

STARTING/CHARGING SYSTEMS

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GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

1. General Description

A: SPECIFICATIONS

1. NON-TURBO MODEL

Item		Designation	
Starter	Type	Reduction type	
	Vehicle type	MT vehicles	AT vehicles
	Model	M000T83981	M001T86481
	Manufacturer	Mitsubishi Electric	
	Voltage and output	12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation	Counterclockwise (when observed from pinion)	
	Number of pinion teeth	8	9
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	2,800 rpm or more
	Load characteristics	Voltage	7.5 V
		Current	300 A
		Torque	8.6 N·m (0.88 kg·m, 6.3 ft-lb) or more
		Rotating speed	920 rpm or more
	Lock characteristics	Voltage	4 V
		Current	650 A or less
		Torque	14.7 N·m (1.50 kgf·m, 10.8 ft-lb) or more
Generator	Type	Rotating-field three-phase type, Voltage regulator built-in type, with load response control system	
	Model	A2TB6291	
	Manufacturer	Mitsubishi Electric	
	Voltage and output	12 V — 90 A	
	Polarity on ground side	Negative	
	Rotating direction	Clockwise (when observed from pulley side)	
	Armature connection	3-phase Y-type	
	Output current	1,500 rpm — 36 A or more	
		2,500 rpm — 65 A or more	
		5,000 rpm — 86 A or more	
	Regulated voltage	14.1 — 14.8 V [20°C (68°F)]	

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2. TURBO MODEL

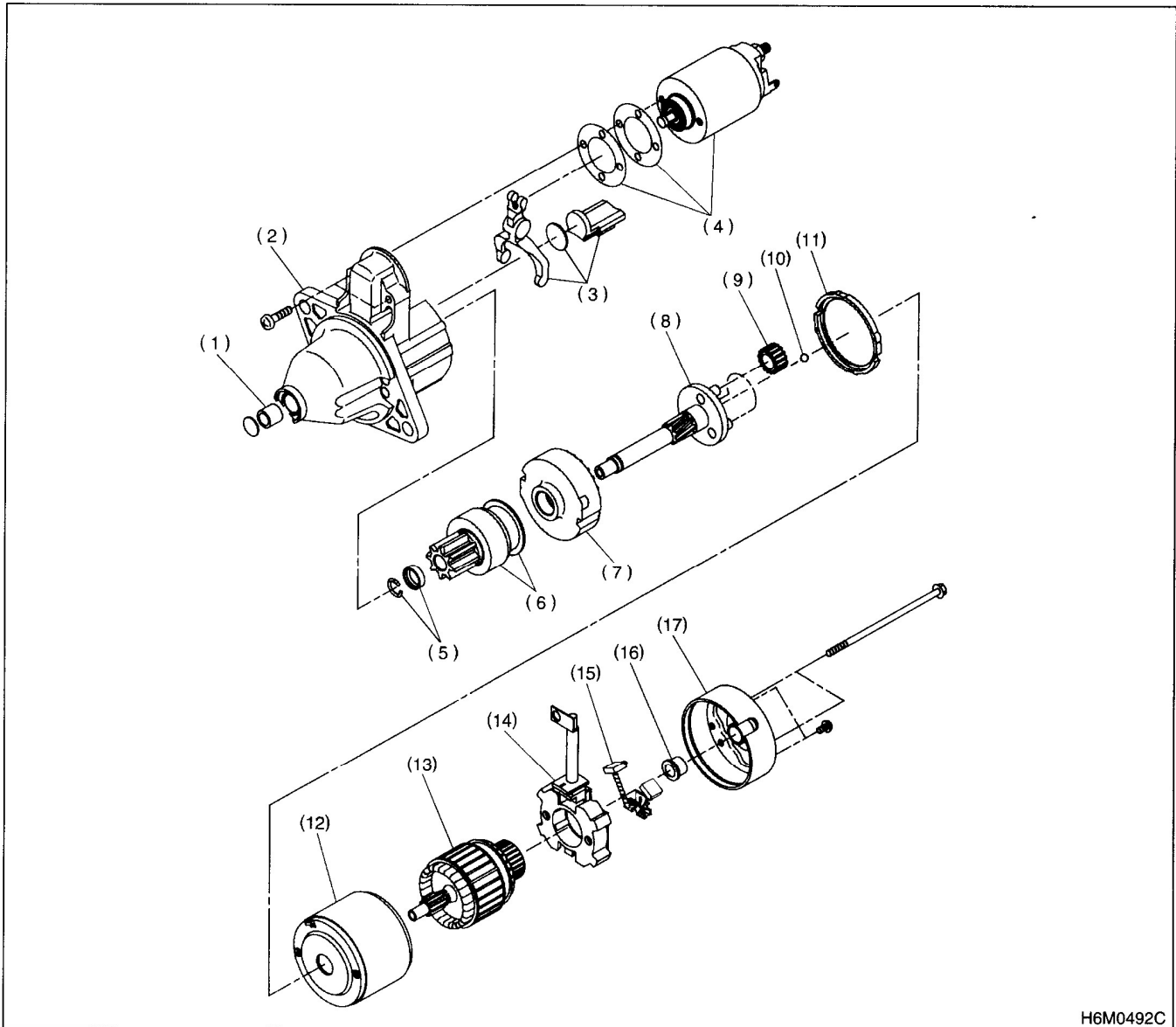
Item		Designation	
Starter	Type	Reduction type	
	Vehicle type	MT vehicles	AT vehicles
	Model	228000 — 9270	M001T86481
	Manufacturer	DENSO	Mitsubishi Electric
	Voltage and output	12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation	Counterclockwise (when observed from pinion)	
	Number of pinion teeth	9	
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	2,860 rpm or more
	Load characteristics		2,400 rpm or more
		Voltage	8 V
		Current	7.7 V
		Torque	280 A
			400 A
	Lock characteristics		16.0 N·m (1.63 kg·m, 11.8 ft·lb) or more
		Rotating speed	9.3 N·m (0.95 kg·m, 6.9 ft·lb) or more
		Voltage	860 rpm or more
		Current	740 rpm or more
Generator	Type	Rotating-field three-phase type, Voltage regulator built-in type, with load response control system	
	Model	A2TB6291	
	Manufacturer	Mitsubishi Electric	
	Voltage and output	12 V — 75 A	
	Polarity on ground side	Negative	
	Rotating direction	Clockwise (when observed from pulley side)	
	Armature connection	3-phase Y-type	
	Output current	1,500 rpm — 30 A or more 2,500 rpm — 64 A or more 5,000 rpm — 76 A or more	
	Regulated voltage	14.1 — 14.8 V [20°C (68°F)]	

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B: COMPONENT

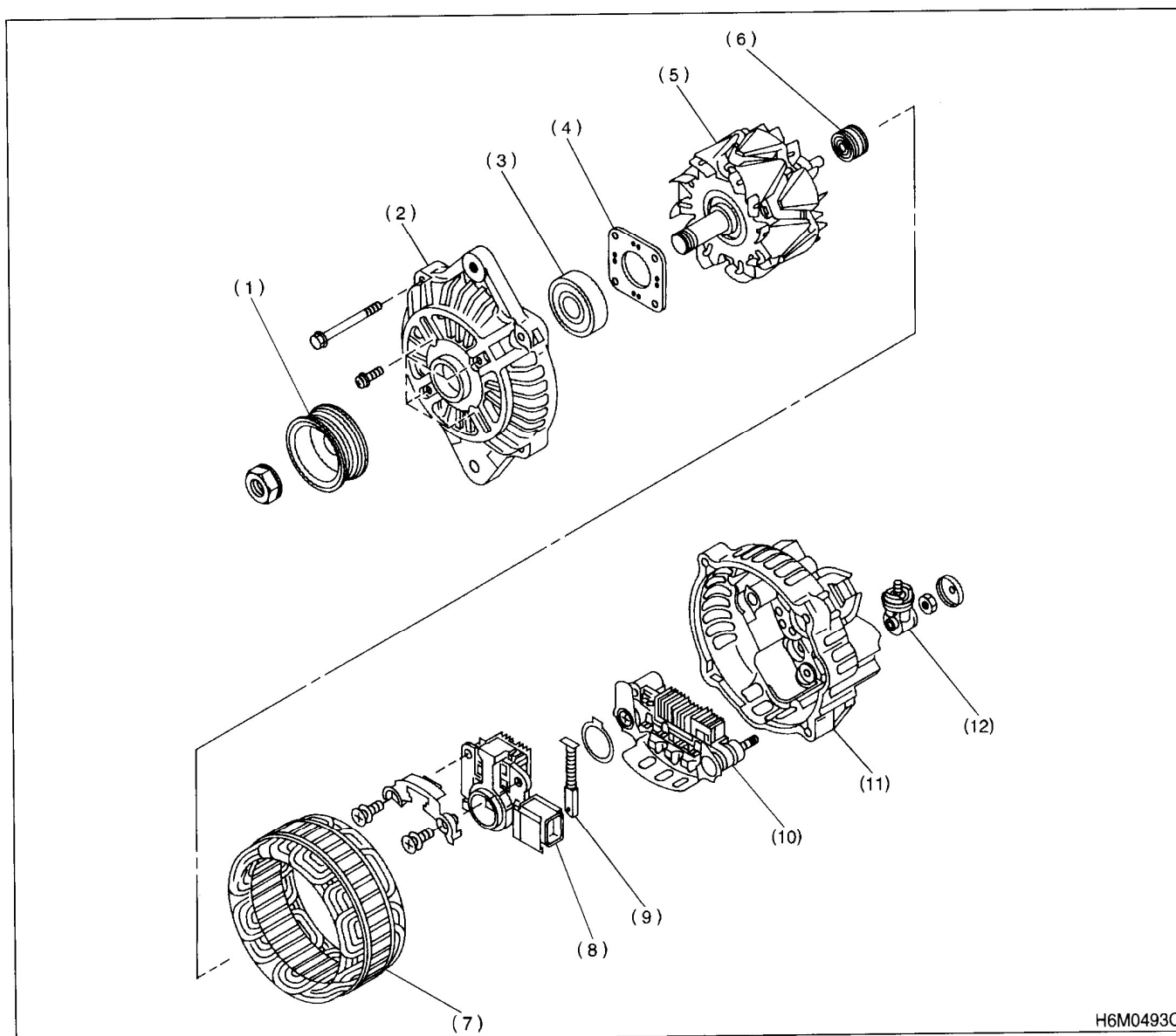
1. STARTER



H6M0492C

- | | | |
|-------------------------|------------------------|---------------------|
| (1) Sleeve bearing | (7) Internal gear ASSY | (13) Armature |
| (2) Front bracket | (8) Shaft ASSY | (14) Brush holder |
| (3) Lever set | (9) Gear ASSY | (15) Brush |
| (4) Magnet switch ASSY | (10) Ball | (16) Sleeve bearing |
| (5) Stopper set | (11) Packing | (17) Rear bracket |
| (6) Over running clutch | (12) Yoke | |

2. GENERATOR



H6M0493C

- | | | |
|----------------------|-----------------------------|-----------------|
| (1) Pulley | (5) Rotor | (9) Brush |
| (2) Front cover | (6) Bearing | (10) Rectifier |
| (3) Ball bearing | (7) Stator coil | (11) Rear cover |
| (4) Bearing retainer | (8) IC regulator with brush | (12) Terminal |

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the negative terminal from battery.

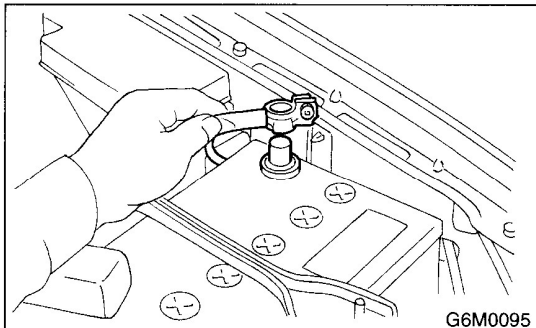
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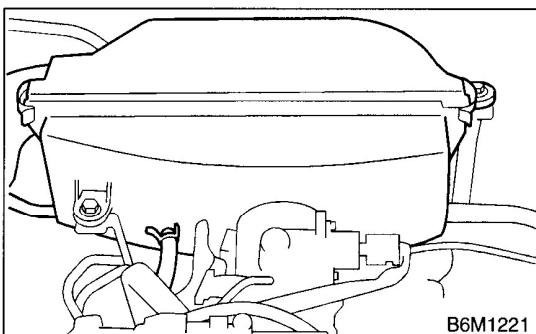
2. Starter

A: REMOVAL

1) Disconnect the ground terminal from battery.



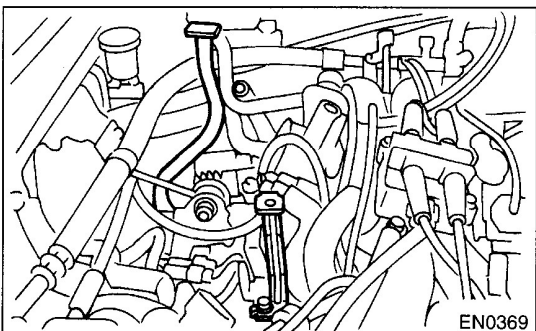
2) Remove the air cleaner case. (Non-Turbo Model)



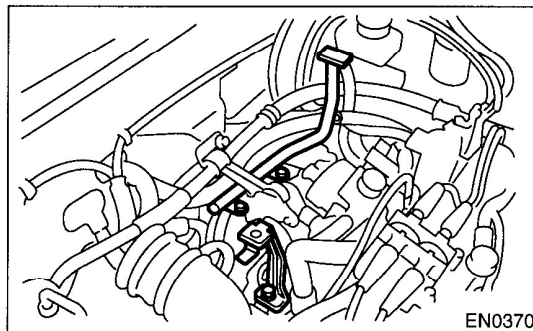
3) Remove the intercooler. (Turbo Model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

4) Remove the air cleaner case stay. (Non-Turbo Model)

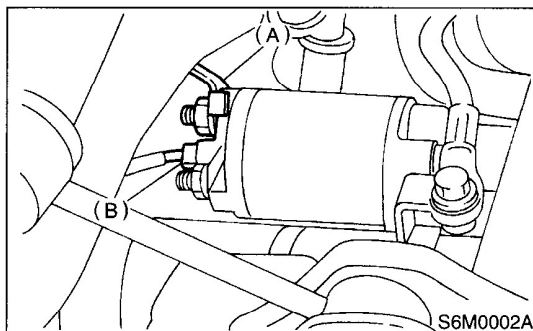
• MT vehicles



• AT vehicles

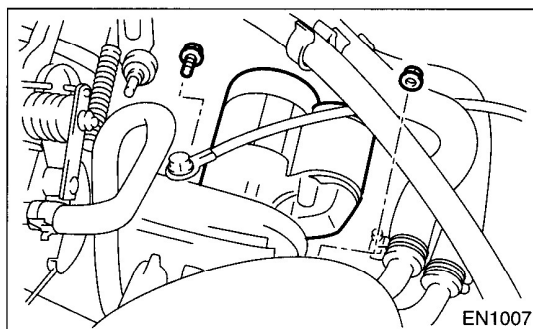


5) Disconnect the connector and terminal from starter.



(A) Terminal
(B) Connector

6) Remove the starter from transmission.



STARTER

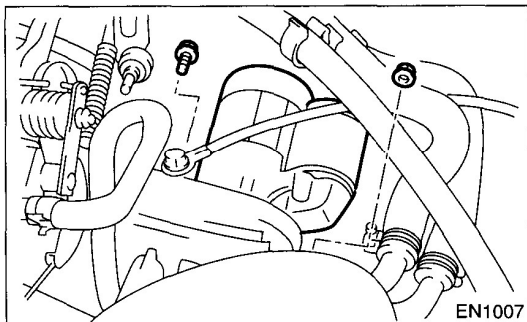
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B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)



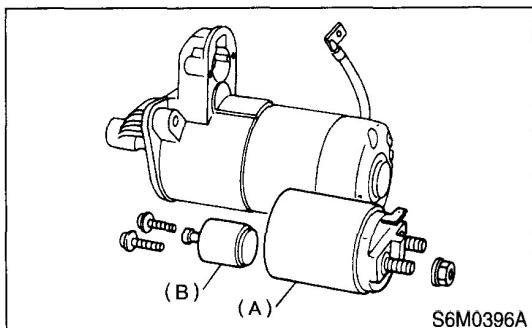
C: DISASSEMBLY

1. STARTER ASSEMBLY

- 1) Loosen the nut which holds terminal M of switch assembly, and disconnect the connector.
- 2) Remove the bolts which hold switch assembly, and remove the switch assembly, plunger and plunger spring from starter as a unit.

CAUTION:

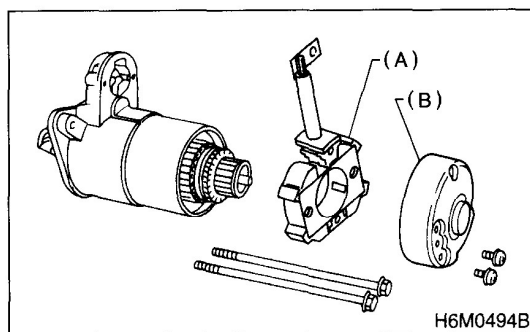
Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



(A) Switch ASSY

(B) Plunger

- 3) Remove both through-bolts and brush holder screws, and detach the rear bracket and brush holder.



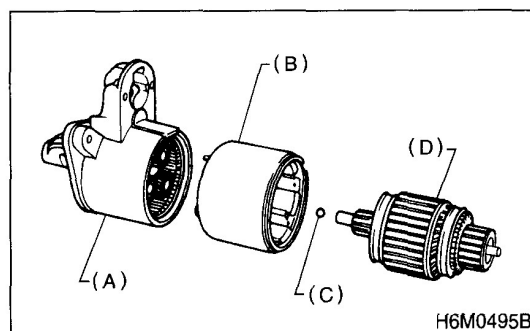
(A) Brush holder

(B) Rear bracket

- 4) Remove the armature and yoke. Ball used as a bearing will then be removed from the end of armature.

CAUTION:

Be sure to mark an alignment mark on the yoke and front bracket before removing the yoke.



(A) Front bracket

(B) Yoke

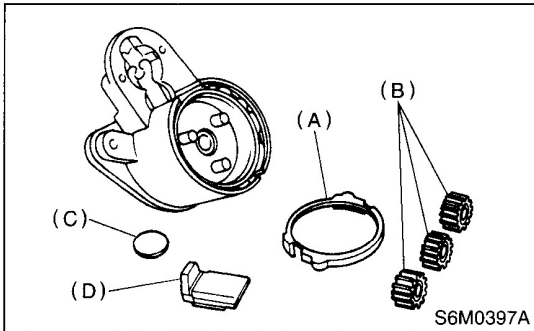
(C) Ball

(D) Armature

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5) Remove packing A, three planetary gears, packing B and plate.

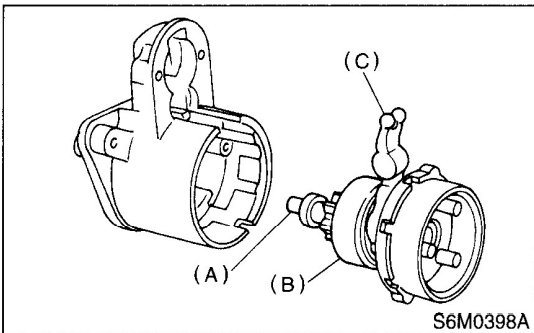


- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

6) Remove the shaft assembly and overrunning clutch as a unit.

CAUTION:

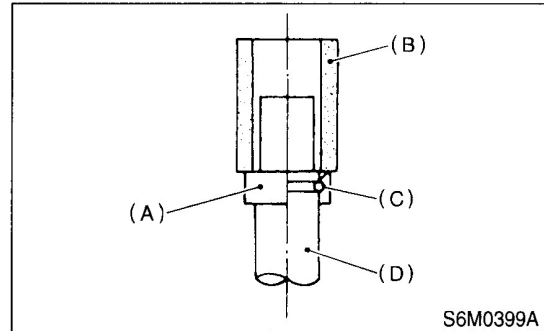
Record the direction of the lever before removing.



- (A) Shaft ASSY
- (B) Overrunning clutch
- (C) Lever

7) Remove the overrunning clutch from shaft assembly as follows:

- (1) Remove the stopper from ring by lightly tapping a fit tool placed on stopper.
- (2) Remove the ring, stopper and clutch from shaft.



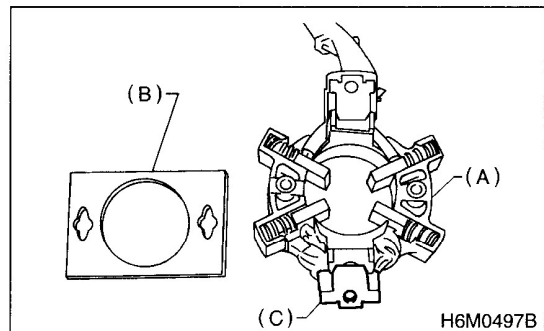
- (A) Stopper
- (B) Tool
- (C) Ring
- (D) Shaft

2. BRUSH HOLDER

Slightly open the metal fitting holding the insulating plate to the brush holder. Remove the insulating plate.

NOTE:

The brush and spring can be easily removed from the brush holder at this time.



- (A) Brush holder
- (B) Insulating plate
- (C) Metal fitting

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D: ASSEMBLY

Assembly is in the reverse order of disassembly procedures. Do the following:

1) Carefully assemble all parts in the order of assembly and occasionally inspect nothing has been overlooked.

2) Apply grease to the following parts during assembly.

- Front and rear bracket sleeve bearing
- Armature shaft gear
- Outer periphery of plunger
- Mating surface of plunger and lever
- Gear shaft splines
- Mating surface of lever and clutch
- Ball at the armature shaft end
- Internal and planetary gears

3) After assembling parts correctly, check to be sure the starter operates properly.

E: INSPECTION

1. ARMATURE

1) Check the commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.

2) Run-out test:

Check the commutator run-out and replace if it exceeds the limit.

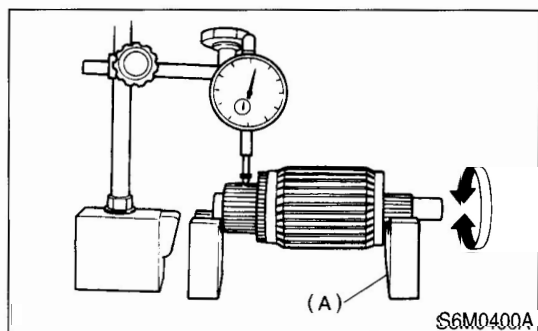
Commutator run-out:

Standard

0.05 mm (0.0020 in)

Service limit

Less than 0.10 mm (0.0039 in)



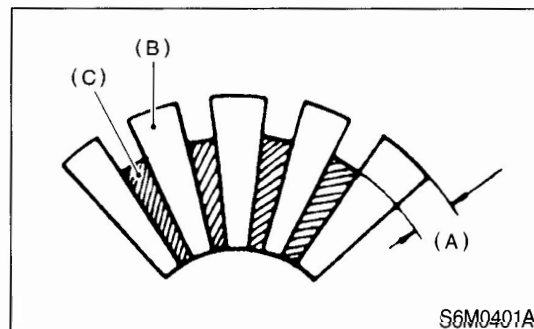
(A) V-block

3) Depth of segment mold:

Check the depth of segment mold.

Depth of segment mold:

0.5 mm (0.020 in)



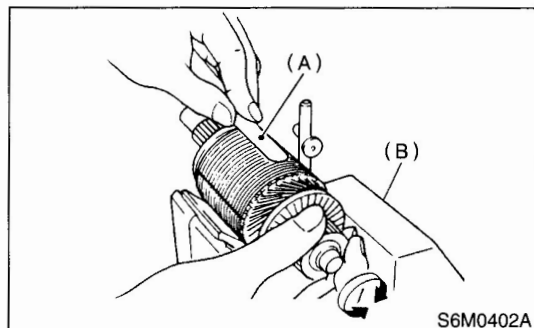
(A) Depth of mold

(B) Segment

(C) Mold

4) Armature short-circuit test:

Check the armature for short-circuit by placing it on growler tester. Hold a hacksaw blade against armature core while slowly rotating armature. A short-circuited armature will cause the blade to vibrate and to be attracted to core. If the hacksaw blade is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



(A) Iron sheet

(B) Growler

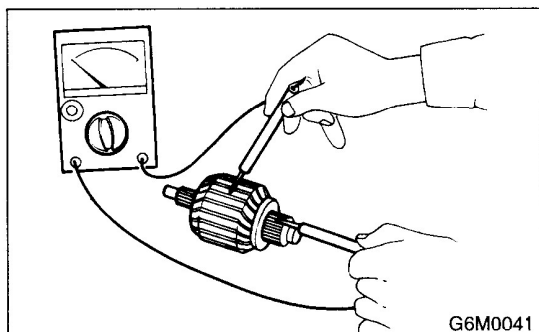
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5) Armature ground test:

Using the circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, armature is grounded.

Replace the armature if it is grounded.



2. YOKE

Make sure the pole is set in position.

3. OVERRUNNING CLUTCH

Inspect the teeth of pinion for wear and damage. Replace if it is damaged. Rotate the pinion in direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:

Do not clean the overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length:

Measure the brush length and replace if it exceeds the service limit.

Replace if abnormal wear or cracks are noticed.

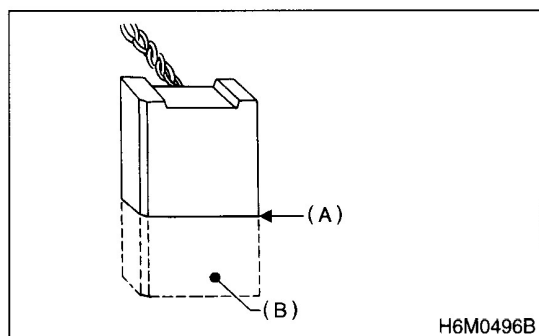
Brush length:

Standard

12.3 mm (0.484 in)

Service limit

7.0 mm (0.276 in)



(A) Service limit line

(B) Brush

2) Brush movement:

Be sure the brush moves smoothly inside brush holder.

3) Brush spring force:

Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

Brush spring force:

Standard

21.6 N (2.2 kg, 4.9 lb) (when new)

Service limit

5.9 N (0.6 kg, 1.3 lb)

5. SWITCH ASSEMBLY

Be sure there is continuity between terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm").

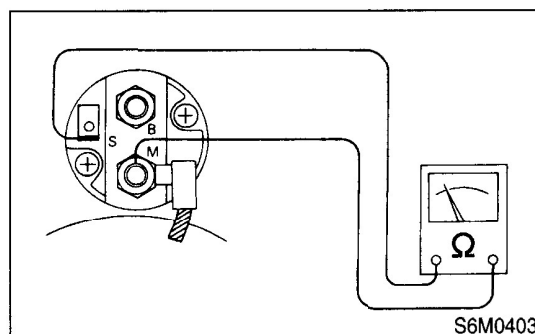
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:

S — M / less than 1Ω

S — Ground / less than 1Ω

M — B / More than 1MΩ



6. SWITCH ASSEMBLY OPERATION

1) Connect terminal S of switch assembly to the positive terminal of battery with a lead wire, and starter body to ground terminal of battery. Pinion should be forced endwise on the shaft.

CAUTION:

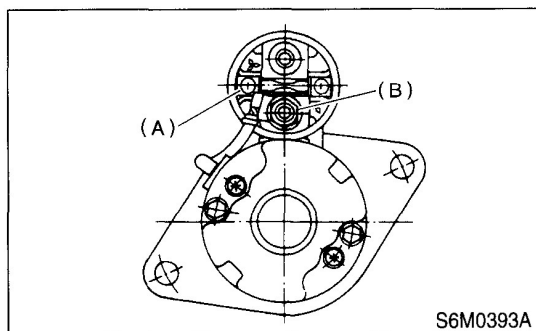
With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

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2) Disconnect the connector from terminal M, and connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.

In this test set up, pinion should return to its original position even when it is pulled out with a screwdriver.



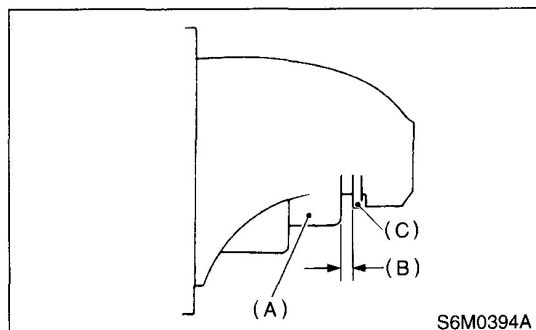
- (A) Terminal S
- (B) Terminal M

7. PINION GAP

1) Measure the pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap:

0.5 — 2.0 mm (0.020 — 0.079 in)



- (A) Pinion
- (B) Gap
- (C) Stopper

If the motor is running with the pinion forced end-wise on the shaft, disconnect the connector from terminal M of switch assembly and connect terminal M to ground terminal (-) of battery with a lead wire. Next, gently push the pinion back with your fingertips and measure pinion gap.

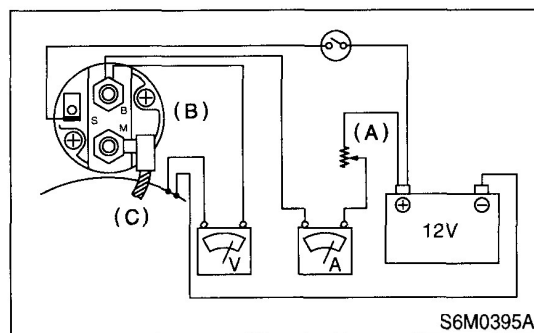
2) If the pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until the correct pinion gap is obtained.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.

Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



- (A) Variable resistance
- (B) Magnetic switch
- (C) Starter body

1) No-load test:

With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading and measure the starter speed. Compare these values with the specifications.

No-load test (Standard):

Voltage / Current

11 V / 90 A max.

Rotating speed

Non-Turbo MT vehicles

2,800 rpm or more

Turbo MT vehicles

2,860 rpm or more

AT vehicles

2,400 rpm or more

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2) Load test:

Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within specifications.

Load test (Standard):

Voltage / Load

Non-Turbo MT vehicles

7.5 V/8.6 N·m (0.88 kgf-m, 6.3 ft-lb)

Turbo MT vehicles

8 V/9.3 N·m (0.95 kgf-m, 6.9 ft-lb)

AT vehicles

7.7 V/16.0 N·m (1.63 kg-m, 11.8 ft-lb)

Current / Speed

Non-Turbo MT vehicles

300 A/920 rpm or more

Turbo MT vehicles

280 A/860 rpm or more

AT vehicles

400 A/740 rpm or more

3) Lock test:

With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):

Voltage / Current

Non-Turbo MT vehicles

4 V/650 A or less

Turbo MT vehicles

5 V/515 A or less

AT vehicles

3.5 V/940 A or less

Torque

Non-Turbo MT vehicles

14.7 N·m (1.50 kgf-m, 10.8 ft-lb) or more

Turbo MT vehicles

16 N·m (1.63 kgf-m, 11.8 ft-lb) or more

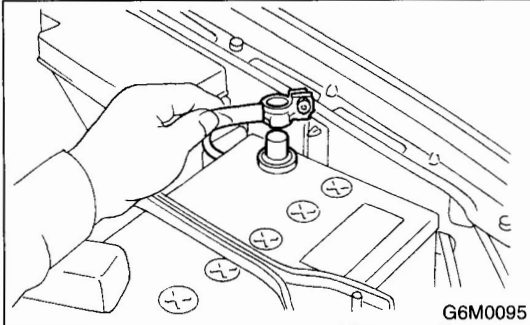
AT vehicles

28.9 N·m (2.95 kgf-m, 21.3 ft-lb) or more

3. Generator

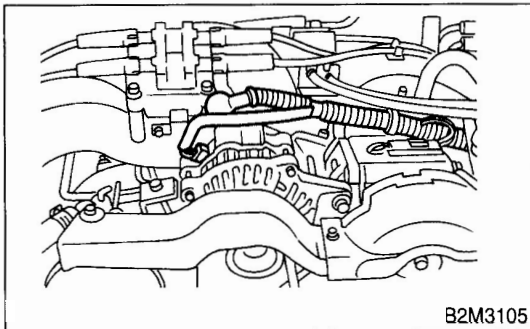
A: REMOVAL

1) Disconnect the ground terminal from battery.

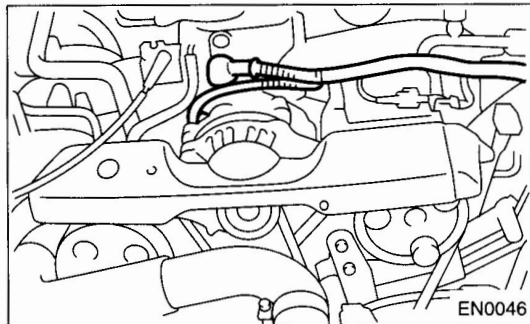


2) Disconnect the connector and terminal from generator.

• Non-Turbo Model

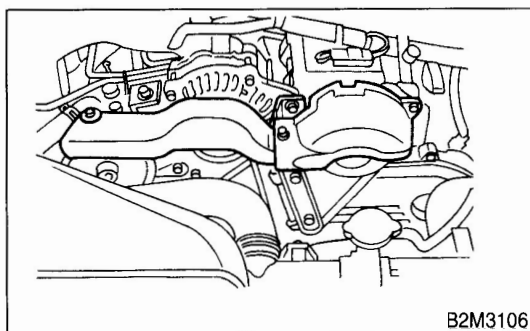


• Turbo Model

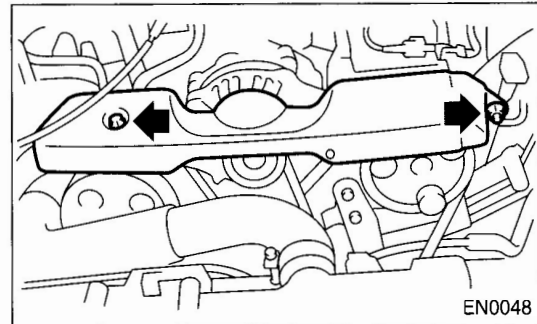


3) Remove the V-belt cover.

• Non-Turbo Model



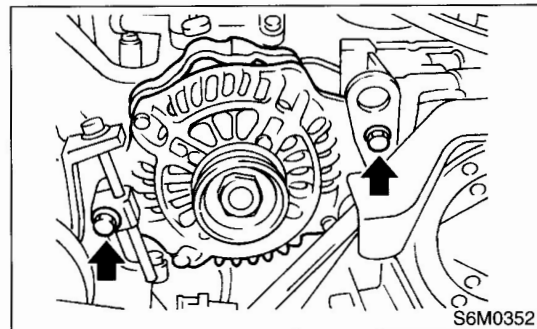
• Turbo Model



4) Remove the front side V-belt.

<Ref. to ME(SOHC)-43, FRONT SIDE BELT, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-44, FRONT SIDE BELT, REMOVAL, V-belt.>

5) Remove the bolts which install the generator onto bracket.

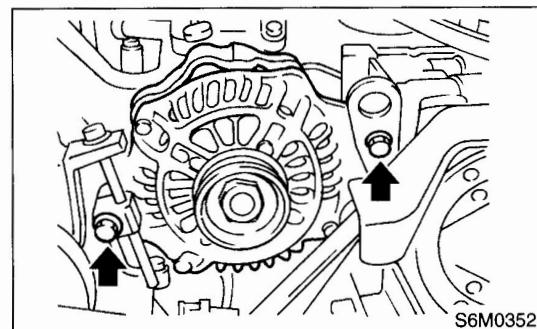


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Check and adjust the V-belt tension. <Ref. to ME(SOHC)-44, INSPECTION, V-belt.> and <Ref. to ME(DOHC TURBO)-45, INSPECTION, V-belt.>

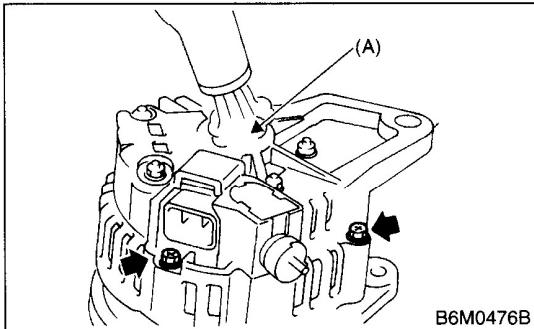


GENERATOR

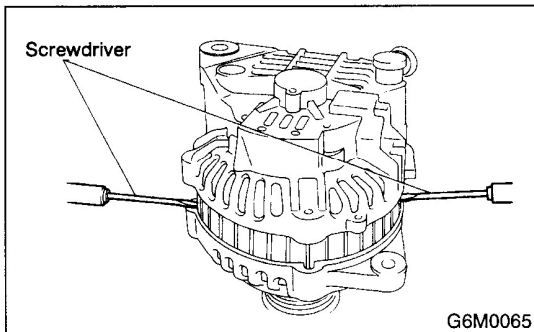
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C: DISASSEMBLY

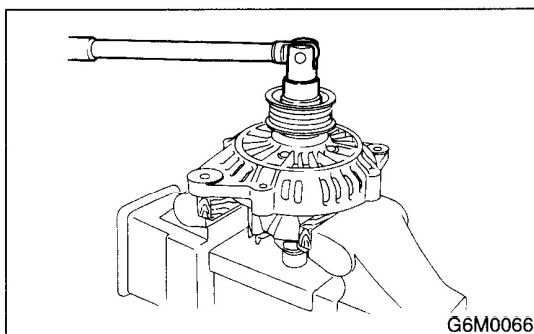
1) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.



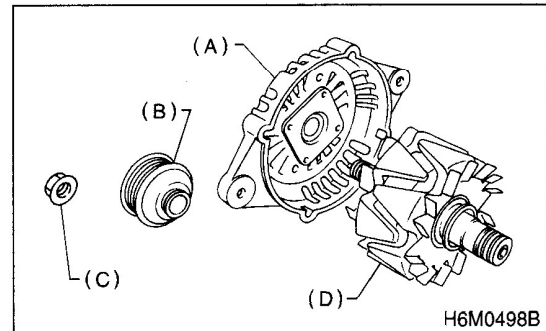
2) Remove the four through bolts. Then insert the tip of a flat-head screwdriver into the gap between the stator core and front bracket. Pry then apart to disassemble.



3) Hold the rotor with a vise and remove the pulley nut.



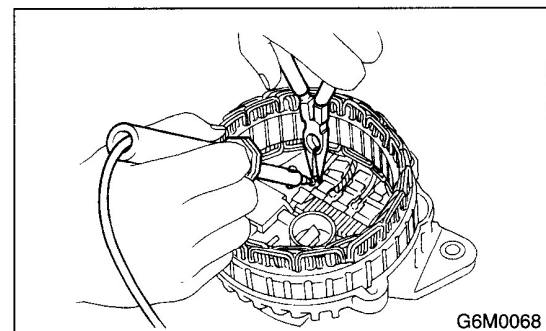
CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of the vise to prevent rotor from damage.



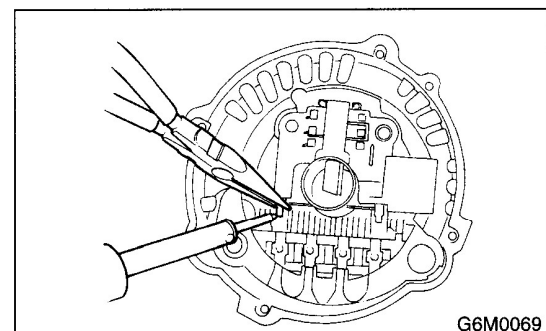
- (A) Front bracket
- (B) Pulley
- (C) Nut
- (D) Rotor

4) Unsolder connection between rectifier and stator coil to remove the stator coil.

CAUTION:
Finish the work rapidly (less than three seconds) because the rectifier cannot withstand heat very well.



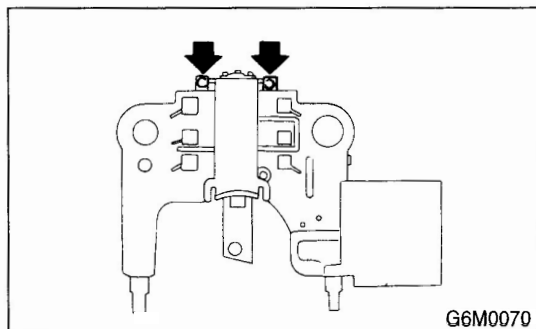
5) Remove the screws which secure the IC regulator to rear cover, and unsolder connection between IC regulator and rectifier to remove the IC regulator.



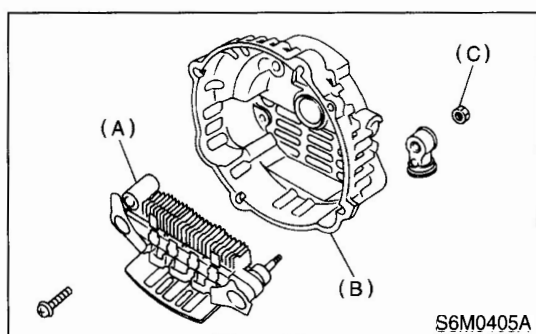
GENERATOR

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6) Remove the brushes by unsoldering at the pig-tails.



7) Remove the nut and insulating bushing at terminal B, and remove the rectifier.



- (A) Rectifier
- (B) Rear cover
- (C) Nut

D: ASSEMBLY

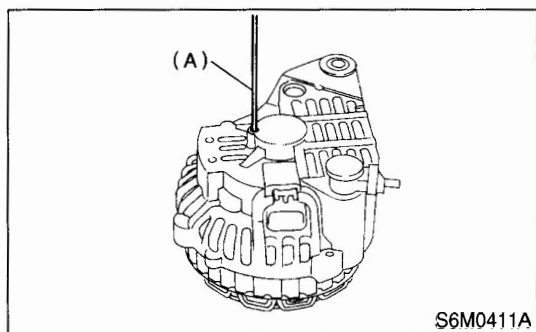
To assemble, reverse the order of disassembly.

1) Pulling up brush:

Before assembling, press the brush down into the brush holder with your finger and secure in that position by passing a [2 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire (A) through the hole shown in the figure.

CAUTION:

Be sure to remove the wire after reassembly.



2) Heat the bearing box in the rear bracket [50 to 60°C (122 to 140°F)] and press the rear bearing into the rear bracket.

CAUTION:

Grease should not be applied for the rear bearing. Remove oil completely if it is found on the bearing box.

3) After reassembly, turn the pulley by hand to check that the rotor turns smoothly.

E: INSPECTION

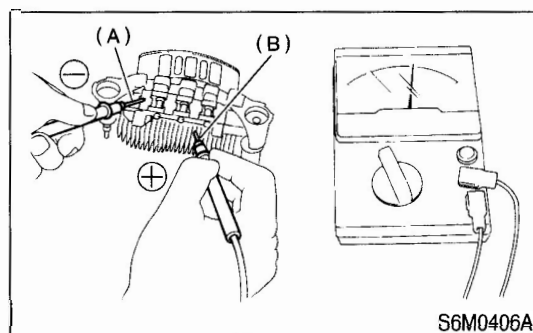
1. DIODE

CAUTION:

Never use a megger tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode:

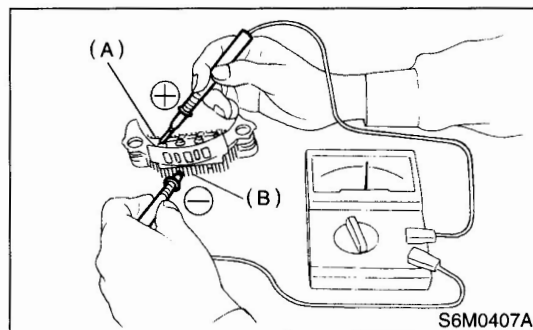
Check for continuity between the diode lead and the positive side heat sink. The positive diode is in good condition if continuity exists only in the direction from the diode lead to the heat sink.



- (A) Diode lead
- (B) Heat sink (Positive side)

2) Checking negative diode:

Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if continuity exists only in the direction from the heat sink to the diode lead.



- (A) Diode lead
- (B) Heat sink (Negative side)

GENERATOR

STARTING/CHARGING SYSTEMS

2. ROTOR

1) Slip ring surface:

Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter:

Measure the slip ring outer diameter. If the slip ring is worn replace the rotor assembly.

Slip ring outer diameter:

Standard

22.7 mm (0.894 in)

Limit

22.1 mm (0.870 in)

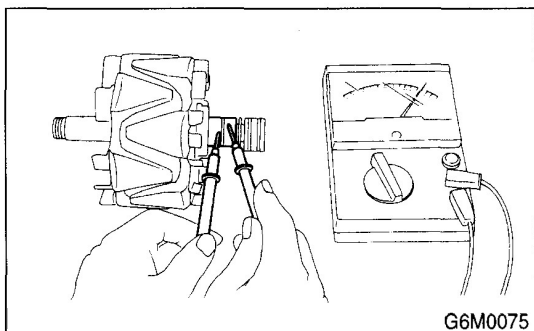
3) Continuity test:

Check the resistance between slip rings using a circuit tester.

If the resistance is not within specification, replace the rotor assembly.

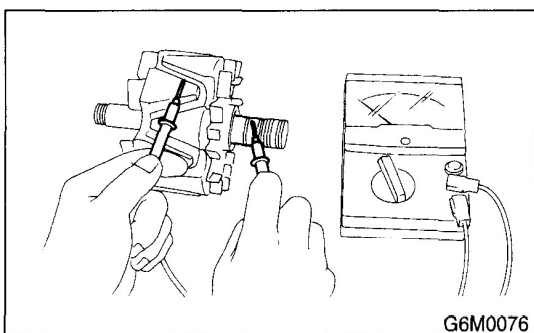
Specified resistance:

Approx. 2.7 — 3.2 Ω



4) Insulation test:

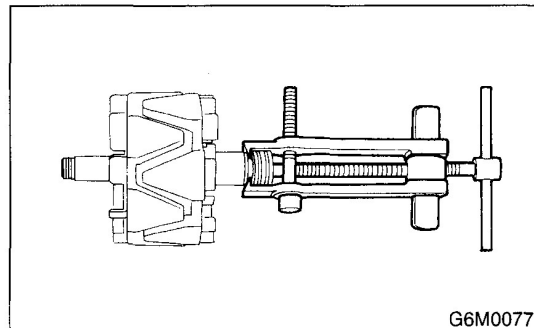
Check the continuity between slip ring and rotor core or shaft. If the resistance value is below 1 Ω , the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side):

(1) Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

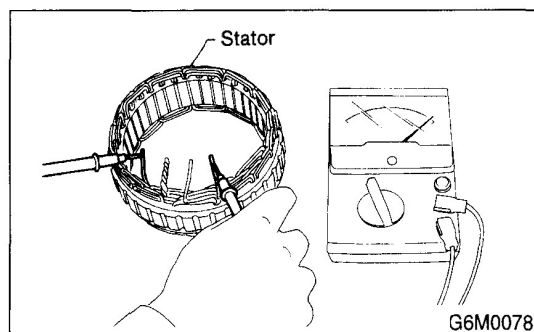
(2) The rear bearing can be removed by using a common bearing puller.



3. STATOR

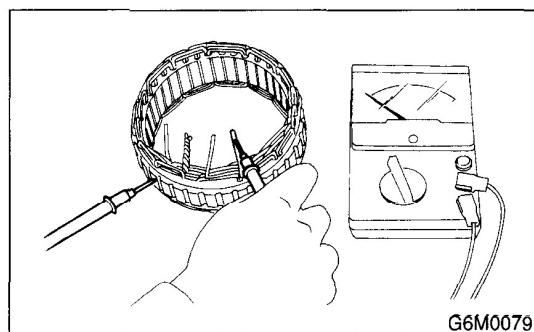
1) Continuity test:

Inspect the stator coil for continuity between each end of the lead wires. If the resistance value is above 1M Ω between individual lead wires, the lead wire is broken, and so replace the stator assembly.



2) Insulation test:

Inspect the stator coil for continuity between stator coil and each end of the lead wire. If the resistance value is below 1 Ω , the stator coil is grounded, and so replace the stator assembly.



4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

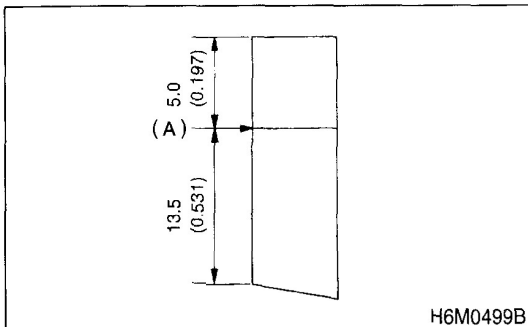
Brush length:

Standard

18.5 mm (0.728 in)

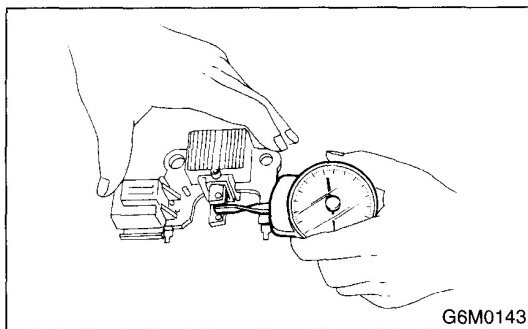
Service limit

5.0 mm (0.197 in)



2) Checking brush spring for proper pressure:

Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of the brush spring. If the pressure is less than 2.648 N (270 g, 9.52 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.609 to 5.786 N (470 to 590 g, 16.58 to 20.81 oz).



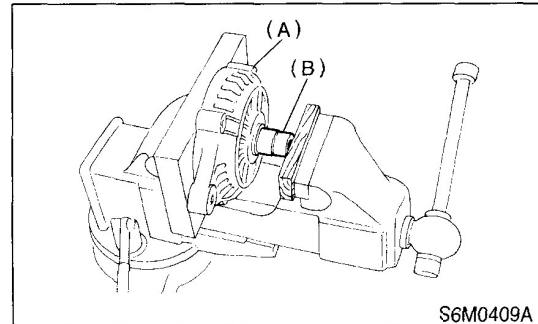
5. BEARING (FRONT SIDE)

1) Check the front ball bearing. If resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

2) Replacing front bearing:

(1) Remove the front bearing retainer.

(2) Closely install a fit tool on the bearing inner race. Press the bearing down out of front bracket with a hand press or vise. A socket wrench can serve as the tool.

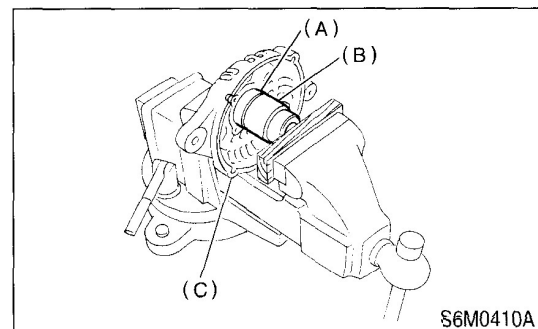


(A) Front bracket

(B) Socket wrench

(3) Set a new bearing and closely install a fit tool on the bearing outer race. Press the bearing down into place with a hand press or vise. A socket wrench can serve as the tool.

(4) Install the front bearing retainer.



(A) Bearing

(B) Socket wrench

(C) Front bracket

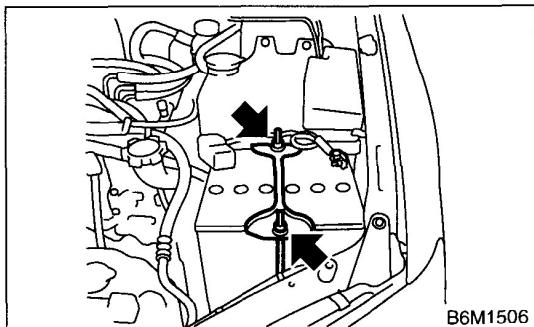
BATTERY

STARTING/CHARGING SYSTEMS

4. Battery

A: REMOVAL

- 1) Disconnect the positive (+) terminal after disconnecting the negative (-) terminal of battery.
- 2) Remove the flange nuts from battery rods and take off battery holder.



- 3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:

- Clean the battery cable terminals and apply grease to retard the formation of corrosion.
- Connect the positive (+) terminal of battery and then the negative (-) terminal of the battery.

C: INSPECTION

WARNING:

- Electrolyte has toxicity; be careful handling the fluid.
- Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
- Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
- Ventilate when charging or using in enclosed space.
- For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
- Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
- To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$$S_{20} = St + 0.0007 \times (t - 20)$$

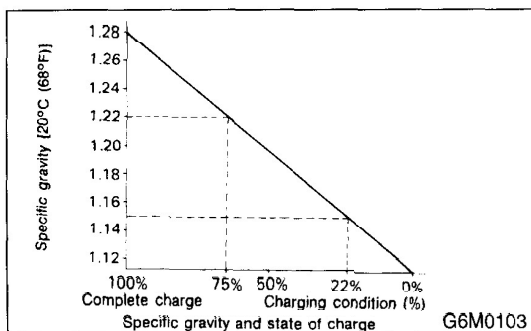
S_{20} : Specific gravity corrected at electrolyte temperature of 20°C

St : Measured specific gravity

t : Measured temperature (°C)

Determine whether or not battery must be charged, according to corrected specific gravity.

Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in the figure.

D: MEASUREMENT

WARNING:

- Do not bring an open flame close to the battery at this time.

CAUTION:

- Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
- Be careful since battery electrolyte overflows while charging the battery.
- Observe instructions when handling the battery charger.
- Before charging the battery on vehicle, disconnect the battery ground terminal. Failure to follow this rule may damage the generator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

- 1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
- 2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)

*: Check electrical system before replacement.

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).

It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:

- Observe the items in 1. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because it will shorten battery life.

