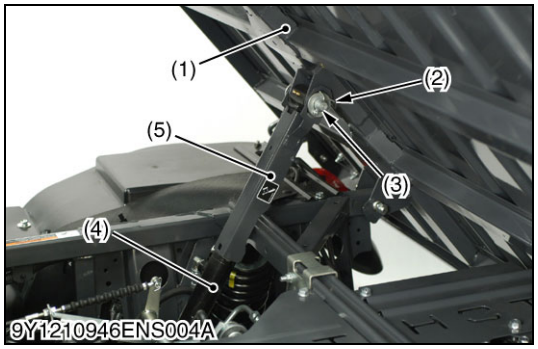
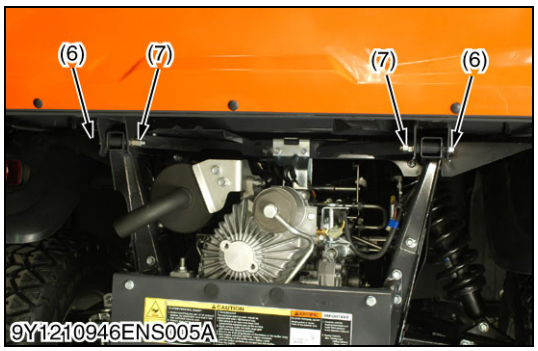
[2] PREPARATION

(1) Removing Hydraulic Pump





Cargo Bed

1. Lift up the cargo bed (1) and support it so that the hydraulic cylinder (4) should not drop. (If hydraulic cylinder equipped.)
2. Remove the cotter pin (2) clevis pin (3) and cylinder lock (5). (If hydraulic cylinder equipped.)
3. Loosen the lock nuts (7) and remove the bolts (6).
4. Remove the cargo bed (1).

(When reassembling)

- Be sure that the split pin is bent to both sides.

(1) Cargo Bed
(2) Cotter Pin
(3) Clevis Pin
(4) Hydraulic Cylinder
(5) Cylinder Lock
(6) Bolt
(7) Lock Nut

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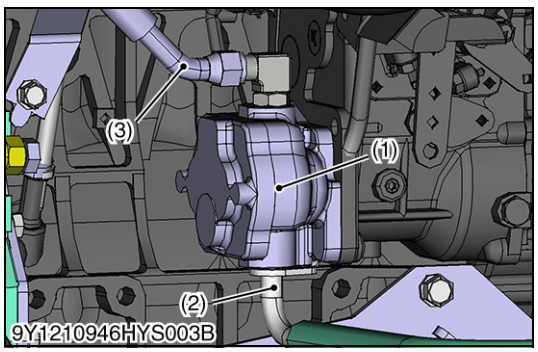

Hydraulic Pump

1. Disconnect the suction pipe (2) and delivery hose (3).
2. Remove the hydraulic pump (1).

(When reassembling)

- Be careful not to damage the O-ring on the hydraulic pump (1) and suction pipe (2).

Tightening torque	Hydraulic pump mounting torque	37.0 to 44.0 N·m 3.78 to 4.48 kgf·m 27.3 to 32.4 lbf·ft

(1) Hydraulic Pump
(2) Suction Pipe
(3) Delivery Hose

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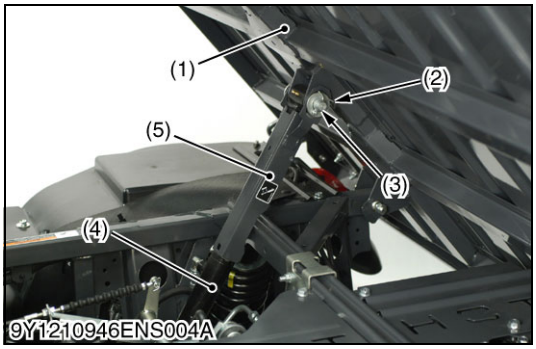
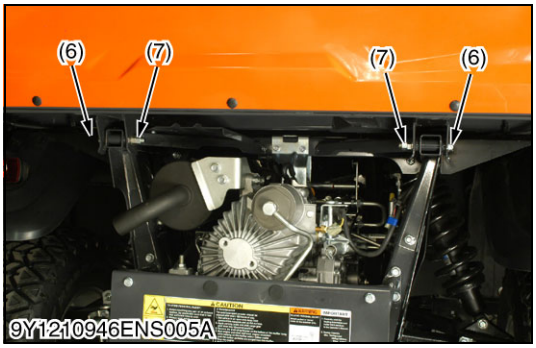
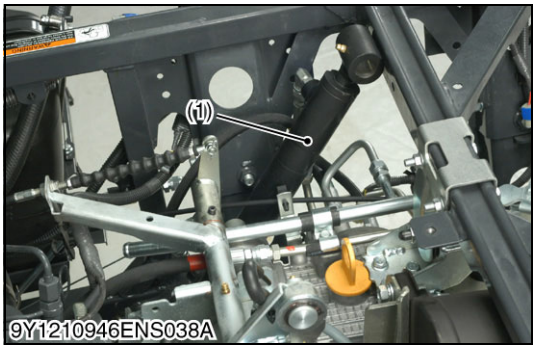
(2) Removing Hydraulic Cylinder LIft Cylinder







Cargo Bed

1. Lift up the cargo bed (1) and support it so that the hydraulic cylinder (4) should not drop. (If hydraulic cylinder equipped.)
2. Remove the cotter pin (2) clevis pin (3) and cylinder lock (5). (If hydraulic cylinder equipped.)
3. Loosen the lock nuts (7) and remove the bolts (6).
4. Remove the cargo bed (1).

(When reassembling)

- Be sure that the split pin is bent to both sides.

(1) Cargo Bed
(2) Cotter Pin
(3) Clevis Pin
(4) Hydraulic Cylinder
(5) Cylinder Lock
(6) Bolt
(7) Lock Nut

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Hydraulic Lift Cylinder

1. Disconnect the hydraulic hoses.
2. Remove the hydraulic lift cylinder (1) and cylinder bracket.

(When reassembling)

Tightening torque	Hydraulic lift cylinder hose retaining nut	24.0 to 25.0 N·m 2.45 to 2.54 kgf·m 17.7 to 18.4 lbf·ft
Tightening torque	Hydraulic lift cylinder pipe retaining nut	24.0 to 25.0 N·m 2.45 to 2.54 kgf·m 17.7 to 18.4 lbf·ft

(1) Hydraulic Lift Cylinder

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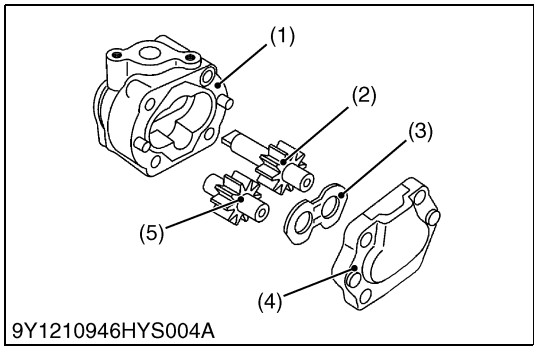
[3] DISASSEMBLING AND ASSEMBLING

(1) Hydraulic Pump



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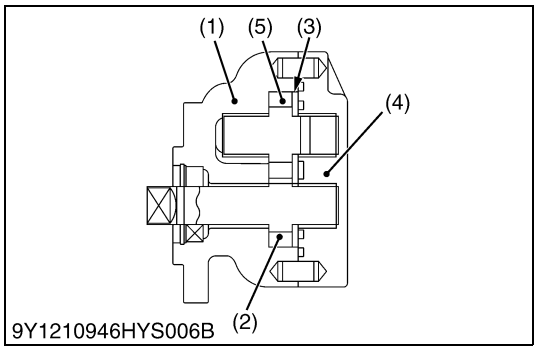

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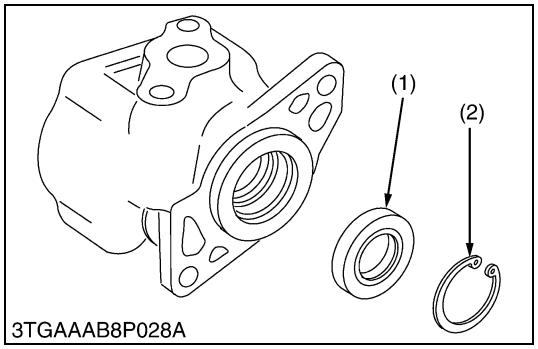

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Hydraulic Pump

1. Secure the hydraulic pump with a vise, and remove the hydraulic pump cover (4).
2. Remove the side plate (3).
3. Remove the drive gear (2) and driven gear (5) from the casing (1).

(When reassembling)

- Be careful not to damage the O-ring.
- Align the holes of the hydraulic pump cover (4) and casing (1).
- Install the side plate (3), nothing its location and direction.
- Install the gears, nothing its direction.

Tightening torque	Hydraulic pump cover mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

(1) Casing
(2) Drive Gear
(3) Side Plate
(4) Hydraulic Pump Cover
(5) Driven Gear

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Oil Seal

1. Remove the internal snap ring (2), and remove the oil seal (1).

(When reassembling)

- If the oil seal is damaged, worn or scratched, replace it.

(1) Oil Seal
(2) Internal Snap Ring

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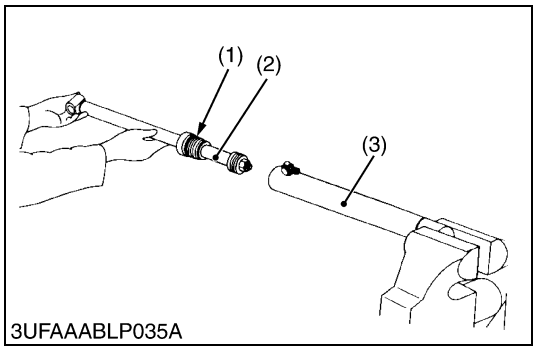
(2) Hydraulic Lift Cylinder



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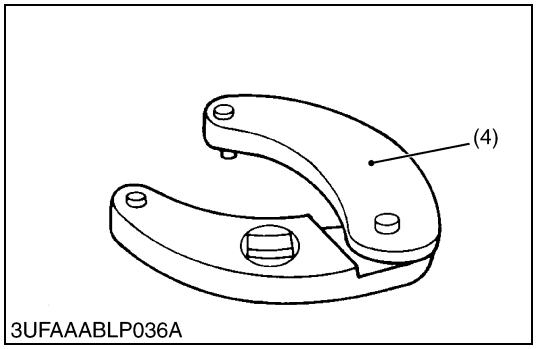

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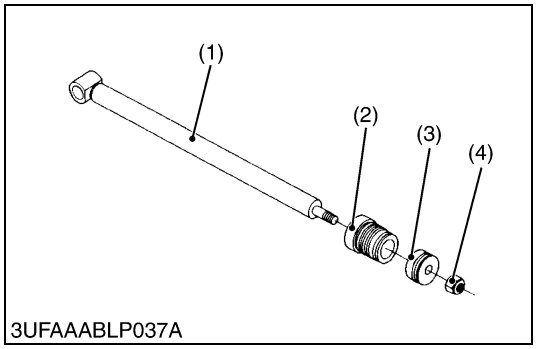

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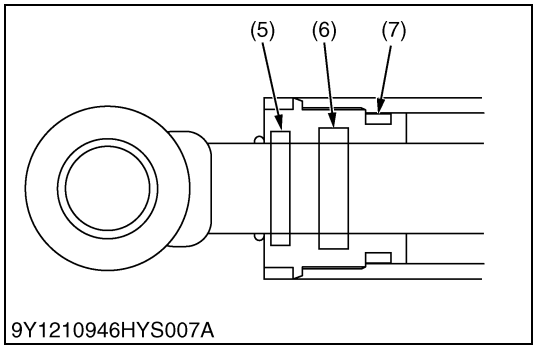

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Piston Rod Assembly

1. Drain hydraulic oil from the hydraulic lift cylinder, and set the tube end of the hydraulic lift cylinder in a vise.
2. Remove the cylinder head (1) with the adjustable gland nut wrench (4).
3. Pull out the piston rod assembly (2) from the cylinder tube (3).

(When reassembling)

- Visually inspect the cylinder tube for signs of scoring or damage.
- Insert the piston rod assembly to the cylinder tube, being careful not to damage the piston seal on the piston.
- Install the cylinder head to the cylinder tube, being careful not to damage the O-ring on the cylinder head.

(1) Cylinder Head
(2) Piston Rod Assembly
(3) Cylinder Tube
(4) Adjustable Gland Nut Wrench

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Cylinder Head, Piston and Nut

1. Set the od end in a vise.
2. Remove the nut, remove the piston (3) and cylinder head (2) from the piston rod (1).

(When reassembling)

- Visually inspect all parts for signs of scoring or damage.
- Insert the piston rod to the cylinder head, being careful not to damage the wiper seal (5) and oil seal (6).
- When installing the cylinder head, apply Loctite 262 to the nut (4).

Tightening torque	Cylinder head	100 to 120 N·m 10.2 to 12.2 kgf·m 73.8 to 88.5 lbf·ft
	Cylinder piston mounting nut	80.0 to 100 N·m 8.16 to 10.1 kgf·m 59.0 to 73.7 lbf·ft

(1) Piston Rod
(2) Cylinder Head
(3) Piston
(4) Nut
(5) Wiper Seal
(6) Oil Seal
(7) Oil Seal

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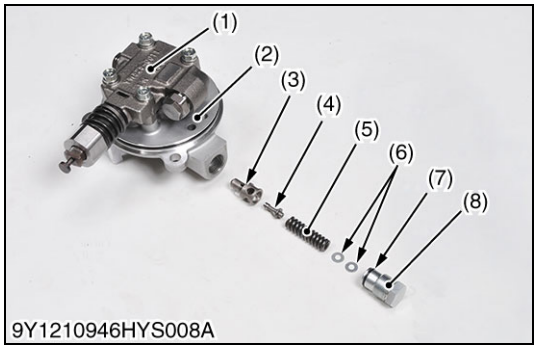
(3) Control Valve



Relief Valve and Control Valve

1. Remove the relief valve plug (8), shims (6), spring (5), poppet (4) and seat (3).
2. Remove the control valve (1).

(When reassembling)

- Be careful not to damage the O-ring.

Tightening torque	Relief valve plug	29.4 to 34.3 N·m 3.00 to 3.49 kgf·m 21.7 to 25.2 lbf·ft
	Control valve mounting screw	18 to 21 N·m 1.9 to 2.1 kgf·m 14 to 15 lbf·ft

(1) Control Valve
(2) Control Valve Cover
(3) Seat
(4) Poppet
(5) Spring
(6) Shim
(7) O-ring
(8) Plug

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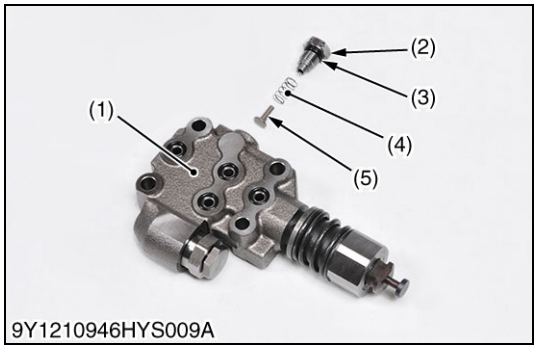


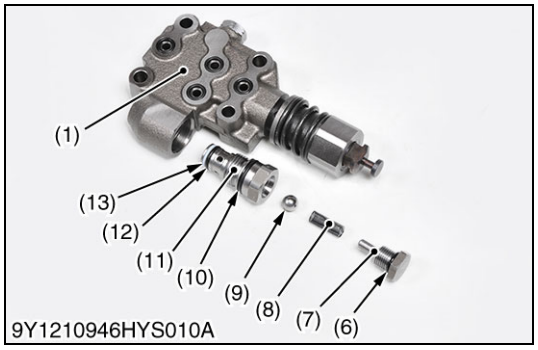
Check Valve

1. Remove the plug (2) and remove the spring (4) and poppet (5).
2. Remove the plug (7) and remove the spring (8) and ball (9).
3. Remove the check valve seat (11).

(When reassembling)

- Be careful not to damage the O-ring.

Tightening torque	Check valve plug (2), (7)	19.6 to 24.5 N·m 2.00 to 2.49 kgf·m 14.5 to 18.0 lbf·ft
	Check valve seat (11)	34 to 39 N·m 3.5 to 3.9 kgf·m 25 to 28 lbf·ft



(1) Control Valve
(2) Check Valve Plug
(3) O-ring
(4) Spring
(5) Poppet
(6) O-ring
(7) Check Valve Plug
(8) Spring
(9) Ball
(10) O-ring
(11) Check Valve Seat
(12) O-ring
(13) Back Up Ring

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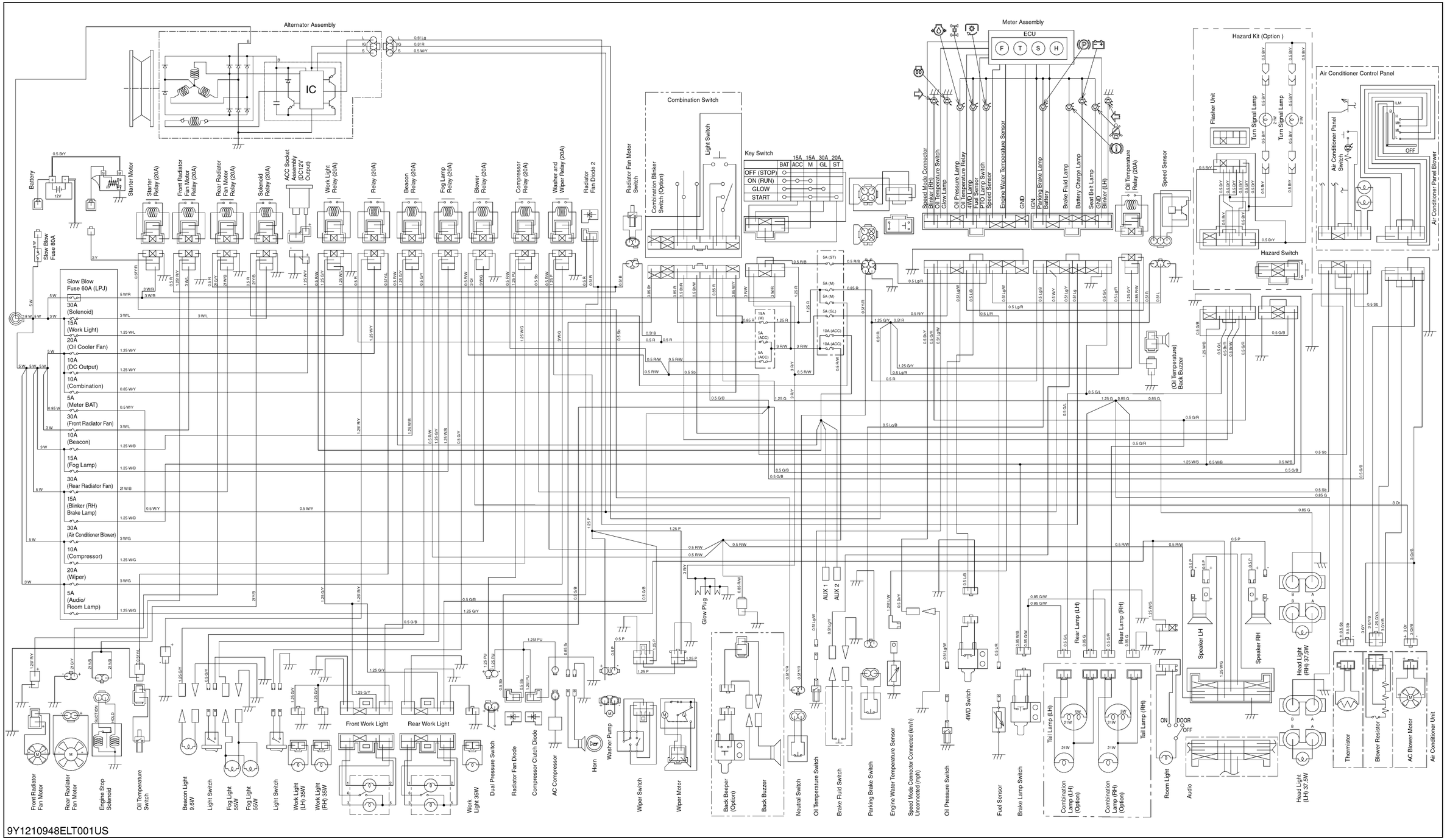
8 ELECTRICAL SYSTEM

MECHANISM

CONTENTS

1. WIRING DIAGRAM



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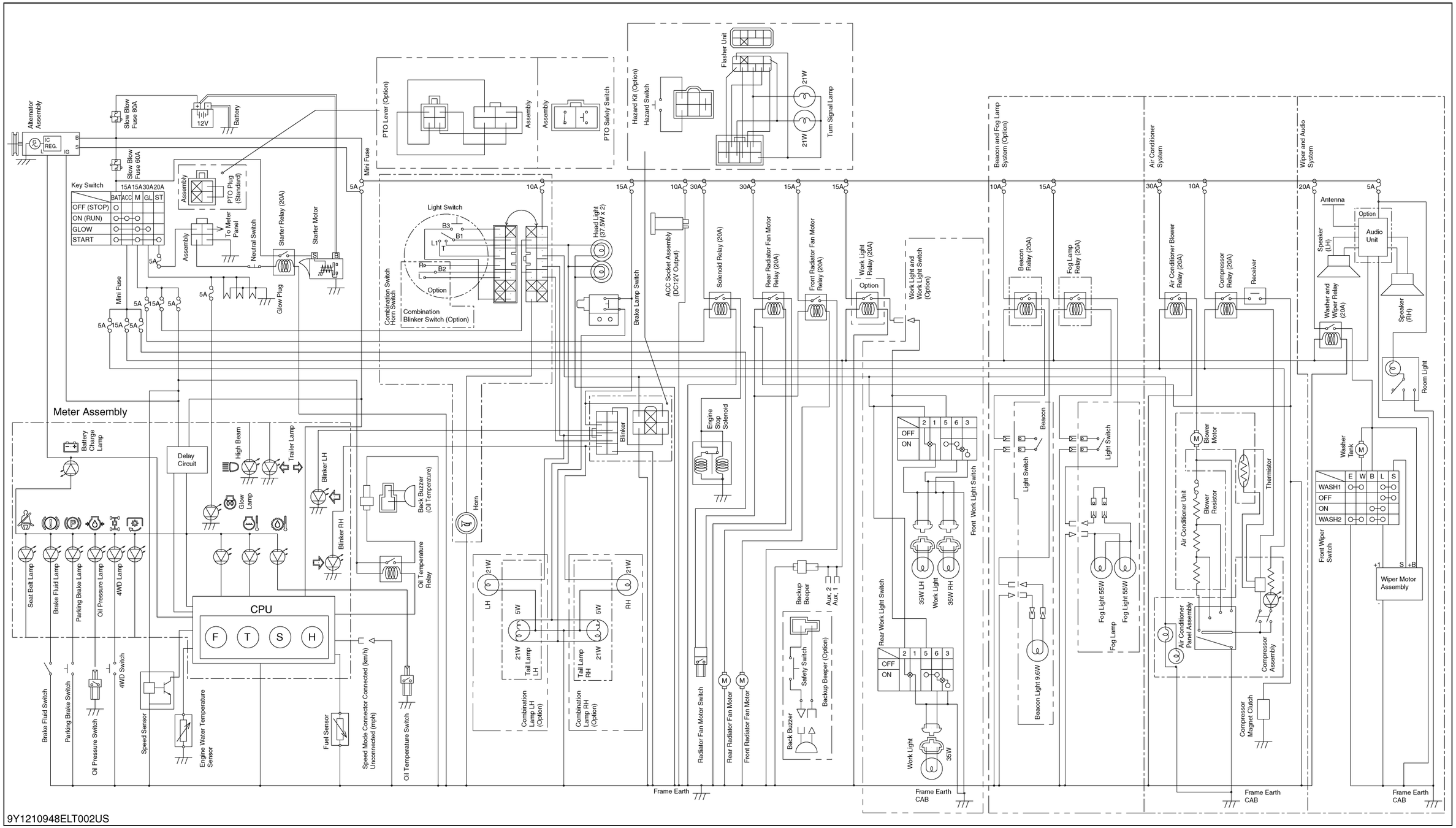
2. ELECTRICAL CIRCUIT



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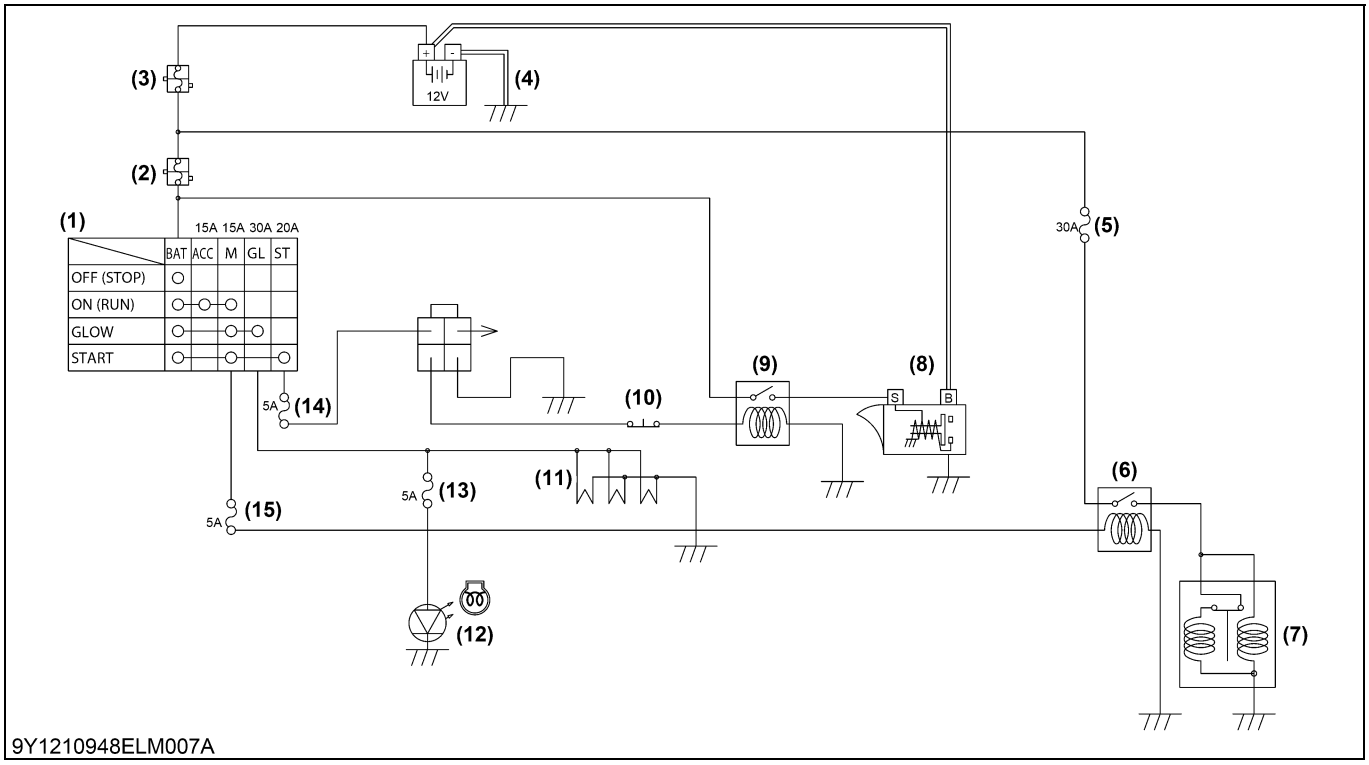
3. STARTING SYSTEM



(1) Key Switch
(2) Slow Blow Fuse (60A)
(3) Slow Blow Fuse (80A)
(4) Battery
(5) Fuse (30A)
(6) Solenoid Relay
(7) Engine Stop Solenoid
(8) Starter Motor
(9) Starter Relay
(10) Safety Switch (Neutral Switch)
(11) Glow Plug
(12) Glow Lamp
(13) Fuse (5A)
(14) Fuse (5A)
(15) Fuse (5A)

When the key switch (1) is turned to the **PREHEAT** position, the terminal **BAT** is connected to the terminals **GLOW** and **ON**. The glow plugs (11) become red-hot, and the preheat indicator lamp also lights on while preheating.

When the key switch is then turned to the **START** position with the safety switch (10) on, the terminal **BAT** is connected to the terminals **ST** and **ON**. Consequently, battery current flows to the starter motor and start the engine.

The key switch (1) automatically returns to the **ON** position, the terminal **BAT** is connected only to the terminal **ON**, thereby causing the starting circuit to be opened, stopping the starter motor (8).

When the key switch (1) turned from the **ON** position to the **OFF** position, the engine stop solenoid (7) moves the fuel injection pump control rack to the **"No Fuel Injection"** position and stop the engine.

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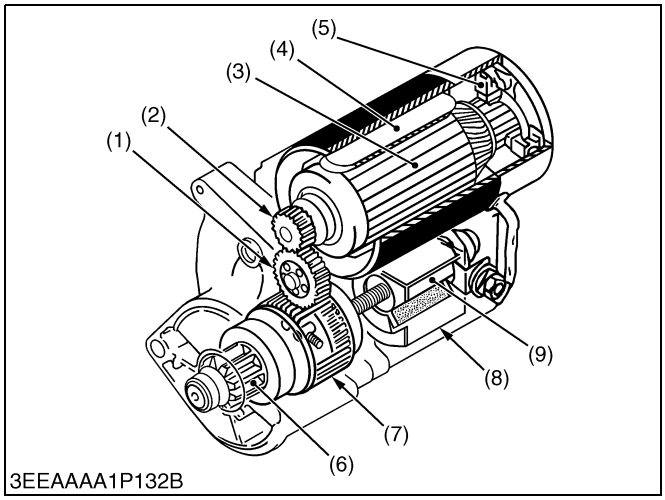
[1] STARTER

(1) Structure



The starter is a reduction type starter with heat-resistant and vibration-resistant features that has a small, high-speed motor, and the revolutions of the armature drive the pinion gear approximately one-third the speed to increase torque.

(1) Idler Gear
(2) Drive Gear
(3) Armature
(4) Field Coil
(5) Brush
(6) Pinion Gear
(7) Overrunning Clutch
(8) Magnetic Switch
(9) Plunger

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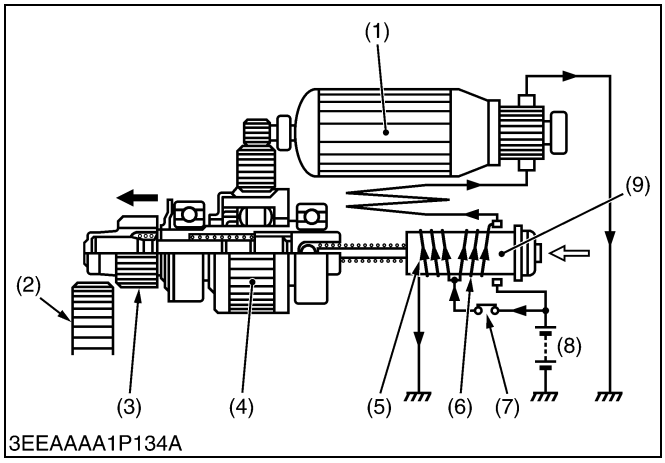
(2) Operation of Starter



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When Key Switch Is Turned to START Position

When key switch (7) is turned to **START** position, current from battery (8) flows to holding coil (5) and pull-in coil (6). The plunger (9) is motivated by magnetism and the pinion gear (3) is pushed out.

(1) Armature
(2) Ring Gear
(3) Pinion Gear
(4) Overrunning Clutch
(5) Holding Coil
(6) Pull-in Coil
(7) Key Switch
(8) Battery
(9) Plunger

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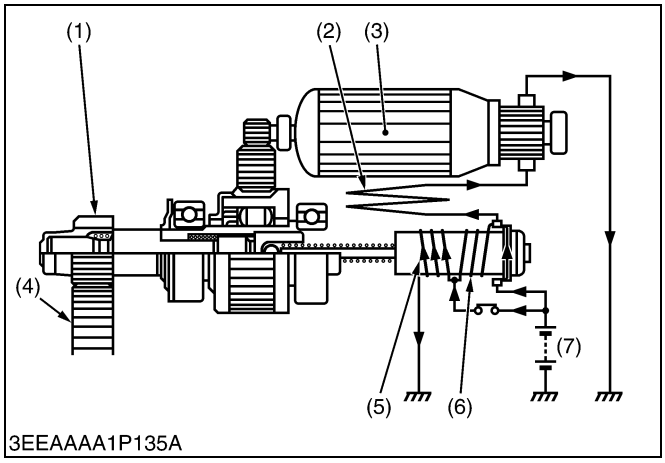

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When Pinion Gear Meshes with Ring Gear

When the pinion gear (1) comes into mesh with the ring gear (4) on the flywheel and the magnetic switch is closed, a large current flows from the battery (7) directly into the field coil (2) and armature coil, but not through the pull-in coil (6).

This rotates the armature (3) at a high speed, which in turn drives the ring gear (4) through the pinion gear (1) at 200 to 300 min^{-1} (rpm).

(1) Pinion Gear
(2) Field Coil
(3) Armature
(4) Ring Gear
(5) Holding Coil
(6) Pull-in Coil
(7) Battery

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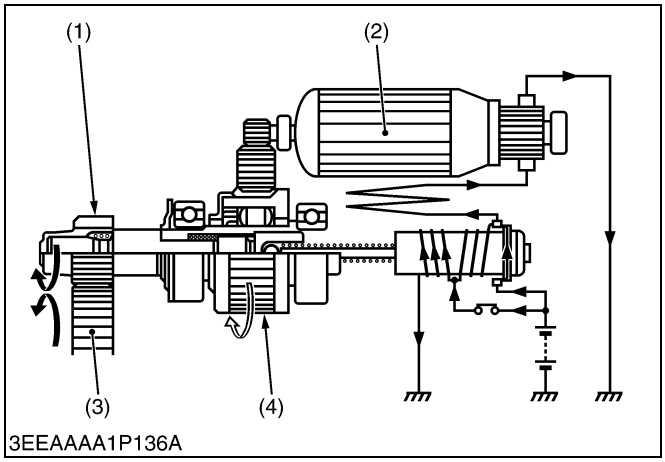

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When Engine Has Started

When the engine starts and drives the pinion gear (1) with the ring gear (3), the overrunning clutch (4) disengages to prevent the armature (2) from being driven by the engine.

(1) Pinion Gear
(2) Armature
(3) Ring Gear
(4) Overrunning Clutch

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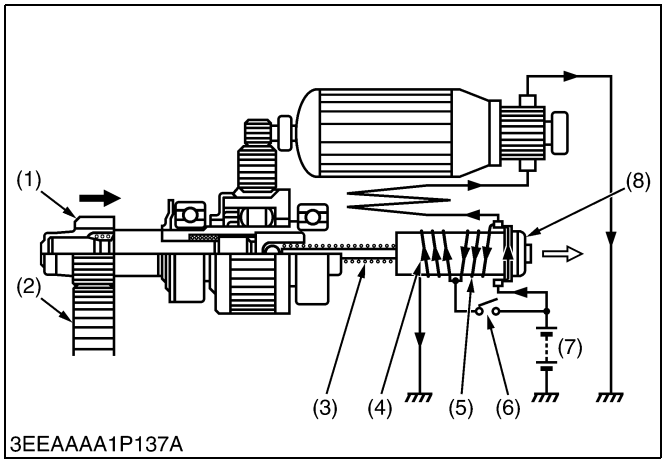

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When Key Switch Is Released

When releasing the key switch (6), it returns from **START** to **ON** position and the starter circuit opens.

Then, current flows from the battery (7) to the pull-in coil (5) and the holding coil (4) through the contact plate.

Since the magnetic force is generated in each coil in the opposite direction, the magnetic field collapses and the plunger (8) is returned to its former position by a return spring (3).

This open the contacts on the contact plate and separates the pinion gear (1) from the ring gear (2), whereupon the pinion gear stops rotating.

(1) Pinion Gear
(2) Ring Gear
(3) Return Spring
(4) Holding Coil
(5) Pull-in Coil
(6) Key Switch
(7) Battery
(8) Plunger

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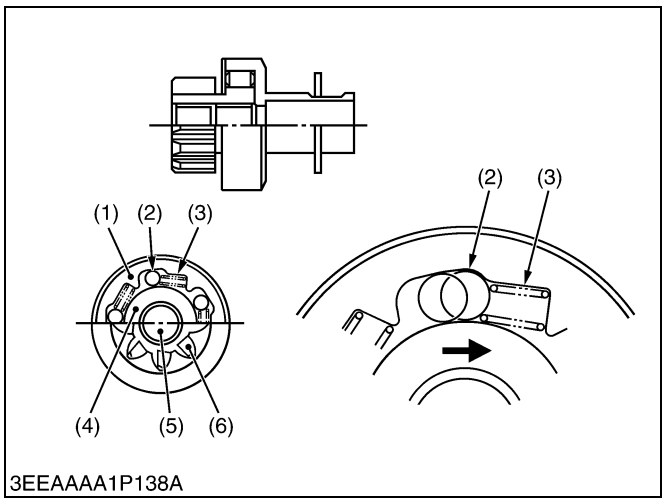
(3) Overrunning Clutch



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The overrunning clutch is constructed so that the power transmission relationship is automatically severed when the clutch pinion shaft (5) speed exceeds the clutch gear outer (1) speed at increased engine speeds.

Therefore, the armature drives the ring gear and is never driven by the engine.

(1) Clutch Gear Outer
(2) Roller
(3) Roller Spring
(4) Spline Tube Inner
(5) Clutch Pinion Shaft
(6) Pinion Gear

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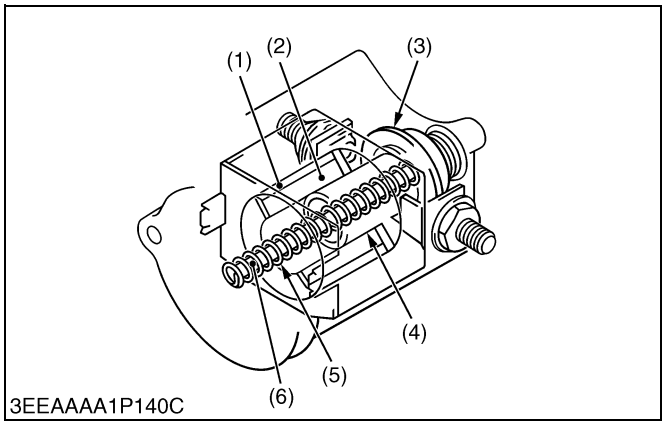
(4) Magnetic Switch



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The plunger (4), contact plate (3) and plunger shaft (6) are mode as one unit. When the key switch is turned to **START** position, the plunger is drawn in and thus clutch pinion shaft is forced out.

This meshes the pinion gear and ring gear, and causes the contact plate to close the contacts, causing the main current to flow into the armature.

When releasing the key switch, the plunger is returned to its former position by a return spring (5).

(1) Holding Coil
(2) Pull-in Coil
(3) Contact Plate
(4) Plunger
(5) Return Spring
(6) Plunger Shaft

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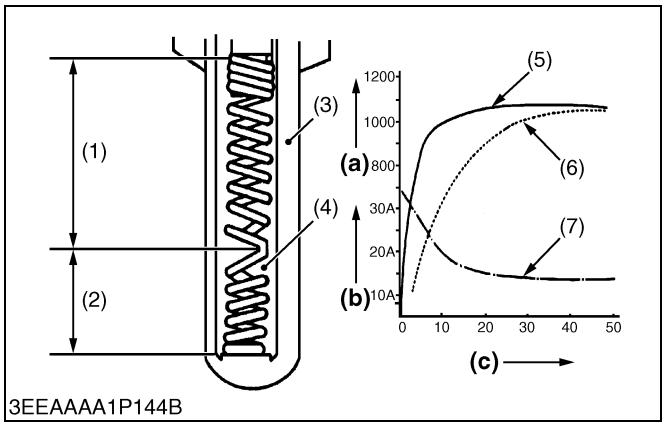
[2] GLOW PLUG



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Quick Glow System (QGS)

This plug is a two-material type QGS for quick temperature rises, and has self-controlling function as well as excellent durability.

The heater (2) connected in series to the heater which also functions as the resistor, is incorporated in the sheath tube (3) of the super glow plug.

The resistance of this heater (1) cum resistor is small when the temperature is low, while the resistance becomes large when the temperature rises.

Therefore, because sufficient current is flow to the heater (2) during the initial period of energization, the temperature rise quickly and the resistance grows with the rise quickly and the resistance grows with the rise in the temperature of the resistor, the flowing current is reduced to prevent the heater (2) from being heated.

The ignition point is in the area of 2.0 to 3.0 mm (0.079 to 0.11 in.) from the tip of the plug in order to reduce its projection into the combustion chamber.

(1)	Heater also functioning as a Resistor	**(a)**	**Glow Plug Temperature (°C)**
(2)	Heater	**(b)**	**Current (A)**
(3)	Sheath Tube	**(c)**	**Time (Sec.)**
(4)	Insulation Powder		
(5)	Super Glow Plug		
(6)	Conventional Quick Heating Type Glow Plug		
(7)	Glow Plug Current		

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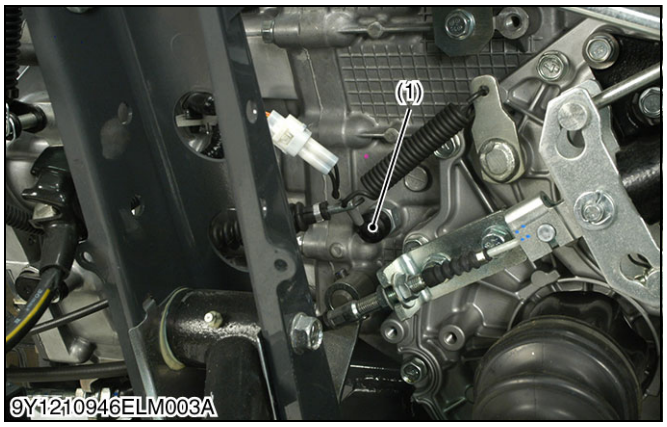
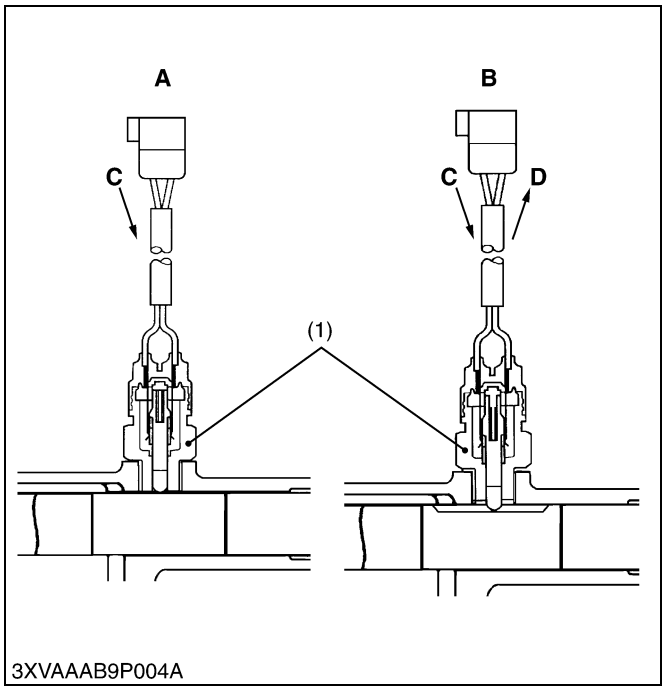
[3] SAFETY SWITCH (NEUTRAL SWITCH)





The safety switch (1) prevents current from flowing to the starter when the point of contact is released. This is to ensure safe starting.

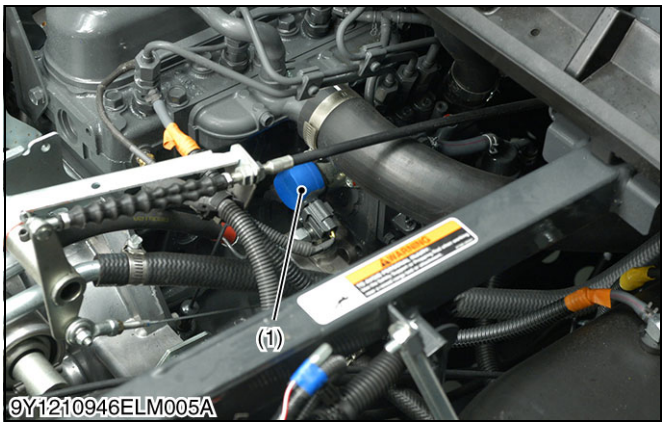
The location of the safety switch is located at the range gear shift lever of the transaxle case.

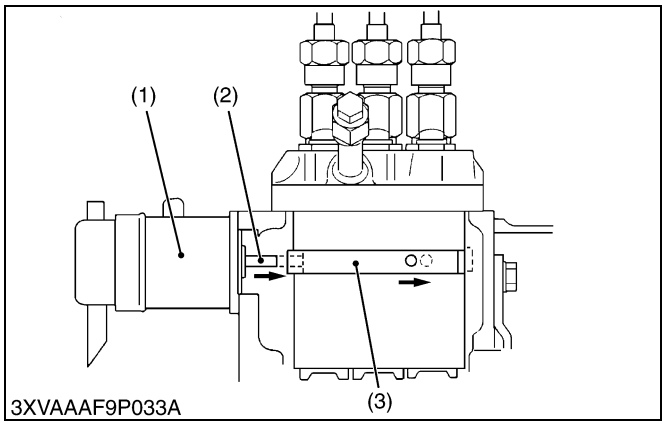
(1) Safety Switch

A: When Shifted
B: When Neutral
C: From Key Switch
D: To Starter

9Y1210946ELM0015US0

[4] ENGINE STOP SOLENOID



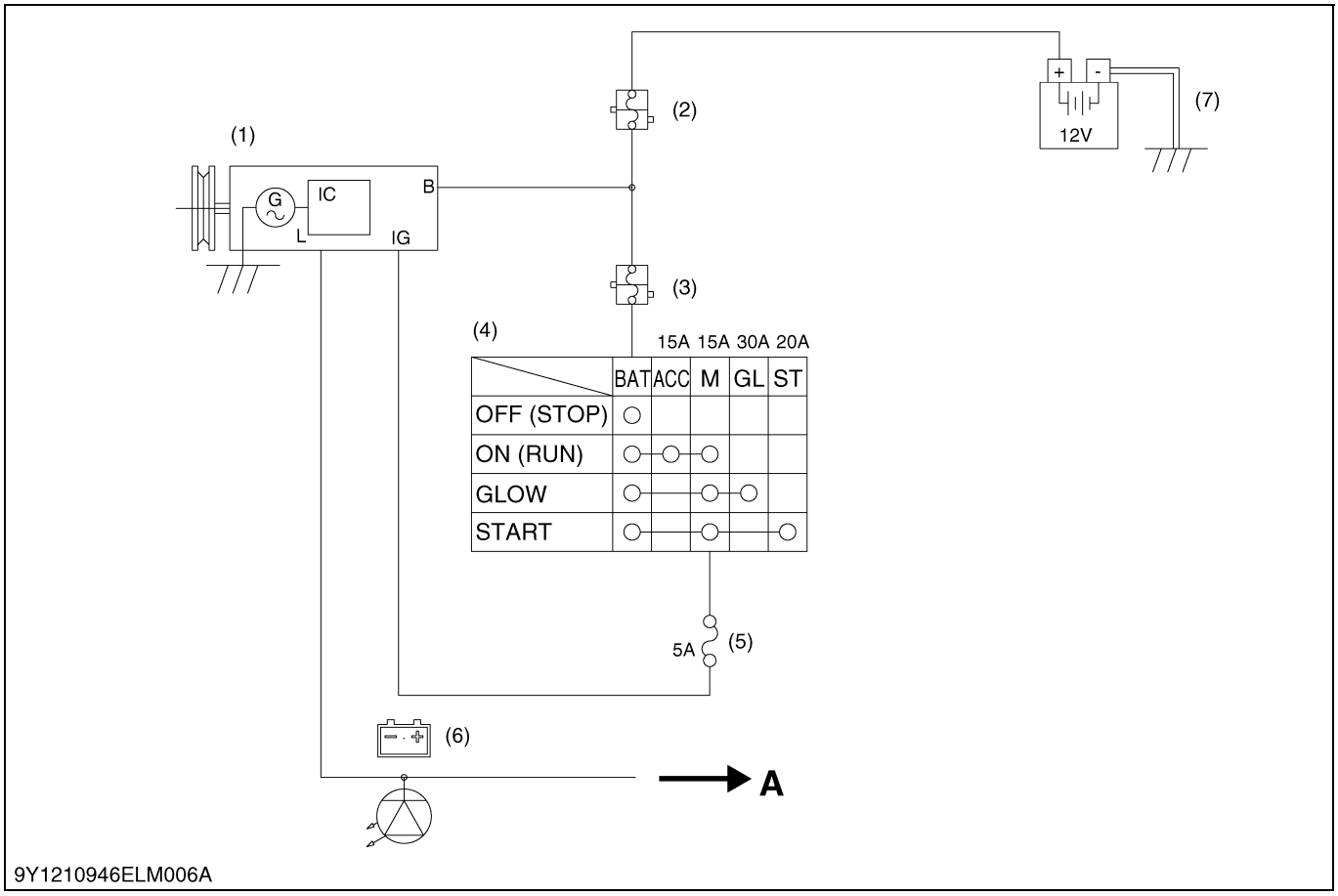


Flowing of the battery current into the stop solenoid (1), the plunger (2) move to left side so that the movement of control rack become free, when the battery current stops, the plunger (2) is returned to the in **"No fuel injection"** position.

(1) Stop Solenoid
(2) Plunger
(3) Control Rack

9Y1210946ELM0017US0

4. CHARGING SYSTEM



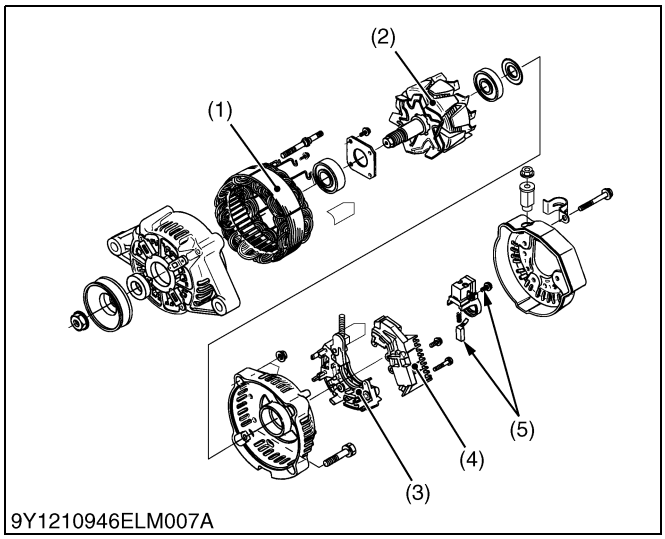
(1) Alternator
(2) Slow Blow Fuse (80A)
(3) Slow Blow Fuse (60A)
(4) Key Switch
(5) Fuse
(6) Battery Charge Lamp
(7) Battery
A: To Panel

The charging system supplies electric power for various electrical devices and also charges the battery while the engine operates.

This alternator has IC regulator.

9Y1210948ELM0009US0

[1] ALTERNATOR



9Y1210946ELM007A

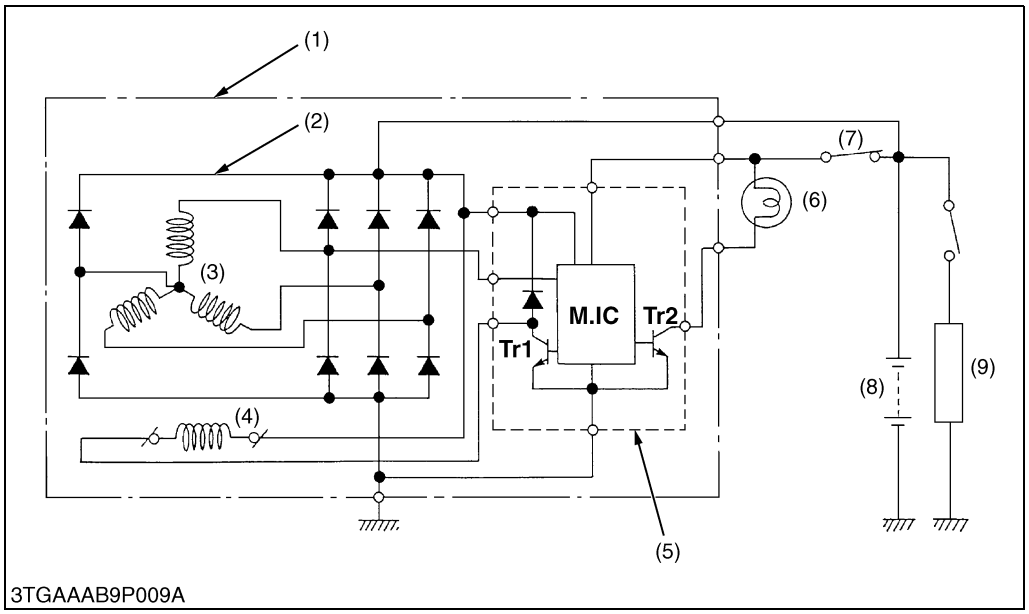
A compact alternator with an IC regulator is used, having the following characteristics:

- Approximately 26 % lighter and 17 % smaller than a standard alternator.
- Cooling performance and safety have been improved by combining the cooling fan with the rotor and incorporating the fan / rotor unit inside the alternator.
- IC regulator is fitted inside the alternator.
- The rectifier, IC regulator and similar components are easy to remove, making it easier to service the alternator.

(1) Stator
(2) Rotor
(3) Rectifier
(4) IC Regulator
(5) Brush Holder

9Y1210946ELM0019US0

[2] IC REGULATOR



3TGAAAB9P009A

(1) Alternator
(2) Rectifier
(3) Stator Coil
(4) Rotor Coil
(5) IC Regulator
(6) Charge Lamp
(7) Key Switch
(8) Battery
(9) Load

An IC regulator uses solid state transistors, chips or other semiconductor elements instead of the relays in a conventional regulator. Stable characteristics are achieved by cutting off the field current. IC regulators have the following characteristics.

- The control voltage does not change over time, so the need for readjustment is eliminated. Since there are no moving parts, IC regulators are extremely durable and resistant to vibration.
- The overheat compensation characteristics ensure that the control voltage is reduced as the temperature rises, so the battery is charged at just the right level.

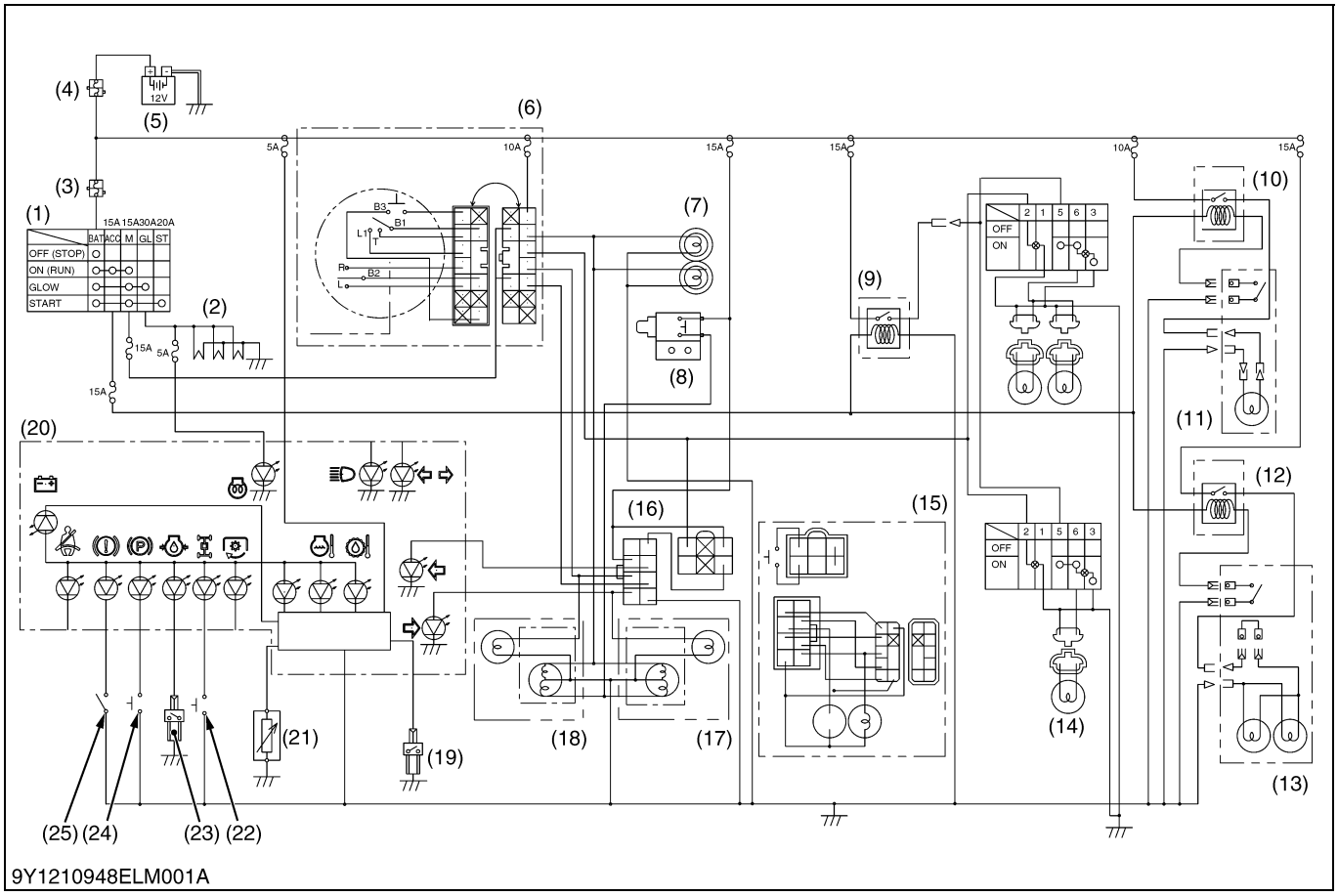
  The internal circuitry of the IC regulator is shown in the diagram. It consists of a hybrid IC incorporating a monolithic IC. (The internal circuitry of the monolithic IC is extremely complex, so it is shown as simply **"M.IC circuit"**.)

  Tr1 acts as the contacts controlling the field current, and **Tr2** acts as the charge lamp relay controlling the flashing of the charge lamp.

The M.IC circuit controls **Tr1** and **Tr2**, and monitors the alternator output voltage, and detects any drop in **L** terminal voltage or breaks in the rotor coil.

9Y1210946ELM0020US0

5. LIGHTING SYSTEM



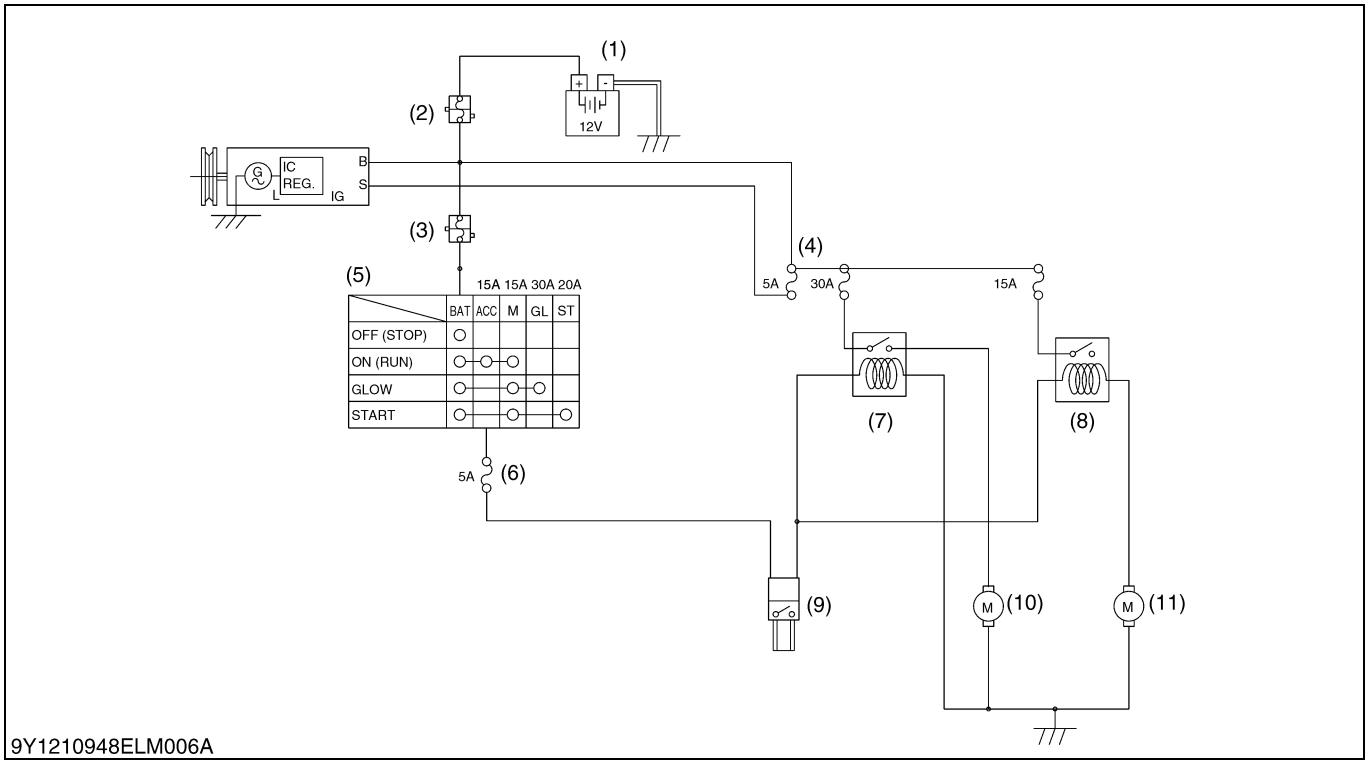
9Y1210948ELM001A

(1) Key Switch
(2) Glow Plug
(3) Slow Blow Fuse (60A)
(4) Slow Blow Fuse (80A)
(5) Battery
(6) Light Switch
(7) Head Light (37.5 W)
(8) Brake Lamp Switch
(9) Work Light Relay (Option)
(10) Beacon Lamp Relay
(11) Beacon Lamp (Option)
(12) Fog Lamp Relay
(13) Fog Lamp (Option)
(14) Work Light (35 W)
(15) Hazard Kit (Option)
(16) Blinker
(17) Combination Lamp (RH) (Option)
(18) Combination Lamp (LH) (Option)
(19) Oil Temperature Switch
(20) Meter Panel
(21) Engine Water Temperature Sensor
(22) 4WD Switch
(23) Oil Pressure Switch
(24) Parking Brake Switch
(25) Brake Fluid SWitch

The lighting system consists of key switch, light switch, head lights, tail lights, etc.

9Y1210948ELM0003US0

6. COOLING SYSTEM

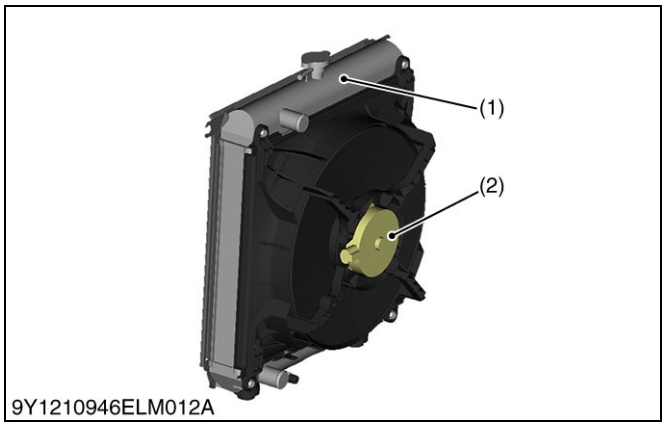


(1) Battery
(2) Slow Blow Fuse (80A)
(3) Slow Blow Fuse (60A)
(4) Fuse
(5) Key Switch
(6) Fuse (5A)
(7) Rear Radiator Fan Motor Relay
(8) Front Radiator Fan Motor Relay
(9) Radiator Fan Motor Switch
(10) Rear Radiator Fan Motor
(11) Front Radiator Fan Motor

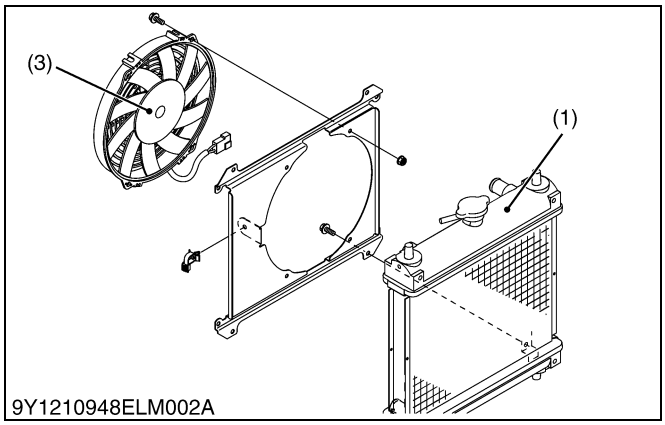
The cooling system consists of radiator fan motor switch, relay, fan motor, etc.

9Y1210948ELM0010US0

[1] FAN MOTOR



9Y1210946ELM012A



9Y1210948ELM002A

The cooling fan of this vehicle is not driven by the engine drive but an electric motor.

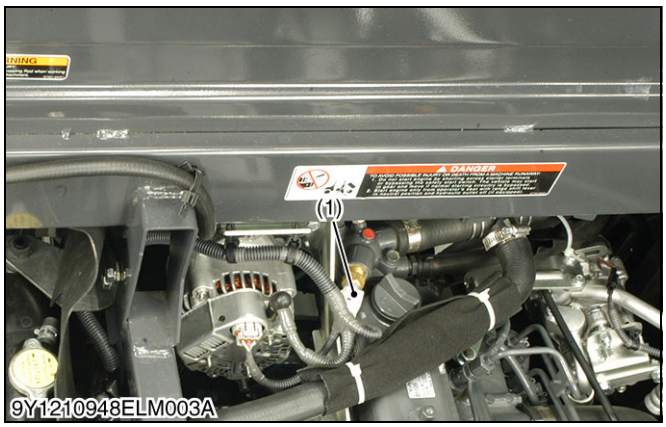
An electric fan can be installed by separating from the engine.

And, it can be operated when it is necessary.

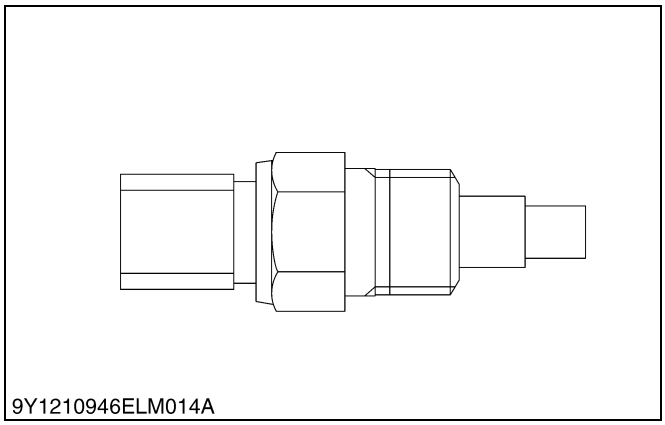
(1) Radiator
(2) Front Radiator Fan Motor
(3) Rear Radiator Fan Motor

9Y1210948ELM0004US0

[2] RADIATOR FAN MOTOR SWITCH



9Y1210948ELM003A


9Y1210946ELM014A

The radiator fan motor switch is installed to the water flange of engine, and its tip is in touch with the coolant.

The fan motor rotates when the coolant temperature goes up more than the specified value.

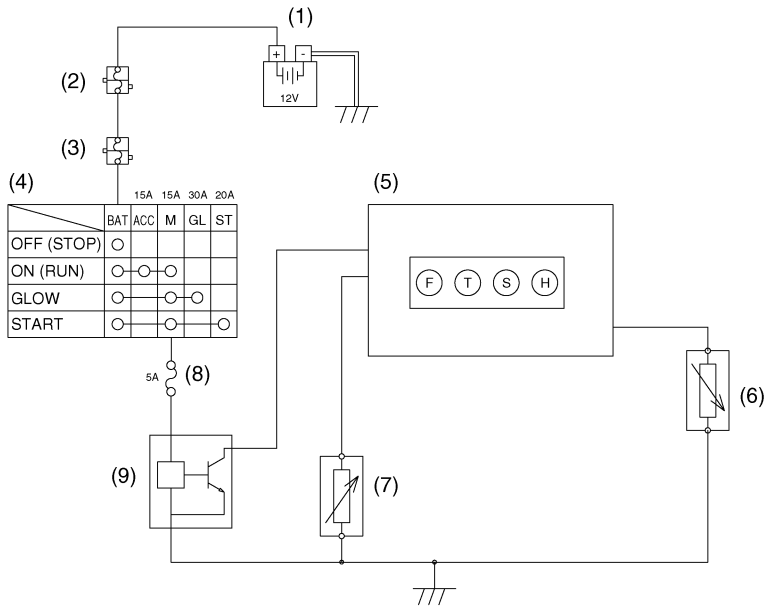
When the coolant temperature falls below the specified value, the fan motor stops.

Characteristics of Radiator Fan Motor Switch		
Type	Operation Temperature	
	Fan motor rotate	Fan motor stop
Normally open	87 to 93 °C 189 to 199 °F	83 °C 181 °F

(1) Radiator Fan Motor Switch

9Y1210948ELM0005US0

7. GAUGES



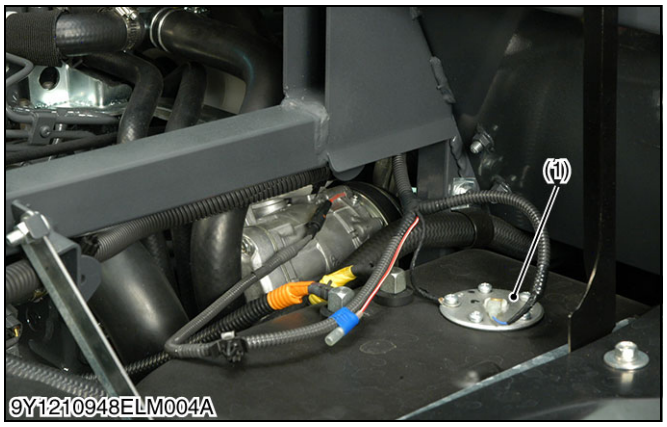
9Y1210946ELM015A

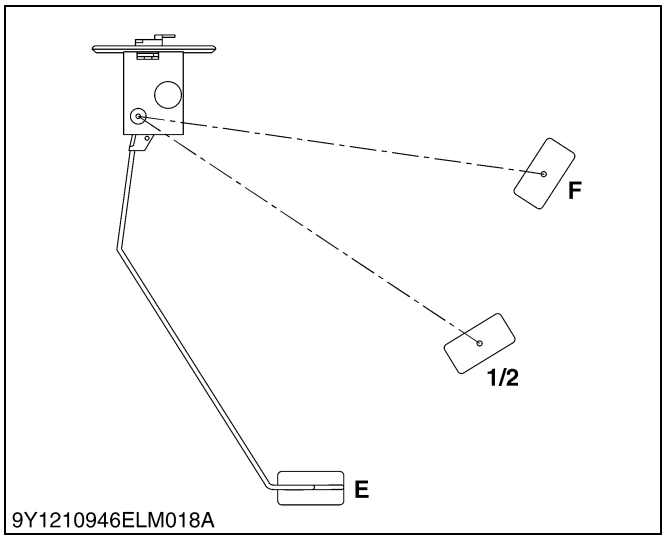
(1) Battery
(2) Slow Blow Fuse (60A)
(3) Slow Blow Fuse (80A)
(4) Key Switch
(5) Meter Panel (CPU)
(6) Fuel Sensor
(7) Engine Water Temperature Sensor
(8) Fuse (5A)
(9) Speed Sensor

The fuel quantity and engine water temperature sensor are indicated by the ammeters. The ammeters indicate each amperage flowing through the fuel level sensor for the fuel quantity detection and through the engine water temperature sensor for the engine water temperature sensor temperature detection.

9Y1210948ELM0011US0

[1] FUEL QUANTITY





Fuel

The remaining fuel quantity is detected by the fuel level sensor installed in the fuel tank and indicated on the fuel gauge. For detection, a float and a resistor are used.

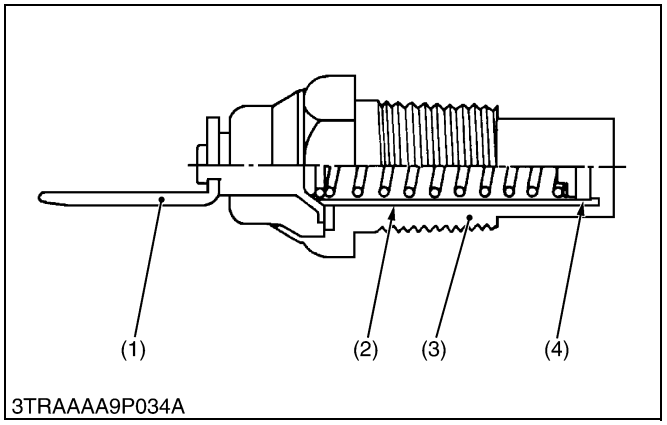
As the float lowers, the resistance of the variable resistor varies. The relation between the amount of fuel and the resistance is as follows.

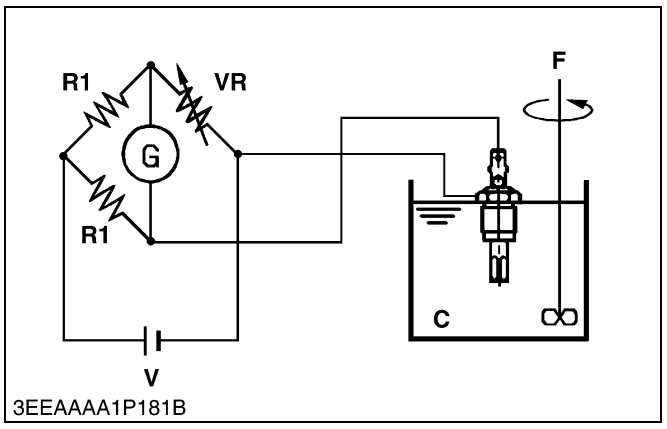
F	1/2	E
1 to 5 Ω	32.5 Ω	103 to 117 Ω

(1) Fuel Level Sensor

9Y1210948ELM0006US0

[2] ENGINE WATER TEMPERATURE SENSOR





Engine Water Temperature Sensor (Thermo Unit)

The engine water temperature sensor is installed to the cylinder head of engine, and its tip is in touch with the coolant. It contains a thermistor (4) whose electrical resistance decreases as the temperature increases.

Current varies with changes in the coolant temperature, and the increases or decreases in the current move the pointer of gauge.

Characteristics of Thermistor		
Temperature	**Resistance of VR: H**	**Condition**
50 °C (122 °F)	153.9 Ω	(A)
80 °C (176 °F)	51.9 Ω	
100 °C (212 °F)	27.4 Ω	
120 °C (248 °F)	16.1 Ω	

★ When galvanometer shows 0 (Zero).

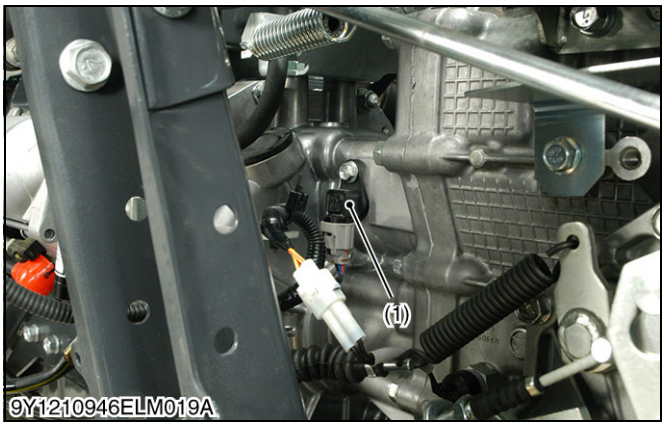
Condition	Setting Value
(A)	**R1**: 54.945 to 55.055 Ω **V**: DC 6.9 to 7.1 V

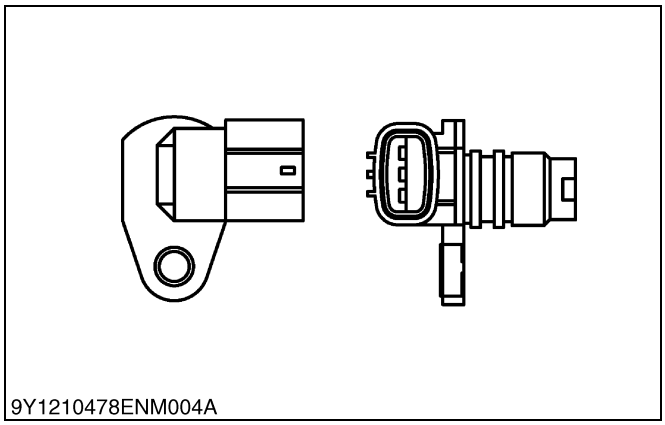
(1) Terminal
(2) Insulator
(3) Body
(4) Thermistor

C: Coolant or Silicon Oil
G: Galvanometer
VR: Variable Resistor
F: Flow Velocity (0.14 to 0.15 m/s)

9Y1210946ELM0030US0

[3] TRAVELING SPEED SENSOR





Measure the traveling speed with the rotation sensor at the left side of the transmission case.

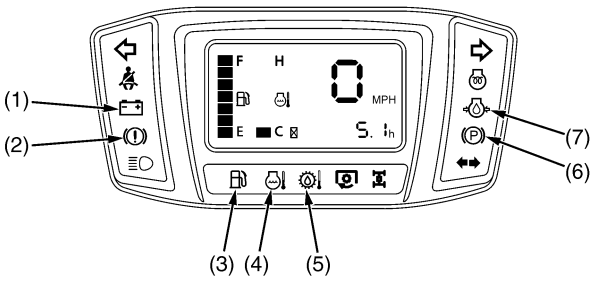
The sensor unit is a MRE (magnetic resistance element) type. For the MRE type, when the pulsar passes the sensor, the magnetic resistance changes and the voltage passing through the sensor changes. This change in voltage is amplified by the internal IC circuit and output to the engine ECU.

(1) Traveling Speed Sensor

9Y1210946ELM0031US0

8. METER PANEL

[1] EASY CHECKER™



9Y1210946ELM020B

If the warning in the Easy Checker™ come on during operation, immediately stop the engine, and find the cause as shown below.

■ **Engine Oil Pressure WARNING Indicator**

If the oil pressure in the engine goes below the prescribed level, the warning lamp in the Easy Checker™ will come on.

■ **Electrical charge WARNING Indicator**

If the alternator in not charging the battery, the Easy Checker™ will come on.

If this should happen during operation, check the electrical charging system.

■ **Low Brake Level WARNING Indicator**

If the brake fluid goes below the prescribed level, the warning lamp in the Easy Checker™ will come on.

If this should in no oil leak in the brake system, and then add Dot3 brake fluid.

■ **VHT Oil Temperature WARNING Indicator**

If the HST temperature goes up above 123 °C (253 °F), and the temperature lasts for 5 seconds, the warning lamp in the Easy Checker™ will come on and the buzzer will sound.

If the HST temperature decrease below 116 °C (241 °F) and the temperature lasts for 5 seconds, the warning lamp in the Easy Checker™ and the buzzer will turn off.

■ **Parking Brake WARNING Indicator**

If the parking brake indicator is on during operation, release the parking brake lever immediately.

The parking brake indicator in the Easy Checker™ comes on if the parking brake is applied.

■ **Engine Overheat WARNING Indicator**

If the coolant temperature goes up above 120 °C (248 °F), and the temperature lasts for 5 seconds, the warning lamp in the Easy Checker™ will come on and the buzzer will sound.

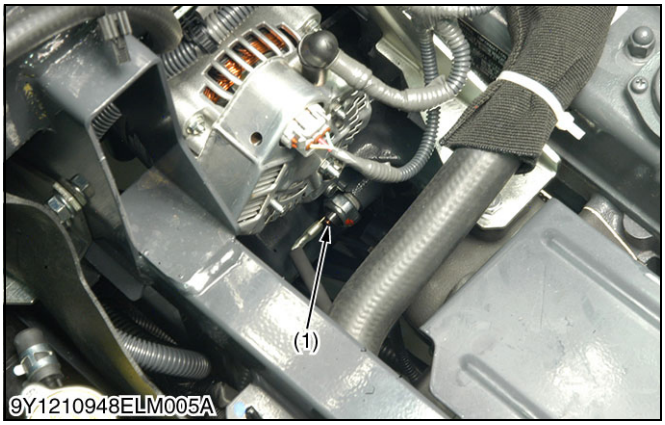
If the coolant temperature decrease below 115 °C (239 °F) and the temperature lasts for 5 seconds, the warning lamp in the Easy Checker™ and the buzzer will turn off.

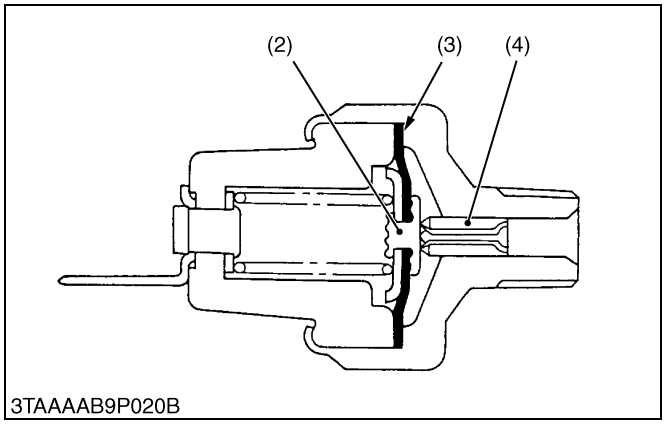
■ **Fuel level Indicator**

If the fuel in the tank goes below the prescribed level (approx. 3.0 L, 0.79 U.S.gals, 0.66 Imp.gals).

(1) Charge Lamp
(2) Brake Fluid Lamp
(3) Fuel Lamp
(4) Overheat Lamp
(5) VHT Oil Temperature Lamp
(6) Parking Brake Lamp
(7) Engine Oil Pressure Lamp

9Y1210948ELM0012US0



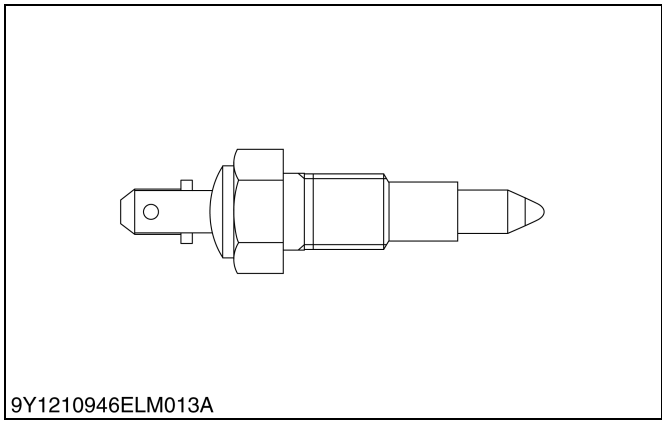


Oil Pressure Switch

While oil pressure is high and the force applied to the diaphragm (3) is larger than the spring tension, the terminal contact (2) is open separated from the body contact (4). If the pressure drops below approx. 49 kPa (0.5 kgf/cm^2, 7.1 psi), the contact closes.

(1) Oil Pressure Switch
(2) Terminal Contact
(3) Diaphragm
(4) Body Contact

9Y1210948ELM0007US0



Oil Temperature Switch

The oil temperature switch is installed to the left side of HST, and its tip is in touch with the fluid.

If the VHT oil overheats, the warning lamp in the Easy Checker™ will come on and the buzzer will sound.

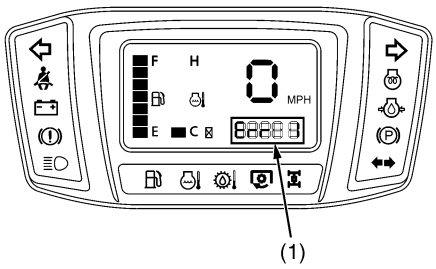
When oil temperature decrease below specified value, the warning lamp in Easy Checker™ and the buzzer will turn off.

Characteristics of VHT Oil Temperature Switch		
Type	Operation Temperatures	
	Lamp and Buzzer ON	Lamp and Buzzer OFF
Normally open	120 to 126 °C 248 to 25 °F	116 °C 241 °F

(1) Oil Temperature Switch

9Y1210946ELM0034US0

[2] ERROR CODE DISPLAY



9Y1210946ELM022A

If trouble should occur at the meter panel, the indicator flashes and error code appears as a warning.

If the trouble is not corrected by restarting the machine, solve the problem according to the following table.

(1) Error Code

Error code	Trouble	Check point or solution
Err 1	Water temperature sensor power circuit trouble	Checking battery voltage or replacing meter panel
Err 2	Fuel sensor power circuit trouble	Checking battery voltage or replacing meter panel
Err 3	Meter panel memory reading trouble	Replacing meter panel

9Y1210946ELM0035US0

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipments Does Not Operate	Battery discharged or damaged	Recharge or replace	G-35, 8-S8
	Battery positive cable disconnected or improperly connected	Repair or replace	8-S7
	Battery negative cable disconnected or improperly connected	Repair or replace	8-S7
	Slow blow fuse blown	Replace	G-60
Fuse Blown Frequently	Short-circuited	Repair or replace	G-58

BATTERY

Symptom	Probable Cause	Solution	Reference Page
Battery Discharges Too Quickly	Battery damaged	Replace	8-S8
	IC Regulator damaged	Replace	8-S28
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Alternator fan belt slipping	Adjust tension	G-37

STARTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Starter Motor Does Not Work	Battery discharged or damaged	Recharge or replace	8-S8
	Slow blow fuse blown	Replace	G-60
	Safety switch improperly adjusted or damaged	Repair or replace	8-S12
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Starter motor damaged	Repair or replace	8-S26
	Key switch damaged	Repair or replace	8-S9
Engine Does Not Stop When Key Switch Is Turned Off Position	Fuse blown (5A)	Replace	G-58
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Engine stop solenoid damaged	Replace	8-S13
	Key switch damaged	Replace	8-S9
Starter Works and Engine Does Not Start	Engine stop solenoid damaged	Replace	8-S13

CHARGING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Charging Lamp Does Not Light When Key Switch Is Turned ON Position	Fuse blown (5A)	Replace	G-58
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Alternator damaged	Repair or replace	8-S28
Charging Lamp Does Not Go Off When Engine Is Operating	Short curcuit between alternator **L** terminal lead and chassis	Repair or replace	–
	Alternator damaged	Repair or replace	8-S28

LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Head Light Does Not Light	Fuse blown (15A)	Replace	G-58
	Light switch damaged	Replace	8-S16
	Bulb blown	Replace	G-60
	Wiring harness disconnected or improperly connected	Repair or replace	–
Tail Light Does Not Light	Fuse blown (15A)	Replace	G-58
	Bulb blown	Replace	G-60
	Wiring harness disconnected or improperly connected	Repair or replace	–
Glow Indicator Lamp Does Not Light When Key Switch Is in Glow Position	Battery discharged or damaged	Recharge or replace	8-S8
	Slow blow fuse blown	Replace	G-60
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Key switch damaged	Replace	8-S9
Parking (Position) Light Does Not Light	Fuse blown (15A)	Replace	G-58
	Parking brake light switch damaged	Repair or replace	8-S18
	Wiring harness disconnected or improperly connected	Repair or replace	–

ENGINE OIL PRESSURE

Symptom	Probable Cause	Solution	Reference Page
Oil Pressure Lamp Lights Up When Engine Is Operating	Engine oil pressure too low	Check and repair	1-S13
	Engine oil insufficient	Fill	G-26
	Oil pressure switch damaged	Replace	8-S17
	Short circuit between oil pressure switch lead and chassis	Repair	–
Oil Pressure Lamp Does Not Light When Key Switch Is Turned ON and Engine Is Not Operating	Oil pressure switch damaged	Replace	8-S17
	Wiring harness disconnected or improperly connected	Repair or replace	–

COOLING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Fan Motor Does Not Rotate When Engine Overheats	Radiator fan motor switch damaged	Replace	8-S21
	Fuse blown (30A)	Replace	G-58
	Radiator fan motor relay damaged	Replace	8-S25
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Radiator fan motor damaged	Replace	8-S22, 8-S22
	Battery discharged or damaged	Recharge or replace	8-S8
Fan Motor Rotates Always (When Key Switch Is ON Position)	Radiator fan motor switch damaged	Replace	8-S21
	Radiator fan motor relay damaged	Replace	8-S25

GAUGES

Symptom	Probable Cause	Solution	Reference Page
Fuel Gauge Does Not Function	Fuel gauge damaged	Replace the panel	–
	Fuel level sensor damaged	Replace	8-S23
	Wiring harness disconnected or improperly connected	Repair or replace	–
Engine Water Temperature Sensor Gauge Does Not Function	Engine water temperature sensor gauge damaged	Replace the panel	–
	Engine water temperature sensor damaged	Replace	8-S24
	Wiring harness disconnected or improperly connected	Repair or replace	–

HORN

Symptom	Probable Cause	Solution	Reference Page
Horn Does Not Sound When Horn Button Is Pushes	Fuse blown (10A)	Replace	G-58
	Horn switch damaged	Replace	8-S25
	Horn damaged	Replace	–
	Wiring harness disconnected or improperly connected	Repair or replace	–

9Y1210948ELS0001US0

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Battery	Voltage	More then 12 V	–
	Potential Difference	Less than 0.1 V	–
	Charging Current	10 to 15A	–
	Charging Voltage	140 to 15A	–
	Dynamo speed	5200 min^{-1} (rpm)	–
Glow Plug	Resistance	Approx. 1.1 Ω	–
Alternator	No-load Voltage	More then 14 V	–
• Stator	Resistance	Less than 0.1 Ω	–
• Rotor	Resistance	2.9 Ω	–
• Slip Ring	O.D.	14.4 mm 0.567 in.	14.0 mm 0.551 in.
• Brush	Length	10.5 mm 0.413 in.	8.4 mm 0.331 in.
Thermo Switch	Working Temperature	120 to 126 °C 24.80 to 258.8 °F	–
Starter • Commutator	O.D.	30.0 mm 1.181 in.	29.0 mm 1.142 in.
• Commutator	Difference of O.D.'s	Less than 0.02 mm 0.0008 in.	0.05 mm 0.0020 in.
• Mica	Undercut	0.50 to 0.80 mm 0.020 to 0.031 in.	0.2 mm 0.008 in.
• Brush	Length	14.0 mm 0.551 in.	9.0 mm 0.35 in.

9Y1210948ELS0002US0

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: Refer to "5. TIGHTENING TORQUES" on page G-14.)

Item	N·m	kgf·m	lbf·ft
Starter (**B** terminal nut)	5.9 to 11	0.60 to 1.2	4.4 to 8.6
Alternator (Pulley nut)	58.4 to 78.9	5.96 to 8.04	43.1 to 58.1

9Y1210948ELS0003US0

4. CHECKING, DISASSEMBLING AND SERVICING

CAUTION

- **To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.**
- **Never remove the battery cap while the engine is operating.**
- **Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately.**
- **Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.**

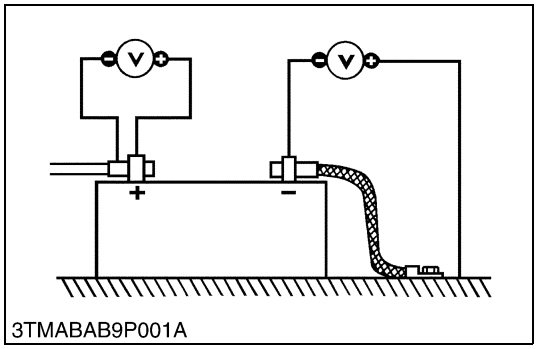
IMPORTANT

- **If the machine is to be operated for a short time without battery (using a slave battery for starting), use additional current (lights) while engine is operating and insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.**

9Y1210946ELS0004US0

[1] CHECKING AND ADJUSTING

(1) Battery



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Battery Voltage

1. Stop the engine and turn the key switch off.
2. Connect the COM (-) lead of the voltmeter to the battery's negative terminal post and the (+) lead to the positive terminal post, and measure the battery voltage.
3. If the battery voltage is less than the factory specification, check the battery specific gravity and recharge the battery.

Battery voltage	Factory specification	More than 12 V

9Y1210948ELS0004US0

Battery Terminal Connection

1. Turn the key switch on, and turn on the head light.
2. Measure the voltage with a voltmeter across the battery's positive terminal post and the cable terminal, and the voltage across the battery's negative terminal post and the chassis.
3. If the measurement exceeds the factory specification, clean the battery terminal posts and cable clamps, and tighten them firmly.

Potential difference	Factory specification	Less than 0.1 V

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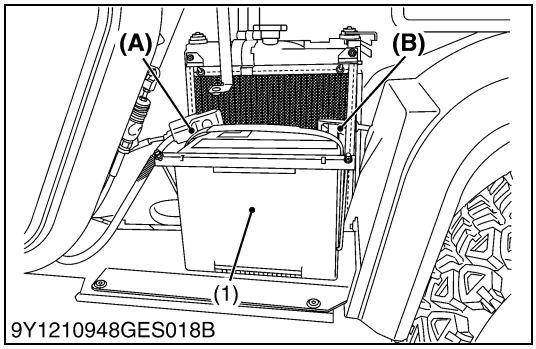

Battery Condition and Charging

■ **NOTE**

- **Follow the manufacture's instructions when you change battery or do maintenance.**

■ **IMPORTANT**

- **Mishandling the battery shortens the service life and adds to maintenance costs.**
  The original battery is maintenance free, but needs some servicing.
  If the battery is week, the engine will be difficult to start and the lights will be dim. It is important to check the battery periodically.
- **When exchanging an old battery for new one, use battery of equal specifications in table below.**

Battery Type	Volts (V)	Reserve Capacity (min)	Cold Cranking Amps	Capacity at 20 hrs (A. H.)	Normal Charging Rate (A)
624FMF	12	120	650	58	17.4

(For non-accessible maintenance-free type batteries.)

Maintenance-free, non-accessible batteries are designed to eliminate the need to add water. Yet the volume of electrolyte above plates may eventually become depleted due to abnormal conditions such as high heat or improper regulator setting. Use a voltmeter to check the state of charge. (See reference chart below to determine if charging is necessary.)

Battery voltage	Reference state of charge
12.6	100 % (Full charge)
12.4	75 %
12.2	50 %
12.0	25 %
11.8	0 %

(1) Battery

(A) Positive Terminal
(B) Negative Terminal

9Y1210948ELS0005US0

(2) Key Switch

Key Switch

1. Disconnect the connector and remove the key switch (1).
2. Perform the following checks.

(1) Key Switch

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Connector Voltage

1. Measure the voltage with a voltmeter across the connector **B** (white/red) terminal and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is damaged.

Voltage	Connector **B** (white/red) terminal – Chassis	Approx. battery voltage

(1) Connector

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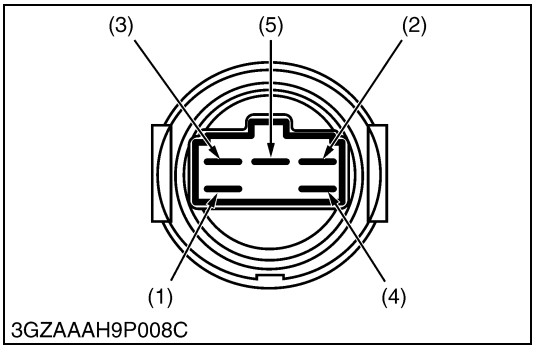

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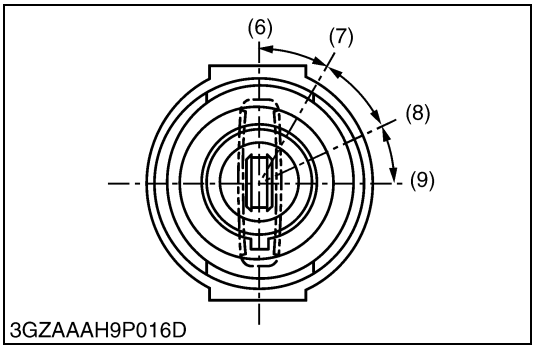

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Terminal Continuity

1. Remove the key switch from the instrument panel.
2. Measure the resistance with an ohmmeter across terminals when the key switch is set at **"OFF"**, **"ON"**, **"GLOW"** and **"START"** position.
3. If the resistance values specified below are not indicated, the key switch is damaged.

1) Key switch is set at "OFF" position

	B terminal	**ACC** terminal	**M** terminal	**G** terminal	**ST** terminal
B terminal	–	Infinity	Infinity	Infinity	Infinity
ACC terminal	Infinity	–	Infinity	Infinity	Infinity
M terminal	Infinity	Infinity	–	Infinity	Infinity
G terminal	Infinity	Infinity	Infinity	–	Infinity
ST terminal	Infinity	Infinity	Infinity	Infinity	–

2) Key switch is set at "ON" position

	B terminal	**ACC** terminal	**M** terminal	**G** terminal	**ST** terminal
B terminal	–	Continuity	Continuity	Infinity	Infinity
ACC terminal	Continuity	–	Continuity	Infinity	Infinity
M terminal	Continuity	Continuity	–	Infinity	Infinity
G terminal	Infinity	Infinity	Infinity	–	Infinity
ST terminal	Infinity	Infinity	Infinity	Infinity	–

3) Key switch is set at "GLOW" position

	B terminal	**ACC** terminal	**M** terminal	**G** terminal	**ST** terminal
B terminal	–	Infinity	Continuity	Continuity	Infinity
ACC terminal	Infinity	–	Infinity	Infinity	Infinity
M terminal	Continuity	Infinity	–	Continuity	Infinity
G terminal	Continuity	Infinity	Continuity	–	Infinity
ST terminal	Infinity	Infinity	Infinity	Infinity	–

4) Key switch is set at "START" position

	B terminal	**ACC** terminal	**M** terminal	**G** terminal	**ST** terminal
B terminal	–	Infinity	Continuity	Infinity	Continuity
ACC terminal	Infinity	–	Continuity	Infinity	Infinity
M terminal	Continuity	Continuity	–	Infinity	Continuity
G terminal	Infinity	Infinity	Infinity	–	Continuity
ST terminal	Continuity	Infinity	Continuity	Continuity	–

(1) **B** Terminal
(2) **ACC** Terminal
(3) **M** Terminal
(4) **G** Terminal
(5) **ST** Terminal
(6) **OFF Position**
(7) **ON Position**
(8) **GLOW** Position
(9) **START** Position

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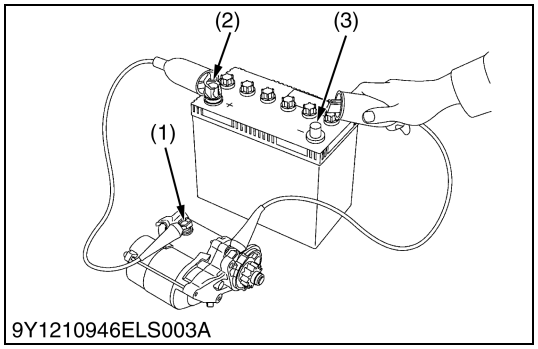
(3) Starter



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Motor Test

CAUTION

- **Secure the starter to prevent it from jumping up and down while testing the motor.**

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable from the battery.
3. Disconnect the leads from the starter **B** terminal.
4. Remove the starter from the engine.
5. Connect a jumper lead from the starter **C** terminal (1) to the battery positive terminal (2).
6. Connect a jumper lead momentarily between the starter's body and the battery negative terminal (3).
7. If the motor does not start starter is failure.
   Repair or replace the starter.

NOTE

- **B terminal: It is the terminal which connects the cable from the battery to the starter.**
- **C terminal: It is the terminal which connects the cable from the motor to the magnet switch.**

(1) **C** Terminal
(2) Positive Terminal
(3) Negative Terminal

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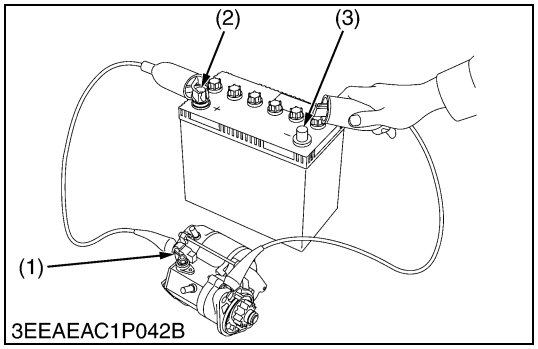

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Magnetic Switch Test

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable from the battery.
3. Disconnect the leads from the starter **B** terminal.
4. Remove the starter from the engine.
5. Connect a jumper lead from the starter **S** terminal (1) to the battery positive terminal (2).
6. Connect a jumper lead momentarily between the starter's body and the battery negative terminal (3).
7. If the pinion gear does not pop out, the magnetic switch is failure.
   Repair or replace the starter.

NOTE

- **B terminal: It is the terminal which connects the cable from the battery to the starter.**
- **S terminal: It is the terminal which connects the cable from the starter switch to the magnet switch.**

(1) **S** Terminal
(2) Positive Terminal
(3) Negative Terminal

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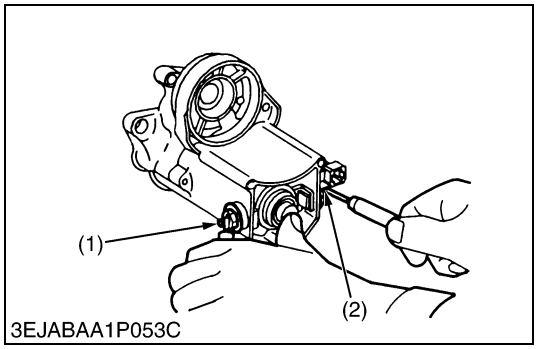

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Magnet Switch Continuity Test

1. Check the continuity across the **C** terminal (1) and the **B** terminal (2) with a circuit tester, pushing in the plunger.
2. If not continuous or if a certain value is indicated, replace the magnet switch.

(1) **C** Terminal
(2) **B** Terminal

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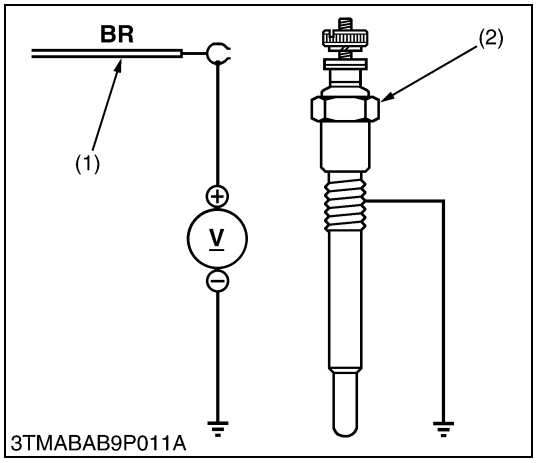
(4) Glow Plug



Lead Terminal Voltage

1. Disconnect the wiring lead (1) from the glow plug (2) after turning the key switch off.
2. Turn the key switch key to the **"PREHEAT"** position, and measure the voltage between the lead terminal and the chassis.
3. Turn the key switch key to the **"START"** position, and measure the voltage with a voltmeter between the lead terminal and the chassis.
4. If the voltage at either position differs from the battery voltage, the wiring harness or key switch is damaged.

Voltage (Lead terminal – Chassis)	Key switch key at **"PREHEAT"**	Approx. battery voltage
	Key switch key at **"START"**	Approx. battery voltage

(1) Wiring Lead (Positive) (2) Glow Plug

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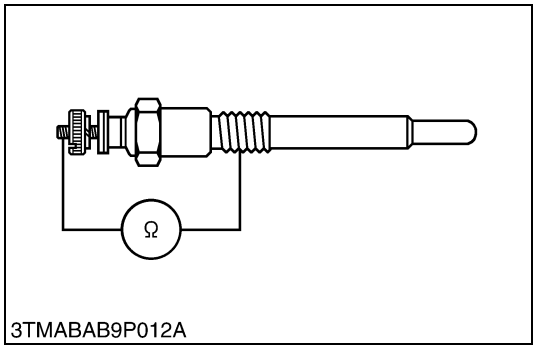

Glow Plug Continuity

1. Disconnect the lead from the glow plugs.
2. Measure the resistance with an ohmmeter between the glow plug terminal and the chassis.
3. If 0 ohm is indicated, the screw at the tip of the glow plug and the housing are short-circuited.
4. If the factory specification is not indicated, glow plug resistance the glow plug is damaged.

Glow plug resistance	Factory specification	Approx. 1.1 Ω

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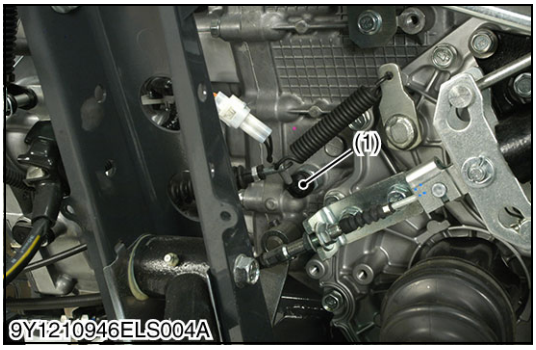
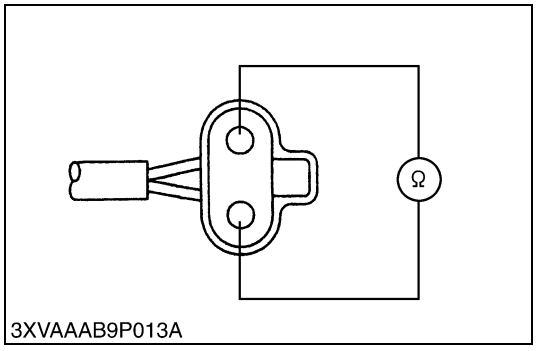
(5) Safety Switch





Safety Switch (Neutral Switch) Continuity

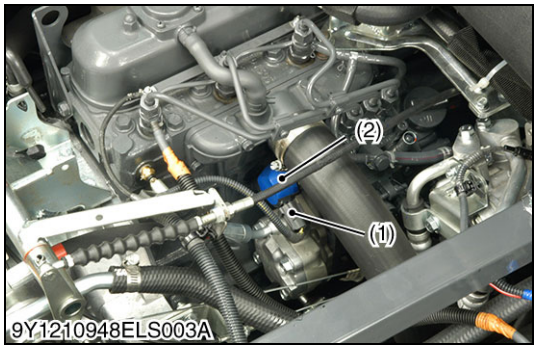
1. Remove the safety switch leads.
2. Connect the circuit tester to the safety switch leads.
3. Measure the resistance between leads.
4. If the safety switch is problem, replace it.

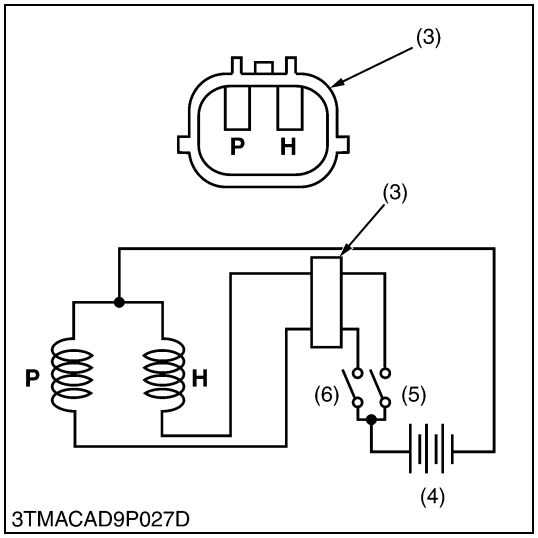
Resistance (Across switch terminal)	Except the neutral position	Infinity
	Neutral position	Continuity

(1) Safety Switch for Main Shift Lever

9Y1210946ELS0016US0

(6) Engine Stop Solenoid





Engine Stop Solenoid

1. Disconnect the **2P** connector (1) from the engine stop solenoid (2).
2. Remove the engine stop solenoid (2) from the engine.
3. Connect the jumper leads from the pulling coil **P** terminal to the switch (5), and from switch (5) to the battery positive terminal.
4. Connect the jumper leads from the holding coil **H** terminal to the switch (6), and from switch (6) to the battery positive terminal.
5. Connect the jumper leads from the engine stop solenoid body to the battery negative terminal.
6. When switch (6) is turn on, the plunger pulls into the solenoid body and then turn off the switch (6), the plunger comes out.
7. Turn on the switch (5) then turn on the switch (6), the plunger pulls into the solenoid body and it keeps in holding position after turning off the switch (6).
8. If the plunger is not attracted, the engine stop solenoid is damaged.

■ **IMPORTANT**

- **Never apply the current for pulling coil more than two seconds when inspecting.**

(1) **2P** Connector
(2) Engine Stop Solenoid
(3) Connector (of Engine Stop Solenoid)
(4) Battery
(5) Switch for Holding Coil
(6) Switch for Pulling Coil

P: Terminal for Pulling Coil
H: Terminal for Holding Coil

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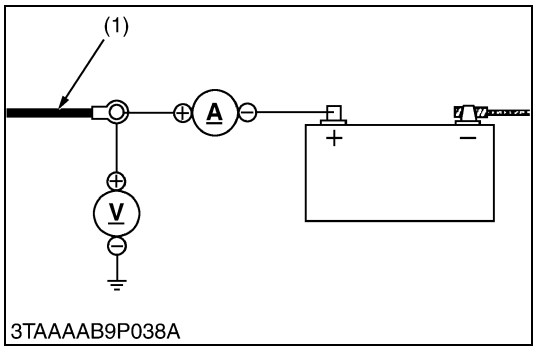
(7) Charging System



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Battery Charging Current

1. After starting the engine, disconnect the battery positive cord (+), and connect an ammeter and voltmeter. Then switch on all electrical loads (such as head lights) and measure the charging current.

■ **NOTE**
- **Connect an ammeter only after starting the engine.**
- **When the electrical loads is considerably low or the battery is fully charged, the specified reading may not be obtained.**

Current	Factory specification	14 to 15A
Voltage		14 to 15A
Dynamo speed		5200 min^{-1} (rpm)

(1) Battery Positive Cord

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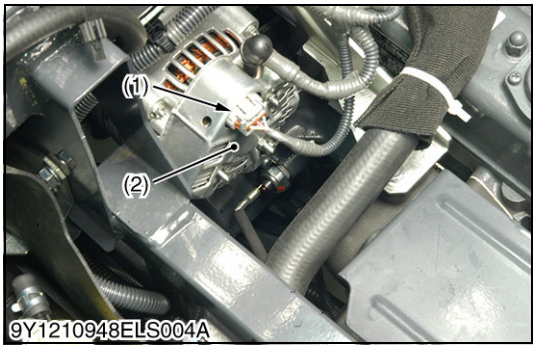

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Alternator

1. Disconnect the **3P** connector (3) from alternator after turning the key switch **OFF**.
2. Perform the following checkings.

(1) **B** Terminal
(2) Alternator
(3) **3P** Connector

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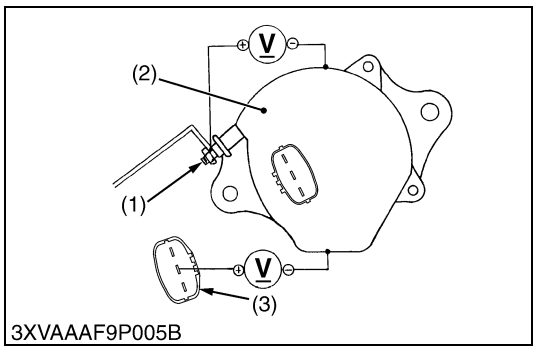

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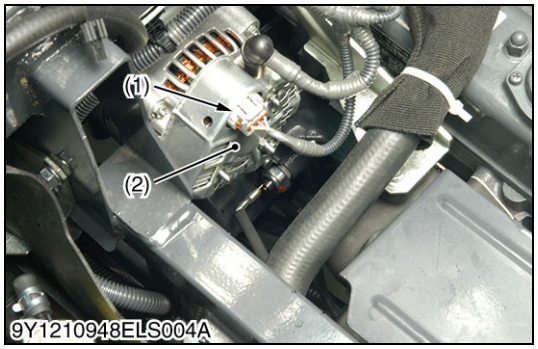

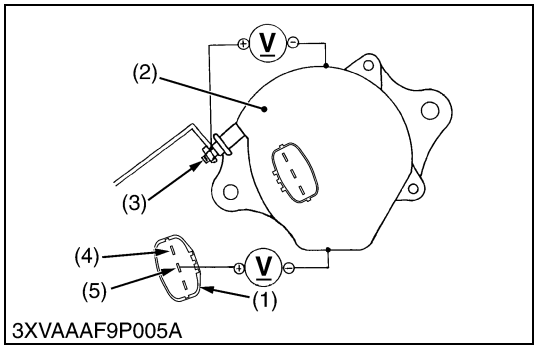

Connector Voltage

1. Disconnect the **3P** connector (1) from the alternator (2) after turning the main switch **OFF**.
2. Measure the voltage between the **B** terminal (3) and the chassis.
3. Turn the main switch **ON**. Measure the voltage between the **IG** terminal (5) and the chassis.

Voltage (Key switch at **OFF**)	**B** Terminal – Chassis	Approx. battery voltage
Voltage (Key switch at **ON**)	**IG** Terminal – Chassis	Approx. battery voltage

(1) **3P** Connector
(2) Alternator
(3) **B** Terminal
(4) **L** Terminal
(5) **IG** Terminal

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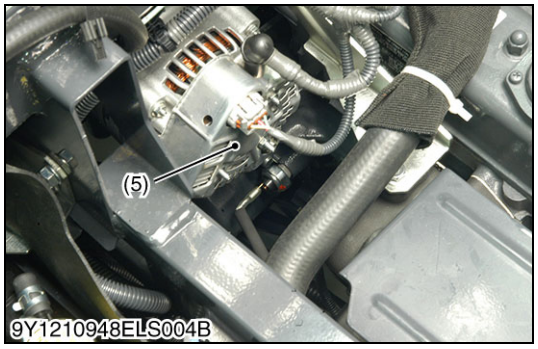

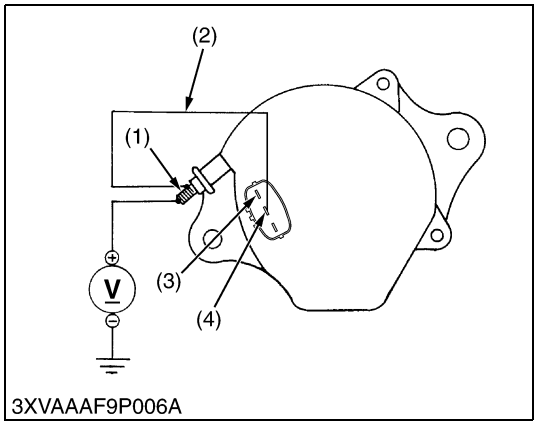

No-Load Test

1. Connect the **3P** connector to previous positions of the alternator after turning the main switch **OFF**.
2. Connect the jumper lead (2) between **IG** terminal (4) and **B** terminal (1).
3. Start the engine and then set at idling speed.
4. Disconnect the negative cable from the battery.
5. Measure the voltage between the **B** terminal (1) and the chassis.
6. If the measurement is less than the factory specification, disassemble the alternator and check the IC regulator.

Voltage	Factory specification	More than 14 V

(Reference)

- Once the engine has started, the alternator temperature rises quickly up to an ambient temperature of 70 to 90 °C (158 to 194 °F). As the temperature goes higher than 50 °C (122 °F), the alternator voltage slowly drops; at higher than 100 °C (212 °F), it drops by about 1 V.

(1) **B** Terminal
(2) Jumper Lead
(3) **L** Terminal
(4) **IG** Terminal
(5) Alternator

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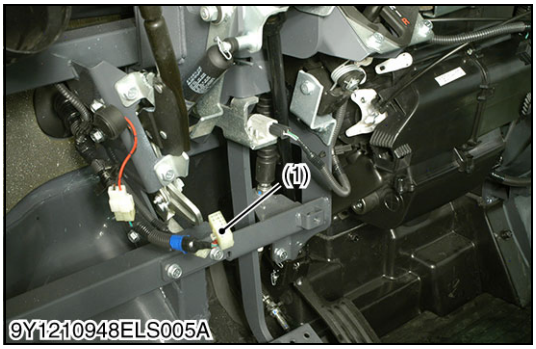
(8) Lighting System



Light Switch

1. Disconnect the connector (1) and remove the light switch (2).
2. Remove the light switch (2) and perform the following checks **1)**.

(1) Connector
(2) Light Switch

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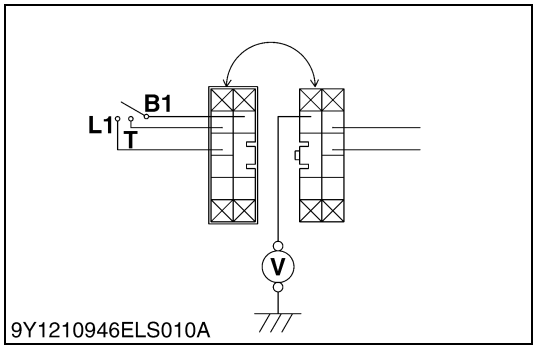

1) Connector Voltage

1. Connect the light switch connector to the main wire harness.
2. Measure the voltage with a voltmeter across the connector **B1** terminal and chassis when the key switch is **ON** position.
3. If the voltage differs from the battery voltage, the wiring harness and key switch is damaged.

Voltage	**B1** terminal – Chassis	Battery voltage

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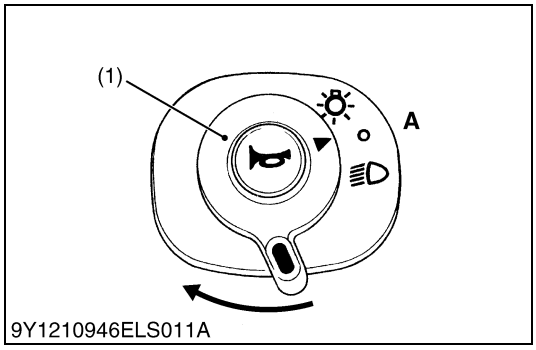
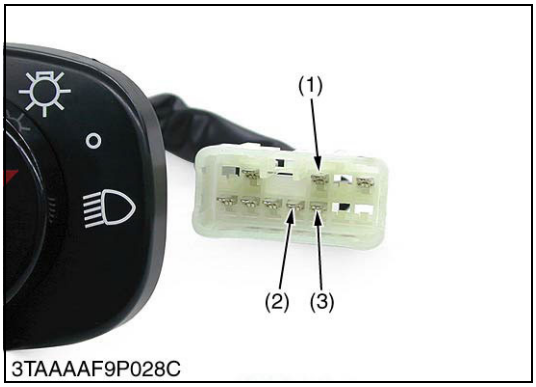


2) Head Light Switch Continuity when Setting Switch at "OFF" Position

1. Set the light switch to the **OFF** position.
2. Measure the resistance with an ohmmeter across the red / yellow lead (1) to the orange lead (3), the red / yellow lead (1) to the yellow lead (2).
3. If infinity is not indicated, the head light switch is damaged.

Resistance (Switch at **OFF** position)	Red / Yellow lead (1) – Orange lead (3)	Infinity
	Red / Yellow lead (1) – Yellow lead (2)	



(1) Red / Yellow Lead
(2) Yellow Lead
(3) Orange Lead

A: Head Light "OFF" Position

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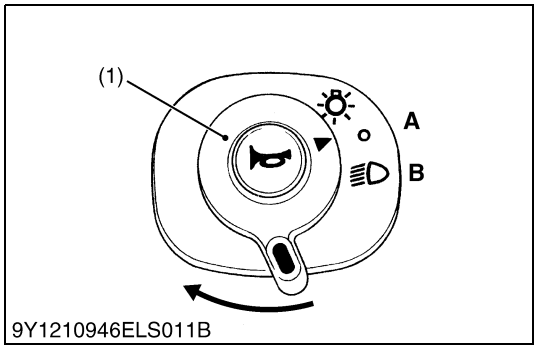

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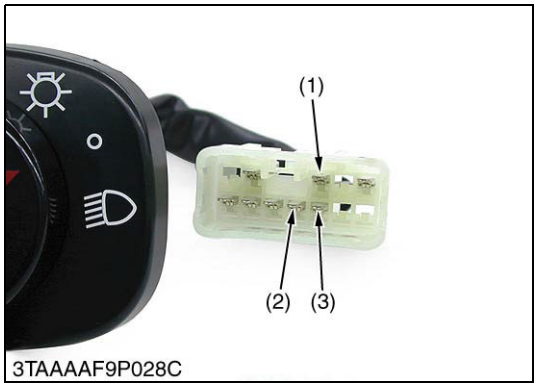

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3) Head Light Switch Continuity when Setting Switch at "ON" Position

1. Set the light switch to the **ON** position.
2. Measure the resistance with an ohmmeter across the red / yellow lead (1) to the orange lead (3) and the red / yellow lead (1) to the yellow lead (2).
3. If infinity is not indicated, the head light switch is damaged.

Resistance (Switch at **ON** position)	Red / Yellow lead (1) – Orange lead (3)	Continuity
	Red / Yellow lead (1) – Yellow lead (2)	

(1) Red / Yellow Lead
(2) Yellow Lead
(3) Orange Lead

A: Head Light "OFF" Position
B: Head Light "ON" Position

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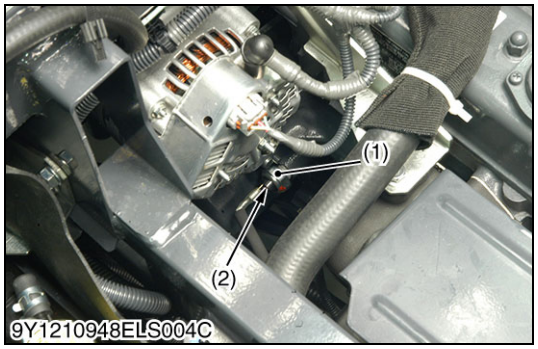

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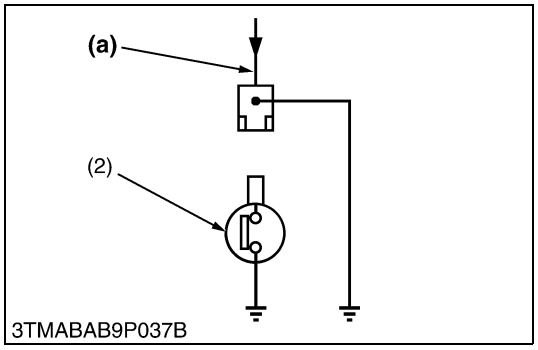
Engine Oil Pressure Lamp

1. Disconnect the wiring lead (2) from the engine oil pressure switch after turning the key switch **OFF**.
2. Turn the key switch **ON** and connect a jumper lead from the lead to the chassis.
3. If the engine oil pressure indicator lamp does not light, the wiring harness is damaged.

(1) Engine Oil Pressure Switch
(2) Wiring Lead

(a) From Oil Pressure Lamp

9Y1210948ELS0014US0



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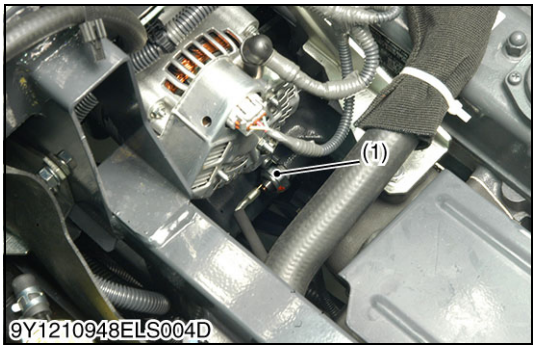

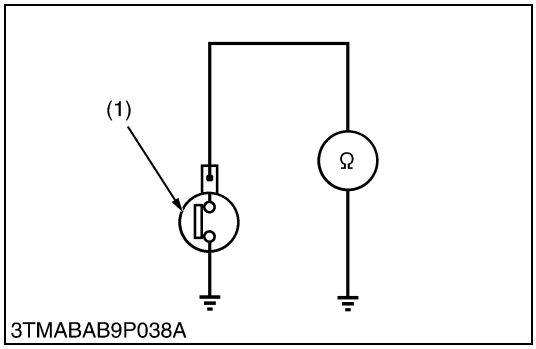

Engine Oil Pressure Switch Continuity

1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 ohm is not indicated in the normal state, the switch is damaged.
3. If infinity is not indicated at pressure over 49 kPa (0.50 kgf/cm^2, 7.1 psi), the switch is damaged.

Resistance (Switch terminal – Chassis)	In normal state	Continuity
Voltage	At pressure over approx. 49 kPa (0.50 kgf/cm^2, 7.1 psi)	Infinity

(1) Engine Oil Pressure Switch

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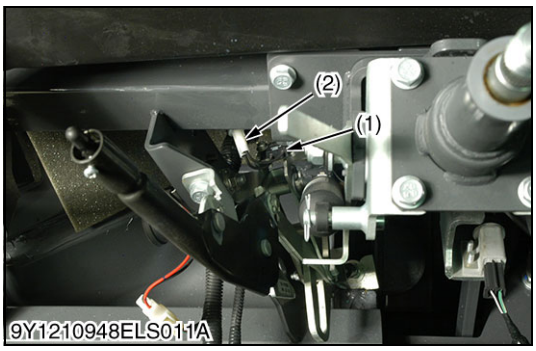
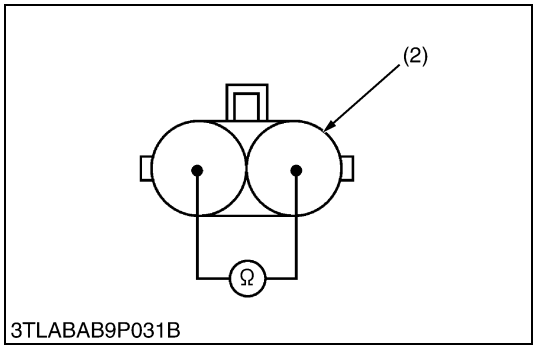




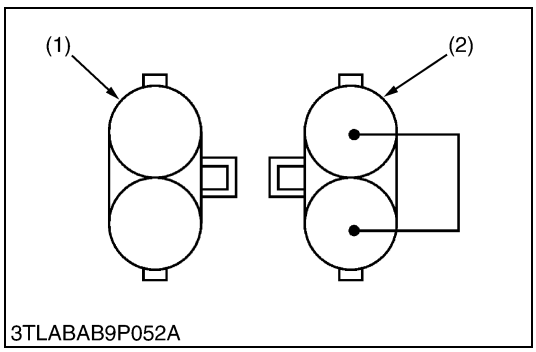
Parking Brake Switch Continuity

1. Disconnect the connector from the parking brake switch (1) after turning the key switch **"OFF"**.
2. Measure the resistance across the two terminals.
3. If continuity is not indicated, the switch is damaged.

Resistance (Across switch terminals)	In normal state	Continuity

(1) Parking Brake Switch (2) Connector of Parking Brake Switch

9Y1210948ELS0016US0



Parking Brake Switch Panel and Wiring Harness

1. Disconnect the connector from the parking brake switch after turning the key switch **"OFF"**.
2. Turn the key switch **"ON"** and connect a jumper lead between the connector terminals of wiring harness.
3. If the parking brake indicator lamp does not light, the panel circuit or wiring harness is damaged.

(1) Connector of Parking Brake Switch (2) Connector of Wiring Harness

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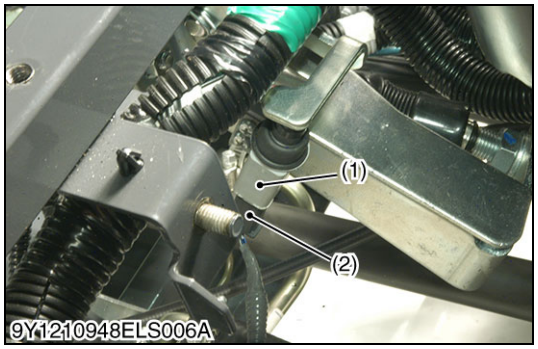

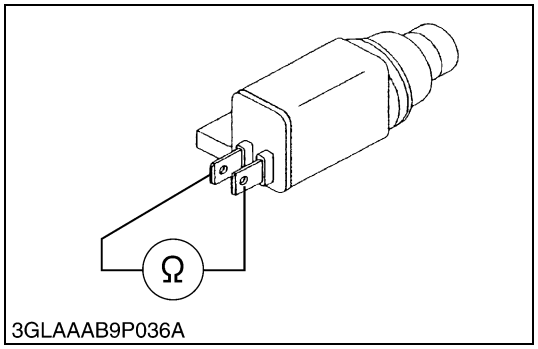

4WD Switch Continuity

1. Remove the side cover.
2. Disconnect the connector (2).
3. Connect the circuit tester to the 4WD switch leads.
4. Measure the resistance between leads.
5. If the 4WD switch (1) is problem, replace it.

Resistance (Across switch terminal)	When switch is pushed	Infinity
	When switch is released	Continuity

(1) 4WD Switch (2) Connector

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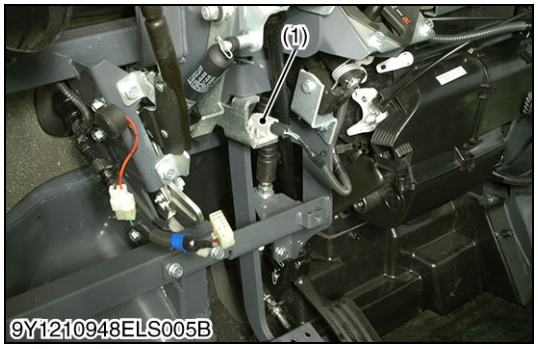

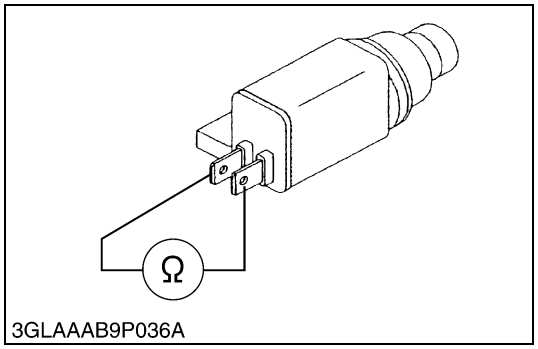

Brake Lamp Switch Continuity

1. Remove the brake lamp switch leads.
2. Connect the circuit tester to the brake lamp switch leads.
3. Measure the resistance between leads.
4. If the safety switch is problem, replace it.

Resistance	When switch is pushed	Infinity
	When switch is released	Continuity

(1) Brake Switch

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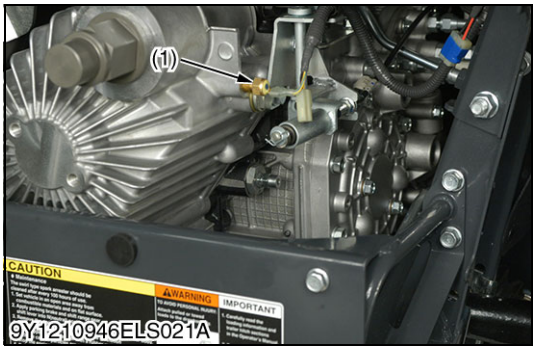
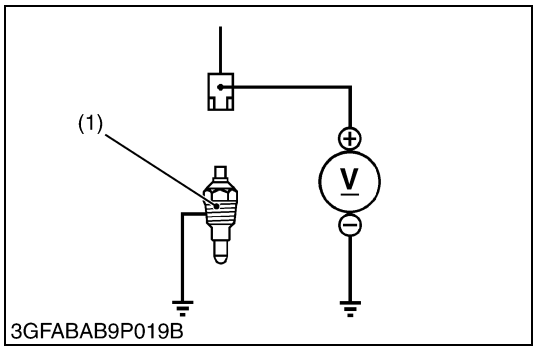




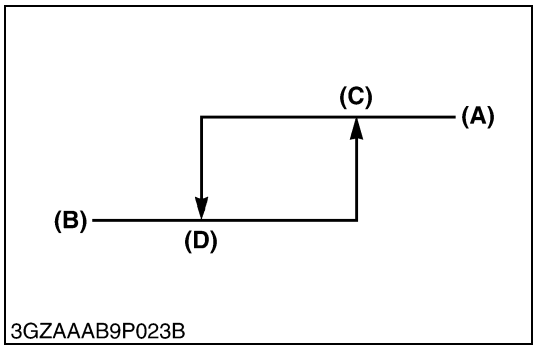
Oil Temperature Alarm Switch Connector Voltage

1. Disconnect the **1P** connector from the oil temperature alarm switch (1).
2. Turn the key switch to the **ON** position, and measure the voltage with a voltmeter between the connector terminal and the chassis.
3. If no voltage is indicated, the wiring harness is damaged.

Voltage (Connector terminal – Chassis)	Factory specification	Positive voltage

(1) Oil Temperature Alarm Switch

9Y1210946ELS0036US0



Thermo Switch Continuity

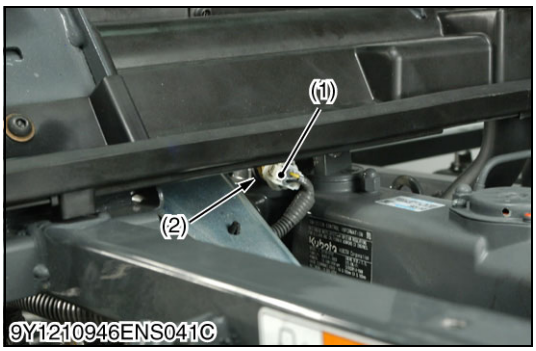
1. Disconnect the **1P** connector, and remove the thermo switch.
2. Using an ohmmeter, check for continuity between the switch terminal and the chassis.
3. If infinity is indicated at temperature over between specifications, the switch is damaged.

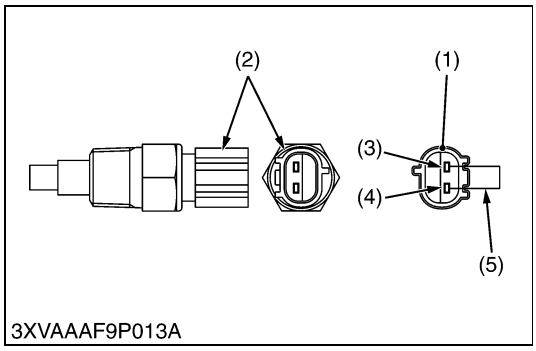
Working temperature	Factory specification	120 to 126 °C 24.80 to 258.8 °F

(A) ON
(B) OFF
(C) 120 to 126 °C (248.0 to 258.8 °F)
(D) 116 °C (240.8 °F) or more

9Y1210946ELS0037US0

(9) Cooling System





Radiator Fan Motor Wiring Harness

1. Disconnect the **2P** connector (1) from the radiator fan motor switch (2) after turning the key switch **OFF**.
2. Turn the key switch **ON** and connect a jumper lead (5) from the connector terminal **1** (3) to the connector terminal **2** (4).
3. If the fan motor does not rotate, wiring harness or fan motor relay is damaged.

(1) **2P** Connector
(2) Radiator Fan Motor Switch
(3) Connector Terminal **1** (to Fan Motor Relay)
(4) Connector Terminal **2** (to Grand)
(5) Jumper Lead

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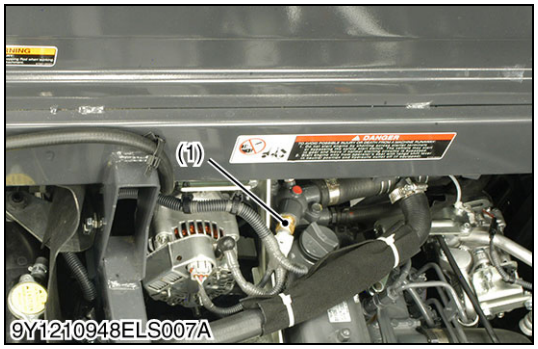

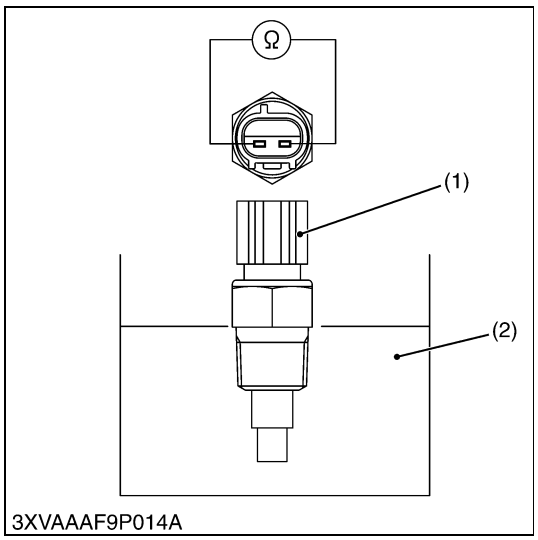

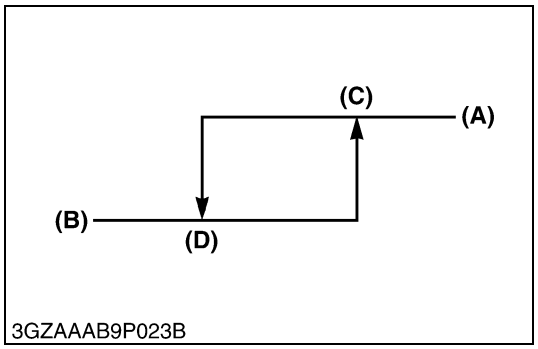

Radiator Fan Motor Switch

1. Measure the resistance with an ohmmeter across the switch terminals.
2. If infinity is not indicated when the coolant temperature is lower than 83 °C (181 °F), the switch is damaged.
3. If 0 ohms is not indicated when the coolant temperature is higher than 87 to 93 °C (189 to 199 °F), the switch is damaged.

Resistance	At coolant temperature lower than 83 °C (181 °F)	Infinity
	At coolant temperature more than 87 to 93 °C (189 to 199 °F)	Continuity

(1) Radiator Fan Motor Switch
(2) Coolant

(A) ON
(B) OFF
(C) 87 to 93 °C (189 to 199 °F)
(D) 83 °C (181 °F)

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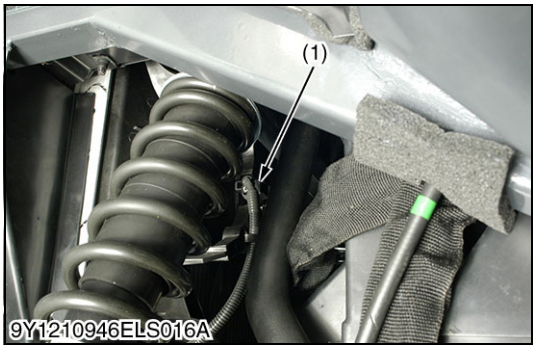

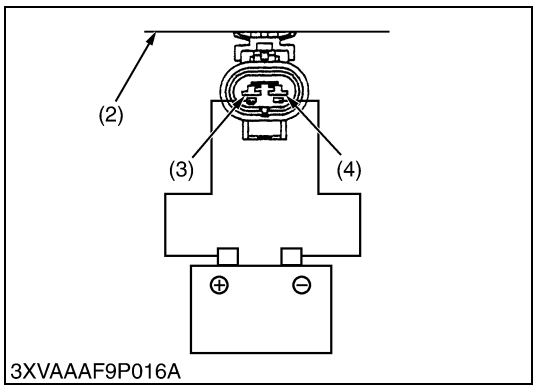

Front Radiator Fan Motor

1. Disconnect the **2P** connector (1) of fan motor after turning the key switch **OFF**.
2. Connect a jumper lead from the **1** terminal (3) to the battery positive terminal post.
3. Connect a jumper lead momentarily between the **2** terminal (4) and the battery negative terminal post.
4. If the fan motor does not start replace it.

(1) **2P** Connector
(2) Radiator
(3) **1** Terminal (Positive Side)
(4) **2** Terminal (Negative Side)

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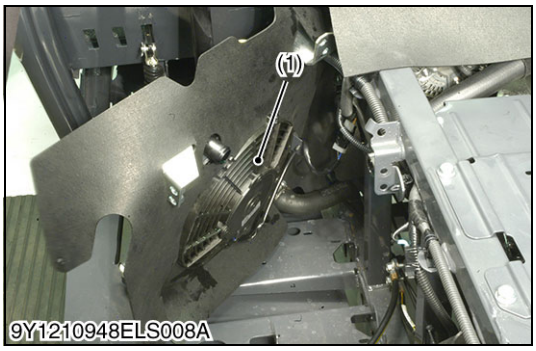

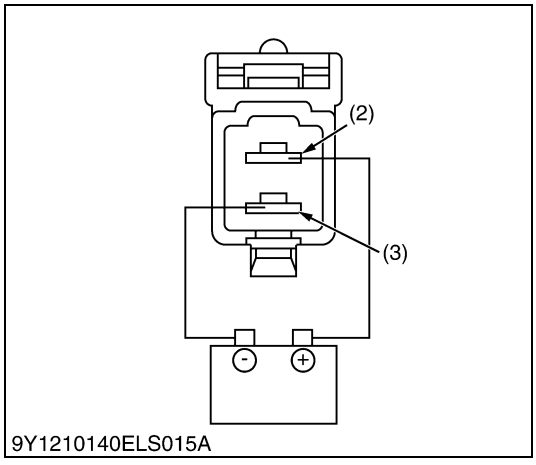

Rear Radiator Fan Motor

1. Disconnect the connector of cooling fan motor (1) after turning the main switch off.
2. Connect a jumper lead from the terminal **1** (2) to the battery positive terminal post.
3. Connect a jumper lead momentarily between the terminal **2** (3) and the battery negative terminal post.
4. If the cooling fan motor (1) does not start replace the new one.

(1) Cooling Fan Motor
(2) Terminal **1** (Positive Side)
(3) Terminal **2** (Negative Side)

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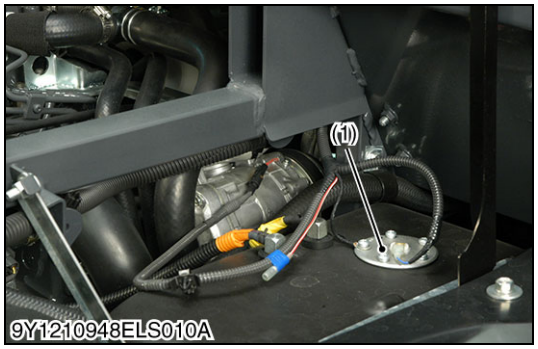
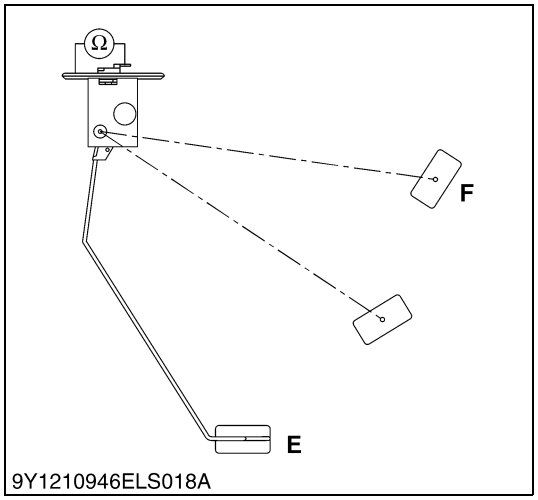
(10) Gauges





Fuel Lever Sensor

1) Sensor Continuity

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the sensor terminal and its body.
3. If the reference value are not indicated, the sensor is damaged.

Resistance (Sensor terminal – its body)	Reference value	Float at upper-most position	1 to 5 Ω
		Float at lower-most position	103 to 117 Ω

(1) Fuel Level Sensor

E: Empty
F: Full

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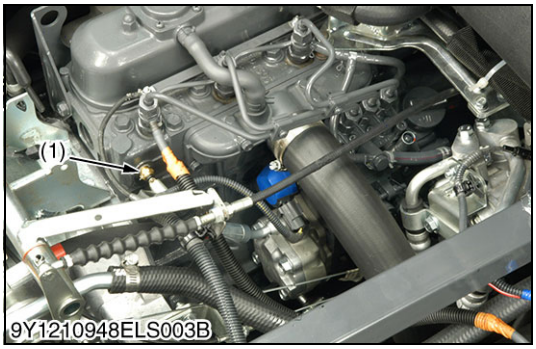
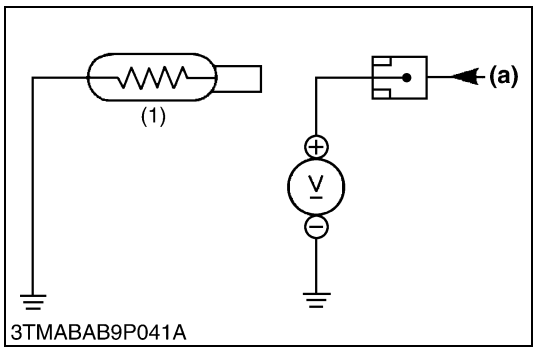
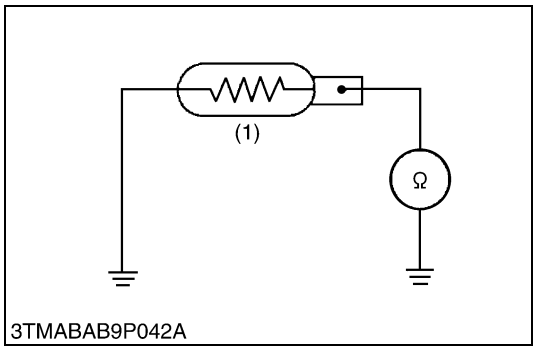






Engine Water Temperature Sensor

1) Lead Terminal Voltage

1. Disconnect the lead from the engine water temperature sensor after turning the key switch **OFF**.
2. Turn the key switch **ON** and measure the voltage with a voltmeter across the lead terminal and the chassis.
   If the voltage differs from the battery voltage, the wiring harness, fuse or coolant temperature gauge is damaged.

Voltage	Lead terminal – Chassis	Approx. battery voltage

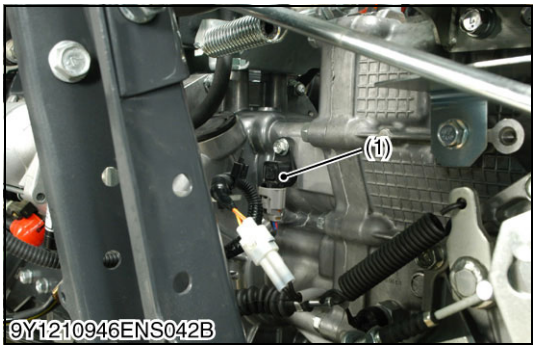
2) Sensor Continuity

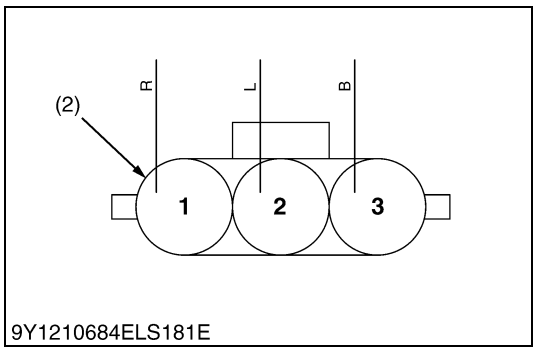
1. Measure the resistances with an ohmmeter across the sensor terminal and the chassis.
2. If the reference value is not indicated, the sensor is damaged.

Resistance (Sensor terminal – Chassis)	Reference value	Approx. 16.1 Ω at 120 °C (248 °F)
		Approx. 27.4 Ω at 100 °C (212 °F)
		Approx. 51.9 Ω at 80 °C (176 °F)
		Approx. 153.9 Ω at 50 °C (122 °F)

(1) Engine Water Temperature Sensor **(a) From Temperature Gauge**

9Y1210948ELS0023US0





Traveling Speed Sensor Connector Voltage

■ **NOTE**

- **Since it is not possible to do unit checking for this sensor, judge the sensor is damaged if the relating electric circuit is normal.**

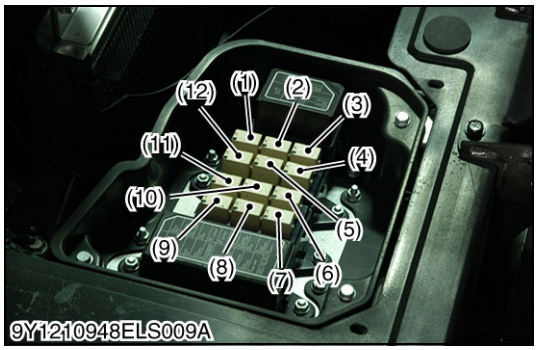
1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

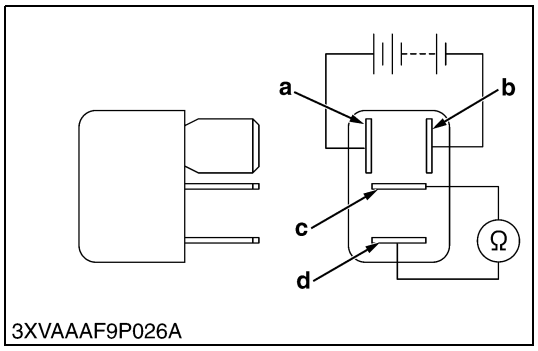
Voltage	Key switch at **"ON"**	Terminal **1** – Chassis	Approx. battery voltage
		Terminal **2** – Chassis	Approx. 5 V

(1) Traveling Speed Sensor (2) Connector (Harness Side)

9Y1210946ELS0045US0

(11) Relays





Relay

1. Turn the key switch **OFF**.
2. Raise the seat.
3. Remove the relay which should be checked.
4. Connect the jumper load across the battery positive terminal to relay terminal **1 "a"**, and the battery negative terminal to relay terminal **2 "b"**.
5. Check the continuity with an ohmmeter between the relay terminal **5 "c"** and relay terminal **3 "d"**.
6. If there is continuity, the relay is proper.

(1) Washer and Wiper Relay
(2) Rear Radiator Fan Motor Relay
(3) Blower Relay
(4) Compressor Relay
(5) Oil Temperature Relay
(6) Front Radiator Fan Motor Relay
(7) Starter Relay
(8) Solenoid Relay
(9) Work Light Relay
(10) Beacon Relay
(11) Spare
(12) Fog Lamp Relay

a: Relay Terminal 1
b: Relay Terminal 2
c: Relay Terminal 5
d: Relay Terminal 3

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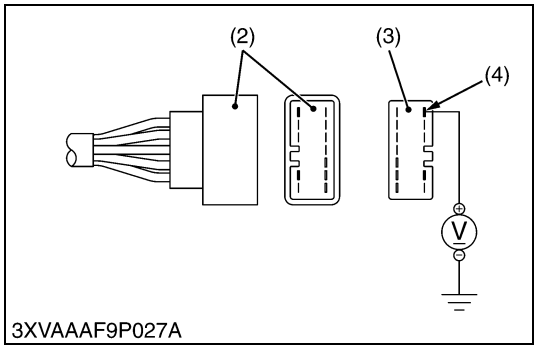
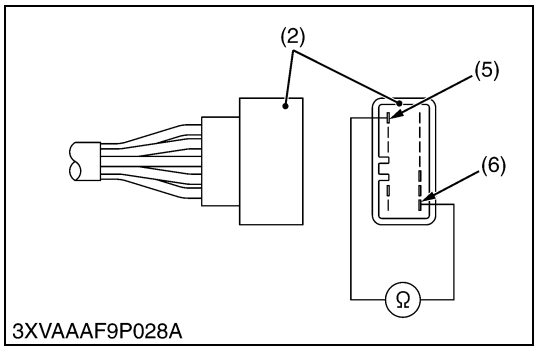
(12) Others





Light Switch (for Horn)

1) Connector Terminal Voltage

1. Disconnect the connector from the light switch (1) after turning the main switch **OFF**.
2. Turn the main switch **ON** and measure the voltage with a voltmeter across the connector terminal **B3** (4) to the chassis.
3. If the voltage differs from the battery voltage, the wiring harness or fuse is damaged.

Voltage	Connector terminal **B3** – Chassis	Approx. battery voltage

2) Switch Continuity

1. Disconnect the connector from the light switch (1) and remove it.
2. Measure the resistance with an ohmmeter across the switch terminal **B3** (5) to terminal **H** (6).
3. If the resistance differs from the factory specifications, the light switch is damaged.

Resistance	Factory specifica-tion	**OFF**	Infinity
		ON	Continuity

(1) Light Switch
(2) Connector (Switch Side)
(3) Connector (Harness Side)
(4) Connector Terminal **B3**
(5) Switch Terminal **B3**
(6) Switch Terminal **H**

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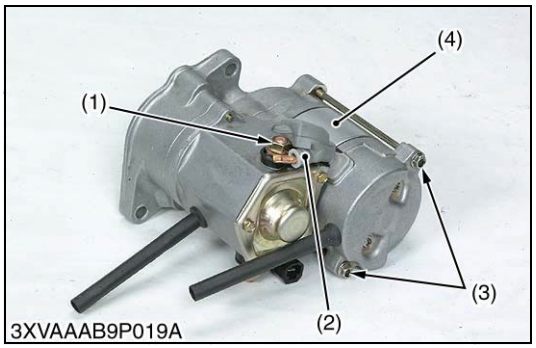
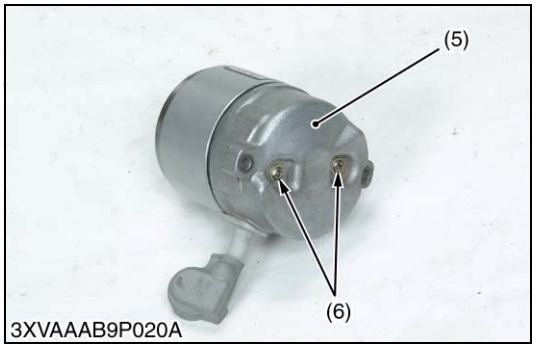
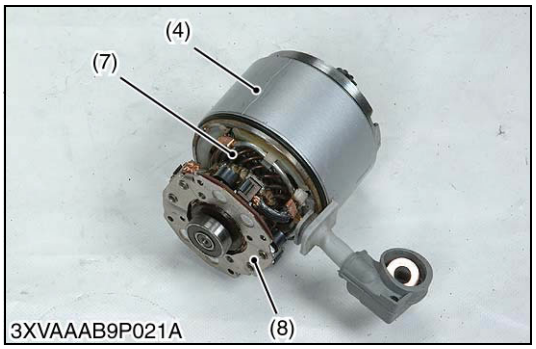
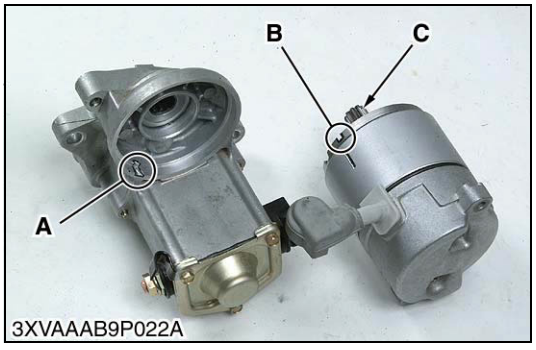
[2] DISASSEMBLING AND ASSEMBLING

(1) Starter









Motor

1. Remove the **B** terminal nut (1), and disconnect the connecting lead (2) from the magnet switch.
2. Remove the motor through screws (3), and then remove the yoke (4).
3. Remove the end frame screws (6) and then remove the end frame (5).
4. Separate the armature (7), the brush holder (8) from the yoke (4).

(When reassembling)

- Apply grease to the spline teeth **"C"** of the armature (7).
- Fit the projection **"B"** on the yoke into the notch **"A"** in the magnet switch.
- Apply LOCTITE-5699 or equivalent to mounting surface of starter assembly.

Tightening torque	**B** terminal nut	5.9 to 11 N·m 0.60 to 1.2 kgf·m 4.4 to 8.6 lbf·ft

(1) **B** Terminal Nut
(2) Connecting Lead
(3) Motor Through Screw
(4) Yoke
(5) End Frame
(6) End Frame Screw
(7) Armature
(8) Brush Holder

A: Notch
B: Projection
C: Spline Teeth

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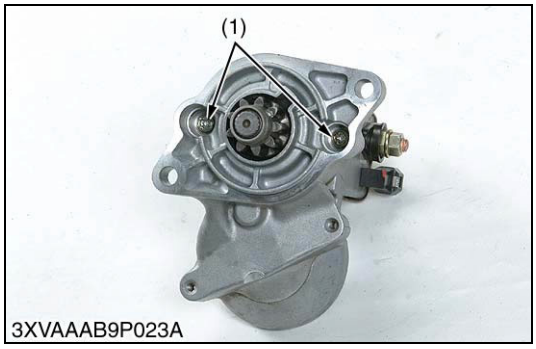
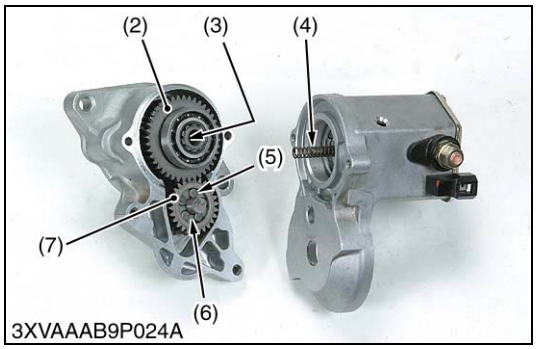
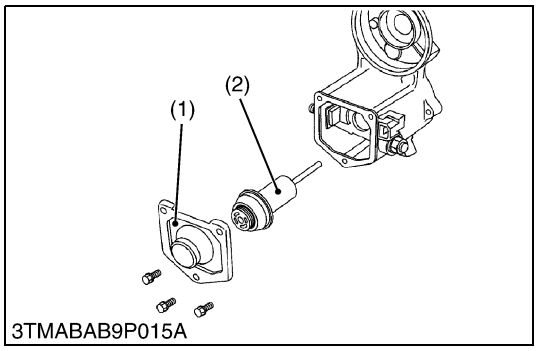






Magnet Switch

1. Remove the drive end frame mounting screws (1).
2. Remove the overrunning clutch (2), steel ball (3), spring (4), idle gear (7), rollers (5) and retainer (6).

(When reassembling)

- Apply grease the gear teeth of the idle gear (7) and the overrunning clutch (2), and the steel ball (3).

(1) Drive End Frame Mounting Screw
(2) Overrunning Clutch
(3) Steel Ball
(4) Spring
(5) Roller
(6) Retainer
(7) Idle Gear

9Y1210946ELS0050US0

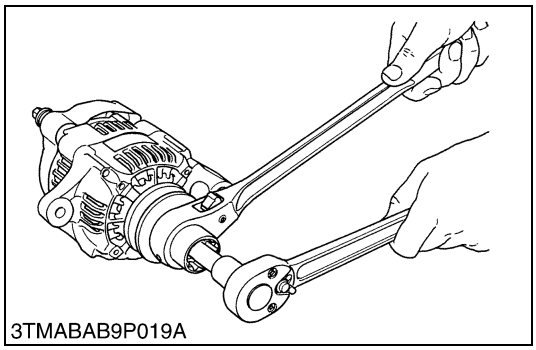
Plunger

1. Remove the end cover (1).
2. Remove the plunger (2).

(1) End Cover
(2) Plunger

9Y1210946ELS0051US0

(2) Alternator


3TMABAB9P019A

Pulley

1. Secure the hexagonal end of the pulley shaft with a double-ended ratchet wrench as shown in the figure.
2. Loosen the pulley nut with a socket wrench and remove it.

(When reassembling)

Tightening torque	Pulley nut	58.4 to 78.9 N·m 5.95 to 8.05 kgf·m 43.1 to 58.2 lbf·ft

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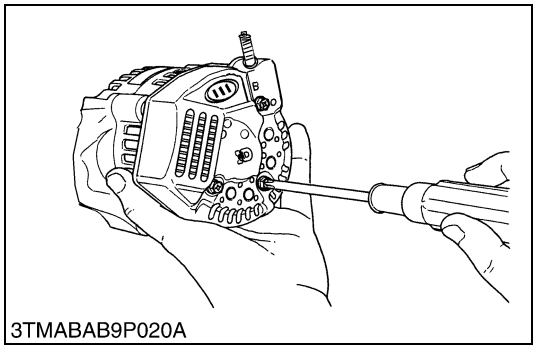
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Rear End Cover

1. Remove the three rear end cover screws and the **B** terminal nut, and remove the rear end cover.

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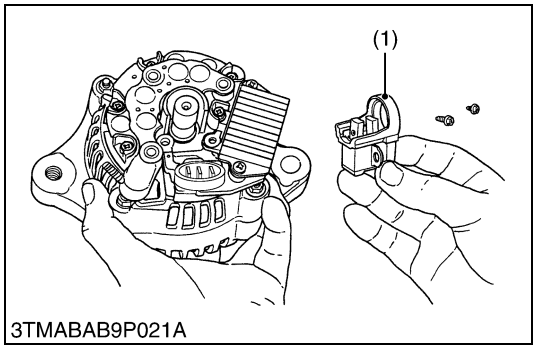

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Brush Holder

1. Remove the two screws holding the brush holder, and remove the brush holder (1).

(1) Brush Holder

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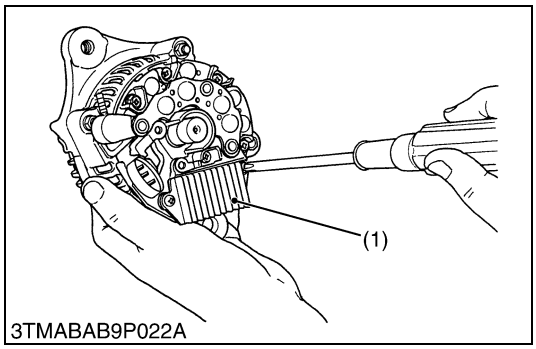

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IC Regulator

1. Remove the three screws holding the IC regulator, and remove the IC regulator (1).

(1) IC Regulator

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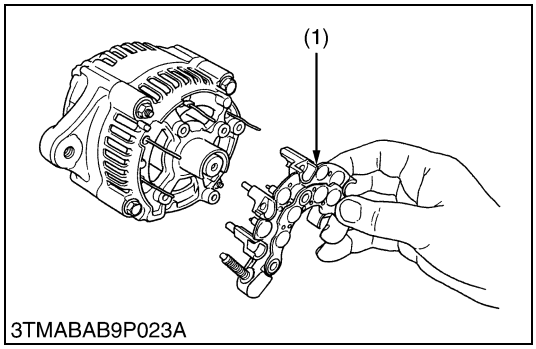

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Rectifier

1. Remove the four screws holding the rectifier and the stator lead wires.
2. Remove the rectifier (1).

(1) Rectifier

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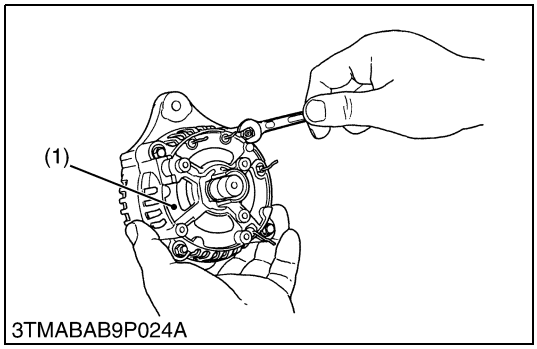

Rear End Frame

1. Remove the two nuts and two screws holding the drive end frame and the rear end frame.
2. Remove the rear end frame (1).

(1) Rear End Frame

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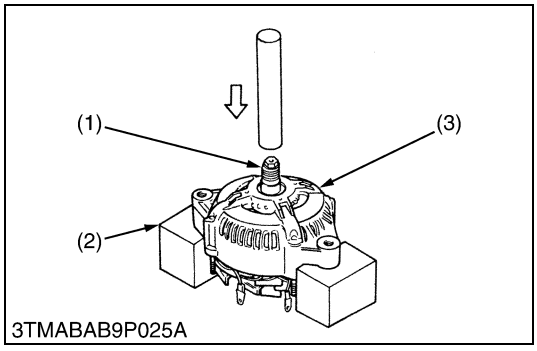

Rotor

1. Press out the rotor (1) from drive end frame (3).

■ **IMPORTANT**

- **Be very careful not to drop the rotor and damage the slip ring or fan, etc..**

(1) Rotor
(2) Block
(3) Drive End Frame

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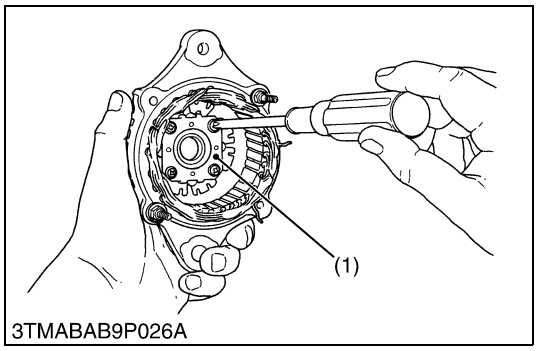

Retainer Plate

1. Remove the four screws holding the retainer plate, and remove the retainer plate (1).

(1) Retainer Plate

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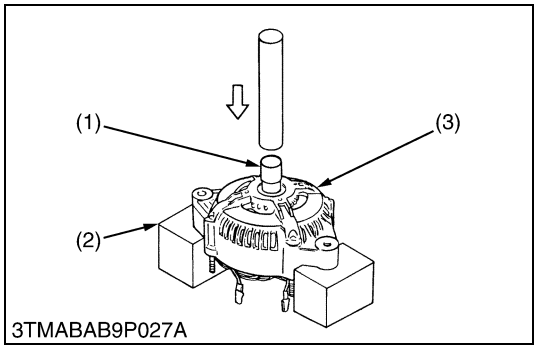

Bearing on Drive End Side

1. Press out the bearing from drive end frame (3) with a press and jig (1).

(1) Jig
(2) Block
(3) Drive End Frame

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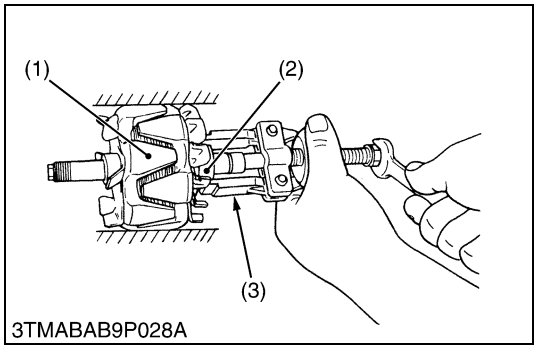

Bearing at Slip Ring Side

1. Lightly secure the rotor (1) with a vise to prevent damage, and remove the bearing (2) with a puller (3).

(1) Rotor
(2) Bearing
(3) Puller

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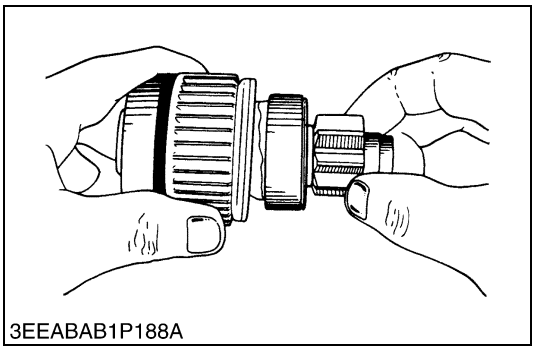
[3] SERVICING
(1) Starter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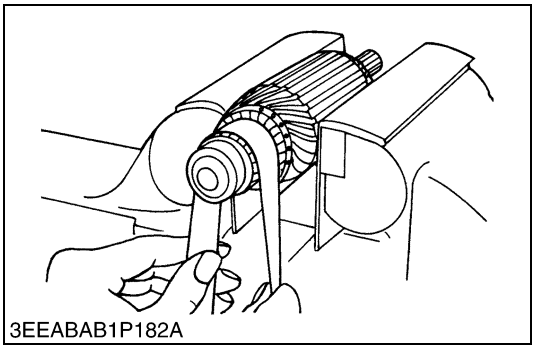
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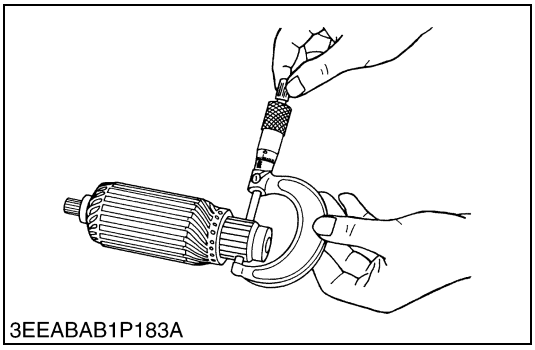
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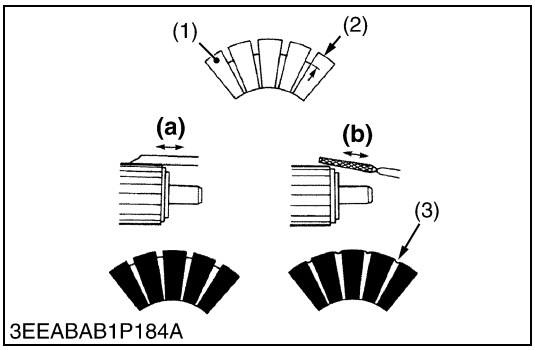

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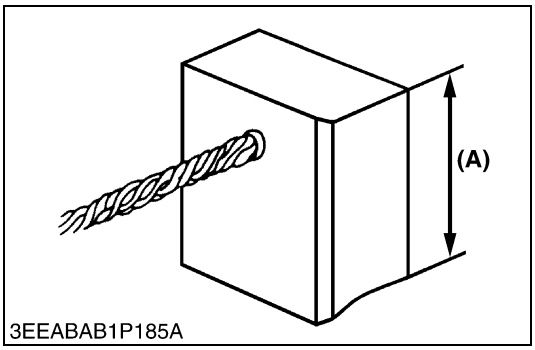

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Overrunning Clutch

1. Inspect the pinion for wear or damage.
2. If there is any problem, replace the overrunning clutch assembly.
3. Check that the pinion turns freely and smoothly in the overrunning direction and does not slip in the cranking direction.
4. If the pinion slips or does not rotate in the both directions, replace the overrunning clutch assembly.

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Commutator and Mica

1. Check the contact face of the commutator for wear, and grind the commutator with emery paper if it is slightly worn.
2. Measure the commutator O.D. with an outside micrometer at several points.
3. If the minimum O.D. is less than the allowable limit, replace the armature.
4. If the difference of the O.D.'s exceeds the allowable limit, correct the commutator on a lathe to the factory specification.
5. Measure the mica undercut.
6. If the undercut is less than the allowable limit, correct it with a saw blade and chamfer the segment edges.

Commutator O.D.	Factory specification	30.0 mm 1.181 in.
	Allowable limit	29.0 mm 1.142 in.

Difference of O.D.'s	Factory specification	Less than 0.02 mm 0.0008 in.
	Allowable limit	0.05 mm 0.0020 in.

Mica undercut	Factory specification	0.50 to 0.80 mm 0.020 to 0.031 in.
	Allowable limit	0.2 mm 0.008 in.

(1) Segment
(2) Undercut
(3) Mica
(a) Correct
(b) Incorrect

WSM000001ELS0034US0

Brush Wear

1. If the contact face of the brush is dirty or dusty, clean it with emery paper.
2. Measure the brush length **(A)** with vernier calipers.
3. If the length is less than the allowable limit, replace the yoke assembly and brush holder.

Brush length **(A)**	Factory specification	14.0 mm 0.551 in.
	Allowable limit	9.0 mm 0.35 in.

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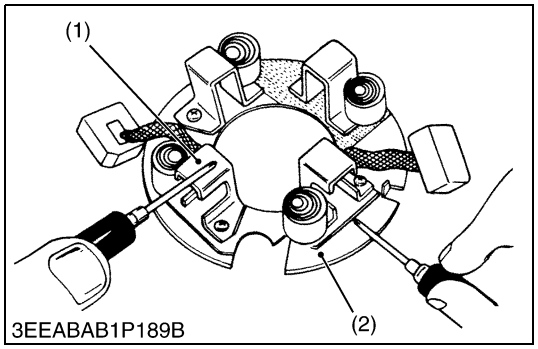

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Brush Holder

1. Check the continuity across the brush holder and the holder support with an ohmmeter.
2. If it conducts, replace the brush holder.

Resistance	Brush holder – Holder support	Infinity

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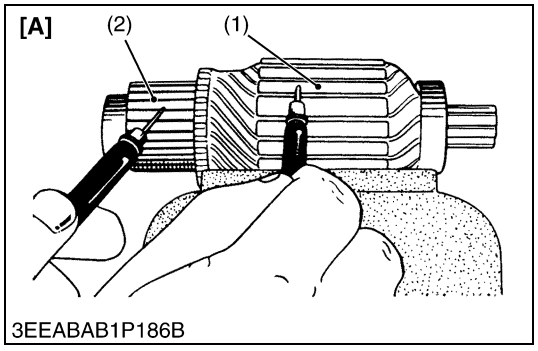

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Armature Coil

1. Check the continuity across the commutator and armature coil core with an ohmmeter. **[A]**
2. If it conducts, replace the armature.
3. Check the continuity across the segments of the commutator with an ohmmeter. **[B]**
4. If it does not conduct, replace the armature.

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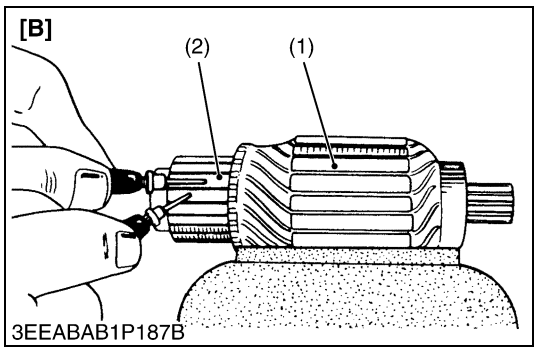

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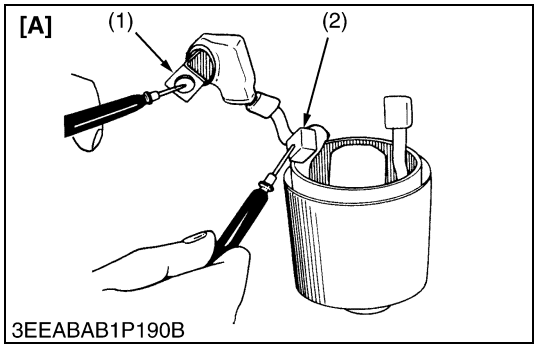

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Field Coil

1. Check the continuity across the lead (1) and brush (2) with an ohmmeter. **[A]**
2. If it does not conduct, replace the yoke assembly.
3. Check the continuity across the brush (2) and yoke (3) with an ohmmeter. **[B]**
4. If it conducts, replace the yoke assembly.

(1) Lead
(2) Brush
(3) Yoke

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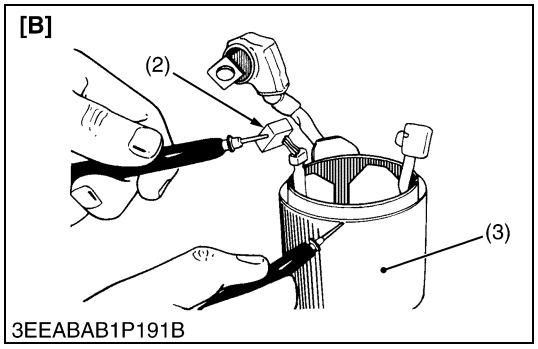

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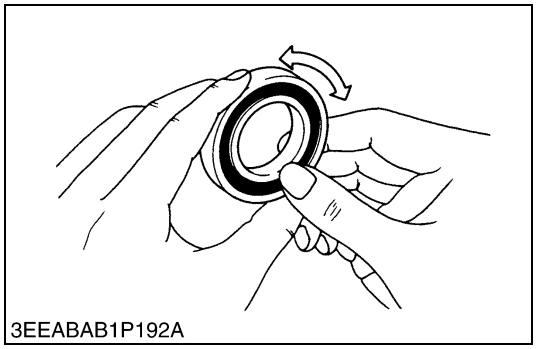
(2) Alternator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Bearing

1. Check the bearing for smooth rotation.
2. If it does not rotate smoothly, replace it.

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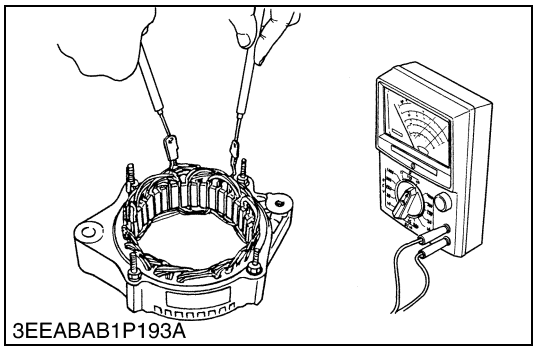
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Stator

1. Measure the resistance across each lead of the stator coil with an ohmmeter.
2. If the measurement is not within service specification, replace it.
3. Check the continuity across each stator coil lead and core with an ohmmeter.
4. If the measurement is not within the service specifications, replace it.

Resistance	Service specification	Less than 1.0 Ω

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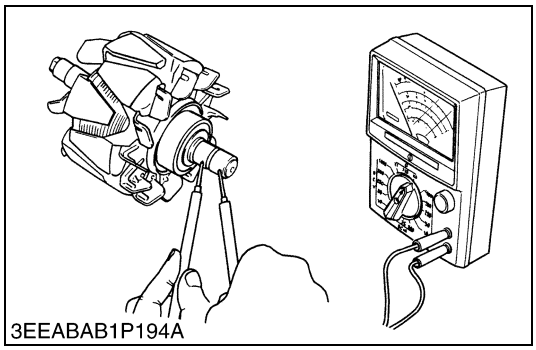
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Rotor

1. Measure the resistance across the slip rings with an ohmmeter.
2. If the resistance is not the service specification, replace it.
3. Check the continuity across the slip ring and core with an ohmmeter.
4. If the measurement is not within the service specifications, replace it.

Resistance	Service specification	2.9 Ω

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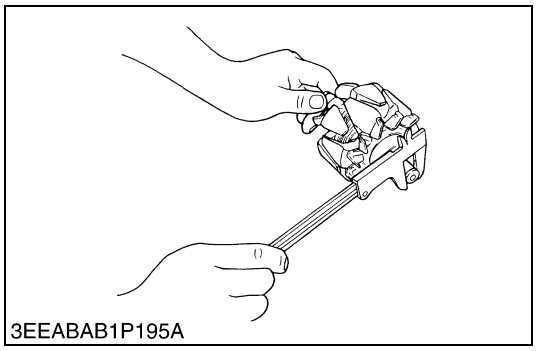
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Slip Ring

1. Check the slip ring for score.
2. If scored, correct with an emery paper or on a lathe.
3. Measure the O.D. of slip ring with vernier calipers.
4. If the measurement is less than the service limit, replace it.

Slip ring O.D.	Service specification	14.4 mm 0.567 in.
	Service limit	14.0 mm 0.551 in.

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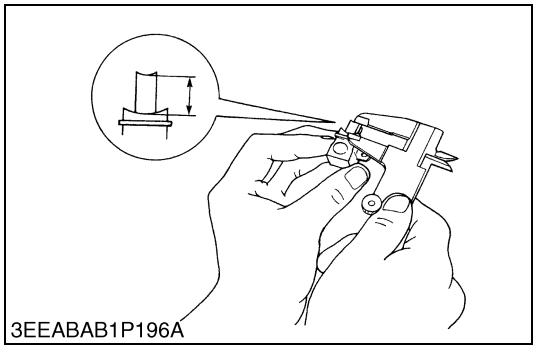
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Brush Wear

1. Measure the brush length with vernier calipers.
2. If the measurement is less than service limit, replace it.
3. Make sure that the brush moves smoothly.
4. If the brush is damaged, replace it.

Brush length	Service specification	10.5 mm 0.413 in.
	Service limit	8.4 mm 0.331 in.

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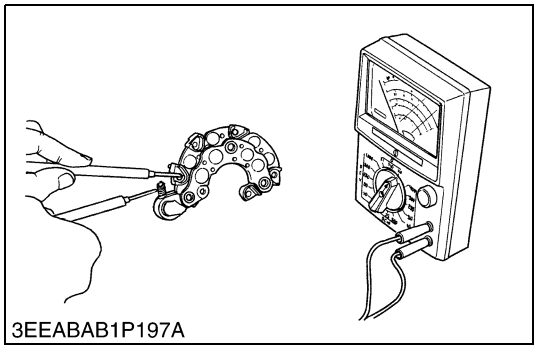
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Rectifier

1. Check the continuity across each diode of rectifier with an analog ohmmeter. Conduct the test in the (R × 1) setting.
2. The rectifier is normal if the diode in the rectifier conducts in one direction and does not conduct in the reverse direction.

■ **IMPORTANT**

- **Do not use a 500 V megohmmeter for measuring because it will destroy the rectifier.**

■ **NOTE**

- **Do not use an auto digital multimeter. Because it's very hard to check the continuity of rectifier by using it.**

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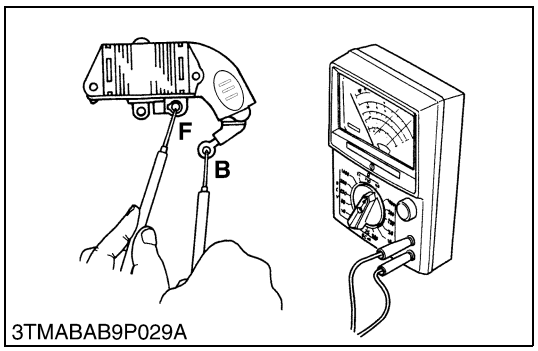

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IC Regulator

1. Check the continuity across the **B** terminal and the **F** terminal of IC regulator with an analog ohmmeter. Conduct the test in the (R × 1) setting.
2. The IC regulator is normal if the IC regulator conducts in one direction and does not conduct in the reverse direction.

■ **IMPORTANT**

- **Do not use a 500 V megohmmeter for measuring because it will destroy the IC regulator.**

■ **NOTE**

- **Do not use an auto digital multimeter. Because it is very hard to check the continuity of IC regulator by using it.**

WSM000001ELS0045US0

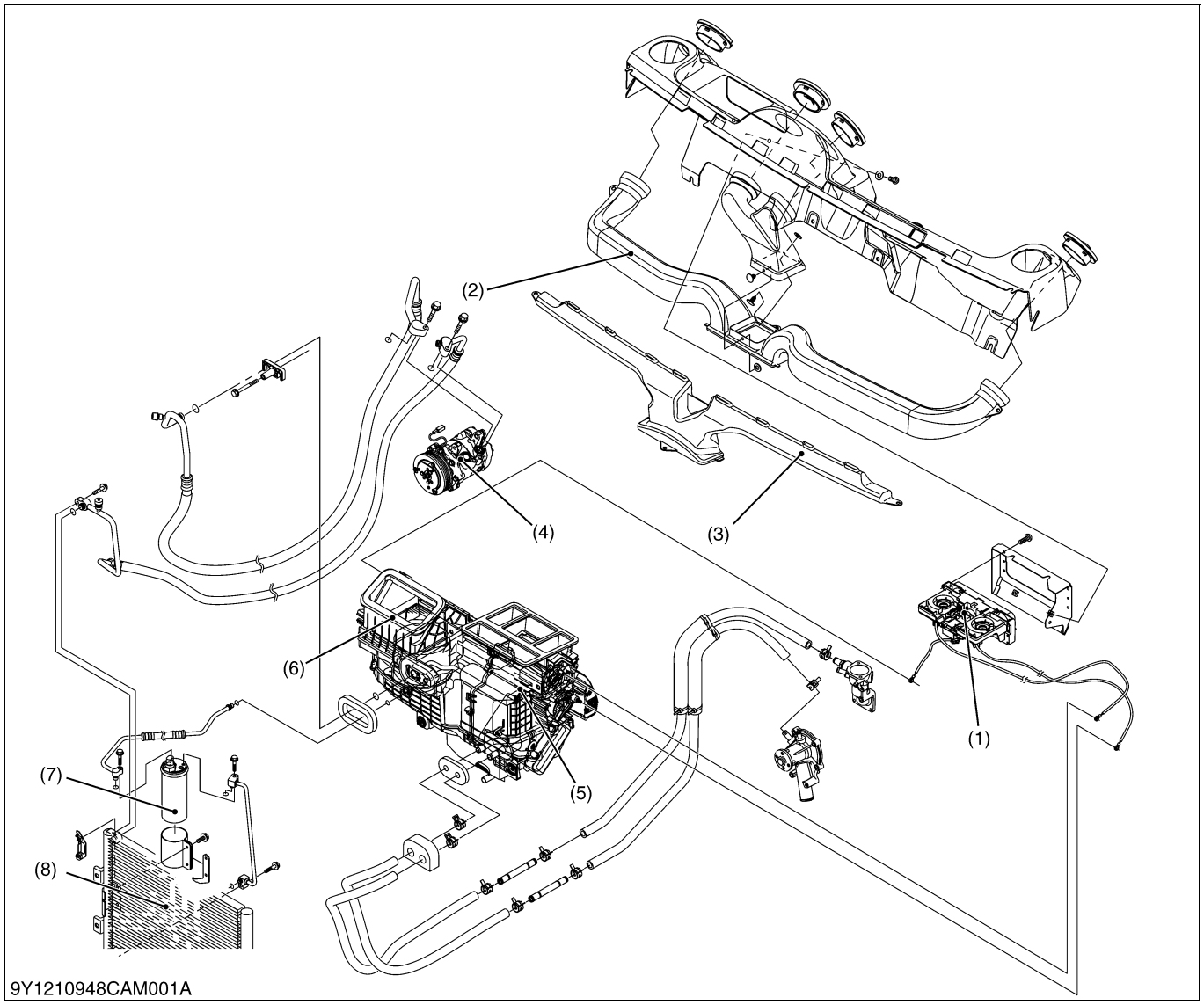
9 CABIN

MECHANISM

CONTENTS

1. AIR CONDITIONING SYSTEM

[1] OUTLINE OF AIR CONDITIONING SYSTEM



(1) Control Panel
(2) Face Blow Port
(3) Defroster Blow Port
(4) Compressor
(5) Air Conditioner Unit
(6) Inner Air Filter
(7) Receiver
(8) Condenser

The vehicle is equipped with a thin large-capacity air conditioner with outside air intake. Through the inside air filter (6) the air reaches the air conditioner unit (5). The air is then cooled and dehumidified by this unit.

The resulting air is heated to a comfortable level. In this way, the air being blown via the blow port can be kept at comfortable temperature and humidity.

The face blow port (2) can be opened and closed using the knob of each port. The defroster blow port (3) opened and closed using the mode switch on the control panel (1). You can feel that your head is cool and that your feet are warm by opening and closing these port.

(To be continued)

(Continued)

Capacity (Cooling)	Factory specification		2.6 kW or more
Capacity (Warming)	Factory specifi-cation	LLC* 50 %	3.3 kw or more
Kinds of refrigerant (Charge amount)	Factory specification		R134a 450 to 550 kg 0.992 to 1.21 lbs
Pressure sensor (Low)	Factory specification		0.196 MPa 2.00 kgf/cm^2 28.4 psi
Pressure sensor (High)	Factory specification		3.14 MPa 32.0 kgf/cm^2 455 psi

*LLC: Anti-freeze

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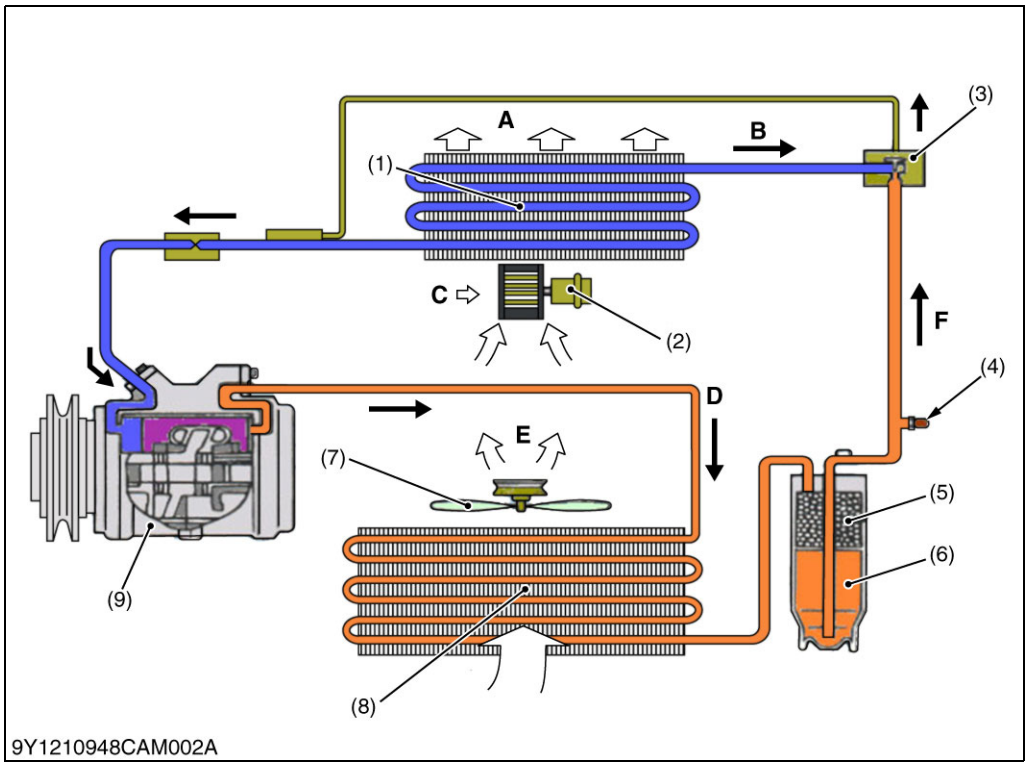
[2] SYSTEM LAYOUT AND COMPONENT PART



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(1) Evaporator
(2) Blow Motor
(3) Expansion Valve
(4) Pressure Switch
(5) Desiccant
(6) Receiver
(7) Front Radiator Fan
(8) Condenser
(9) Compressor

A: Cold Air
B: Low Pressure, Low Temperature Mist
C: Cabin Interior or Exterior Air
D: High Pressure, High Temperature Gas
E: Hot Air
F: Liquid

The refrigerant cycle of air conditioning system is as follows.

1. The gaseous refrigerant evaporated through the evaporator (1) is compressed in the compressor (9) to approx. 1.47 MPa (15 kgf/cm^2, 213 psi) and is also raised in temperature to approx. 70 °C (158 °F) and delivered to the condenser (8).
2. The gaseous refrigerant is cooled down through the condenser (8) to approx. 50 °C (122 °F) and delivered to the receiver (6) in the liquid state.
   At this time, heat removed from the cabin interior is extracted by means of the condenser (8).
3. The liquid refrigerant is collected in the receiver (6) for a certain period. At this time moisture are removed from the refrigerant by desiccant (5).
4. The liquid refrigerant after removing moisture and dust is jetted out of the small hole of the expansion valve (3) into the evaporator (1) as if it were distributed by an atomizer. Thus, the refrigerant is reduced in both pressure and temperature, and becomes easy to evaporate.
5. The refrigerant evaporates at 0 °C (32 °F) vigorously, taking heat from the surface of the pipes in the evaporator (1).
6. At this time, warm air in a cabin is drawn into the evaporator (1) by the blower motor and is passed over those pipes, transferring its heat to the refrigerant for evaporation. The air thus cooled is distributed to the cabin. (That is heat in a cabin is taken by the evaporator.)

(Reference)

- Since warm air in a cabin is cooled suddenly, water in the air is liquefied and removed, which means dehumidification is also performed.

7. The gaseous refrigerant from the evaporator (1) after having performed the cooling action is returned to the compressor (9), and is compressed to liquefy it (high pressure and high temperature). This cycle is repeated.
8. The air coming from the evaporator is fed to the air mixing doors, by which part of the air is introduced into the heater core. In doing so, the air temperature can be adjusted to a comfortable level. The air mixing doors are controlled through the cable connected with the control panel.

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(1) Compressor

The compressor is installed to on the engine and is driven by crank pulley through a belt.

The compressor is a pump designed to raise the pressure of refrigerant. Raising the pressure means raising the temperature. High temperature refrigerant vapor will condense rapidly in the condenser by releasing heat to the surrounding.

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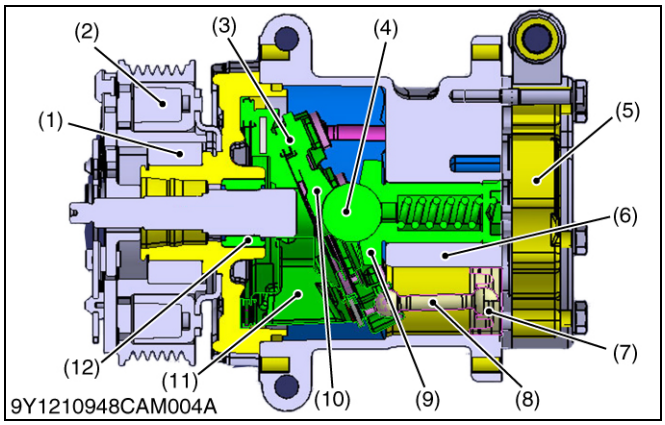
[A] Wobble Type Compressor



The wobble plate type, variable displacement compressor has a constant velocity joint mechanism equipped with an inner ring, an outer ring, and balls that are held between inner ring and outer ring guide races and that transmit power. The wobble plate is provided with a cylindrical part that extends in the axial direction of a swash plate. In the relative rotation structure between the swash plate and the wobble plate and the outer ring, the swash plate is supported to be able to rotate only in relation to the wobble plate by means of a bearing interposed between at least the aforementioned cylindrical part and the inner diameter portion of the swash plate, rather than being supported to be able to rotate relative to the external ring. With this wobble plate type, variable displacement compressor using the distinctive constant velocity joint mechanism, the relative rotation structure between the wobble plate, and the outer ring and the swash plate can be improved.

(1) Pulley Bearing
(2) Magnetic Clutch
(3) Wobble Plate
(4) Ball Bearing
(5) Cylinder Head
(6) Cylinder Block
(7) Piston
(8) Actuating Rod
(9) Fixing Gear
(10) Oscillating Gear
(11) Cam Rotor
(12) Needle Bearing

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Compressor Oil

The compressor oil dissolves in the refrigerant, circulates through the air-conditioning cycle, and functions to lubricate the compressor. But the conventional compressor oil for R12 doesn't dissolve in R134a, so it doesn't circulate through the cycle, and the life span of the compressor is considerably shortened.

It is still essential to ensure that the correct refrigerant oil is used. R12 systems were lubricated with mineral oil, which is totally unsuitable for R134a systems. The letter require PAG oil, which mixes very well with the refrigerant and provides ideal lubrication throughout the system.

Quantity (Total)	Brand Name
100 cc 0.106 U.S.qts 0.0880 Imp.qts	SP-10 oil or equivalent

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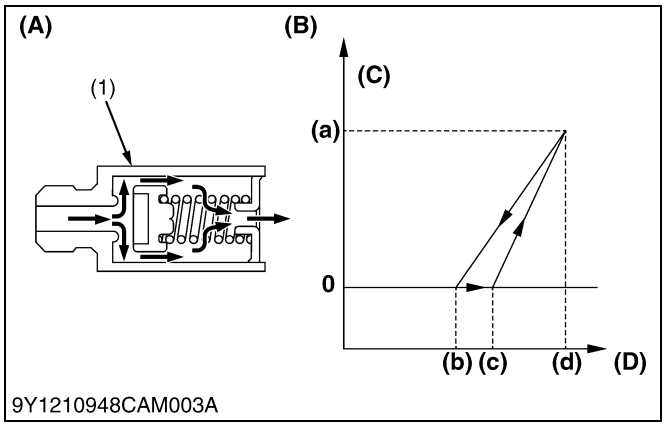
[B] Pressure Relief Valve



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If the high pressure is abnormally high, the pressure relief valve open, and the refrigerant is released into the atmosphere, and the system is kept. At the time, all of the refrigerant in the system is released into the atmosphere.

Even in the worst case, the outflow of refrigerant is stopped at the minimum limit.

(Reference)

- In normal operation, the high pressure switch is triggered first and the compressor stops, so the pressure relief valve is not triggered so easily.

(1) Pressure Relief Valve
(A) Gas Ejection Route When Operating
(a) 113 L/min. (27.2 U.S.gals/min., 24.86 Imp.gals/min.)
(B) Operation Characteristic
(b) 3.26 MPa (33.2 kgf/cm^2, 473 psi)
(C) Leakage Quantity
(c) 3.60 MPa (36.7 kgf/cm^2, 522 psi)
(D) Pressure
(d) 4.69 MPa (47.8 kgf/cm^2, 680 psi)

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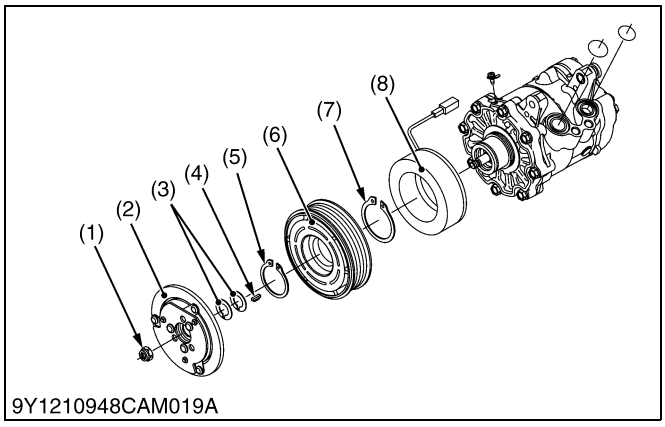
[C] Magnetic Clutch



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A magnetic clutch is used to engage and disengage the compressor from the engine. Main components are stator and rotor with pulley, and pressure plate to engage the drive pulley and compressor magnetically.

The stator is fixed on the compressor housing, and the pressure plate is attached to the compressor shaft. Two ball bearings are used between the inner surface of the rotor and the front housing of the compressor.

(1) Shaft Nut
(2) Armature Plate
(3) Clutch Shim
(4) Rotor Bearing Dust Cover
(5) Snap Ring
(6) Pulley and Bearing Assembly
(7) Snap Ring
(8) Field Coil

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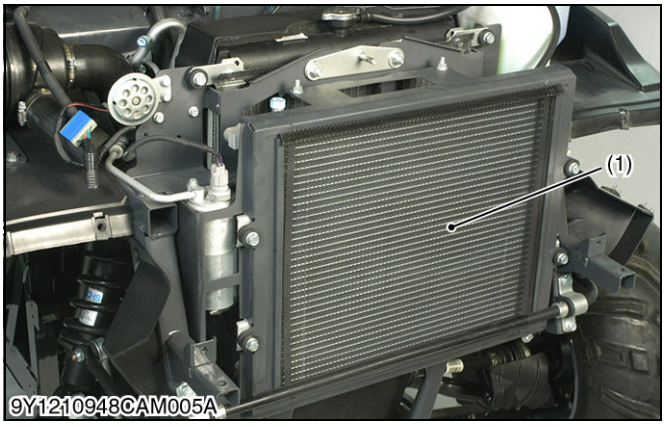
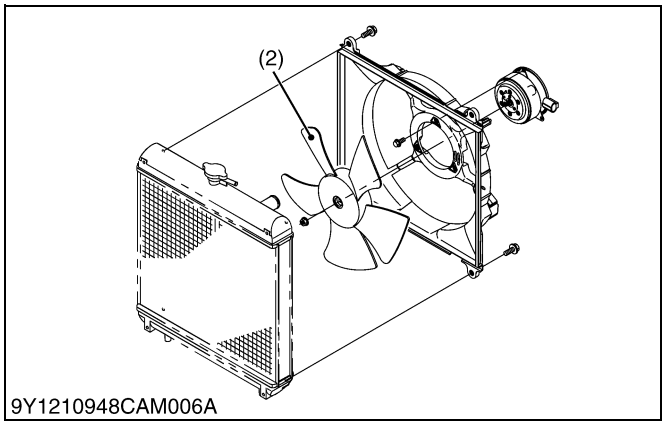
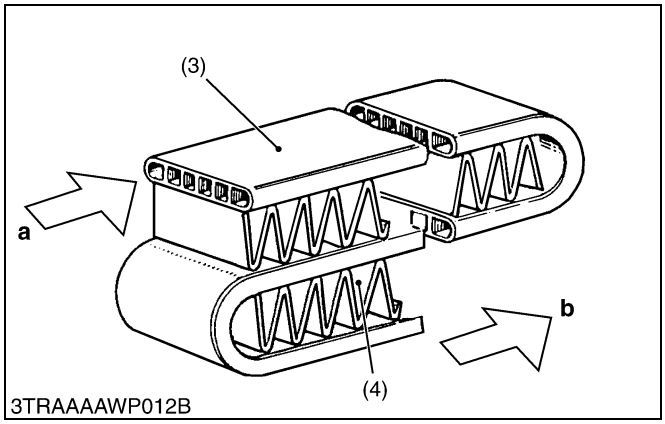
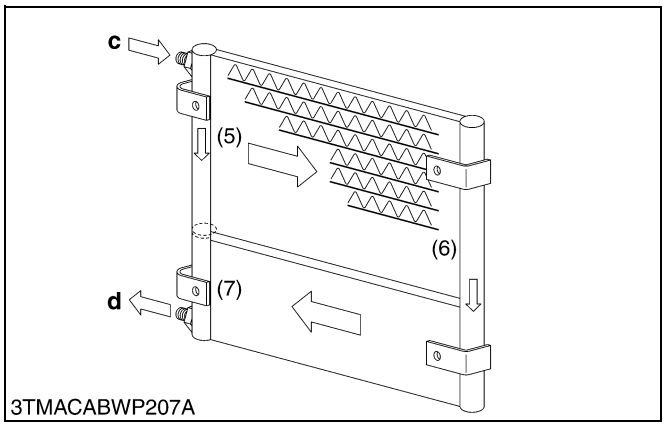
(2) Condenser









The condenser (1) is installed in the front side of the vehicle. The condenser equips with a fan (2) to enable forcible cooling.

The condenser is used for the purpose of cooling and robbing the heat from the refrigerant gas, which has been compressed by the compressor into high temperature, high pressure gas, so as to change this gas into liquid refrigerant.

The heat given off by the gaseous refrigerant in the condenser is the sum of the heat absorbed at the evaporator and the heat of work required by the compressor to compress the refrigerant. The greater the amount of heat give off in the condenser, the greater will be the cooling effect attainable by the evaporator.

(1) Condenser
(2) Fan
(3) Tube
(4) Fin
(5) Vapor
(6) Liquefying
(7) Liquefied

a: Gaseous Refrigerant
b: Liquid Refrigerant
c: Heated Vapor from Compressor (70 °C, 158 °F)
d: Cooled Liquid to Receiver (50 °C, 122 °F)

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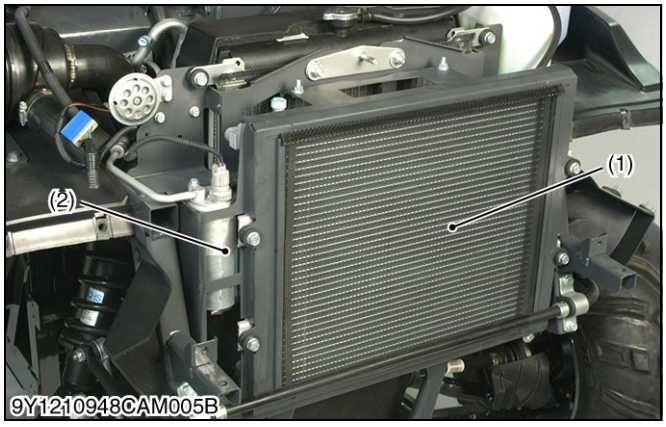
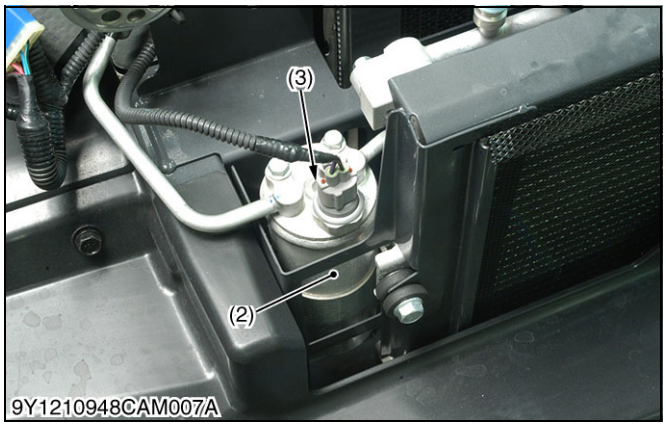
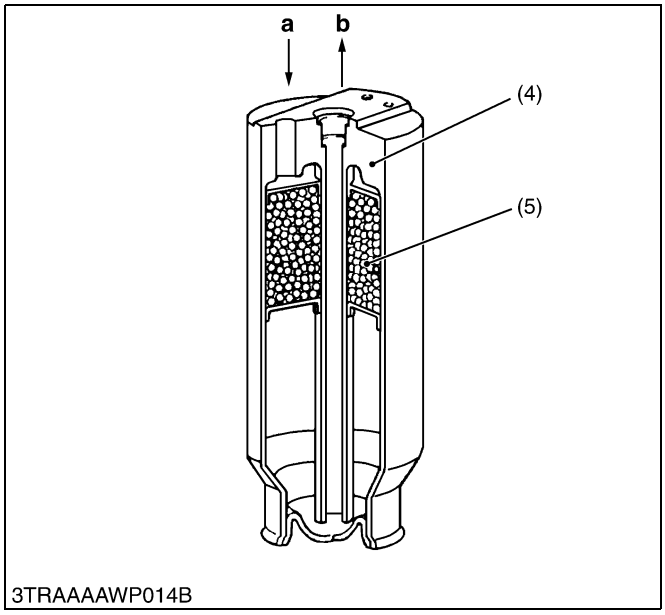
(3) Receiver







The receiver (2) serves the purpose of storing the liquid refrigerant. The amount of the liquid refrigerant flowing through the system varies with the operating condition of the air conditioner. To be accurate, the receiver stores excess amount of refrigerant when the heat load is lowered. It also releases stored refrigerant when additional cooling is needed, thus, keeping the optimum flow of refrigerant within the system.

The receiver includes a desiccant (5). It has the job of removing moisture as the refrigerant circulates within the system.

The sight glass (3) is installed on the top of receiver. Amount of refrigerant to be charged is very important for the efficiency of air conditioner. The sight glass is used to check the amount of refrigerant. If large flow of bubbles can be seen in the sight glass, there is insufficient refrigerant charged. If so, fill the refrigerant to the proper level.

(1) Condenser
(2) Receiver
(3) Sight Glass
(4) Receiver Body
(5) Desiccant

a: IN
b: OUT

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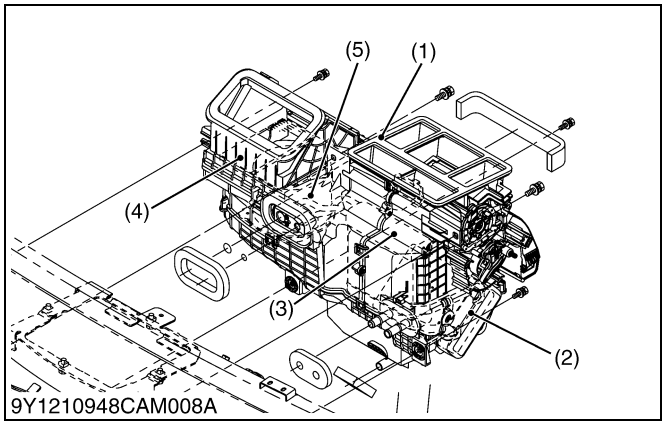
(4) Air Conditioner Unit



Air conditioner unit (1) consists of heater core (2), evaporator (3), blower (5), expansion valve (4), etc..

(1) Air Conditioner Unit
(2) Heater Core
(3) Evaporator
(4) Expansion Valve
(5) Blower

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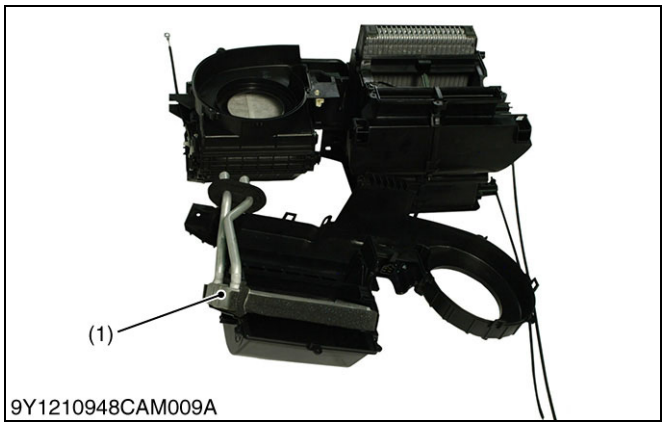
[A] Heater Core



The heater-sauce of heater uses coolant which becomes high temperature by heat of engine.

The inlet port of heater core is connected to the delivery side of engine water pump by a rubber hose, and the water valve is installed on the inlet port of heater core. Also, the outlet port of heater core is connected to the water flange in the engine.

The heater core is one of the heat exchangers like evaporator or condenser, and heat is exchanged between heated coolant passing through the core and air in the cabin or fresh outdoor air. Thus, air is heated.

(1) Heater Core
(2) Water Valve

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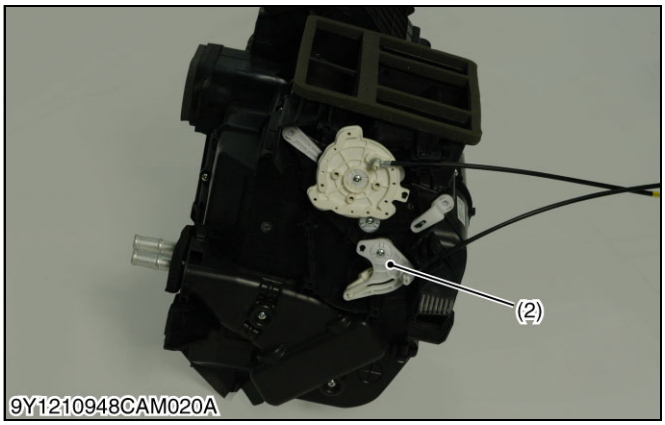
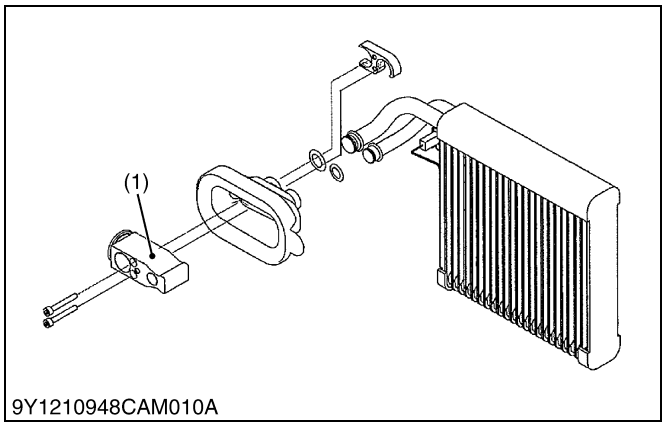


[B] Expansion Valve



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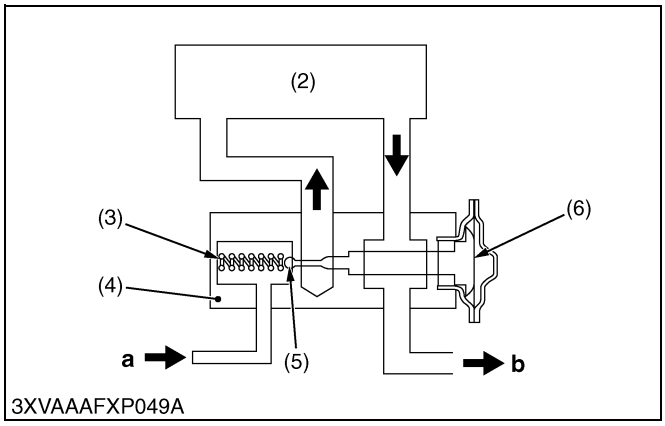

3XVAAAFXP049A

The expansion valve (1) restricts the flow of liquid refrigerant as it passes through the expansion valve and delivers sprayed refrigerant to the evaporator (2) for facilitating refrigerant evaporation.

The cabin interior will not be cooled sufficiently if the expansion valve outlet is too small. If it is too wide, frost will be produced on the evaporator, decreasing cooling efficiency. Thus the size of this small spray hole has to be controlled according to various conditions.

(1) Expansion Valve
(2) Evaporator
(3) Spring
(4) Valve Body
(5) Needle Valve
(6) Diaphragm

a: From Receiver
b: To Compressor

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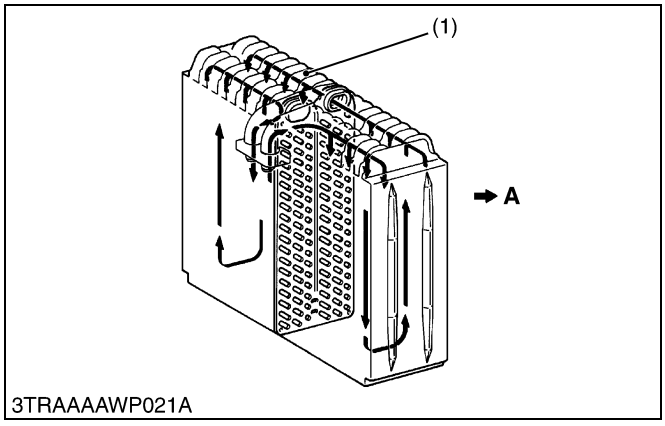
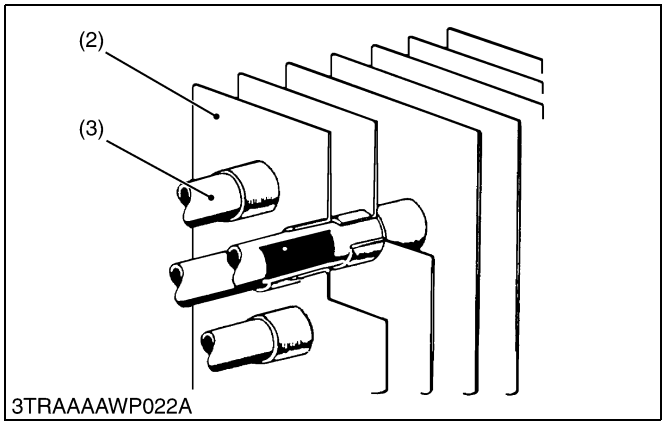
[C] Evaporator



3TRAAAAWP021A



3TRAAAAWP022A

The purpose of evaporator (1) is just opposite to that of the condenser. The state of refrigerant immediately after the expansion valve is 100 % liquid. As soon as the liquid pressure drops, it starts to boil, and in doing so, absorbs heat. This heat is removed from the air passing over the cooling fins of the evaporator and causes the air to cool.

If too much refrigerant is sent into the evaporator, it will not boil away so easily. Also, the evaporator filled with liquid refrigerant eliminates a place for the refrigerant to properly vaporize, which is necessary in order to take on heat. A flooding condition of the evaporator will allow an excess of liquid refrigerant to leave the evaporator and may cause serious damage to the compressor.

If too little refrigerant is sent into the evaporator, again the evaporator will not cool because the refrigerant will vaporize, or boil off, long before it passes through the evaporator.

Refrigerant properly metered into the evaporator should allow for 100 % liquid just after the expansion valve, and 100 % gas at the outlet.

(1) Evaporator
(2) Fin
(3) Tube

A: Flow of Refrigerant

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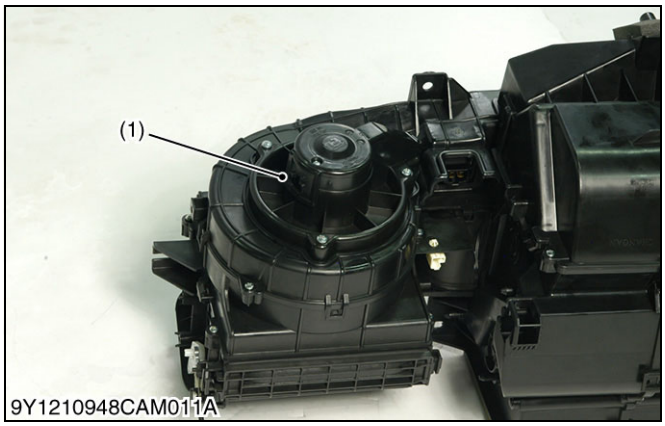
[D] Air Conditioner Blower



The blower is incorporated in the left-hand space of the air conditioner unit. It blows cool, warm of fresh air via the front and side blow ports into the cabin.

The speed of the blower motor (1) can be adjusted in 4 steps by the resistor.

The blower fan is centrifugal type. The air being sucked in parallel with the rotary shaft is blown in the centrifugal direction; in other words, perpendicular to the rotary shaft.

(1) Blower Motor

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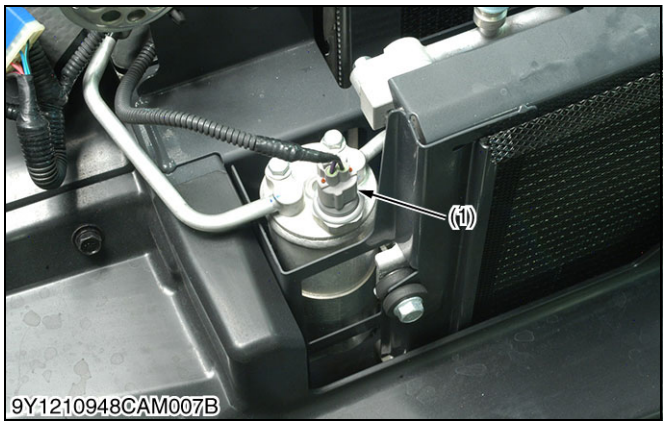
[E] Pressure Switch



The pressure switch detects the pressure in the refrigerant cycle, and when something is wrong, turns off the magnetic clutch to prevent the component from troubling. This system has dual type pressure switch (1), and this switch controls low pressure cut and high pressure cut.

(1) Pressure Switch

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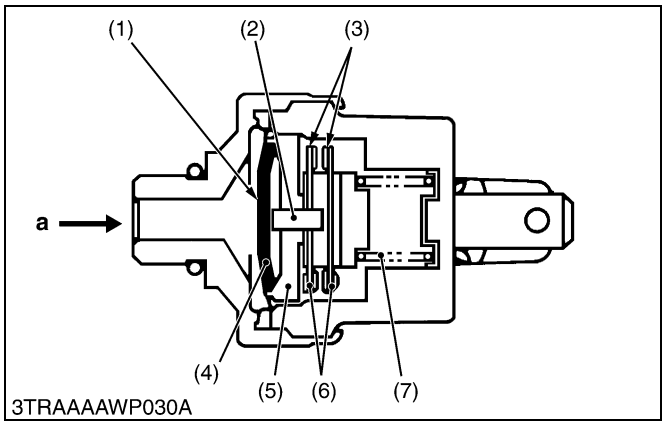

1) Pressure Switch (Dual Type)

The pressure switch is installed in inlet line (liquid line) between receiver and expansion valve.

The contact of pressure switch is normally open type.

(1) Diaphragm
(2) Pin
(3) Terminal
(4) Belleville Spring
(5) Plate
(6) Movable Contact
(7) Spring

a: Pressure

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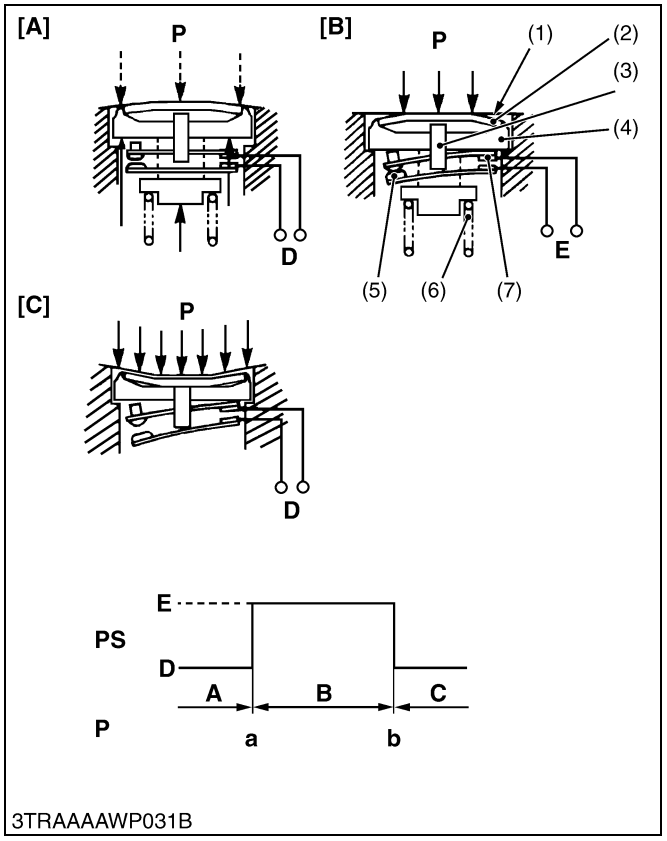

■ **OFF Position: [A] (When the Refrigerant Pressure is Low)**

The pressure switch detects the pressure drop when the refrigerant leaks from the system causing compressor seizure. When pressure of refrigerant is less than specified pressure, the switch is turned **OFF** and disengages magnetic clutch.

■ **ON Position: [B] (When the Refrigerant Pressure is Normal)**

When the pressure in the inlet line is between 0.196 MPa (2.00 kgf/cm^2, 28.4 psi) and 2.94 MPa (30.0 kgf/cm^2, 455 psi), the switch is turned **ON**, and engages magnetic clutch.

■ **OFF Position: [C] (When the Refrigerant Pressure is High)**

When the pressure in the inlet line is higher than specified pressure, the switch is turned **OFF**, and disengages magnetic clutch.

(1) Diaphragm
(2) Belleville Spring
(3) Pin
(4) Plate
(5) Contact
(6) Spring
(7) Terminal

D: OFF
E: ON
P: Pressure
PS: Pressure Switch
a: 0.196 MPa (2.00 kgf/cm^2, 28.4 psi)
b: 3.14 MPa (32.0 kgf/cm^2, 455 psi)

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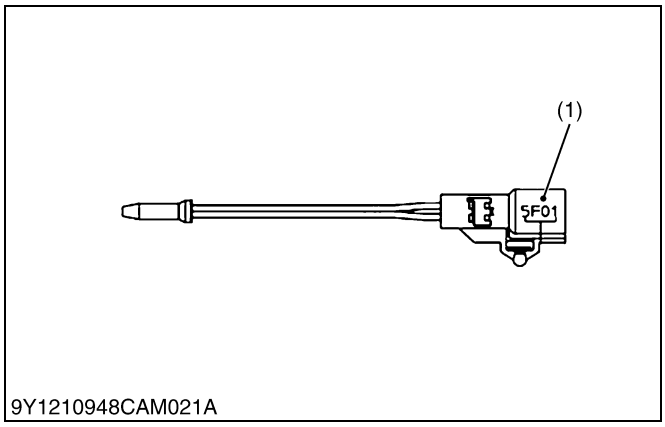
[F] Thermistor



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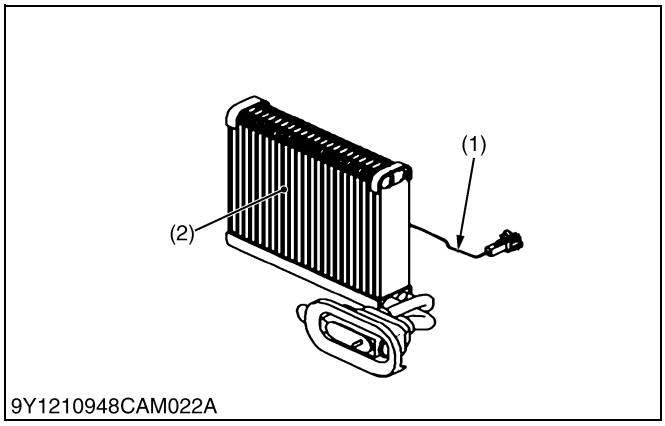

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Thermistor

This machine has a thermistor.

The thermistor prevents an evaporator from frosting.

A resistance of the thermistor is high when the temperature is low.

The thermistor controls the operation of the compressor by utilizing this characteristic.

The thermistor detects the temperature of the air flowing through the evaporator.

Depending on the air temperature, the resistance of the thermistor changes and sends a signal to the control panel assembly.

The control panel assembly sends a signal for controlling the compressor clutch relay **ON** and **OFF**.

If the air temperature of the evaporator is lower than the setting temperature, the compressor clutch relay is turned **OFF** and the compressor does not work.

This prevents the evaporator from frosting.

If the air temperature of the evaporator is higher than the setting temperature, the compressor clutch relay is turned **ON** and the compressor works.

This performs a cooling of the evaporator.

(Reference)

- Thermostat setting temperature:
  OFF: Approx. 2.0 °C (35.6 °F)
  ON: Approx. 4.0 °C (39.2 °F)

(1) Thermistor (2) Evaporator

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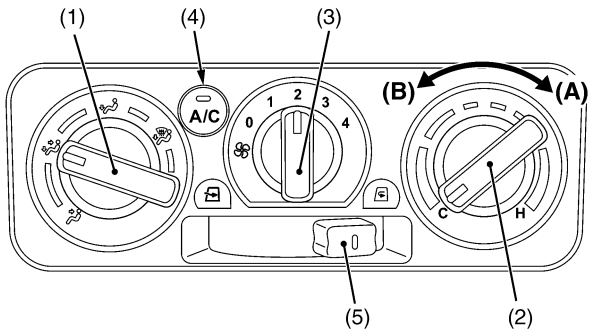
[3] SYSTEM CONTROL



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■ **Recirculation / Fresh Air Selection Lever**

• **RECIRCULATION (Right)**

In-CAB air will be recirculated. This is useful for cooling or heating the CAB quickly or keeping it extra cool or warm.

• **FRESH AIR (Left)**

Fresh air will flow into the CAB. This is helpful when you work in dusty conditions or if the glass windows get foggy.

■ **Air Conditioner Switch**

Push this switch to activate the air conditioner. An indicator light will light up when the switch is set to **"ON"**.

Push the switch again to turn the air conditioner off, in which case the indicator light will be off.

■ **Mode Switch**

• **FACE**

Air is blown from the face and side area air outlets.

• **FACE + FEET**

Air is blown from the face and feet air outlets.

• **FEET**

Air is blown from the feet air outlets

• **FEET + DEFROSTER**

Air is blown from the feet and defroster air outlets.

• **DEFOROSTER**

Air is blown from the defroster air outlets.

■ **Blower Switch**

Air volume can be changed in four steps. At the **"4"** position, the largest air volume is obtained.

■ **Air Conditioner Switch**

Push this switch to activate the air conditioner. An indicator will light up when the switch is set to **"ON"**. Push the switch again to turn the air conditioner off, in which case the indicator light will be off.

(1) Mode Switch
(2) Temperature Control Dial
(3) Blower Switch
(4) Air Conditioner Switch with Indicator Light
(5) Recirculation / Fresh Air Selection Lever

(A) "WARM"
(B) "COOL"

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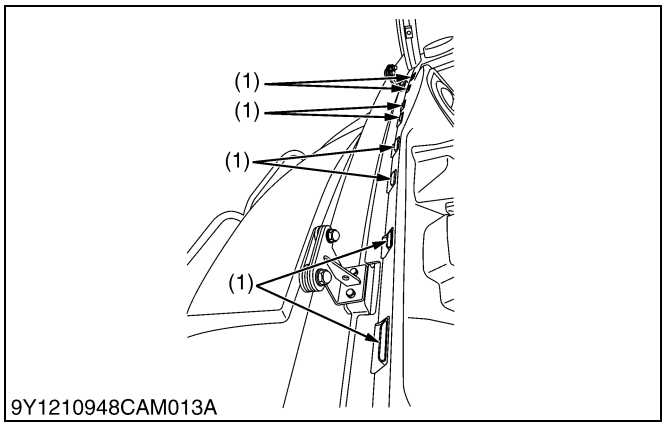
[4] AIR FLOW



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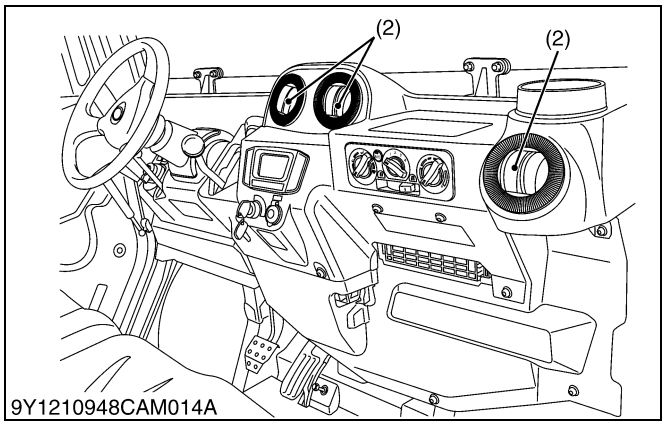

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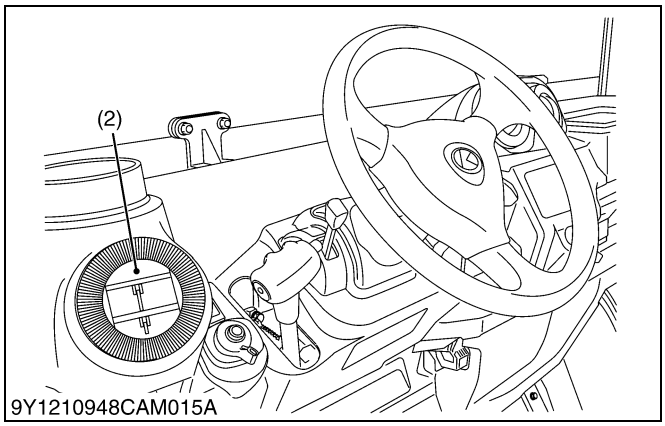

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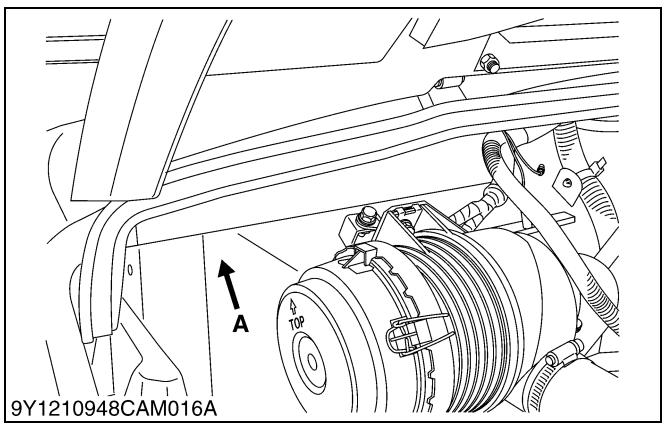

9Y1210948CAM016A

Air in the cabin and fresh air introduced into the cabin flow as shown in the figures. Adjust the 5 air ports to obtain the desired condition.

■ **IMPORTANT**

- **Do not pour water directly into the fresh air port while washing the vehicle.**

(1) Defroster Air Outlet
(2) Dashboard Air Outlet

A: Fresh Air Inlet

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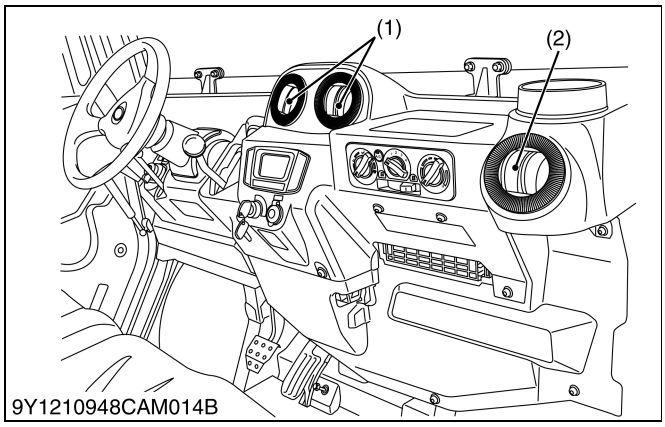
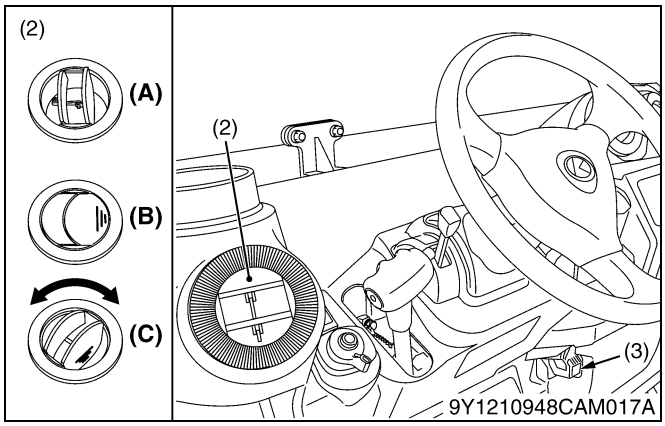
[5] AIR CONTROL VENT





The dashboard air outlet can be independently adjusted as required.

WARNING

To avoid serious injury:

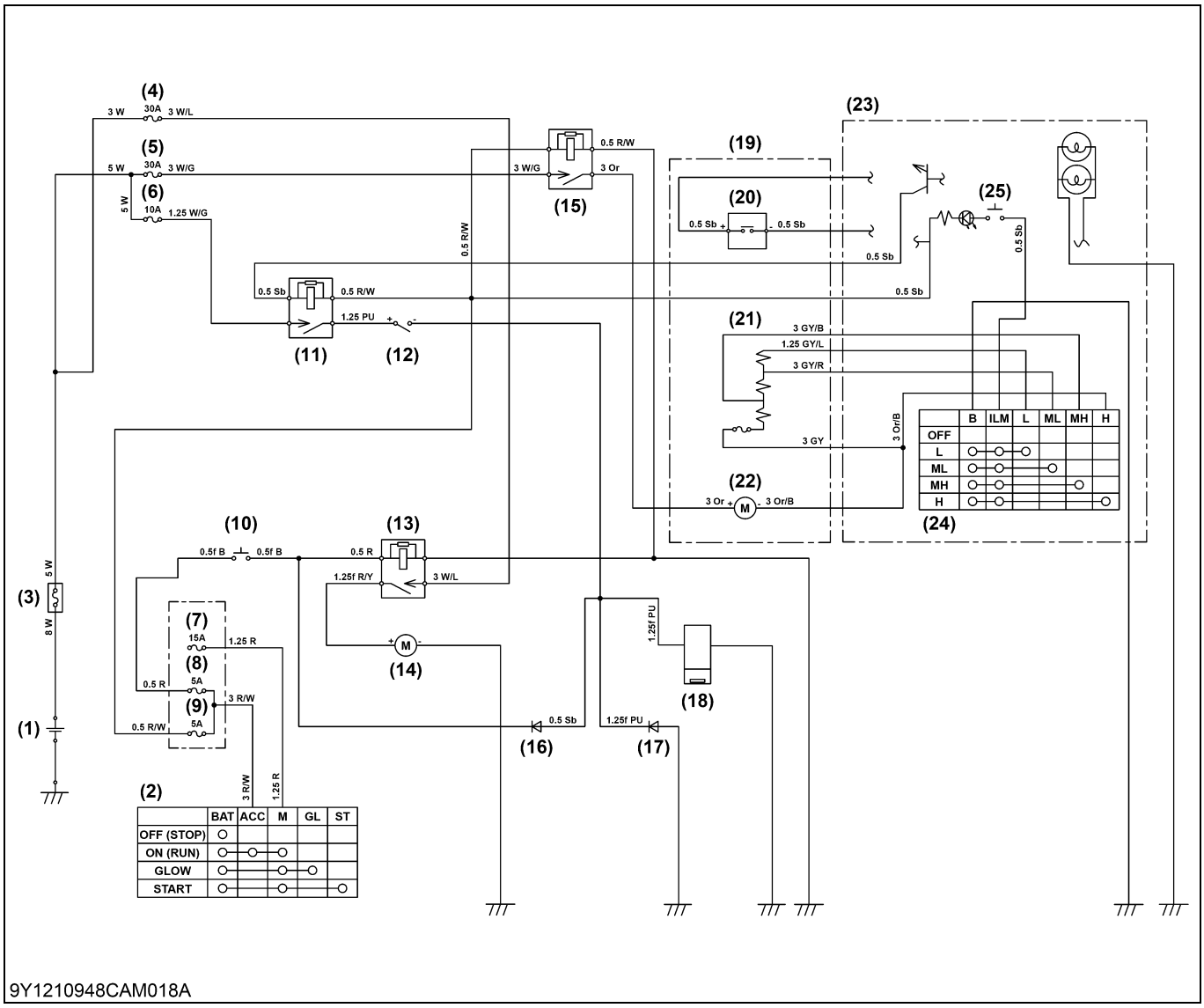
- **Replace the water hoses every two years.**
- **Daily inspection**
  Have the vehicle repaired immediately if any of the following problem are discovered.
  (Such problem may cause burns or injury. They may also cause engine seizure or other serious failure.)
  - **Scratches, cracks or swelling in water hoses.**
  - **Water leakage at water hose joints.**
  - **Loose mounting bolts, damaged brackets.**
- **Do not touch the water hoses and the heater with your hand. You may get burned.**
- **If the window fails to defrost in extreme conditions or becomes cloudy when dehumidifying the CAB, wipe off moisture with a soft cloth.**
- **Do not block all the air outlets of the air conditioner. A trouble could occur.**

(1) Face Area Air Outlet
(2) Side Area Air Outlet
(3) Feet Area Air Outlet

(A) Open
(B) Shut
(C) Turn

9Y1210948CAM0021US0

[6] ELECTRICAL SYSTEM
(1) Electrical Circuit



9Y1210948CAM018A

(1) Battery
(2) Key Switch
(3) Slow Blow Fuse (80A)
(4) Fuse (30A)
(5) Fuse (30A)
(6) Fuse (10A)
(7) Fuse (15A)
(8) Fuse (5A)
(9) Fuse (5A)
(10) Radiator Fan Motor Switch
(11) Compressor Relay
(12) Dual Pressure Switch
(13) Radiator Fan Motor Relay
(14) Radiator Fan Motor
(15) Blower Relay
(16) Radiator Fan Diode
(17) Compressor Clutch Diode
(18) Air Conditioner Compressor
(19) Air Conditioner Unit
(20) Thermistor
(21) Blower Resister
(22) Air Conditioner Blower Motor
(23) Air Conditioner Control Panel
(24) Air Conditioner Panel Switch
(25) Air Conditioner Panel Blower

9Y1210948CAM0022US0

SERVICING

CONTENTS

1. TROUBLESHOOTING

COMPRESSOR

Symptom	Probable Cause	Solution	Reference Page
Noisy (Compressor ON)	Bearing of compressor worn or damaged	Replace	9-S23
	Valves in compressor damaged	Replace	9-S23
	Belt slipping	Adjust or replace	G-45
	Compressor bracket mounting screws loosen	Tighten	G-45
	Piping resonant	Tighten or add clamp	9-S23
Noisy (Compressor OFF)	Blower motor damaged	Repair or replace	9-S31
	Bearings of magnetic clutch, idle pulley or crank pulley worn or damaged	Replace	9-S23

AIR CONDITIONING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Does Not Cool (No Air Flow)	Fuse blown	Replace	G-58
	Blower relay damaged	Replace	9-S22
	Blower motor damaged	Replace	9-S31
	Blower switch damaged	Replace	9-S18
	Wiring harness disconnected or improperly connected	Repair	–
Does Not Cool (Compressor Does Not Rotate)	Fuse blown	Replace	G-58
	Magnetic clutch damaged	Repair or replace	9-S23
	Blower switch damaged	Replace	9-S18
	Pressure switch damaged	Replace	9-S21
	Belt slipping	Adjust or replace	G-45
Does Not Cool (Others)	Insufficient refrigerant	Check with manifold gauge	9-S11
	Expansion valve damaged	Replace	9-S31
	Compressor damaged	Replace	9-S18
Insufficient Cooling (Insufficient Air Flow)	Air filter clogged	Clean or replace	G-44
	Evaporator frosted	Clean or replace thermo switch	9-S31
	Blower motor damaged	Replace	9-S31
	Blower resistor damaged	Replace	9-S20
Insufficient Cooling (Many Bubbles in Sight Glass)	Insufficient refrigerant	Check with manifold gauge	9-S11
	Gas leaking from some place in refrigerating cycle	Repair and charge refrigerant	9-S16
	Air mixed in	Check with manifold gauge	9-S11
Insufficient Cooling (No Bubbles in Sight Glass)	Too much refrigerant	Check with manifold gauge	9-S11

Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Compressor Does Not Rotate Properly)	Belt slipping	Adjust or replace	G-45
	Magnetic clutch damaged	Repair or replace	9-S23
	Compressor damaged	Replace	9-S23
Insufficient Cooling (Others)	Control cable damaged	Replace	9-S29
	Condenser fin clogged with dust	Clean	G-44
	Expansion valve damaged	Replace	9-S31
Insufficient Heating	Control cable damaged	Check and repair	9-S29
	Insufficient coolant	Fill	G-8
Too Low Air Flow Rate (Blower Motor Does Not Operate)	Blower switch damaged	Check and repair	9-S18
	Blower relay damaged	Replace	9-S22
	Fuse blown out	Replace	G-58
	Wrong wiring or loose connections	Check and repair	–
Too Low Air Flow Rate (Flow Rate Does Not Change in 4 Steps)	Blower resistor damaged	Replace	9-S20
	Blower relay damaged	Replace	9-S22
	Blower switch damaged	Replace	9-S18
Too Low Air Flow Rate (Others)	Blower is not tightened enough	Check and repair	9-S31
	Blower deformed	Replace	9-S31
	Blower in contact with casing	Check and repair	9-S31
	Obstacle at or near suction port	Check and repair	9-S23
	Evaporator frosted	Clean or replace	9-S31
	Filter clogged	Clean or replace	G-44
	Blow duct clogged or missing	Check and repair	9-S31
Insufficient Cooling (Compressor Magnetic Clutch Does Not Work)	Low battery voltage	Charge	G-35
	Rotor in contact with stator	Replace	9-S23
	Wrong wiring loose connections	Check and repair	9-S23
	Compressor relay damaged	Replace	9-S22
	Coil shortage	Replace	9-S23
	Ground malfunction	Check and repair	–
	Coil burst out	Replace	9-S23
Insufficient Cooling (Hi-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	9-S11
	Condenser clogged with dust and dirt	Clean	G-45
	Air mixed	Check with manifold gauge	9-S11
Insufficient Cooling (Hi-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	9-S11
	Compressor discharge valve damaged	Replace	9-S23
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	9-S33

Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	9-S11
	Themistor damaged	Check and repair	9-S31
	Expansion valve too open	Replace	9-S31
Insufficient Cooling (Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	9-S11
	Themistor damaged	Check and repair	9-S31
	Evaporator frosted	Clean or replace	9-S31
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	9-S33
	Expansion valve clogged	Replace	9-S31
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	9-S11
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	9-S11
Temperature Cannot be Controlled (Temperature Motor and / or Temperature control dial Malfunction)	Control cable damaged	Replace	9-S29
	Temperature control dial damaged	Replace	9-S29
	Wiring harness connector disconnected	Repair or Replace	–
Temperature Cannot be Controlled (Water Valve Does Not Open Properly)	Cable wrongly set	Repair	9-S29
	Cable disconnected	Repair	9-S29
Temperature Cannot be Controlled (Mode Motor and / or Mode Switch Malfunction)	Control cable damaged	Replace	9-S29
	Mode switch damaged	Replace	9-S29
	Wiring harness connector disconnected	Repair or replace	–
Temperature Cannot be Controlled (Heater Hoses Laid is Bad)	Heater hose caught	Repair	9-S30
	Heater hose twisted or bent	Repair or replace	9-S30

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Kinds of Refrigerant	Charge Amount	R134a 450 to 550 g 0.992 to 1.12 lbs	–
Refrigerating Cycle (Refrigerating Cycle is Normal Operating)	Pressure (**LO** Pressure Side)	0.15 to 0.19 MPa 1.5 to 2.0 kgf/cm^2 22 to 28 psi	–
	Pressure (**HI** Pressure Side)	1.28 to 1.66 MPa 13.0 to 17.0 kgf/cm^2 185 to 241 psi	–
Air-gap of Air Conditioner Compressor Magnet Clutch	Air-gap	0.40 to 0.80 mm 0.016 to 0.031 in.	–
Air Conditioner Drive Belt	Tension	10 to 12 mm (0.40 to 0.47 in.) deflection at 98 N (10 kgf, 22 lbs) of force	–
Pressure Switch (Dual Type) (When pressure switch is turned **OFF**)	Pressure (**LO** Pressure Side)	Less than approx. 0.196 MPa 2.00 kgf/cm^2 28.4 psi	–
	Pressure (**HI** Pressure Side)	More than approx. 2.94 MPa 30.0 kgf/cm^2 426 psi	–

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: Refer to "5. TIGHTENING TORQUES" on page G-14.)

Item	N·m	kgf·m	lbf·ft
High pressure pipe and low pressure pipe mounting screw (Compressor side)	8.0 to 12	0.82 to 1.2	5.9 to 8.8
Compressor mounting screw	18 to 20	1.8 to 2.1	13 to 15
Armature nut (M8)	15 to 21	1.5 to 2.1	11 to 15
Steering wheel mounting nut	29 to 49	3.0 to 4.9	22 to 36
Air conditioner hose joint mounting screw	8.00 to 12.0	0.816 to 1.22	5.90 to 8.85
Condenser mounting screw	10.0 to 12.5	1.02 to 1.27	7.38 to 7.21
Tube mounting screw	8.00 to 12.0	0.816 to 1.22	5.90 to 8.85
High pressure hose and low pressure hose 1 mounting screw (Rear side)	8.0 to 12	0.82 to 1.2	5.9 to 8.8
Wiper arm nut	2.9 to 3.9	0.30 to 0.39	2.2 to 2.8
Wiper motor nut	6.4 to 9.3	0.66 to 0.94	4.8 to 6.8
Wiper motor mounting screw and nut	3.4 to 4.4	0.35 to 0.44	2.5 to 3.2
Front glass mounting cap nut	10.0 to 15.0	1.02 to 1.52	7.38 to 11.0
Door glass mounting bolt and nut	9.80 to 11.3	1.00 to 1.15	7.23 to 8.33

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4. PRECAUTIONS AT REPAIRING REFRIGERANT CYCLE

When checking or repairing the air conditioning system, the following precautions and rules must be observed. And it is of first importance that no other personnel than a well-trained serviceman should be allow to handle the refrigerant.

CAUTION

- **Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. Always wear goggles to protect your eyes when working around the system.**
- **The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instructions on the label. In particular, never heat the refrigerant container above 40 °C (104 °F) or drop it from a high height.**
- **Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.**
- **If you improperly connect the hose between the service valve of compressor and gauge manifold, or incorrectly handle the valves, the refrigerant service container or charging hose will explode. When connecting the hose or handling the valve, be sure to check the high pressure side or low pressure side.**
- **In case the refrigerant is charged while the compressor is operated, do not open the high pressure valve of the gauge manifold.**
- **Be careful of the toxicity of the gas. The gas is harmless and nontoxic in its original state, however it produces a toxic substance when it comes in contact with high temperature parts and decomposes.**
- **Do not heat the service can unless necessary. When it has to be heated, use warm water of 40 °C (104 °F) or lower. Do not heat using boiling water.**

■ IMPORTANT

- **If the refrigerant, O-rings, etc. for R12 are used in the R134a air conditioner system, problems such as refrigerant leakage or cloudiness in the sight glass may occur. Therefore, in order to prevent charging of refrigerant or erroneous connections, the shapes of the piping joint as well as the shapes of the service valve and the service tools have been changed.**
- **Always keep the working place clean and dry and free from dirt and dust. Wipe off water from the line fittings with a clean cloth before disconnecting.**
- **Use only for R134a refrigerant service tool.**
- **Use for R134a refrigerant recovery and recycling machine when discharging the refrigerant.**
- **Before attaching the charging hose to the can tap valve of the refrigerant container, check each packing for clogging.**
- **When disconnecting the charging hose from the charging valve of compressor and receiver, remove it as quick as possible so that gas leakage can be minimized.**
- **Be sure to charge the specified amount of refrigerant, but not excessively. Over-charging of the refrigerant in particular may cause insufficient cooling, etc..**
- **Since the charging hose can be connected to can tap valve by hand, do not use a pliers for tightening it.**
- **Keep refrigerant containers in a cool and dark place avoiding such place which are subject to strong sunlight or high temperature.**
- **R134a compressor oil absorbs moisture easily, so that be sure to seal after disconnecting the each parts.**
- **Do not use old-type refrigerant R12a or compressor oil for old-type refrigerant.**
- **When replacing the condenser**

(Refrigerant)

Kinds of refrigerant (Charge amount)	Factory specification	R134a 450 to 550 g 0.992 to 1.12 lbs

(Compressor Oil)

Quantity (Total)	Brand Name
100 cc 0.106 U.S.qts 0.0880 Imp.qts	SP10 oil <PAG* oil>

*PAG: Polyalkyleneglycol (Synthetic oil)

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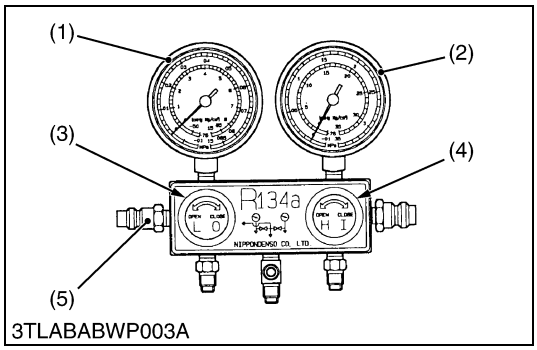
[1] HANDLING OF SERVICE TOOLS

(1) Manifold Gauge Set



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The hand valves on the manifold gauge set are used to open and close the valve. The hand valve inscribed **LO** is for the low pressure side valve (3) and **HI** is for the high pressure side valve (4). By opening or closing the high and low pressure hand valves, the following circuits are established.

(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **LO** Pressure Side Valve
(4) **HI** Pressure Side Valve
(5) Schrader Valve

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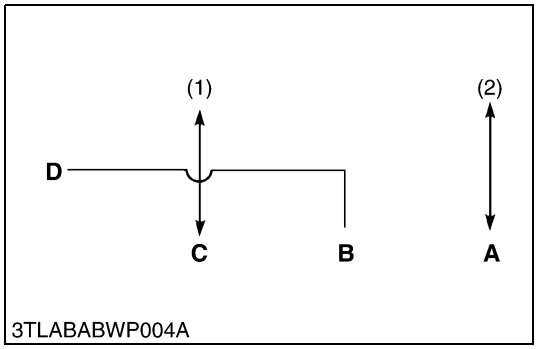

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■ **When LO Pressure Side Valve and HI Pressure Side Valve are Closed**
Two circuits are established.
Port **"C"**→ **LO** pressure gauge (1)
Port **"A"**→ **HI** pressure gauge (2)

■ **NOTE**
- **Schrader valve "D" must be opened.**

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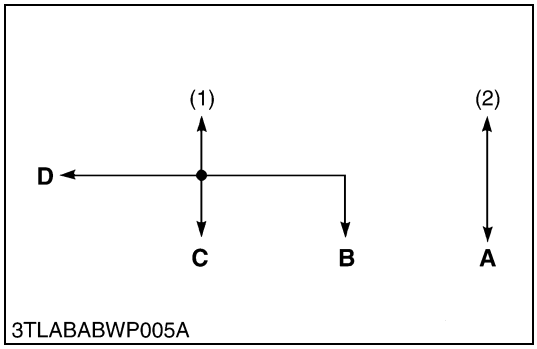

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■ **When LO Valve is Opened and HI Valve is Closed**
Two circuits are established.
Port **"C"**→ **LO** pressure gauge (1)
→ Port **"B"**
→ Port **"D"**
Port **"A"**→ **HI** pressure gauge (2)

■ **NOTE**
- **Schrader valve "D" must be opened.**

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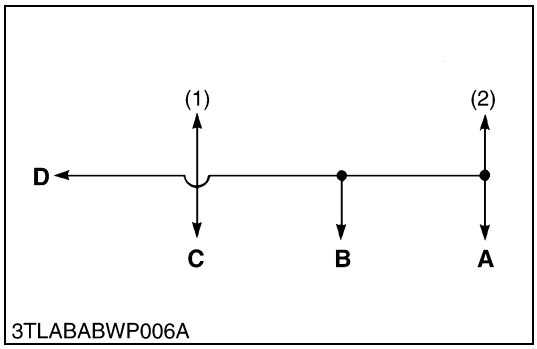

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■ **When LO Valve is Closed and HI Valve is Opened**
Two circuits are established.
Port **"C"**→ **LO** pressure gauge (1)
→ Port **"B"**
→ Port **"D"**
Port **"A"**→ **HI** pressure gauge (2)

■ **NOTE**
- **Schrader valve "D" must be opened.**

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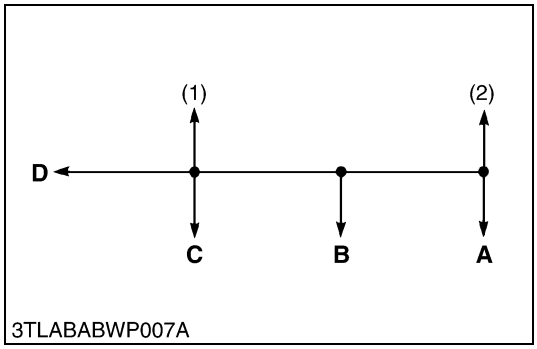

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■ **When LO and HI Valve are Opened**
Circuits are established.
Port **"A"**→ **HI** pressure gauge (2)
→ **LO** pressure gauge (1)
→ Port **"B"**
→ Port **"C"**
→ Port **"D"**

■ **NOTE**
- **Schrader valve "D" must be opened.**

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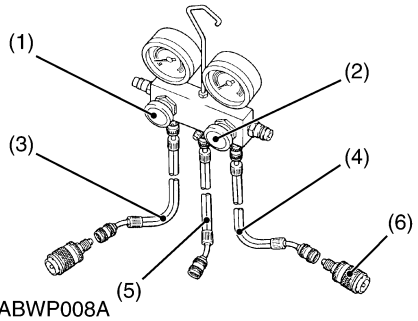
(2) Refrigerant Charging Hose



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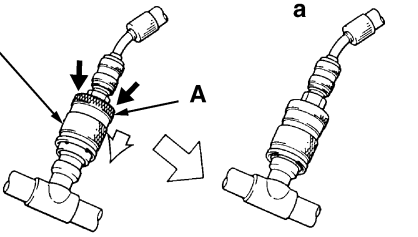

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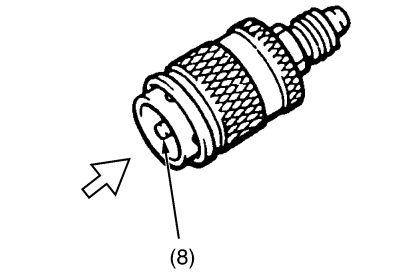

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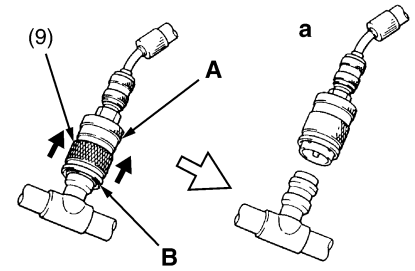

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The charging hoses are classified into three colors. Each charging hose must be handled as follows:

- The air conditioner manufacture recommends that the blue hose (3) is used for the **LO** pressure side (suction side), the green hose (5) for refrigeration side (center connecting port) and the red hose (4) for **HI** pressure side (discharged side).

(When connecting)

- Push the quick disconnect adaptor (6) into the charging valve, and push on part **"A"** until a click is heard.

■ **NOTE**

- **When connecting, push carefully so the pipe doesn't bend.**
- **When connecting the quick disconnect connector, should the sleeve (7) move before the quick link connector can be connected to the charging valve, move the quick sleeve to its original position and try again.**
- **When some refrigerant remains in the charging hose at the time of connections, it may be difficult to connect the quick link connector. In this case, perform the operation after removing any residual pressure in the hose. (Remove the residual pressure by pushing the pusher (8).)**

(When reassembling)

- While holding on to part **"A"** of the quick disconnect adaptor, slide part **"B"** up.

■ **NOTE**

- **After removing the adaptor, ensure to cap the quick disconnect adaptor service valve.**

(1) **LO** Pressure Side Valve
(2) **HI** Pressure Side Valve
(3) Blue Hose
(4) Red Hose
(5) Green Hose
(6) Quick Disconnect Adaptor
(7) Sleeve
(8) Pusher
(9) Sleeve

a: CLICK

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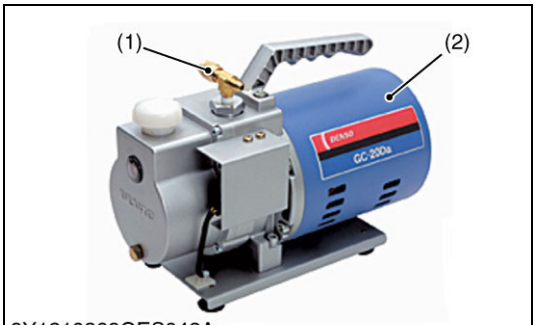
(3) Vacuum Pump Adaptor



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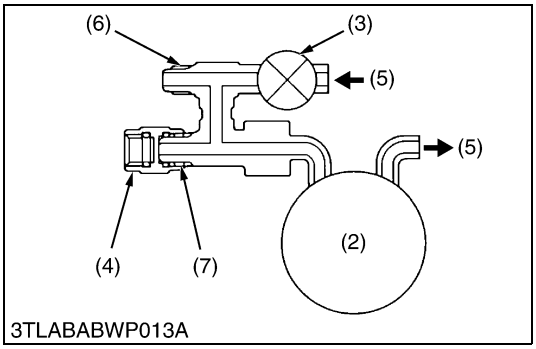

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Objective of the Vacuum Pump Adaptor

1. After vacuum has been created in the air conditioning cycle, when the vacuum pump is stopped, since there is vacuum in hoses within the gauge manifold, the vacuum pump oil flows back into the charging hose. If the refrigerant is refilled with the system still in this state, the vacuum pump oil left in the charging hose enters the air conditioner cycle together with the refrigerant.
   Vacuum pump adaptor with a solenoid valve is used to prevent this back-flow of oil from the vacuum pump. The role of the solenoid valve is that when the current passes through the solenoid valve, the valve closes to keep out the outside air and allow the vacuum to build up, but when the current stops, the valve opens to allow in air and end the vacuum.
2. Attaching this adaptor to the R12 vacuum pump currently being used allows the pump to be used with both R134a and R12.

(1) Vacuum Pump Adaptor
(2) Vacuum Pump
(3) Magnetic Valve
(4) Blind Cap
(5) Air
(6) For R134a
(7) For R12

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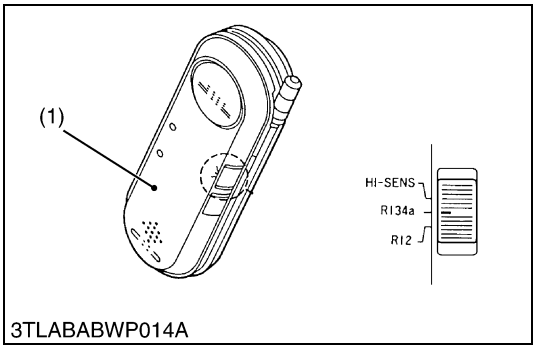
(4) Electric Gas Leak Tester



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The current R12 gas leak tester has poor sensitivity for R134a and cannot be used. Therefore, a new electric gas leak tester with greater sensitivity has been designed and can be used with both R134a and R12.

(Reference)

Leak tester with halide torch

- Since the reaction with chlorine within the refrigerant is used to detect gas leaks, R134a, which contains no chlorine, cannot be detected.

(1) Electric Gas Leak Tester

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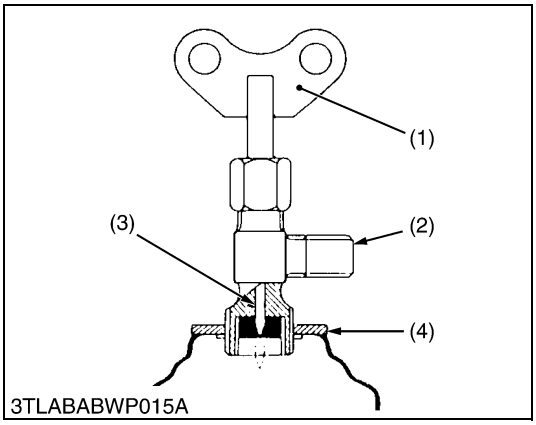
(5) Can Tap Valve



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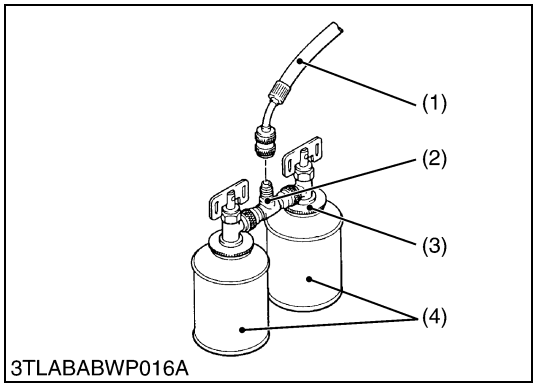
The can tap valve that is used to charge the refrigerant into the air conditioning system, should be used as follows:

1. Before putting the can tap valve on the refrigerant container, turn the handle (1) counterclockwise till the valve needle is fully retracted.
2. Turn the plate nut (disc) (4) counterclockwise till it reaches its highest position, then screw down the can tap valve into the sealed tap.
3. Turn the place nut clockwise fully, and fix the center charging hose to the valve.
4. Tighten the place nut firmly by hand.
5. Turn the handle (1) clockwise, thus making a hole in the sealed tap.
6. To charge the refrigerant into the system, turn the handle (1) counterclockwise. To stop charging, turn it clockwise.

(1) Butterfly Handle
(2) Connection
(3) Needle
(4) Disc

9Y1210948CAS0013US0

(6) T-joint



T-joint (2) is used to increase efficiency of gas charging using two refrigerant containers (4) at a time.

1. Install two refrigerant container service valves to T-joint (2) sides and connect the charging hose (1) to it.

(1) Charging Hose (Green)
(2) T-joint
(3) Can Tap Valve
(4) Refrigerant Container

9Y1210948CAS0014US0

(7) R134a Refrigerant Recovery and Recycling Machine

1. When there is necessity of discharging the refrigerant on repairing the tractor, it should use recovery and recycling machine.
   (Don't release the refrigerant into the atmosphere.)

■ **IMPORTANT**

- **Use only R134a refrigerant recovery and recycling machine, eliminate mixing R134a equipment, refrigerant and refrigerant oils with R12 systems to prevent compressor damage.**

9Y1210948CAS0015US0

5. CHECKING AND CHARGING REFRIGERANT CYCLE

[1] CHECKING WITH MANIFOLD GAUGE

■ **IMPORTANT**

- **The gauge indications described in the following testing are those taken under the same condition, so it should be noted that the gauge readings will differs somewhat with the ambient conditions.**

Condition

- Ambient temperature: **30 to 35 °C (86 to 95 °F)**
- Engine speed: Approx. **1500 min^{-1} (rpm)**
- Temperature control lever: **Maximum cooling position**
- Air conditioner switch: **ON**
- Blower switch: **HI** position

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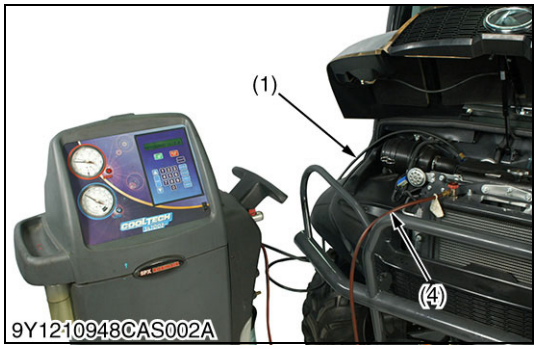
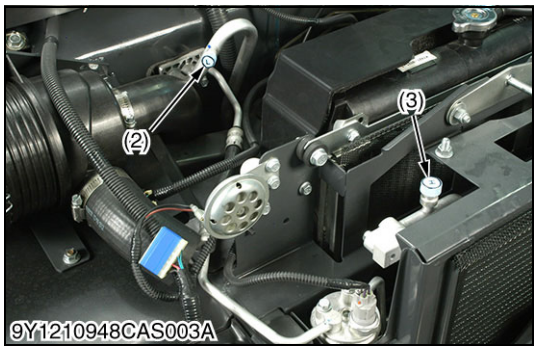
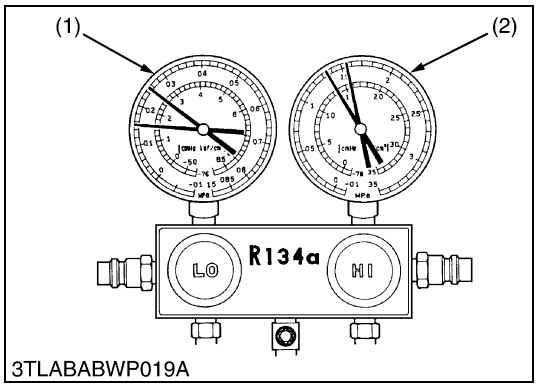






Manifold Gauge Connecting and Test Preparation

1. Close the **HI** and **LO** pressure side valve tightly.
2. Connect the charging hose (red) to the **HI** pressure side charging valve and connect the charging hose (black) to the **LO** pressure side charging valve.

■ **NOTE**

- **Be sure to drive out the air in the charging hoses at the connection end by utilizing the refrigerant pressure in the refrigerating cycle.**

3. Start the engine and set at approx. **1500 min^{-1} (rpm)**.
4. Turn on the air conditioner switch and set the temperature control lever to **maximum cooling** position.
5. Set the blower switch to **HI** position.

(1) Charging Hose (Black)
(2) **LO** Pressure Side Valve
(3) **HI** Pressure Side Valve
(4) Charging Hose (Red)

9Y1210948CAS0017US0

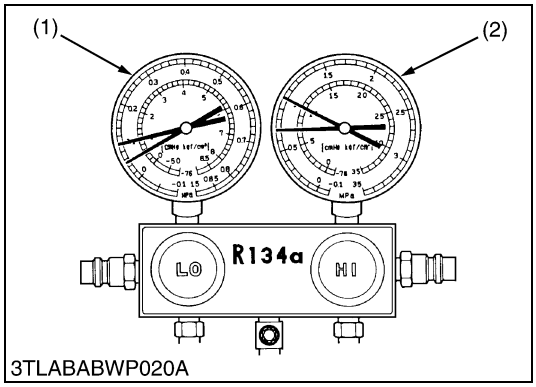
Normal Operating

If the refrigerating cycle is operating normally, the reading at the **LO** pressure side (1) should be generally by around 0.15 to 0.19 MPa (1.5 to 2.0 kgf/cm^2, 22 to 28 psi) and that at the **HI** pressure side (2) around 1.28 to 1.66 MPa (13.0 to 17.0 kgf/cm^2, 185 to 241 psi).

Gas pressure	Factory specification	Low pressure side	0.15 to 0.19 MPa 1.5 to 2.0 kgf/cm^2 22 to 28 psi
		High pressure side	1.28 to 1.66 MPa 13.0 to 17.0 kgf/cm^2 185 to 241 psi

(1) **LO** Pressure Side
(2) **HI** Pressure Side

9Y1210948CAS0018US0



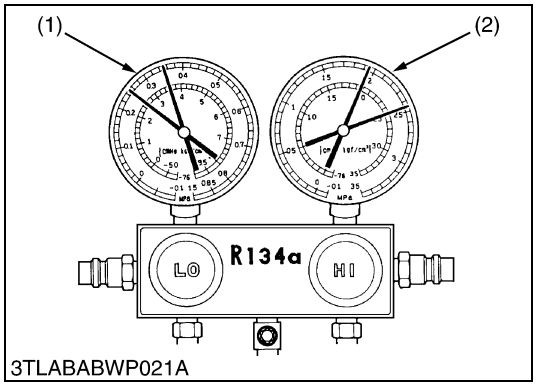
3TLABABWP020A

Insufficient Refrigerant

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too low.
     LO pressure side (1): 0.049 to 0.098 MPa (0.50 to 1.0 kgf/cm^2, 7.2 to 14 psi)
     HI pressure side (2): 0.69 to 0.98 MPa (7.0 to 10 kgf/cm^2, 100 to 140 psi)
   - Bubbles seen in sight glass.
   - Air discharged from air conditioner sightly cold.
2. Probable cause
   - Gas leaking from some place in refrigerant cycle.
3. Solution
   - Check for leakage with electric gas leak tester (see page 9-S9) and repair.
   - Recharge refrigerant to the proper level. (See page 9-S11.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210948CAS0019US0



3TLABABWP021A

Excessive Refrigerant or Insufficient Condenser Cooling

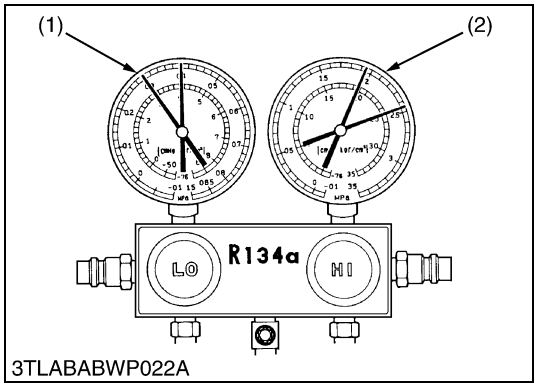
1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1): 0.20 to 0.34 MPa (2.0 to 3.5 kgf/cm^2, 29 to 49 psi)
     HI pressure side (2): 2.0 to 2.4 MPa (20 to 25 kgf/cm^2, 290 to 350 psi)
2. Probable cause
   - Overcharging refrigerant into cycle.
   - Condenser cooling damaged.
3. Solution
   - Clean condenser. (See page G-23.)
   - Adjust air conditioner belt to proper tension. (See page G-45.)
   - If the above two items are in normal condition, check refrigerant quantity. (See page 9-S11.)

■ **NOTE**

- **If excessive refrigerant is to be discharged, loosen manifold gauge LO pressure side valve and vent out slowly.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210948CAS0020US0



3TLABABWP022A

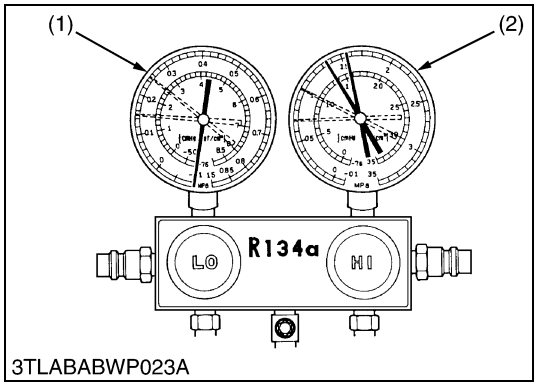
Air Entered in the Cycle

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1): 0.20 to 0.34 MPa (2.0 to 3.5 kgf/cm^2, 29 to 49 psi)
     HI pressure side (2): 2.0 to 2.4 MPa (20 to 25 kgf/cm^2, 290 to 350 psi)
   - **LO** pressure side (1) piping not cold when touched.
2. Probable cause
   - Air entered in refrigerating cycle.
3. Solution
   - Replace receiver.
   - Check compressor oil contamination and quantity.
   - Evacuate and recharge new refrigerant. (See page 9-S16.)

■ **NOTE**
- **The above cycle can be seen when the cycle is charged without evacuation.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210948CAS0021US0



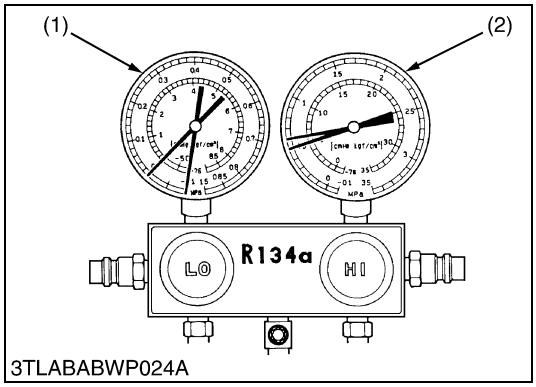
3TLABABWP023A

Moisture Entered in the Cycle

1. Symptoms seen in refrigerating cycle
   - The air conditioner operates normally at the beginning, but over time, **LO** pressure side (1) pressure is **vacuum** and **HI** pressure side (2) is low pressure.
     LO pressure side (1): Vacuum
     HI pressure side (2): 0.69 to 0.98 MPa (7.0 to 10 kgf/cm^2, 100 to 140 psi)
2. Probable cause
   - The moisture in the refrigerating cycle freezes in the expansion valve orifice and causes temporary blocking. After a time, the ice melts and condition returns to normal.
3. Solution
   - Replace receiver.
   - Remove moisture in cycle by means of repeated evacuation. (See page 9-S16.)
   - Recharge new refrigerant to the proper level. (See page 9-S11.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210948CAS0022US0



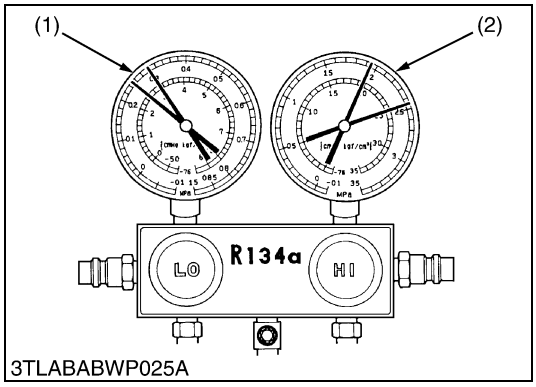
3TLABABWP024A

Refrigerant Fails to Circulate

1. Symptoms seen in refrigerating cycle
   - **LO** pressure side (1) pressure is vacuum and, **HI** pressure side (2) is low pressure.
     LO pressure side (1): Vacuum
     HI pressure side (2): 0.49 to 0.58 MPa (5.0 to 6.0 kgf/cm^2, 72 to 85 psi)
2. Probable cause
   - Refrigerant flow obstructed by moisture or dirt in the refrigerating cycle freezing or sticking on the expansion valve orifice.
3. Solution
   Allow to stand for same time and then resume operation to decide whether the plugging is due to moisture or dirt.
   - If caused by moisture, correct by referring to instructions in previous.
   - If caused by dirt, remove the expansion valve and blow out the dirt with compressed air.
   - If unable to remove the dirt, replace the expansion valve. Replace the receiver. Evacuate and charge in proper amount of new refrigerant. (See page 9-S16.)
   - If caused by gas leakage in heat sensitizing tube, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210948CAS0023US0



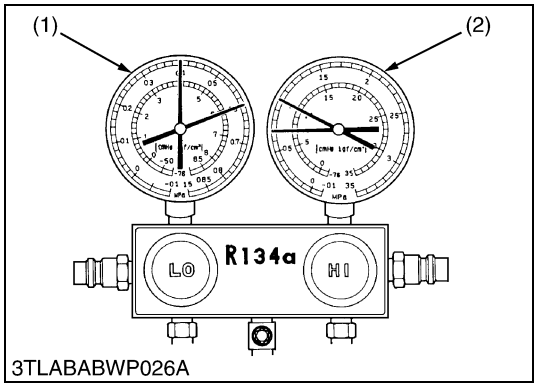
3TLABABWP025A

Expansion Valve Opens Too Far or Improper Installation of Heat Sensitizing Tube

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1): 0.30 to 0.39 MPa (3.0 to 4.0 kgf/cm^2, 43 to 56 psi)
     HI pressure side (2): 2.0 to 2.4 MPa (20 to 25 kgf/cm^2, 290 to 350 psi)
   - Frost or heavy dew on low pressure side piping.
2. Probable cause
   - Expansion valve trouble or heat sensitizing tube improperly installed.
   - Flow adjustment not properly done.
3. Solution
   - Check installed condition of heat sensitizing tube.
   - If installation of heat sensitizing tube is correct, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210948CAS0024US0



3TLABABWP026A

Faulty Compression of Compressor

1. Symptoms seen in refrigerating cycle
   - **LO** pressure side (1): 0.40 to 0.58 MPa (4.0 to 4.6 kgf/cm^2, 57 to 85 psi)
   - **HI** pressure side (2): 0.69 to 0.98 MPa (7.0 to 10 kgf/cm^2, 100 to 140 psi)
2. Probable cause
   - Leak in compressor.
3. Solution
   - Replace compressor. (See page 9-S23.)

■ **NOTE**

- **Manifold gauge indications (left side figure) at faulty compressing by compressor.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

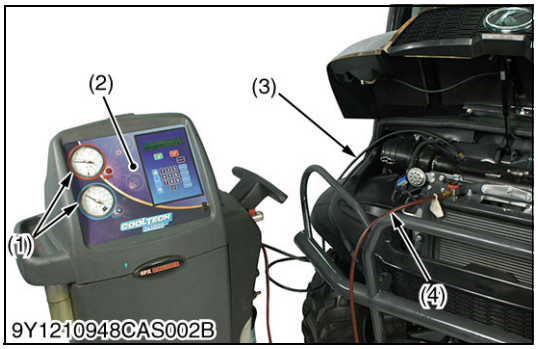
9Y1210948CAS0025US0

[2] DISCHARGING, EVACUATING AND CHARGING

■ **NOTE**
- **Follow the manufacture's instructions when you discharging, evacuating and charging the refrigerant system.**

9Y1210948CAS0026US0

(1) Discharging Evacuating and Charging the Refrigerant



Prepare for the R134a refrigerant recovery, and charging recycling machine.

1. Connect the charging hose (black) (3) to **LO** pressure side charging valve. Connect the charging hose (red) to **HI** pressure side charging valve.
2. Follow the manufacturers instructions and discharge, recovering, recycling and charging the system.

■ **IMPORTANT**
- **Use only R134a refrigerant recovering, recycling and charging machine (2). Eliminate mixing R134a equipment, refrigerant, and refrigerant oils with R12 system to prevent compressor damage.**

CAUTION
- **Protect fingers and eyes with cloth against frostbite by refrigerant when disconnecting the hose to the charging valve.**

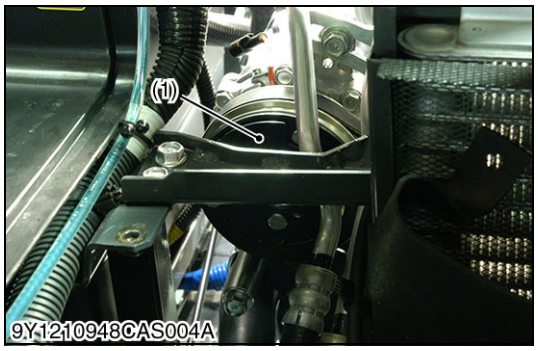
(1) Manifold Gauge
(2) Refrigerant Recovering, Recycling and Charging Machine
(3) Charging Hose (Black)
(4) Charging Hose (Red)

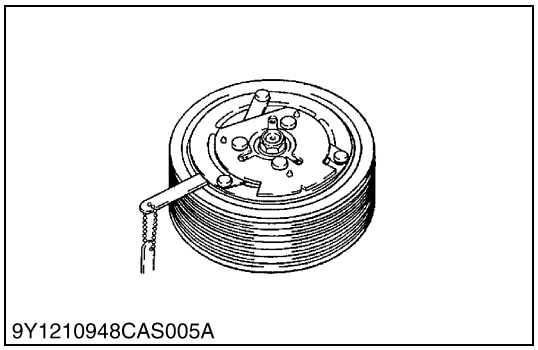
9Y1210948CAS0027US0

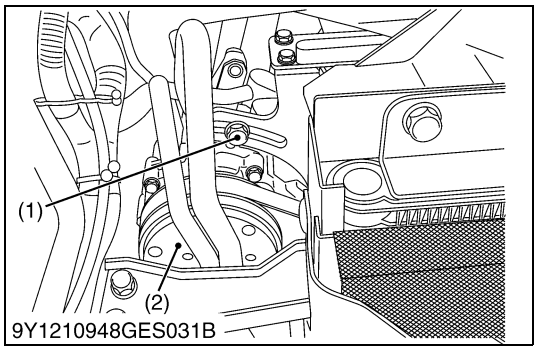
6. CHECKING, DISASSEMBLING AND SERVICING

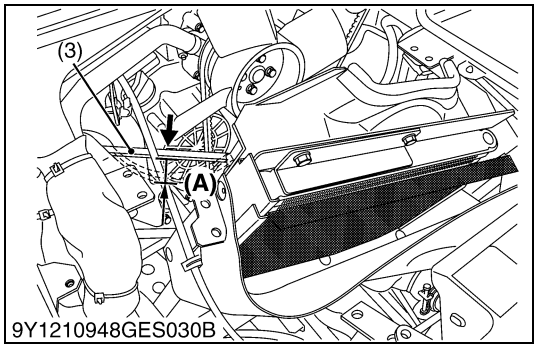
[1] CHECKING AND ADJUSTING

(1) Compressor









Operation of Magnetic Clutch

1. Turn off the air conditioner switch after starting the engine.
2. Check whether abrasion or abnormal noise is heard when only the magnetic clutch pulley is operating.
3. Check that the magnetic clutch (1) does not slip when the air conditioner switch and blower switch are turned **ON** (when the air conditioner is in operation).
4. If anything abnormal is found, repair or replace.

(1) Magnetic Clutch

9Y1210948CAS0028US0

Air Gap

1. Check the air gap with feeler gauge.
2. If the measurement is not within the factory specifications, replace it. (See page 9-S23.)

Air gap	Factory specification	0.40 to 0.80 mm 0.016 to 0.031 in.

9Y1210948CAS0029US0

Adjusting Air Conditioner Belt Tension

CAUTION

- **Be sure to stop the engine before checking air conditioner belt tension.**

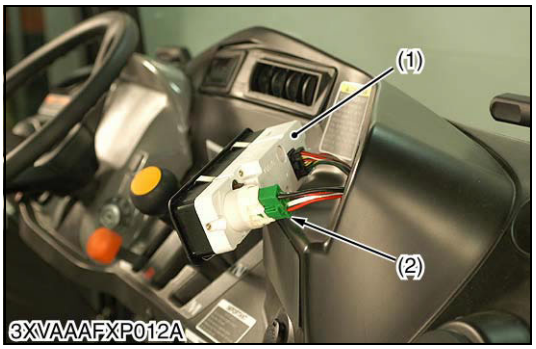
1. Stop the engine and remove the key.
2. Apply 98 N (10 kgf, 22 lbf) pressure to the belt between the pulleys.
3. If tension is incorrect, adjust the belt tension.
4. If belt is damaged, replace it.

Air conditioner belt tension	Factory specification	A deflection of between 10 to 12 mm (0.40 to 0.47 in.) when the belt is pressed in the middle of the span

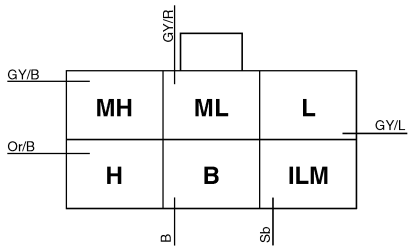
(1) Adjusting Bolt
(2) Belt Tension Pulley
(3) Belt
(A) Deflection

9Y1210948CAS0030US0

(2) Control Panel (Blower Switch, Air Conditioner Switch, Mode Control Dial, Temperature Control Dial and Recirculation/Fresh Air Selection Switch)

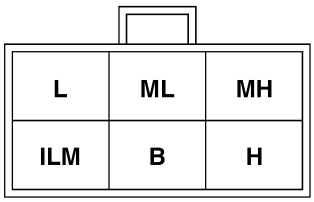


(A)



9Y1210948CAS001A

(A)



9Y1210948CAS055A

Blower Switch Connector Voltage

1. Disconnect the **6P** connector (2) from blower switch.
2. Turn the main switch to **ON** position.
3. Measure the voltage with a voltmeter across the connector terminal **B** and terminal **H**.
4. If the voltage differs from the battery voltage, the wiring harness, air conditioner relay, fuse or main switch is damaged.

Voltage	Terminal **B** – Terminal **H**	Approx. battery voltage

(1) Control Panel
(2) **6P** Connector

(A) 6P Connector (Wire Harness Side)

9Y1210948CAS0031US0

Blower Switch Test

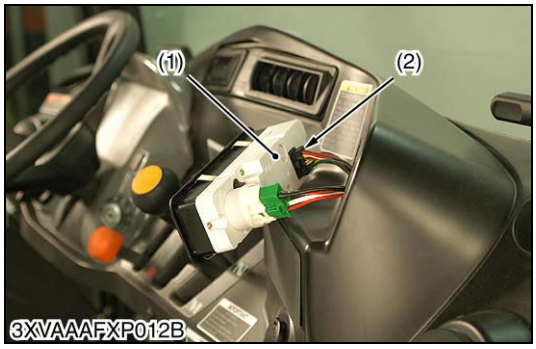
1. Check the continuity through the switch with an ohmmeter.
2. If the continuity specified below are not indicated, the switch is damaged.

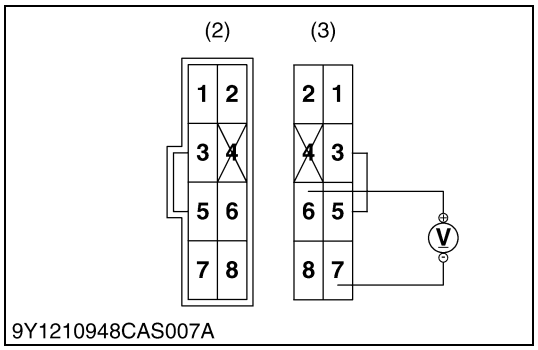
Position		Terminal					
		B	**ILM**	**L**	**ML**	**MH**	**H**
Air conditioner switch	**OFF**						
	Low	●	●	●			
	Medium Low	●	●		●		
	Medium High	●	●			●	
	High	●	●				●

9Y1210948CAS006US

(A) 6P Connector (Blower Switch Side)

9Y1210948CAS0032US0





(3) Blower Motor

Connector Voltage

1. Disconnect the **8P** connector (2) from control panel switch.
2. Turn the main switch to **ON** position.
3. Measure the voltage with a voltmeter across the terminal **6** and terminal **7**.
4. If the voltage differs from the battery voltage, the wiring harness, air conditioner relay or fuse is damaged.

Voltage	Terminal **7** – Terminal **6**	Approx. battery voltage

(1) Control Panel
(2) **8P** Connector (Switch Side)
(3) **8P** Connector (Wire Harness Side)

9Y1210948CAS0033US0

Blower Motor Test

CAUTION

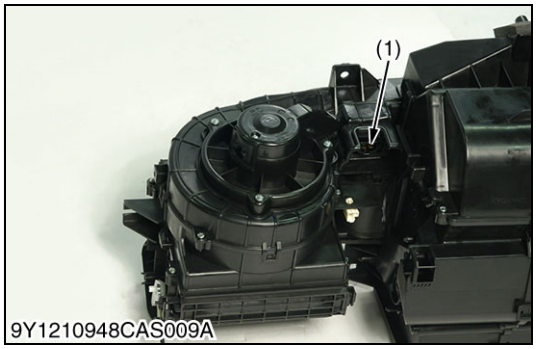
- **Do not touch the rotating blower fan.**

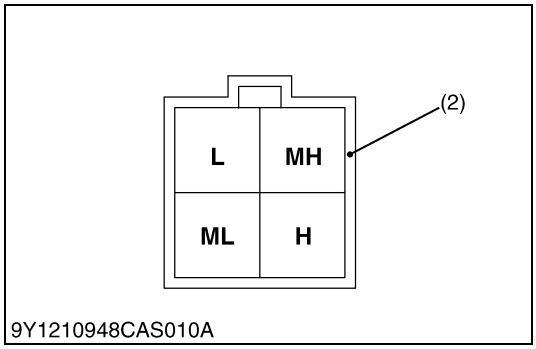
1. Turn the main switch to **OFF** position.
2. Turn the main switch to **ON** position
3. Turn the blower switch (1) to **1** position.
4. If the blower motor does not operate check it.
5. Next, turn the blower switch (1) from **1** to **4** position sequentially.
6. At this time, make sure the rotational speed of blower fan increase sequentially.
7. If the rotational speed of blower fan does not change by position of blower switch, check the blower resister.

(1) Blower Switch

9Y1210948CAS0034US0

(4) Blower Resistor





Blower Resistor Check

■ **NOTE**

- **Perform the blower motor test, before checking of blower resister.**

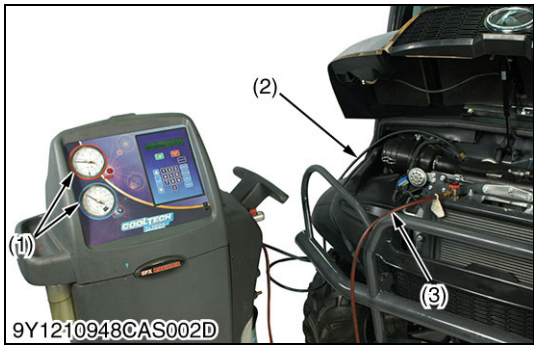
1. Remove the air conditioner unit. (See page 9-S27.)
2. Measure each resistance from terminal HI of the blower resister (1).
3. If the factory specifications are not indicated, replace the blower resister (1).

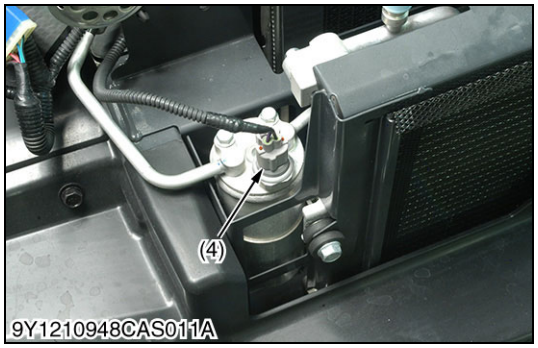
Voltage	Factory specification	Terminal **H** – Terminal **ML**	Approx. 1.47 Ω
		Terminal **H** – Terminal **MH**	Approx. 0.55 Ω
		Terminal **H** – Terminal **L**	Approx. 3.3 Ω

(1) Blower Resistor (2) Connector

9Y1210948CAS0035US0

(5) Pressure Switch





Pressure Switch

■ **NOTE**

- **Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerant cycle.**

1) HI Pressure Side

1. Close the **HI** and **LO** pressure side valves of manifold gauge tightly, and connect the charging hoses (red and black) to the respective compressor service valves.
2. Start the engine and set at approx. 1500 min^{-1} (rpm). Turn on the air conditioner switch, then set the blower switch to **HI** position.
3. Raise pressure on the **HI** pressure side of the refrigerant cycle by covering the condenser front with a corrugated cardboard, and the pressure switch is activated and the compressor magnetic clutch is turned off. At this time, read the **HI** pressure gauge of the manifold gauge. If this pressure reading differs largely with the setting pressure, replace the pressure switch with a new one.

Setting pressure	Factory specification	Pressure switch **OFF**	More than approx. 3.14 MPa 32.0 kgf/cm^2 455 psi

2) LO Pressure Side

1. Disconnect **2P** connector of pressure switch (4).
2. Measure the resistance with an ohmmeter across the connector terminals.
3. If 0 ohm is not indicated at normal condition, there is no refrigerant in the refrigerating cycle because gas leaks or pressure switch is damaged.

(Reference)

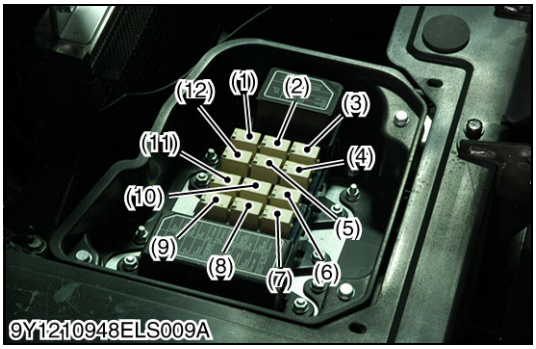
Setting pressure	Factory specification	Pressure switch **OFF**	Less than approx. 0.196 MPa 2.00 kgf/cm^2 28.4 psi

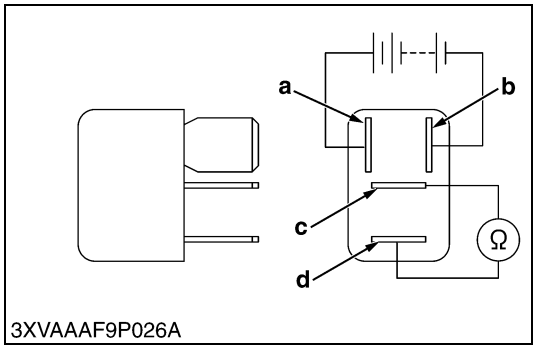
- The resistance of pressure switch is 0 ohm in normal condition, but it becomes infinity if the pressure is out of factory specification. Because the pressure switch starts to work.

(1) Manifold Gauge
(2) Charging Hose (Black)
(3) Charging Hose (Red)
(4) Pressure Switch

9Y1210948CAS0036US0

(6) Relays





Relay

1. Turn the main switch to **OFF** position.
2. Remove the cover.
3. Remove the relay which should be checked.
4. Connect the jumper load across the battery positive terminal to relay terminal **1 "a"**, and the battery negative terminal to relay terminal **2 "b"**.
5. Check the continuity with an ohmmeter between the relay terminal **5 "c"** and terminal **3 "d".**
6. If the continuity is 0 ohms, the relay is proper.

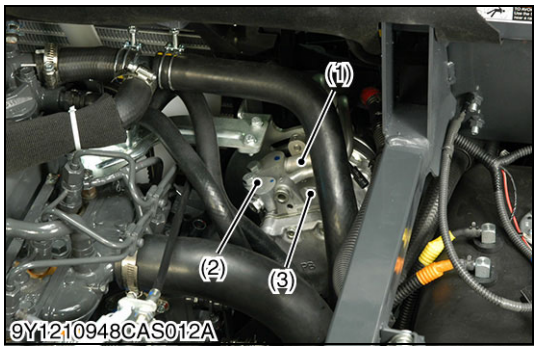
(1) Wiper Relay
(2) Rear Radiator Fan Motor Relay
(3) Blower Relay
(4) Compressor Relay
(5) Oil Temperature Relay
(6) Front Radiator Fan Motor Relay
(7) Starter Relay
(8) Solenoid Relay
(9) Work Light Relay
(10) Spare
(11) Beacon Relay
(12) Fog Lamp Relay

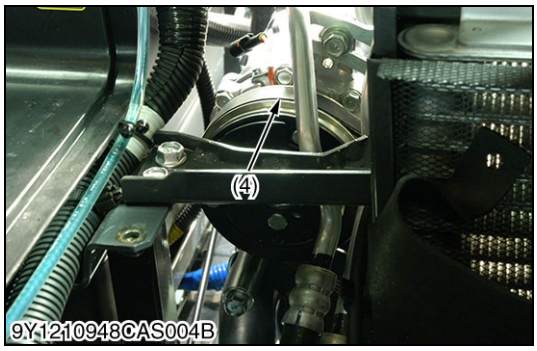
a: Relay Terminal 1
b: Relay Terminal 2
c: Relay Terminal 5
d: Relay Terminal 3

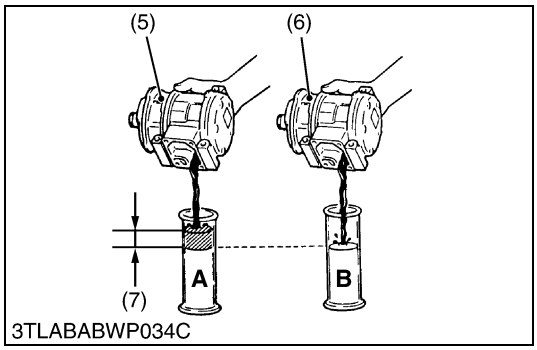
9Y1210948CAS0037US0

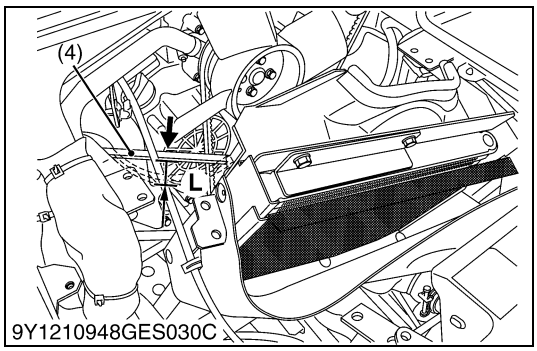
[2] DISASSEMBLING AND ASSEMBLING

(1) Removing Compressor Assembly









Compressor Assembly

■ **NOTE**

- **Follow the manufacture's instructions when you discharging the refrigerant system.**

1. Discharge the refrigerant from the system.
2. Disconnect the low pressure pipe (suction) (1) and high pressure pipe 1 (discharge) (2) from the compressor, then cap the open fitting immediately to keep moisture out of the system.
3. Disconnect the **1P** connector of magnetic clutch.
4. Remove the air conditioner belt (4) and remove the compressor (5).

(When reassembling)

- After reassembling the compressor, be sure to adjust the air conditioner belt tension and recharge the refrigerant to the system.
- Apply compressor oil (SP10 or equivalent) to the O-rings and be careful not to damage them.
- **"S"** letter is marked on the compressor for connecting the low pressure pipe (suction side).
- **"D"** letter is marked on the compressor for connecting the high pressure pipe (discharge side).
- When replacing the compressor with a new one, meet the oil amount with old one.
- Push on the belt between the pulleys at measurement point **"L"** with a finger. Deflection **"L"** of 10 to 12 mm (0.40 to 0.47 in.) under a 98 N (10 kgf, 22 lbf) load is appropriate.

Tightening torque	High pressure pipe and low pressure pipe mounting screw	8.0 to 12 N·m 0.82 to 1.2 kgf·m 5.9 to 8.8 lbf·ft
	Compressor mounting screws	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

(1) Low Pressure Pipe
(2) High Pressure Pipe 1
(3) Compressor
(4) Air Conditioner Belt
(5) New Compressor
(6) Old Compressor
(7) Remove the Excess Oil (**A**-**B**)

A: Oil Flow New Compressor
B: Oil Flow Replace Compressor
L: Deflection (10 to 12 mm (0.40 to 0.48 in.))

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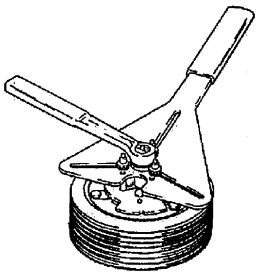
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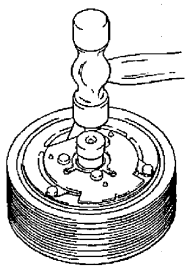
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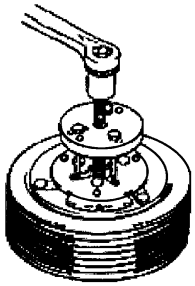
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Armature Nut

1. If armature dust cover is present, remove the 3 or 6 bolts holding it in place and remove cover. If auxiliary sheet metal pulley is present, remove the screws holding it in place. Then remove pulley.
2. Insert pins of armature plate spanner into threaded holes of armature assembly.
3. Hold armature assembly stationary while removing retaining nut with socket wrench, as appropriate.

(When reassembling)

- Replace retaining nut

Tightening torque	Armature nut (M8)	15 to 21 N·m 1.5 to 2.1 kgf·m 11 to 15 lbf·ft

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Key Shaft Armature

1. Remove the armature plate assembly using puller.
2. Thread 3 puller bolts into the threaded holes in the armature assembly.
3. Turn the center screw clockwise until armature assembly comes loose.

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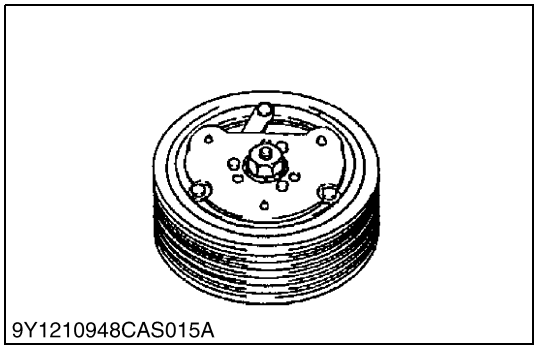
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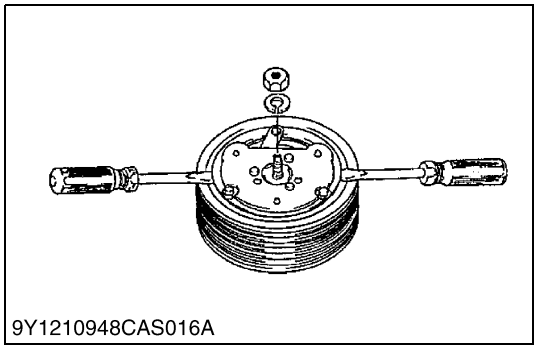
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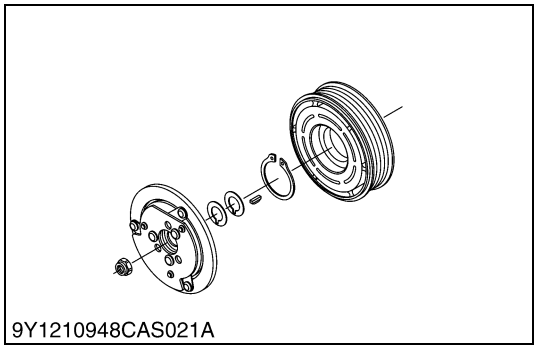
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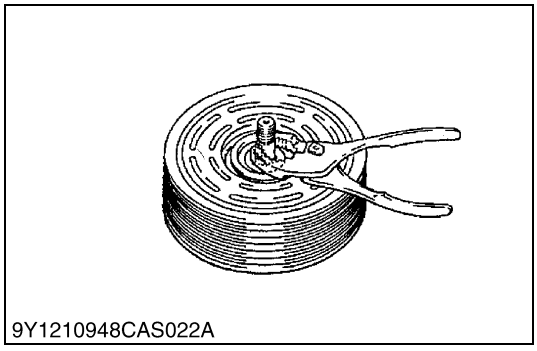
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Spline Shaft Armature

1. The spline shaft armature will not have threaded holes to accept the armature puller.
2. Lift off armature plate with fingers. If armature does not come off easily, spray an anti-seize oil into shaft to loosen. Armature plate can also be loosened by gently prying between rotor and armature plate with two flat screwdrivers.
3. Remove the shaft key and shims.

(When resembling)

1. Install clutch shims.

■ **NOTE**

- **Clutch air gap is determined by shim thickness. When installing a clutch on a used compressor, try the original shims first. When installing a clutch on a compressor that has not had a clutch installed before, first try 1.0 mm (0.04 in.), 0.5 mm (0.02 in.), 0.1 mm (0.004 in.) shims.**
  Install shaft key with pliers.
  Align keyway in armature assembly to shaft key.
- **Using driver and a hammer or arbor press, drive the armature assembly down over the shaft until it bottoms on the shims.**
- **A distinct sound change will be noted if driving with a hammer.**
- **Align slot in armature with locator tooth on shaft. Press armature towards rotor with hand until armature rests against the shims.**

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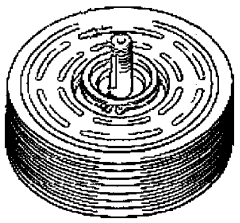
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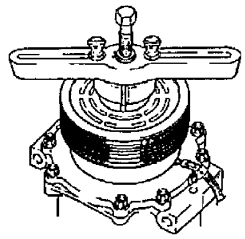
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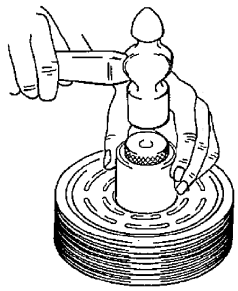
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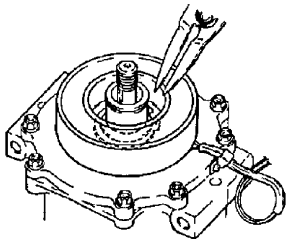
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Rotor Pulley Assembly

1. Remove the rotor snap ring.
2. Insert the lip of the jaws into the snap ring groove.
3. Place rotor pulley shaft protector (puller set) over the exposed shaft.
4. Align thumb screws to puller jaws and finger tighten.
5. Turn puller center bolt clockwise using a socket wrench until rotor pulley is free.

(When reassembling)

1. Place compressor on support stand, supported at rear end of compressor. If the compressor must be clamped in a vise, clamp only on the mounting ears, never on the body if the compressor.
2. Set rotor squarely over the front housing boss.
3. Place the rotor installer ring into the bearing bore. Ensure that the edge rests only on the inner race of the bearing, not on the seal, pulley, or outer race of the bearing.
4. Place the driver into the ring and drive the rotor down onto the front housing with a hammer or arbor press. Drive the rotor against the front housing step. A distinct change of sound can be heard when using the hammer to install the rotor.
5. Reinstall rotor retaining snap ring with external snap ring pliers. If a bevel is present on the snap ring, it should face up (away from the body of the compressor).

9Y1210948CAS0042US0

Field Coil Assembly

1. Loosen lead wire clamp screw with #2 Phillips screw driver until wire(s) can be slipped out from under clamp.
2. Undo any wire connections on the compressor which would prevent removal of the field coil assembly.
3. Remove the field coil snap ring.
4. Remove the field coil assembly.

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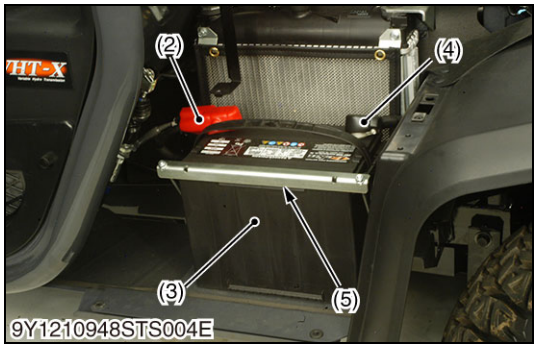
(2) Removing Air Conditioner Unit



Battery

CAUTION

- **When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.**

1. Remove the battery cover (1).
2. Disconnect the negative cable (4) from the battery.
3. Disconnect the positive cable (2) from the battery.
4. Remove the battery stay (5).
5. Remove the battery (3).

(1) Battery Cover
(2) Positive Cable
(3) Battery
(4) Negative Cable
(5) Battery Stay

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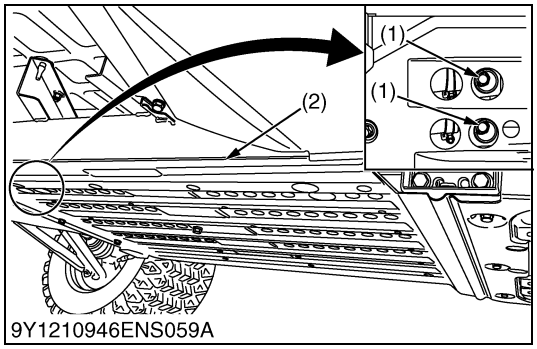

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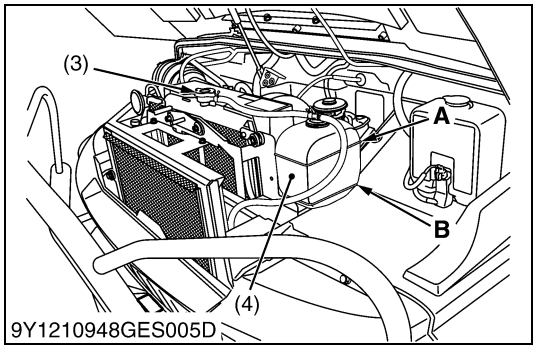

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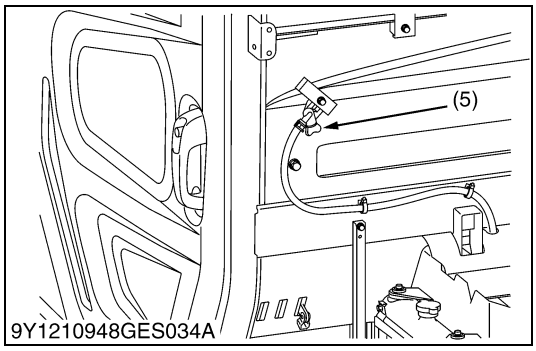

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Draining Coolant

WARNING

To avoid serious injury:

- **Do not remove the radiator cap while coolant is hot. When cool, slowly rotate cap to the first stop and allow sufficient time for excess pressure to escape before removing the cap completely.**

IMPORTANT

- **Do not start engine without coolant.**
- **Do not remove the cap on the radiator.**
- **Use clean, fresh distilled water and anti-freeze to fill the radiator and recovery tank.**
- **When the anti-freeze is mixed with distilled water, the antifreeze mixing ratio is 50 %.**
- **Securely tighten radiator cap. If the cap is loose or improperly fitted, water may leak out and the engine could overheat.**
- **Make sure that the engine coolant breather is closed, after filling the coolant.**

1. Stop the engine and let cool down.
2. Open the hood.
3. To drain the coolant, remove the radiator cap (3), open the engine coolant breather (5), and remove the radiator drain plugs (1). The radiator cap must be removed to completely drain the coolant.
4. After all coolant is drained, close the drain plug and engine coolant breather.

Radiator with recovery tank (Coolant)	Capacity	7.9 L 8.3 U.S.qts 7.0 Imp.qts

(1) Drain Plug
(2) Front Skid Plate
(3) Radiator Cap
(4) Recovery Tank
(5) Engine Coolant Breather

A: FULL
B: LOW

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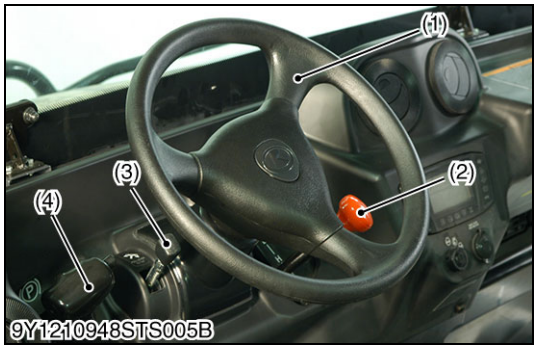

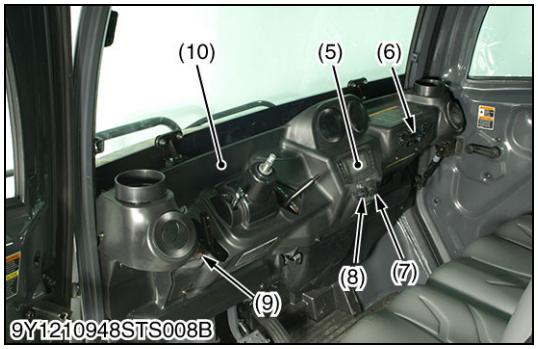

Control Panel

1. Remove the steering wheel (1).
2. Remove the shift lever grip (2), tilt lever grip (3), and the parking brake lever (4).
3. Disconnect the head light switch (9), meter assembly (5), starter switch (8), and ACC socket (7).
4. Disconnect the air conditioner control panel (6) from the panel (10).
5. Remove the panel (10).

(When reassembling)

- Connect the each cable set the below position.
  Made switch: Face position
  Blower switch: 0 position
  Temperature control dial: Coolest position
  Recirculation/Flash air selection lever: Recirculation position

Tightening torque	Steering wheel mounting nut	29 to 49 N·m 3.0 to 4.9 kgf·m 22 to 36 lbf·ft

(1) Steering Wheel
(2) Shift Lever Grip
(3) Tilt Lever Grip
(4) Parking Brake Lever
(5) Meter Assembly
(6) Air Conditioner Control Panel
(7) ACC Socket
(8) Starter Switch
(9) Head Light Switch
(10) Panel

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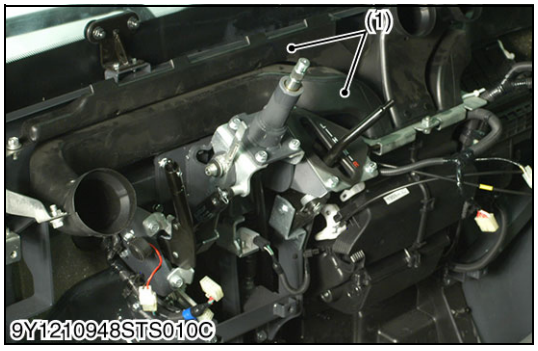

Air Duct

1. Remove the air ducts (1).

(1) Air Duct

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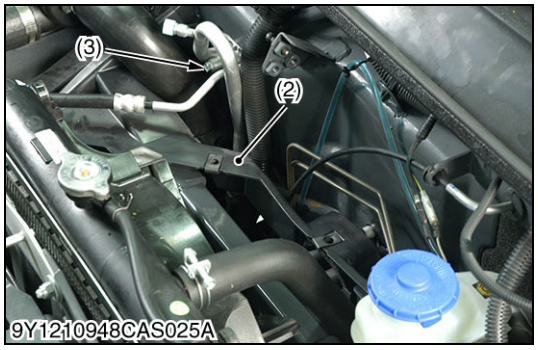

Radiator Cover

1. Remove the radiator upper cover (1).
2. Remove the radiator lower cover (2).
3. Remove the hose joint (3).

(When reassembling)

- Apply the compressor oil (SP10 or equivalent) to the O-ring and be careful not to damage them.

Tightening torque	Air conditioner hose joint mounting screw	8.00 to 12.0 N·m 0.816 to 1.22 kgf·m 5.90 to 8.85 lbf·ft

(1) Upper Cover
(2) Lower Cover
(3) Hose Joint

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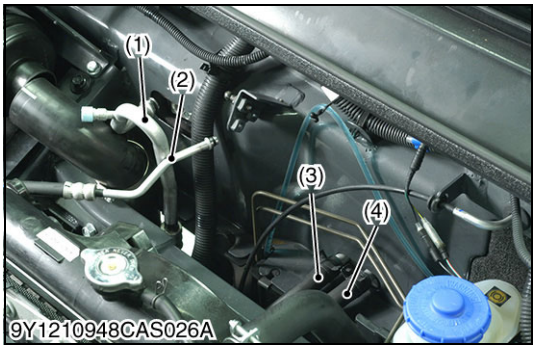

Heater Hoses and Air Conditioner Hoses

1. Disconnect the heater hoses (3), (4).
2. Disconnect the air conditioner hoses (1), (2).

■ **NOTE**

- **Cap the open fittings immediately to keep moisture out of the system.**

(1) Air Conditioner Hose (Suction)
(2) Air Conditioner Hose (Liquid)
(3) Heater Hose (OUT)
(4) Heater Hose (IN)

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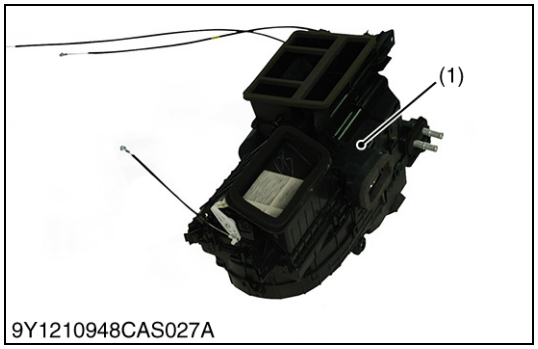
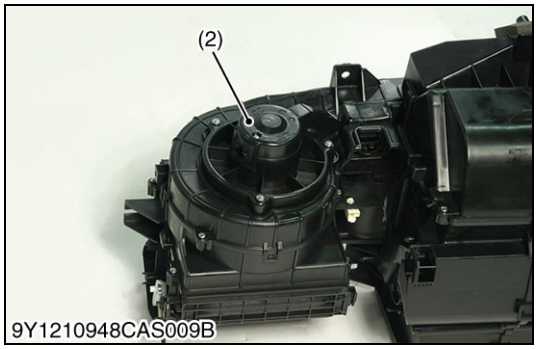
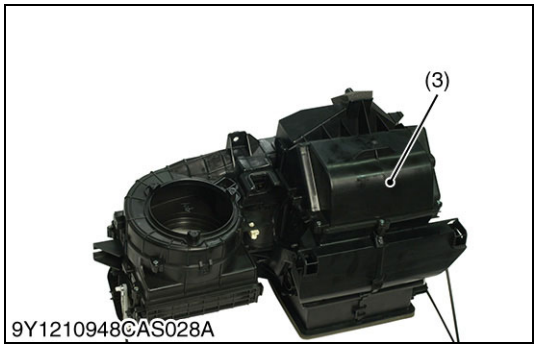
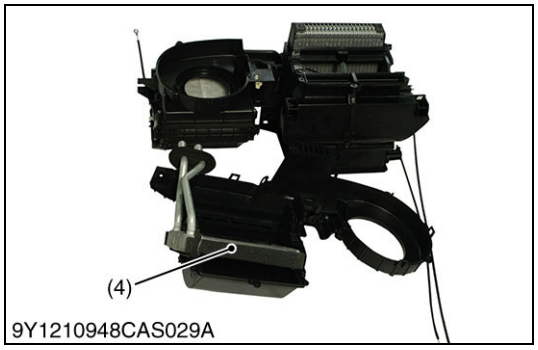
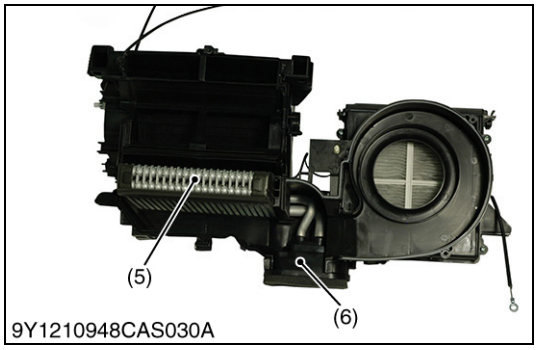








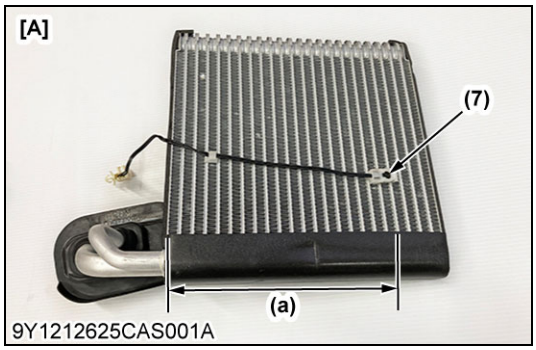


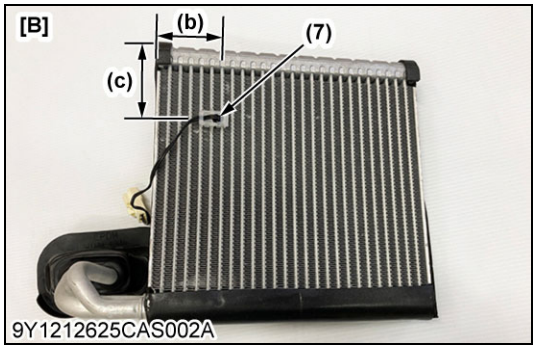
Air Conditioner Unit

1. Disconnect the connectors from blower motor (2), blower resister and thermistor (7).
2. Remove the air conditioner unit (1).
3. Remove the blower motor (2).
4. Remove the cover (3).
5. Remove the heater core (4).
6. Remove the evaporator (5) with expansion valve (6).
7. Remove the thermistor (7)

(When reassembling)

- Please reinstall the thermistor (7) to the original position.





(1) Air Conditioner Unit
(2) Blower Motor
(3) Cover
(4) Heater Core
(5) Evaporator
(6) Expansion Valve
(7) Thermistor

(a) 20th row
(b) 6th row
(c) 42 mm (1.7 in.)
[A] OLD: Serial No. below 64318
[B] NEW: Serial No. above 64318

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(3) Removing Condenser

Discharging Refrigerant Gas

1. See page 9-S15.

9Y1210948CAS0049US0

Front Guard and Bumper

1. Remove the front guard (1) and bumper (2).

(1) Front Guard (2) Bumper

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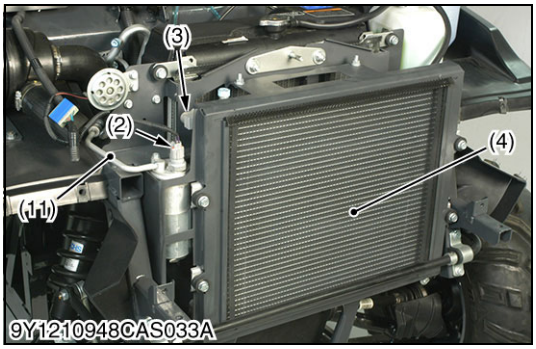
Condenser Assembly



1. Disconnect the pressure switch connector (2).
2. Disconnect the air conditioner hose (1).
3. Disconnect the air conditioner hose (3).
4. Remove the condenser (4) with receiver (5).
5. Remove the tube (6).
6. Remove the receiver (5).

(When reassembling)

Tightening torque	Air conditioner hose (liquid, discharge) mounting screw	8.00 to 12.0 N·m 0.816 to 1.22 kgf·m 5.90 to 8.85 lbf·ft
	Condenser mounting screw	10.0 to 12.5 N·m 1.02 to 1.27 kgf·m 7.38 to 7.21 lbf·ft
	Tube mounting screw	8.00 to 12.0 N·m 0.816 to 1.22 kgf·m 5.90 to 8.85 lbf·ft

- Apply the compressor oil (SP10 or equivalent) to the O-ring and be careful not to damage them.

(1) Air Conditioner Hose (Liquid)
(2) Pressure Switch Connector
(3) Air Conditioner Hose (Discharge)
(4) Condenser
(5) Receiver
(6) Tube

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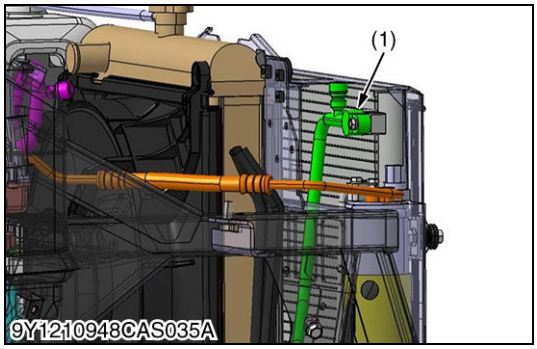
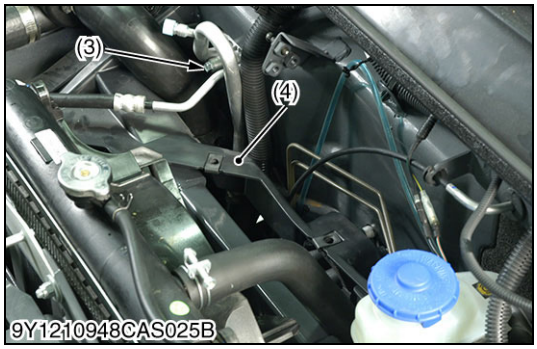
(4) Removing Air Conditioner Hoses





Discharging Refrigerant Gas

1. See page 9-S15.

9Y1210948CAS0049US0

Radiator Cover and Air Conditioner Hose (Front Side)

1. Open the front hood.
2. Disconnect the air conditioner hose (1).
3. Remove the upper cover (2) and lower cover (4).
4. Remove the hose joint (3).
5. Then cap the open fitting immediately to keep moisture out of system.

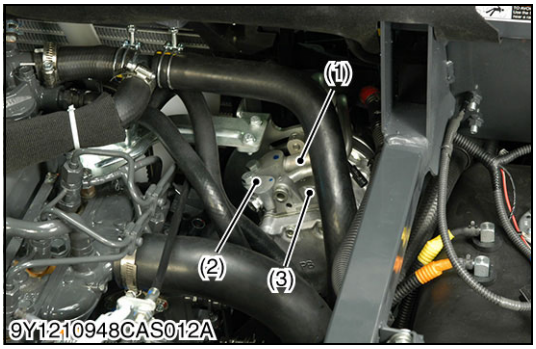
(When reassembling)

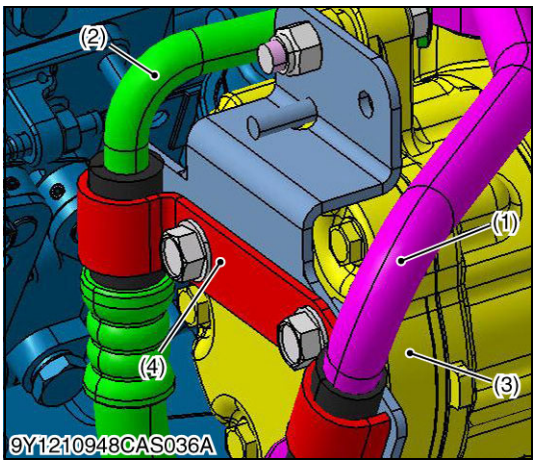
- Apply to compressor oil (SP10 or equivalent) to the O-ring and be careful not to damage them.

Tightening torque	Air conditioner hose joint mounting screw	8.00 to 12.0 N·m 0.816 to 1.22 kgf·m 5.90 to 8.85 lbf·ft

(1) Air Conditioner Hose
(2) Upper Cover
(3) Hose Joint
(4) Lower Cover

9Y1210948CAS0052US0





Air Conditioner Hose (Rear Side)

1. Disconnect the low pressure hose (suction) (1) from the compressor (3).
2. Disconnect the high pressure hose 1 (discharge) (2) from the compressor (3).
3. Then cap the open fitting immediately to keep moisture out of the system.
4. Remove the hose clamp (4).

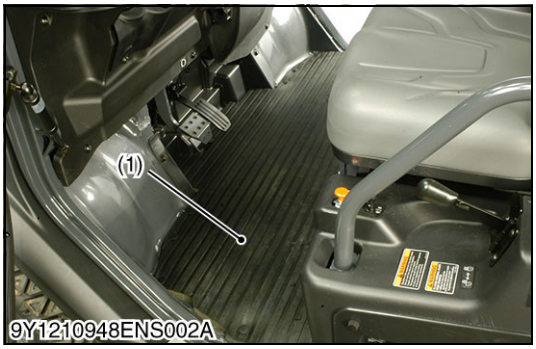
(When reassembly)

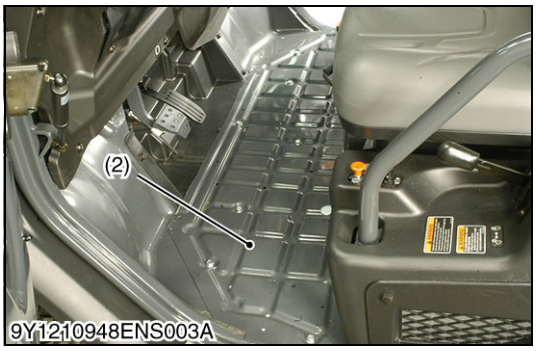
- Apply compressor oil (SP10 or equivalent) to the O-rings and be careful not to damage them.
- **"S"** letter is marked on the compressor (3) for connecting the low pressure hose (suction side) (1).
- **"D"** letter is marked on the compressor (3) for connecting the high pressure hose 1 (discharge side) (2).

Tightening torque	High pressure hose and low pressure hose 1 mounting screw	8.0 to 12 N·m 0.82 to 1.2 kgf·m 5.9 to 8.8 lbf·ft

(1) Low Pressure Hose
(2) High Pressure Hose 1
(3) Compressor
(4) Hose Clamp

9Y1210948CAS0053US0



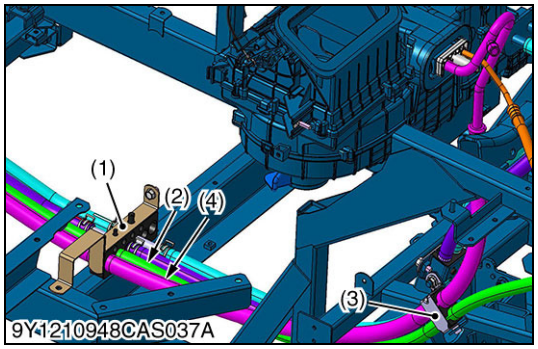


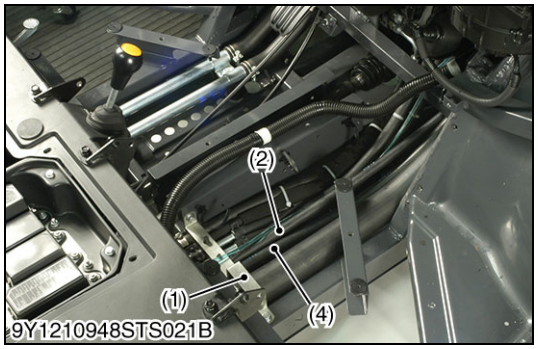
Mat and Center Step

1. Remove the mat (1).
2. Remove the center step (2).

(1) Mat
(2) Center Step

9Y1210948ENS0015US0





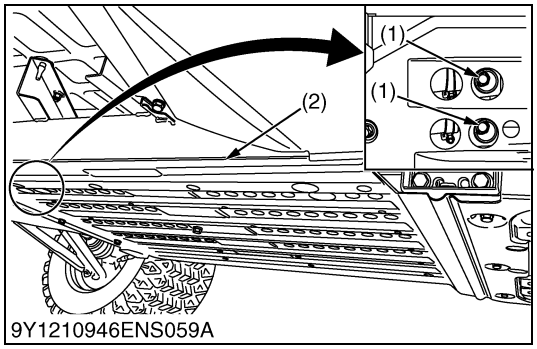
Air Conditioner Hoses

1. Remove the hose clamp (1), (3).
2. Remove the low pressure hose (4) and high pressure hose 1 (2).

(1) Hose Clamp
(2) High Pressure Hose 1
(3) Hose Clamp
(4) Low Pressure

9Y1210948CAS0054US0

(5) Removing Heater Hoses



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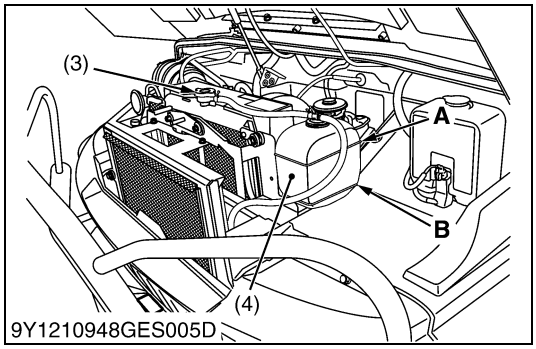

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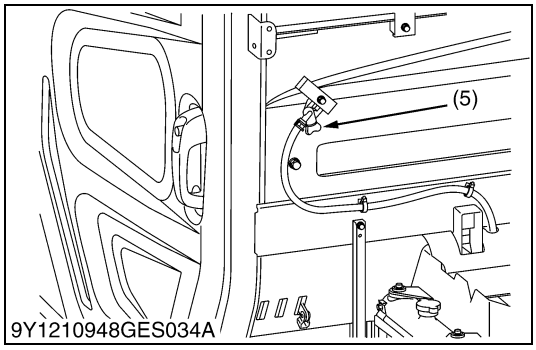

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Draining Coolant

WARNING

To avoid serious injury:

- **Do not remove the radiator cap while coolant is hot. When cool, slowly rotate cap to the first stop and allow sufficient time for excess pressure to escape before removing the cap completely.**

■ **IMPORTANT**

- **Do not start engine without coolant.**
- **Do not remove the cap on the radiator.**
- **Use clean, fresh distilled water and anti-freeze to fill the radiator and recovery tank.**
- **When the anti-freeze is mixed with distilled water, the antifreeze mixing ratio is 50 %.**
- **Securely tighten radiator cap. If the cap is loose or improperly fitted, water may leak out and the engine could overheat.**
- **Make sure that the engine coolant breather is closed, after filling the coolant.**

1. Stop the engine and let cool down.
2. Open the hood.
3. To drain the coolant, remove the radiator cap (3), open the engine coolant breather (5), and remove the radiator drain plugs (1). The radiator cap must be removed to completely drain the coolant.
4. After all coolant is drained, close the drain plug and engine coolant breather.

Radiator with recovery tank (Coolant)	Capacity	7.9 L 8.3 U.S.qts 7.0 Imp.qts

(1) Drain Plug
(2) Front Skid Plate
(3) Radiator Cap
(4) Recovery Tank
(5) Engine Coolant Breather

A: FULL
B: LOW

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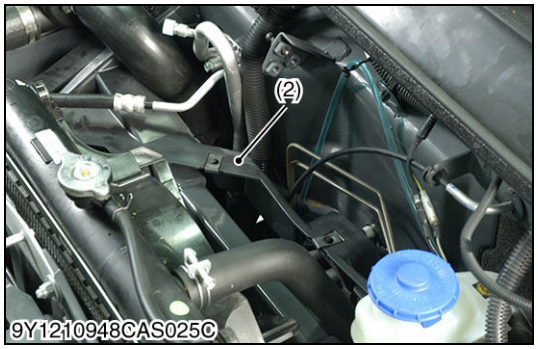
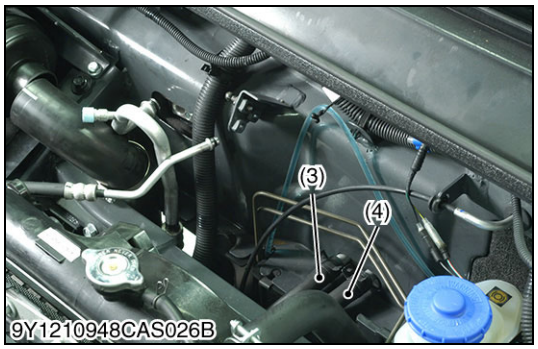




Radiator Cover and Heater Hose (Front Side)

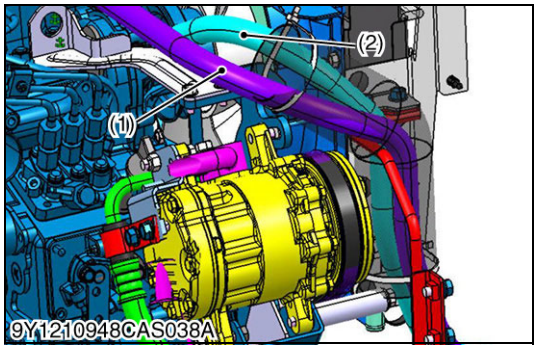
■ **NOTE**

- **Before disconnecting the heater hoses (3), (4), put the parting marks on the hoses for marking proper reconnecting.**

1. Open the from hood.
2. Remove the upper cover (1) and lower cover (2).
3. Disconnect the heater hoses (3), (4).

(1) Upper Cover
(2) Lower Cover
(3) Heater Hose (OUT)
(4) Heater Hose (IN)

9Y1210948CAS0055US0



Heater Hoses (Rear Side)

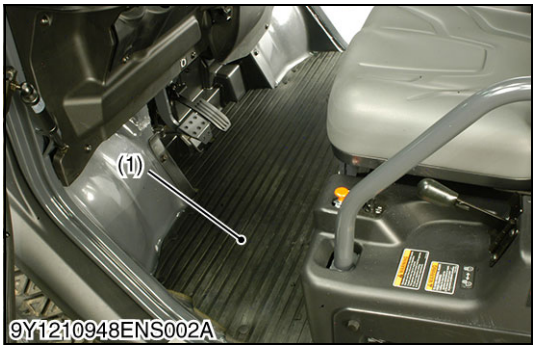
■ **NOTE**

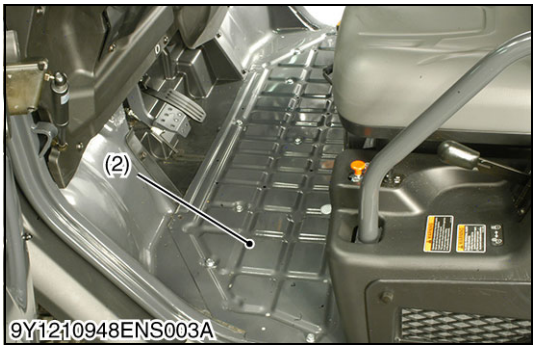
- **Before disconnecting the heater hoses (1), (2), put the parting marks on the hoses for marking proper reconnecting.**

1. Disconnect the heater hose (1) from engine upper side.
2. Disconnect the heater hose (2) from engine lower side.

(1) Heater Hose (IN)
(2) Heater Hose (OUT)

9Y1210948CAS0056US0



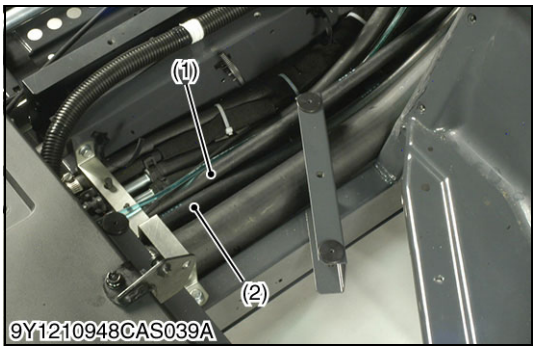


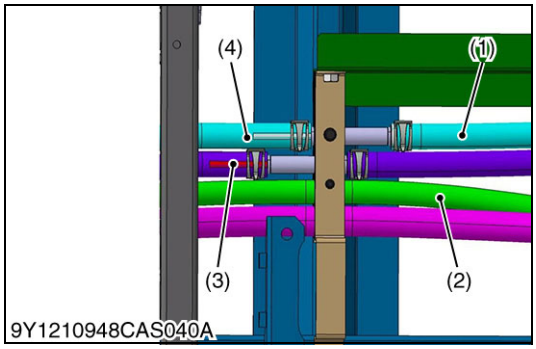
Mat and Center Step

1. Remove the mat (1).
2. Remove the center step (2).

(1) Mat
(2) Center Step

9Y1210948ENS0015US0





Heater Hoses

■ **NOTE**

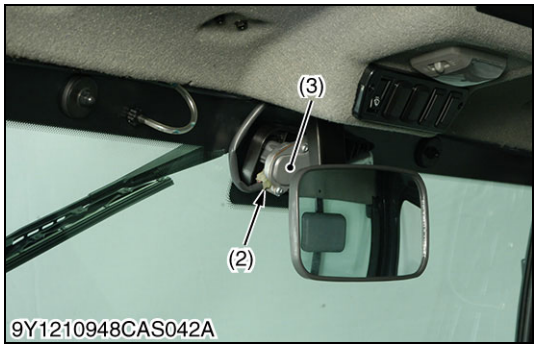
- **Before disconnecting the heater hoses, put the parting marks on the hoses for marking proper reconnecting.**

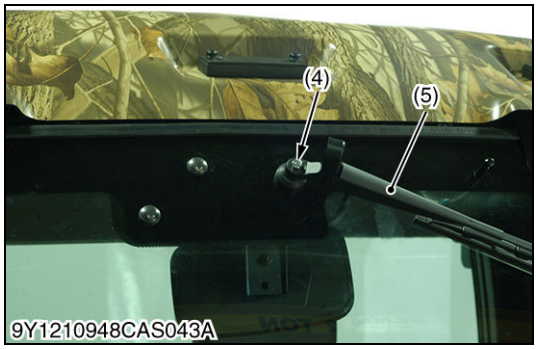
1. remove the hose clamp.
2. remove the heater hoses (1), (2) from front side.
3. Remove the heater hoses (3), (4) from rear side.

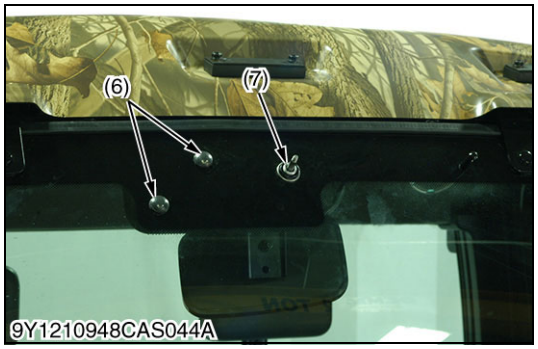
(1) Heater Hose (OUT, Front)
(2) Heater Hose (IN, Front)
(3) Heater Hose (IN, Rear)
(4) Heater Hose (OUT, Rear)

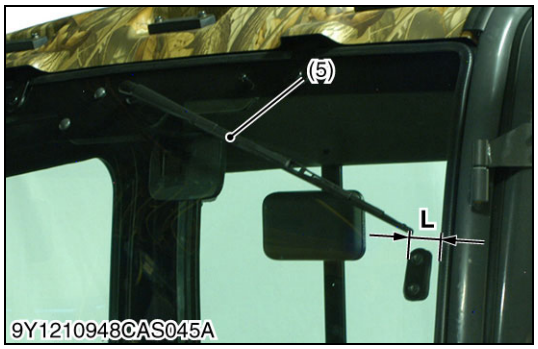
9Y1210948CAS0057US0

(6) Removing Front Glass









Wiper Arm and Wiper Motor

1. Remove the cover (1).
2. Disconnect the wiper motor connector (2).
3. Remove the wiper arm nut (4).
4. Remove the wiper arm (5).
5. Remove the wiper motor nut (7).
6. Remove the wiper motor (3).

(When reassembling)

Tightening torque	Wiper arm nut	2.9 to 3.9 N·m 0.30 to 0.39 kgf·m 2.2 to 2.8 lbf·ft
	Wiper motor nut	6.4 to 9.3 N·m 0.66 to 0.94 kgf·m 4.8 to 6.8 lbf·ft
	Wiper motor mounting screw and nut	3.4 to 4.4 N·m 0.35 to 0.44 kgf·m 2.5 to 3.2 lbf·ft

(1) Cover
(2) Wiper Motor Connector
(3) Wiper Motor
(4) Wiper Arm Nut
(5) Wiper Arm
(6) Wiper Motor Mounting Screw and Nut
(7) Wiper Motor Nut

L: 30 to 35 mm (1.2 to 1.3 in.)

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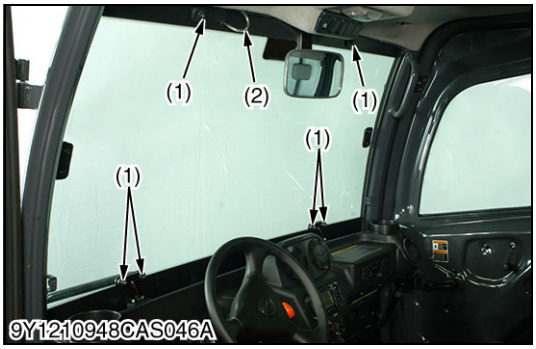
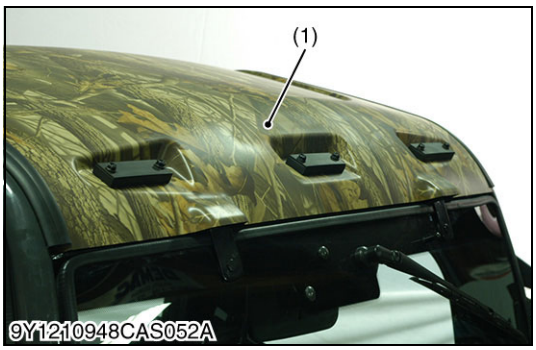
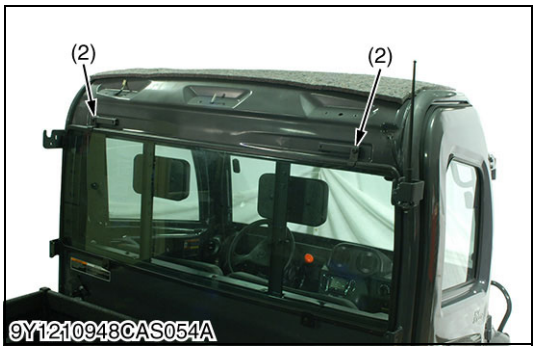


(7) Removing Rear Glass





Front Glass

1. Disconnect the window washer hose (2).
2. Remove the front glass.

(When reassembling)

Tightening torque	Front glass mounting cap nut	10.0 to 15.0 N·m 1.02 to 1.52 kgf·m 7.38 to 11.0 lbf·ft

(1) Cap Nut
(2) Window Washer Hose

9Y1210948CAS0059US0

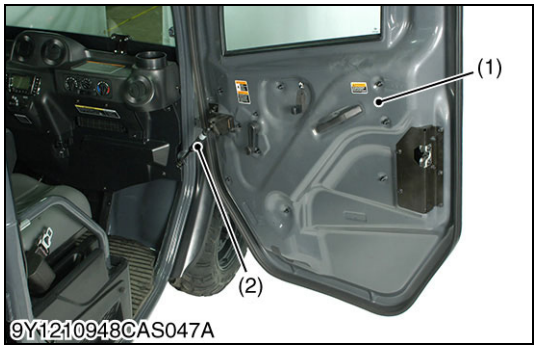
Rear Glass

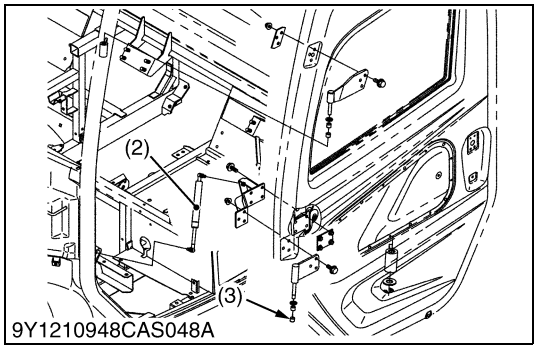
1. Remove the outer roof (1).
2. Remove the retainer plates (2).
3. Remove the rear glass (3).

(1) Outer Roof
(2) Retainer Plate
(3) Rear Glass

9Y1210948CAS0060US0

(8) Removing Door





Door

1. Remove the door damper (2).
2. Remove the external circlip (3).
3. Remove the door (1).

(1) Door
(2) Door Damper
(3) External Circlip

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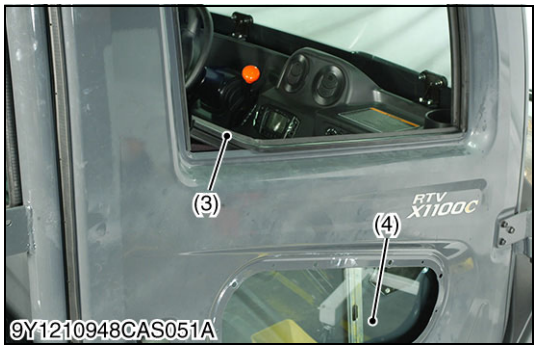
(9) Removing Door Glass



Door Glass

1. Remove the cover (1).
2. Remove the door glass mounting bolts and nuts (2).
3. Remove the weatherstrip (3).
4. Remove the door glass (4) from upper side.

(When reassembling)

Tightening torque	Door glass mounting bolt and nut	9.80 to 11.3 N·m 1.00 to 1.15 kgf·m 7.23 to 8.33 lbf·ft

(1) Cover
(2) Door Glass Mounting Bolt and Nut
(3) Weatherstrip
(4) Door Glass

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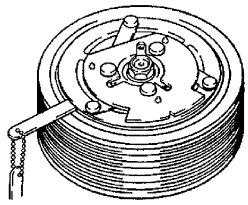
[3] SERVICING



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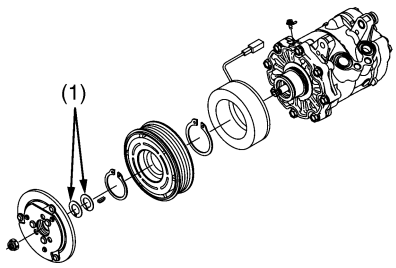

9Y1210948CAS056A

Adjustment of Air Gap

1. Measure the air gap with a feeler gauge.
2. When the measurement value comes off from factory specification, adjustment shim is added or deleted.

Air gap	Factory specification	0.40 to 0.80 mm 0.016 to 0.031 in.

(Reference)

- Adjusting shim size:
  0.10 mm (0.0039 in.)
  0.20 mm (0.0079 in.)
  0.30 mm (0.012 in.)
  0.50 mm (0.020 in.)
  0.80 mm (0.031 in.)
  1.0 mm (0.039 in.)
  1.2 mm (0.047 in.)

(1) Shim

9Y1210948CAS0063US0

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