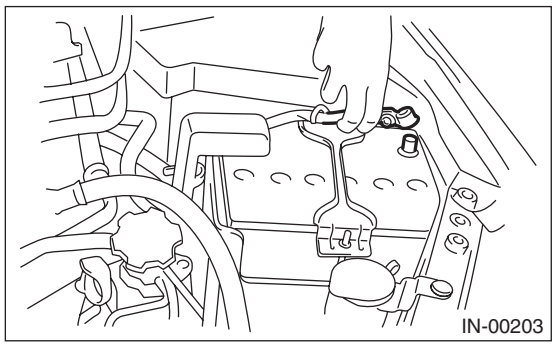
2. Starter

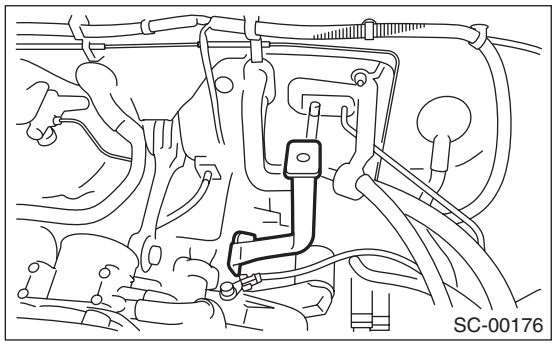
A: REMOVAL

1) Disconnect the ground cable from battery.

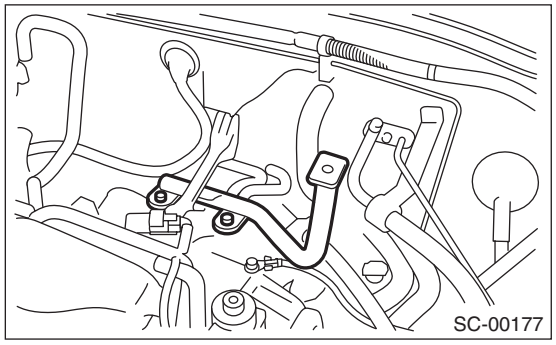


2) Remove the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Chamber.>
3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Remove the air intake chamber stay LH. (Non-turbo model)

- MT MODEL



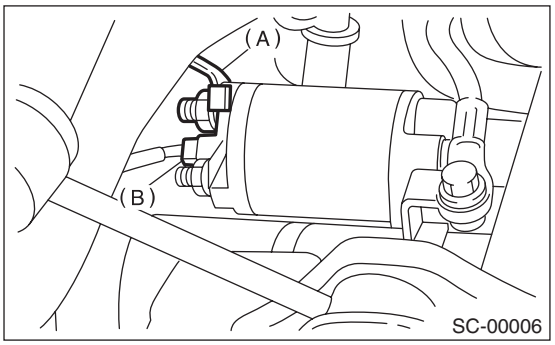
- AT MODEL



C: DISASSEMBLY

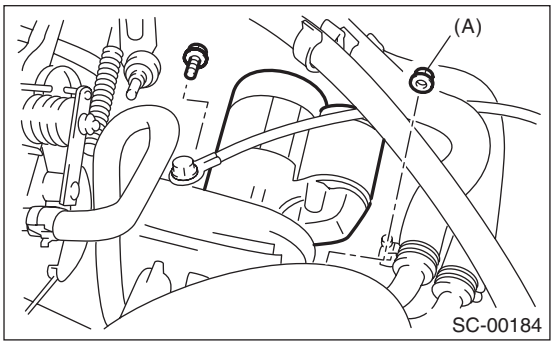
1) Remove the nuts fastening the M terminal of the magnet switch assembly, and disconnect the cable from the M terminal.

5) Disconnect the connector (B) and terminal (A) from starter.



6) Remove the starter from transmission.

NOTE:
For the MT model, a bolt is used in place (A).

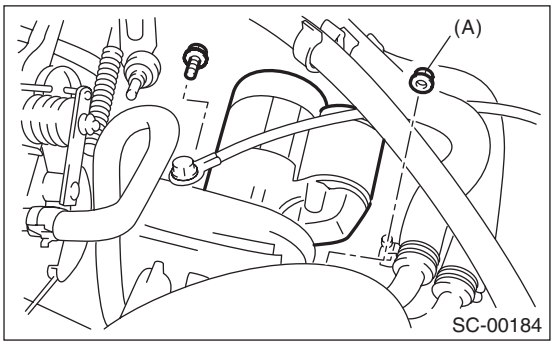


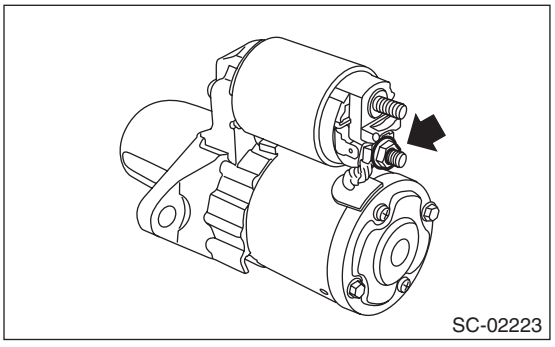
B: INSTALLATION

Install in the reverse order of removal.

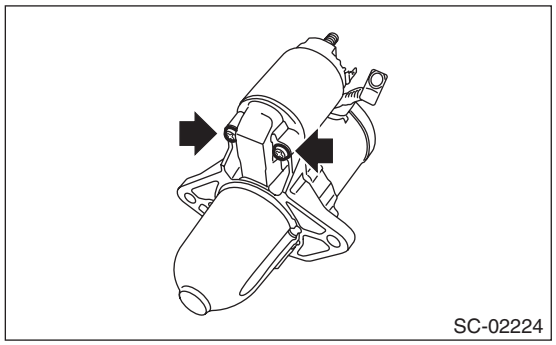
NOTE:
For the MT model, a bolt is used in place (A).

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

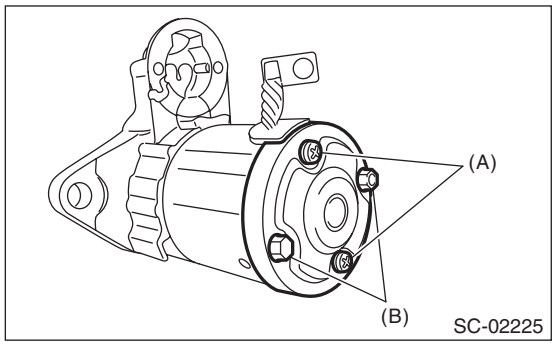




2) Remove the screws fastening the magnet switch assembly, then remove the magnet switch assembly from the starter housing assembly.


SC-02224

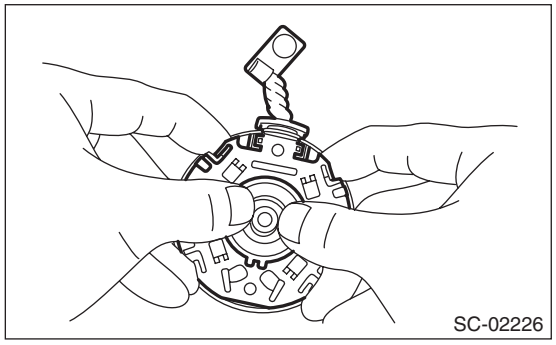
3) Remove screws (A) of the brush holder assembly, and through bolts (B) on both sides, and remove the starter cover assembly.



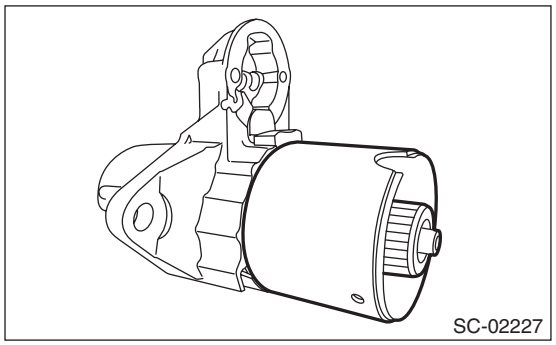
SC-02225

4) Remove the brush holder assembly from the armature assembly.

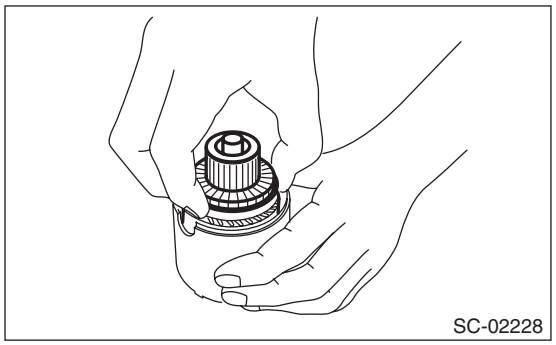
NOTE:
Hold the brush with your fingers so that the brush spring does not come flying out.


SC-02226

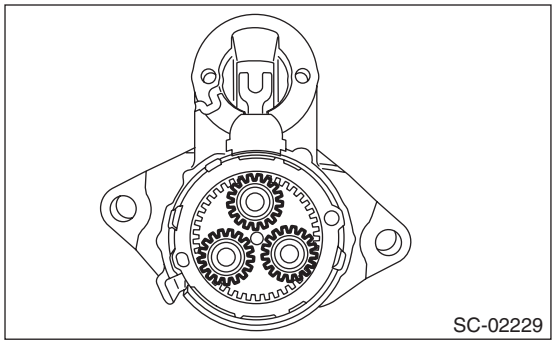
5) Remove the armature assembly and yoke assembly from the starter housing assembly together as a single unit.


SC-02227

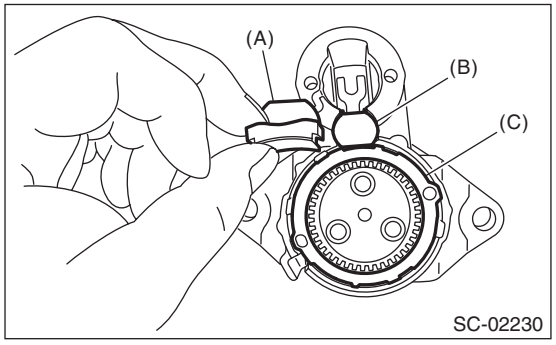
6) Separate the armature assembly and yoke assembly.


SC-02228

7) Remove the pinion gear from the internal gear assembly.

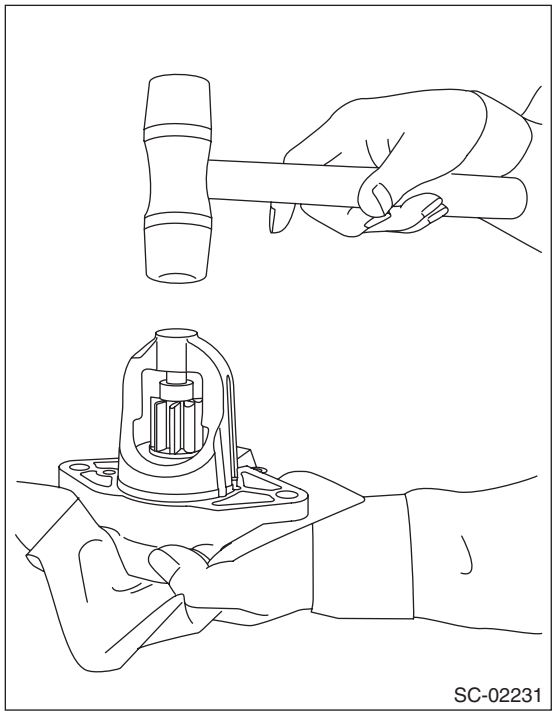

SC-02229

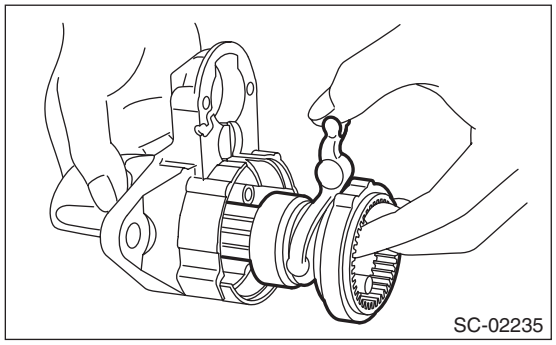
8) Remove rubber seal (A), plate (B), and rubber seal (C).



SC-02230

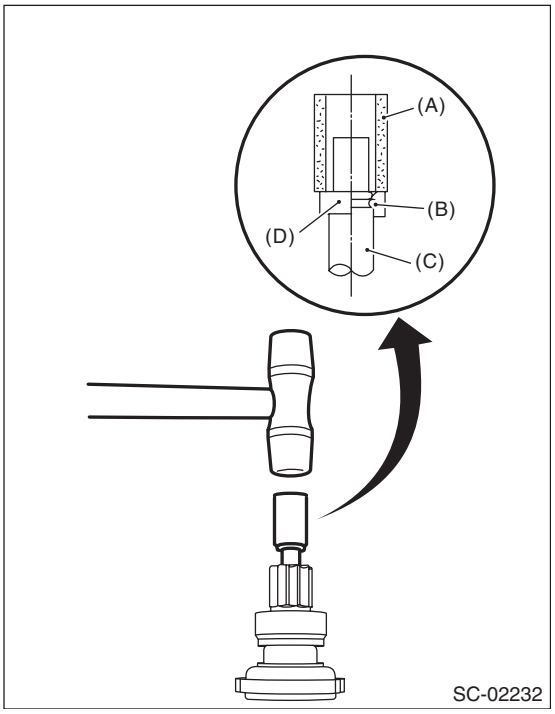
9) Lightly tap the starter housing assembly with a plastic hammer as shown in the figure, and remove the overrunning clutch, internal gear assembly, shaft and shift lever together as one unit.


SC-02231


SC-02235

10) Use the following procedures to remove the overrunning clutch from the shaft.

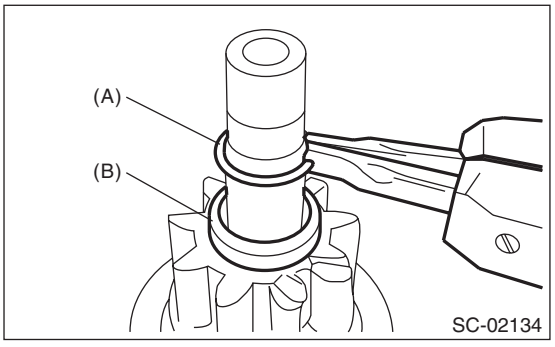
(1) Use an appropriate tool (such as a fit socket wrench), and remove the stopper from snap ring by lightly tapping the stopper with a plastic hammer.



SC-02232

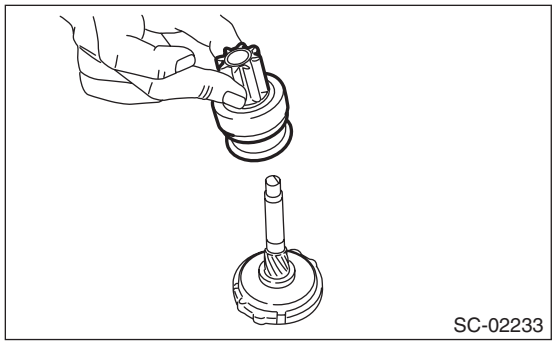
(A) Appropriate tool
(B) Snap ring
(C) Shaft
(D) Stopper

(2) Remove snap ring (A) from the shaft, and remove stopper (B).

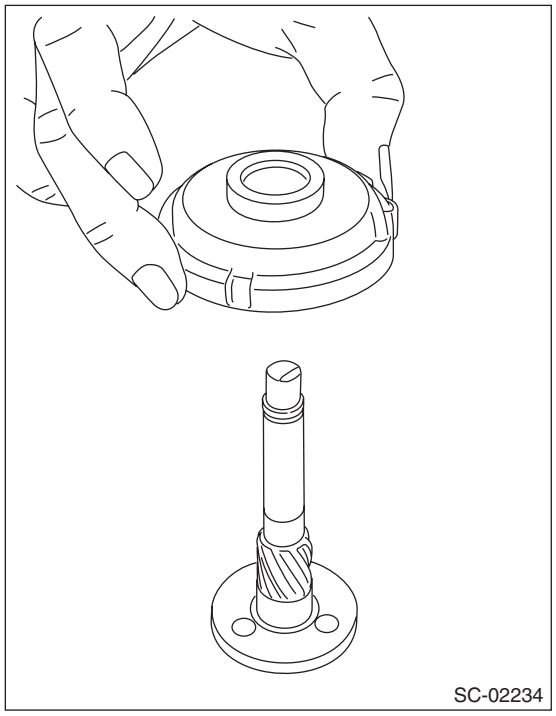


SC-02134

(3) Remove the overrunning clutch from the shaft.


SC-02233

11) Separate the internal gear assembly and shaft.

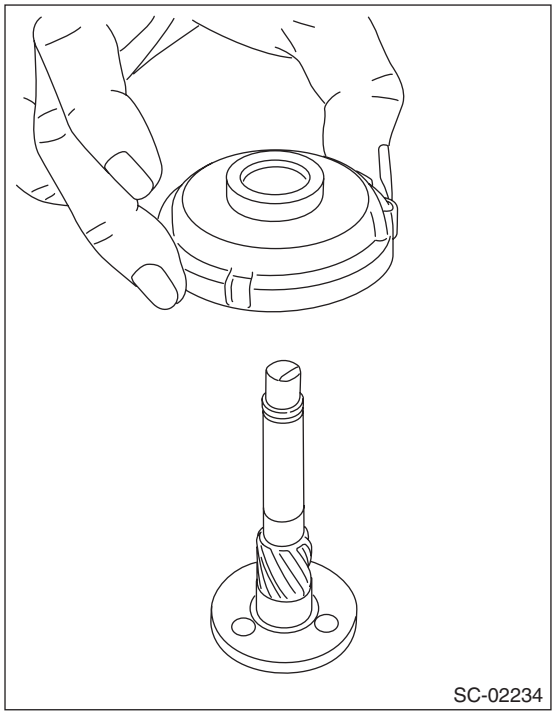

SC-02234

D: ASSEMBLY

1) Apply grease to the sliding surfaces of the internal gear assembly shaft.

Grease:
Multemp #6129 or equivalent

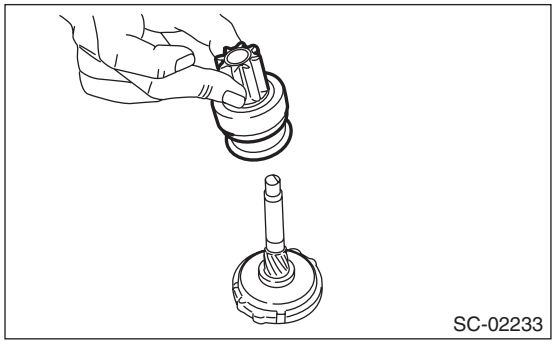
2) Assemble the shaft to the internal gear assembly.


SC-02234

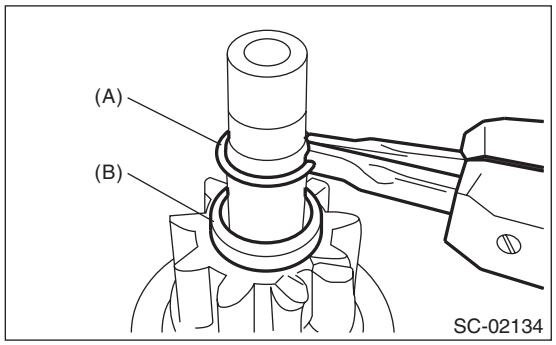
3) Assemble the overrunning clutch as follows:
(1) Apply grease to the spline portion of the shaft.

Grease:
Multemp #6129 or equivalent

(2) Install the overrunning clutch to shaft.

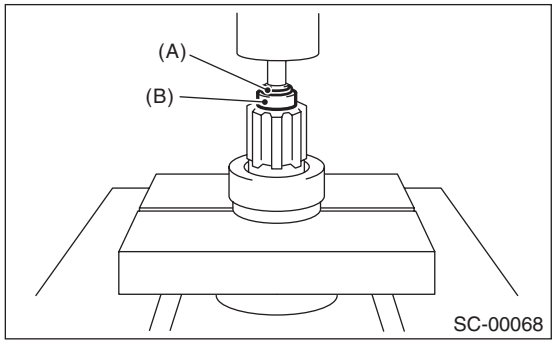

SC-02233

(3) Pass stopper (B) through the shaft assembly, and attach snap ring (A).



NOTE:
Use new stoppers and snap rings.

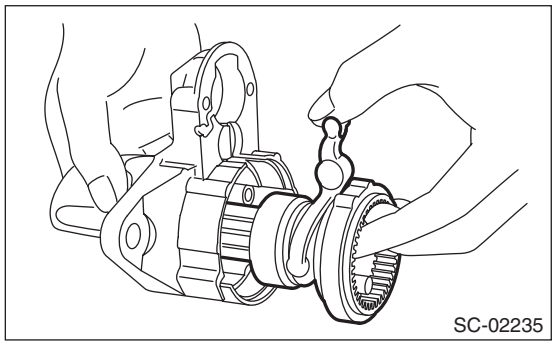
(4) Using a press, pressure fit stopper (B) into snap ring (A).



4) Assemble the overrunning clutch, internal gear assembly, shaft and shift lever as a single unit into the starter housing assembly.

NOTE:
Apply grease to the moving parts of the shift lever.

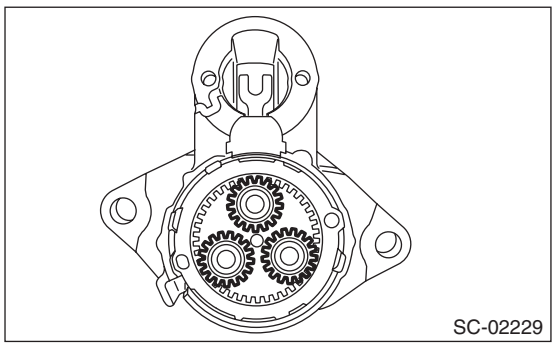
Grease:
Multemp #6129 or equivalent



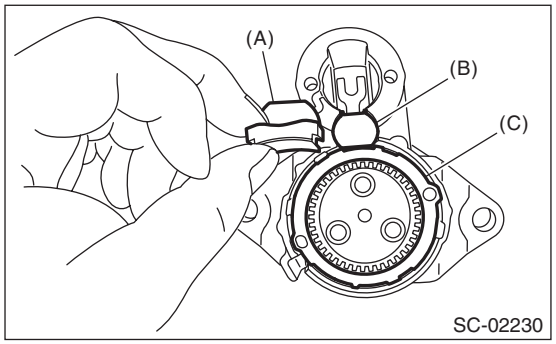
5) Apply grease to the inside of the internal gear assembly and pinion gear, and attach the pinion gear to the internal gear assembly.

NOTE:
• Apply grease evenly to the contact surfaces of each gear.
• Be careful that no debris becomes attached.

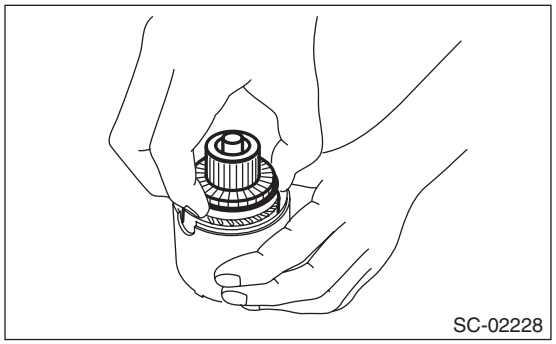
Grease:
Molykote® AG650 or equivalent



6) Attach rubber seal (A), plate (B), and rubber seal (C).

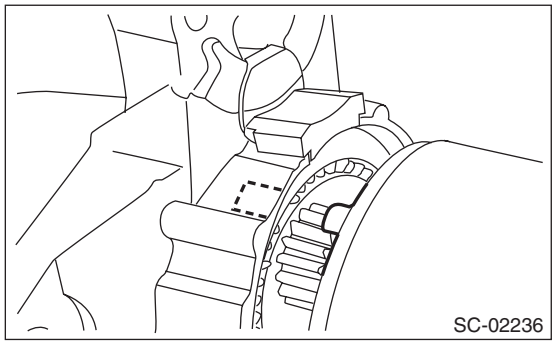


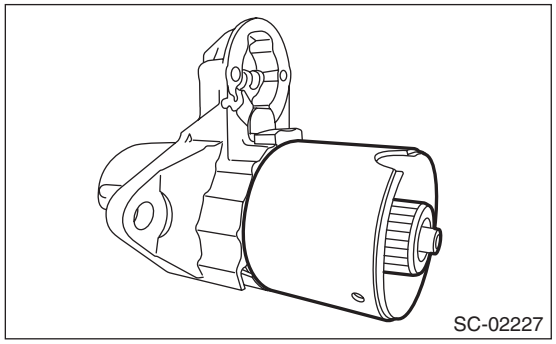
7) Assemble the armature assembly to the yoke assembly.



8) Attach the armature assembly and yoke assembly to the starter housing assembly together as a single unit.

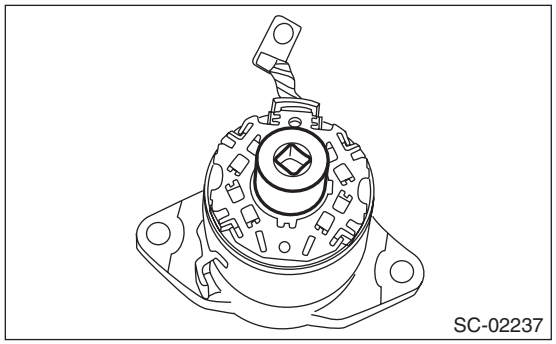
NOTE:
As shown in the figure, match the protrusion of the yoke assembly to the cut out of the starter housing assembly.


SC-02236


SC-02227

9) Use an appropriate tool (such as correctly sized socket wrenches) and attach the brush holder assembly to the armature assembly.

NOTE:
Be careful not to damage the brushes.

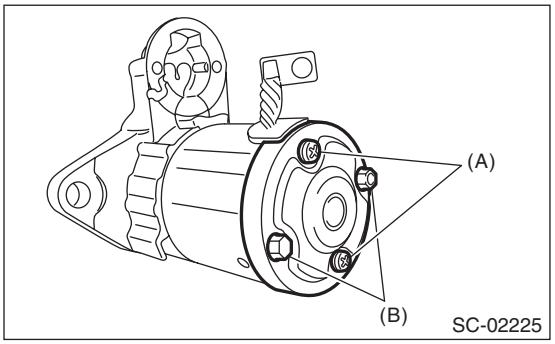

SC-02237

10) Secure starter cover assembly to the brush holder assembly with screws (A).

Tightening torque:
1.4 N·m (0.1 kgf-m, 1.0 ft-lb)

11) Install through bolts (B) on both sides.

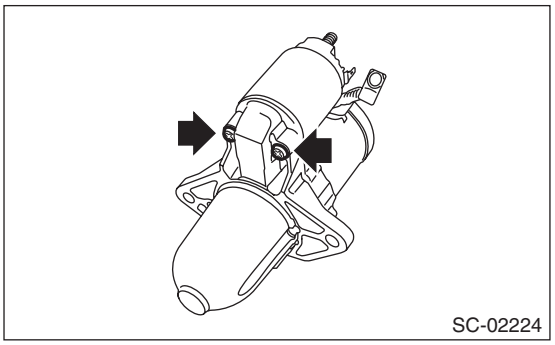
Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)



SC-02225

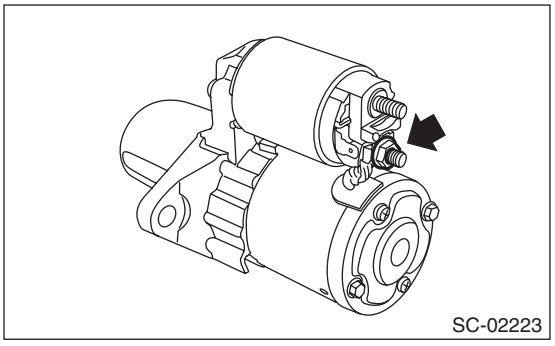
12) Attach the magnet switch assembly to the starter housing assembly.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)


SC-02224

13) Attach the cable to the M terminal of the magnet switch assembly, and secure with nuts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

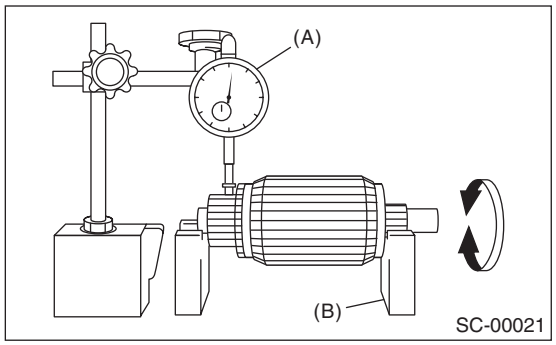

SC-02223

E: INSPECTION

1. ARMATURE

1) Check the commutator for signs of seizure or stepped wear caused by roughness of the surface. If there is light wear, use sandpaper to repair.
2) Runout test
Check for runout on the commutator. If excessive, replace it.

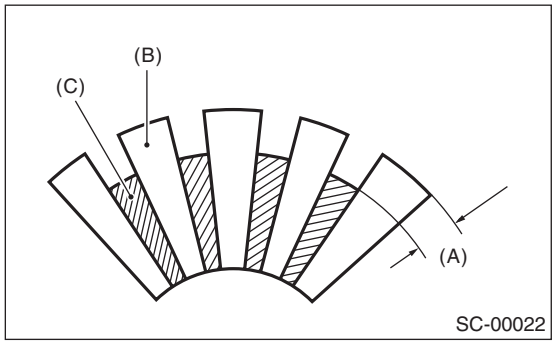
Commutator runout:
Standard
0.05 mm (0.002 in)
Service limit
0.10 mm (0.004 in) or less



(A) Dial gauge
(B) V-block

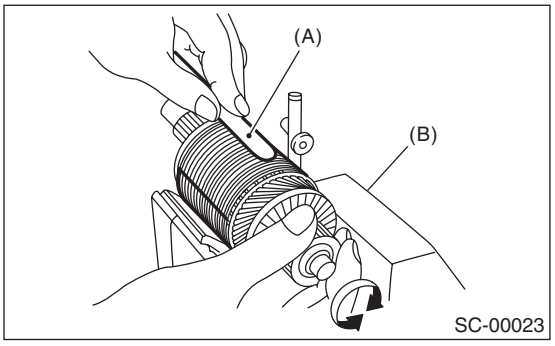
3) Depth of segment mold
Check the depth of the segment mold.

Depth of segment mold:
0.50 mm (0.020 in)



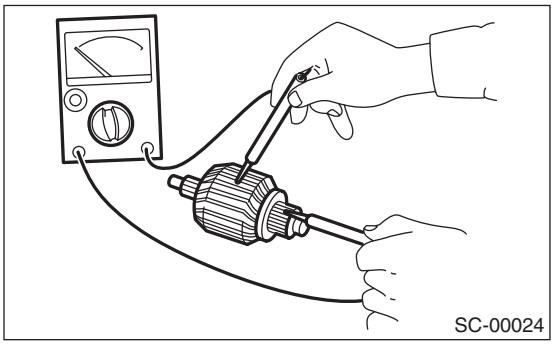
(A) Depth of mold
(B) Segment
(C) Mold

4) Armature short-circuit test
Place the armature on the growler tester to check for short circuits. While slowly turning the armature, support the steel sheet for the armature core. If the circuit of the armature is shorted, the steel sheet will vibrate, causing it to move towards the core. When the steel sheet has moved or vibrated, replace or repair the armature with the shorted circuit.



(A) Steel sheet
(B) Growler tester

5) Armature ground test
Use a circuit tester to touch the probe of one side to the commutator segment, and the other probe to the shaft. If there is no continuity, it is normal. If there is continuity, the armature is grounded.
If grounded, replace the armature.



2. YOKE

Make sure that the pole is set at the predetermined position.

3. OVERRUNNING CLUTCH

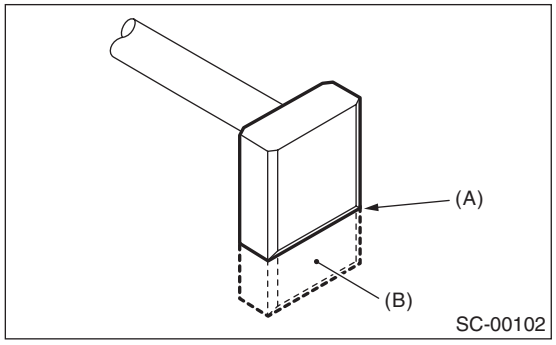
Check that there is no wear or damage to the piston teeth. Replace if it is damaged. If it rotates smoothly when rotated in the correct direction (counterclockwise) and does not return to the other direction, it is normal.

CAUTION:
To prevent spilling of grease, do not clean the overrunning clutch with oil.

4. BRUSH AND BRUSH HOLDER

1) Brush length
Measure the length of the brush. If it exceeds service limits, replace it.
Replace if there is abnormal wear or cracks.

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
Check that the brush moves smoothly in the brush holder.
3) Brush spring force
Measure the brush spring force with a spring scale.
Replace the brush holder if below the service limit.

Brush spring force:

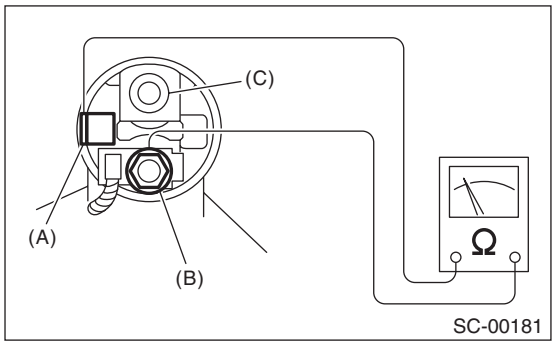
Standard
15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lbf) (When new)

Service limit
2.5 N (0.25 kgf, 0.56 lbf)

5. SWITCH ASSEMBLY

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

Terminal/Resistance:
S — M/1 Ω or less
S — Ground/1 Ω or less
M — B/1 MΩ or more

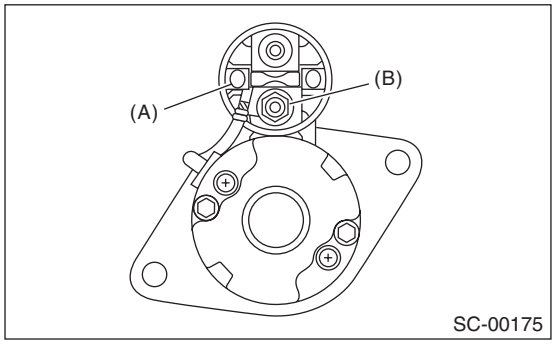


(A) S terminal
(B) M terminal
(C) B terminal

6. SWITCH ASSEMBLY OPERATION

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

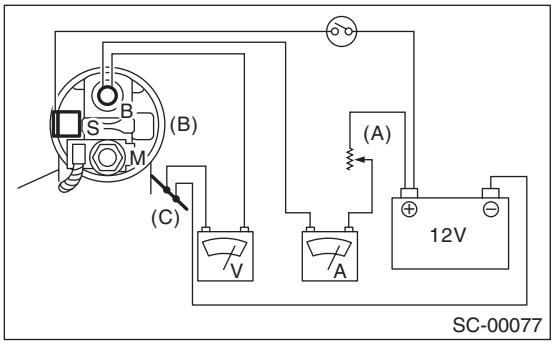
NOTE:
With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.
2) Disconnect the connector from M terminal. Then using a lead wire, connect the positive terminal of battery and M terminal and ground terminal 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) S terminal
(B) M terminal

7. 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) Magnet switch
(C) Starter body

1) No-load test
With switch on, adjust the variable resistance until the voltage is 11 V, read the value of ammeter to measure starter speed. Compare these values with the standard.

No-load test (standard):

Voltage/Current
MT model
Max. 11 V/95 A
AT model
Max. 11 V/90 A

Rotating speed
MT model
2,500 rpm or more
AT model
2,000 rpm or more

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

Load test (standard):

Voltage/Load
MT model
7.5 V/8.84 N·m (0.9 kgf-m, 6.5 ft-lb)
AT model
7.7 V/16.7 N·m (1.7 kgf-m, 12.3 ft-lb)

Current/Speed:
MT model
300 A/870 rpm or more
AT model
400 A/710 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 standard voltage.

Lock test (standard):

Voltage/Current
MT model
4 V/680 A or less
AT model
3.5 V/960 A or less

Torque
MT model
17 N·m (1.7 kgf-m, 12.5 ft-lb) or more
AT model
31 N·m (3.2 kgf-m, 22.9 ft-lb) or more