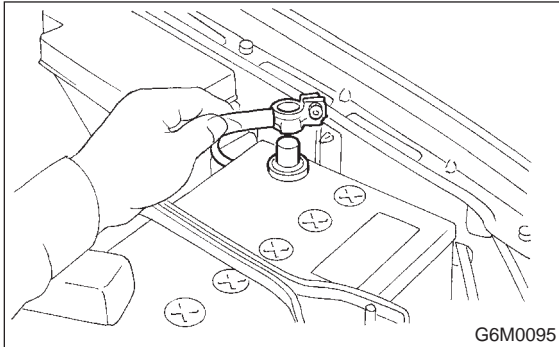


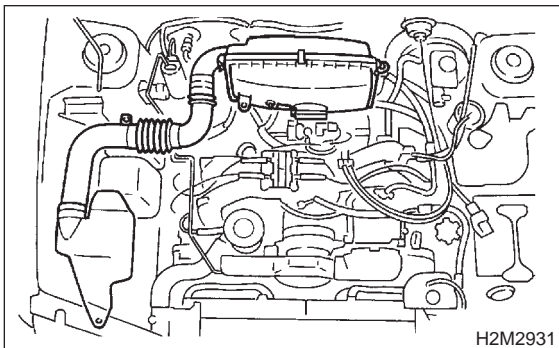
## 1. Starter

### A: REMOVAL AND INSTALLATION

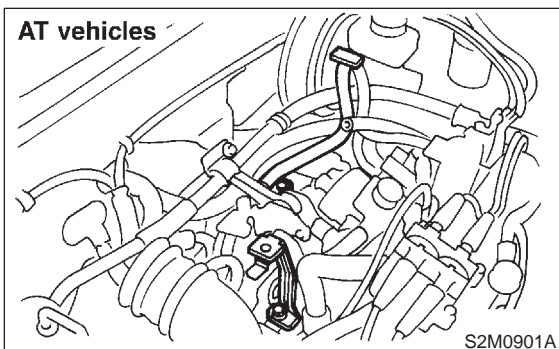
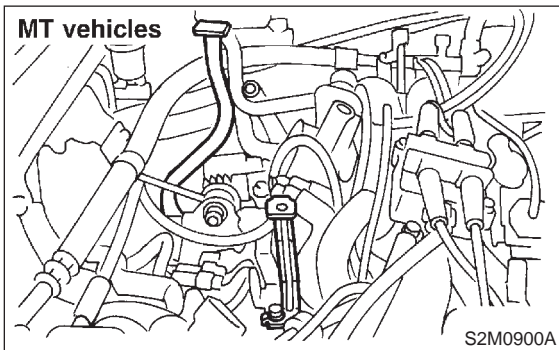
- 1) Disconnect battery ground cable.



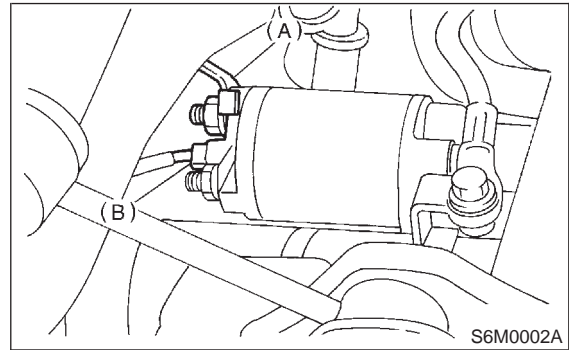
- 2) Remove air cleaner case and air intake duct.  
<Ref. to 2-7 [W1A0].>



- 3) Remove air intake chamber stay.

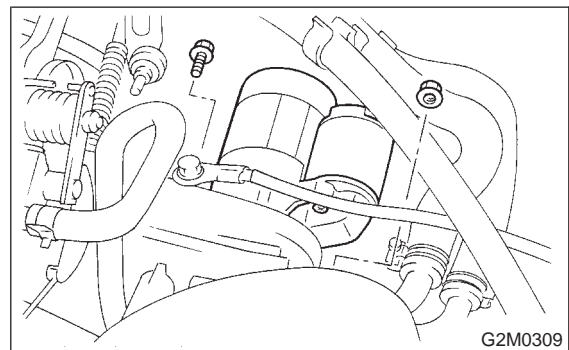


- 4) Disconnect connector and terminal from starter.



- (A) Terminal  
(B) Connector

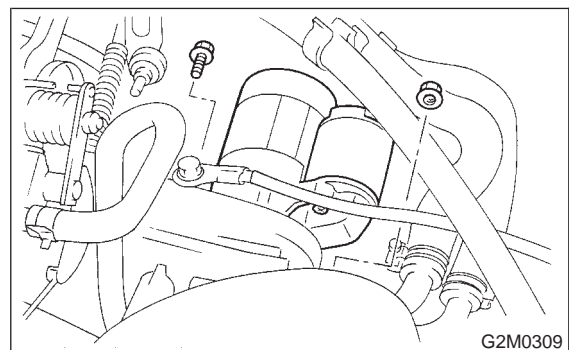
- 5) Remove starter from transmission.



- 6) Install in the reverse order of removal.

#### **Tightening torque:**

**50±4 N·m (5.1±0.4 kg·m, 37±2.9 ft·lb)**



## B: TEST

### 1. SWITCH ASSEMBLY OPERATION

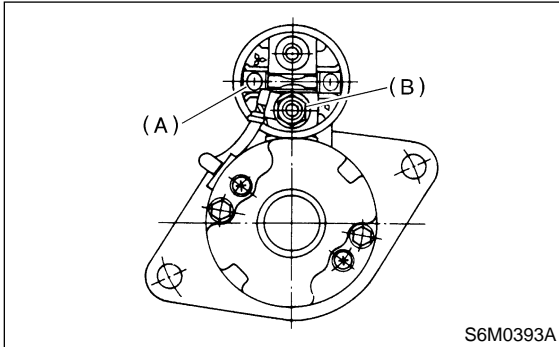
- 1) Connect terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. Pinion should be forced endwise on shaft.

#### **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.



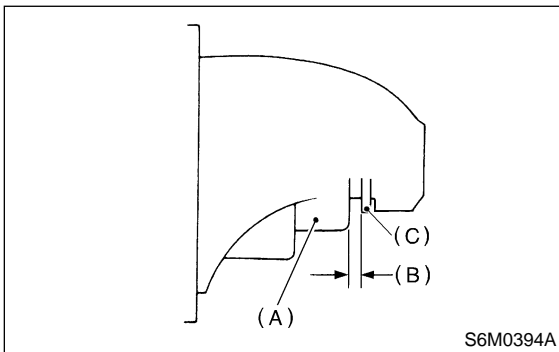
- (A) Terminal S
- (B) Terminal M

## 2. PINION GAP

1) With pinion forced endwise on shaft, as outlined in step 1) before <Ref. to 6-1 [W1B1]> measure pinion gap.

### Pinion gap:

**0.5 — 2.0 mm (0.020 — 0.079 in)**



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

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.

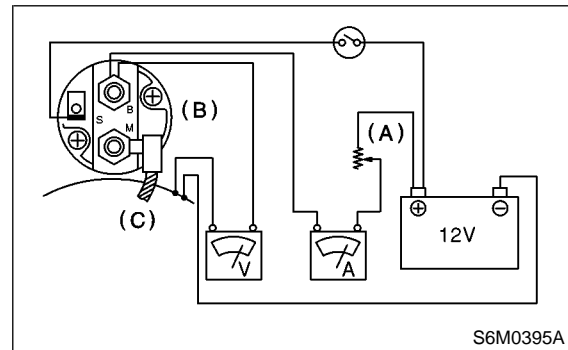
2) If pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

## 3. 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

###### 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):

##### Voltage / Load

###### MT vehicles

**7.5 V/8.7 N-m (0.89 kg-m, 6.4 ft-lb)**

###### AT vehicles

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

##### Current / Speed

###### MT vehicles

**300 A/890 rpm or more**

###### AT vehicles

**400 A/740 rpm or more**

## 1. Starter

## 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):****Voltage / Current****MT vehicles**

4 V/780 A or less

**AT vehicles**

3.5 V/940 A or less

**Torque****MT vehicles**

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

**AT vehicles**

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

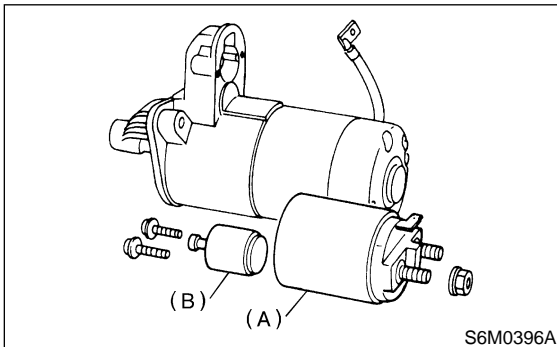
**C: DISASSEMBLY****1. STARTER ASSEMBLY**

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:**

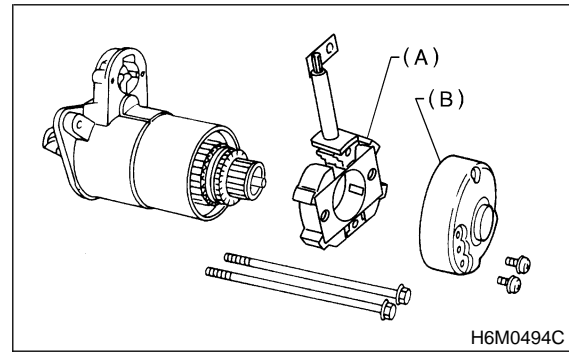
Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



(A) Switch ASSY

(B) Plunger

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



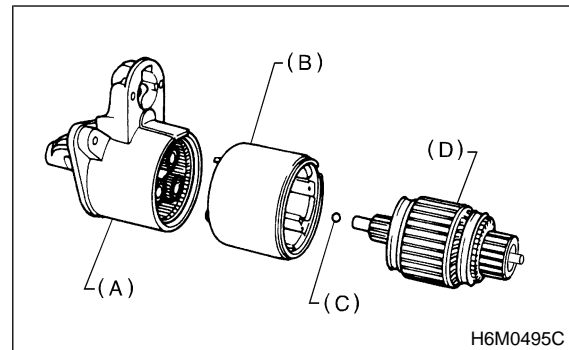
(A) Brush holder

(B) Rear bracket

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.



(A) Front bracket

(B) Yoke

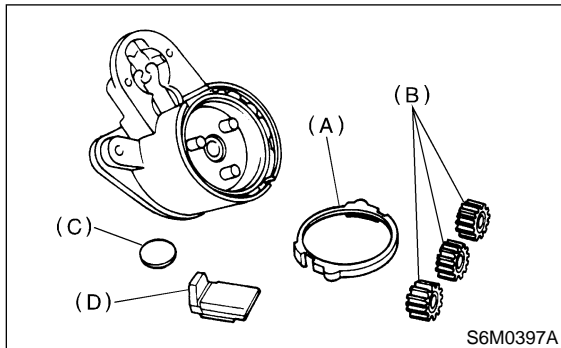
(C) Ball

(D) Armature

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

**CAUTION:**

**Record the position of packing A before removing.**

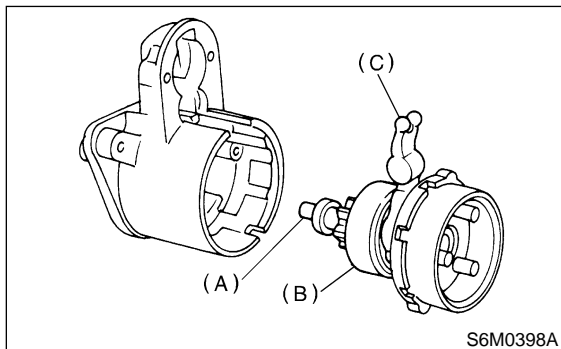


- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

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

**CAUTION:**

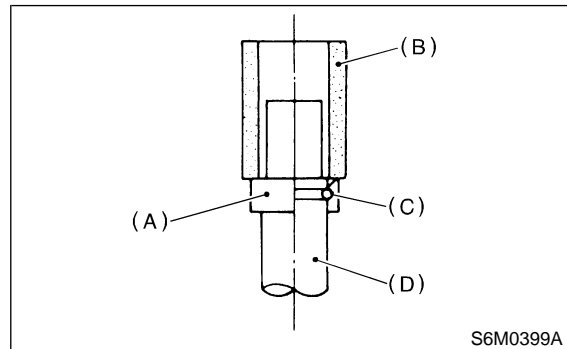
**Record the direction of lever before removing.**



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

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.



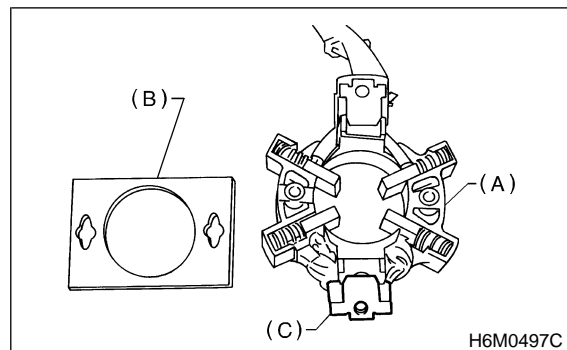
- (A) Stopper
- (B) Tool
- (C) Ring
- (D) Shaft

**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

**D: INSPECTION**

**1. ARMATURE**

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

## 1. Starter

## 2) Run-out test

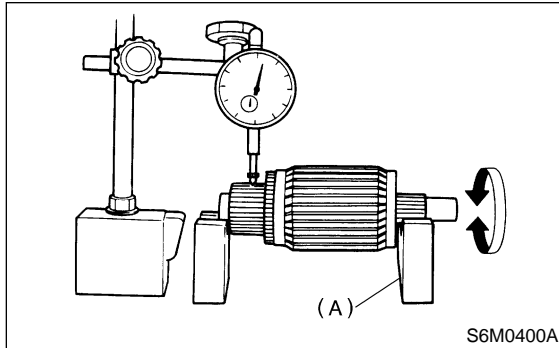
Check the commutator run-out and replace if it exceeds the limit.

**Commutator run-out:****Standard**

**0.05 mm (0.0020 in)**

**Service limit**

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



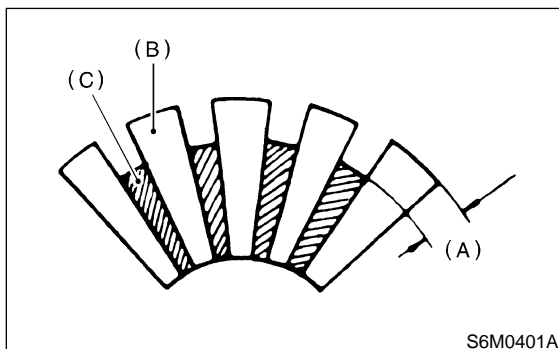
(A) V-block

## 3) Depth of segment mold

Check the depth of segment mold.

**Depth of segment mold:**

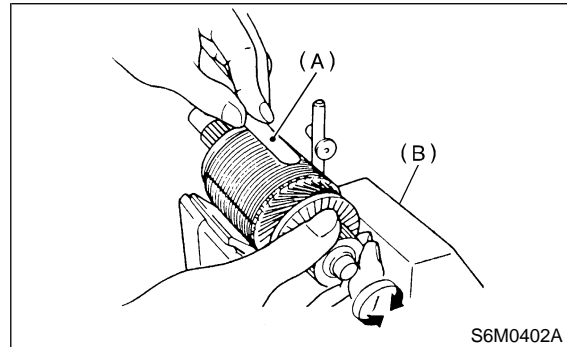
**0.5 mm (0.020 in)**



- (A) Depth of mold  
(B) Segment  
(C) Mold

## 4) Armature short-circuit test

Check 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.

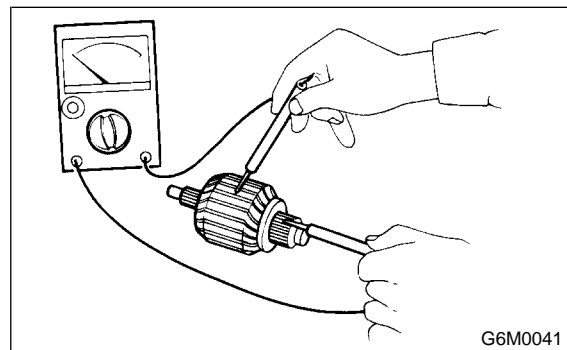


- (A) Iron sheet  
(B) Growler tester

## 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.



G6M0041

**2. YOKE**

Make sure pole is set in position.

**3. OVERRUNNING CLUTCH**

Inspect teeth of pinion for wear and damage. Replace if it is damaged. Rotate pinion in direction of rotation (counterclockwise). 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**

1) Brush length

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

Replace if abnormal wear or cracks are noticed.

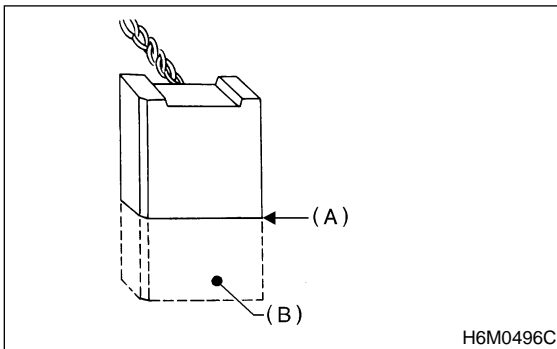
**Brush length:**

**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 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 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").

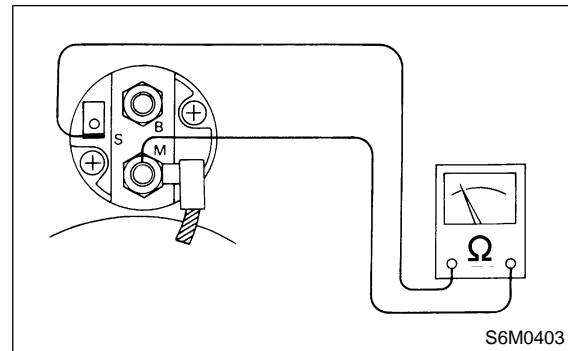
Also check to be sure there is no continuity between terminal M and B.

**Terminal / Specified resistance:**

**S — M / Continuity**

**S — Ground / Continuity**

**M — B / No continuity**



**E: ASSEMBLY**

Assemble in the reverse order of disassembly. 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 starter operates properly.