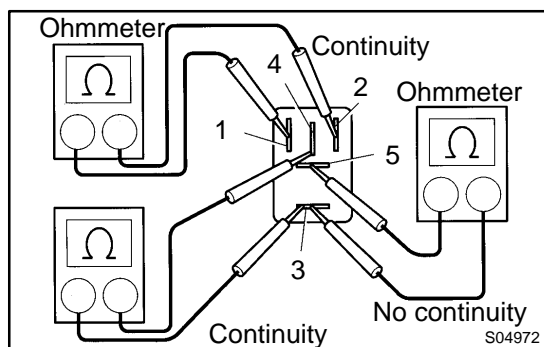


ACC CUT RELAY INSPECTION

ST00U-01

1. REMOVE ACC CUT RELAY

Remove the relay box and ACC cut relay.



2. INSPECT ACC CUT RELAY CONTINUITY

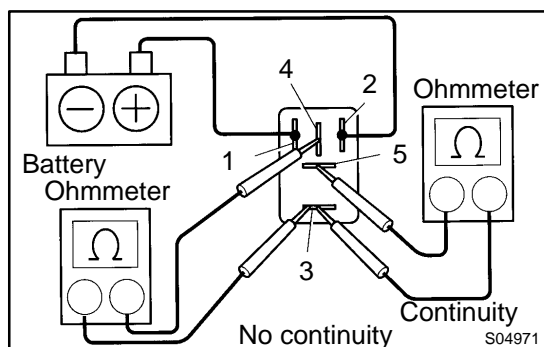
- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

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

If there is continuity, replace the relay.

- (c) Check that there is continuity between terminals 3 and 4. If there is no continuity, replace the relay.



3. INSPECT ACC CUT RELAY OPERATION

- (a) Apply battery positive voltage across terminals 1 and 2.

- (b) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.

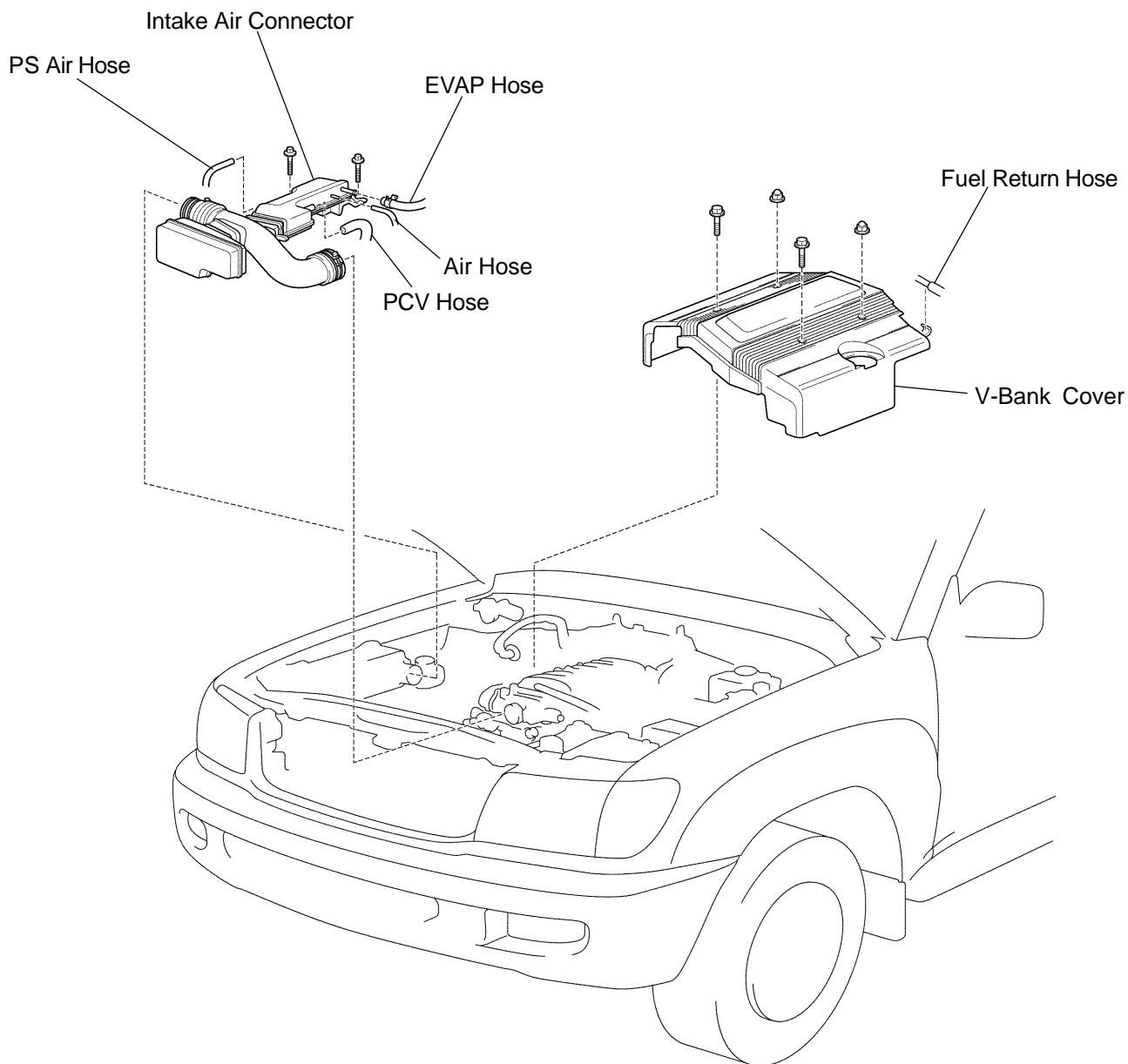
- (c) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL ACC CUT RELAY

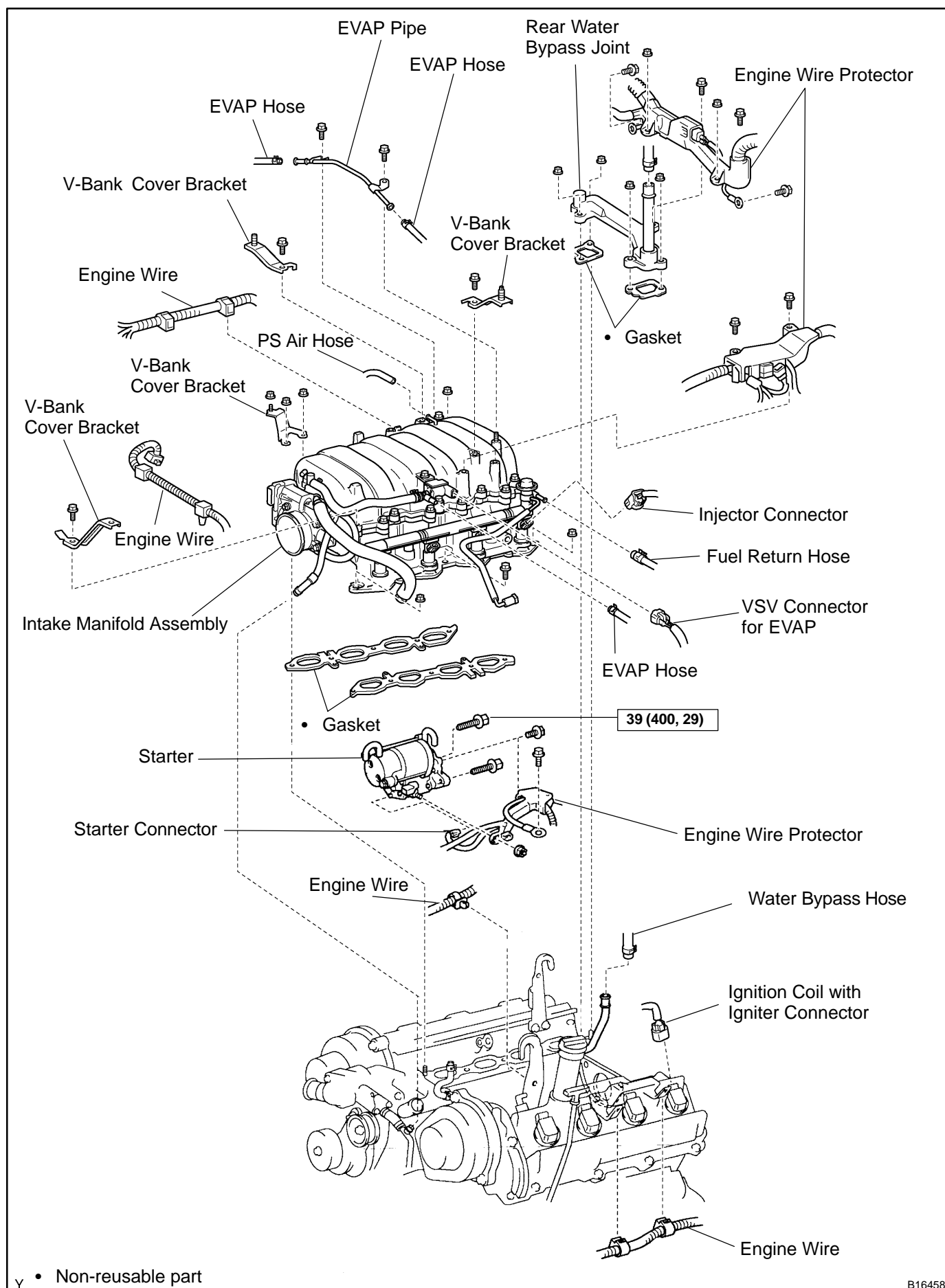
STARTER COMPONENTS

ST08B-03

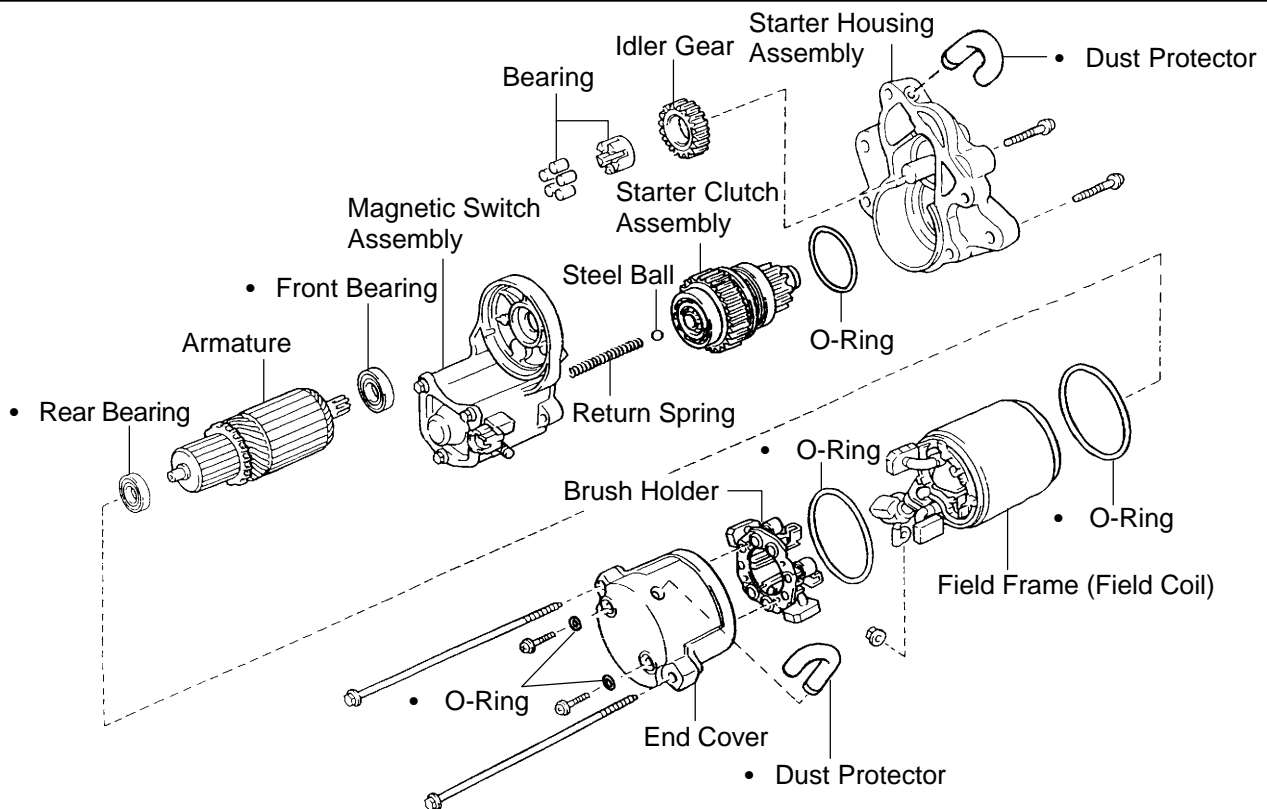


P

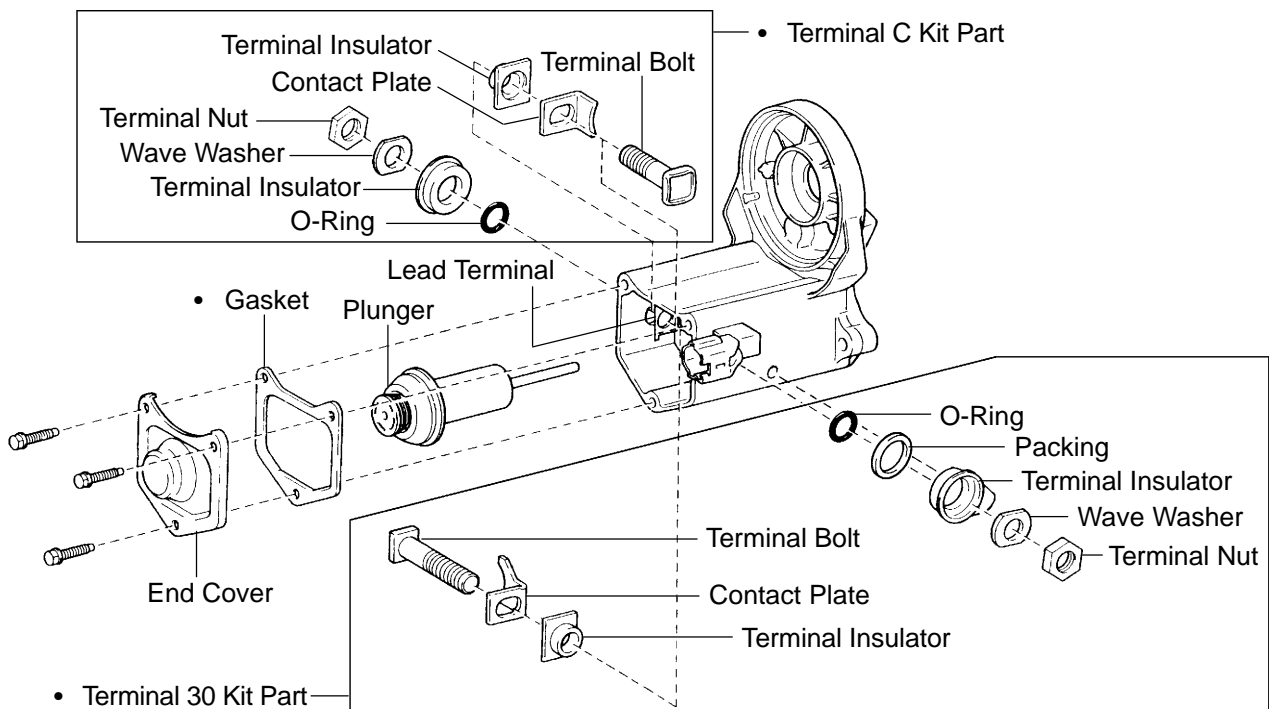
B16434



B16458

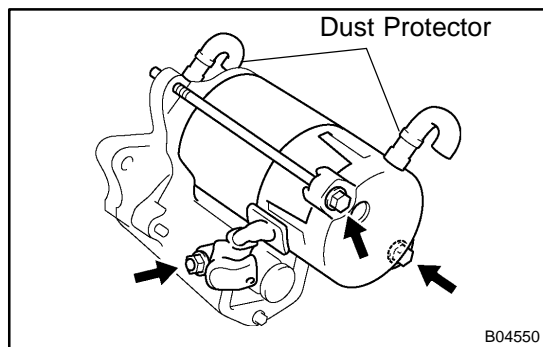


Magnetic Switch Assembly



• Non-reusable part

B04547



DISASSEMBLY

1. REMOVE 2 DUST PROTECTORS

2. REMOVE FIELD FRAME AND ARMATURE

- (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: 9.3 N·m (95 kgf·cm, 82 in.-lbf)

- (c) Pull out the field frame together with the armature from the magnetic switch assembly.

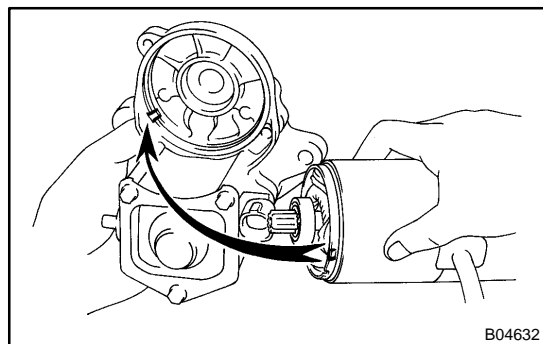
NOTICE:

At the time of notice, align the protrusion of the field frame with the groove of the magnetic switch.

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

HINT:

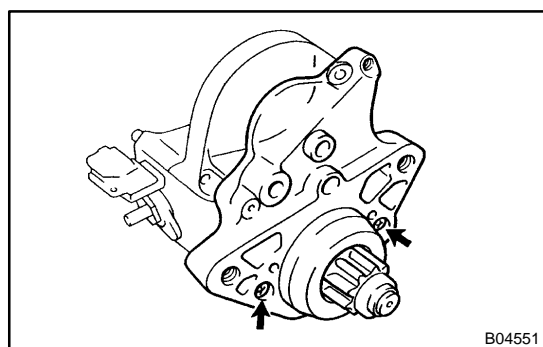
At the time of assembly, use a new O-ring.



3. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

- (a) Remove the 2 screws.

Torque: 9.3 N·m (95 kgf·cm, 82 in.-lbf)

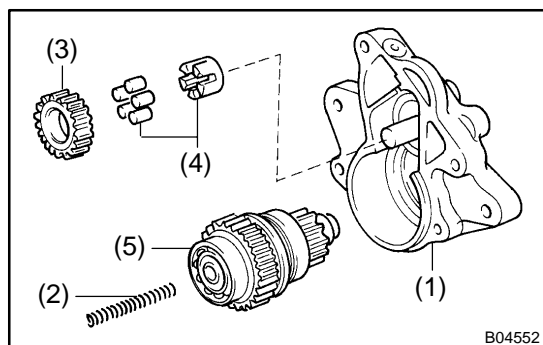


- (b) Remove these parts from the magnetic switch assembly:

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

HINT:

At the time of assembly, apply grease to the return spring and insert the return spring into the clutch shaft hole.

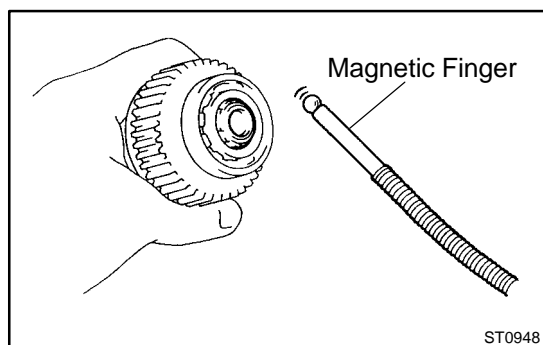


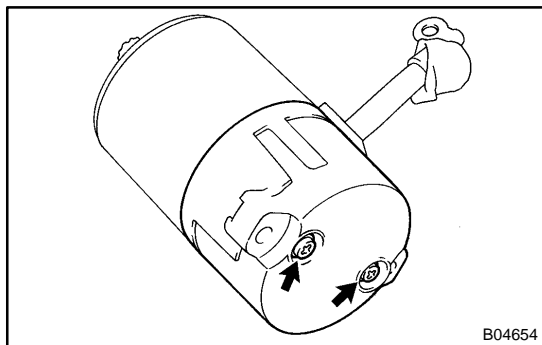
4. REMOVE STEEL BALL

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

HINT:

At the time of assembly, apply grease to the steel ball and insert the steel ball into the clutch shaft hole.



**5. REMOVE BRUSH HOLDER**

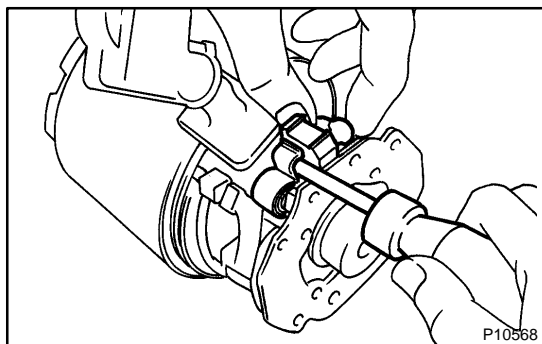
- (a) Remove the 2 screws w/ O-ring and the end cover from the field frame.

Torque: 3.8 N·m (39 kgf-cm, 34 in.-lbf)

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

HINT:

At the time of assembly, use a new O-ring.

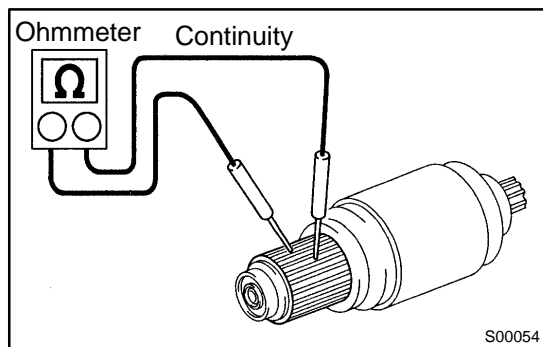


- (c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the 4 brushes, and remove the brush holder.

NOTICE:

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

6. REMOVE ARMATURE FROM FIELD FRAME

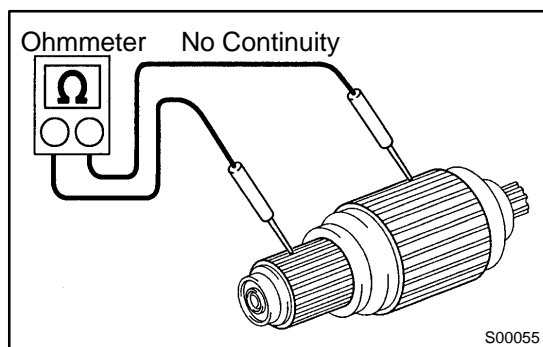


INSPECTION

1. INSPECT 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.



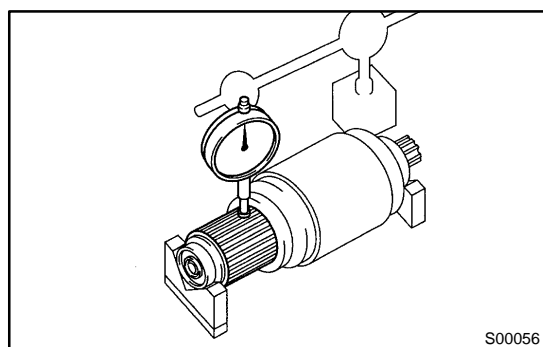
2. INSPECT COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

3. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACE

If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a lathe.



4. INSPECT COMMUTATOR CIRCLE RUNOUT

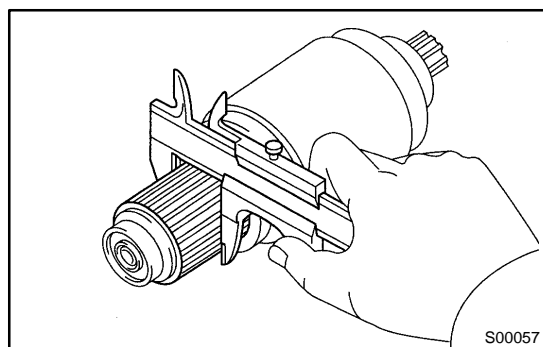
(a) Place the commutator on V-blocks.

(b) Using a dial indicator 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.



5. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.

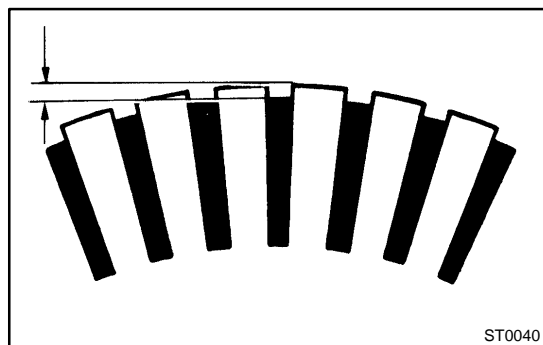
Standard diameter:

35.0 mm (1.378 in.)

Minimum diameter:

34.0 mm (1.339 in.)

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



6. INSPECT UNDERCUT DEPTH

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

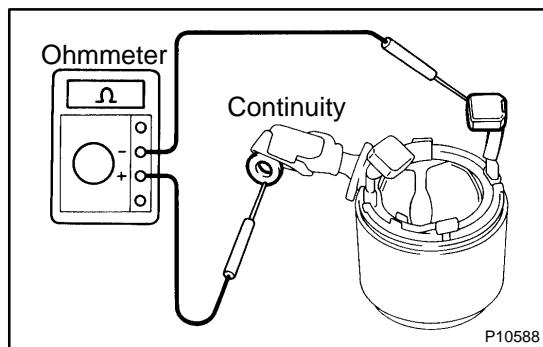
Standard undercut depth:

0.7 mm (0.028 in.)

Minimum undercut depth:

0.2 mm (0.008 in.)

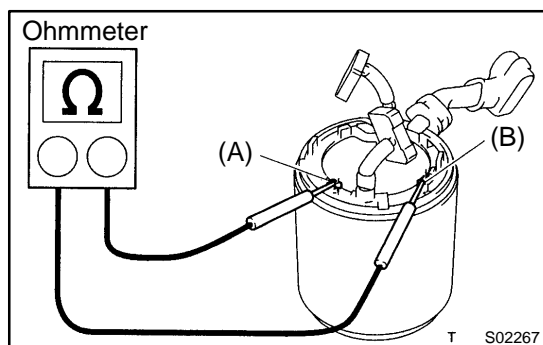
If the undercut depth is less than minimum, correct it with a hacksaw blade.



7. INSPECT 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.



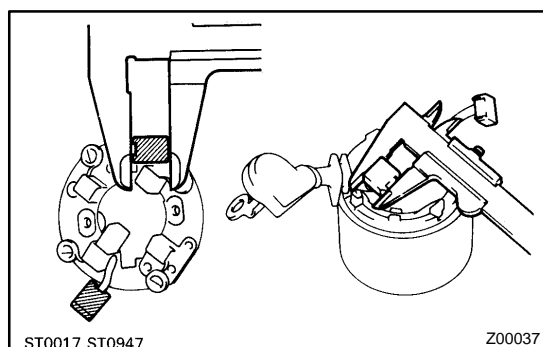
8. INSPECT SHUNT COIL FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between shunt coil terminals (A) and (B).

Resistance:

1.5 - 1.9 Ω at 20°C (68°F)

If the resistance is not as specified, replace the field frame.



9. INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

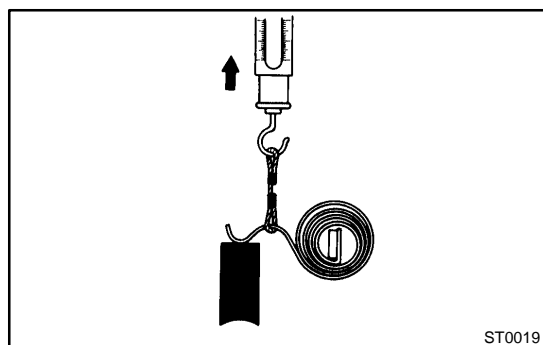
Standard length:

15.0 mm (0.591 in.)

Minimum length:

9.0 mm (0.354 in.)

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



10. INSPECT BRUSH SPRING LOAD

Using a pull scale, measure the spring load by pulling the spring from the brush until they are separated.

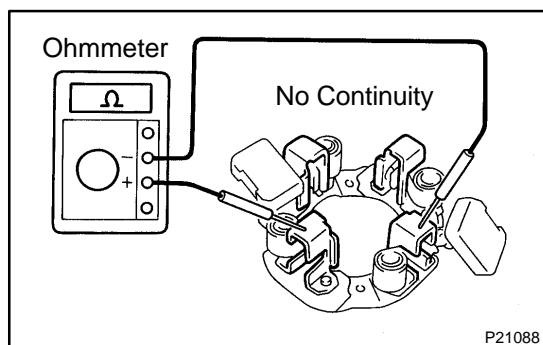
Standard spring installed load:

21.5 - 27.5 N (2.2 - 2.8 kgf, 4.8 - 6.2 lbf)

Minimum spring installed load:

12.7 N (1.3 kgf, 2.9 lbf)

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



11. INSPECT BRUSH HOLDER INSULATION

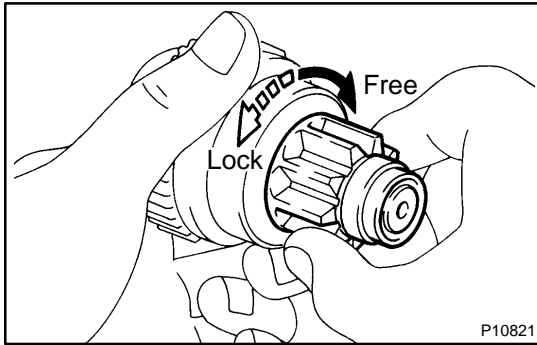
Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.

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

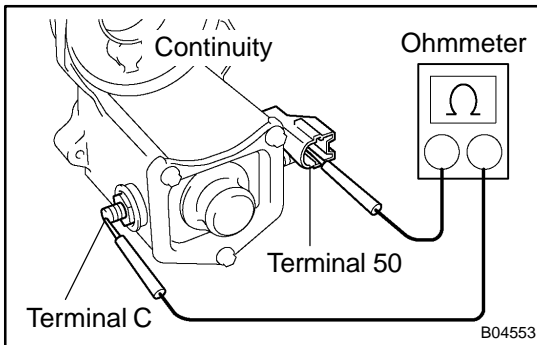
12. INSPECT GEAR TEETH

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

If any damage is found, replace the gear or clutch assembly, and also check the drive plate ring gear for wear or damage.

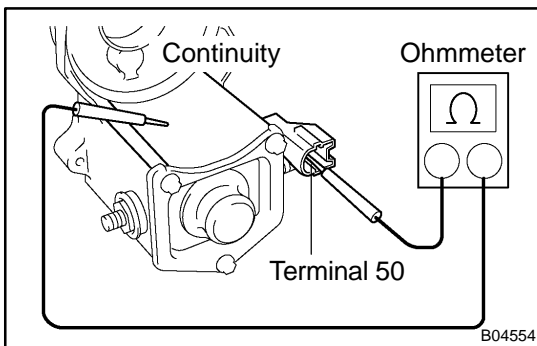
**13. INSPECT CLUTCH PINION GEAR**

Rotate the pinion gear clockwise, and check that it turns freely. Check that it locks by rotating the pinion gear counterclockwise. If necessary, replace the clutch assembly.

**14. DO PULL-IN COIL OPEN CIRCUIT TEST**

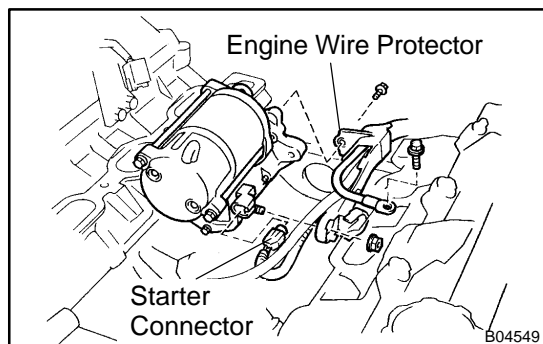
Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, replace the magnetic switch.

**15. DO HOLD-IN COIL OPEN CIRCUIT TEST**

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

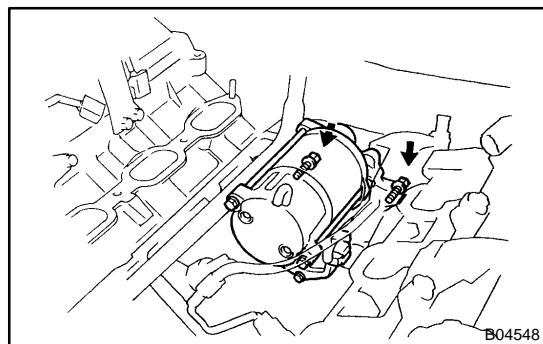
If there is no continuity, replace the magnetic switch.



INSTALLATION

1. INSTALL STARTER

- (a) Install the engine wire protector to the starter with the bolt.
Torque: 9.81 N·m (100 kgf·cm, 84 in.-lbf)
- (b) Connect the starter wire with the nut.
Torque: 9.81 N·m (100 kgf·cm, 84 in.-lbf)
- (c) Connect the starter connector.
- (d) Connect the starter to the cylinder block.
- (e) Connect the engine wire with the bolt.



- (f) Install the starter with the 2 bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
2. **INSTALL INTAKE MANIFOLD ASSEMBLY**
(See page [EM-59](#))
3. **INSTALL INTAKE AIR CONNECTOR**
4. **INSTALL V-BANK COVER**

REASSEMBLY

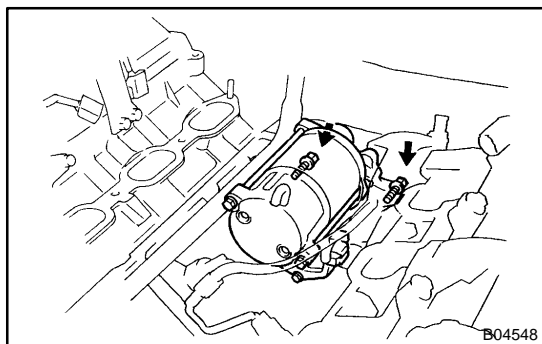
Reassembly is in the reverse order of disassembly (See page [ST-6](#)).

HINT:

At the time of assembly, use high-temperature grease to lubricate the bearing and gears when assembling the starter.

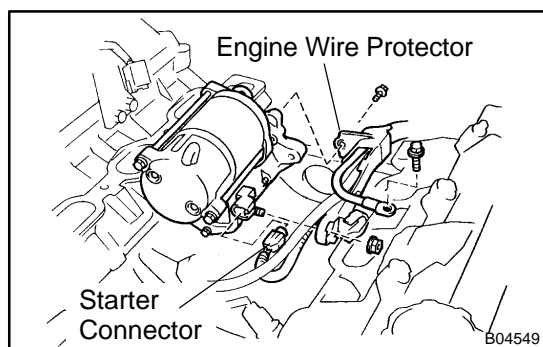
REMOVAL

1. REMOVE V-BANK COVER
2. REMOVE INTAKE AIR CONNECTOR
3. REMOVE INTAKE MANIFOLD ASSEMBLY
(See page [EM-35](#))

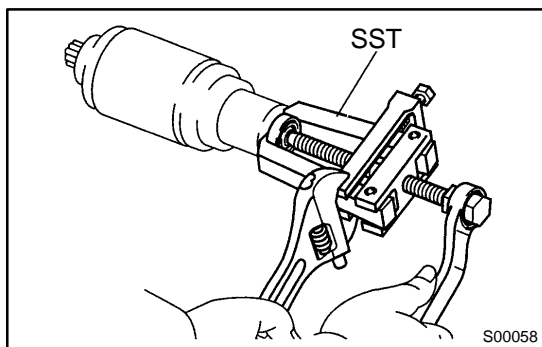


4. REMOVE STARTER

- (a) Remove the 2 bolts holding the starter from the cylinder block.
- (b) Disconnect the starter from the cylinder block.



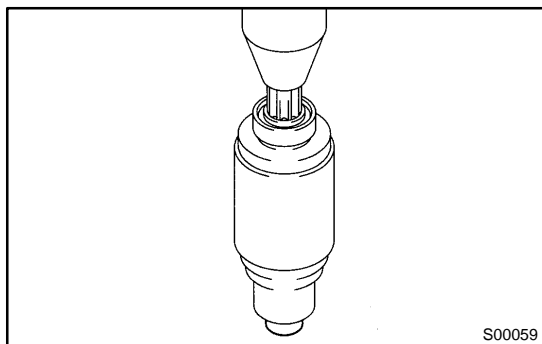
- (c) Disconnect the starter connector.
- (d) Remove the nut, bolt and disconnect the starter wire.
- (e) Remove the bolt, and disconnect the engine wire protector from the starter.
- (f) Remove the starter.



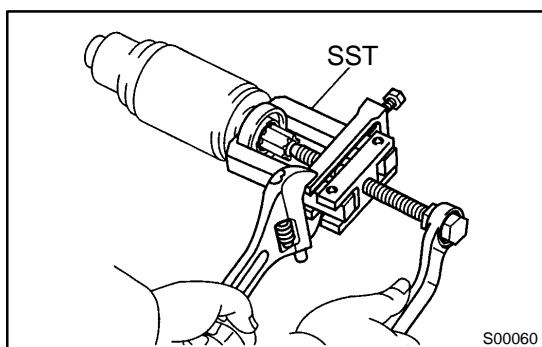
REPLACEMENT

1. REPLACE REAR BEARING

- (a) Using SST, remove the bearing.
SST 09286-4601 1

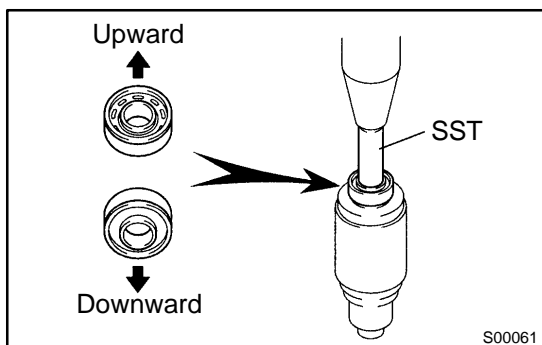


- (b) Using a press, press in a new bearing.



2. REPLACE FRONT BEARING

- (a) Using SST, remove the bearing.
SST 09286-4601 1

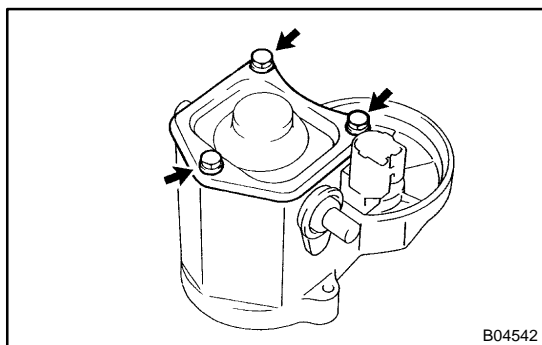


- (b) Using SST and a press, press in a new bearing.

NOTICE:

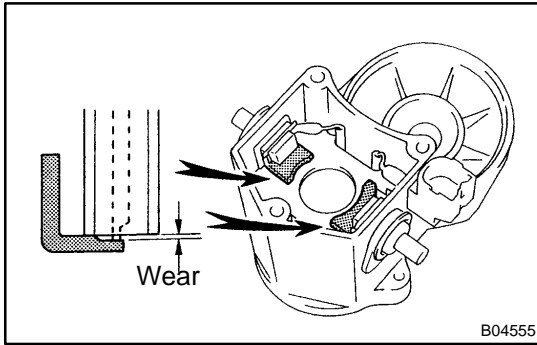
Be careful of the bearing installation direction.

SST 09820-00031



3. REPLACE MAGNETIC SWITCH TERMINAL KIT PARTS

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

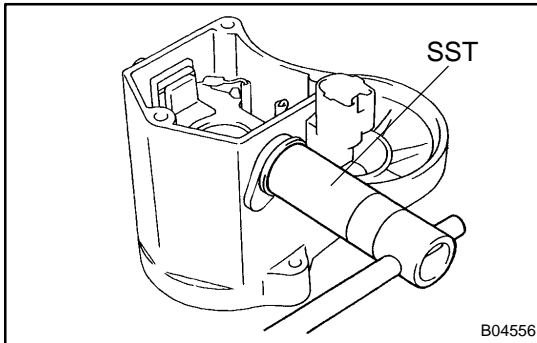


- (b) Inspect contact plate for wear.
Using vernier calipers, measure the contact plate for depth of wear.

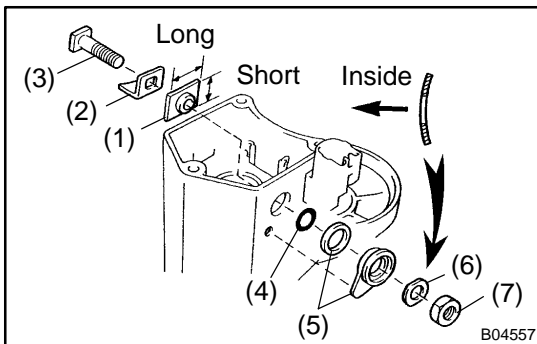
Maximum wear:

0.9 mm (0.035 in.)

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



- (c) Remove 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), O-ring, terminal bolt, contact plate, terminal insulator (inside).



- (d) Temporarily install these new terminal 30 kit parts:
- (1) Terminal insulator (inside)
 - (2) Contact plate
 - (3) Terminal bolt
 - (4) O-ring
 - (5) Packing and terminal insulator (outside)
Install the packing to the terminal insulator, and install them.

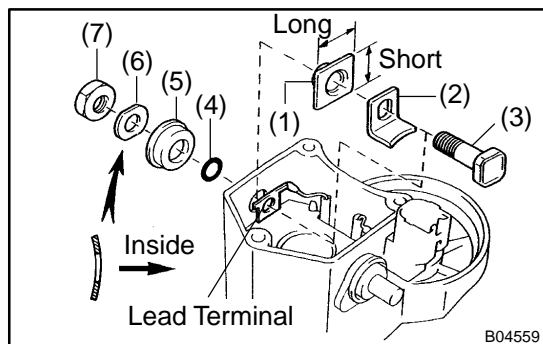
HINT:

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

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

NOTICE:

Be careful to install the terminal insulator (inside) and wave washer in the correct direction.



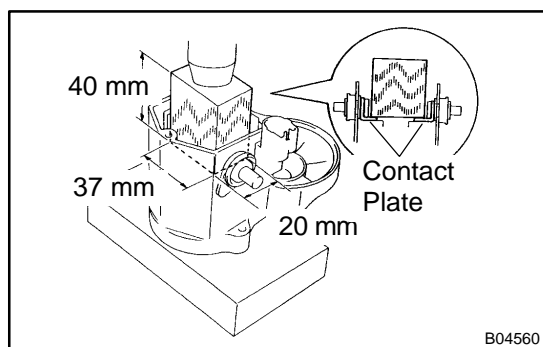
(e) Temporarily install these new terminal C kit parts:

- (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 insulator (inside) and wave washer in the correct direction.

(f) Temporarily tighten the terminal nuts.



(g) Tighten terminal nuts.

- (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:

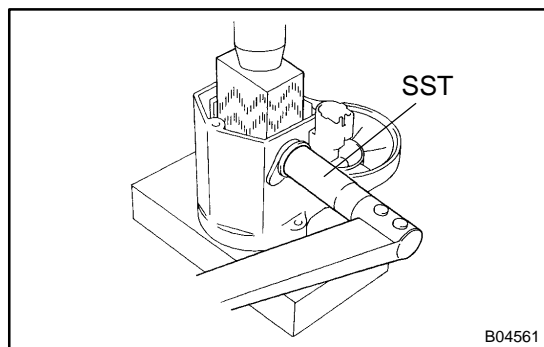
$$(\text{kgf/cm}^2) = \frac{100 \text{ kgf}}{\left(\frac{\text{Ram diameter (cm)}}{2} \right)^2 \times 3.14 (\pi)}$$

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

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

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

- 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.

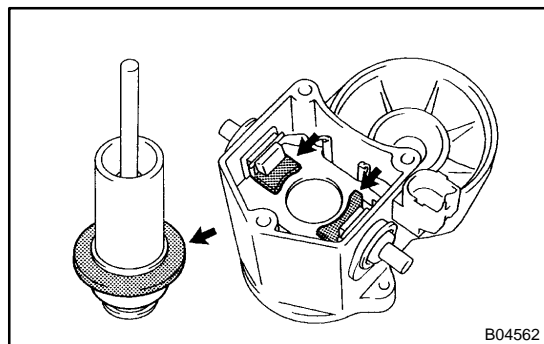


- (2) Using SST, tighten the nuts to the specified torque.
SST 09810-38140

Torque: 17 N·m (170 kgf-cm, 13 ft-lbf)

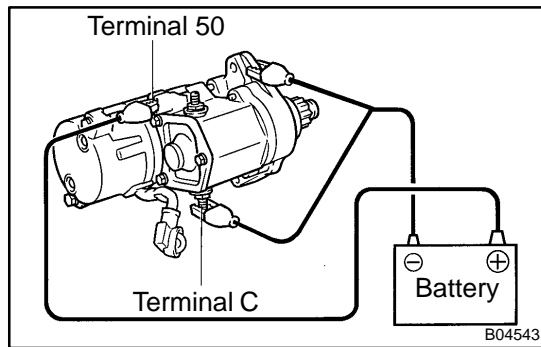
NOTICE:

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



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

Torque: 3.6 N·m (37 kgf-cm, 32 in.-lbf)



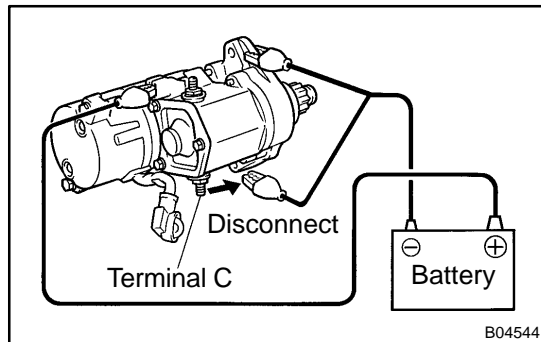
TEST

NOTICE:

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

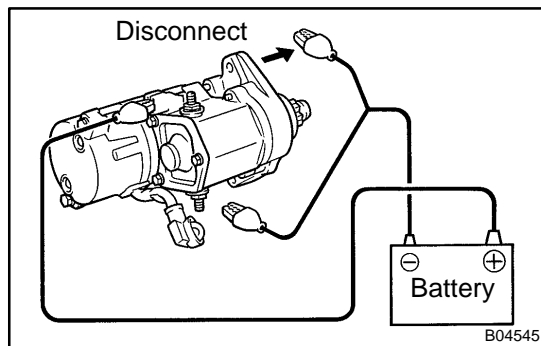
1. DO PULL-IN TEST

- 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.



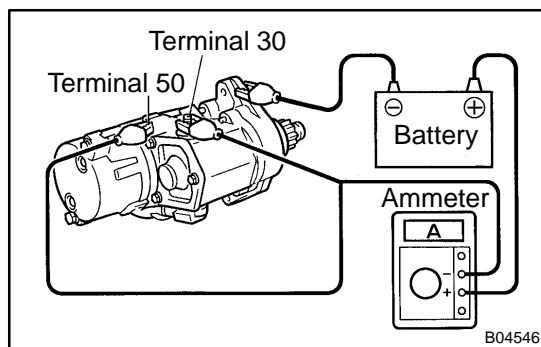
2. DO HOLD-IN TEST

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.

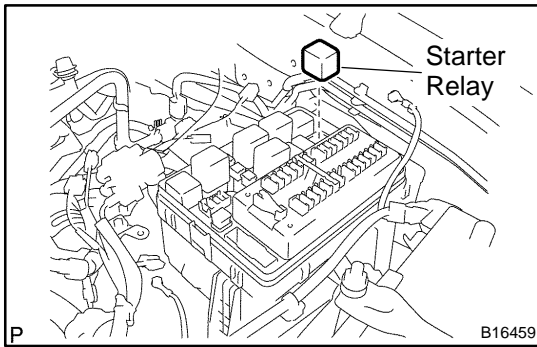


4. DO NO-LOAD PERFORMANCE TEST

- 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:

At 11.5 V: 100 A or less

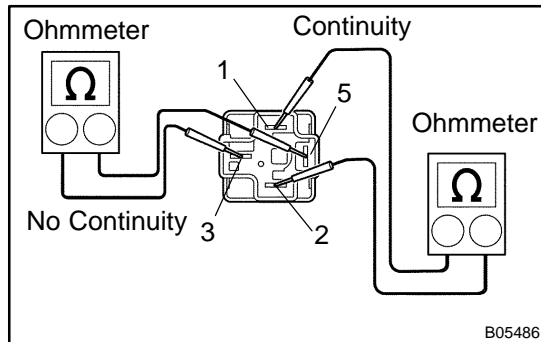


STARTER RELAY INSPECTION

ST08J-07

1. REMOVE STARTER RELAY (Marking: "ST")

Remove the relay box cover and starter relay.



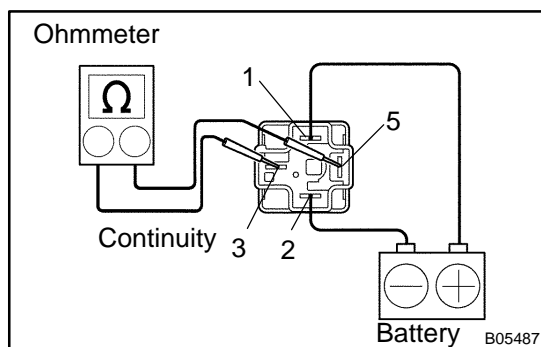
2. INSPECT RELAY CONTINUITY

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

If there is no continuity, replace the relay.

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

If there is continuity, replace the relay.



3. INSPECT RELAY OPERATION

- (a) Apply battery voltage across terminals 1 and 2.

- (b) 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

STARTING SYSTEM

ON-VEHICLE INSPECTION

ST08A-01

NOTICE:

Before changing the starter, check these items again:

- Connector connection
- Accessory installation, e.g.: theft deterrent system