

STARTING SYSTEM

ON-VEHICLE INSPECTION

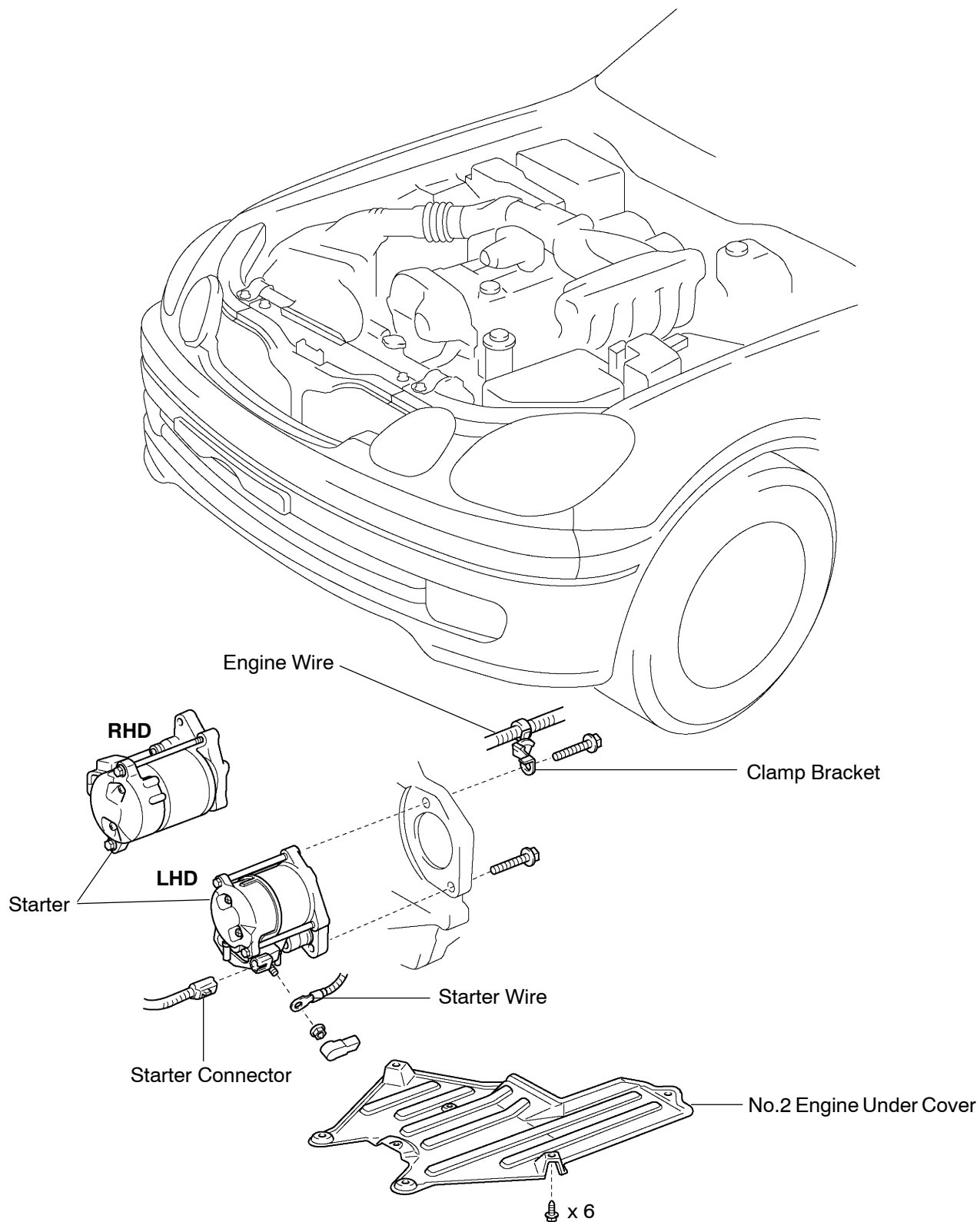
ST04X-02

NOTICE:

- Before changing the starter, check the following items again:
- Connector connection
- Accessory installation, e.g.: theft deterrent system

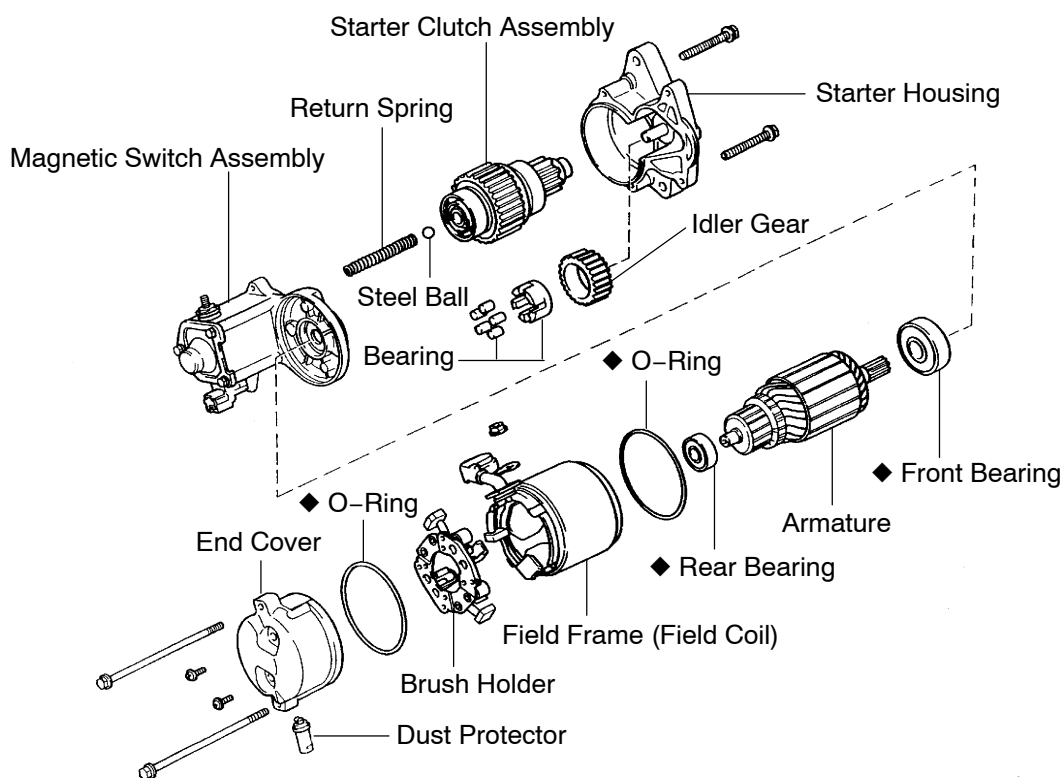
STARTER (Reduction Type) COMPONENTS

ST06E-01



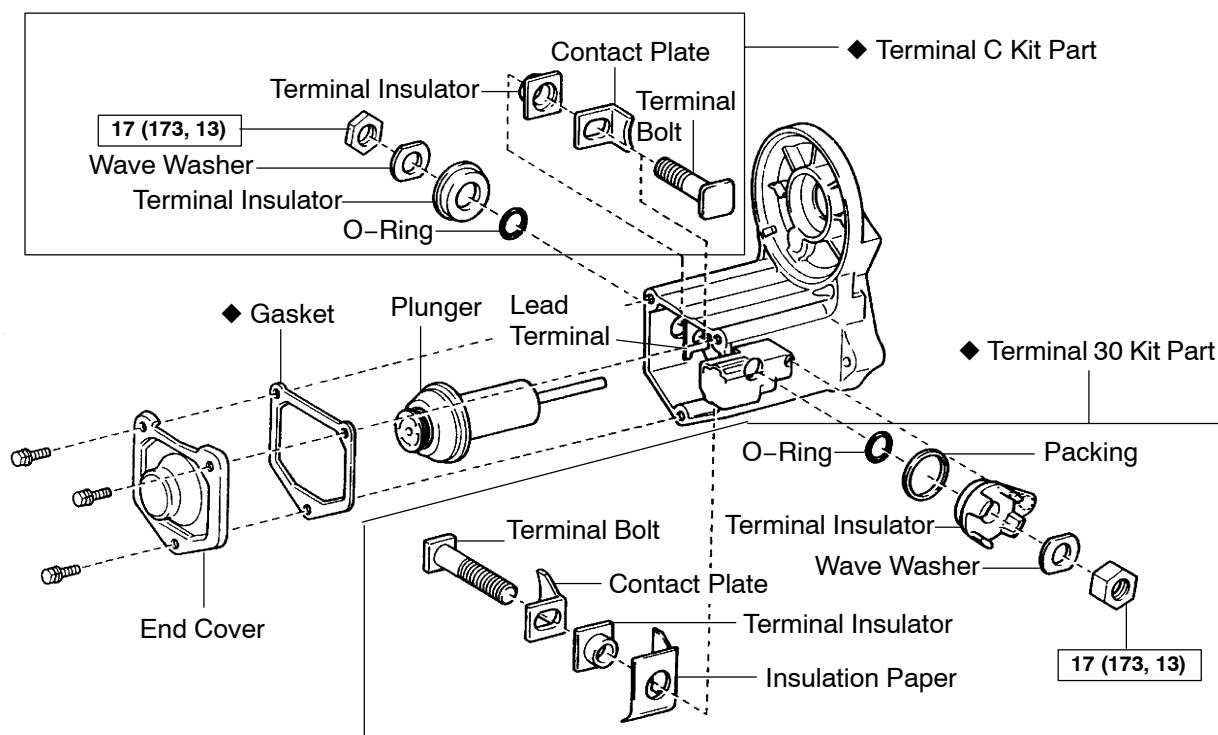
B01659

LHD



B01640

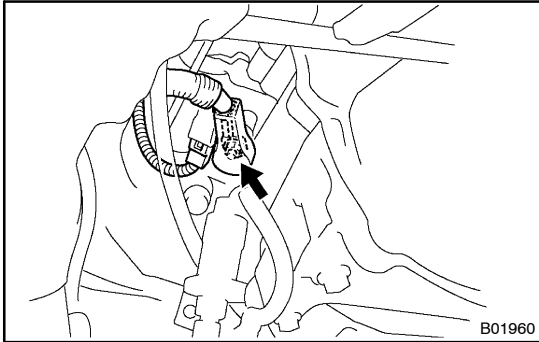
Magnetic Switch Assembly



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

B01641

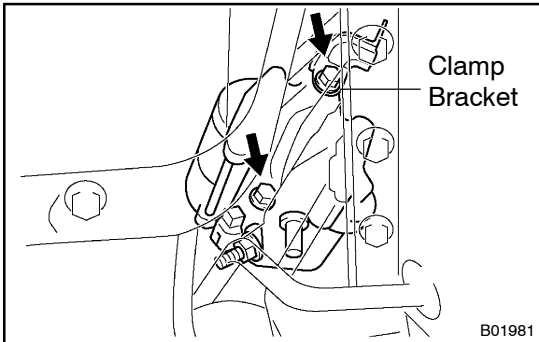


REMOVAL

1. REMOVE NO.2 ENGINE UNDER COVER

2. REMOVE STARTER

- (a) Remove the cap and nut, and disconnect the starter wire.
- (b) Disconnect the starter connector.



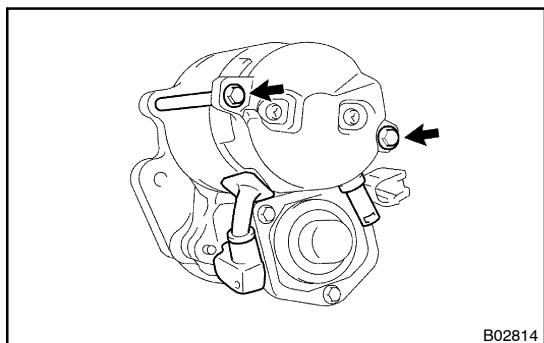
- (c) Remove the 2 bolts and starter.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

HINT:

At time of the installation, place refer to the following item.

When installing the upper bolt, tighten it together with the clamp bracket.



DISASSEMBLY

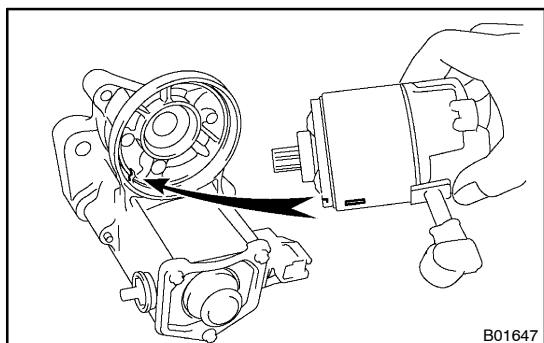
1. REMOVE DUST PROTECTOR

- (a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

- (b) Remove the 2 through bolts.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)



- (c) Pull out the field frame together with the armature.

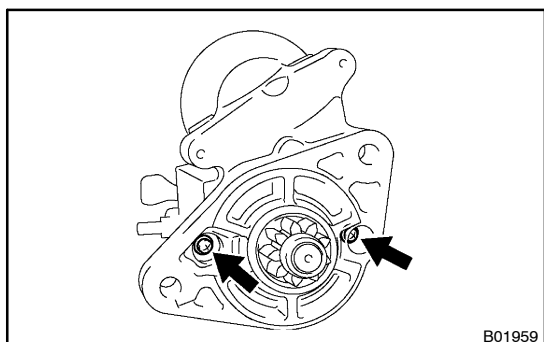
HINT:

Align the protrusion of the field frame with the groove of the magnetic switch.

- (d) Remove the O-ring from the field frame.

HINT:

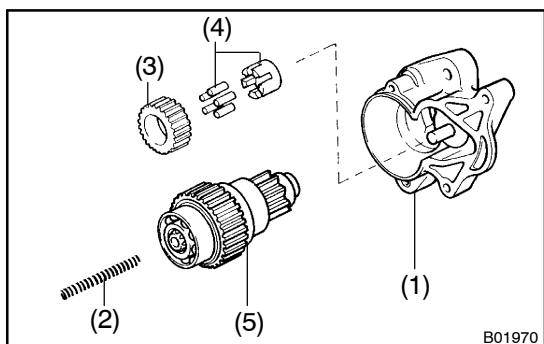
At the time of installation, please refer to the following items.
Use a new O-ring.



2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

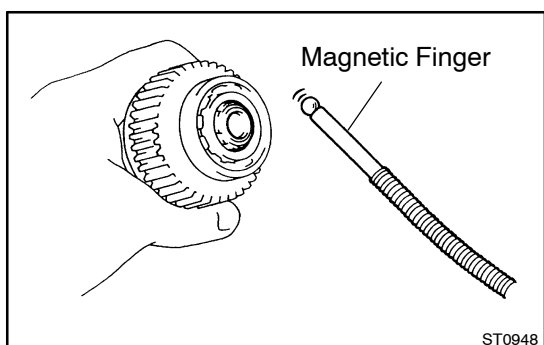
- (a) Remove the 2 bolts.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)



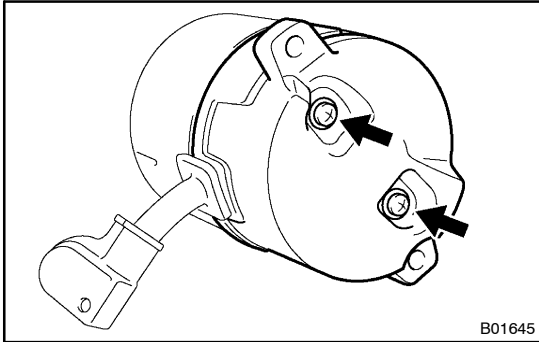
- (b) Remove these parts from the magnetic switch:

- (1) Starter housing
- (2) Return spring
- (3) Idler gear
- (4) Bearing
- (5) Clutch assembly



3. REMOVE STEEL BALL

Using a magnetic finger, remove the steel ball from the clutch shaft hole.

**4. REMOVE BRUSH HOLDER**

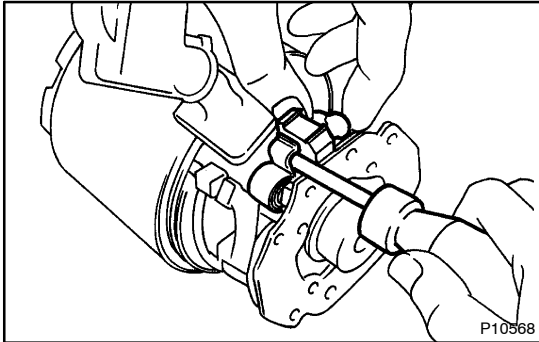
- (a) Remove the 2 screws and end cover from the field frame.

Torque: 1.5 N·m (15 kgf·cm, 13 in·lbf)

- (b) Remove the O-ring from the field frame.

HINT:

At the time of installation, please refer to the following items.
Use a new O-ring.

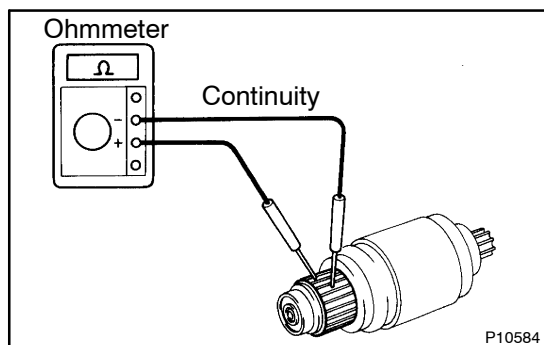


- (c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the 4 brushes, and remove the brush holder.

NOTICE:

Check that the positive (+) lead wires are not grounded.

5. REMOVE ARMATURE FROM FIELD FRAME

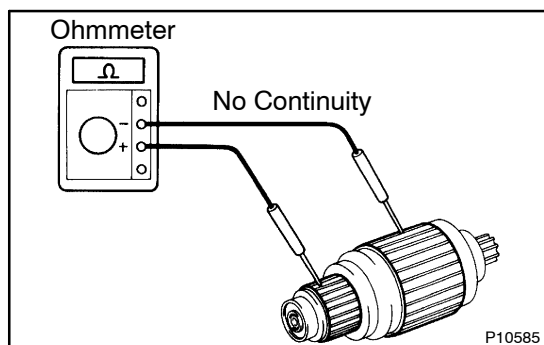


INSPECTION

1. INSPECT ARMATURE COIL

- (a) Check the commutator for open circuit.
Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.

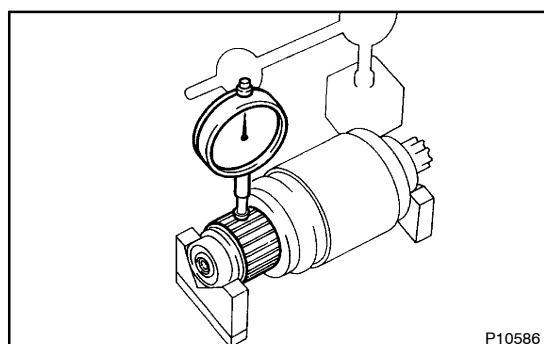


- (b) Check the commutator for ground.
Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is no continuity, replace the armature.

2. INSPECT COMMUTATOR

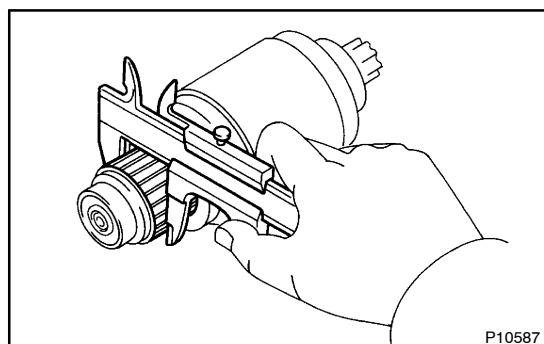
- (a) Check the commutator for the dirty and burnt surfaces.
If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a table.



- (b) Check for the commutator circle runout.
(1) Place the commutator on V-blocks.
(2) Using a dial gauge, measure the circle runout.

Maximum circle runout: 0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.

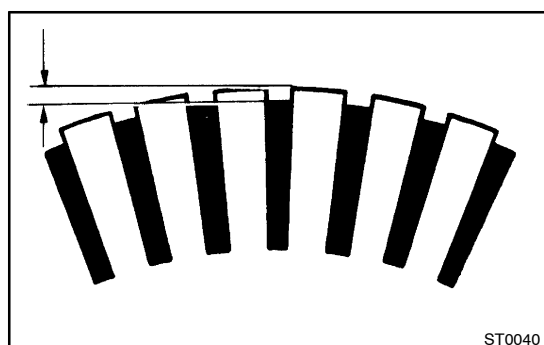


- (c) Using a vernier caliper, measure the commutator diameter.

Standard diameter: 30.0 mm (1.181 in.)

Minimum diameter: 29.0 mm (1.412 in.)

If the diameter is less than minimum, replace the armature.

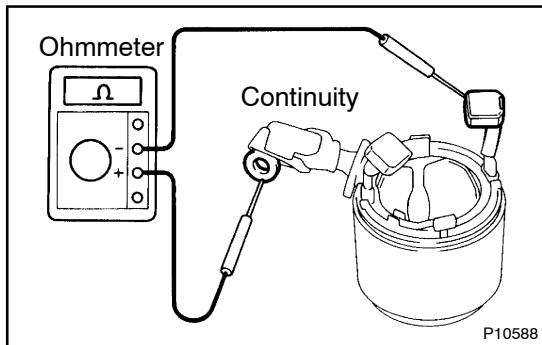


- (d) Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

Standard undercut depth: 0.6 mm (0.024 in.)

Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

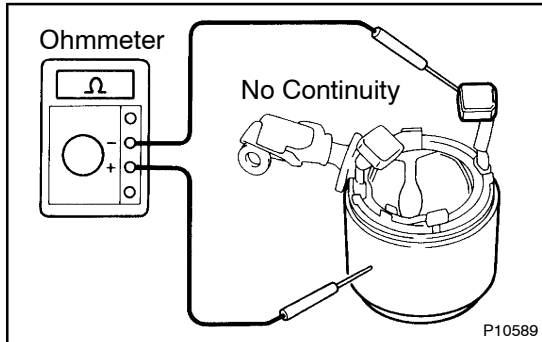


3. INSPECT FIELD COIL

- (a) Check the field coil for open circuit.

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

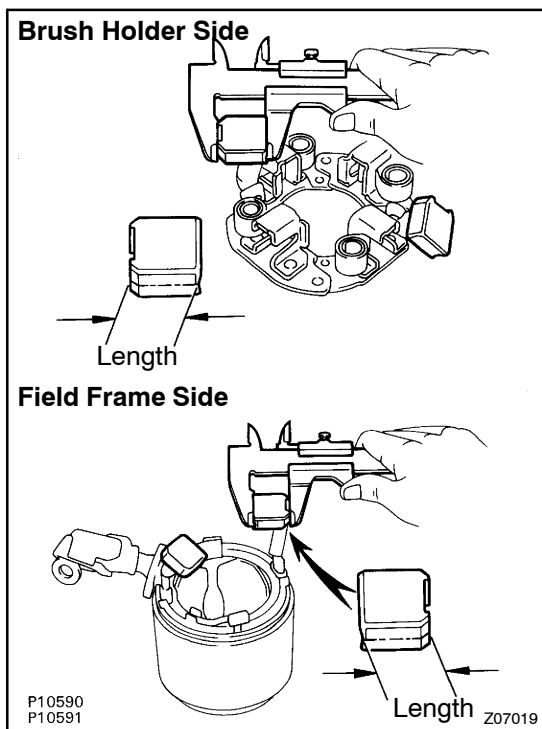
If there is no continuity, replace the field frame.



- (b) Check the field coil for ground.

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, replace the field frame.



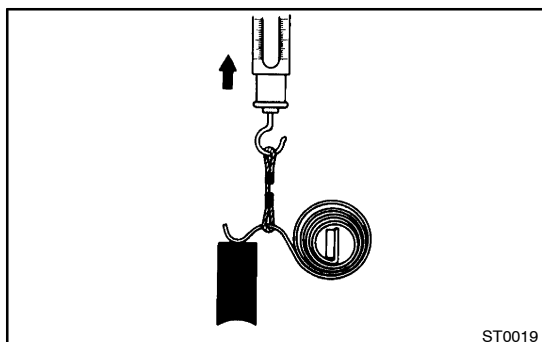
4. INSPECT BRUSHES

Using a vernier caliper, measure the brush length.

Standard length: 15.5 mm (0.610 in.)

Minimum length: 10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame.



5. INSPECT BRUSH SPRINGS

Check the brush spring load. Take the pull scale reading the instant the brush spring separates from the brush.

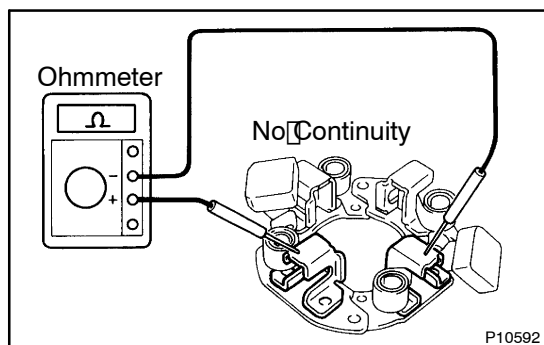
Standard spring installed load:

17.6 - 23.5 N (1.8 - 2.4 kgf, 3.9 - 5.3 lbf)

Minimum spring installed load:

11.8 N (1.2 kgf, 2.6 lbf)

If the installed load is less than minimum, replace the brush springs.



6. INSPECT BRUSH HOLDER

Check the brush holder insulator. Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.

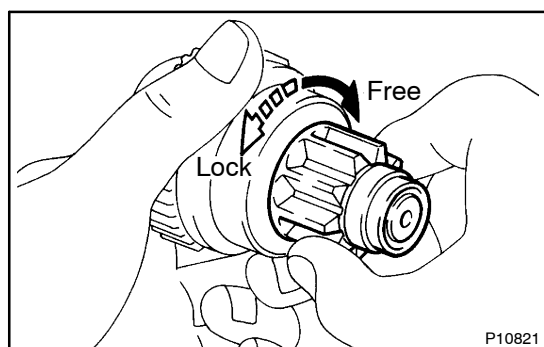
If there is continuity, repair or replace the brush holder.

7. INSPECT CLUTCH AND GEAR

(a) Check the gear teeth on the pinion gear, idle gear and the clutch assembly for wear or damage.

If damaged, replace the gear or clutch assembly.

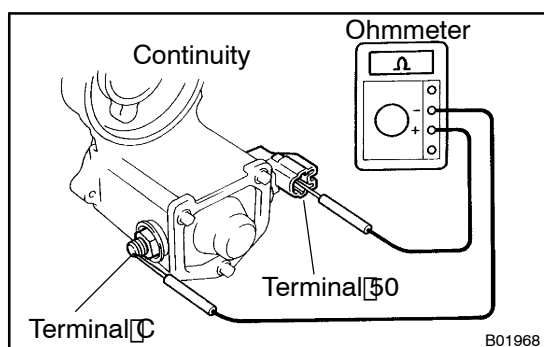
If damaged, also check the drive plate ring gear for wear or damage.



(b) Check the clutch pinion gear.

Rotate the pinion gear counterclockwise, and check that it turns freely. Try to rotate the pinion gear clockwise and check that it locks.

If necessary, replace the clutch assembly.

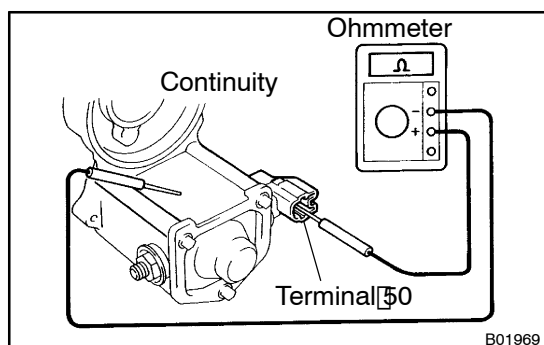


8. INSPECT MAGNETIC SWITCH

(a) Check the pull-in coil for open circuit.

Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, check and replace the magnetic switch.



(b) Check the hold-in coil for open circuit.

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

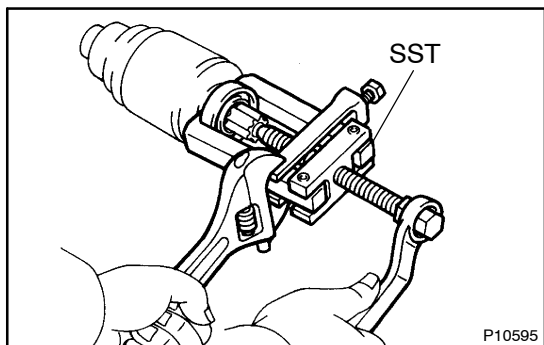
If there is no continuity, replace the magnetic switch.

9. INSPECT BEARING

Turn the bearing by hand and while apply inward force.

If resistance is felt or bearing sticks, replace the bearing.

(See page ST-10)

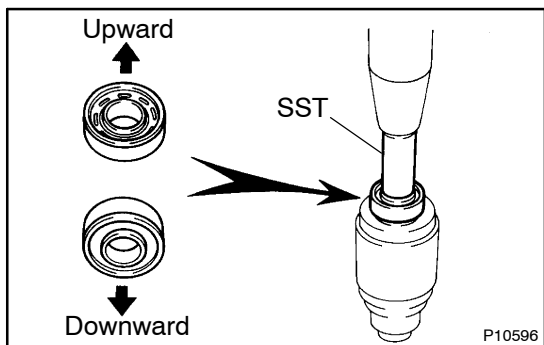


REPLACEMENT

1. REPLACE FRONT BEARING

- (a) Using SST, remove the bearing.

SST 09286-46011

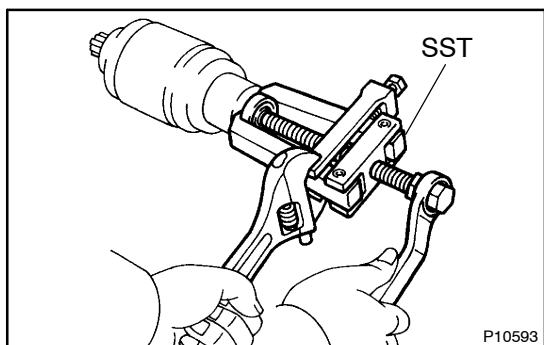


- (b) Using SST and a press, press in a new bearing.

NOTICE:

Be careful of the bearing installation direction.

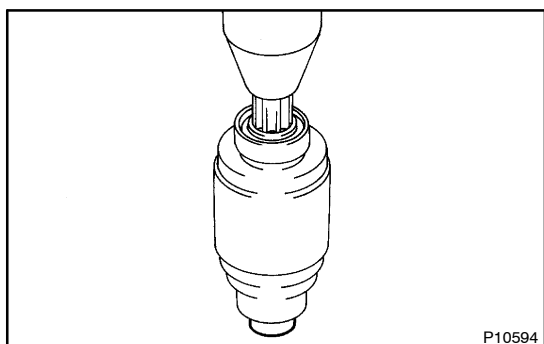
SST 09820-00030



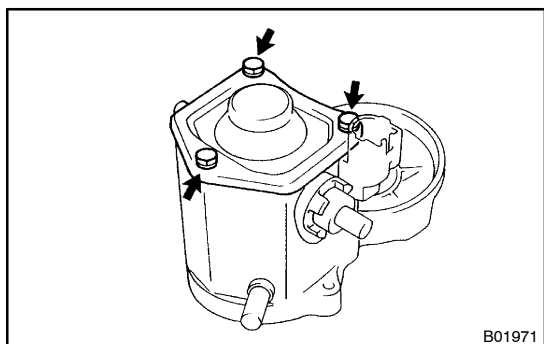
2. REPLACE REAR BEARING

- (a) Using SST, remove the bearing.

SST 09286-46011

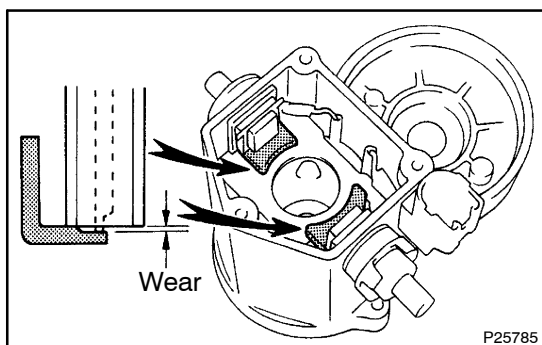


- (b) Using a press, press in a new rear bearing.



3. REPLACE MAGNETIC SWITCH TERMINAL PARTS

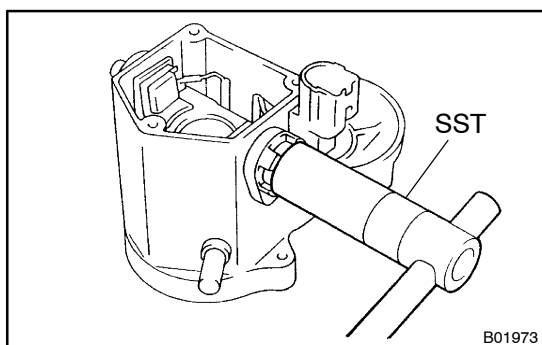
- (a) Remove the 3 bolts, end cover, gasket and plunger.



- (b) Using vernier calipers, measure the contact plate for depth of wear.

Maximum wear: 0.9 mm (0.035 in.)

If the depth of wear is greater than the maximum, replace the contact plate.



- (c) Remove the terminal kit parts.

- (1) Using SST, loosen the terminal nuts.

SST 09810-38140

- (2) Terminal C:

Remove the terminal nut, wave washer, terminal insulator (outside), O-ring, terminal bolt, contact plate and terminal insulator (inside).

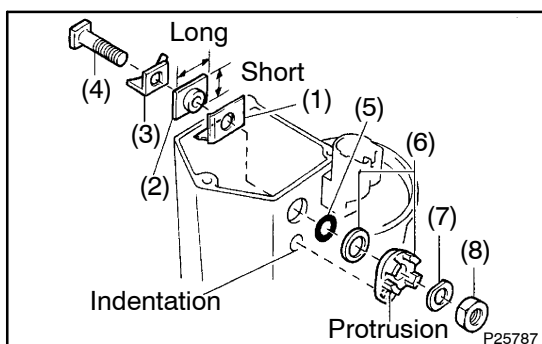
- (3) Terminal 30:

Remove the terminal nut, wave washer, terminal insulator (outside), packing, O-ring, terminal bolt, contact plate, terminal insulator (inside) and insulation paper.

- (d) Temporarily install these new terminal 30 kit parts:

- (1) Insulation paper
- (2) Terminal insulator (inside)
- (3) Contact plate
- (4) Terminal bolt
- (5) O-ring
- (6) Packing and terminal insulator (outside)

Install the packing to the terminal insulator, and install them.



HINT:

Match the protrusion of the insulator with the indentation of the housing.

- (7) Wave washer
- (8) Terminal nut

NOTICE:

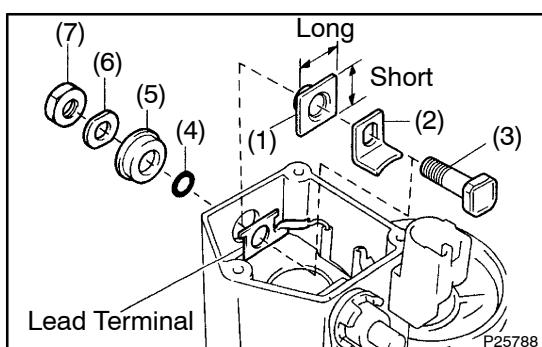
Be careful to install the terminal insulators in the correct direction.

- (e) Temporarily install these new terminal C kit parts:

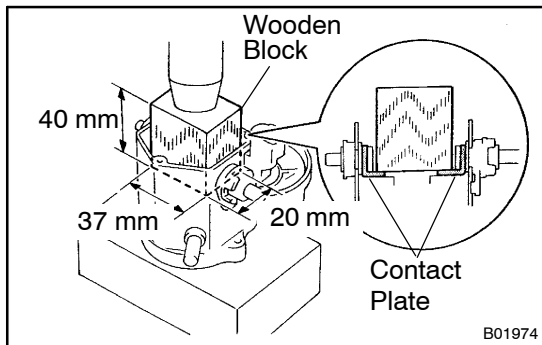
- (1) Terminal insulator (inside)
- (2) Contact plate
- (3) Terminal bolt
- (4) O-ring
- (5) Terminal insulator (outside)
- (6) Wave washer
- (7) Terminal nut

NOTICE:

Be careful to install the terminal insulators in the correct direction.



- (f) Temporarily tighten the terminal nuts.



- (g) Tighten the terminal nut
(1) Put a wooden block on the contact plate and press it down with a hand press.

Dimensions of wooden block:

20 x 37 x 40 mm (0.79 x 1.46 x 1.57 in.)

Press force:

981 N (100 kgf, 221 lbf)

NOTICE:

- Check the diameter of the hand press ram. Then calculate the gauge pressure of the press when 981 N (100 kgf, 221 lbf) of force is applied.

Gauge pressure:

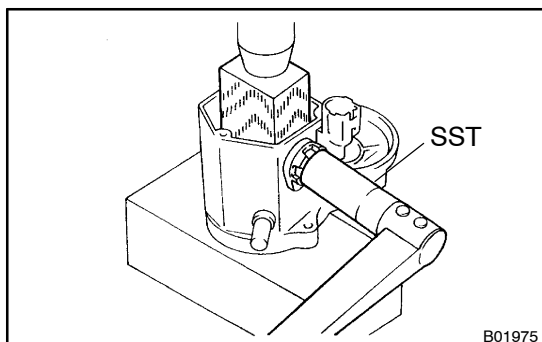
$$(\text{kgf/cm}^2) = \frac{100 \text{ kgf}}{\left(\frac{\text{Ram diameter (cm)}}{2} \right)^2 \times 3.14 (\pi)}$$

$$(\text{psi}) = \frac{221 \text{ lbf}}{\left(\frac{\text{Ram diameter (in.)}}{2} \right)^2 \times 3.14 (\pi)}$$

$$(\text{kPa}) = (\text{kgf/cm}^2) \times 98.1$$

$$(\text{kPa}) = (\text{psi}) \times 6.9$$

- If the contact plate is not pressed down with the specified pressure, the contact plate may tilt due to coil deformation or the tightening of the nut.



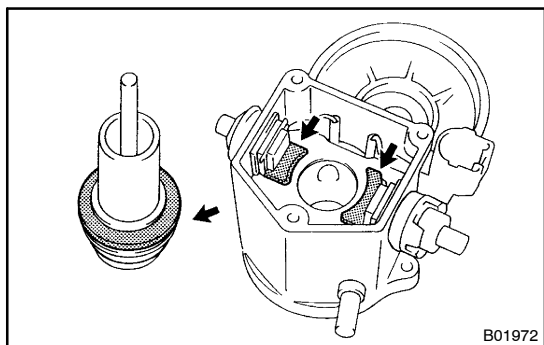
- (2) Using SST, tighten the nuts to the specified torque.

SST 09810-38140

Torque: 17 N·m (173 kgf·cm, 13 ft·lbf)

NOTICE:

If the nut is over tightened, it may cause cracks on the inside of the insulator.



- (h) Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag.
- (i) Reinstall the plunger, new gasket, end cover and lead clamp with the 3 bolts.

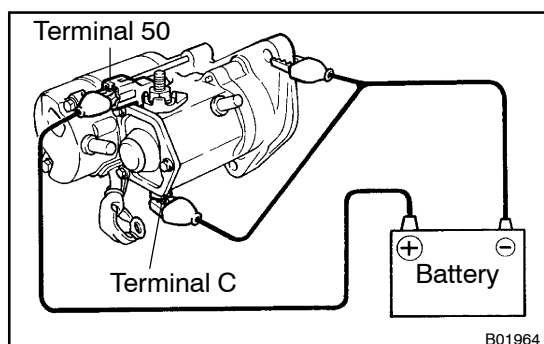
Torque: 2.5 N·m (26 kgf·cm, 22 in.·lbf)

REASSEMBLY

Reassembly is in the reverse order of disassembly. (See page ST-5)

HINT:

Use high-temperature grease to lubricate the bearings and gears when assembling the starter.



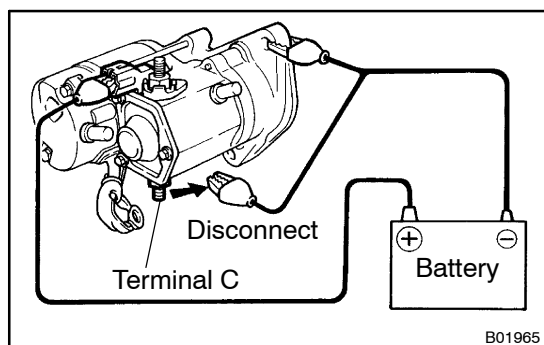
TEST

NOTICE:

These tests must be done within 3 to 5 seconds to avoid burning out the coil.

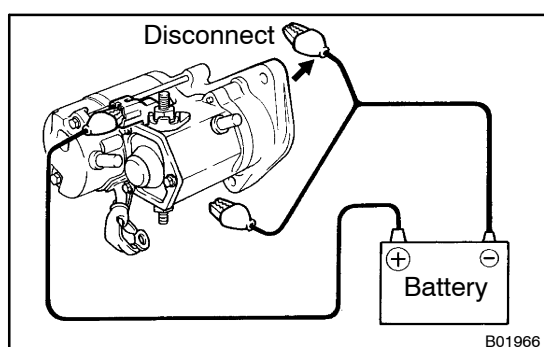
1. DO PULL-IN TEST

- Disconnect the field coil lead wire from terminal C.
- Connect the battery to the magnetic switch as shown. Check that the pinion gear moves outward.



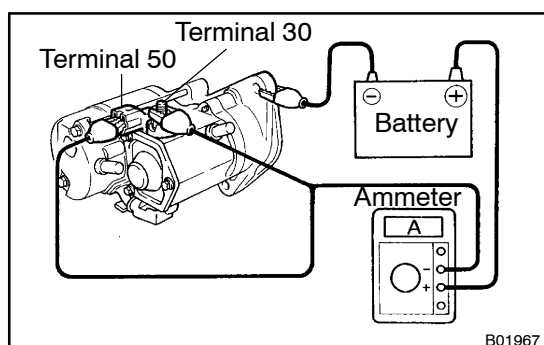
2. DO HOLD-IN TEST

While connected as above with the pinion gear out, disconnect the negative (-) lead from terminal C. Check that the pinion gear remains out.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (-) lead from the starter body. Check that the pinion gear returns inward.



4. DO NO-LOAD PERFORMANCE TEST

- Connect the battery and ammeter to the starter as shown.
- Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter shows the specified current.

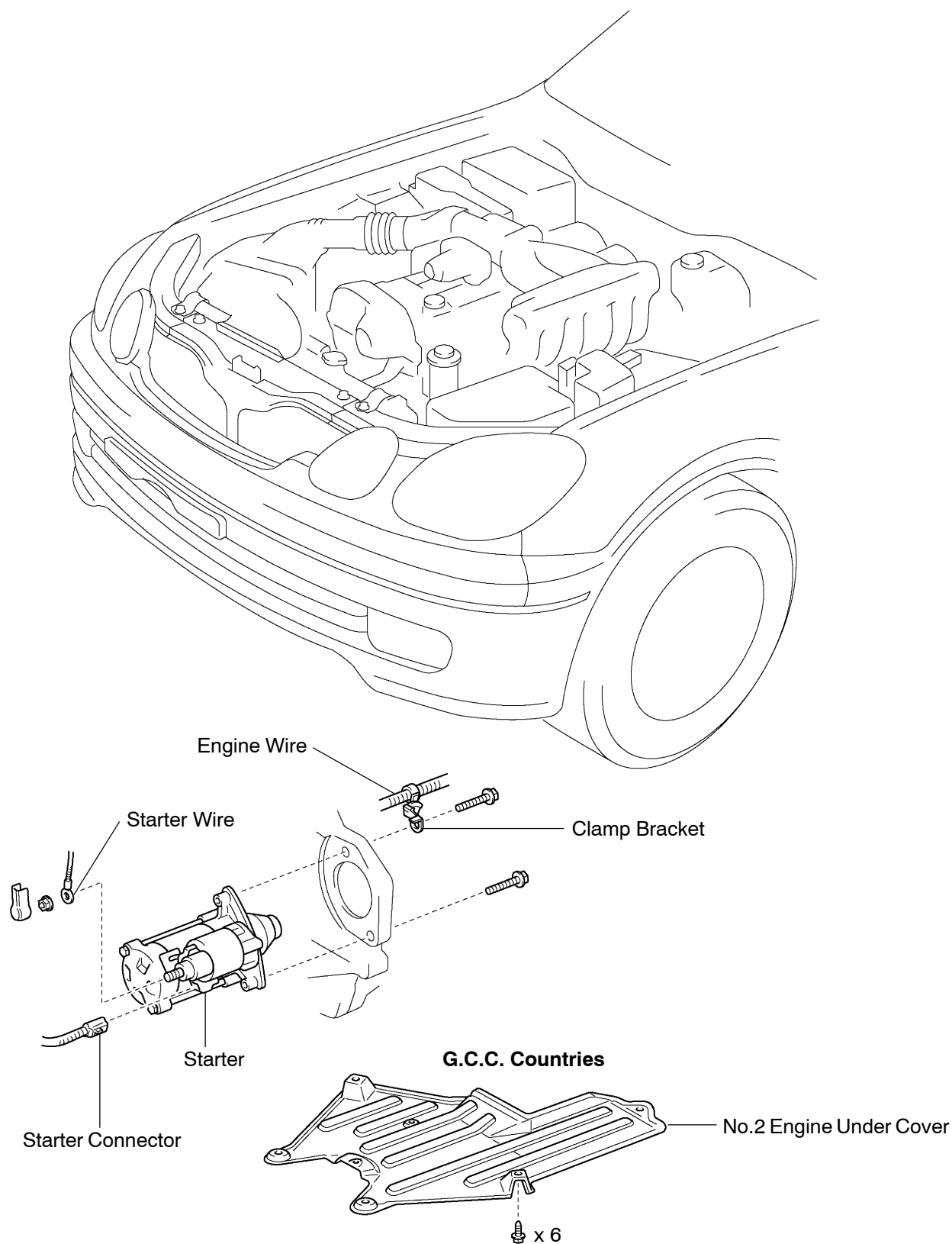
Specified current: 90 A or less at 11.5 V

INSTALLATION

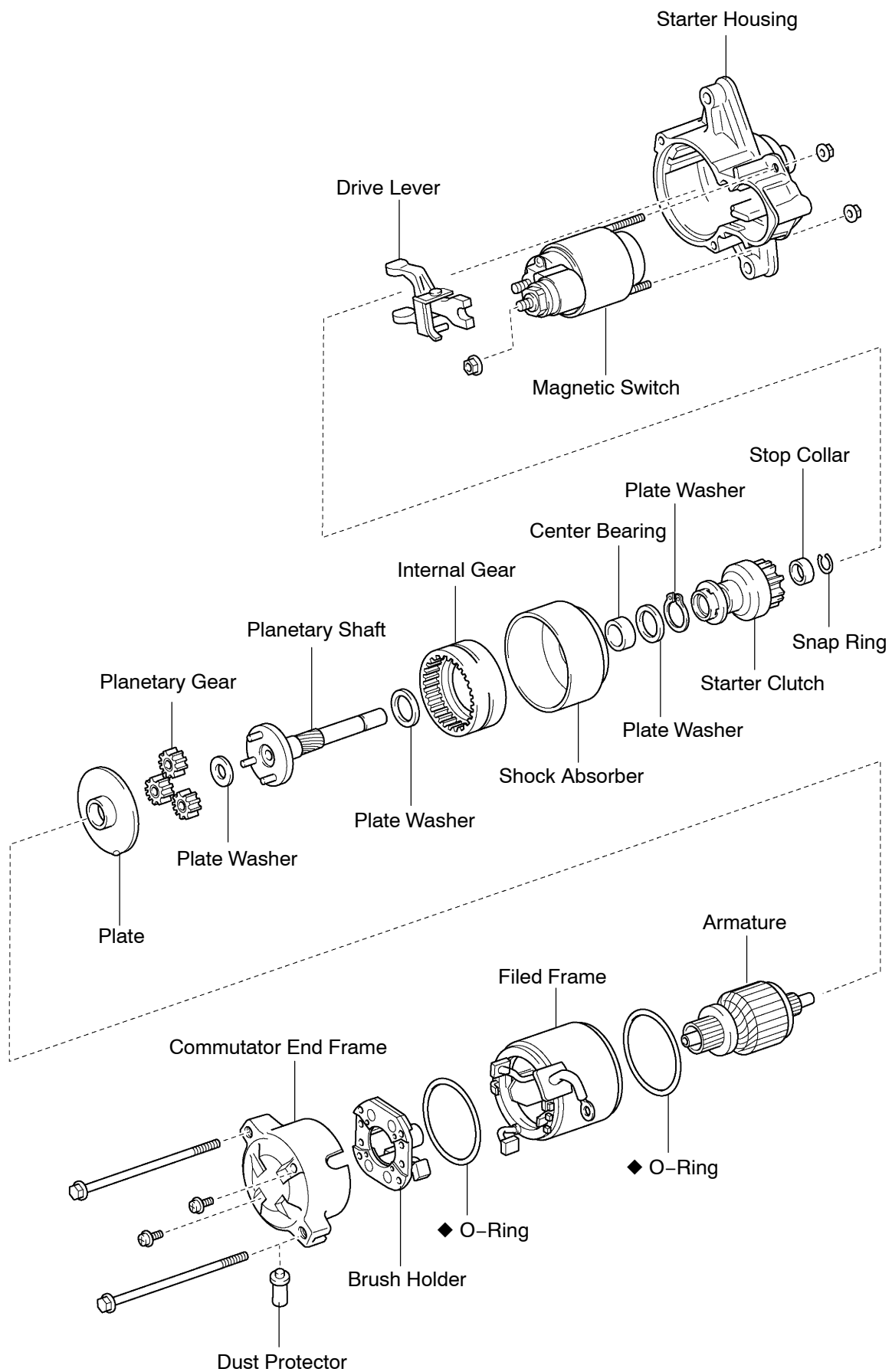
Installation is in the reverse order of removal. (See page ST-4)

STARTER (Planetary Type) COMPONENTS

ST06M-01



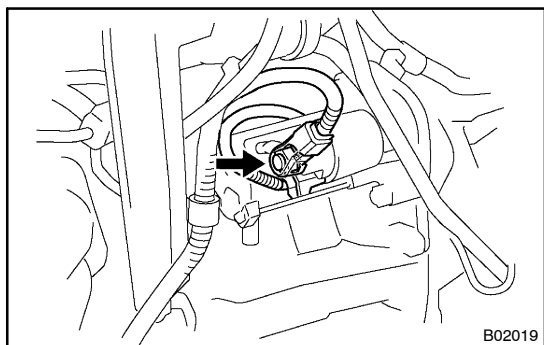
B02018



◆ Non-reusable part

LEXUS GS300 (RM588E)

B01590



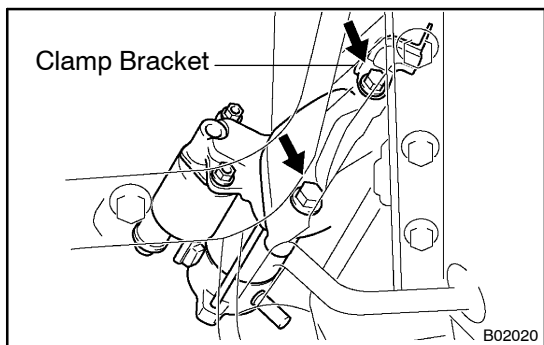
REMOVAL

1. G.C.C. Countries:

REMOVE NO.2 ENGINE UNDER COVER

2. REMOVE STARTER

- (a) Remove the cap and nut, and disconnect the starter wire.
- (b) Disconnect the starter connector.

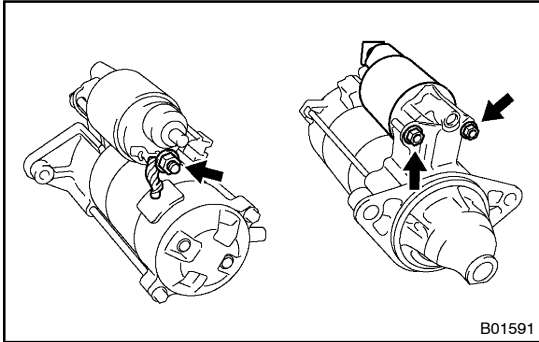


- (c) Remove the 2 bolts and starter.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

HINT:

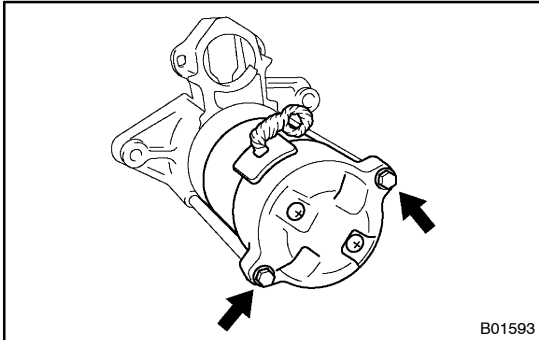
At time of the installation, place refer to the following item. When installing the upper bolt, tighten it together with the clamp bracket.



DISASSEMBLY

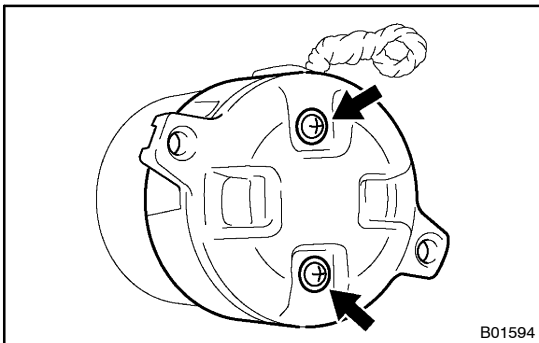
1. REMOVE MAGNETIC SWITCH

- (a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.
- (b) Loosen the 2 nuts holding the magnetic switch to the starter housing.
- (c) Pull the magnetic switch and while lifting the front part of the magnetic switch, release the plunger hook from the drive lever, then release the magnetic switch.



2. REMOVE FIELD FRAME AND ARMATURE

- (a) Remove the 2 through bolts, and pull out the field frame together with the armature.
- (b) Remove the O-ring from the field frame.

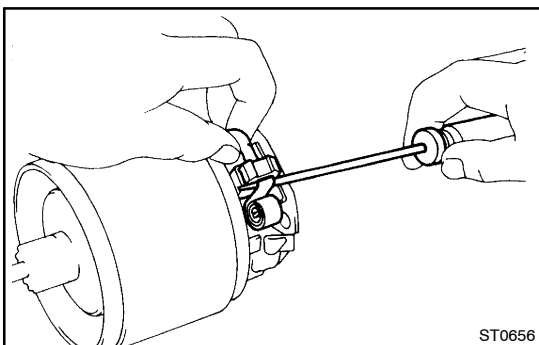


3. REMOVE COMMUTATOR END FRAME

- (a) Remove the 2 screws and commutator end frame, and hold down the lead wire while releasing the commutator end frame.
- (b) Remove the O-ring from the field frame.

NOTICE:

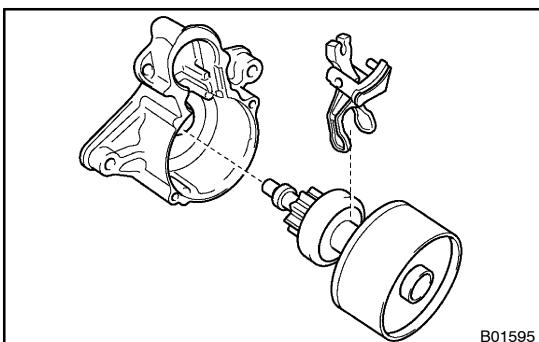
To avoid interference between the brush holder and the dust protector, pull the commutator end frame away at an angle.



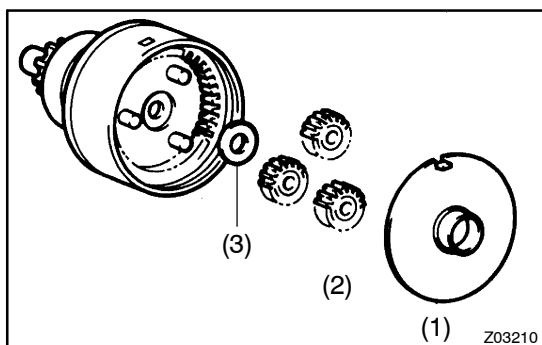
4. REMOVE BRUSH HOLDER

- (a) Using a screwdriver, hold the spring back and disconnect the brush holder.
- (b) Disconnect the 4 brushes, and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME



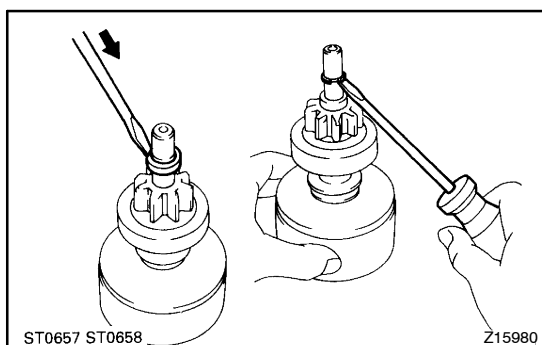
6. REMOVE DRIVE LEVER AND STARTER CLUTCH WITH SHOCK ABSORBER FROM STARTER HOUSING



7. REMOVE PLANETARY GEARS

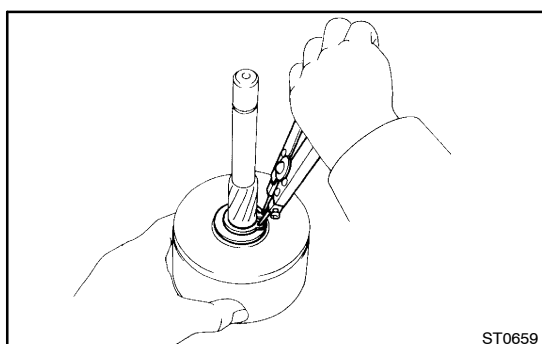
Remove these parts from the shock absorber:

- (1) Plate
- (2) 3 planetary gears
- (3) Plate washer



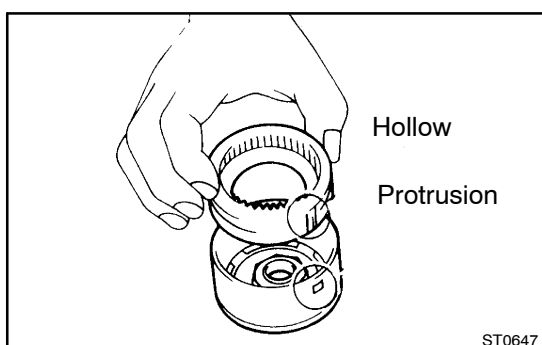
8. REMOVE STARTER CLUTCH

- (a) Using a screwdriver, tap in the stop collar towards the starter clutch.
- (b) Using a screwdriver, pry off the snap ring.
- (c) Remove the stop collar and starter clutch from the planetary shaft.

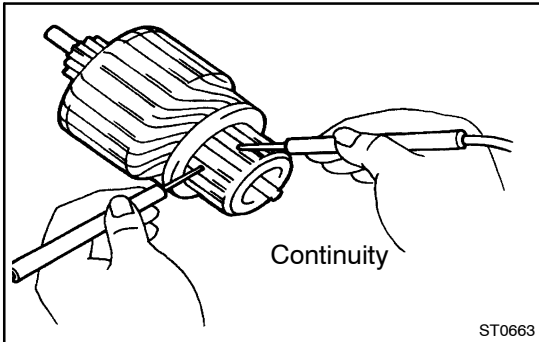


9. REMOVE PLANETARY SHAFT AND INTERNAL GEAR

- (a) Using snap ring pliers, remove the snap ring and plate washer.
- (b) Remove the planetary shaft and plate washer.



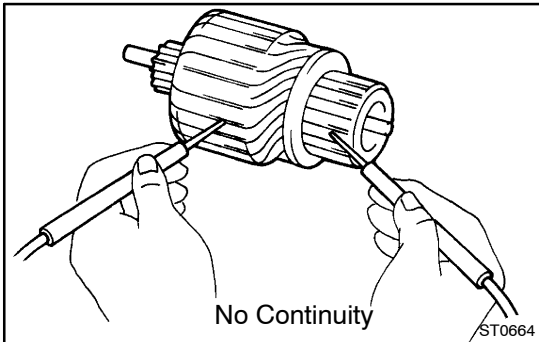
- (c) Align the hollow of the internal gear with the protrusion inside the shock absorber, and remove the internal gear.



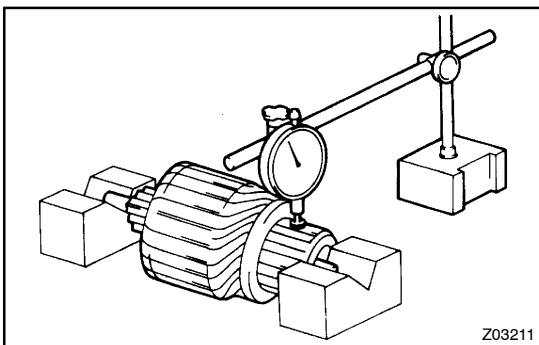
INSPECTION

1. INSPECT ARMATURE COIL

- (a) Check the commutator for open circuit.
Using an ohmmeter, check that there is continuity between the segments of the commutator.
If there is no continuity between any segment, replace the armature.

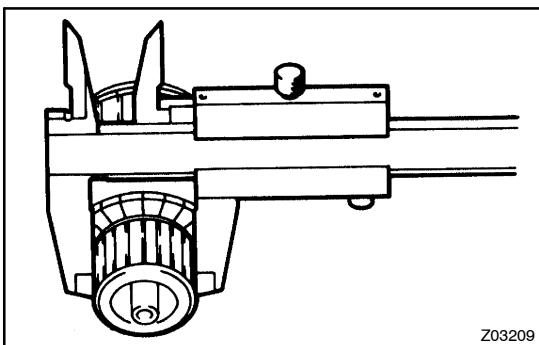


- (b) Check the commutator for ground.
Using an ohmmeter, check that there is no continuity between the segments of the commutator.
If there is continuity, replace the armature.

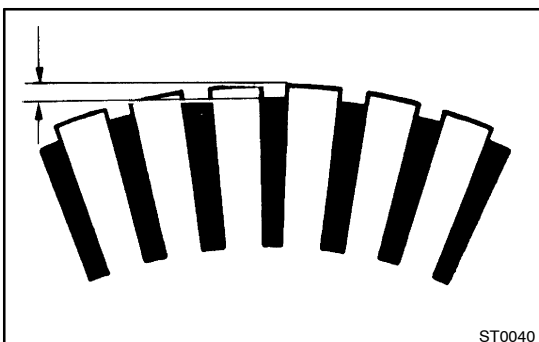


2. INSPECT COMMUTATOR

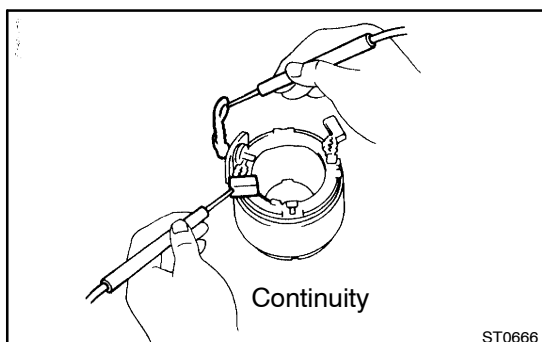
- (a) Check the commutator for the dirty and burnt surface.
If the surface is dirty or burnt, correct with sandpaper (No.400) or a lathe.
- (b) Check for the commutator circuit runout.
- (1) Place the commutator on V-blocks.
 - (2) Using a dial gauge, measure the circle runout.
- Maximum circle runout: 0.05 mm (0.0020 in.)**
If the circle runout is greater than maximum, correct it on a lathe.



- (c) Using a vernier calipers, measure the commutator diameter.
- Standard diameter: 28.0 mm (1.10 in.)**
Minimum diameter: 27.0 mm (1.06 in.)
If the diameter is less than minimum, replace the armature.

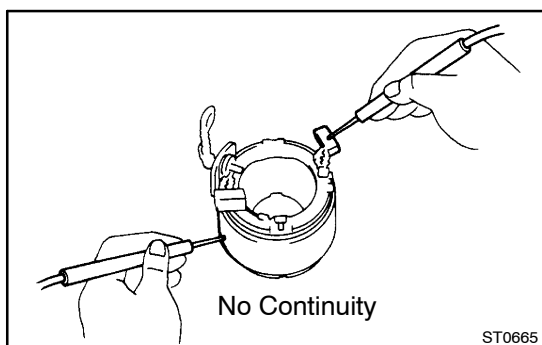


- (d) Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.
- Standard undercut depth: 0.6 mm (0.024 in.)**
Minimum undercut depth: 0.2 mm (0.008 in.)
If the undercut depth is less than minimum, correct it with a hacksaw blade.

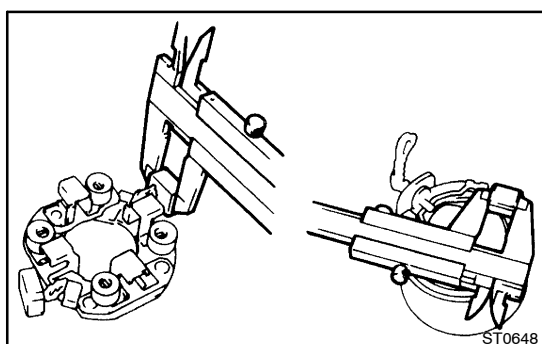


3. INSPECT FIELD COIL

- (a) Check the field coil for open circuit.
Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.
If there is no continuity, replace the field frame.



- (b) Check the field coil for ground.
Using an ohmmeter, check that there is no continuity between the field coil end and field frame.
If there is continuity, repair or replace the field frame.



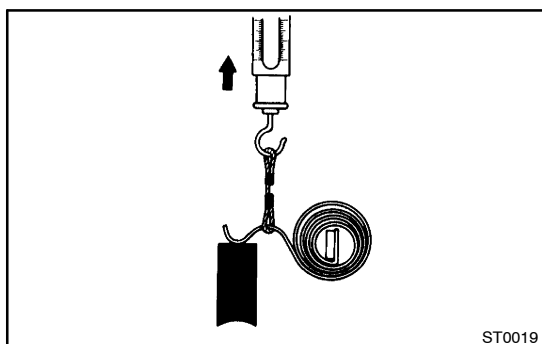
4. INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

Standard length: 14.0 mm (0.551 in.)

Minimum length: 9.0 mm (0.354 in.)

If the length is less than minimum, replace the brush (field frame side) (see page ST-26) brush holder, and dress with an emery cloth.



5. INSPECT BRUSH SPRINGS

Check the brush spring load. Take the pull scale reading the instant the brush spring separates from the brush.

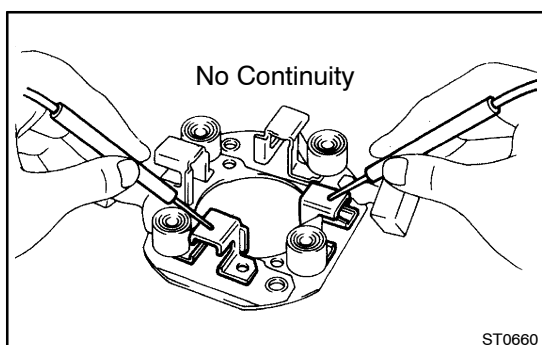
Standard spring installed load:

13.7 – 17.6 N (1.4 – 1.8 kgf, 3.1 – 4.0 lbf)

Minimum spring installed load:

8.8 N (0.9 kgf, 2.0 lbf)

If the installed load is less than minimum, replace the brush springs.



6. INSPECT BRUSH HOLDER

Check the brush holder insulator. Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.

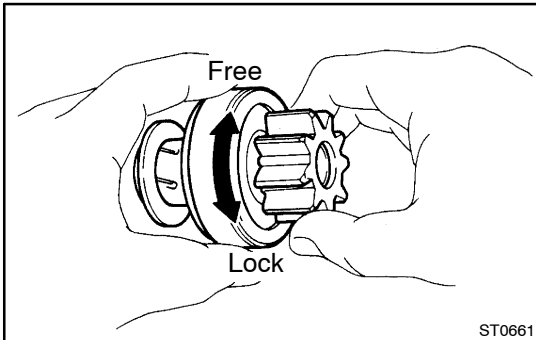
If there is continuity, repair or replace the brush holder.

7. INSPECT CLUTCH AND GEAR

- (a) Check the gear teeth on the planetary gear, internal gear and starter clutch for wear or damage.

If the gear is damaged, replace it.

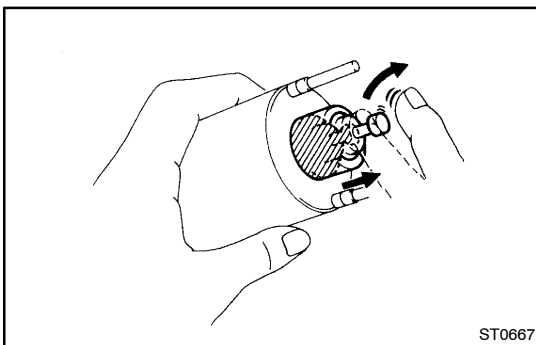
If damaged, replace the gear or clutch assembly. If damaged, also check the drive plate ring gear for wear or damage.



- (b) Check the starter clutch.

Rotate the clutch pinion gear clockwise and check that it turns freely. Try to rotate the clutch pinion gear counter-clockwise and check that it locks.

If necessary, replace the starter clutch.

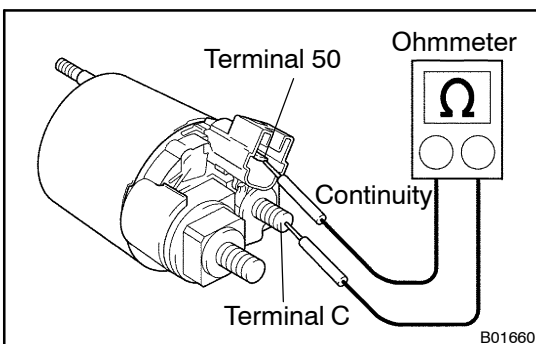
**8. INSPECT MAGNETIC SWITCH**

- (a) Check the plunger.

Push in the plunger and replace it.

Check that it returns quickly to its original position.

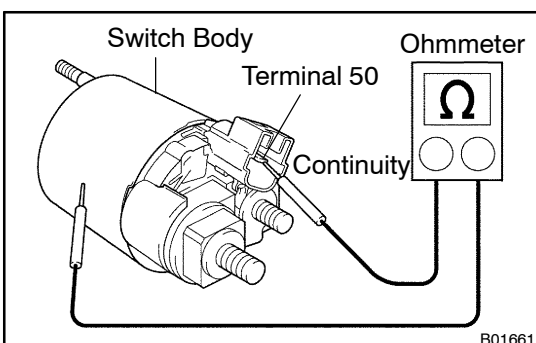
If necessary, replace the magnetic switch.



- (b) Check the pull-in coil for open circuit.

Using an ohmmeter, check that there is continuity between terminals 50 and C.

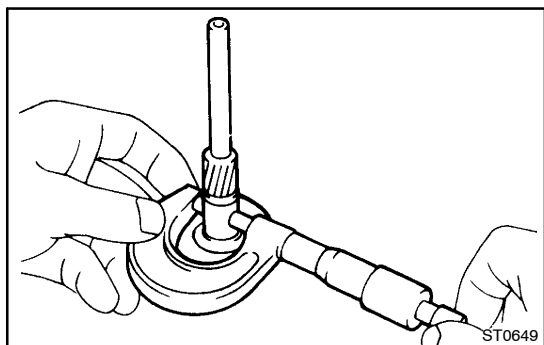
If there is no continuity, replace the magnetic switch.



- (c) Check the hold-in coil for open circuit.

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.

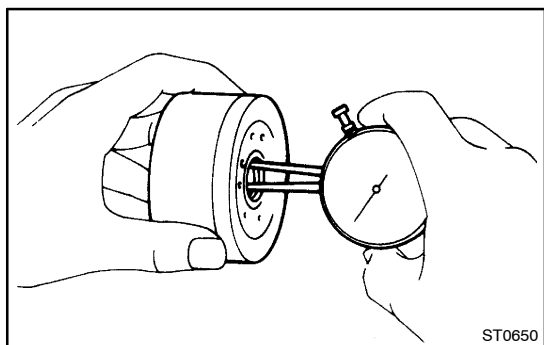


9. INSPECT PLANETARY SHAFT AND CENTER BEARING

- (a) Using a micrometer, measure the outer diameter of the surface in contact with the center bearing of the planetary shaft.

Planetary shaft outer diameter:

14.982 – 15.000 mm (0.5898 – 0.5906 in.)



- (b) Using a caliper gauge, measure the inside diameter of the center bearing.

Center bearing inside diameter:

15.008 – 15.050 mm (0.5909 – 0.5925 in.)

- (c) Subtract the planetary shaft diameter from the bearing inside diameter measurement.

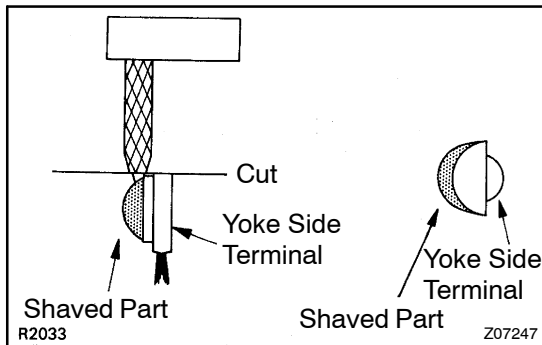
Standard center bearing oil clearance:

0.01 – 0.06 mm (0.0004 – 0.0024 in.)

Maximum center bearing oil clearance:

0.2 mm (0.008 in.)

If the clearance is greater than maximum, replace the planetary shaft and center bearing. (See page ST-26)



REPLACEMENT

1. REPLACE BRUSHES

HINT:

Only the 2 brushes of the positive (+) side (yoke side) are exchangeable, negative (-) side brush must be changed in the body with the brush holder.

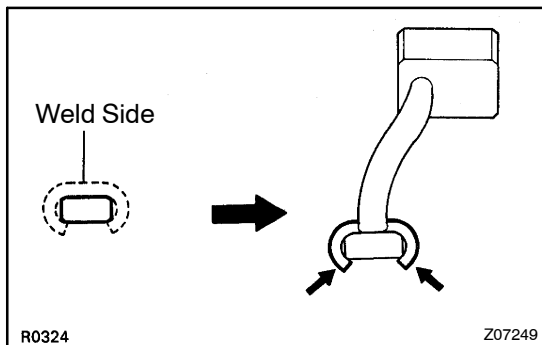
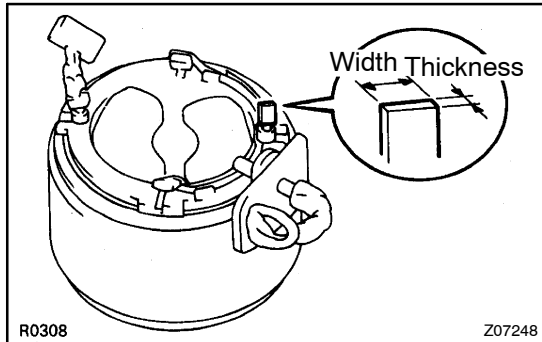
- Cut the brush lead wire at the terminal side.
- Shave welded mark of the brush lead wire with sandpaper etc., and correct the terminal to the specified.

NOTICE:

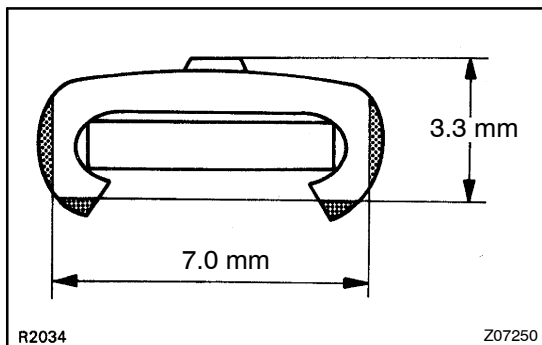
Part to be shaved is so narrow that you should take care not to harm the field coil.

Specified width: 5.0 mm (0.197 in.)

Specified thickness: 1.6 mm (0.063 in.)



- Press the plate of the supply brush on the welded side of the terminal lead wire.



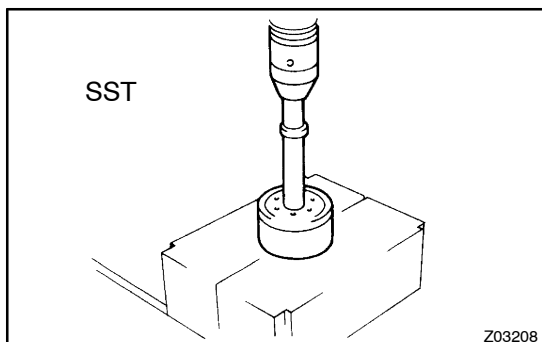
- Solder the pressed part, and shave to the specified measures with the sandpaper etc.

Specified width: 7.0 mm (0.276 in.)

Specified thickness: 3.3 mm (0.130 in.)

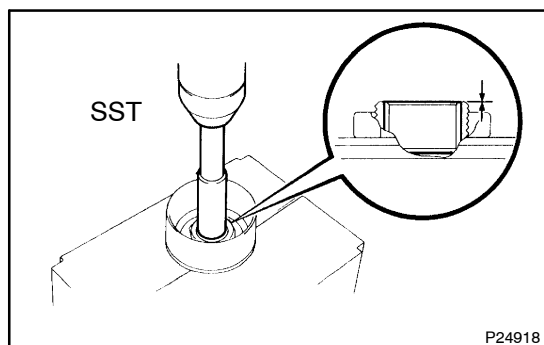
HINT:

- Heat the soldered part well, and flow the solder inside the plate, take care not to flow it into the inside lead wire.
- Take care not to flow the solder into the field.

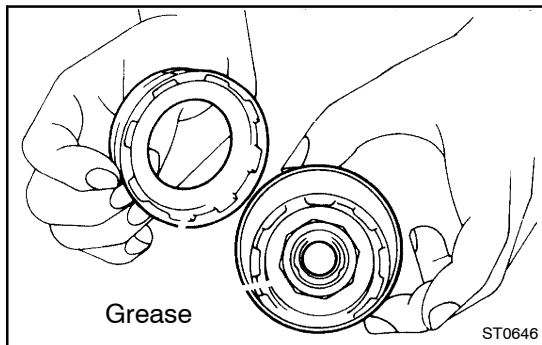


2. REPLACE CENTER BEARING

- Using SST and press, press out the center bearing.
SST 09221-25026 (09221-00090)



- (b) Using SST and a press in a new center bearing to the position shown in the illustration.
SST 09221-25026 (09221-00071)



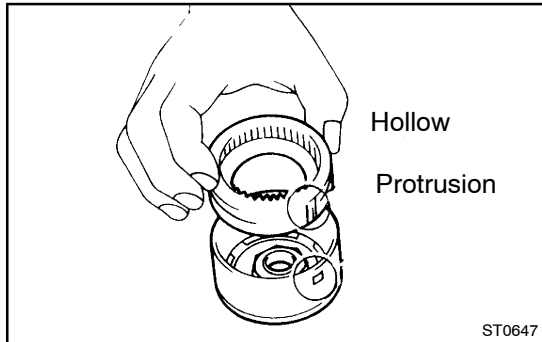
REASSEMBLY

HINT:

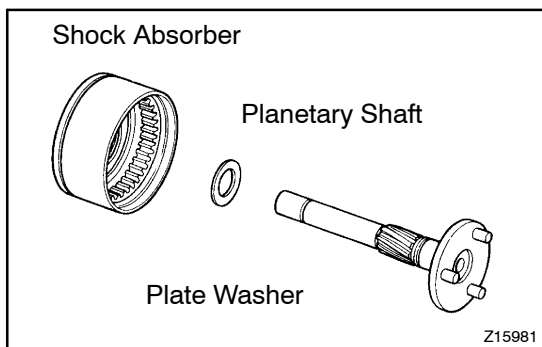
Use high temperature-resistant grease to lubricate the bearings and sliding parts when assembling the starter.

1. INSTALL INTERNAL GEAR AND PLANETARY SHAFT

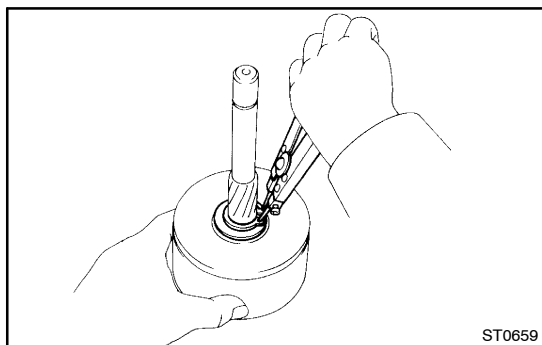
- (a) Apply grease to the internal gear touching the sock absorber and planetary gears.
- (b) Align the hollow of the internal gear with the protrusion inside the shock absorber.
- (c) Insert and turn the internal gear so that it interlocks with the shock absorber.



- (d) Apply turbine oil with additives to the center bearing.
- (e) Apply grease to the plate washer, and install it to the planetary shaft.
- (f) Install the planetary shaft to the shock absorber.

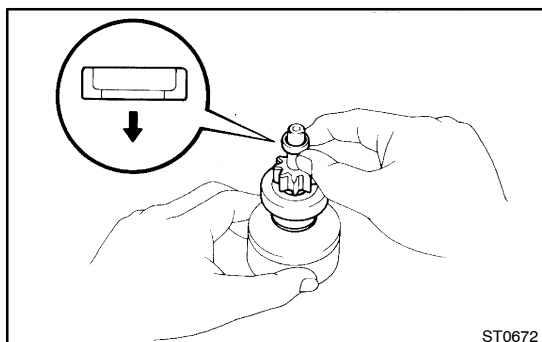


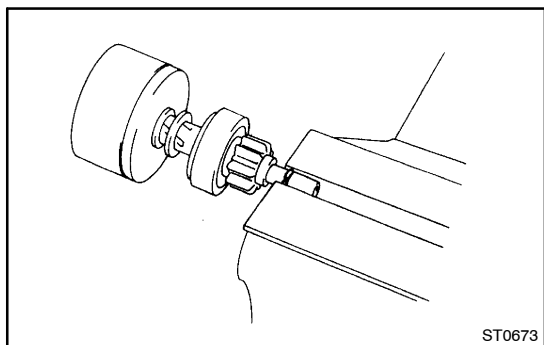
- (g) Using snap ring pliers, install the plate washer and snap ring.



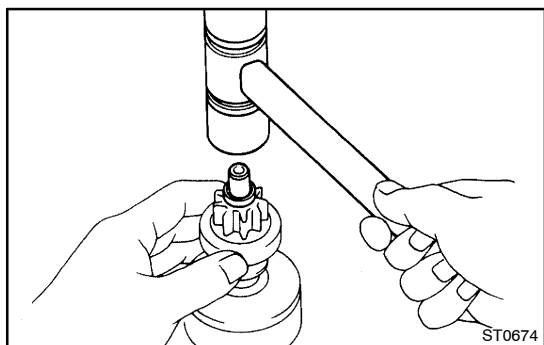
2. INSTALL STARTER CLUTCH

- (a) Apply grease to the bushing and spline of the starter clutch and stop collar.
- (b) Place the starter clutch and stop collar on the planetary shaft.

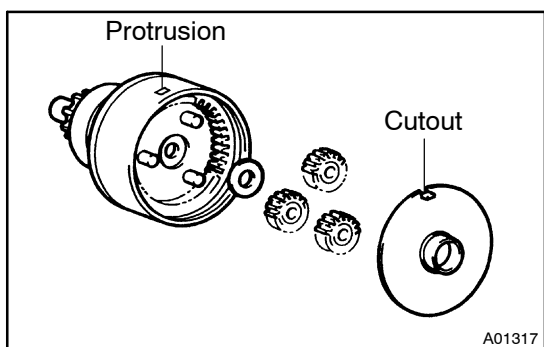




- (c) Apply grease to the snap ring, and install it to the planetary shaft groove.
- (d) Using a vise, compress the snap ring.

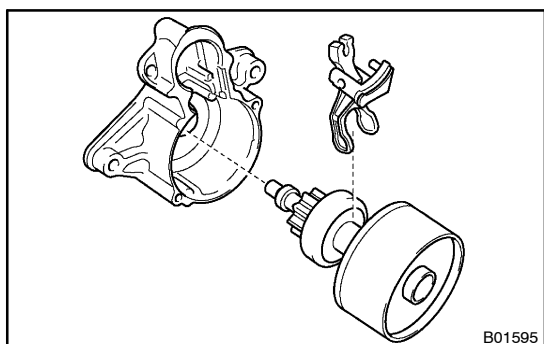


- (e) Hold the starter clutch, tap the planetary shaft and install the stop collar onto the snap ring with a plastic-faced hammer.



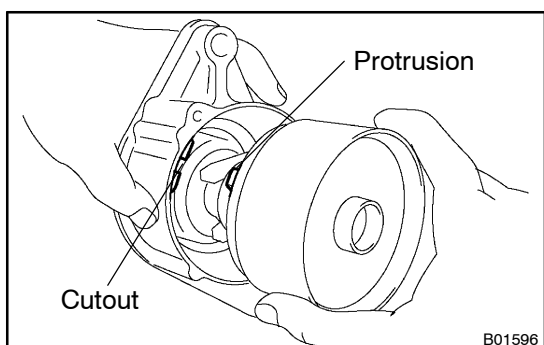
3. INSTALL PLANETARY GEARS

- (a) Apply grease to the planetary gears and flange pin parts of the planetary shaft.
- (b) Install the plate washer and 3 planetary gears.
- (c) Align the cutout of the plate with the protrusion inside the shock absorber, and install the plate.



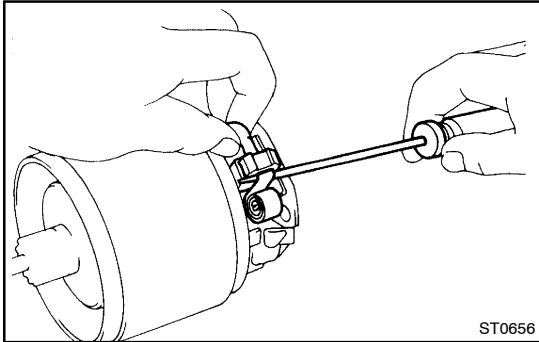
4. INSTALL DRIVE LEVER AND STARTER CLUTCH WITH SHOCK ABSORBER

- (a) Apply turbine oil with additives to the bearing of the starter housing.
- (b) Apply grease to the drive lever touching the starter pivot part of the drive lever.
- (c) Install the drive lever to the starter clutch.



- (d) Align the protrusion of the shock absorber with the cutout of the starter housing and install them.

5. PLACE ARMATURE INTO FIELD FRAME

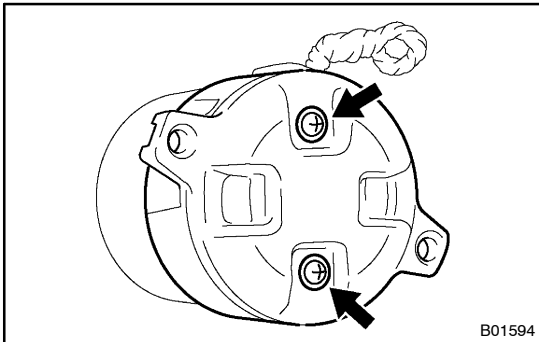


6. INSTALL BRUSH HOLDER

- Place the brush holder in position on the armature.
 - Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder.
- Connect the 4 brushes.

NOTICE:

Check that positive (+) lead wires are not grounded.



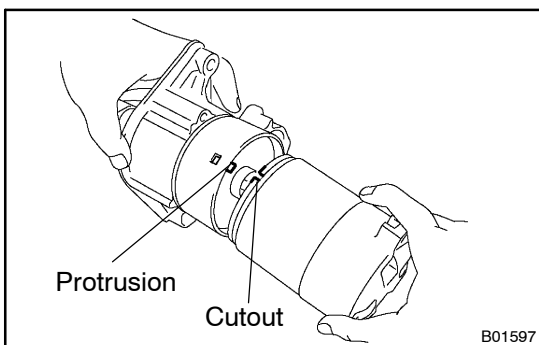
7. INSTALL COMMUTATOR END FRAME

- Install a new O-ring to the groove of the field frame.
- Apply turbine oil with additives to the bearing of the end frame.
- Install the end frame with the 2 screws.

Torque: 1.5 N·m (15 kgf·cm, 13 in.·lbf)

NOTICE:

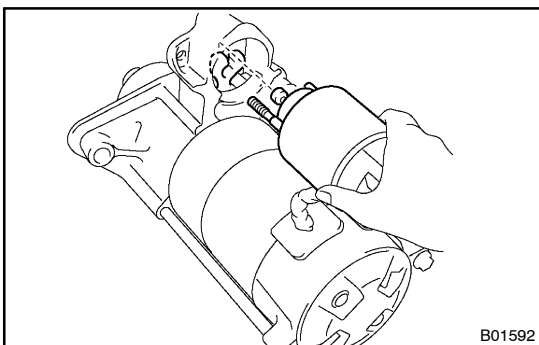
To avoid interference between the brush holder and the dust protector pull the commutator end frame away at an angle.



8. INSTALL FIELD FRAME AND ARMATURE ASSEMBLY

- Install a new O-ring to the groove of the field frame.
- Align the cutout of the field frame with the protrusion of the shock absorber.
- Install the field frame and armature assembly with the 2 through bolts.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)



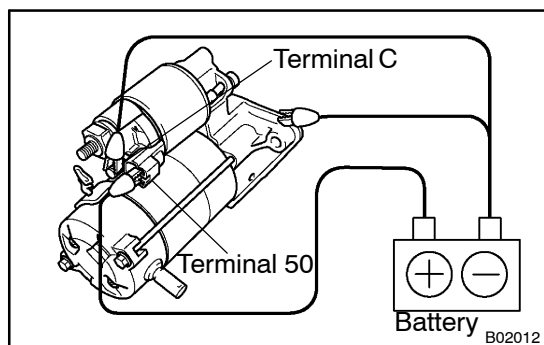
9. INSTALL MAGNETIC SWITCH

- Install the plunger cover to the magnetic switch.
- Hang the plunger of the magnetic switch to the drive lever from the upper side.
- Install the magnetic switch with the 2 nuts.

Torque: 8.3 N·m (85 kgf·cm, 73 in.·lbf)

- Connect the lead wire to the terminal, and install the nut.

Torque: 9.8 N·m (100 kgf·cm, 87 in.·lbf)



TEST

NOTICE:

These tests must be done within 3 to 5 seconds to avoid burning out the coil.

1. DO PULL-IN TEST

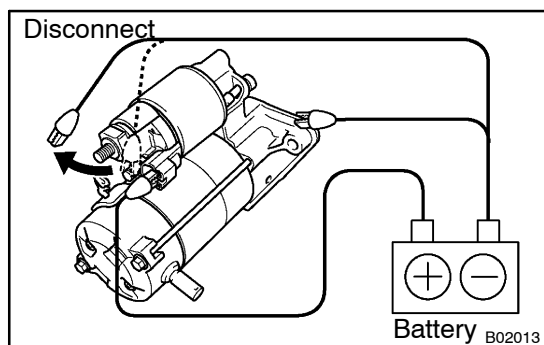
- Disconnect the field coil lead from terminal C.
- Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.

If the clutch pinion gear does not move, replace the magnetic switch.

2. DO HOLD-IN TEST

With the battery connected as above and with the clutch pinion gear out disconnect the negative (–) lead from terminal C. Check that the clutch pinion gear remains out.

If the clutch pinion gear returns inward, replace the magnetic switch.

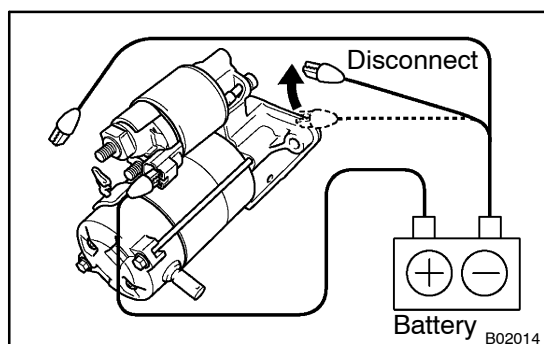


3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body.

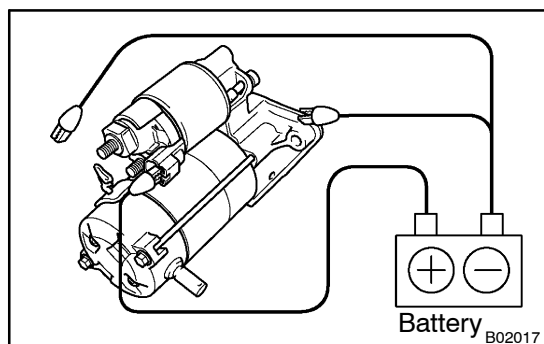
Check that the clutch pinion gear returns inward.

If the clutch pinion gear does not return, replace the magnetic switch.



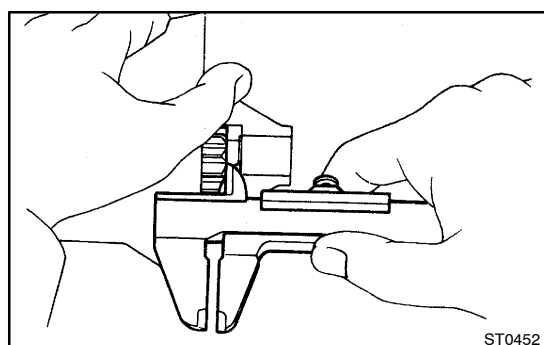
4. INSPECT CLUTCH PINION GEAR CLEARANCE

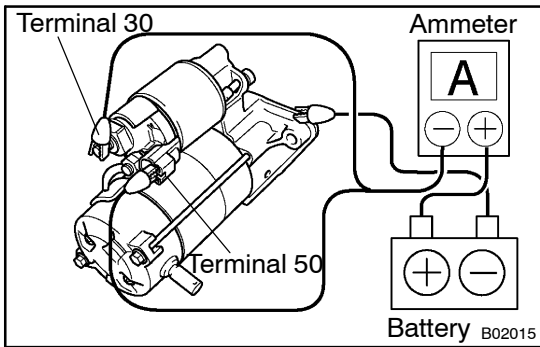
- Connect the battery to the magnetic switch as shown.



- Move the pinion gear toward the armature to remove slack and measure the clearance between the pinion gear end and stop collar.

Standard clearance: 1 – 5 mm (0.04 – 0.20 in.)



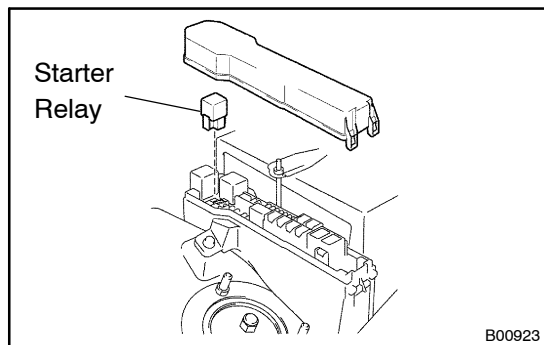
**5. DO NO-LOAD PERFORMANCE TEST**

- (a) Connect the field coil lead to terminal C. Make sure the lead is not grounded.
- (b) Connect the battery and ammeter to the starter as shown.
- (c) Check that the starter rotates smoothly and steadily with the clutch pinion gear moving out. Check that the ammeter reads the specified current.

Specified current: Less than 90 A at 11.5 V

INSTALLATION

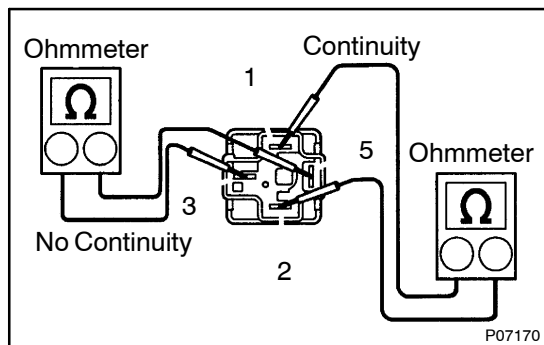
Installation is in the reverse order of removal. (See page ST-19)



STARTER RELAY INSPECTION

ST056-02

1. REMOVE RELAY BOX COVER
2. REMOVE STARTER RELAY



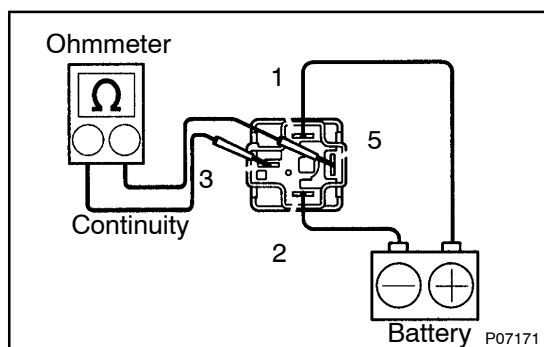
3. INSPECT STARTER RELAY

- (a) Inspect the relay continuity.
 - (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

 - (2) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



- (b) Inspect the relay operation.
 - (1) Apply battery positive voltage across terminals 1 and 2.
 - (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.
4. REINSTALL STARTER RELAY
 5. REINSTALL RELAY BOX COVER