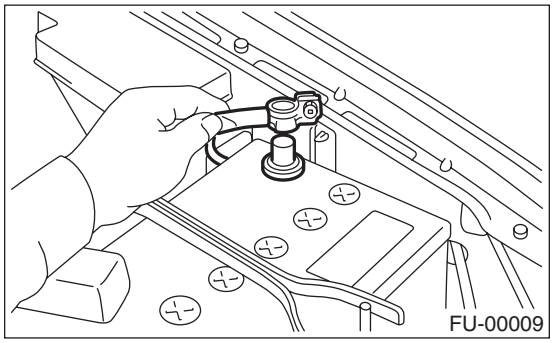
2. Starter

A: REMOVAL

1) Disconnect the ground cable from battery.

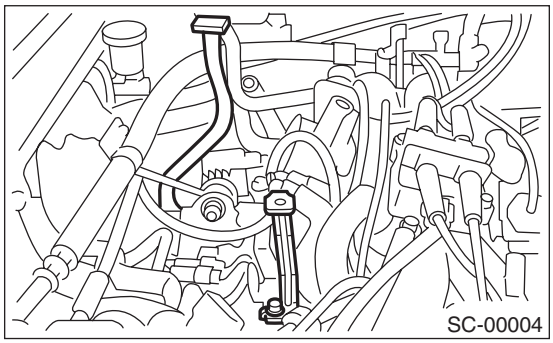


2) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

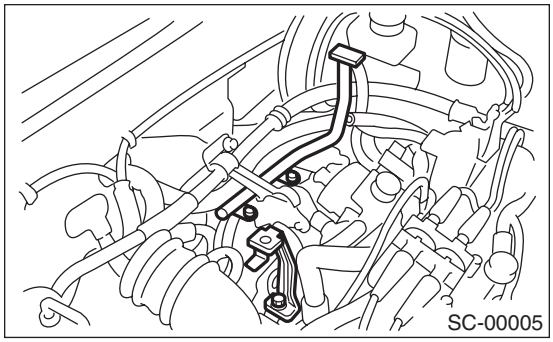
3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

4) Remove the air cleaner case stay. (Non-turbo model)

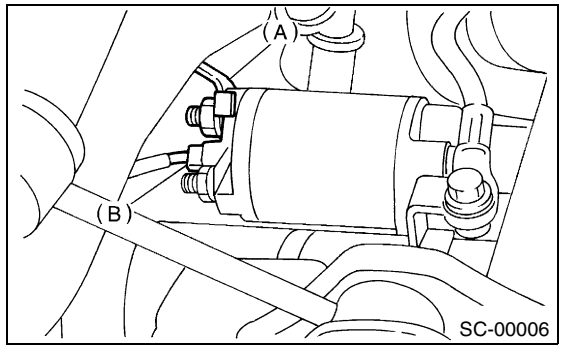
- MT model



- AT model

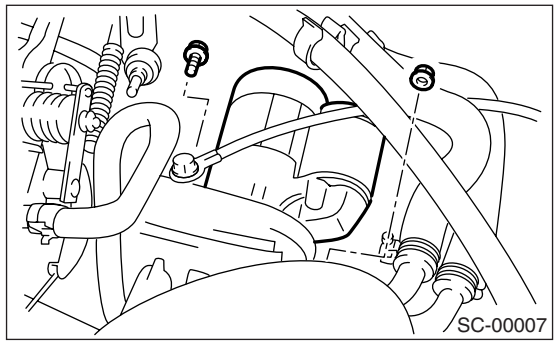


5) Disconnect the connector and terminal from starter.



(A) Terminal
(B) Connector

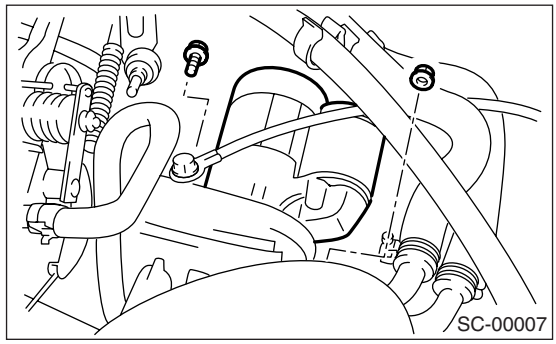
6) Remove the starter from transmission.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

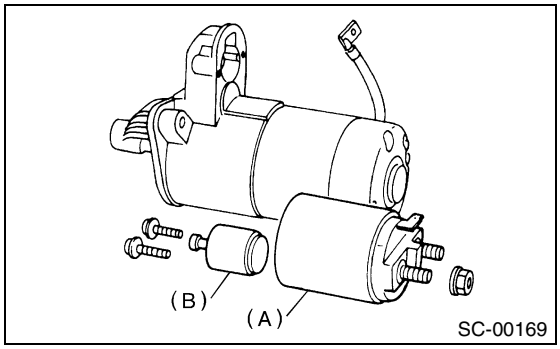


C: DISASSEMBLY

1. STARTER ASSEMBLY

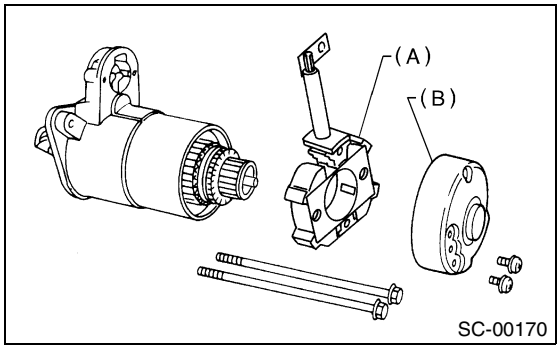
1) Loosen the nut which holds terminal M of switch assembly, and then disconnect the connector.
2) Remove the bolts which hold the switch assembly, and then remove switch assembly, plunger and plunger spring from starter as a unit.

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



(A) Switch assembly
(B) Plunger

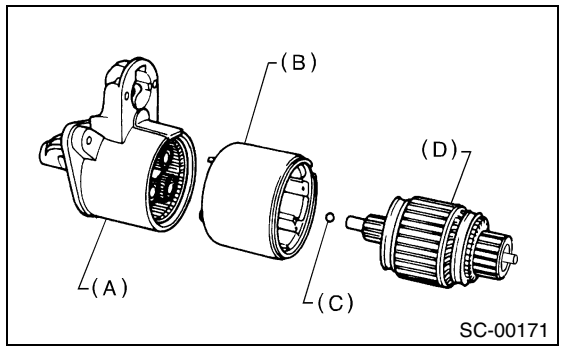
3) Remove both through-bolts and brush holder screws, and then detach the rear cover and brush holder.



(A) Brush holder
(B) Rear cover

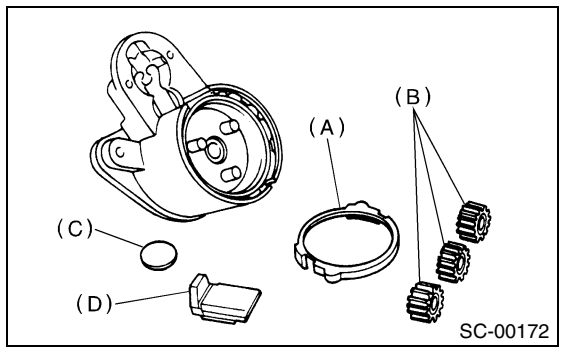
4) Remove the armature and yoke from front bracket. The ball used as a bearing will come off from the armature end.

NOTE:
Before removal of the yoke, put alignment marks on the yoke and front bracket.



(A) Front bracket
(B) Yoke
(C) Ball
(D) Armature

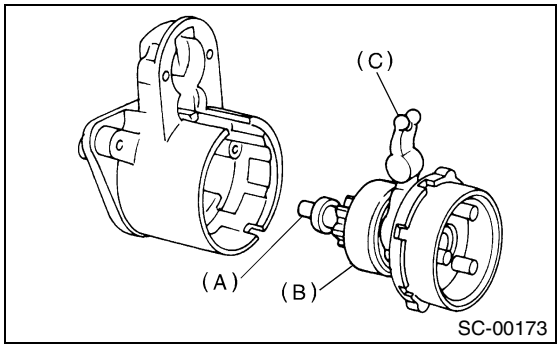
5) Remove packing A, planetary gears, packing B and plate.



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

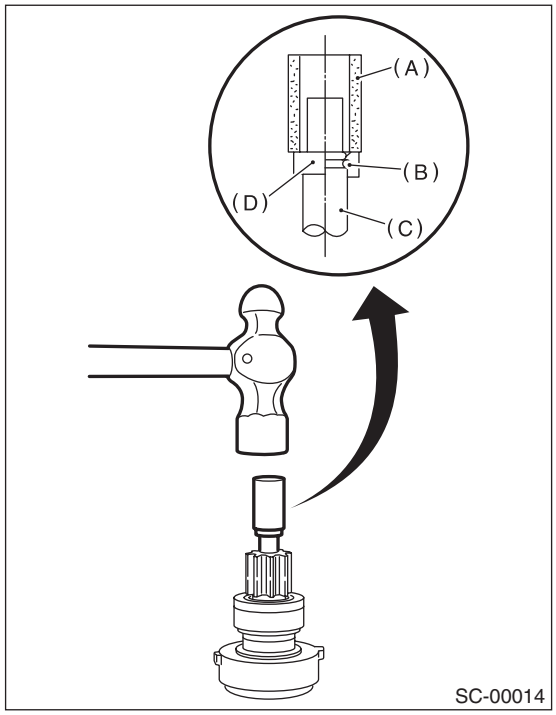
6) Remove the shaft assembly and overrunning clutch as a unit.

NOTE:
Note the direction of the lever before removing.



(A) Shaft assembly
(B) Overrunning clutch
(C) Lever

7) Remove the overrunning clutch from shaft assembly as follows:
(1) Remove the stopper from ring by lightly tapping the stopper with an appropriate tool (such as a fit socket wrench).
(2) Remove the ring, stopper and clutch from shaft.

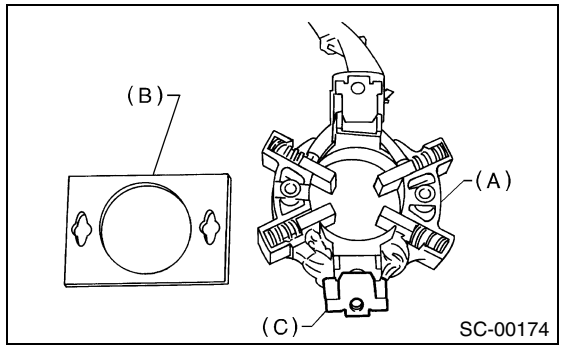


(A) Socket wrench
(B) Ring
(C) Shaft
(D) Stopper

2. BRUSH HOLDER

Slightly open the metal fitting while holding the insulating plate against 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: ASSEMBLY

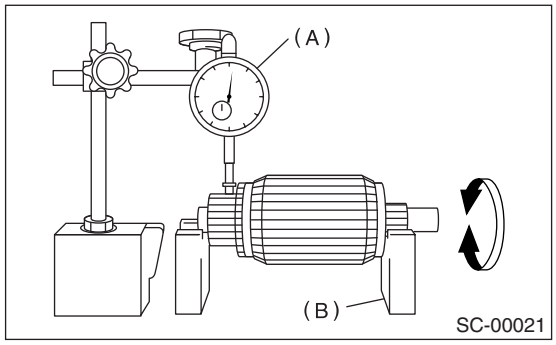
1) To assemble, reverse order of disassembly.
2) Apply grease to the following parts before assembly.
- Front and rear bracket sleeve bearings
- Armature shaft gear
- Outer periphery of plunger
- Mating surfaces of plunger and lever
- Gear shaft splines
- Mating surfaces of lever and clutch
- Ball at armature shaft end
- Planetary gear

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 then replace if it exceeds the limit.

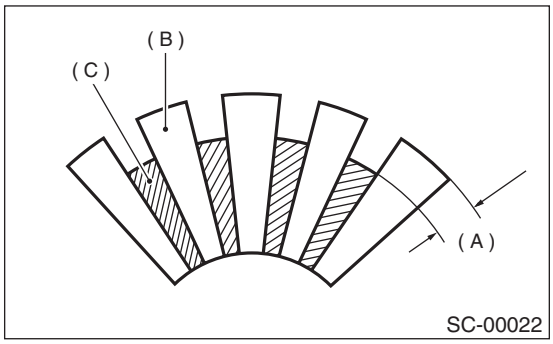
Commutator run-out:
Standard
0.05 mm (0.0020 in)
Service limit
Less than 0.10 mm (0.0039 in)



(A) Dial gauge
(B) V-block

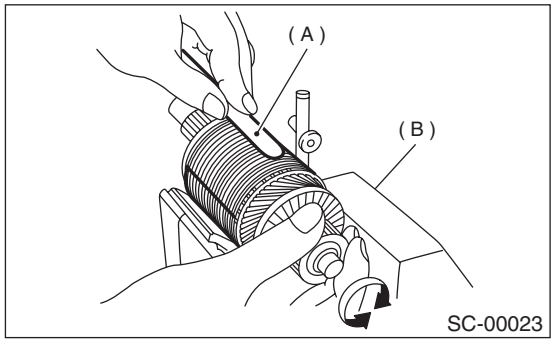
3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.5 mm (0.020 in)



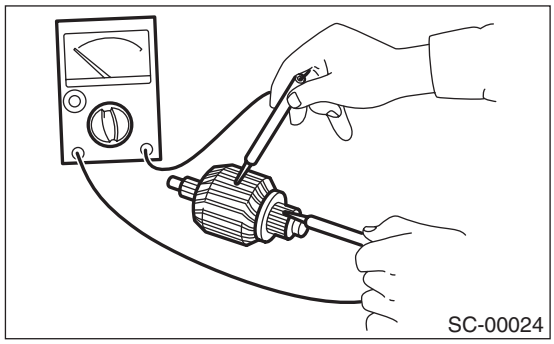
(A) Depth of mold
(B) Segment
(C) Mold

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



(A) Iron sheet
(B) Grower tester

5) Armature ground test
Using a circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, the armature is grounded.
Replace the armature if it is grounded.



2. YOKE

Make sure the pole is set in position.

3. OVERRUNNING CLUTCH

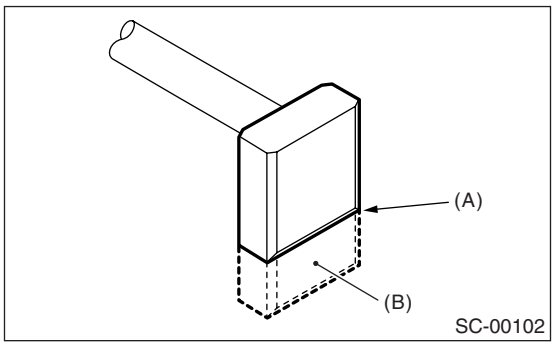
Inspect the teeth of pinion for wear and damage. Replace if it is damaged. It is normal if the pinion rotates smoothly in direction of rotation (counterclockwise) and does not rotate in the opposite direction.

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 then replace if it is worn down to under 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

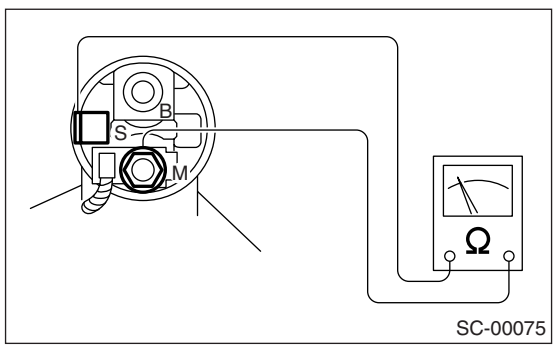
2) Brush movement
Be sure the brush moves smoothly inside brush holder.
3) Brush spring force
Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

Brush spring force:
Standard
21.6 N (2.2 kgf, 4.9 lb) (when new)
Service limit
5.9 N (0.6 kgf, 1.3 lb)

5. SWITCH ASSEMBLY

Using a circuit tester (set in "ohm"), check if there is continuity between terminals S and M, and between terminal S and ground.
Also check to be sure there is no continuity between terminals M and B.

Terminal / Specified resistance:
S — M / Less than 1 Ω
S — Ground / Less than 1Ω
M — B / More than 1 MΩ

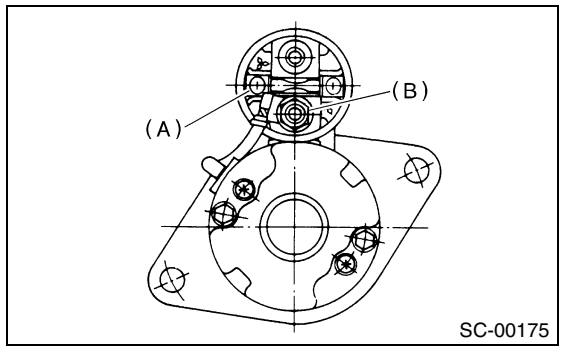


6. SWITCH ASSEMBLY OPERATION

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

CAUTION:
With the pinion forced endwise on shaft, the starter motor may rotate because current flows through the pull-in coil to motor, however, this is not a problem.

2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.
In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.

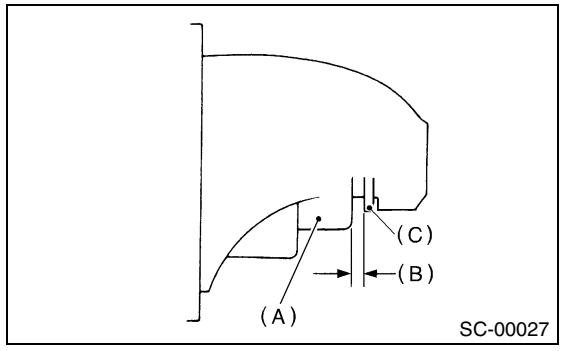


(A) Terminal S
(B) Terminal M

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)



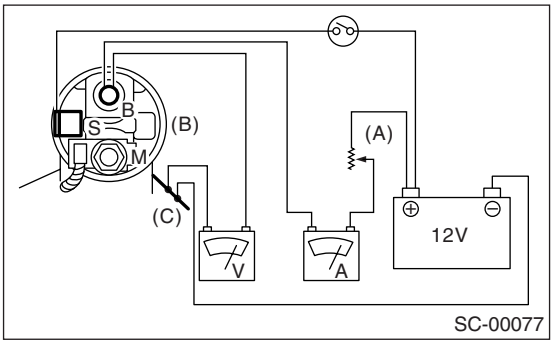
(A) Pinion
(B) Gap
(C) Stopper

If the motor is running with the pinion forced endwise on shaft, disconnect the connector from termi-

nal M of switch assembly, and then connect terminal M to ground terminal (–) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the 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 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 resistor
(B) Magnetic switch
(C) Starter body

1) No-load test
With switch on, adjust the variable resistor to obtain 11 V, take the ammeter reading, and then measure the starter speed. Compare these values with the specifications.

No-load test (standards):

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

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

Load test (standards):

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 kgf-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 (standards):

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