine and run it until engine stops for lack of fuel. Repeat cranking engine 2 – 3 times for about 3 seconds each time in order to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
- 7) After servicing, connect fuel pump relay (1) to relay / fuse box and install relay / fuse box cover.



I4RS0B170005-01

### Fuel Leakage Check Procedure

S4RS0B1706004

After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

- 1) Turn ON ignition switch for 3 seconds (to operate fuel pump) and then turn it OFF.  
Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line until fuel pressure is felt by hand placed on fuel feed hose.
- 2) In this state, check to see that there are no fuel leakages from any part of fuel system.

### Fuel Lines On-Vehicle Inspection

S4RS0B1706005

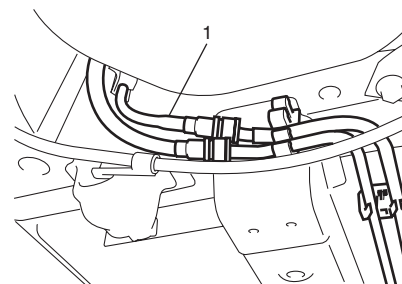
#### **⚠ CAUTION**

**Due to the fact that fuel feed line (1) is under high pressure, use special care when servicing it.**

Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration or damage.

Make sure all clamps are secure.

Replace parts as needed.



I4RS0B170006-01

### Fuel Pipe Removal and Installation

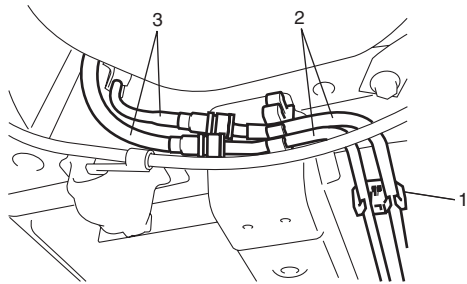
S4RS0B1706006

#### **⚠ WARNING**

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

#### **Removal**

- 1) Relieve fuel pressure in fuel feed line according to “Fuel Pressure Relief Procedure: ”.
- 2) Disconnect negative cable at battery.
- 3) Disconnect fuel pipe joint and fuel hose (3) from fuel pipe (2) at the front and rear of each fuel pipe referring to “Fuel Hose Disconnecting and Reconnecting: ”.
- 4) Mark the location of clamps (1) on fuel pipes (2), so that the clamps can be reinstalled to where they were.
- 5) Remove pipes (2) with clamp (1) from vehicle.
- 6) Remove clamp (1) from pipes (2).



I4RS0B170007-01

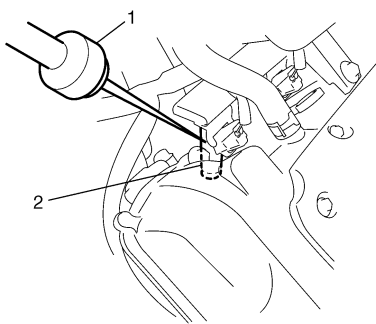
**Installation**

- 1) Install clamps to marked location on pipes. If clamp is deformed, its claw is bent or broken, replace it with new one.
- 2) Install pipes with pipe clamps to vehicle.
- 3) Connect fuel hoses and pipes to each pipe referring to "Fuel Hose Disconnecting and Reconnecting: ".
- 4) Connect negative cable at battery.
- 5) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

**Fuel Injector On-Vehicle Inspection**

S4RS0B1706007

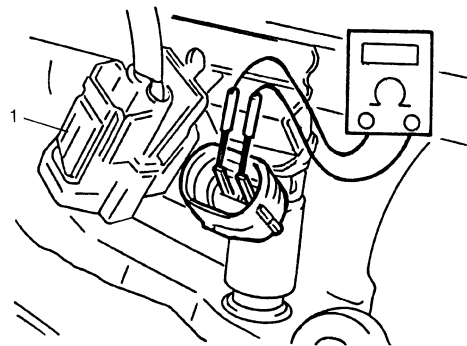
- 1) Using sound scope (1) or such, check operating sound of injector (2) when engine is running or cranking.  
Cycle of operating sound should vary according to engine speed.  
If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector.



I2RH0B170007-01

- 2) Disconnect connector (1) from injector, connect ohmmeter between terminals of injector and check resistance.  
If resistance is out of specification, replace.

**Resistance of fuel injector**  
11.3 – 13.8 Ω at 20 °C, 68 °F



I2RH0B170008-01

- 3) Connect connector to injector securely.

**Fuel Injector Removal and Installation**

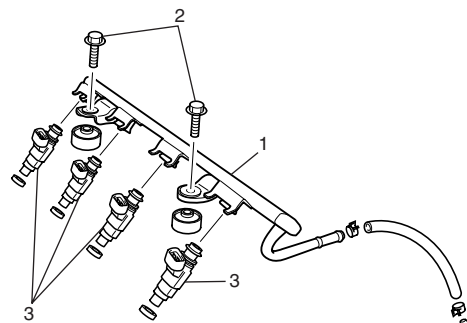
S4RS0B1706008

**▲ WARNING**

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

**Removal**

- 1) Relieve fuel pressure according to "Fuel Pressure Relief Procedure: ".
- 2) Disconnect negative cable at battery.
- 3) Disconnect MAF sensor connector, and detach EVAP canister purge valve.
- 4) Remove air cleaner assembly with air intake pipe.
- 5) Disconnect fuel injector couplers.
- 6) Disconnect fuel feed hose from fuel delivery pipe (1).
- 7) Remove fuel delivery pipe bolts (2).
- 8) Remove fuel injector(s) (3).



I3RM0A170010-01

**Installation**

Reverse removal procedure for installation noting the following.

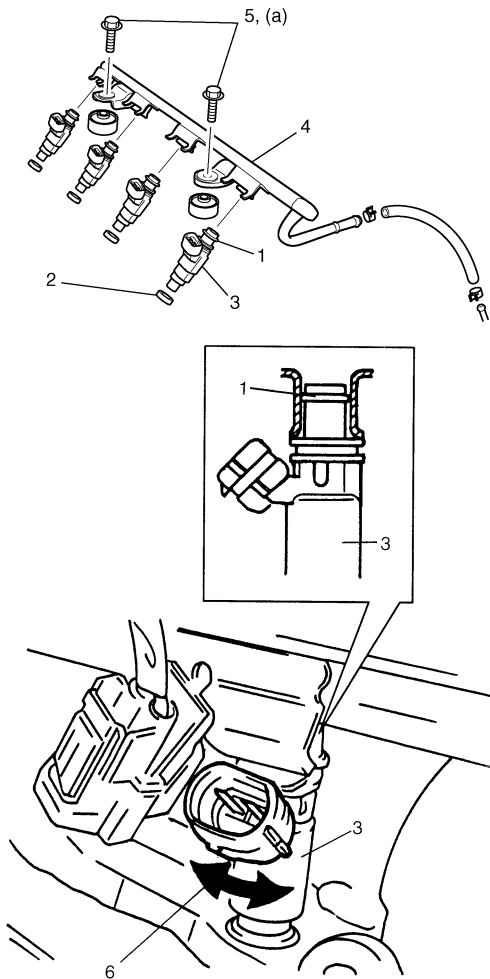
- Replace injector O-ring (1) with new one using care not to damage it.
- Check if cushion (2) is scored or damaged. If it is, replace with new one.
- Apply thin coat of fuel to O-rings (1) and then install injectors (3) into delivery pipe (4) and cylinder head.

Make sure that injectors rotate smoothly (6). If not, probable cause is incorrect installation of O-ring. Replace O-ring with new one.

- Tighten delivery pipe bolts (5) to specified torque and make sure that injectors rotate smoothly.

**Tightening torque**

**Fuel delivery pipe bolt (a): 25 N·m (2.5 kgf·m, 18.0 lb·ft)**



I3RM0A170011-01

- After installation, with engine OFF and ignition switch ON, check for fuel leaks around fuel line connection.

**Fuel Injector Inspection**

S4RS0B1706009

**⚠ WARNING**

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

- 1) Install injector to special tool (injector checking tool).

**Special tool**

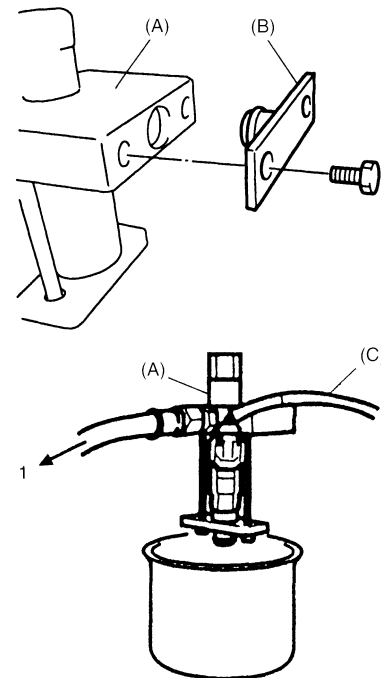
**(A): 09912-58421**

**(B): 09912-57610**

- 2) Connect special tools (hose and attachment) to fuel feed pipe (1) of vehicle.
- 3) Connect special tool (test lead) to injector.

**Special tool**

**(C): 09930-88530**



I3RM0A170012-01

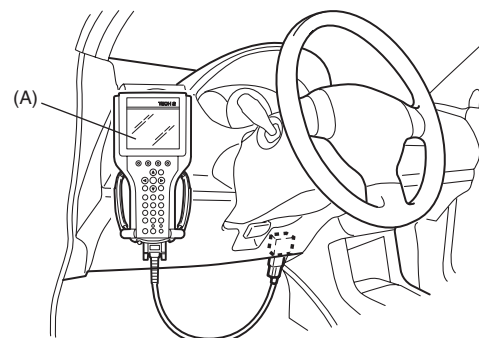
- 4) Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
- 5) Put graduated cylinder under injector.
- 6) Operate fuel pump and apply fuel pressure to injector as follows:

a) When using scan tool:

- i) Connect scan tool to DLC with ignition switch OFF.
- ii) Turn ignition switch ON, clear DTC and select "MISC TEST" mode on scan tool.
- iii) Turn fuel pump ON by using scan tool.

**Special tool**

**(A): SUZUKI scan tool**



I4RS0B170008-01

b) When not using scan tool:

- i) Remove fuel pump relay from connector.

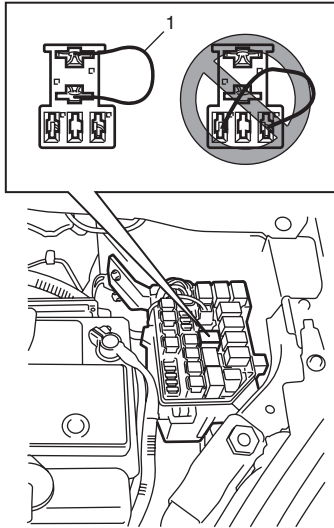
## 1G-10 Fuel System:

- ii) Connect two terminals of relay connector using service wire (1) as shown in the figure.

### **⚠ CAUTION**

Check to make sure that connection is made between correct terminals. Wrong connection can cause damage to ECM, wire harness, etc.

- iii) Turn ignition switch ON.



I4RS0B170009-01

- 7) Apply battery voltage to injector (1) for 15 seconds and measure injected fuel volume with graduated cylinder. Test each injector two or three times. If not within specification, replace injector.

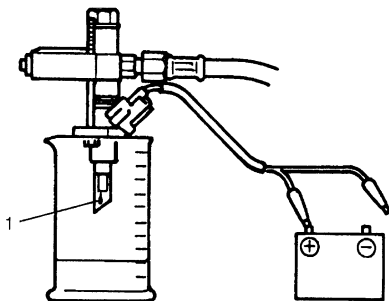
### **Injected fuel volume**

**43 – 47 cc/15 sec. (1.45/1.51 – 1.58/1.65 US/Imp oz/15 sec.)**

- 8) Check fuel leakage from injector nozzle. Do not operate injector for this check (but fuel pump should be at work). If fuel leaks (1) more than the following specifications, replace.

### **Fuel leakage**

**Less than 1 drop/min.**



I2RH0B170013-01

## Fuel Filler Cap Inspection

S4RS0B1706010

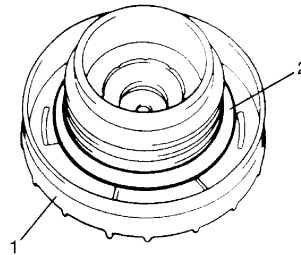
### **⚠ WARNING**

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

Remove cap (1), and check gasket for even filler neck imprint, and deterioration or any damage. If gasket (2) is in malcondition, replace cap.

### **NOTE**

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in fire and personal injury.



I2RH01170008-01

## Fuel Tank Removal and Installation

S4RS0B1706013

### **⚠ WARNING**

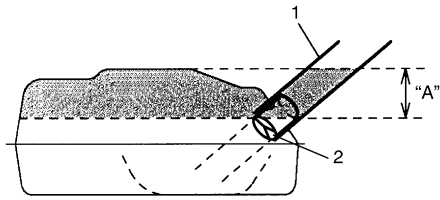
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service:" in order to reduce the risk of fire and personal injury.

### **Removal**

- 1) Relieve fuel pressure in fuel feed line according to "Fuel Pressure Relief Procedure:".
- 2) Disconnect negative cable at battery.
- 3) Remove fuel filler cap.
- 4) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space "A" as shown in figure.

### **⚠ CAUTION**

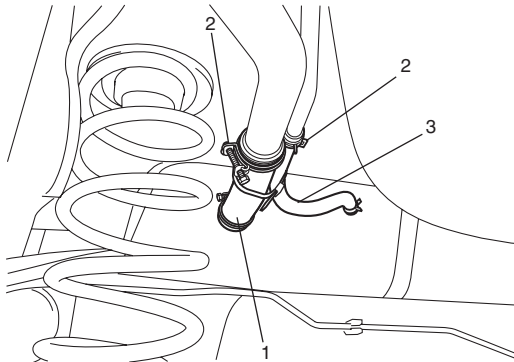
**Do not force pump hose into fuel tank.**



I4RS0B170022-01

2. Inlet check valve

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



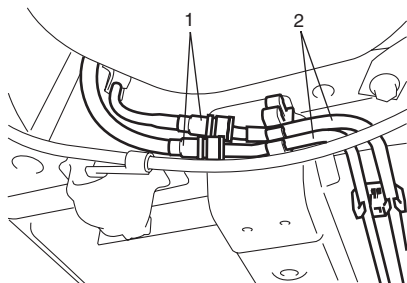
I4RS0B170010-01

- 6) Remove exhaust center pipe.  
 7) Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler. Use hand operated pump device to drain fuel tank.

**⚠ CAUTION**

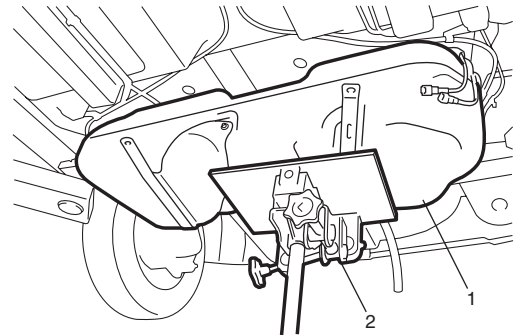
- Do not force pump hose into fuel tank.
- Never store fuel in an open container due to possibility of fire or explosion.

- 8) Disconnect quick joint (fuel pipe) (1) from fuel pipes (2) referring to "Fuel Hose Disconnecting and Reconnecting: ".



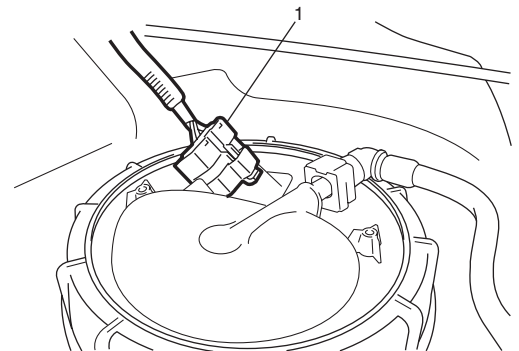
I4RS0B170011-01

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



I4RS0B170012-01

- 10) Lower fuel tank a little as to disconnect wire harness at connector (1), then remove fuel tank.



I4RS0B170013-01

**Installation**

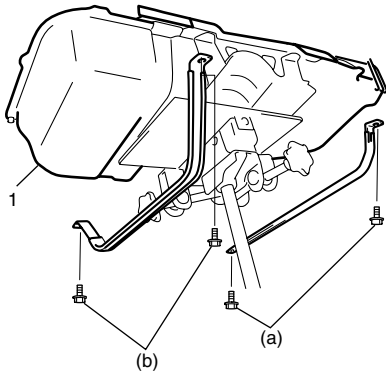
**⚠ CAUTION**

- When connecting joint, clean outside surfaces of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.
- Never let the fuel hoses touch the ABS sensor harness (if equipped).

- 1) If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.
- 2) Raise fuel tank (1) with jack and connect fuel pump connector and clamp wire harness.
- 3) Install fuel tank to vehicle.

**Tightening torque**

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

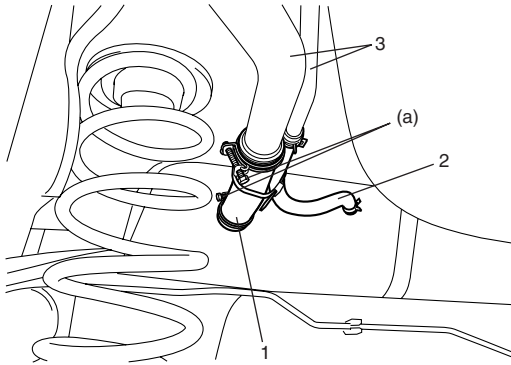


I4RS0A170011-01

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

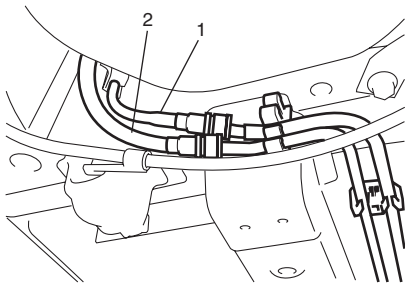
**Tightening torque**

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



I4RS0A170012-01

- 5) Connect fuel feed hose (1) and vapor hose (2) to each pipe as shown in figure, and clamp them securely.



I4RS0B170014-01

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

**Fuel Tank Inspection**

S4RS0B1706014

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.

Replace any damaged or malconditioned parts.

**Fuel Tank Purging Procedure**

S4RS0B1706015

**▲ WARNING**

- **Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk of fire and personal injury.**
- **This purging procedure will not remove all fuel vapor. Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.**

**▲ CAUTION**

**Never remain water in fuel tank after washing, or fuel tank inside will get corrosion.**

The following procedure are used for purging fuel tank.

- 1) After removing fuel tank, remove all hoses, pipes and fuel pump assembly from fuel tank.
- 2) Drain all remaining fuel from tank.
- 3) Place fuel tank to flushing area.
- 4) Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean. Replace tank if its inside is rusty.
- 5) Completely flush out remaining water after washing.
- 6) Be sure to dry fuel tank assembly thoroughly out of direct sunlight after washing.

**Fuel Pump On-Vehicle Inspection**

S4RS0B1706016

**▲ WARNING**

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

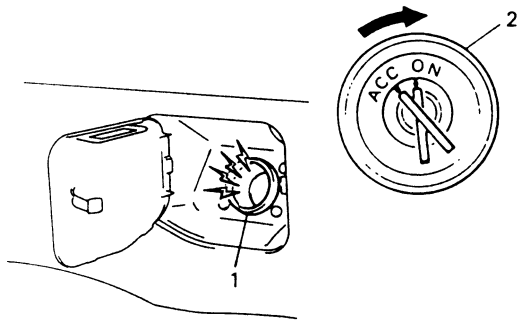
**NOTE**

**The fuel pressure regulator is incorporated with the fuel pump assembly so individual inspection of it is impossible.**

- 1) Remove filler cap and turn ON ignition switch (2). Then fuel pump operating sound should be heard from fuel filler (1) for about 2 seconds and stop. Be sure to reinstall fuel filler cap after checking.

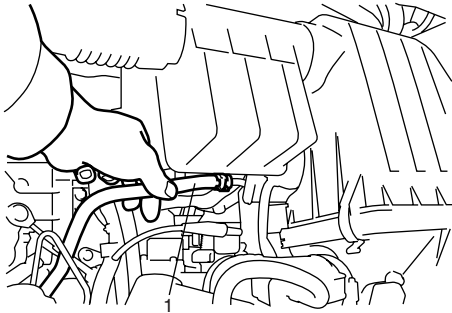


If the check result is not satisfactory, go to "Fuel Pump and Its Circuit Check: in Section 1A".



IVSY01170013-01

- 2) Turn OFF ignition switch and leave over 10 minutes as it is.
- 3) Fuel pressure should be felt at fuel feed hose (1) for about 2 seconds after ignition switch ON. If fuel pressure is not felt, go to "Fuel Pressure Check: in Section 1A".



I3RM0A170019-01

### Fuel Pump Assembly Removal and Installation

S4RS0B1706021

#### **⚠ WARNING**

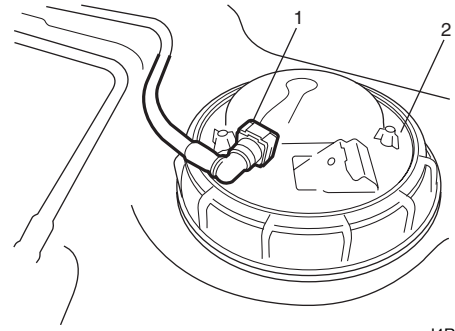
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

#### **⚠ CAUTION**

Never disassemble fuel pump assembly except fuel level sensor. Disassembly will spoil its original performance. If faulty condition is found, replace it with new one.

#### Removal

- 1) Remove fuel tank from vehicle referring to "Fuel Tank Removal and Installation: ".
- 2) Disconnect fuel feed pipe (1) from fuel pump assembly (2) referring to "Fuel Hose Disconnecting and Reconnecting: ".

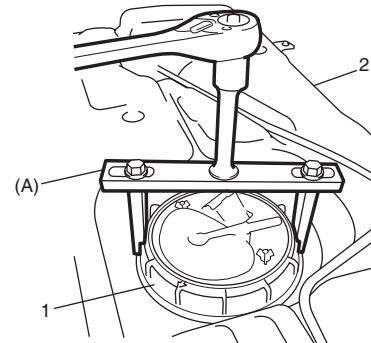


I4RS0B170015-01

- 3) Remove fuel pump lock nut (1) from fuel tank (2) using special tool.

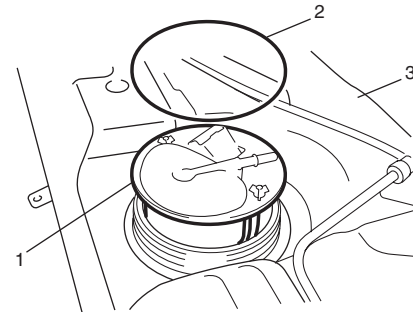
#### Special tool

(A): 09941-51010



I4RS0B170016-01

- 4) Remove fuel pump assembly (1) and O-ring (2) from fuel tank (3).



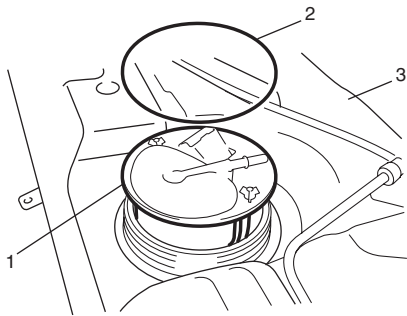
I4RS0B170017-01

#### Installation

#### **⚠ CAUTION**

When connecting joint, clean outside surface of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.

- 1) Clean mating surfaces of fuel pump assembly and fuel tank.
- 2) Install fuel pump assembly (1) and new O-ring (2) to fuel tank (3).



I4RS0B170017-01

3) Install new fuel pump lock nut (1) to fuel tank (2) as follows.

- a) Tighten new fuel pump lock nut (1) by hand.

**NOTE**

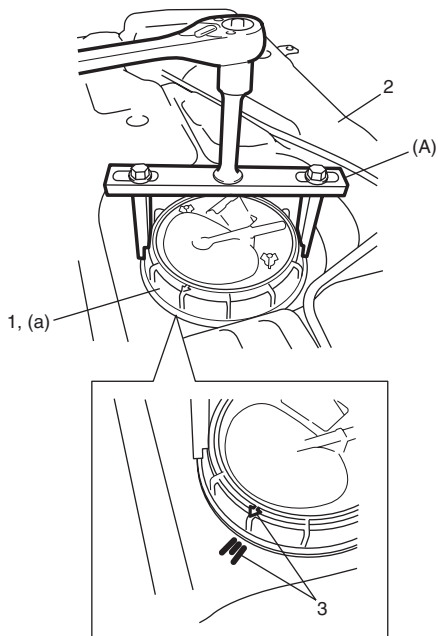
**Tighten lock nut while pressing straight on it so that it will not tilt.**

- b) Using special tool, tighten fuel pump lock nut (1) until indexes (3) of fuel pump lock nut and fuel tank are aligned.

**NOTE**

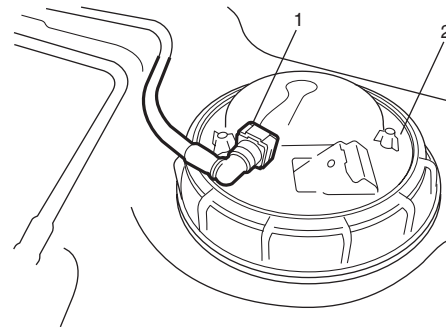
- **Indexes are aligned when fuel pump lock nut is tightened by approx. 1 and 1/3 rotations.**
- **After tightening fuel pump lock nut, check for loosening and play.**

**Special tool  
(A): 09941-51010**



I4RS0B170018-02

4) Connect fuel feed pipe (1) to fuel pump assembly (2) referring to “Fuel Hose Disconnecting and Reconnecting: ”.



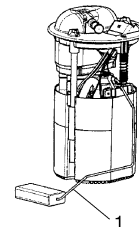
I4RS0B170015-01

5) Install fuel tank to vehicle referring to “Fuel Tank Removal and Installation: ”.

**Fuel Pump Inspection**

S4RS0B1706019

- Check fuel pump assembly for damage.
- Check fuel suction filter for evidence of dirt and contamination. If present, replace or clean and check for presence of dirt in fuel tank.
- For electrical circuit, refer to “Fuel Pressure Check: in Section 1A”.
- For inspection of fuel level gauge (1), refer to “Fuel Level Sensor Inspection: in Section 9C”.



I4RS0B170021-01



## Specifications

### Tightening Torque Specifications

S4RS0B1707001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Fuel delivery pipe bolt	25	2.5	18.0	☞
Fuel tank bolt	50	5.0	36.5	☞
Fuel filler hose clamp	2	0.2	1.5	☞

#### NOTE

The specified tightening torque is also described in the following.

“Fuel System Components: ”

“Fuel Hose Disconnecting and Reconnecting: ”


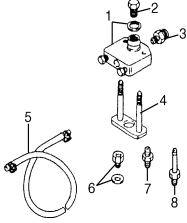
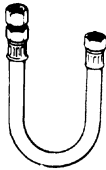

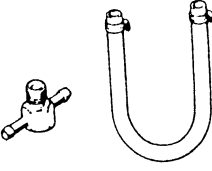
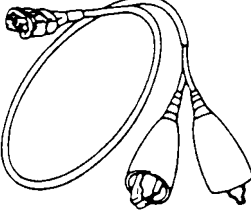
#### Reference:

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

## Special Tools and Equipment

### Special Tool

S4RS0B1708001

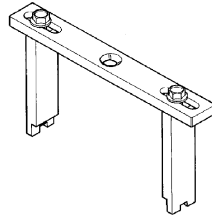
<p>09912-57610 Injector checking tool plate ☞</p> 	<p>09912-58421 Checking tool set This kit includes the following items. 1. Tool body and washer, 2. Body plug, 3. Body attachment-1, 4. Holder, 5. Return hose and clamp, 6. Body attachment-2 and washer, 7. Hose attachment-1, 8. Hose attachment-2 ☞</p> 
<p>09912-58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413). ☞</p> 	<p>09912-58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413). ☞</p> 
<p>09912-58490 3-way joint &amp; hose ☞</p> 	<p>09930-88530 Injector test lead ☞</p> 

**1G-16 Fuel System:**

09941-51010

Lock ring wrench

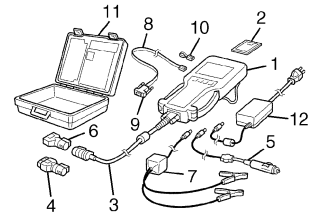
🔧 / 🔧



SUZUKI scan tool

—

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



# Ignition System

## General Description

### Ignition System Construction

S4RS0B1801001

The ignition system is an electronic (distributorless) ignition system. It consists of the parts as described below.

- **ECM**

It detects the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the ignitor (power unit) in the ignition coil assembly.

- **Ignition coil assembly (including an ignitor)**

The ignition coil assembly has a built-in ignitor which turns ON and OFF the current flow to the primary coil according to the signal from ECM. When the current flow to the primary coil is turned OFF, a high voltage is induced in the secondary coil.

- **High-tension cords and spark plugs**

- **CMP sensor (Camshaft position sensor) and CKP sensor (Crankshaft position sensor)**

Using signals from these sensors, ECM identifies the specific cylinder whose piston is in the compression stroke, detects the crank angle and adjusts initial ignition timing automatically.

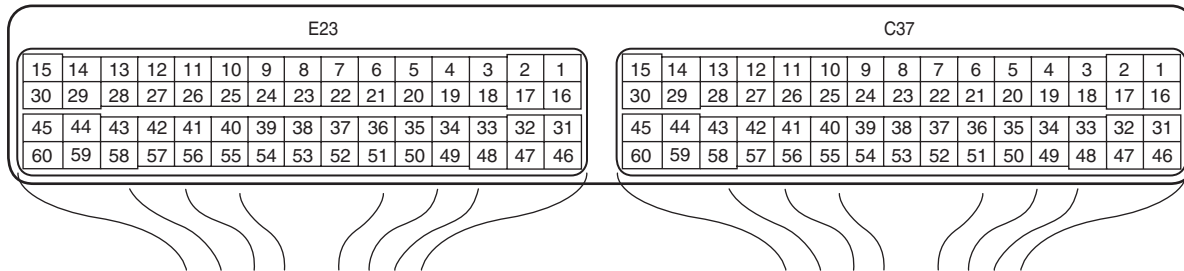
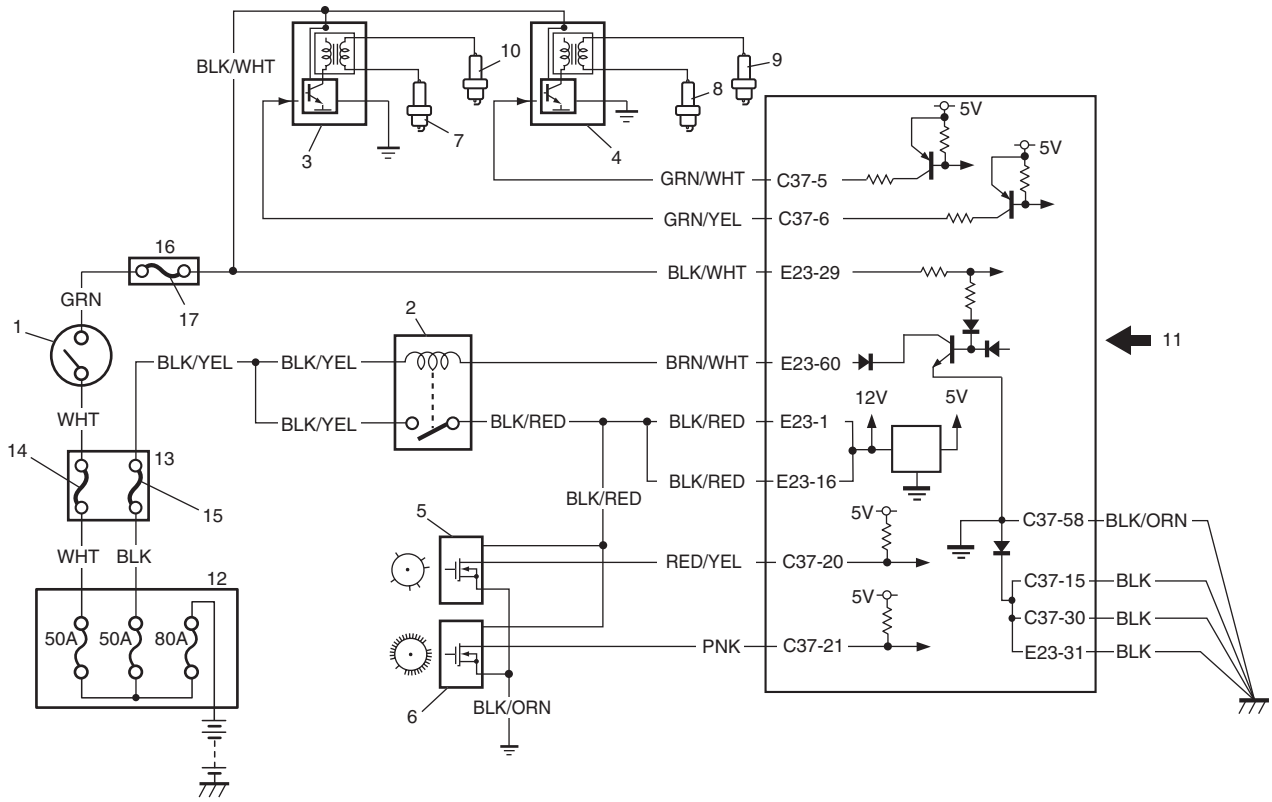
- **TP sensor, ECT sensor, MAP sensor, MAF sensor, IAT sensor, knock sensor and other sensors / switches**

Although this ignition system does not have a distributor, it has two ignition coil assemblies (one is for No.1 and No.4 spark plugs and the other is for No.2 and No.3 spark plugs). When an ignition signal is sent from ECM to the ignitor in the ignition coil assembly for No.1 and No.4 spark plugs, a high voltage is induced in the secondary coil and that passes through the high-tension cords and causes No.1 and No.4 spark plugs to spark simultaneously. Likewise, when an ignition signal is sent to the ignitor in the other ignition coil assembly, No.2 and No.3 spark plugs spark simultaneously.

# Schematic and Routing Diagram

## Ignition System Wiring Circuit Diagram

S4RS0B1802001



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 (MAP sensor, ECT sensor, MAF and IAT sensor, TP sensor, Knock sensor, VSS, Electric load signal, Engine start signal)	17. "IG COIL" fuse
6. CKP sensor	12. Battery fuse box	

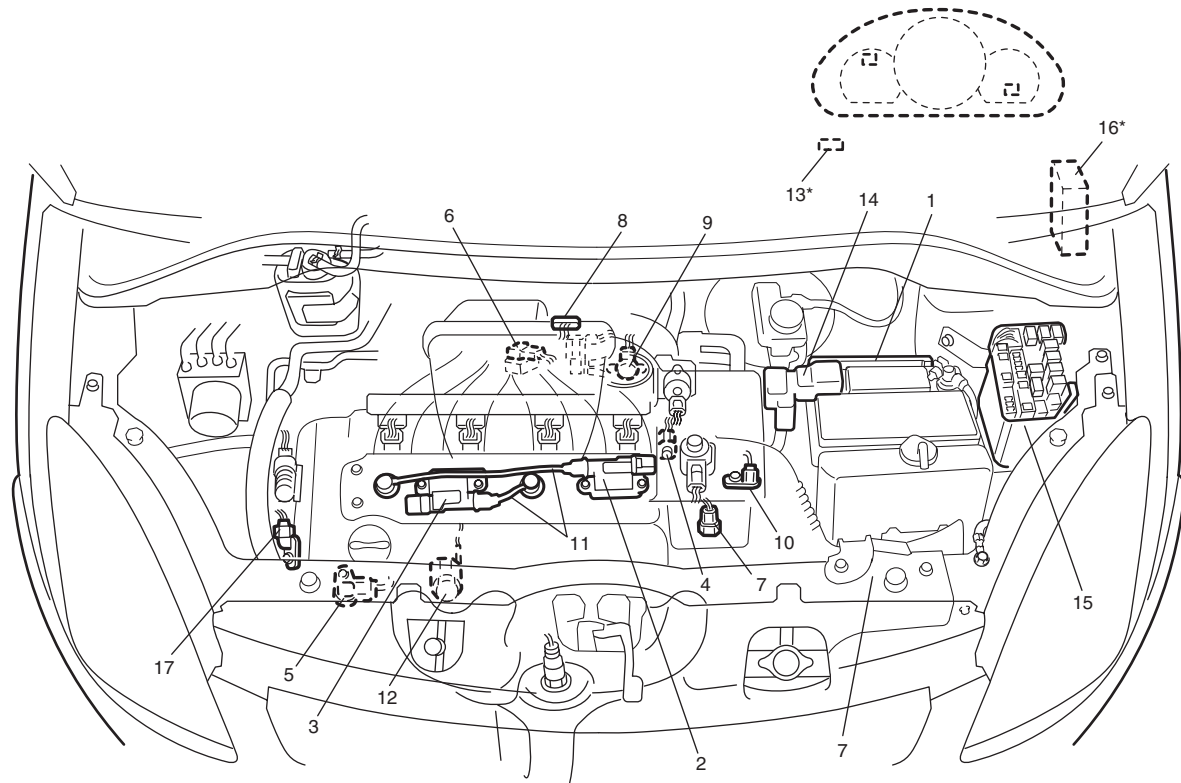
## Component Location

### Ignition System Components Location

S4RS0B1803001

**NOTE**

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



I4RS0B180002-01

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 (for A/T and M/T models) or electric throttle body assembly (for Automated Manual Transaxle model)	15. Relay box
4. CMP sensor (for M15 engine model)	10. VSS	16. Junction block assembly
5. CKP sensor	11. High-tension cords	17. CMP sensor (for M13 engine model)
6. MAP sensor	12. Knock sensor	

## Diagnostic Information and Procedures

### Ignition System Symptom Diagnosis

S4RS0B1804001

Condition	Possible cause	Correction / Reference Item
<b>Engine cranks, but will not start or hard to start (No spark)</b>	Blown fuse for ignition coil	<i>Replace.</i>
	Loose connection or disconnection of lead wire or high-tension cord(s)	<i>Connect securely.</i>
	Faulty high-tension cord(s)	<i>Replace.</i>
	Faulty spark plug(s)	<i>Replace.</i>
	Faulty ignition coil	<i>Replace ignition coil assembly.</i>
	Faulty CKP sensor or CKP sensor plate	<i>Clean, tighten or replace.</i>
	Faulty CMP sensor or sensor rotor tooth of camshaft	<i>Clean, tighten or replace.</i>
	Faulty ECM	<i>Replace.</i>

## 1H-4 Ignition System:

Condition	Possible cause	Correction / Reference Item
<b>Poor fuel economy or engine performance</b>	Incorrect ignition timing	<i>Check related sensors and CKP sensor plate.</i>
	Faulty spark plug(s) or high-tension cord(s)	<i>Adjust, clean or replace.</i>
	Faulty ignition coil assembly	<i>Replace.</i>
	Faulty CKP sensor or CKP sensor plate	<i>Clean, tighten or replace.</i>
	Faulty CMP sensor or sensor rotor tooth of camshaft	<i>Clean, tighten or replace.</i>
	Faulty knock sensor	<i>Replace.</i>
	Faulty ECM	<i>Replace.</i>

### Reference Waveform of Ignition System

S4RS0B1804002

Refer to "Reference waveform No.5", "Reference waveform No.6" and "Reference waveform No.7" under "Inspection of ECM and Its Circuits: in Section 1A" for waveform of Ignition trigger signal.

### Ignition System Check

S4RS0B1804003

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: in Section 1A".
2	<b>Ignition spark test</b> 1) Check all spark plugs for condition and type referring to "Spark Plug Inspection: ". 2) If OK, perform ignition spark test referring to "Ignition Spark Test: ". <i>Is spark emitted from all spark plugs?</i>	Go to Step 13.	Go to Step 3.
3	<b>DTC check</b> 1) Perform DTC check referring to "DTC Check: in Section 1A". <i>Is DTC stored in ECM?</i>	Go to applicable DTC diag. flow.	Go to Step 4.
4	<b>Electrical connection check</b> 1) Check ignition coil assemblies and high-tension cords for electrical connection. <i>Are they connected securely?</i>	Go to Step 5.	Connect securely.
5	<b>High-tension cords check</b> 1) Check high-tension cord for resistance referring to "High-Tension Cord Inspection: ". <i>Is check result satisfactory?</i>	Go to Step 6.	Replace high-tension cord(s).
6	<b>Ignition coil assembly power supply and ground circuit check</b> 1) Check ignition coil assembly power supply and ground circuits for open and short. <i>Are circuits in good condition?</i>	Go to Step 7.	Repair or replace.
7	<b>Ignition coil assembly check</b> 1) Check ignition coil for resistance referring to "Ignition Coil Assembly (Including ignitor) Inspection: ". <i>Is check result satisfactory?</i>	Go to Step 8.	Replace ignition coil assembly.

Step	Action	Yes	No
8	<p><b>CKP sensor check</b></p> <p>1) Check CKP sensor referring to “Crankshaft Position (CKP) Sensor Inspection: in Section 1C”.</p> <p><i>Is check result satisfactory?</i></p>	Go to Step 9.	Tighten CKP sensor bolt, replace CKP sensor or CKP sensor plate.
9	<p><b>CMP sensor check</b></p> <p>1) Check CMP sensor referring to “Camshaft Position (CMP) Sensor Inspection: in Section 1C”.</p> <p><i>Is check result satisfactory?</i></p>	Go to Step 10.	Tighten CMP sensor bolt, replace CMP sensor or intake camshaft.
10	<p><b>Ignition trigger signal circuit check</b></p> <p>1) Check ignition trigger signal wire for open, short and poor connection.</p> <p><i>Is circuit in good condition?</i></p>	Go to Step 11.	Repair or replace.
11	<p><b>A known-good ignition coil assembly substitution</b></p> <p>1) Substitute a known-good ignition coil assembly and then repeat Step 2.</p> <p><i>Is check result of Step 2 satisfactory?</i></p>	Go to Step 12.	Substitute a known-good ECM and then repeat Step 2.
12	<p><b>Knock sensor check</b></p> <p>1) Confirm that knock sensor circuit is in good condition referring to “DTC P0327 / P0328: Knock Sensor Circuit Low / High: in Section 1A”.</p> <p>2) Check oscilloscope waveform of knock sensor signal referring to “Reference waveform No.23” and “Reference waveform No.24” under “Inspection of ECM and Its Circuits: in Section 1A”.</p> <p><i>Is check result satisfactory?</i></p>	Go to Step 13.	Substitute a known-good knock sensor and recheck.
13	<p><b>Ignition timing check</b></p> <p>1) Check initial ignition timing and ignition timing advance referring to “Ignition Timing Inspection: ”.</p> <p><i>Is check result satisfactory?</i></p>	System is in good condition.	Check CMP sensor, CMP sensor rotor tooth of camshaft, CKP sensor, CKP sensor plate and/or input signals related to this system.

### Ignition Spark Test

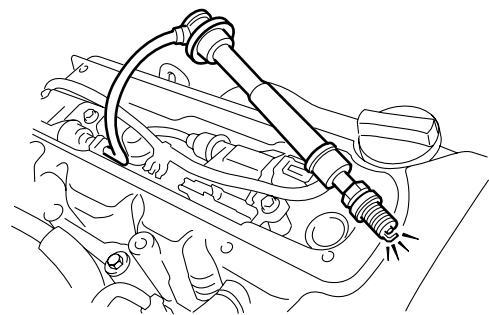
S4RS0B1804004

- 1) Remove air cleaner assembly with air intake pipe.
- 2) Disconnect all injector couplers from injectors.

**▲ WARNING**

**Without disconnection of injector couplers, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.**

- 3) Remove spark plug and check it for condition and type referring to “Spark Plug Inspection: ”.
- 4) If OK, connect ignition coil coupler to ignition coil assembly and connect spark plug to ignition coil assembly or high-tension cord. Ground spark plug.
- 5) Crank engine and check if each spark plug sparks.



I4RS0A180006-01

- 6) If no spark is emitted, inspect the related parts as described in “Ignition System Symptom Diagnosis: ”.

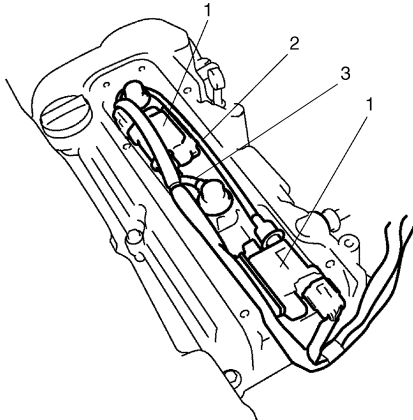
## Repair Instructions

### High-Tension Cord Removal and Installation

S4RS0B1806001

#### Removal

- 1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
- 2) Disconnect No.1 cylinder (2) and No.3 cylinder (3) high-tension cords from ignition coil assemblies (1) while gripping each cap.



I4RS0A180003-01

- 3) Pull out high-tension cords from spark plugs while gripping each cap.

#### ⚠ CAUTION

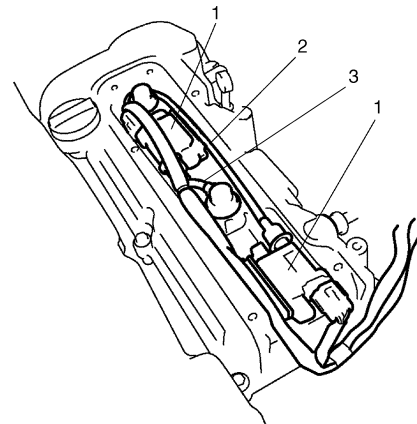
- Removal of high-tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).
- For the same reason, pull out each connection by gripping cap portion.

#### Installation

- 1) Install No.1 cylinder (2) and No.3 cylinder (3) high-tension cords to spark plugs and ignition coil assemblies (1) while gripping each cap.

#### ⚠ CAUTION

- Never attempt to use metal conductor high-tension cords as replacing parts.
- Insert each cap portion fully when installing high-tension cords.



I4RS0A180004-01

### High-Tension Cord Inspection

S4RS0B1806002

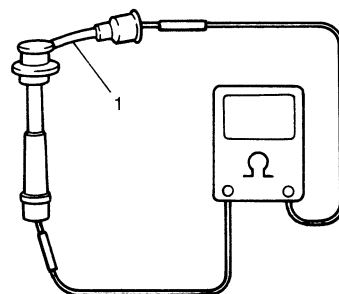
Measure resistance of high-tension cord (1) by using ohmmeter.

If resistance exceeds specification, replace high-tension cord(s).

#### High-tension cord resistance

**No.1 cylinder high-tension cord resistance: 1.4 – 4.0 kΩ**

**No.3 cylinder high-tension cord resistance: 0.6 – 2.0 kΩ**



I2RH0B180005-01

### Spark Plug Removal and Installation

S4RS0B1806003

#### Removal

- 1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
- 2) Pull out high-tension cords by gripping their caps and then remove ignition coil assemblies referring to "Ignition Coil Assembly (Including ignitor) Removal and Installation: ".
- 3) Remove spark plugs.

#### Installation

- 1) Install spark plugs and tighten them to specified torque.



**Tightening torque**

**Spark plug: 25 N·m (2.5 kgf-m, 18.0 lb-ft)**

- 2) Install ignition coil assemblies referring to "Ignition Coil Assembly (Including ignitor) Removal and Installation: ".
- 3) Install high-tension cords securely by gripping their caps.
- 4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.

**Spark Plug Inspection**

S4RS0B1806004

**⚠ 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.)

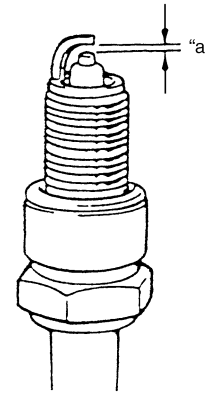
**Spark plug type**

**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).**



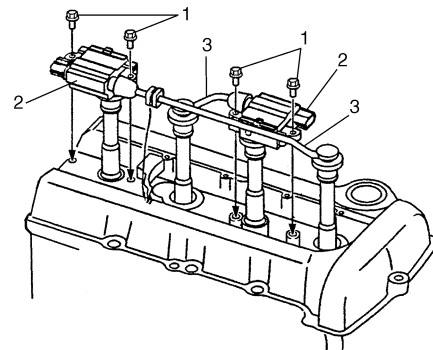
IYSQ01181012-01

**Ignition Coil Assembly (Including ignitor) Removal and Installation**

S4RS0B1806005

**Removal**

- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
- 3) Disconnect ignition coil coupler.
- 4) Disconnect high-tension cord (3) from ignition coil assembly (2).
- 5) Remove ignition coil bolts (1) and then pull out ignition coil assembly.



I2RH0B180006-01

**Installation**

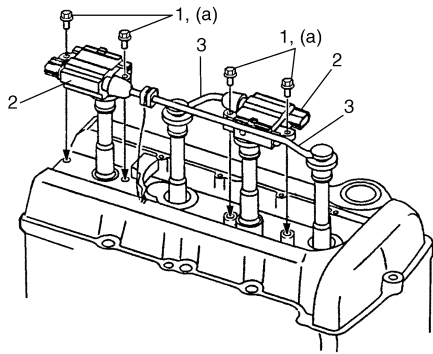
- 1) Install ignition coil assembly (2).
- 2) Tighten ignition coil bolts (1) to specified torque, and then connect ignition coil coupler.

**Tightening torque**

**Ignition coil bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)**

- 3) Install high-tension cord (3) to ignition coil assembly while gripping its cap.

## 1H-8 Ignition System:



I3RM0A180004-01

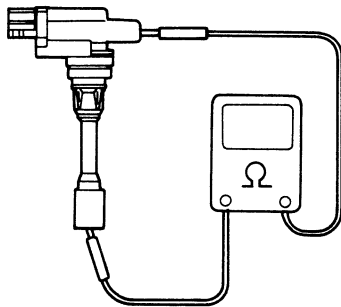
- 4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.
- 5) Connect negative cable to battery.

### Ignition Coil Assembly (Including ignitor) Inspection

S4RS0B1806006

Measure secondary coil for resistance.  
If resistance is out of specification, replace ignition coil assembly.

**Secondary coil resistance**  
7.0 – 9.5 k $\Omega$  at 20 °C, 68 °F



I2RH0B180007-01

### Ignition Timing Inspection

S4RS0B1806007

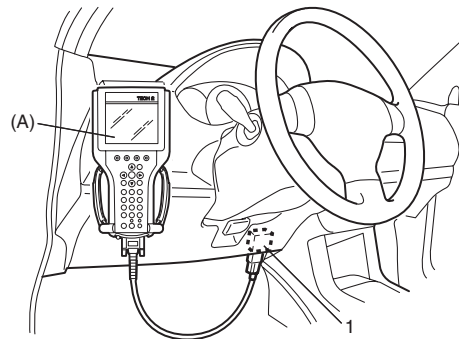
#### NOTE

- 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 (For A/T and M/T Models): in Section 1A".
- 5) Fix ignition timing by using "Fixed Spark" or "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)

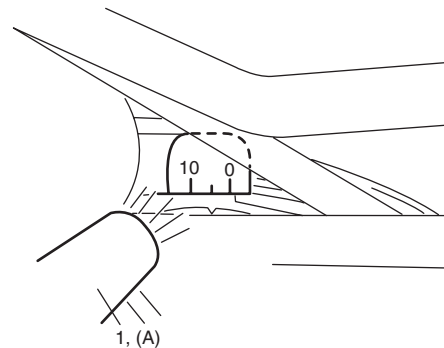
5  $\pm$  3° BTDC (at specified idle speed)

### 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
  - CMP sensor
  - CMP sensor rotor tooth of camshaft
  - VSS
  - Timing chain cover installation