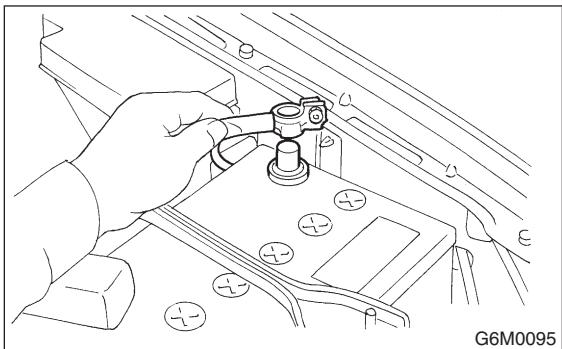


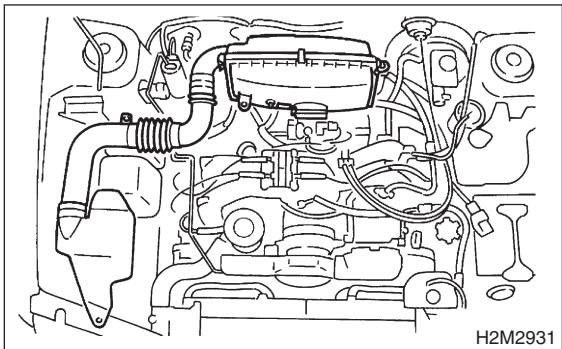
## 2. Starter S109012

### A: REMOVAL S109012A18

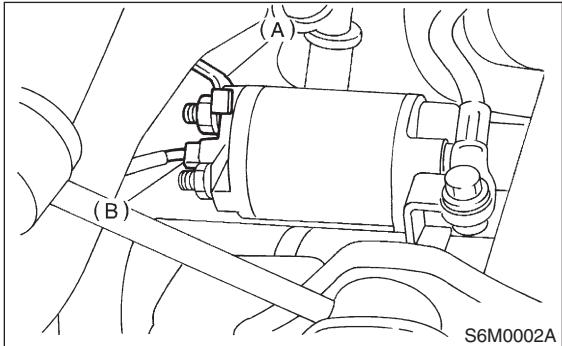
- 1) Disconnect battery ground cable.



- 2) Remove air cleaner case <Ref. to IN-4 REMOVAL, Air Cleaner Case.> and air intake duct. <Ref. to IN-5 REMOVAL, Air Intake Duct.>

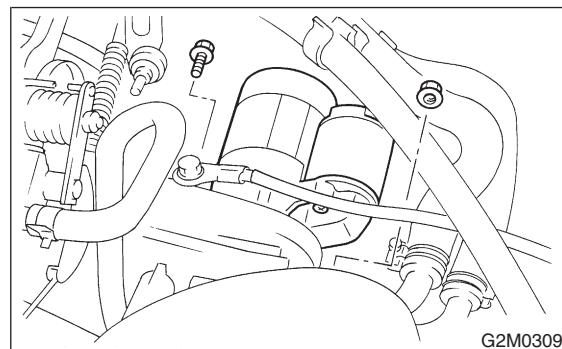


- 3) Disconnect connector and terminal from starter.



(A) Terminal  
(B) Connector

- 4) Remove starter from transmission.

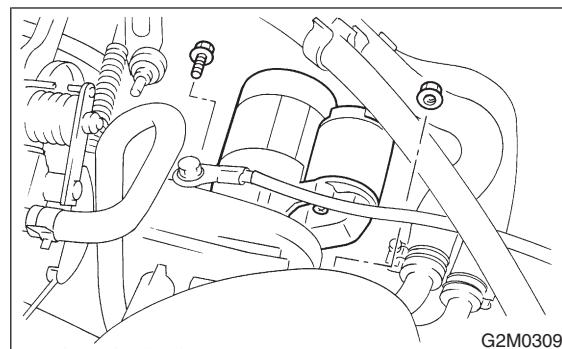


### B: INSTALLATION S109012A11

Install in the reverse order of removal.

#### **Tightening torque:**

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**

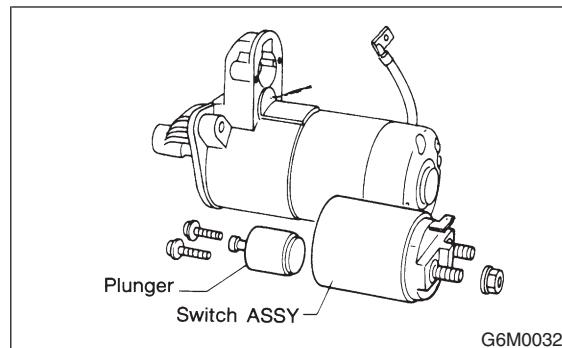


### C: DISASSEMBLY S109012A06

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

#### **CAUTION:**

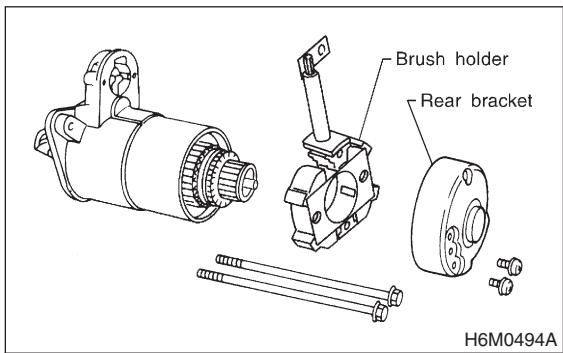
**Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.**



# STARTER

## Starting/Charging Systems

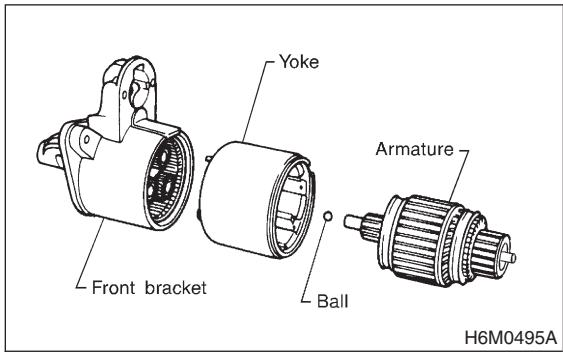
3) Remove both through-bolts and brush holder screws, and detach rear bracket and brush holder.



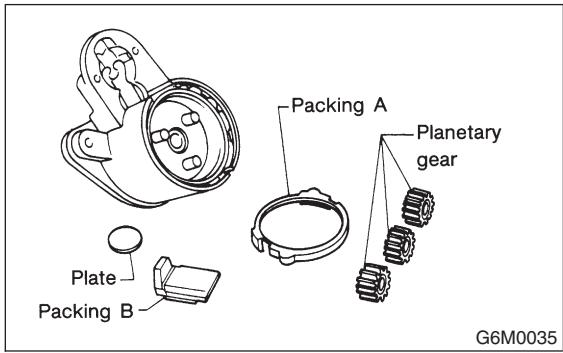
4) Remove armature and yoke. Ball used as a bearing will then be removed from the end of armature.

**CAUTION:**

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

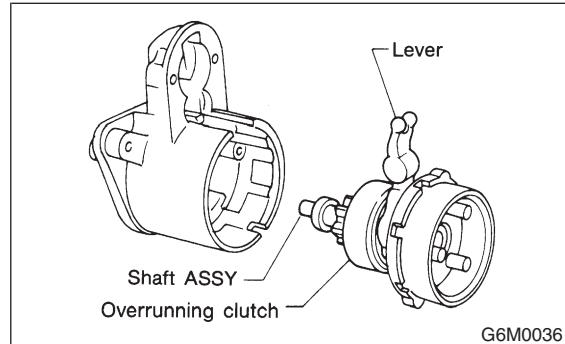


5) Remove packing A, three planetary gears, packing B and plate.



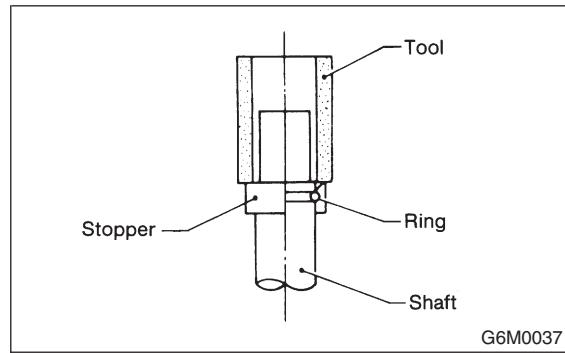
6) Remove shaft assembly and overrunning clutch as a unit.

**CAUTION:**  
**Record the direction of lever before removing.**



7) Remove overrunning clutch from shaft assembly as follows:

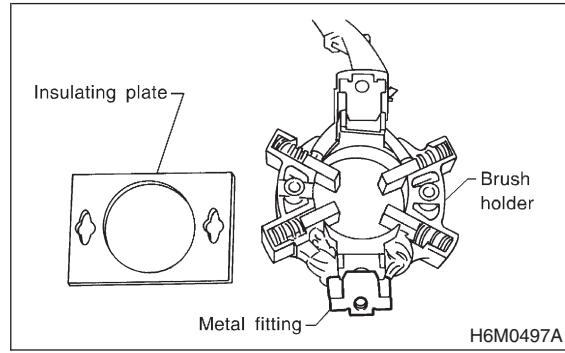
- (1) Remove stopper from ring by lightly tapping a fit tool placed on stopper.
- (2) Remove ring, stopper and clutch from shaft.



8) 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.



## D: ASSEMBLY S109012A02

Assembe is in the reverse order of disassembly. Observe the following:

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

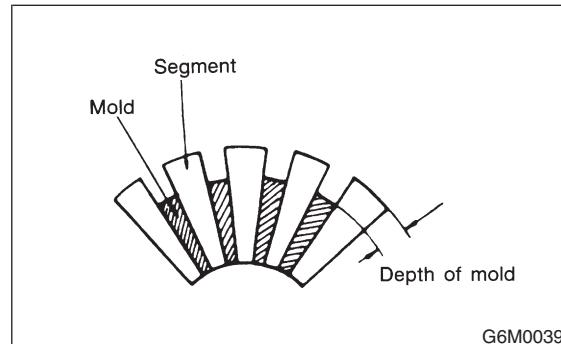
2) Apply grease to the following parts during assembly.

- Front 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 starter operates properly.

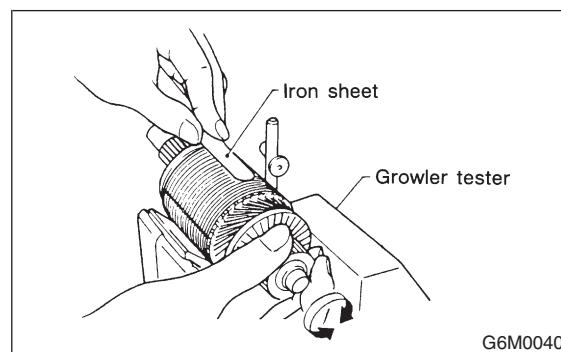
3) Depth of segment mold  
Check the depth of segment mold.

**Depth of segment mold:**  
**0.5 mm (0.020 in)**



4) Armature short-circuit test

Check 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.



## E: INSPECTION S109012A10

### 1. ARMATURE S109012A1001

1) Check 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.

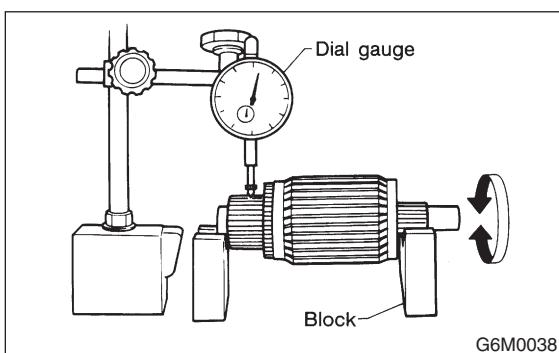
#### Commutator run-out:

**Standard**

**0.05 mm (0.0020 in)**

**Service limit**

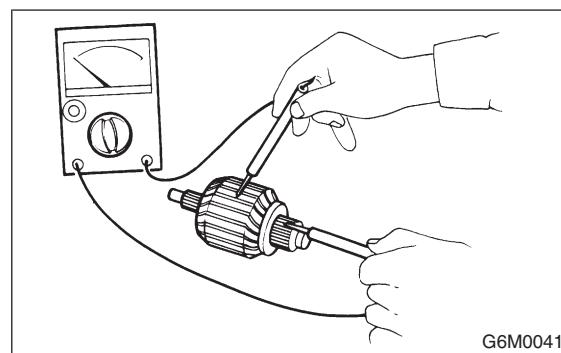
**Less than 0.10 mm (0.0039 in)**



5) Armature ground test

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

Replace armature if it is grounded.



# STARTER

## Starting/Charging Systems

### 2. YOKE S109012A1002

Make sure pole is set in position.

### 3. OVERRUNNING CLUTCH S109012A1003

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

#### CAUTION:

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

### 4. BRUSH AND BRUSH HOLDER S109012A1004

#### 1) Brush length

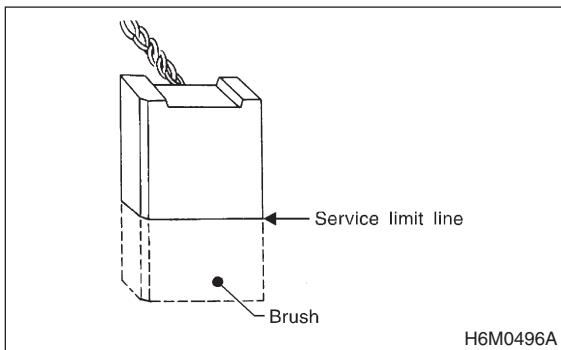
Measure the brush length and replace if it exceeds the service limit.

Replace if abnormal wear or cracks are noticed.

#### Brush length:

**Standard 17.0 mm (0.669 in)**

**Service limit 11.5 mm (0.453 in)**



H6M0496A

#### 2) Brush movement

Be sure brush moves smoothly inside brush holder.

#### 3) Brush spring force

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

#### Brush spring force:

**Standard**

**21.6 N (2.2 kgf, 4.9 lb) (when new)**

**Service limit**

**5.9 N (0.6 kgf, 1.3 lb)**

### 5. SWITCH ASSEMBLY S109012A1008

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

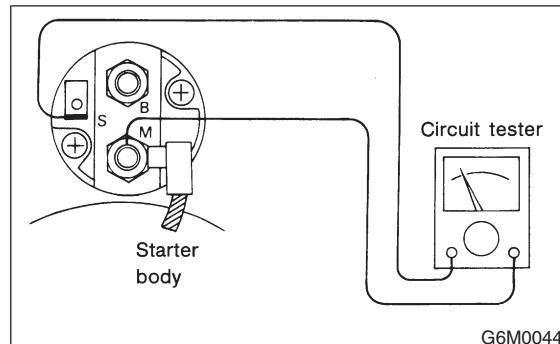
Also check to be sure there is no continuity between terminal M and B.

#### Terminal / Specified resistance:

**S—M / Continuity**

**S—Ground / Continuity**

**M—B / No continuity**



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### 6. SWITCH ASSEMBLY OPERATION

S109012A1009

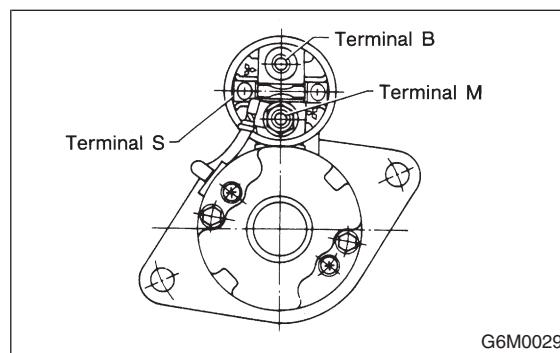
1) Connect terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. Pinion should be forced endwise on shaft.

#### CAUTION:

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

2) Disconnect connector from terminal M, and connect 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.



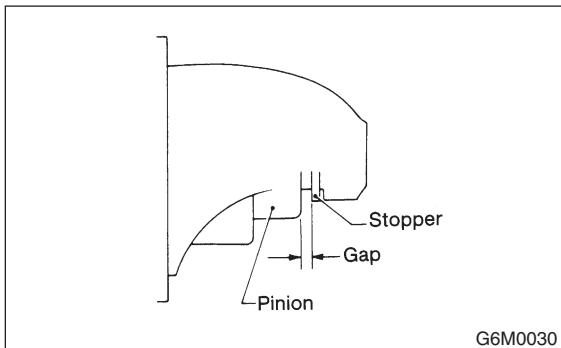
G6M0029

## 7. PINION GAP S109012A1010

1) With pinion forced endwise on shaft, as outlined in step 1) before <Ref. to SC-7 INSPECTION, Starter.>, measure pinion gap.

### Pinion gap:

0.5 — 2.0 mm (0.020 — 0.079 in)



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

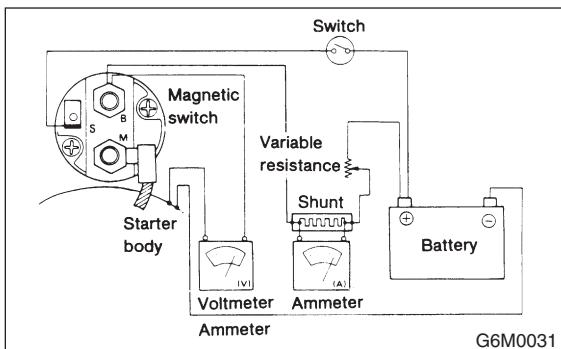
3) If pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

## 8. PERFORMANCE TEST S109012A1007

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.



### 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 or less

##### Rotating speed

- MT vehicles 2,800 rpm or more
- AT vehicles 2,400 rpm or more

### 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):

##### • MT vehicles

##### Voltage / Load

7.5 V / 8.73 N·m (0.89 kgf-m, 6.4 ft-lb)

##### Current / Speed

300 A / 890 rpm or more

##### • AT vehicles

##### Voltage / Load

7.7 V / 16.00 N·m (1.63 kgf-m, 11.8 ft-lb)

##### Current / Speed

400 A max. / 740 rpm or more

### 3) Lock test

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

#### Lock test (Standard):

##### • MT vehicles

##### Voltage / Load

4 V / 780 A or less

##### Torque

15.7 N·m (1.60 kgf-m, 11.6 ft-lb) or more

##### • AT vehicles

##### Voltage / Current

3.5 V / 940 A or less

##### Torque

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