

ELECTRICAL

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BATTERY CHARGING SYSTEM

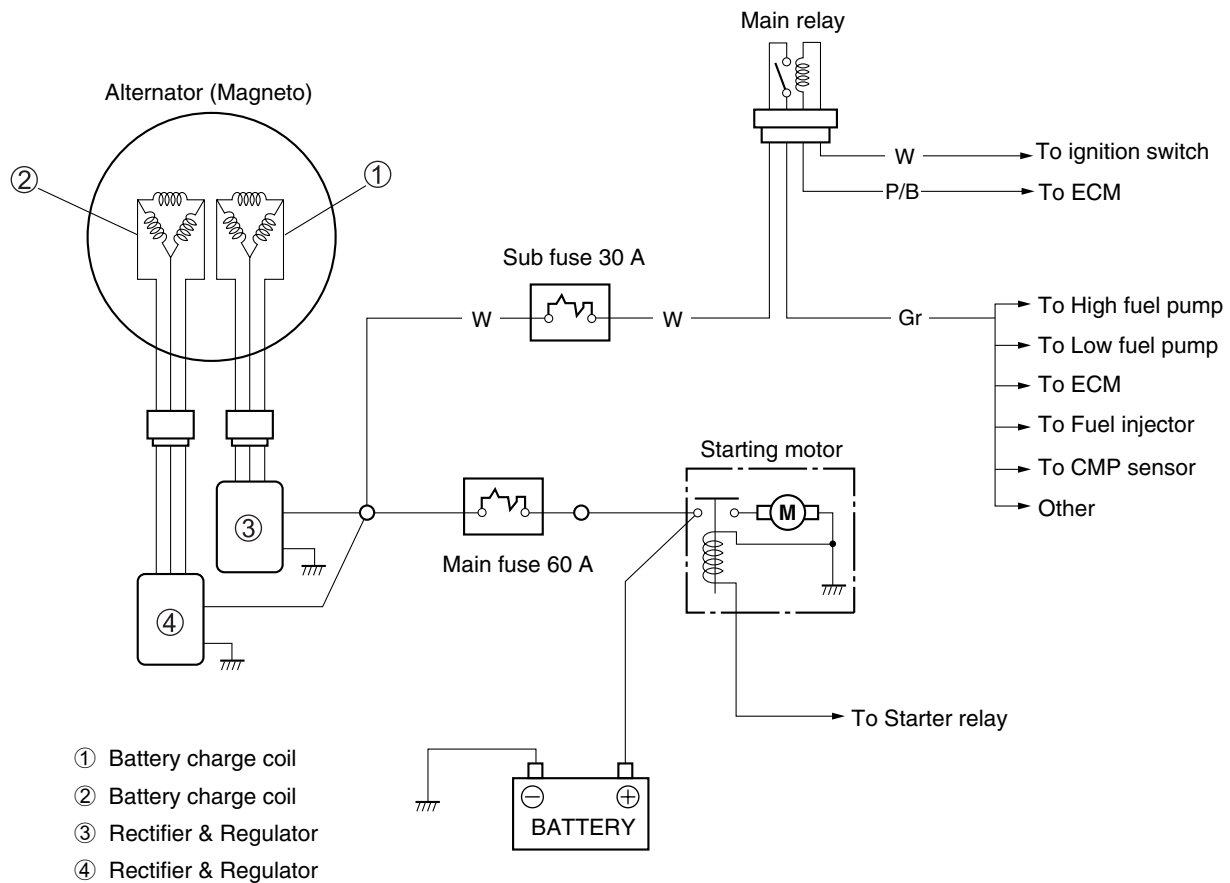
OUTLINE

The battery charging system circuit is illustrated below.

It is composed of the BATTERY CHARGE COIL, RECTIFIER & REGULATORS and BATTERY.

The three phase AC current generated from the battery charge coil is converted by the rectifier & regulators into regulated DC current which is used to charge the battery.

OUTPUT	12 V 54 A (648 W)/3 000 r/min.
REGULATED VOLTAGE	14.2 – 15.2 V



INSPECTION

BATTERY CHARGE COIL

Measure battery charge coil resistance.

TOOL 09930-99320: Digital tester

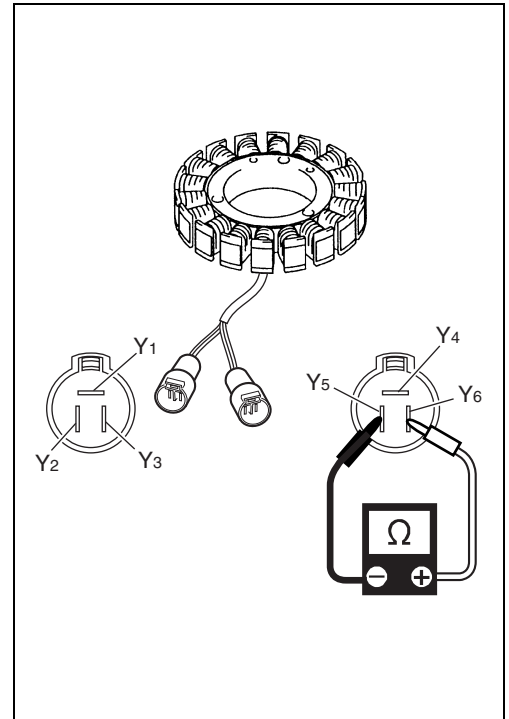
TESTER Tester range: Ω (Resistance)

1. Disconnect battery charge coil leads from rectifier & regulators.
2. Measure resistance between leads in the combinations shown.

Battery charge coil resistance:

Terminal for tester probe connection	Resistance
Yellow 1 to Yellow 2	0.32 – 0.48 Ω
Yellow 2 to Yellow 3	
Yellow 3 to Yellow 1	
Yellow 4 to Yellow 5	0.32 – 0.48 Ω
Yellow 5 to Yellow 6	
Yellow 6 to Yellow 4	

If measurement exceeds specification, replace battery charge coil.



FUSE CASE/FUSE

TOOL 09930-99320: Digital tester

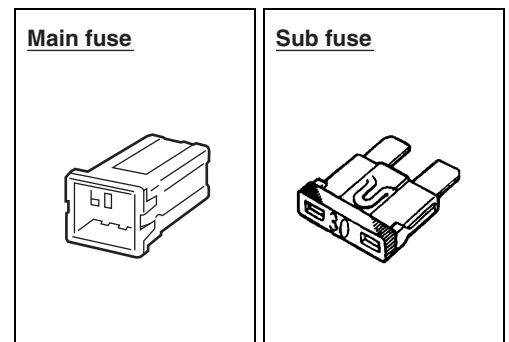
TESTER Tester range: \rightarrow (Continuity)

Fuse

1. Remove the fuse from fuse case (or fuse terminal).
2. Inspect continuity between both terminals of fuse. If no continuity is indicated, replace fuse.

Main fuse : 60 A

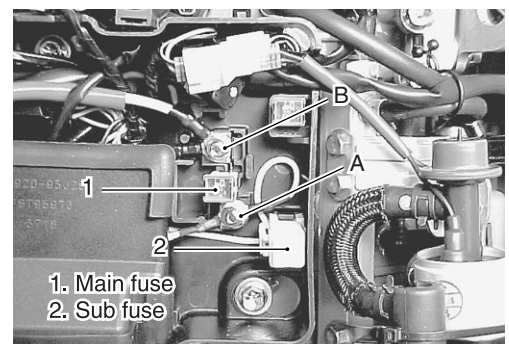
Sub fuse : 30 A



Main fuse terminal

Inspect continuity between terminal (A) and (B).

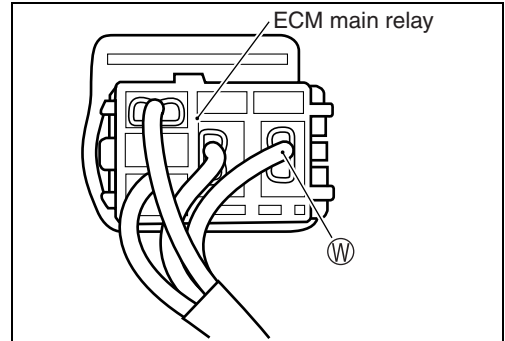
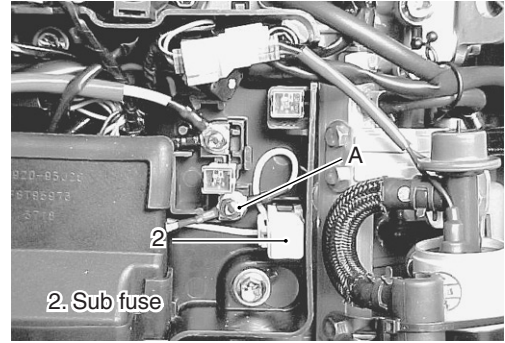
If no continuity is indicated, replace fuse terminal and/or fuse.



Sub fuse case


1. Disconnect battery cables from battery.
2. Disconnect white lead wire of fuse case from terminal (A).
3. Check continuity between White lead wire with plate terminal and the white lead wire (W) of ECM main relay connector.

If no continuity is indicated, replace main harness and/or fuse.



RECTIFIER & REGULATOR

 **09900-25002: Pocket tester**

 **Tester range: x1 kΩ (Resistance)**

1. Disconnect all lead wires of rectifier & regulator.
2. Measure resistance between leads in the combinations shown.

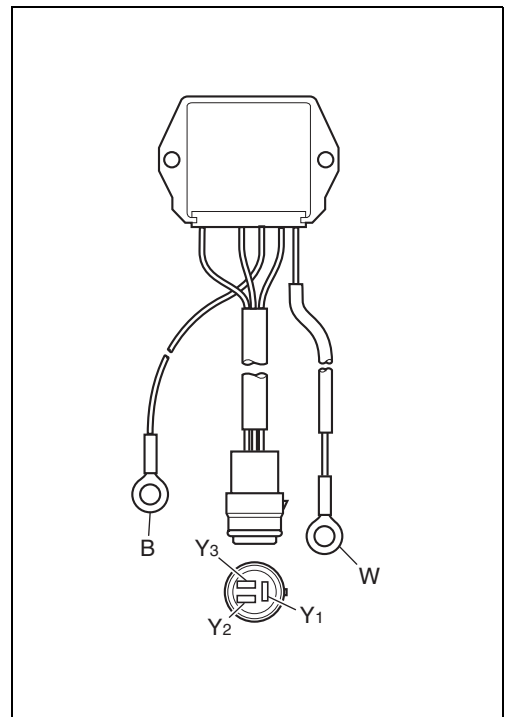
NOTE:

The values given below are for a SUZUKI pocket tester.
As thyristors, diodes, etc. are used inside this rectifier & regulator, the resistance values will differ when an ohmmeter other than SUZUKI pocket tester is used.

Rectifier & regulator resistance:

Unit: Approx. kΩ

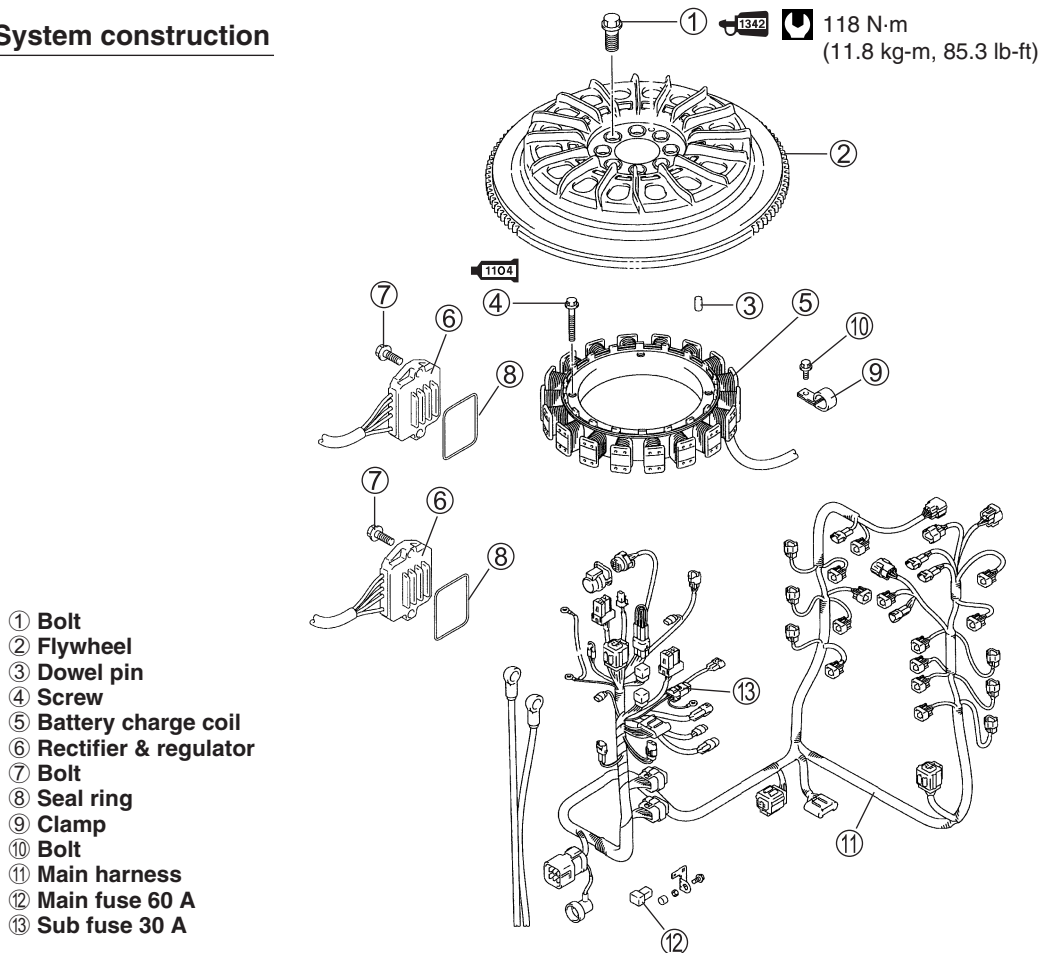
		Tester probe ⊕ (Red)				
		Black	White	Yellow 1	Yellow 2	Yellow 3
Tester probe ⊖ (Black)	Black		3.0 – 4.6	1.8 – 2.8	1.8 – 2.8	1.8 – 2.8
	White	∞		∞	∞	∞
	Yellow 1	2 – 3.2	2 – 3.4		4 – 7	4 – 7
	Yellow 2	2 – 3.2	2 – 3.4	4 – 7		4 – 7
	Yellow 3	2 – 3.2	2 – 3.4	4 – 7	4 – 7	



If measurement exceeds specification, replace rectifier & regulator.

REMOVAL/INSTALLATION

System construction



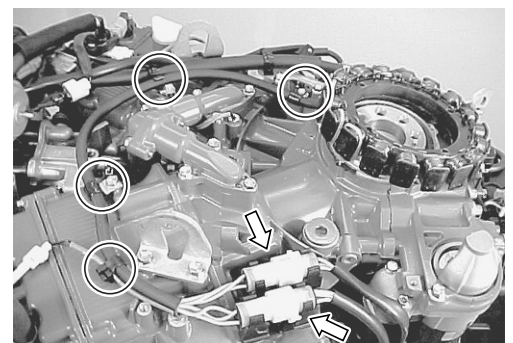
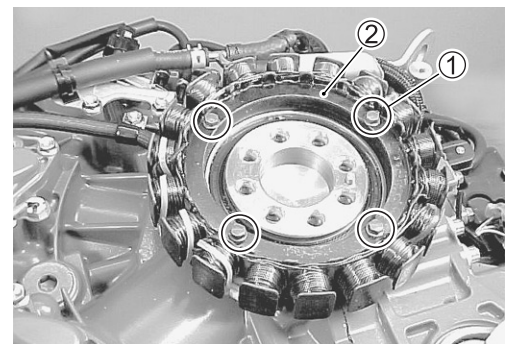
REMOVAL

Prior to removing electrical parts:

- Disconnect battery cables from battery.

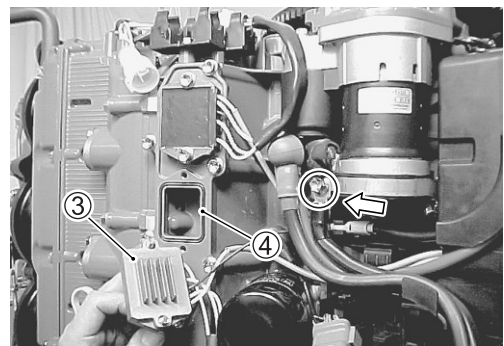
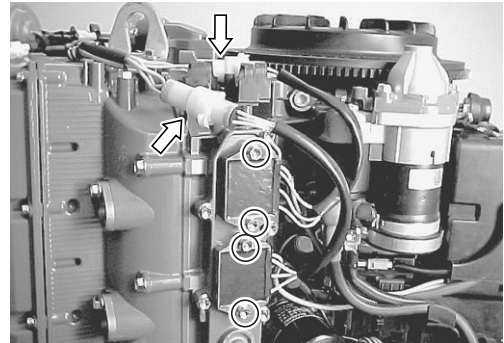
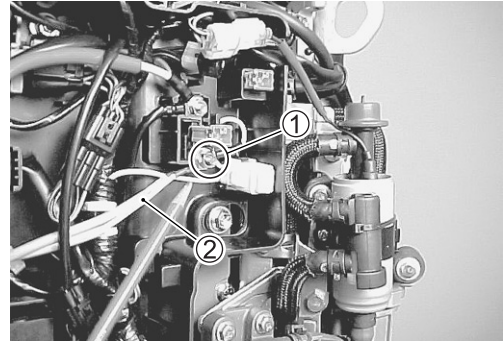
Battery charge coil

- Remove flywheel magneto. (See page 3-66.)
- Remove four (4) screws ① securing the battery charge coil ②.
- Disconnect battery charge coil lead wire connectors from Rectifier & regulator.
- Remove the lead wire clamps and battery charge coil.



Rectifier & regulator

- Remove the electric parts holder cover.
- Remove the nut ① and charge output (white) leads ② from main fuse terminal.
- Disconnect battery charge coil lead wire connector from Rectifier & regulator.
- Remove the bolt securing ground lead wire of Rectifier & regulator.
- Remove the bolts securing the Rectifier & regulator.
- Remove the rectifier & regulator ③ and seal ring ④.



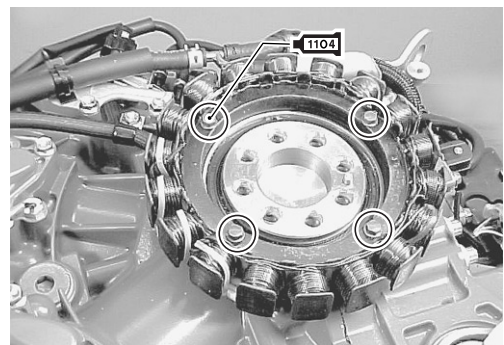
INSTALLATION

Installation is reverse order of removal with special attention to the following steps.

Battery charge coil

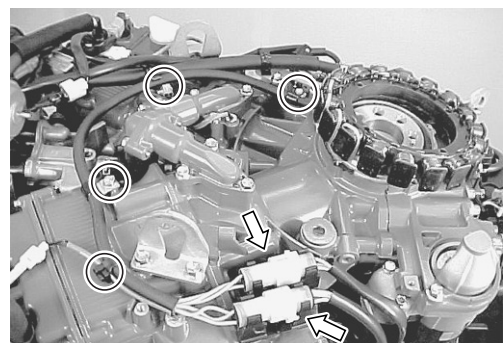
Apply Suzuki Bond No.1104 to the coil securing screws.

1104 99000-32050: SUZUKI BOND NO. 1104



Wire routing

Secure coil lead wire with lead wire clamps, then check that coil lead wire is routed properly and away from hot or rotating parts. (For wire routing – See page - to - .)



STARTER MOTOR OPERATION CONDITION

The starter motor relay will only engage when the ignition switch is turned to the "START" position if the all of the following conditions are satisfied.

- Lock plate is attached to emergency stop switch.
- Neutral switch is in "ON" position.
- Engine is not already operating.

NOTE:

If a failure exists in the Sub-battery cable or the 15 amp. fuse in its circuit, the starter motor relay circuit will not function properly.

STARTER ENGAGEMENT MECHANISM

A solenoid (electromagnetic force) type starter switch, utilizing a torsion spring and shift lever, engages the pinion gear to the flywheel.

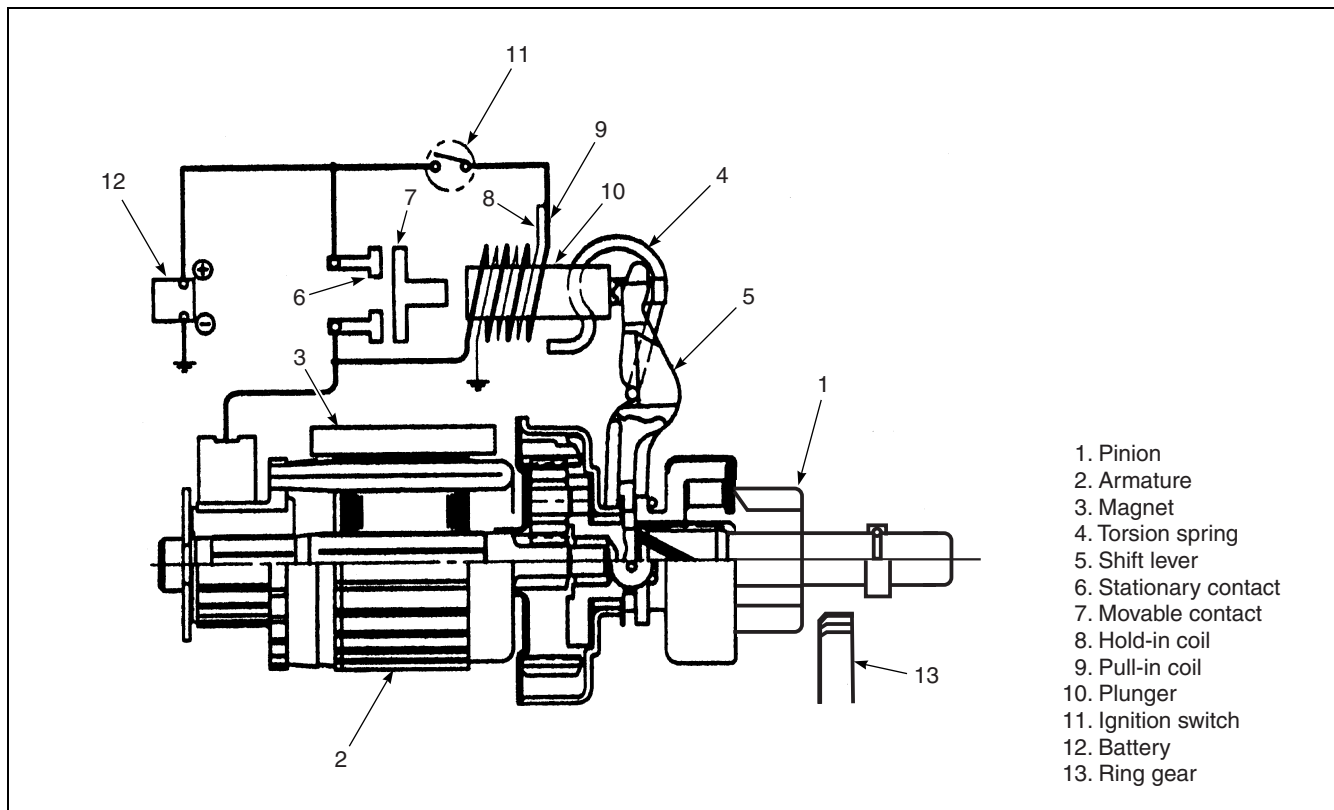
When the ignition key is turned to "START", current flows through the switch winding creating an electromagnet pulling the plunger in.

The shift lever, attached to the plunger, then pushes the pinion up into engagement with the flywheel. Plunger and shift lever movement also compresses the torsion spring, which applies pressure against the shift lever and pinion gear to maintain positive engagement.

Final plunger movement closes the starter switch contacts, which allows current to flow through the starter motor windings, rotating the starter motor armature, pinion gear and flywheel.

When the ignition key is released from start, current flow to the switch is shut off and electromagnetic force ceases. The torsion spring then pulls the plunger out, disengaging the pinion gear from the flywheel through the shift lever.

Movement of the plunger also opens the switch contacts, stopping current flow to the starter motor windings, shutting off the starter motor.



TROUBLESHOOTING

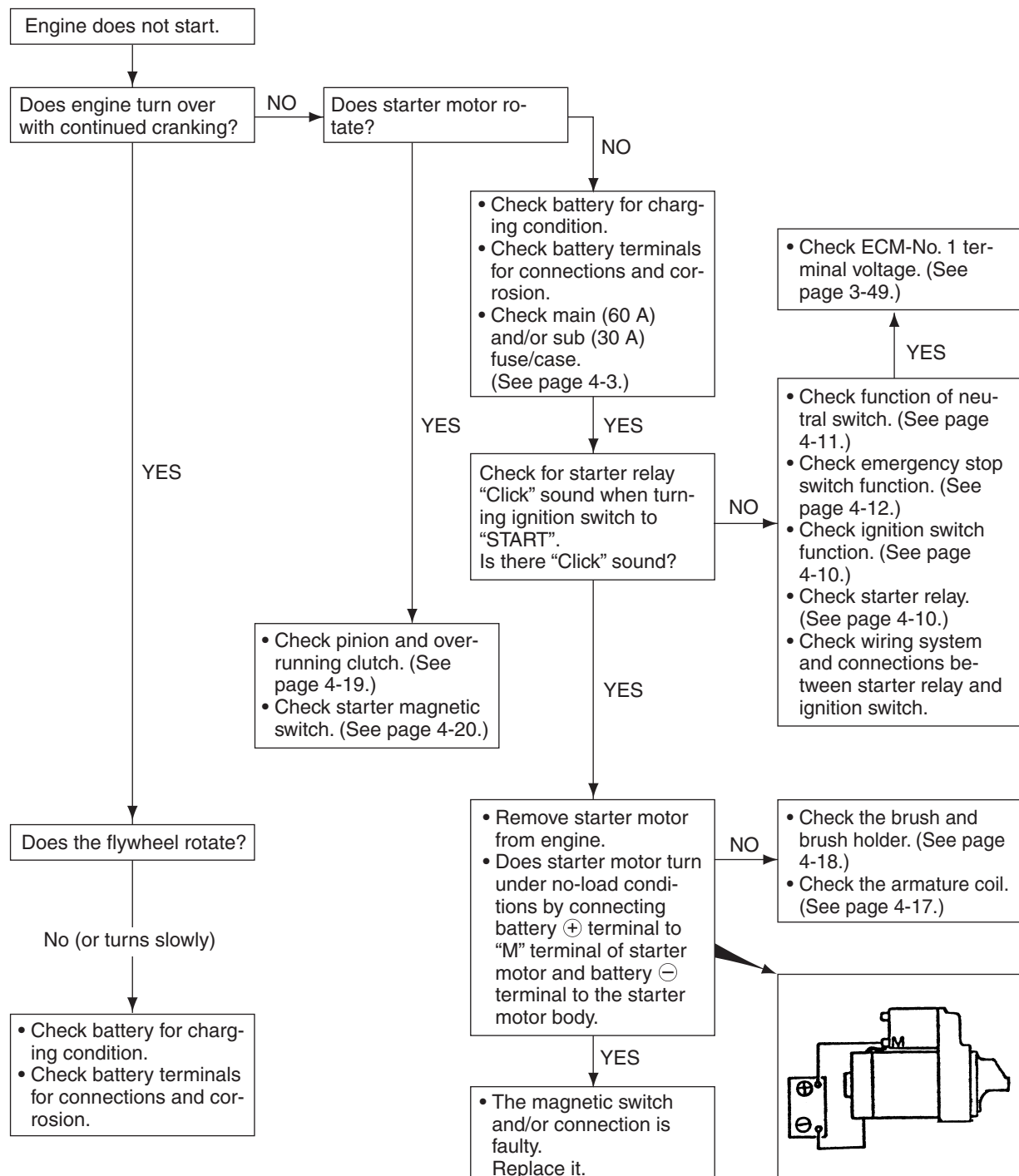
NOTE:

Before troubleshooting the electric starter system, make sure of the following:

- Battery is fully charged.
- All cables/wires are securely connected.
- Shift is in "NEUTRAL" position.
- Emergency stop switch lock plate is set in place.

CAUTION

If any abnormality is found, immediately disconnect battery cables from battery.



INSPECTION

IGNITION SWITCH

TOOL 09930-99320: Digital tester

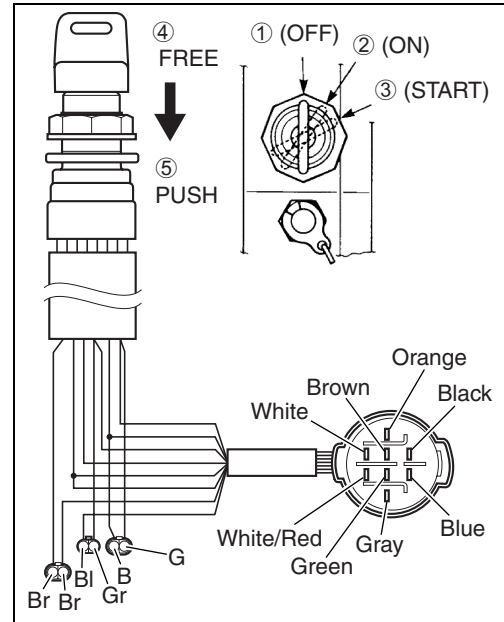
CONT Tester range: (Continuity)

1. Disconnect the ignition switch from remo-con box wiring harness.
2. Check continuity between wiring leads at the key positions shown in the chart.

Key Position	Switch Lead Wires					
	Black	Green	White	Gray	Brown	Orange
① OFF	○—○					
② ON			○—○			
③ START			○—○	○—○	○—○	
④ FREE						
⑤ PUSH			○—○	○—○		○—○

○—○: Continuity

If out of specification, replace ignition switch.

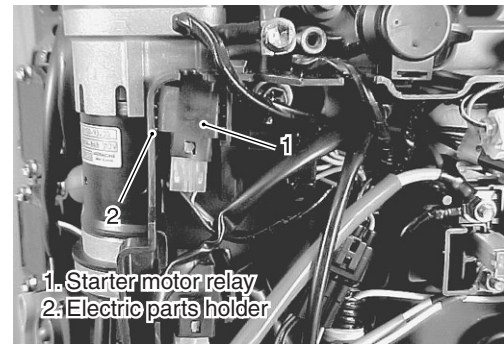


STARTER MOTOR RELAY

TOOL 09930-99320: Digital tester

CONT Tester range: (Continuity)

1. Disconnect starter motor relay from wire.

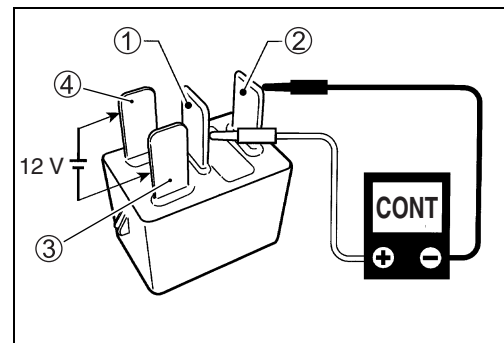


1. Starter motor relay
2. Electric parts holder

2. Check continuity between terminal ① and ② each time 12 V is applied. Connect positive ⊕ side to terminal ④, and negative ⊖ side to terminal ③.

Starter motor relay function:

12 V power	Continuity
Applied	Yes
Not applied	No



CAUTION

Be careful not to touch 12 V power supply wires to each other or with other terminals.

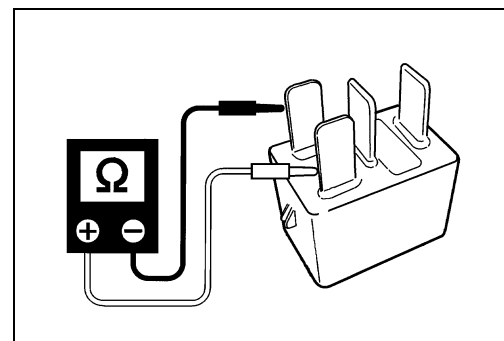
3. Measure resistance between relay terminals ③ and ④.

Ω Tester range: Ω (Resistance)

Starter motor relay solenoid coil resistance:

145 – 190 Ω

If out of specification, replace starter motor relay.



NEUTRAL SWITCH

Check for continuity/infinity of the neutral switch.

TOOL 09930-99320: Digital tester

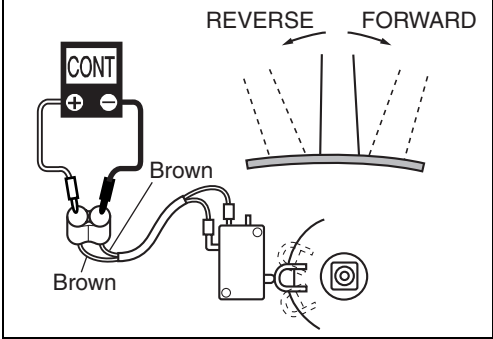
CONT Tester range: (Continuity)

Neutral switch in remo-con box

1. Disconnect neutral switch lead wire connector from ignition switch.
2. Check continuity/infinity between switch brown wire leads while operating remo-con handle.

Shift position	Tester indicates
Neutral	Continuity
Forward	Infinity
Reverse	Infinity

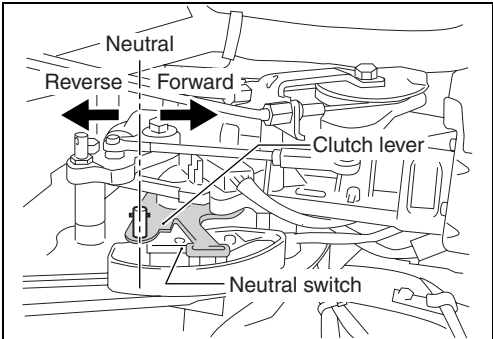
If out of specification, replace neutral switch.



Neutral switch on engine side

1. Disconnect neutral switch lead wire connector.
2. Check continuity/infinity between Yellow/Green and Brown lead wires while operating remo-con handle.

Shift position	Tester indicates
Neutral	Continuity
Forward	Infinity
Reverse	Infinity

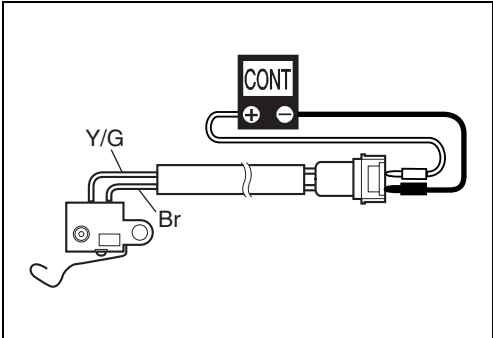


If out of specification:

- 1st Check switch position adjustment, readjust if necessary.
- 2nd Replace neutral switch.


NOTE:

After installing neutral switch, check for correct function by operating remo-con handle.

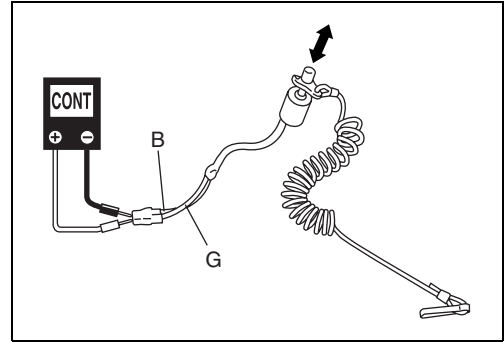


EMERGENCY STOP SWITCH

TOOL 09930-99320: Digital tester

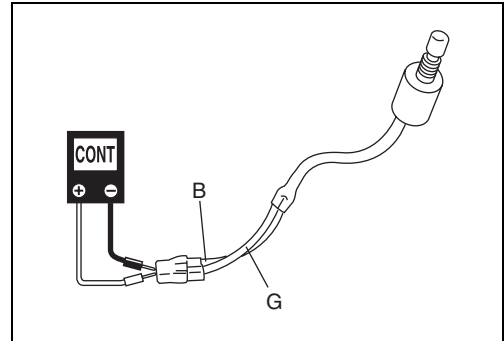
CONT Tester range:  (Continuity)

1. Disconnect the emergency stop switch lead wire.



2. Check continuity/infinity between the wiring leads under the condition shown below.

	Tester probe connection		Tester indicates
	Red (+)	Black (-)	
Lock plate installed	Green	Black	Infinity
Lock plate removed			Continuity



3. If out of specification, replace switch.

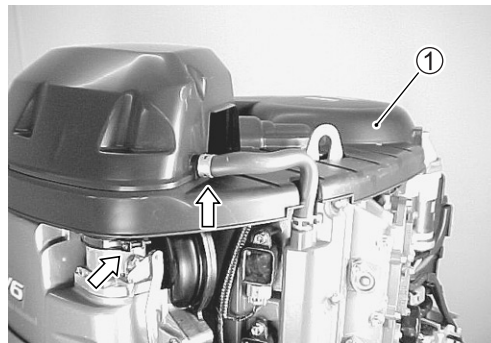
STARTER MOTOR

REMOVAL

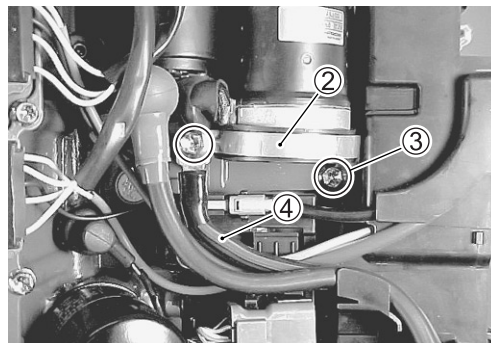
Prior to removing starter motor:

- **Disconnect battery cables from battery.**

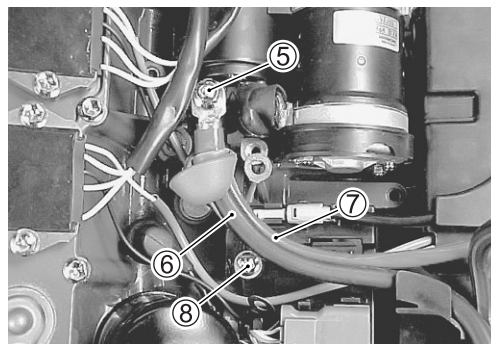
1. Remove bolts and ring gear cover with air intake silencer case ①. (See page 6-2.)



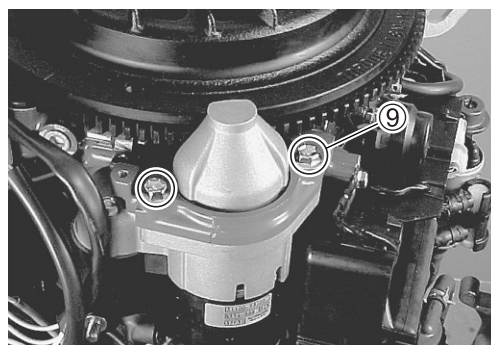
2. Remove the two (2) bolts ③, negative \ominus battery cable ④ and starter motor band ②.



3. Remove nut ⑤ and positive \oplus battery cable ⑥, positive \oplus battery charge cable ⑦ from the magnetic switch of starter motor.

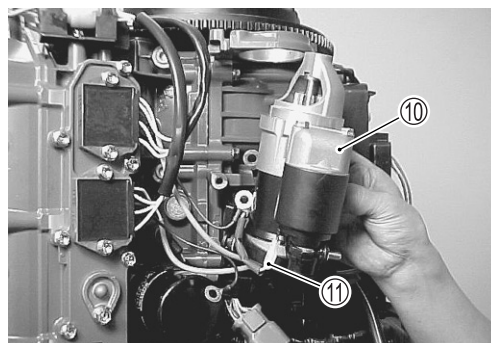


4. Remove the bolt ⑧ securing the remote control cable connector holder.



5. Remove the two bolts ⑨ securing starter motor.


6. Remove the starter motor ⑩, then disconnect the red lead wire ⑪ from "S" terminal of starter magnetic switch.

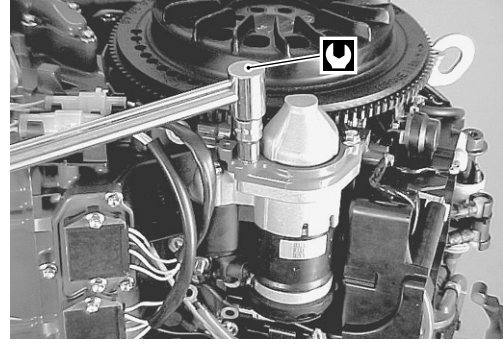


INSTALLATION

Installation is reverse order of removal with special attention to the following steps.

- Install starter motor and tighten starter motor mounting bolts securely.

 **Starter motor mounting bolt:**
23 N·m (2.3 kg·m, 16.5 lb-ft)

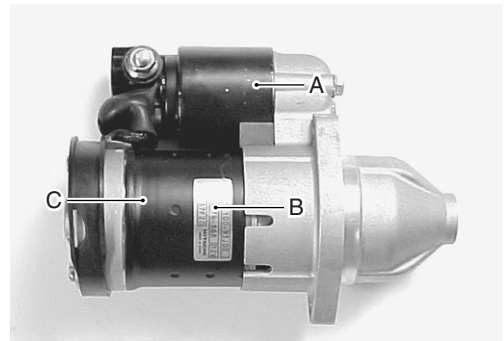
**DISASSEMBLY**

When overhauling starting motor, it is recommended that component parts be cleaned thoroughly.

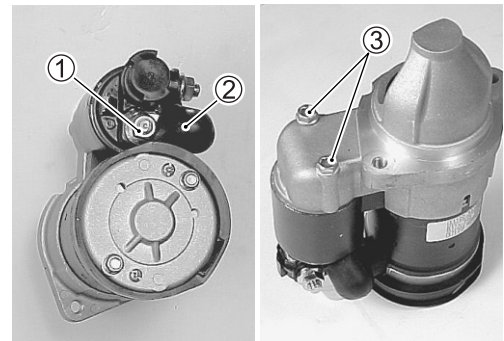
However, the yoke assembly, armature coil, over-running clutch assembly, magnetic switch assembly, and rubber or plastic parts should not be washed in a degreasing tank or with a grease dissolving solvent. These parts should be cleaned with compressed air or wiped with clean cloth.

NOTE:

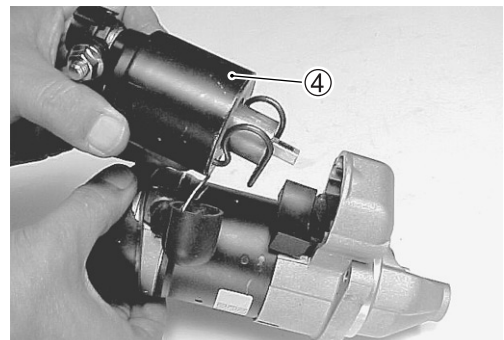
Before disassembling starting motor, be sure to put match marks (A, B and C) as shown in figure at right to avoid any possible component alignment mistakes.



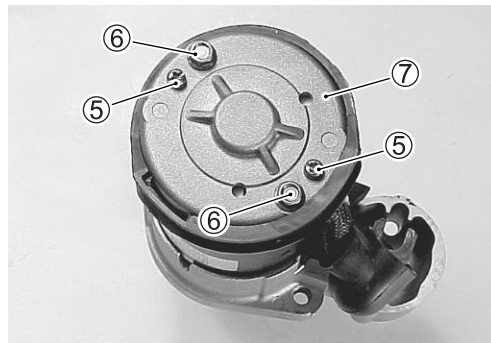
1. Remove nut ① from magnetic switch, then disconnect the connecting wire ②.
2. Remove two bolts ③ securing magnetic switch.



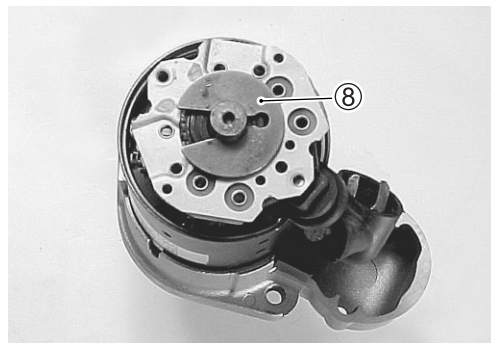
3. Remove the magnetic switch ④.



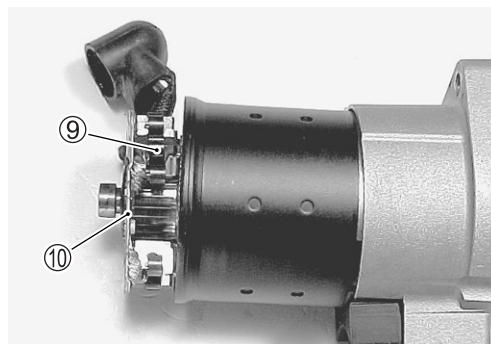
4. Remove screws ⑤, long through bolts ⑥ and rear cover ⑦.



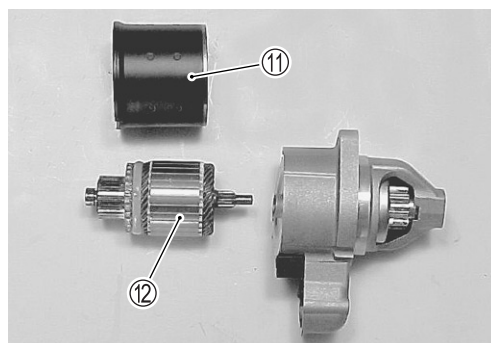
5. Remove thrust washer ⑧ with screwdriver.



6. Pull the brush spring ⑨ up to separate the brush from the surface of the commutator, then remove the brush holder ⑩.

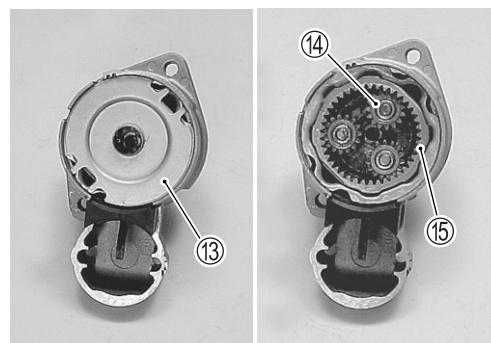


7. Remove the yoke ⑪ and armature ⑫.

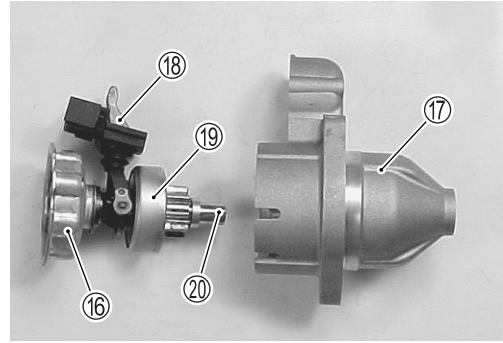


8. Remove the center cover plate ⑬.

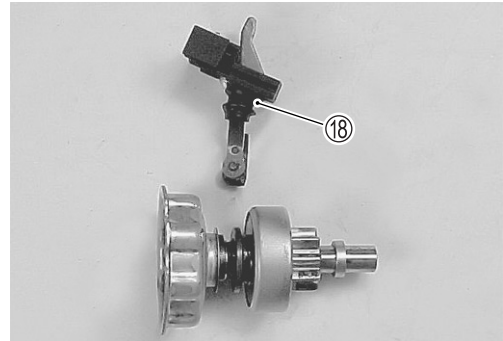
9. Remove the planetary gears ⑭ and internal gear ⑮.



10. Remove the center bracket ⑯ (with shift lever ⑱, pinion ⑲ and pinion shaft ⑳) from front housing ⑰.



11. Remove the shift lever ⑱.



12. Push the pinion stopper ㉑ down, then remove stopper ring ㉒.

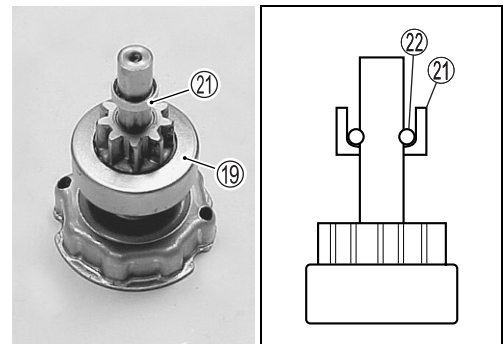
Remove the pinion stopper and pinion ⑲.

⚠ WARNING

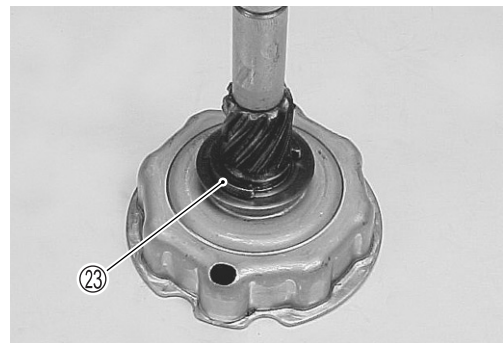
Wear safety glasses when disassembling and assembling stopper ring.

NOTE:

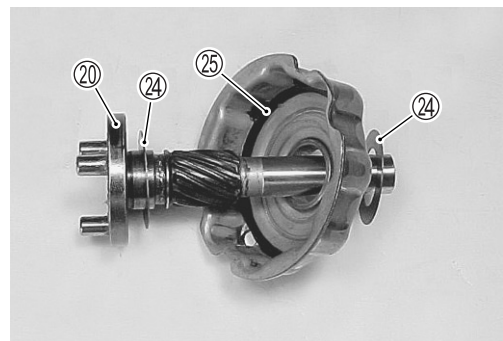
Using a screw-driver, pry off the stopper ring.



13. Remove the E-ring ㉓.




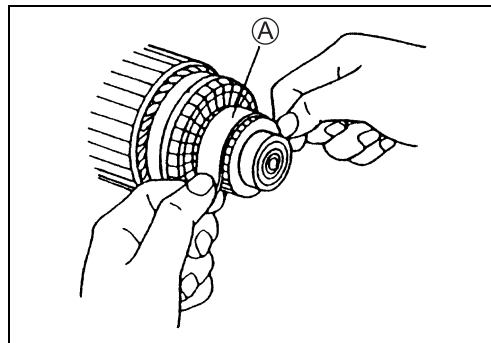
14. Remove the pinion shaft ㉔, washers ㉕ and rubber ring ㉖ from center bracket.




INSPECTION AND SERVICING

Armature and Commutator

- Inspect the commutator surface.
If surface is gummy or dirty, clean with #500 grit emery paper .



- Measure commutator outside diameter.

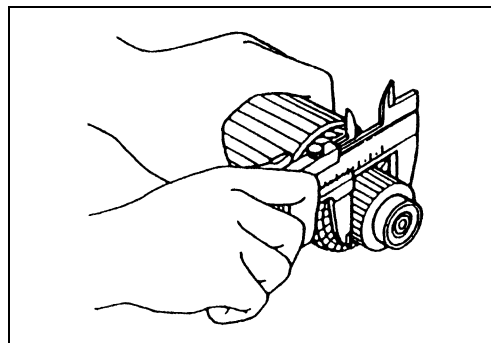
 **09900-20101: Vernier calipers**

Commutator outside diameter:

Standard: 29.0 mm (1.14 in)

Service limit: 28.0 mm (1.10 in)

If measurement exceeds service limit, replace armature.



- Check that mica (insulator) between the segments is undercut to specified depth.

Commutator undercut .

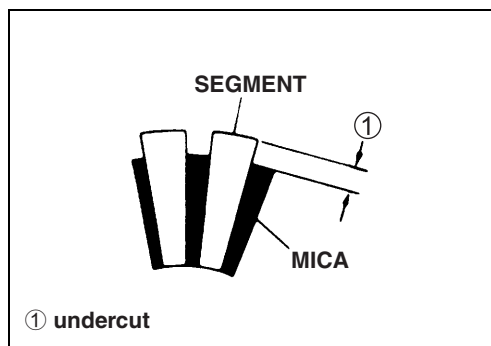
Standard: 0.5 – 0.8 mm (0.02 – 0.03 in)

Service limit: 0.2 mm (0.01 in)

If measurement exceeds service limit, cut to specified depth.

NOTE:

Remove all particles of mica and metal using compressed air.




 undercut

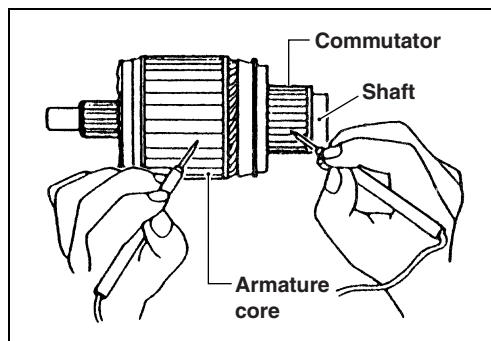
WARNING

Wear safety glasses when using compressed air.

- Check for continuity between the commutator and the armature core/shaft.
Replace armature if continuity is indicated.


 **09930-99320: Digital tester**

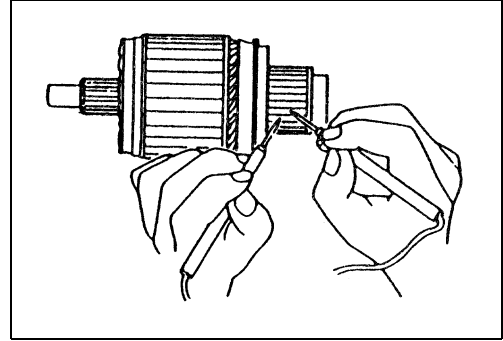
 **Tester range:  (Continuity)**



- Check for continuity between adjacent commutator segments. Replace armature if no continuity is indicated.

TOOL 09930-99320: Digital tester

CONT Tester range:  (Continuity)



BRUSHES

Check the length of each brush.

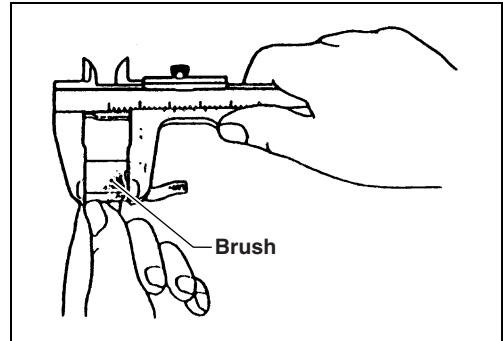
TOOL 09900-20101: Vernier calipers

Brush length:

Standard: 16.0 mm (0.63 in)

Service limit: 12.0 mm (0.47 in)


If brushes are worn down to the service limit, they must be replaced.



BRUSH HOLDER

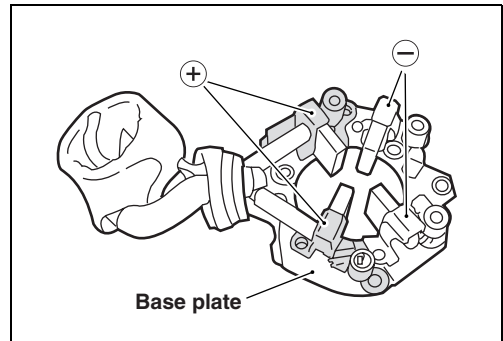
- Check brush holder continuity.

TOOL 09930-99320: Digital tester

CONT Tester range:  (Continuity)

Brush holder continuity:

Tester probe connection	Continuity
Brush holder positive ⊕ to Brush holder negative ⊖	No
Brush holder positive ⊕ to Base plate (ground)	No



Replace brush holder if the tester doesn't show the above.

BRUSH SPRING

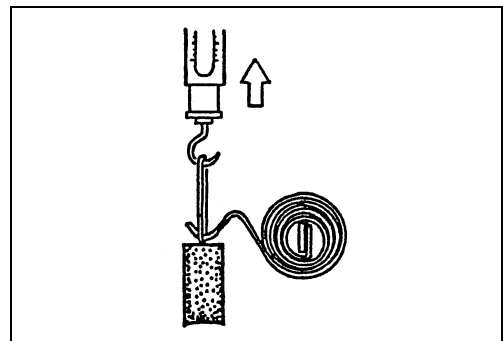
Inspect brush spring for wear, damage or other abnormal conditions.

Check the brush spring tension.

Replace if necessary.

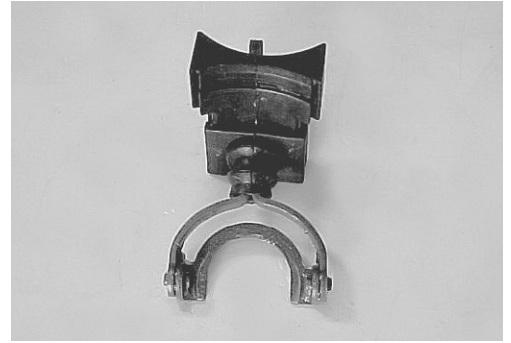
Brush spring tension

Standard: 15 – 18 N (1.5 – 1.8 kg, 3.3 – 4.0 lb)

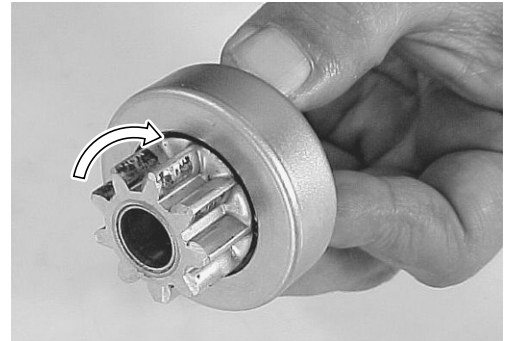


SHIFT LEVER

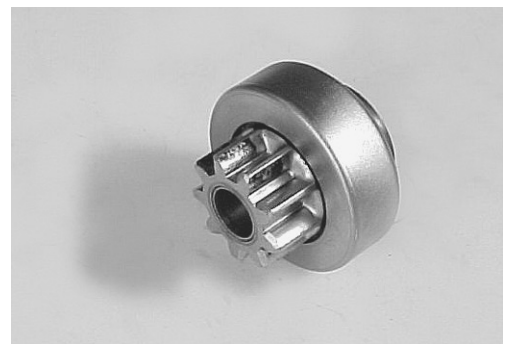
Inspect shift lever for wear.
Replace if necessary.

**PINION AND OVER-RUNNING CLUTCH**

- Inspect pinion for wear, damage or other abnormal conditions. Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction. Replace if necessary.



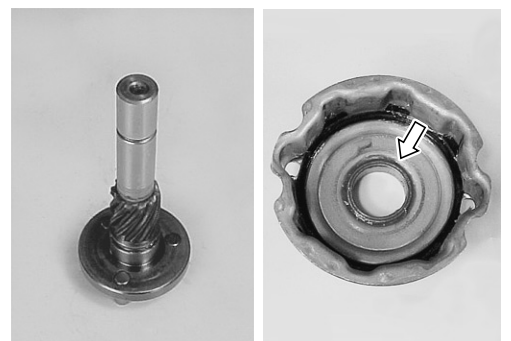
- Inspect spline teeth for wear or other damage. Inspect pinion for smooth movement. Replace if necessary.

**GEAR**

- Inspect planetary gears and internal gear for wear, damage or other abnormal conditions. Replace if necessary.

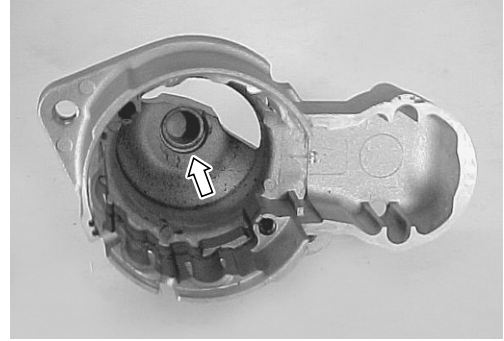
**PINION SHAFT/PINION SHAFT BUSH**

- Inspect pinion shaft for wear, damage or other abnormal conditions. Replace if necessary.
- Inspect pinion shaft bush for wear or other damage. Replace if necessary.



FRONT HOUSING

- Inspect front housing for wear, damage or other abnormal conditions. Replace if necessary.
- Inspect bush for wear or other damage. Replace if necessary.



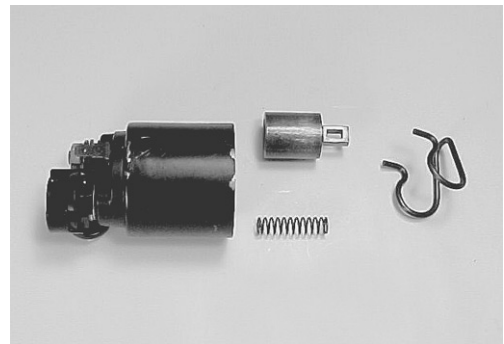
ARMATURE SHAFT BUSH

Inspect bush for wear or other damage.
Replace if necessary.



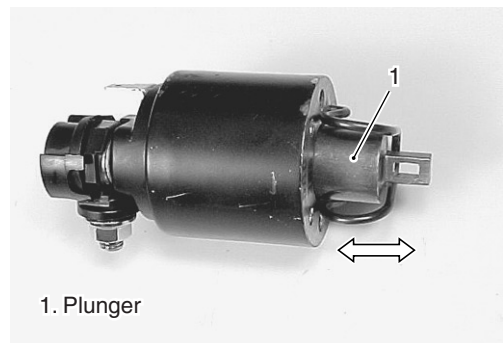
PLUNGER

Inspect plunger for wear or other damage.
Replace if necessary.



MAGNETIC SWITCH

Push in plunger and release. The plunger should return quickly to its original position.
Replace if necessary.



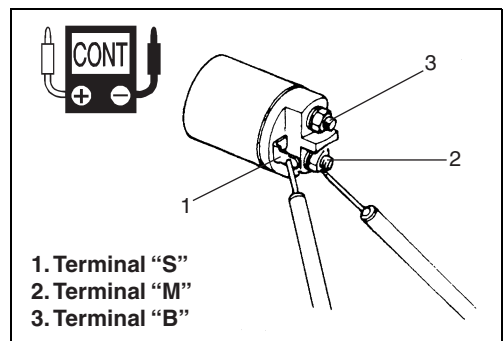
Pull-in coil Open circuit Test

TOOL 09930-99320: Digital tester


CONT Tester range: (Continuity)

Check for continuity across magnetic switch “S” terminal and “M” terminal.

If no continuity exists, the coil is open and should be replaced.



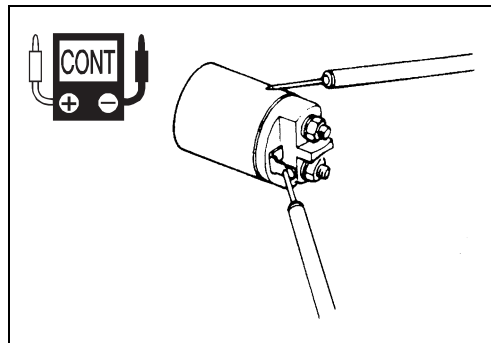
Hold-in coil Open circuit Test


 **09930-99320: Digital tester**


 **Tester range: \rightarrow (Continuity)**

Check for continuity across magnetic switch “S” terminal and coil case.

If no continuity exists, the coil is open and should be replaced.

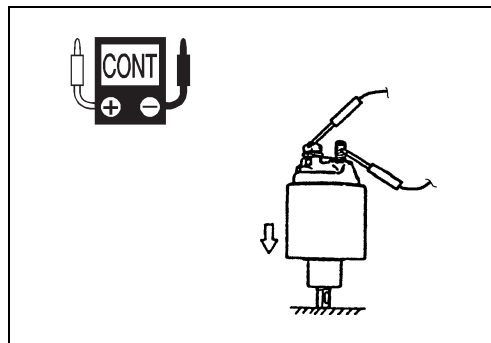
**Contact points Test**

 **09930-99320: Digital tester**

 **Tester range: \rightarrow (Continuity)**

Put the plunger on the under side and then push the magnetic switch down. At this time, check for continuity between terminal “B” and terminal “M”.

Continuity indicates proper condition. If no continuity exists, replace the magnetic switch and/or plunger.



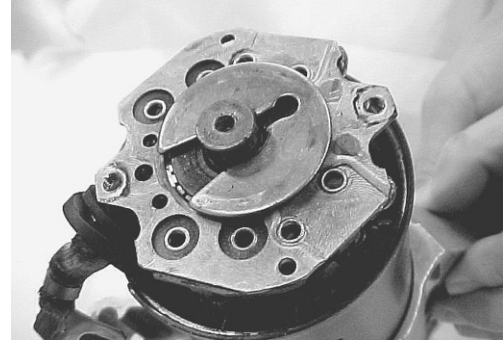
ASSEMBLY

Assembly is reverse order of disassembly with special attention to the following steps.

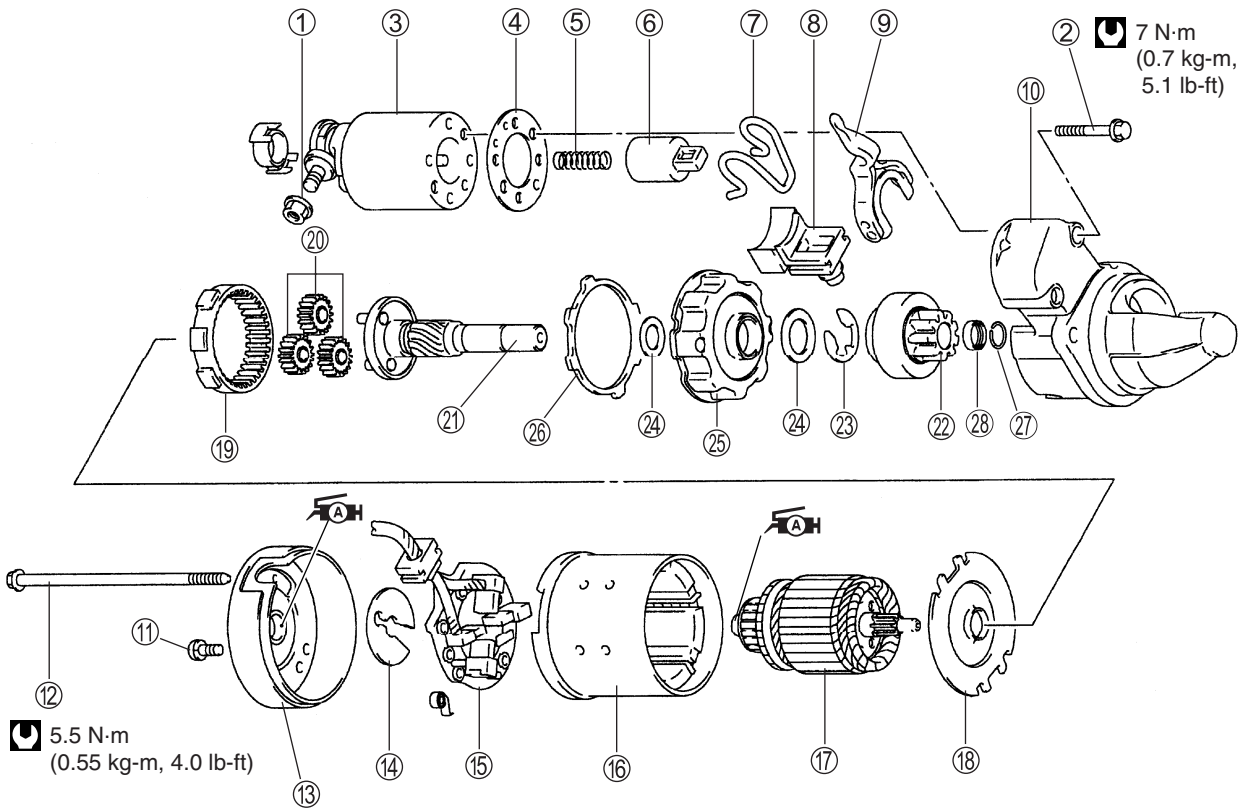
CAUTION

When installing armature, use care to avoid breaking brushes.

When installing pinion shift lever, refer to figure in construction diagram for installation direction.



Construction diagram



- | | | |
|-------------------|----------------------|------------------|
| ① Nut | ⑪ Screw | ⑳ Pinion shaft |
| ② Bolt | ⑫ Through bolt | ㉑ Pinion |
| ③ Magnetic switch | ⑬ Rear cover | ㉒ E-ring |
| ④ Gasket | ⑭ Thrust washer | ㉓ Washer |
| ⑤ Spring | ⑮ Brush holder | ㉔ Center bracket |
| ⑥ Plunger | ⑯ Yoke | ㉕ Rubber ring |
| ⑦ Torsion spring | ⑰ Armature | ㉖ Stopper ring |
| ⑧ Rubber packing | ⑱ Center cover plate | ㉗ Pinion stopper |
| ⑨ Shift lever | ㉘ Internal gear | |
| ⑩ Front housing | ㉙ Planetary gear | |

PERFORMANCE TEST**CAUTION**

Each test must be performed within 3 – 5 seconds to avoid coil damage from overheating.

⚠ WARNING

When performing the following test, be sure to connect the battery and the starting motor with a lead wire of the same size as original equipment used there.

PULL-IN/HOLD-IN TEST

Connect battery to magnetic switch as shown in figure.

- Check that plunger and pinion (over-running clutch) move outward.

If plunger and pinion don't move, replace magnetic switch.

NOTE:

Before testing, disconnect brush lead from terminal "M".

- While connected as above with plunger out, disconnect negative lead from terminal "M".

Check that plunger and pinion remain out.

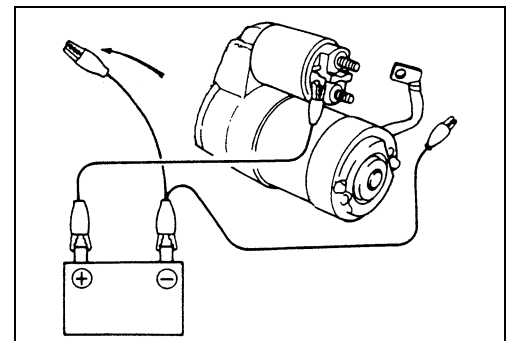
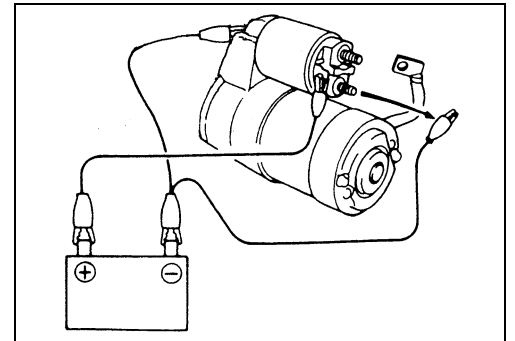
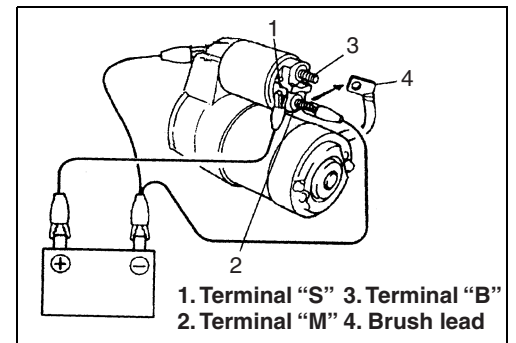
If plunger and pinion return inward, replace magnetic switch.

PLUNGER AND PINION RETURN TEST

Disconnect negative lead from switch/motor body.

Check that plunger and pinion return inward.

If plunger and pinion don't return inward, replace magnetic switch.



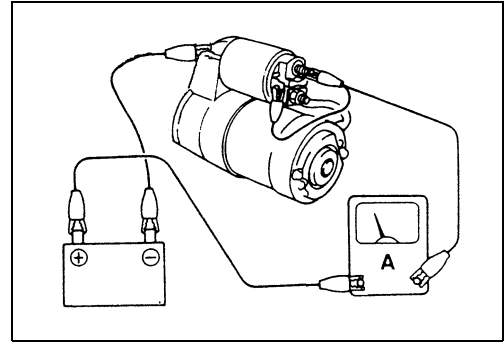
NO-LOAD PERFORMANCE TEST

CAUTION

Before performing following test, secure the starter motor to the test bench.

1. Connect battery and ammeter to starter motor as shown.
2. Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter indicates specified current.

No load current: Within 90 A at 11 V



MONITOR-TACHOMETER

INSPECTION

MONITOR LAMP CHECK

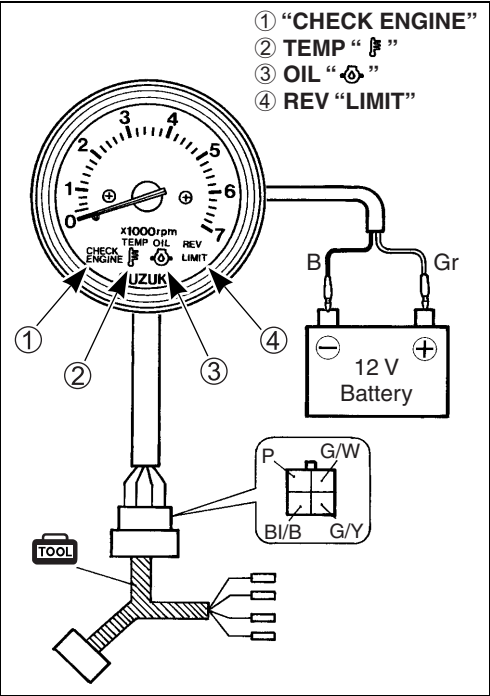
1. Connect test cord as shown in figure.

TOOL 09930-89240: 4-pin test cord

NOTE:

This check can be performed without test cord (P/no. 09930-89240). If it is not available, directly connect battery to terminal of meter.

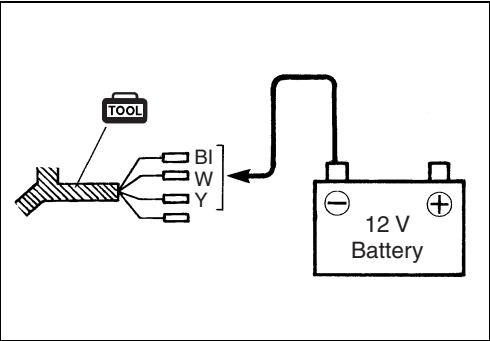
2. Apply 12 V power to meter. Connect Gray wire to positive ⊕ terminal, and Black wire to negative ⊖ terminal of battery.



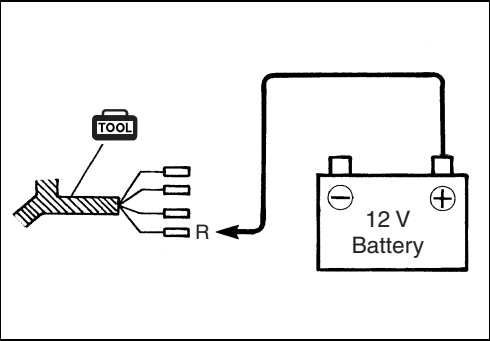
3. Check if lamp lights when connecting battery to test cord terminal as shown.

Monitor lamp check:

Battery terminal	Terminal for battery connection		Lighting lamp
	Test cord	Meter	
Negative ⊖	BI	G/W	Lamp ①
Negative ⊖	W	G/Y	Lamp ②
Negative ⊖	Y	BI/B	Lamp ③
Positive ⊕	R	P	Lamp ④



If out of specification, replace monitor-tachometer.

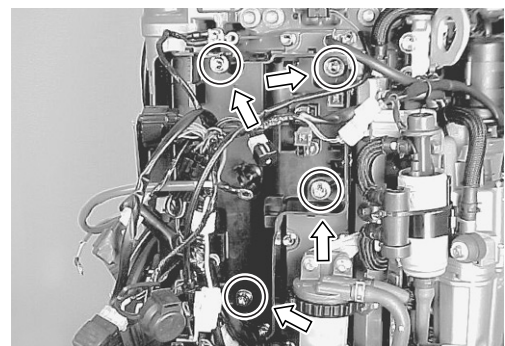
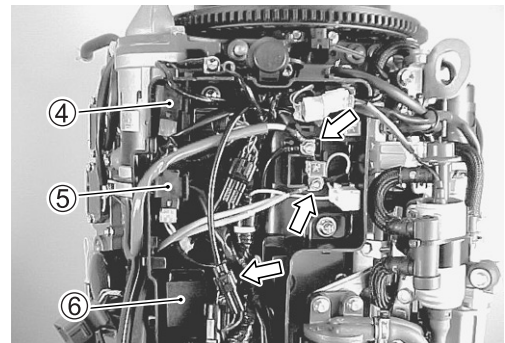
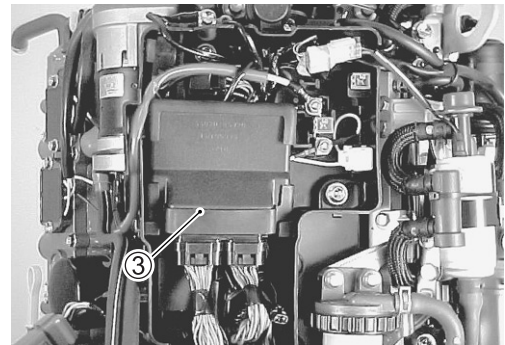
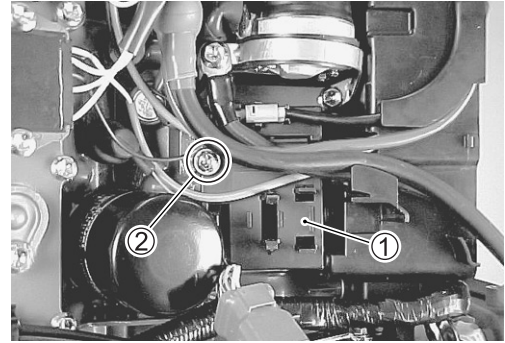


ELECTRIC PARTS HOLDER REMOVAL

Before removing electric parts holder:

- Disconnect battery cables from battery.

- Remove bolt ②, then remove remo-con cable holder ① by sliding it upward.
- Remove electric parts holder cover.
- Disconnect lead wire connectors from ECM ③, then remove ECM.
- Disconnect following lead wires in electric parts holder.
 - Two (2) White Rectifier & Regulator lead wires and White 30 A fuse lead on 60 A main fuse lower terminal.
 - Red battery charge lead and Red lead of PTT relay unit on 60 A main fuse upper terminal.
 - Harness connector at CKP sensor.
- Remove starter motor relay ④, ECM main relay ⑤, PTT relay unit ⑥, 30 A fuse case from electric parts holder.
- Remove four (4) bolts securing electric parts holder, then remove electric parts holder.



INSTALLATION

Installation is reverse order of removal.

Final check:

- All parts removed have been returned to their original position.
- Check wire routing. (See page x-xx to x-xx.)

FUEL SYSTEM

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PRECAUTIONS WHEN SERVICING FUEL SYSTEM

GENERAL PRECAUTION

⚠ WARNING

Gasoline is extremely flammable and toxic. Always observe the following precautions when working around gasoline or servicing the fuel system.

- Disconnect battery cables except when battery power is required for servicing/inspection.
- Keep the working area well ventilated and away from open flame (such as gas heater) or sparks.
- Do not smoke or allow anyone else to smoke near the working areas.

Post a “NO SMOKING” sign.

- Keep a fully charged CO2 fire extinguisher and readily available for use.
- Always use appropriate safety equipment and wear safety glasses when working around pressurized fuel system.
- To avoid potential fire hazards, do not allow fuel to spill on hot engine parts or on operating electrical components.
- Wipe up fuel spills immediately.

⚠ WARNING

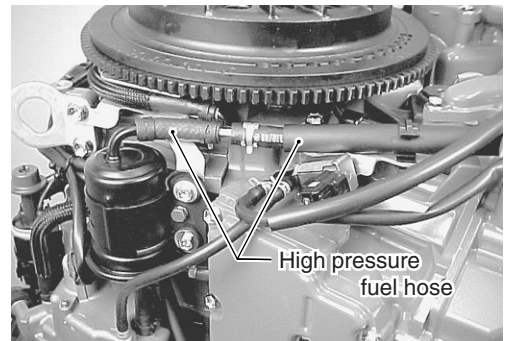
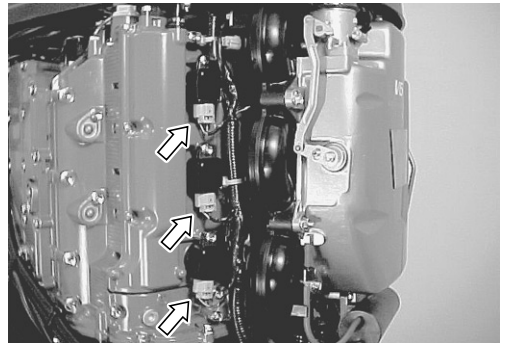
Fuel components and fuel hoses after the high pressure fuel pump remain pressurized at all times.

To protect against fuel spray, relieve fuel line pressure before disconnecting or removing components.

FUEL PRESSURE RELIEF PROCEDURE

After making sure that engine is cold, relieve fuel pressure as follows.

1. Turn OFF ignition switch.
2. Disconnect high pressure fuel pump lead wire connector at high pressure fuel pump.
3. Disconnect the ignition coil primary lead wire connector from all ignition coils.
4. Crank the engine 5 – 10 times (3 seconds each time) to dissipate fuel pressure in lines.
5. Make sure fuel pressure has been removed by pinching high pressure fuel hose between finger tips (line should feel soft without pressure).
6. Upon completion of servicing, connect ignition coil primary lead wire and high pressure fuel pump lead wire.



FUEL LINE REMOVAL/INSTALLATION

Pay special attention to the following steps when removing or installing fuel hoses.

⚠ WARNING

Fuel components and fuel hoses after the high pressure fuel pump remain pressurized at all times. To protect against fuel spray, relieve fuel line pressure before disconnecting or removing components.

CAUTION

- Do not over bend (kink) or twist hoses when installing.
- When installing hose clamps, position tabs to avoid contact with other parts.
- Be sure hoses do not contact rods, levers or other components with engine either operating or at rest.
- Extreme care should be taken not to cut, abrade or cause any other damage to hoses.
- Use care not to excessively compress hoses when tightening clamps.

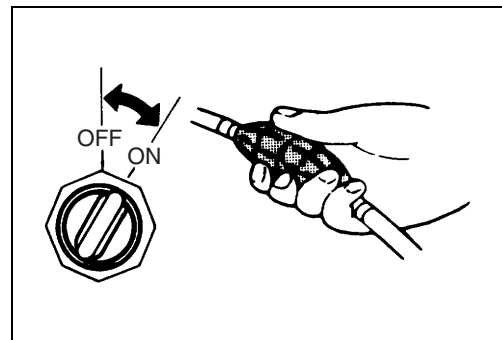
NOTE:

- Check fuel hose routing. (See page xx-xx and xx-xx.)
- Check for fuel leakage.

FUEL LEAKAGE CHECK PROCEDURE

After performing any fuel system service, always be sure there is no fuel leakage by checking as follows.

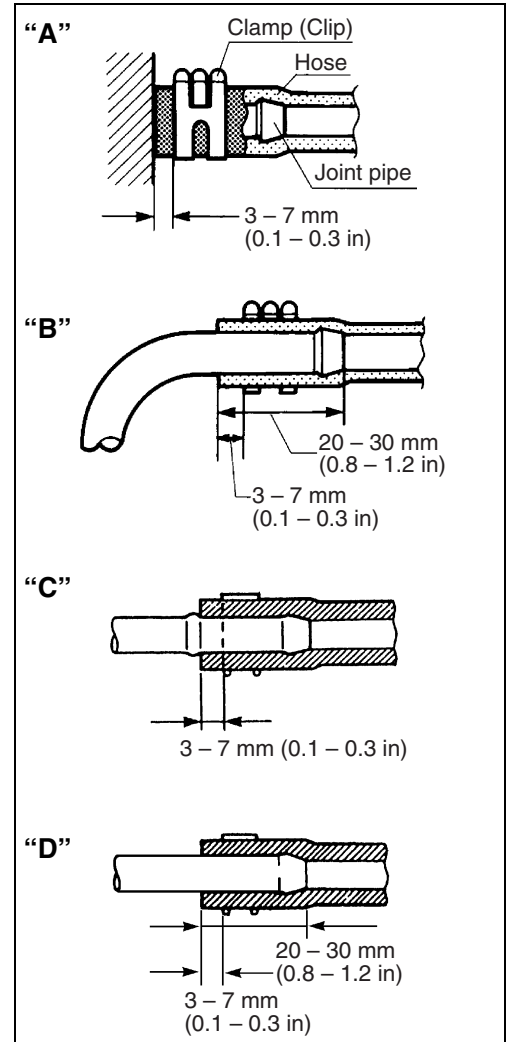
1. Squeeze fuel primer bulb until you feel resistance.
2. Ensure emergency stop switch lock plate is in place.
3. Turn ignition switch "ON" for 6 seconds (to operate fuel pump), then turn it "OFF".
Repeat this (ON and OFF) procedure 3 or 4 times to pressurize the fuel system.
4. Once pressurized, check all connections and components for any signs of leakage.



FUEL HOSE CONNECTION


Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly by referring to the figure.

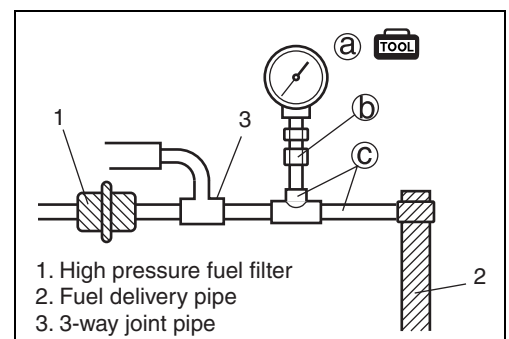
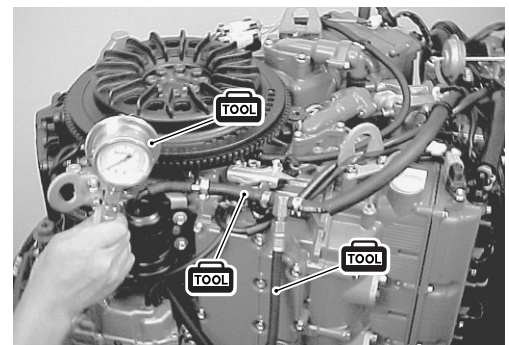
- For type “A” (short barbed end) pipe, hose must completely cover pipe.
- For type “B” (bent end) pipe, hose must cover straight part of pipe by 20 – 30 mm (0.8 – 1.2 in).
- For type “C” pipe, hose must fit up against flanged part of pipe.
- For type “D” pipe, hose must cover pipe by 20 – 30 mm (0.8 – 1.2 in).



FUEL PRESSURE INSPECTION

1. Relieve fuel pressure in fuel feed line. (See page 5-3.)
2. Remove the ring gear cover and air intake silencer case. (See page 6-xx.)
3. Disconnect high pressure fuel feed hose from 3-way joint pipe.
4. Connect special tools (pressure gauge, pressure hose & pressure joint) between fuel feed hose and 3-way joint pipe as shown in figure.
Clamp hose securely to ensure no leaks occur during checking.

-  **09912-58442: Pressure gauge – ①**
- 09912-58432: Fuel pressure hose – ②**
- 09912-58490: Fuel pressure joint – ③**



CAUTION

A small amount of fuel may be released when the fuel feed hose is disconnected.

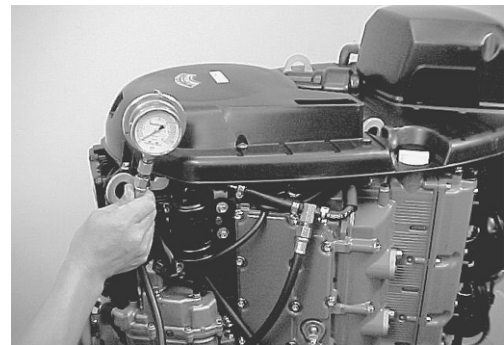
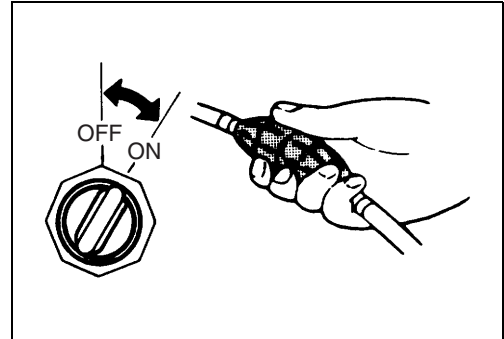
Place container under the fuel feed hose or 3-way joint pipe with a shop cloth so that released fuel is caught in container or absorbed in cloth. Place fuel soaked cloth in an approved container.

5. Ensure emergency stop switch lock plate is in place.
6. Squeeze fuel primer bulb until you feel resistance.
7. Turn ignition switch "ON" for 6 seconds (to operate fuel pump), then turn it "OFF".
8. Repeat this ("ON" and "OFF") procedure 3 or 4 times to pressurize the fuel system and then check fuel pressure.
9. Check for any signs of fuel leakage, then reinstall the ring gear cover and air intake silencer case.
10. Measure fuel pressure in line at cranking or idle speed operation.

**Fuel pressure: Approx. 255 kPa
(2.55 kg/cm², 36.3 psi)**

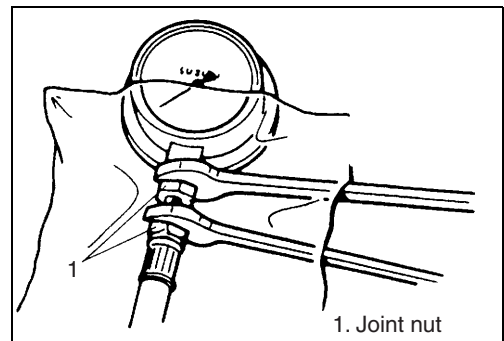
11. Stop engine and wait 5 minutes.
Check residual fuel pressure in line.

**Residual fuel pressure: 200 kPa (2.0 kg/cm², 28.4 psi)
or more**

**CAUTION**

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

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



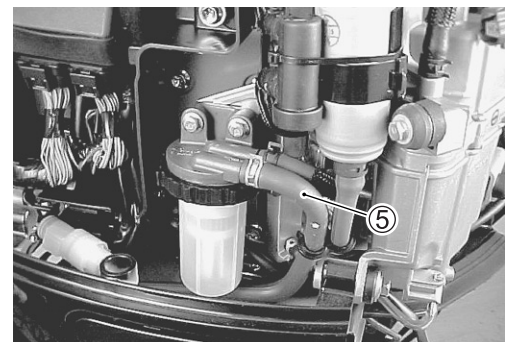
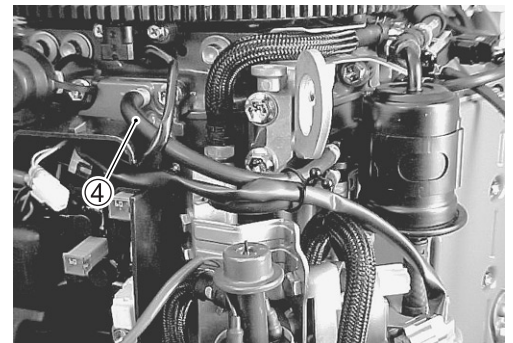
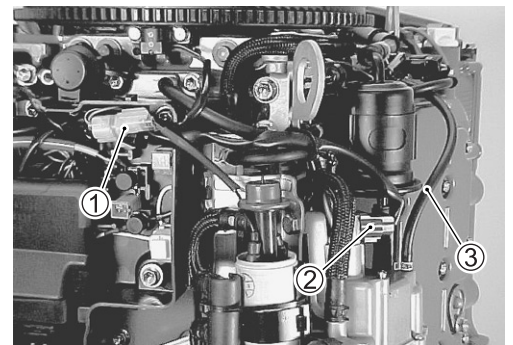
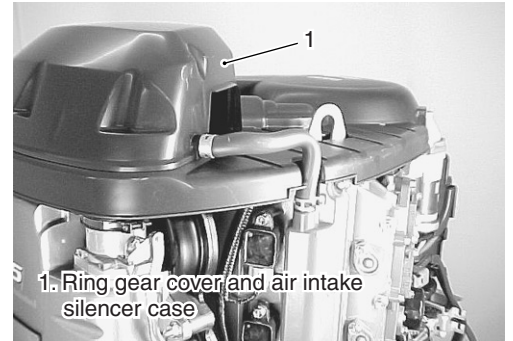
12. After checking fuel pressure, remove fuel pressure gauge.
13. Reconnect fuel line.
14. With engine not running and ignition switch "ON", check fuel system for leaks .
15. Reinstall the ring gear cover and air intake silencer case.

LOW PRESSURE FUEL PUMP/FUEL VAPOR SEPARATOR SET REMOVAL

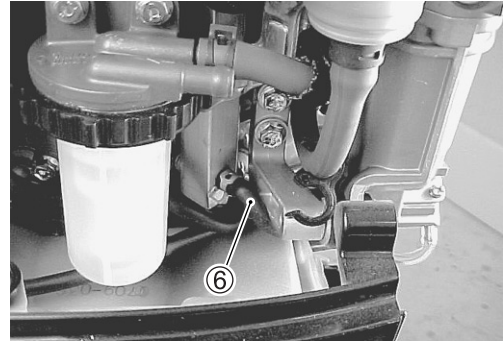
⚠ WARNING

Fuel components and fuel hoses after the high pressure fuel pump remain pressurized at all times. To protect against fuel spray, relieve fuel line pressure before disconnecting or removing components.

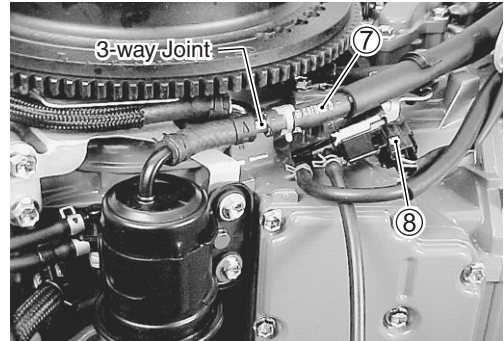
1. Relieve fuel pressure in fuel feed line. (See page 5-3.)
2. Remove the ring gear cover and air intake silencer case. (See page 6-2.)
3. Disconnect low pressure fuel pump lead wire connector ①. Disconnect high pressure fuel pump lead wire connector ② at fuel pump.
4. Disconnect purge valve hose ③ from fuel vapor separator.
5. Disconnect water outlet hose ④ from crankcase water jacket cover.
6. Disconnect fuel inlet hose ⑤ from low pressure fuel filter.



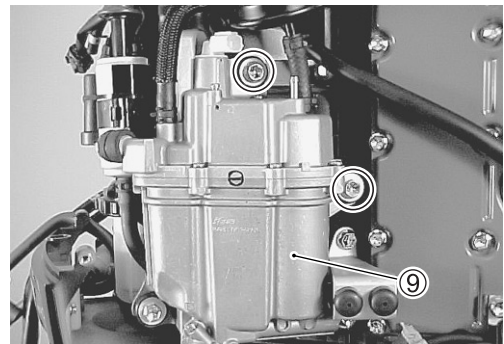
7. Disconnect water inlet hose ⑥ from fuel cooler.



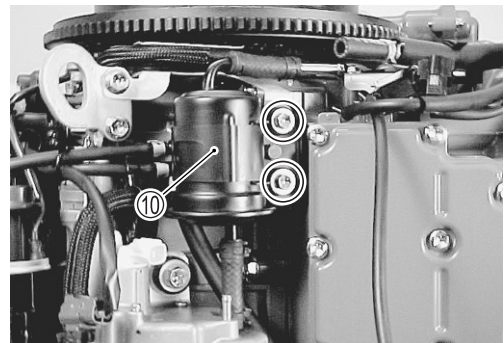
8. Disconnect high pressure fuel feed hose ⑦ from 3-way joint pipe.
Disconnect purge valve lead wire connector ⑧ at purge valve.



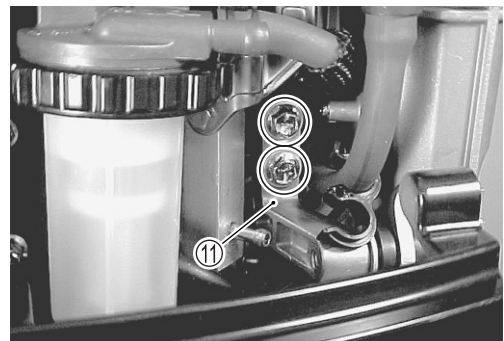
9. Remove the two (2) bolts securing fuel vapor separator ⑨ to crankcase.



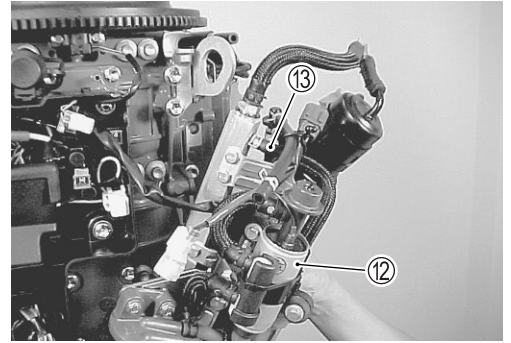
10. Remove the two (2) bolts securing high pressure fuel filter ⑩ to crankcase.



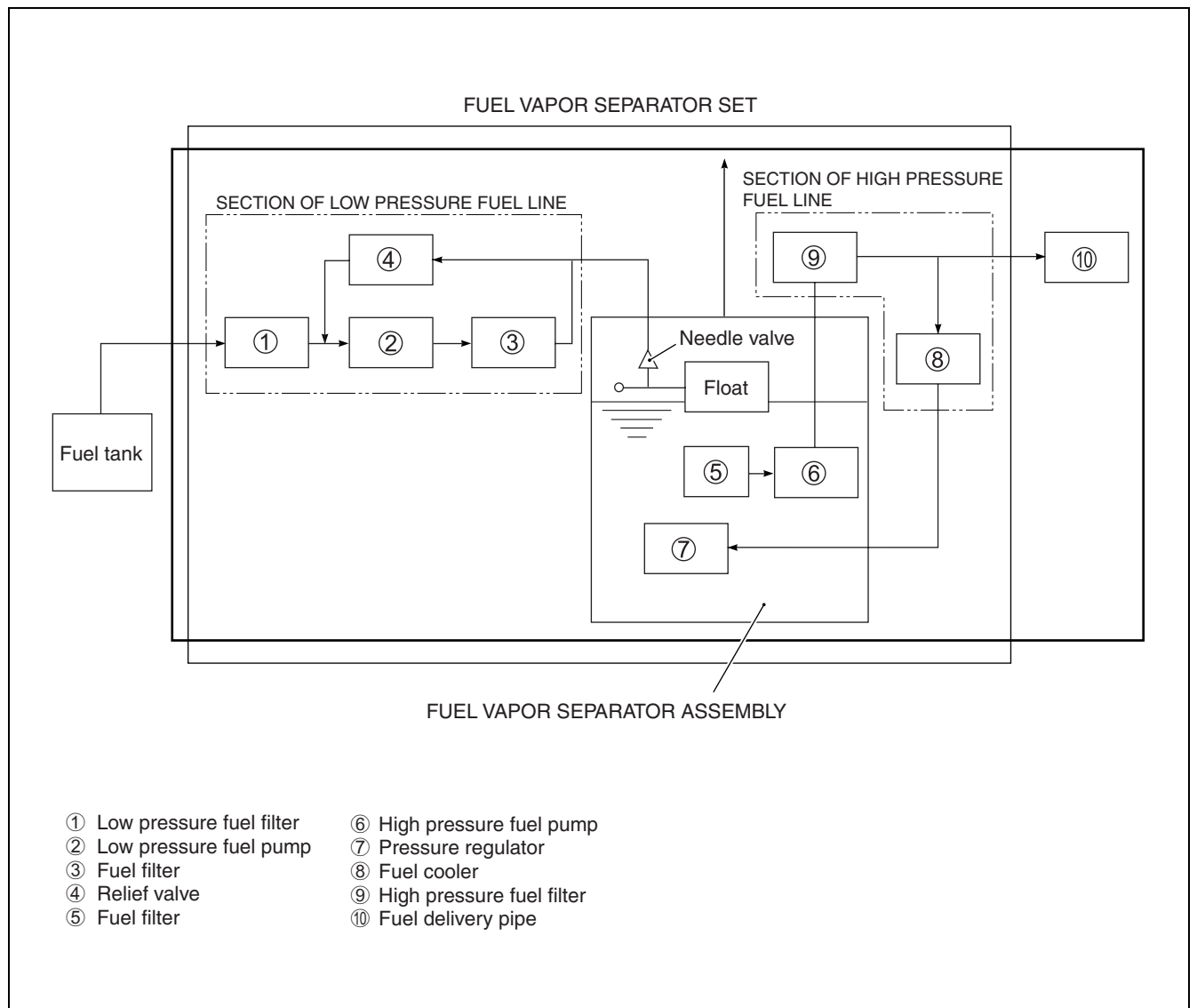
11. Remove the two (2) bolts securing fuel vapor separator bracket ⑪.



12. Remove the low pressure fuel pump/fuel vapor separator set ⑫, then disconnect cooling water outlet hose ⑬ from fuel cooler.



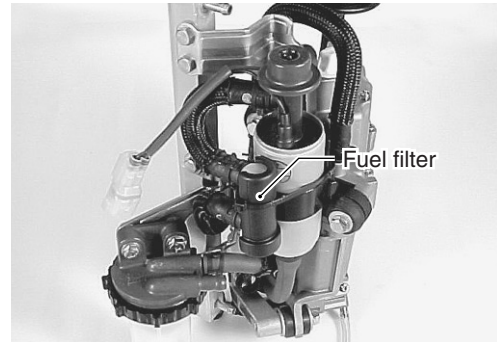
FUEL SYSTEM DIAGRAM



INSPECTION

FUEL FILTER

- Remove the fuel filter.
- Inspect filter for clog or other damage.
Replace or clean if necessary.
- Reinstall fuel filter, then secure the hose with hose clamp (clip).



RELIEF VALVE

Check the relief valve operation.

- TOOL** 09952-99310 : Hand air pump
 09940-44121 : Air pressure gauge
 09940-44130 : Attachment

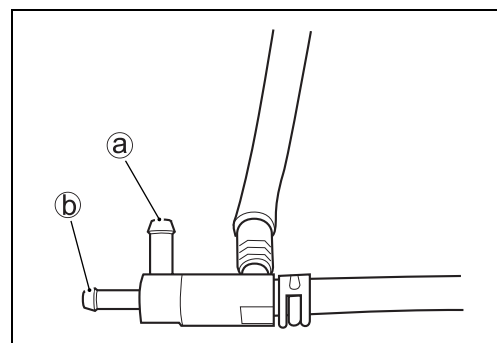
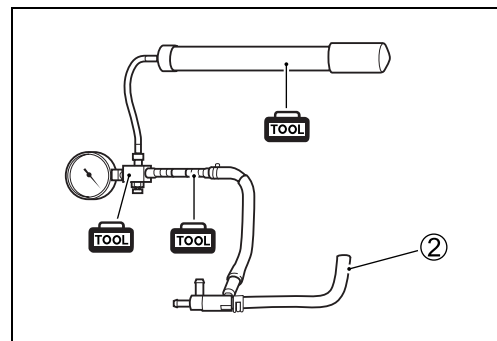
1. Remove the relief valve ①.
2. Connect special tool to inlet side of relief valve as shown in figure.
3. Plug the outlet hose ②.
4. Pump air into the relief valve using hand air pump until air is released through fitting a·b.
5. Read pressure on gauge when air is released.

Relief valve operating pressure:

70 – 80 kPa (0.7 – 0.8 kg/cm², 10 – 11.4 psi)

If out of specification, replace relief valve.

6. Reinstall relief valve, then secure the hose with hose clamp (clip).



INSTALLATION

Installation is reverse order of removal with special attention to the following steps.

Final Check

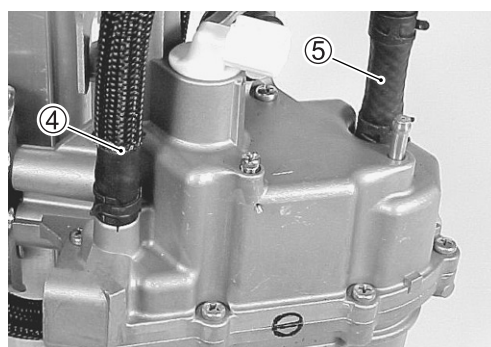
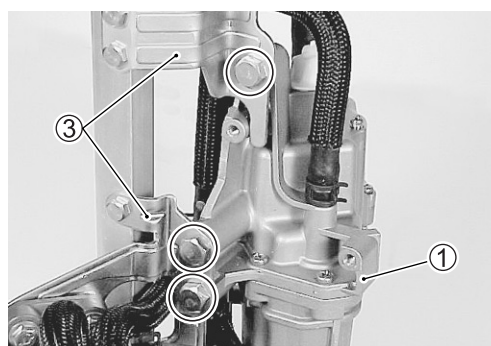
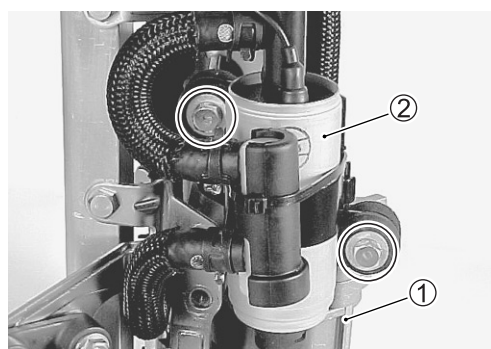
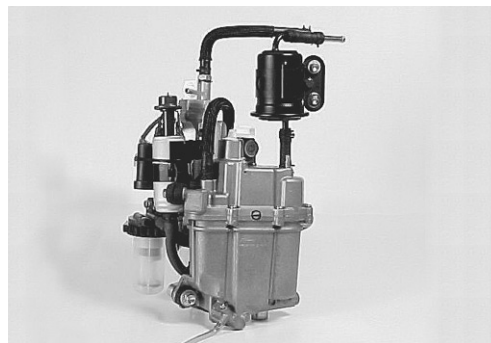
- Check to ensure that all removed parts are back in place.
- Check fuel and water hose routing. (See page x-xx.)
- Check wire routing. (See page x-xx to x-xx.)
- Check for fuel leakage. (See page 5-4.)
- Check for water leakage.

FUEL VAPOR SEPARATOR/HIGH PRESSURE FUEL PUMP REMOVAL AND DISASSEMBLY

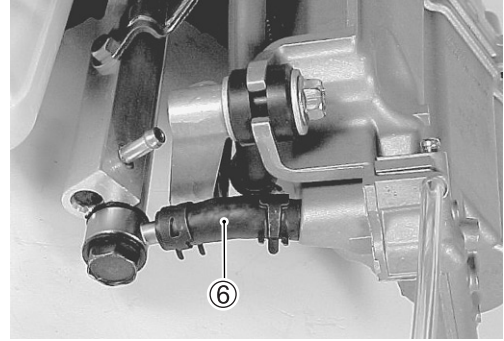
⚠ WARNING

Fuel components and fuel hoses after the high pressure fuel pump remain pressurized at all times. To protect against fuel spray, relieve fuel line pressure before disconnecting or removing components

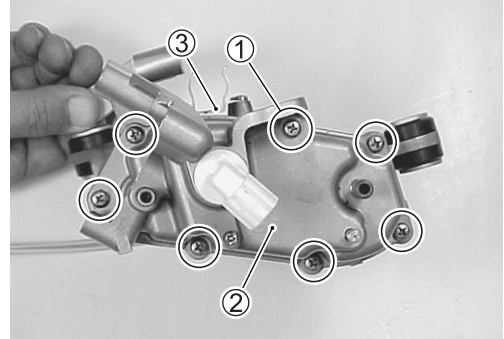
1. Remove the low pressure fuel pump/fuel vapor separator set. (See page 5-7.)
2. Remove the two (2) bolts securing low pressure fuel pump ② to fuel vapor separator ①.
3. Remove the three (3) bolts securing fuel cooler bracket ③ to fuel vapor separator ①.
4. Disconnect fuel inlet hose ④ and fuel outlet hose ⑤ from fuel vapor separator.



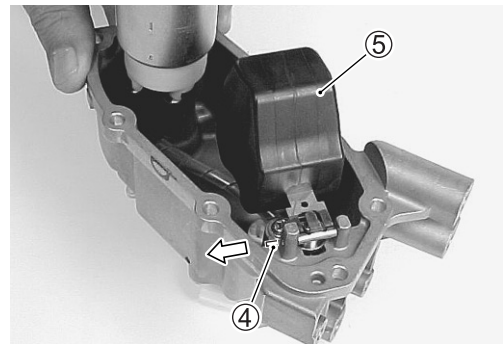
5. Disconnect fuel return hose ⑥ from fuel vapor separator.



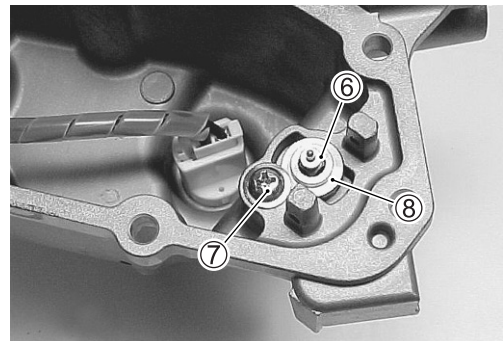
6. Remove seven (7) screws ①.
Remove separator cover ② with high pressure fuel pump from separator case ③.



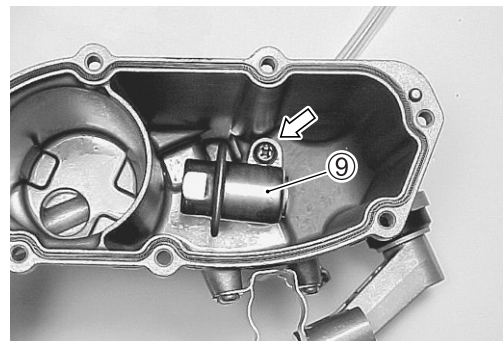
7. Remove float pin ④ and float ⑤.



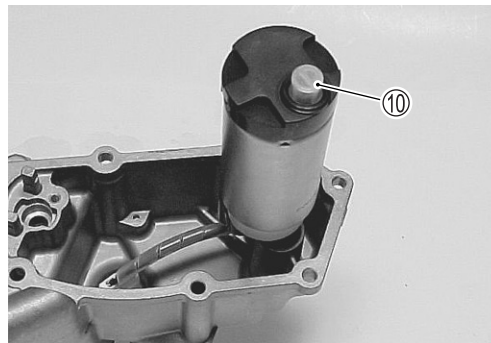
8. Remove needle valve ⑥, screw ⑦ and valve seat ⑧.



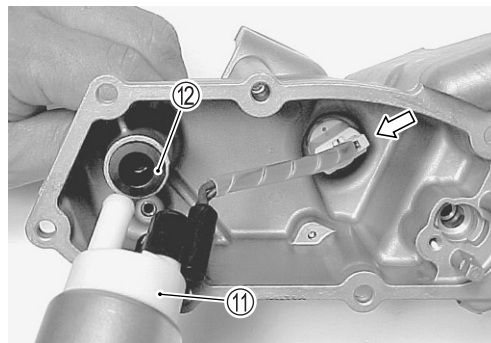
9. Remove screw and fuel pressure regulator ⑨ from separator case.



10. Remove suction filter ⑩.



11. Remove high pressure fuel pump ⑪ and grommet ⑫ from separator cover and then disconnect pump lead wire connector.



INSPECTION

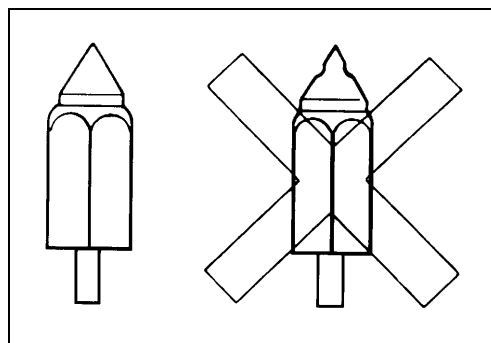
NOTE:

If cracks, excessive wear or other damage is found on any component, replace component.

Needle valve/Valve seat

Inspect needle valve and valve seat for groove, other damage or dirt.

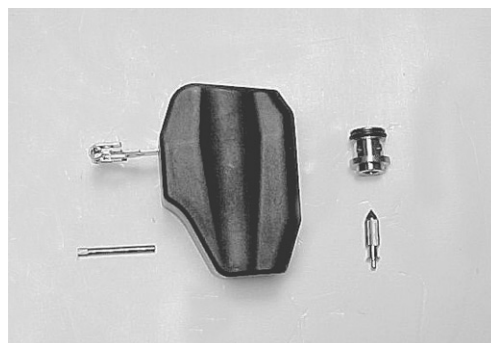
Replace or clean if necessary.



Float

Inspect float for crack or other damage.

Replace if necessary.



Filter

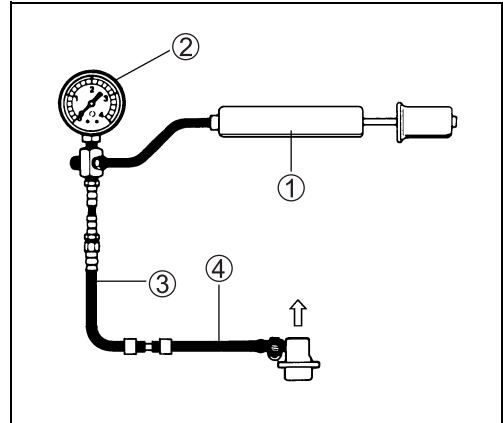
Inspect pump suction filter for clog or other damage.
Replace or clean if necessary.

**Fuel pressure regulator**

Check fuel pressure regulator operation.

- TOOL** 09952-99310 : Hand air pump ①
09940-44121 : Air pressure gauge ②
09940-44130 : Attachment ③
09912-58490 : Hose ④

1. Connect special tools to inlet side of regulator as shown in figure.
2. Pump air into regulator using pump ① until air is released through outlet side.
3. Read pressure on gauge when air is released.

**Regulator operating pressure:**

240 – 270 kPa (2.4 – 2.7 kg/cm², 34.1 – 38.4 psi)

If out of specification, replace regulator.

ASSEMBLY

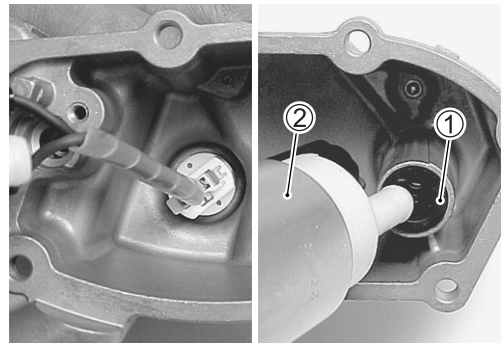
Assembly is reverse order of disassembly with special attention to the following steps.

High pressure fuel pump

Connect pump lead wire connector, then install grommet ① and fuel pump ②.

NOTE:

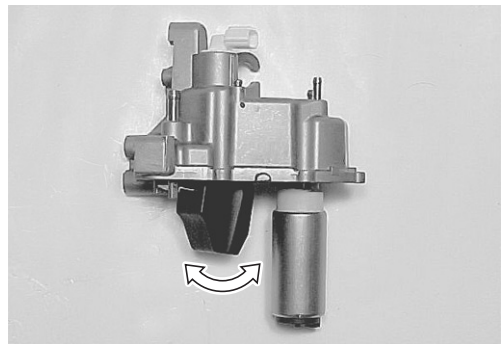
Apply fuel to grommet before installing.

**Float/Float pin**

Install float and float pin.


NOTE:

After assembling, check for smooth and free float movement.



Checking float height

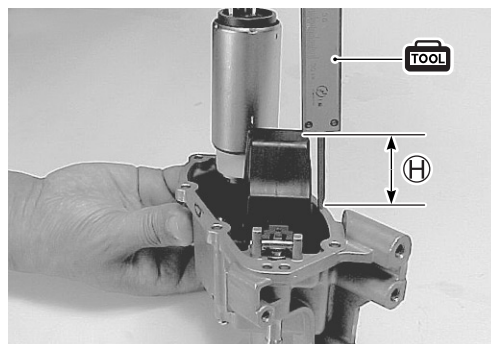
Measure float height.

 **09900-20101: Vernier calipers**

Float height \ominus : 43 ± 1 mm

NOTE:

Make sure that float weight is not applied to needle valve.

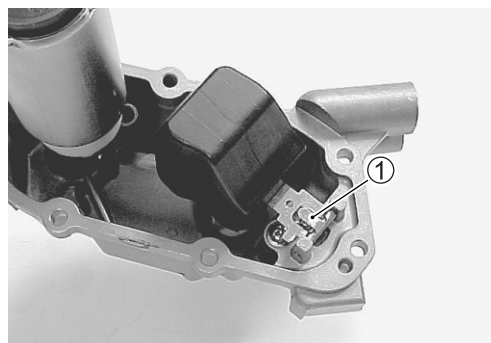


Setting float height

To correct specification, bend only adjustment tab ①.

CAUTION

When adjusting tab, do not bend to the point that it applies pressure to the needle and seat.



Fuel pressure regulator

Install fuel pressure regulator and tighten screw securely.

NOTE:

Apply fuel to O-ring before installing regulator.



Separator cover/Separator case

1. Install seal ring ①, then apply SUZUKI BOND evenly to only the outside mating surface of separator case as shown in figure.

 **99000-31140: SUZUKI BOND "1207B"**

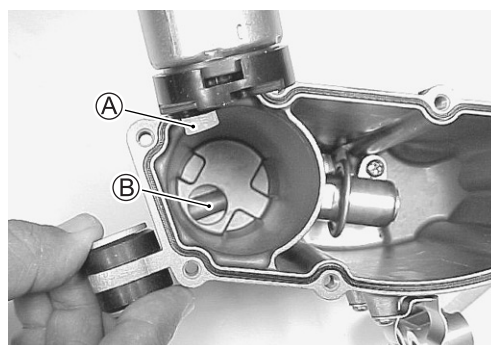
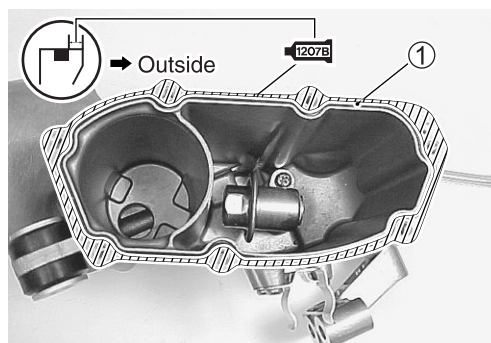
NOTE:

- Clean mating surfaces before applying bond.
- Do not apply bond to seal ring, groove and inside mating surface.

2. Install separator case, then tighten screws securely.

NOTE:

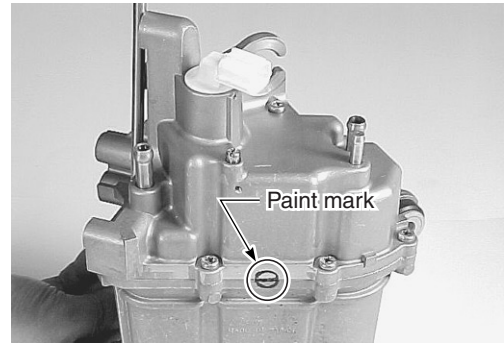
When installing separator case, align suction hole \textcircled{A} with hole \textcircled{B} of separator case.



NOTE:

Separator cover and case are a set.

Make sure paint marks on both items are matched when assembling.



Final check

- Check to ensure that all removed part are back in place.
- Check fuel and water hose routing. (See page x-xx.)
- Check for fuel leakage. (See page 5-4.)

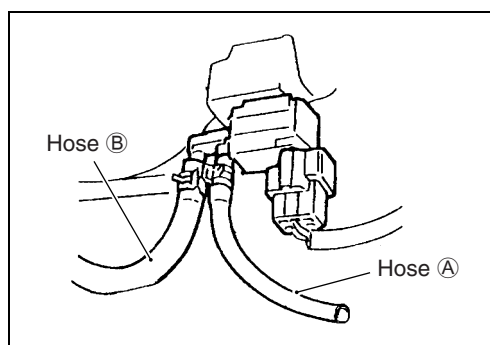
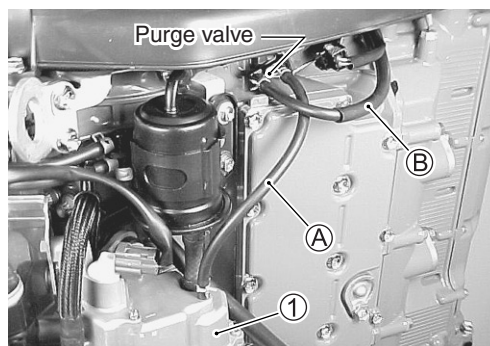
EVAPORATION PURGE SYSTEM SYSTEM INSPECTION

1. Warm up engine to normal operating temperature.
2. Disconnect purge hose (A) from fuel vapor separator (1).

▲ WARNING

**Do not suck air through valve.
Fuel vapor inside valve is harmful.**

3. Blow into hose (A), air should come out of hose (B).
4. Stop engine, blow into hose (A).
Air should not come out of hose (B).
5. If check results are not satisfactory, check vacuum passage, hose, purge valve, wire harness and ECM. (See page 3-xx.)



PURGE VALVE

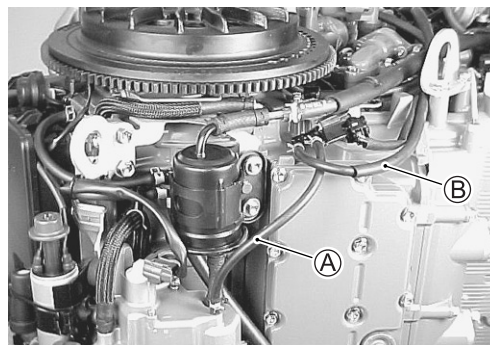
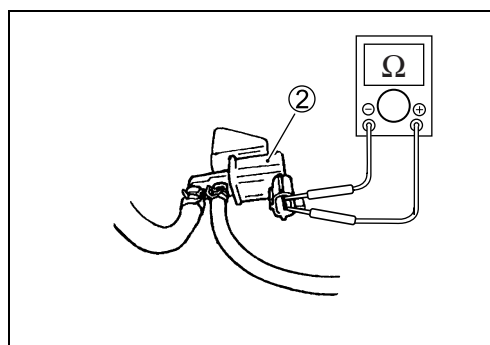
INSPECTION

1. With ignition switch OFF, disconnect connector from purge valve (2).
2. Check resistance between two terminals of purge valve.

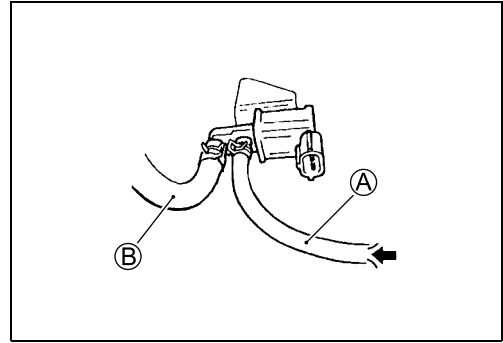
Resistance of purge valve: 28 – 35 Ω at 20 °C

If resistance is as specified, proceed to next operation check.

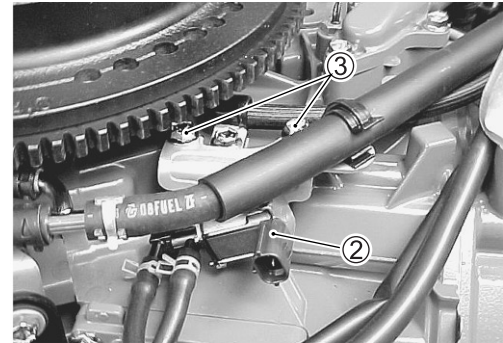
3. Remove the ring gear cover and air intake silencer case. (See page x-xx.)
Disconnect purge hose (A) from fuel vapor separator.



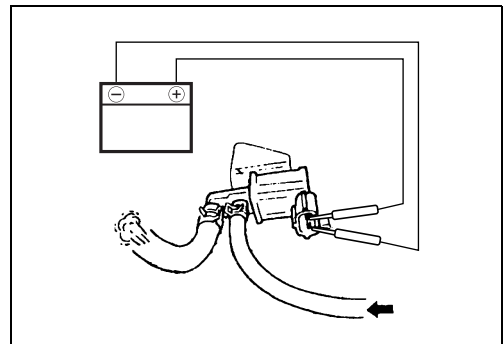
4. With connector disconnected, blow into hose ①. Air should not come out of hose ②.



5. Remove two (2) bolts ③, purge valve ② and purge valve bracket.



6. Connect 12-V battery to purge valve terminals. With voltage applied, blow into hose ①. Air should come out of hose ②. If check result is not as described, replace purge valve.



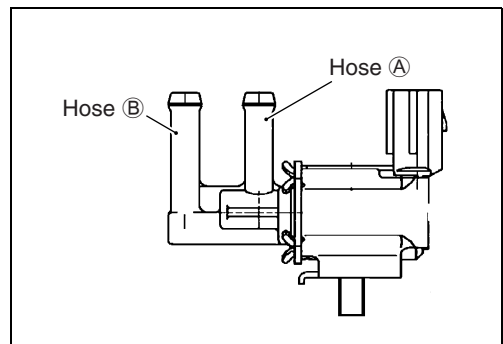
⚠ WARNING

**Do not suck air through valve.
Fuel vapor inside valve is harmful.**

7. Install purge valve and purge valve bracket, then connect purge hose.
Install the ring gear cover and air intake silencer case.

Hose ①: Vapor separator to purge valve.
Hose ②: Purge valve to air intake silencer case.

8. Connect purge valve connector securely.



FUEL INJECTOR REMOVAL

1. Relieve fuel pressure according to procedure described on page 5-3.
2. Remove the collector assembly. (See page x-xx.)
3. Loosen clamp and place a large cloth over end of fuel feed hose.

Slowly pull fuel feed hose from PORT side fuel delivery pipe. Drain any excess fuel in hose into a small container.

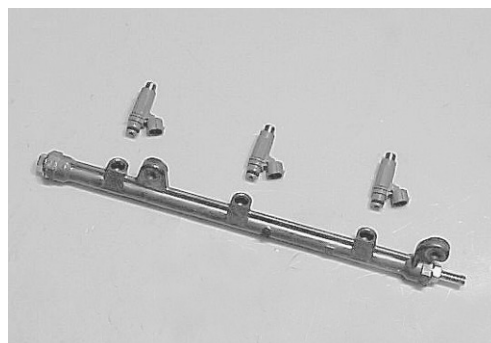
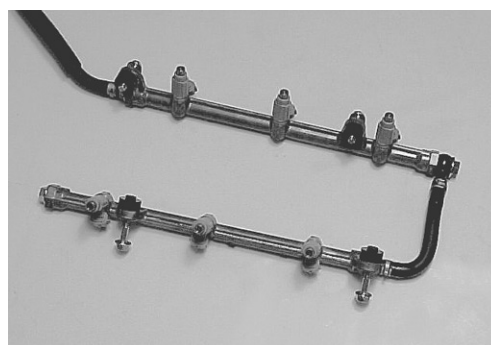
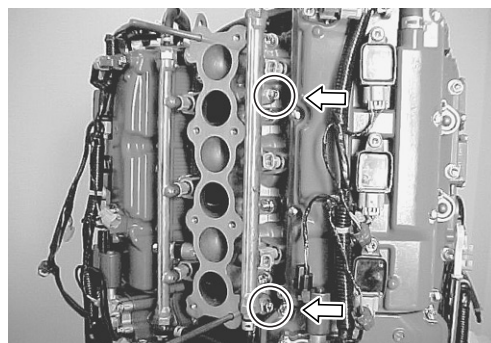
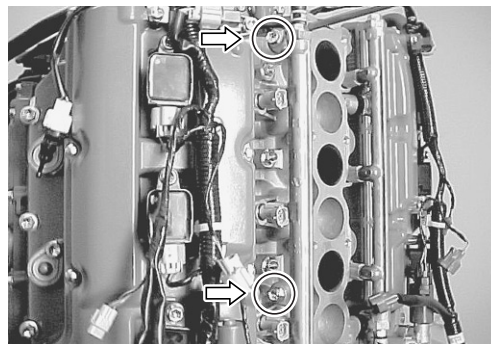
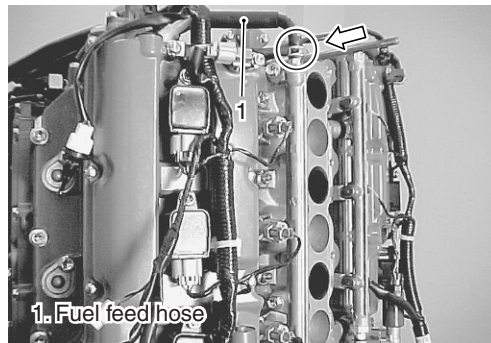
4. Disconnect six (6) fuel injector connectors.
5. For PORT side bank:
Loosen the two (2) bolts securing fuel delivery pipe.

6. For STBD side bank:
Loosen the two (2) bolts securing fuel delivery pipe.
7. Remove PORT/STBD fuel delivery pipes (with fuel injectors), delivery pipe bolts and collars.

CAUTION

**A small amount of fuel may be released when the fuel injector is removed from delivery pipe.
Place a shop cloth under fuel injector before removal to absorb any fuel released.
Dispose of fuel soaked cloth in appropriate container.**

8. Remove each injector from delivery pipe.



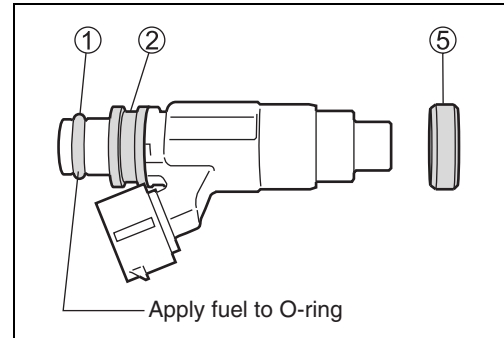
INSTALLATION

Installation is reverse order of removal with special attention to the following steps.

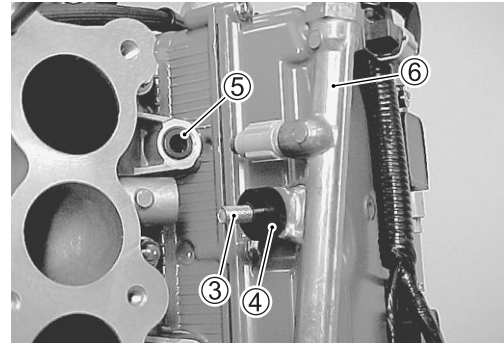
CAUTION

**Do not re-use O-ring and cushion once removed.
Always use new parts.**


1. Replace injector O-ring ① with new one using care not to damage it. Install grommet ② to injector.
2. Place delivery pipe bolts ③ and four (4) insulators (collars) ④ in position.

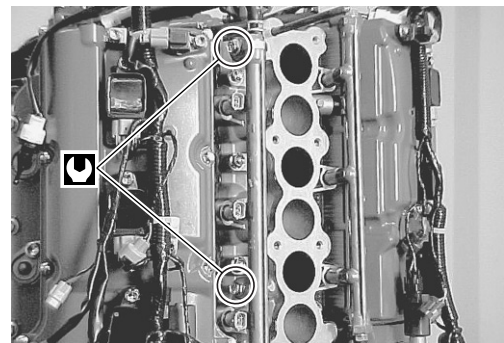
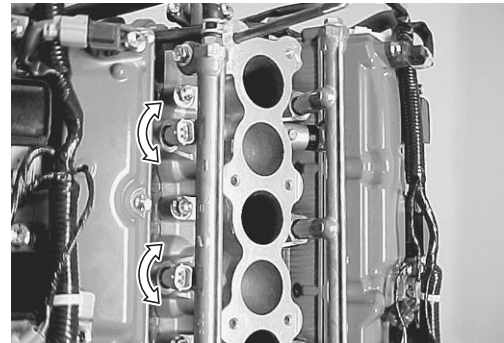


3. Replace injector cushion ⑤ with new one and install it to intake manifold.
4. Apply thin coat of fuel to injector O-rings, then install injectors into delivery pipes ⑥ and intake manifold. Make sure that injectors rotate smoothly.

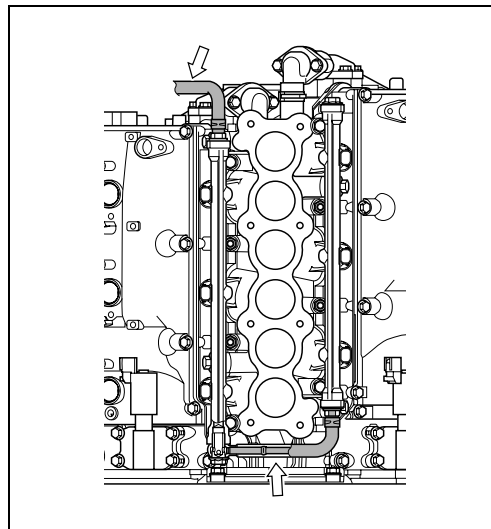


5. Tighten delivery pipe bolts and make sure that injectors rotate smoothly.

 **Fuel delivery pipe bolt: 23 N·m (2.3 kg·m, 16.5 lb·ft)**



6. Reconnect fuel feed hose securely.
7. Connect lead wire connector to injectors securely.



8. Make sure the emergency stop switch lock plate is in place.

NOTE:

Because some sensor leads are disconnected when removing the collector assembly, a diagnosis code will temporarily be displayed during inspection.

9. Squeeze fuel primer bulb until you feel resistance.
Turn ignition switch "ON" for 6 seconds (to operate fuel pump), then turn it "OFF".
Repeat this (ON and OFF) procedure 3 or 4 times to pressurize fuel system.
Check for fuel leaks around fuel injector.
10. Install collector assembly. (See page x-xx.)

LOW PRESSURE FUEL PUMP

The low pressure fuel pump is a non-serviceable component.

If it is defective, it must be replaced as a complete unit.


The following procedure will determine whether or not the pump is defective.

INSPECTION

NOTE:

To prevent damage to the low pressure fuel pump, fill the fuel feed lines with fuel prior to operating the pump.

1. Install the emergency stop switch lock plate in position.
2. When the ignition key is turned to ON from OFF, check that a pump operating sound is heard for six (6) seconds.
3. If no pump operating sound is heard:
 - (a) Turn the ignition key to OFF and disconnect the pump lead connector.
 - (b) Check for contact failure in the lead connector.
 - (c) Measure resistance between the two terminals of pump lead connector.

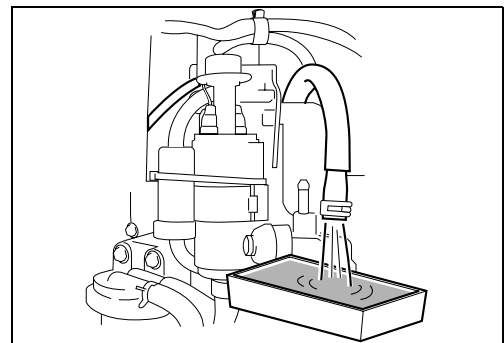
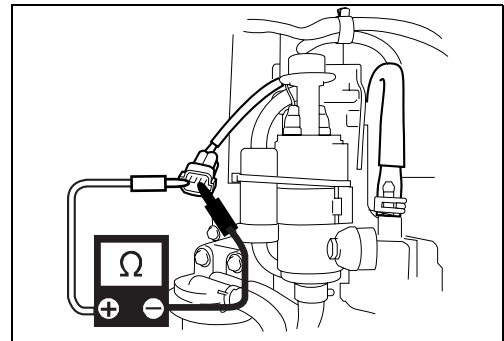
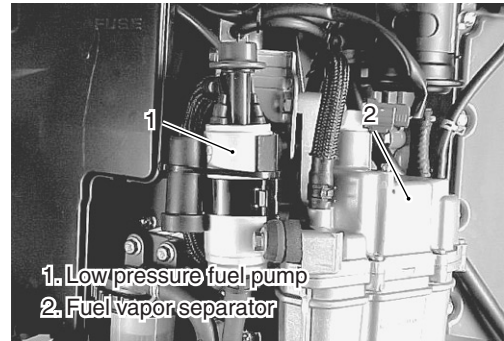
 **09930-99320: Digital tester**

 **Tester range: Ω (Resistance)**

Pump resistance: Standard 1 – 5 Ω

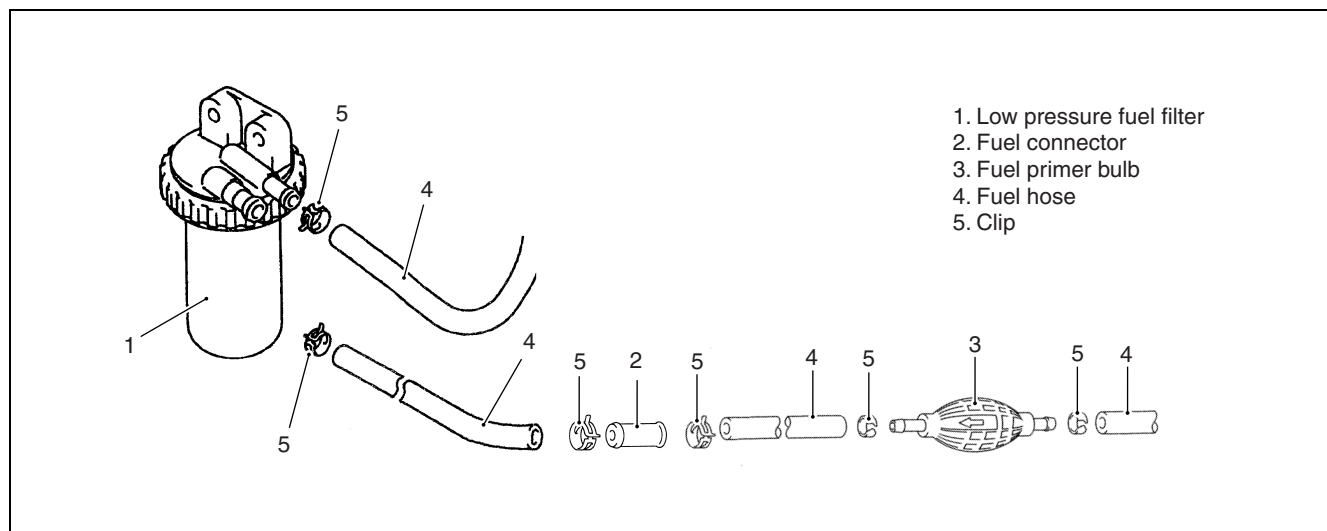
If the measurement is out of specification, replace the pump.

- (d) Check that pump drive voltage is output from ECM and no abnormal condition exists in the engine main wiring harness. (See page 3-xx.)
4. If the pump operating sound is heard:
 - (1) Remove the fuel feed hose from the vapor separator.
 - (2) Operate the pump by turning the ignition key from OFF to ON and discharge fuel into a suitable container.
 - (3) If no fuel is discharged, check for clogging or other failure in the fuel feed line. If no failure is found, replace the pump.



LOW PRESSURE FUEL FILTER/FUEL HOSE

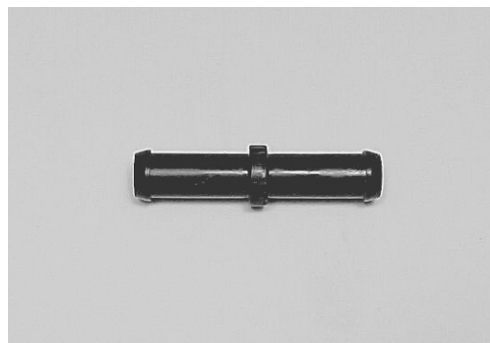
When disassembling or reassembling fuel line, refer to the construction diagram below.



INSPECTION

FUEL CONNECTOR

Inspect fuel connector for leakage, deterioration or other damage. Replace if necessary.

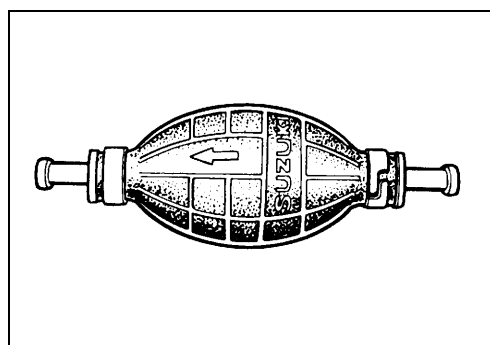


FUEL HOSE

Inspect fuel hose for cuts, cracks, leakage, tears or deterioration. Replace if necessary.

FUEL PRIMER BULB

Inspect fuel primer bulb for cracks, leakage, deterioration or check valve function. Replace if necessary.



LOW PRESSURE FUEL FILTER

To perform fuel filter inspection, refer to "PERIODIC MAINTENANCE/LOW PRESSURE FUEL FILTER" section on page 2-19.

