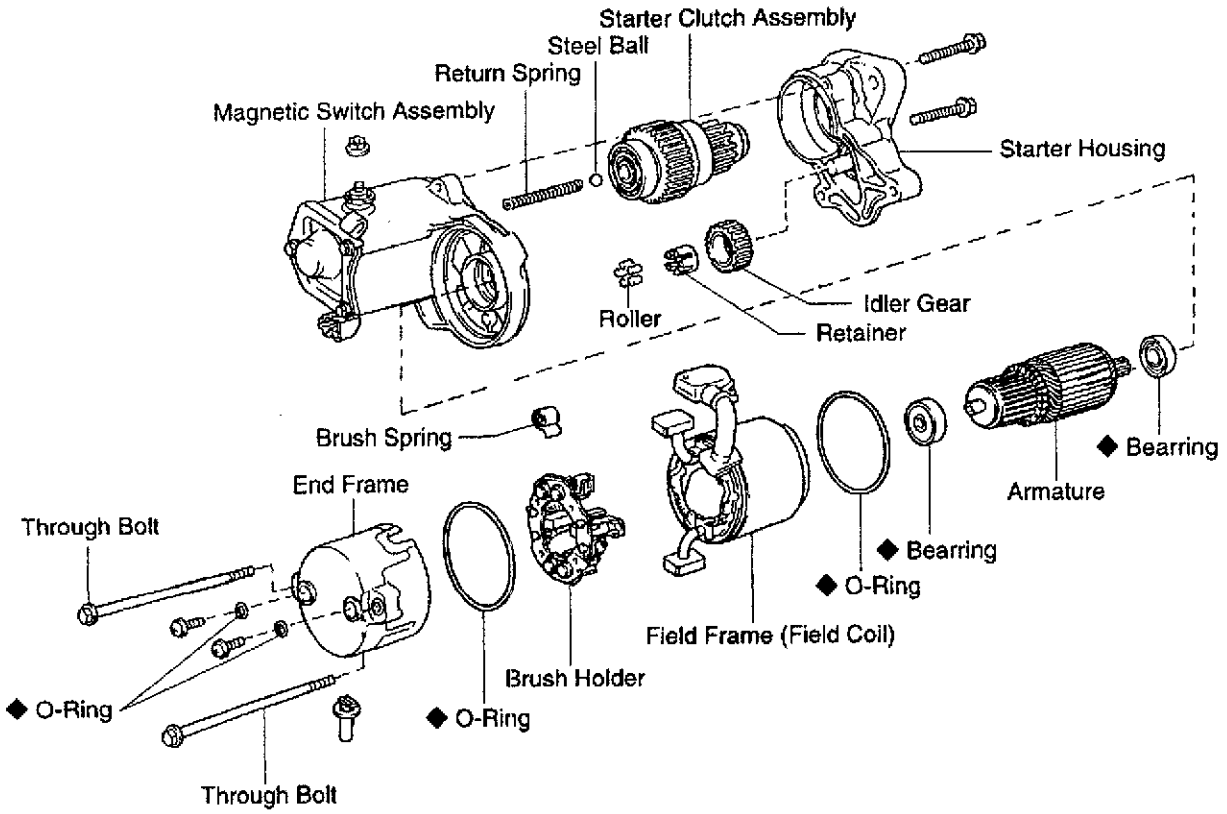
STARTER

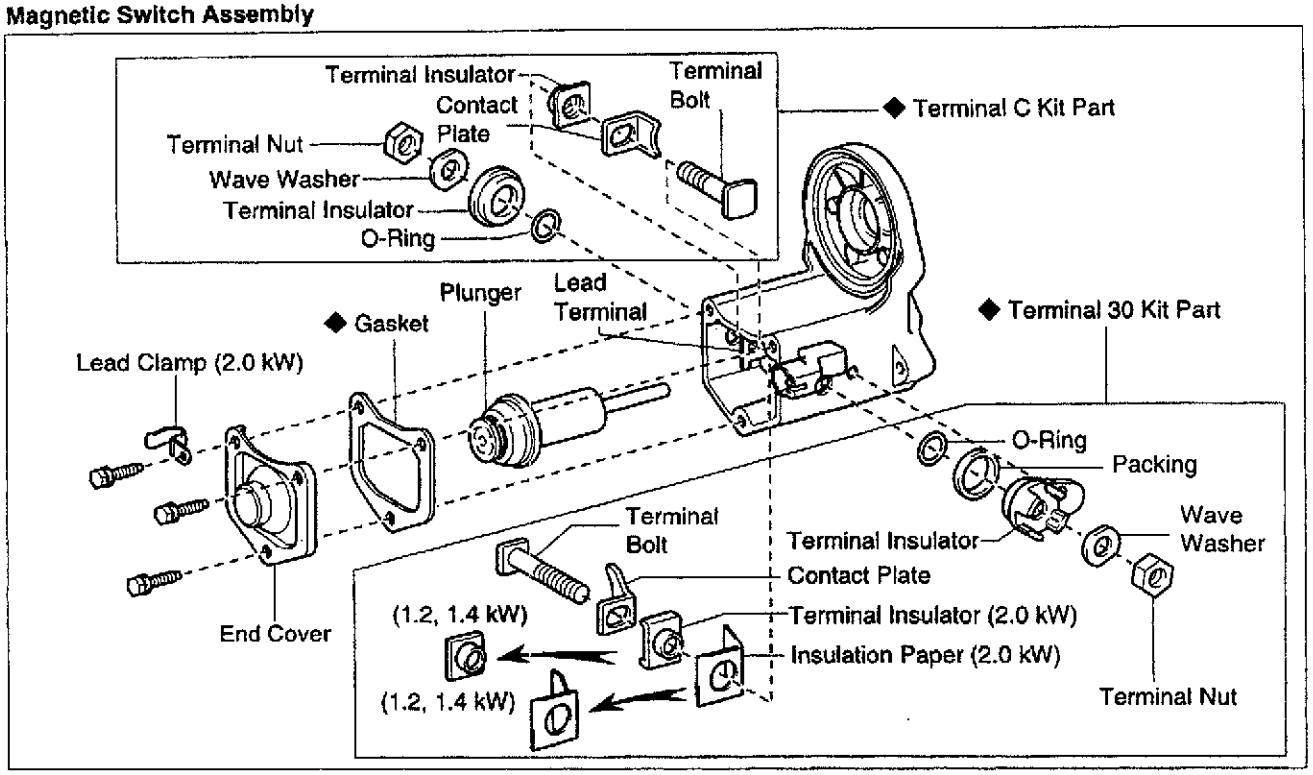
COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

ST0DA-02



P25575

Magnetic Switch Assembly



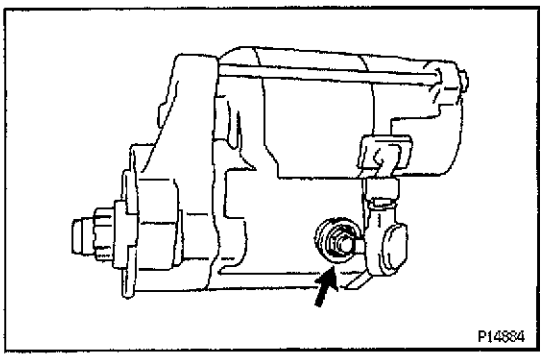
P25576

◆ Non-reusable part

Y Z18509

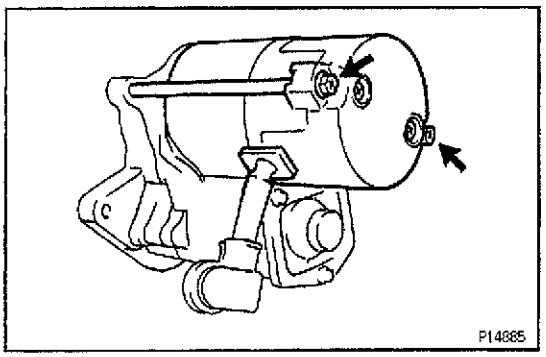
ST097-06

STARTER DISASSEMBLY

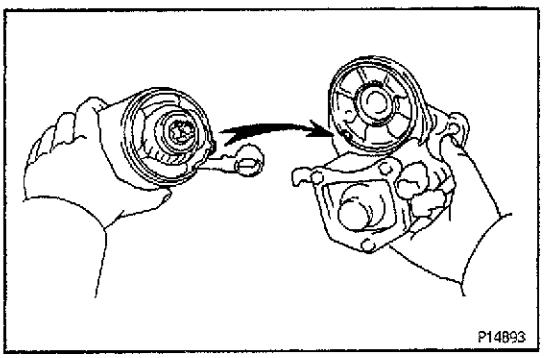


1. REMOVE FIELD FRAME AND ARMATURE

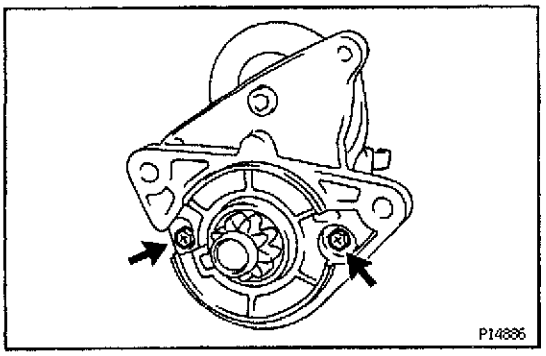
(a) Remove the nut and disconnect the lead wire from the magnetic switch terminal.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)



(b) Remove the 2 through bolts.
Torque:
1.2 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
2.0 kW type: 9.3 N·m (93 kgf·cm, 82 in.·lbf)

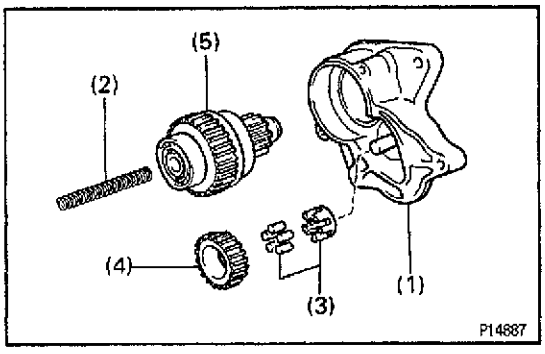


(c) Pull out the field frame with the armature from the magnetic switch assembly.
(d) Remove the O–ring.
ASSEMBLY HINT:
- Use a new O–ring.
- Align the protrusion of the field frame with the cutout of the magnetic switch.

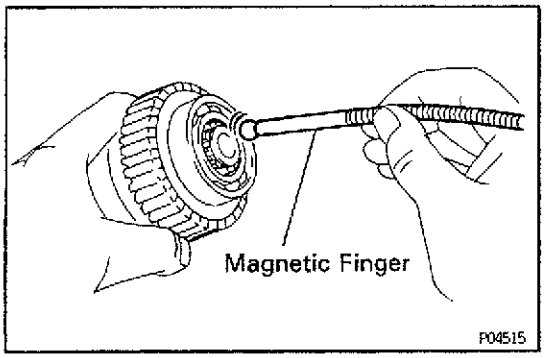


2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Remove the 2 screws.
Torque:
1.2 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
2.0 kW type: 9.3 N·m (93 kgf·cm, 82 in.·lbf)

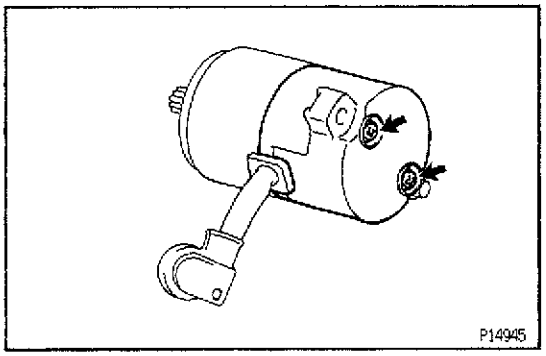


(b) Remove these parts from the magnetic switch assembly:
(1) Starter housing
(2) Return spring
(3) Bearing
(4) Idler gear
(5) Clutch assembly



3. REMOVE STEEL BALL

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



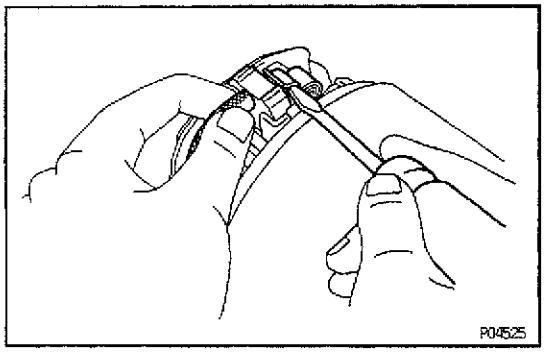
4. REMOVE BRUSH HOLDER

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

Torque:

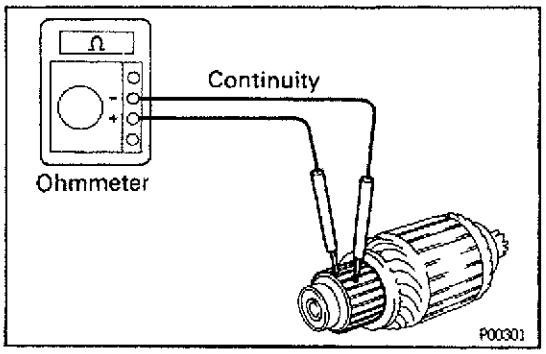
1.2 kW type: 1.5 N·m (15 kgf·cm, 13 in.·lbf)
1.4 kW type: 1.5 N·m (15 kgf·cm, 13 in.·lbf)
2.0 kW type: 3.8 N·m (39 kgf·cm, 34 in.·lbf)

(b) Remove the O–ring from the field frame.
ASSEMBLY HINT: 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.

5. REMOVE ARMATURE FROM FIELD FRAME



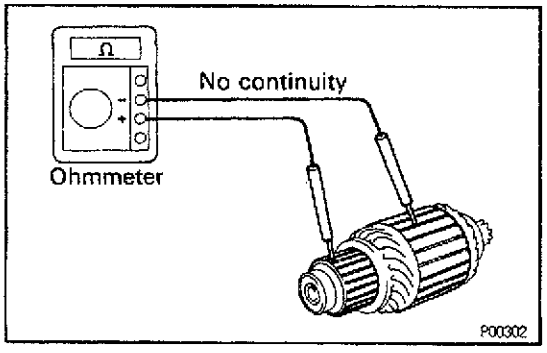
ST0DW–02

STARTER INSPECTION AND REPAIR

Armature Coil

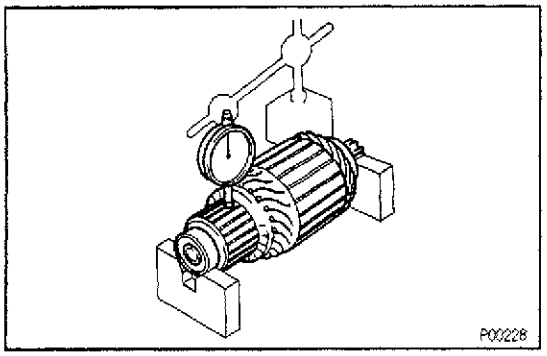
1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

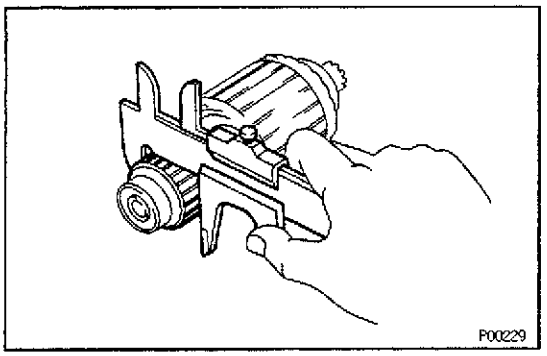
Using an ohmmeter, check that there is continuity between the segments of the commutator.
If there is no continuity between any segment, replace the armature.

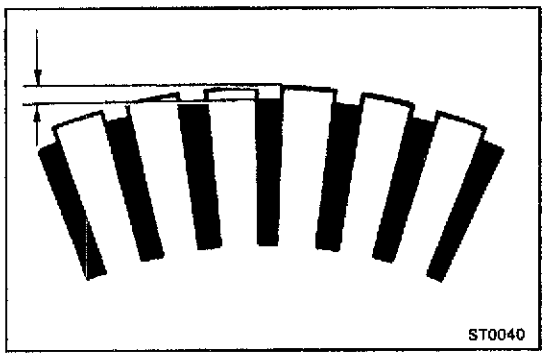


2. INSPECT COMMUTATOR FOR GROUND

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







Commutator

1. **INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES**

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

2. **INSPECT COMMUTATOR CIRCLE RUNOUT**

(a) Place the commutator on V—blocks.

(b) Using a dial indicator, measure the circle runout.

Maximum circle runout:

0.05 mm (0.0020 in.)

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

3. **INSPECT COMMUTATOR DIAMETER**

Using vernier calipers, measure the commutator diameter.

Standard diameter:

1.2 kW type: 30 mm (1.18 in.)
1.4 kW type: 30 mm (1.18 in.)
2.0 kW type: 35 mm (1.378 in.)

Minimum diameter:

1.2 kW type: 29 mm (1.14 in.)
1.4 kW type: 29 mm (1.14 in.)
2.0 kW type: 34 mm (1.339 in.)

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

4. **INSPECT UNDERCUT DEPTH**

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

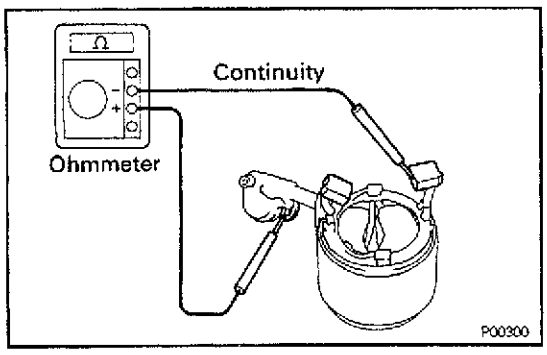
Standard undercut depth:

1.2 kW type: 0.6 mm (0.024 in.)
1.4 kW type: 0.6 mm (0.024 in.)
2.0 kW type: 0.7 mm (0.028 in.)

Minimum undercut depth:

0.2 mm (0.008 in.)

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

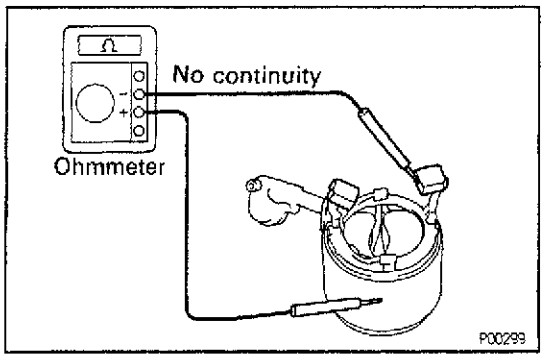


Field Frame (Field Coil)

1. **INSPECT FIELD COIL FOR OPEN CIRCUIT**

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

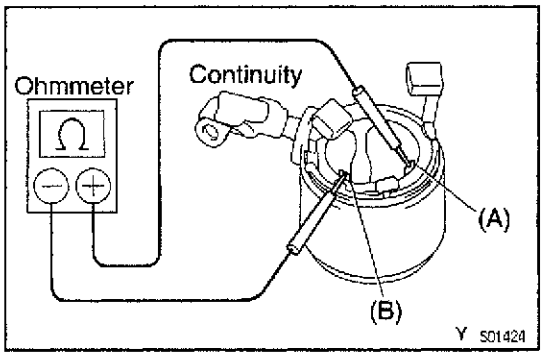
If there is no continuity, replace the field frame.



2. INSPECT 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.



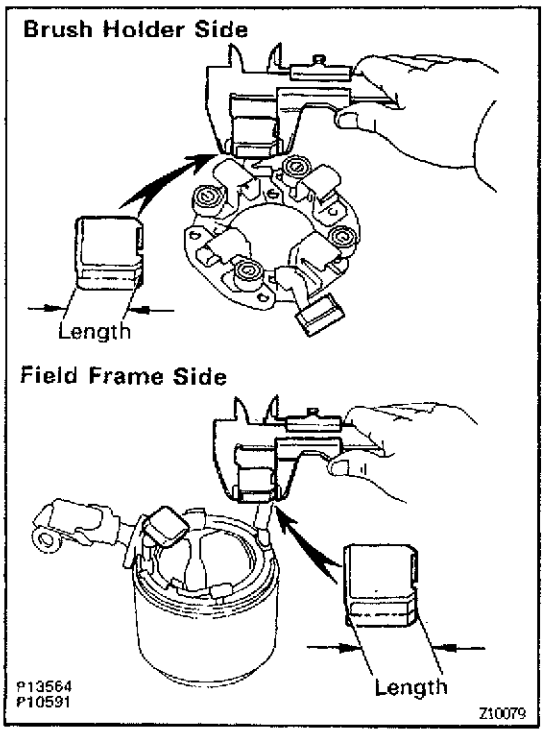
3. 2.0 kW type:

INSPECT SHUNT COIL FOR RESISTANCE

Using an ohmmeter, check that the resistance between the shunt terminal (A) and shunt terminal (B).

Standard Resistance:

At 20°C: 1.5 – 1.9 Ω



Brushes

INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

Standard length:

1.2 kW type: 15.5 mm (0.610 in.)

1.4 kW type: 15.5 mm (0.610 in.)

2.0 kW type: 15.0 mm (0.596 in.)

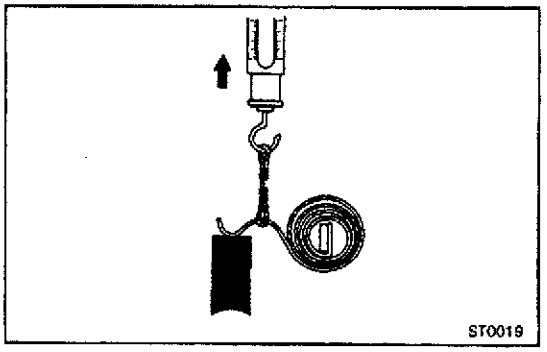
Minimum length:

1.2 kW type: 10.0 mm (0.394 in.)

1.4 kW type: 10.0 mm (0.394 in.)

2.0 kW type: 9.0 mm (0.355 in.)

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



Brush Springs

INSPECT BRUSH SPRING LOAD

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

Spring installed load:

1.2 kW type:

13.7 – 19.6 N (1.40 – 2.00 kgf, 3.1 – 4.4 lbf)

1.4 kW type:

17.6 – 23.5 N (1.80 – 2.40 kgf, 4.0 – 5.3 lbf)

2.0 kW type:

21.5 – 27.5 N (2.20 – 2.80 kgf, 4.9 – 6.2 lbf)

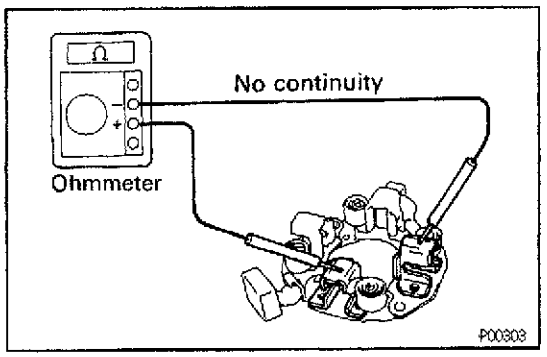
Minimum spring installed load:

1.2 kW type: 9.8 N (1.0 kgf, 2.2 lbf)

1.4 kW type: 11.8 N (1.2 kgf, 2.6 lbf)

2.0 kW type: 12.7 N (1.30 kgf, 2.7 lbf)

If the installed load is not within specification, replace the brush springs.



Brush Holder

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.

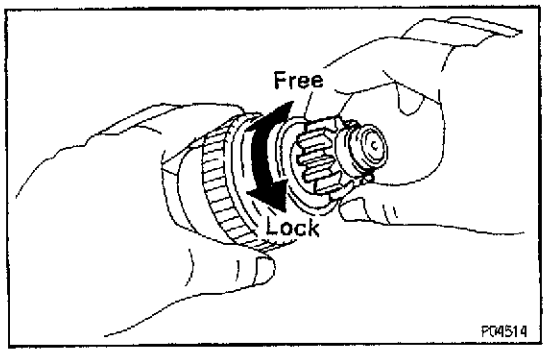
Clutch and Gears

1. INSPECT GEAR TEETH

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

If damaged, replace the gear or clutch assembly.

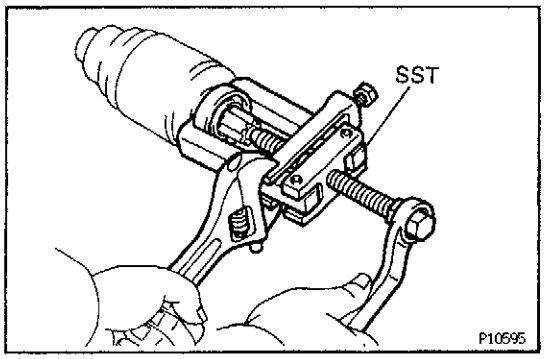
If damaged, also check the fly wheel ring gear for wear or damage.



2. INSPECT CLUTCH PINION GEAR

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

If necessary, replace the clutch assembly.



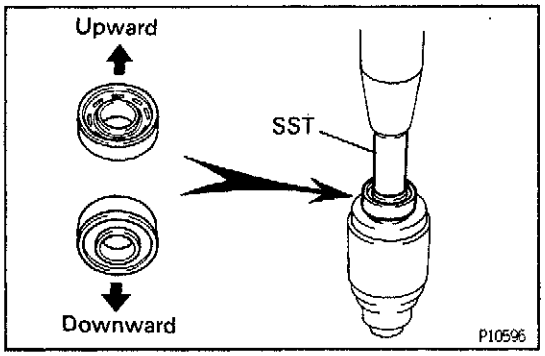
Bearings

3. INSPECT FRONT BEARING

Turn the bearing by hand while applying inward force. If resistance is felt or the bearing sticks, replace the bearing.

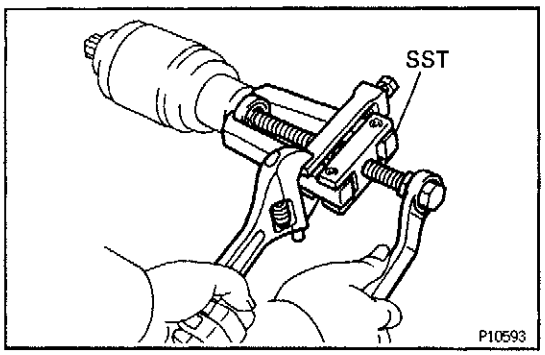
4. IF NECESSARY, REPLACE FRONT BEARING

(a) Using SST, remove the bearing.
SST 09286–46011



(b) Using a press, press in a new front bearing.
NOTICE: Be careful of the bearing installation direction.
SST 09201–41020

ST

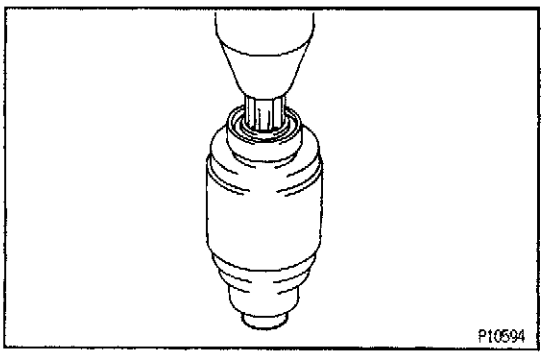


1. INSPECT REAR BEARING

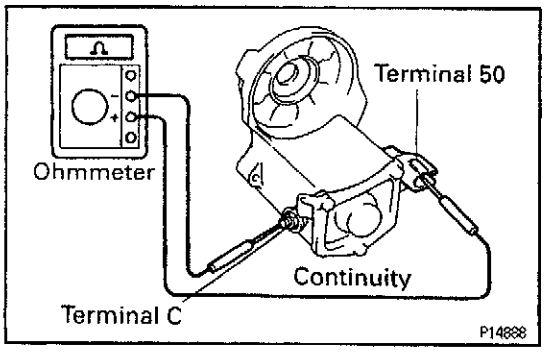
Turn the bearing by hand while applying inward force. If resistance is felt or the bearing sticks, replace the bearing.

2. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing.
SST 09286–46011



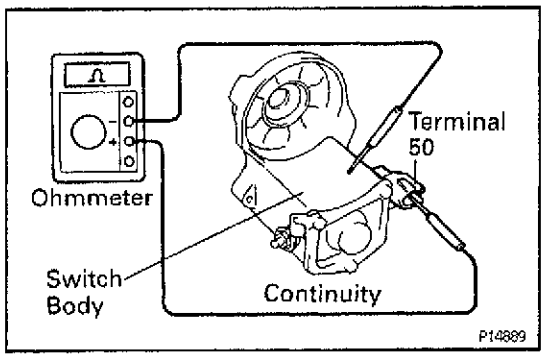
(b) Using a press, press in a new rear bearing.



Magnetic Switch

1. 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, check and replace the magnetic switch.

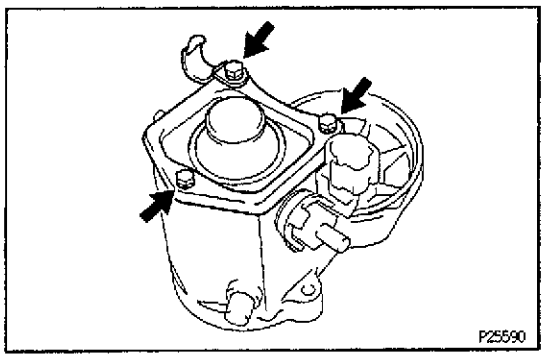


2. DO HOLD–IN COIL OPEN CIRCUIT TEST

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

If there is no continuity, replace the magnetic switch.

ST

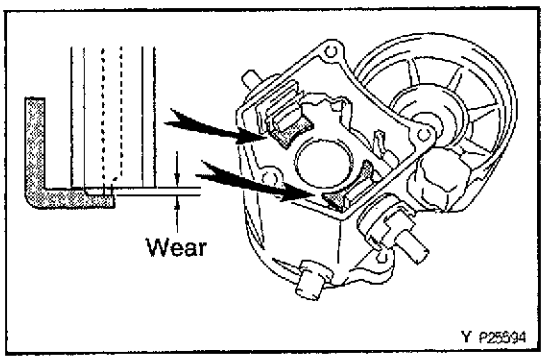


ST0D8–03

MAGNETIC SWITCH TERMINAL KIT PARTS REPLACEMENT

1. REMOVE MAGNETIC SWITCH END COVER

Remove the 3 bolts, lead clamp(2.0 kW type), end cover, gasket and plunger.



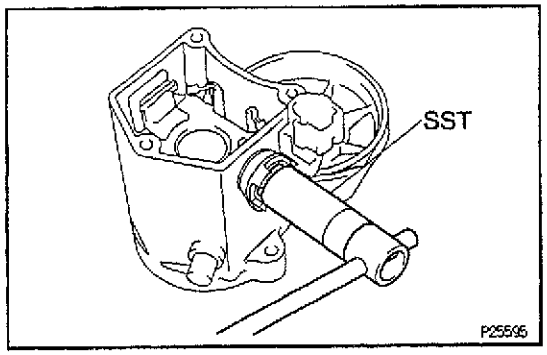
2. INSPECT CONTACT PLATE FOR WEAR

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.

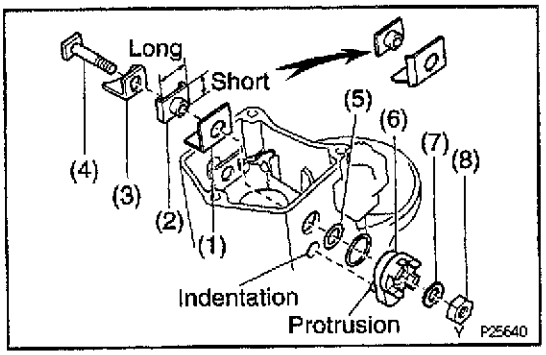


3. REMOVE TERMINAL KIT PARTS

(a) Using SST, loosen the terminal nuts.
SST 09810–38140

(b) Terminal C:
Remove the terminal nut, wave washer, terminal insulator (outside), O–ring, terminal bolt, contact plate and terminal insulator (inside).

(c) Terminal 30:
Remove the terminal nut, wave washer, terminal insulator (outside), packing, O–ring, terminal bolt, contact plate, terminal insulator (inside) and insulation paper.



4. REINSTALL TERMINAL KIT PARTS

(a) Install these new parts:
Terminal 30:
(1) Insulation paper
(2) Terminal insulator (inside)

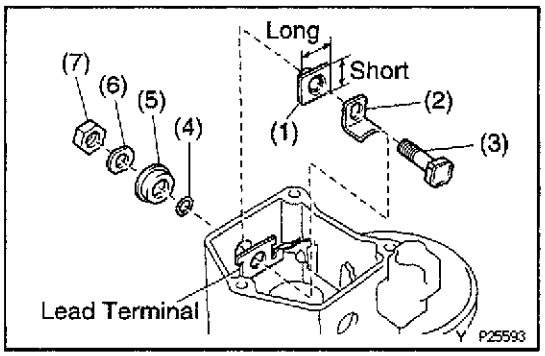
NOTICE: Be careful to install the terminal insulator in the correct direction.

(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



Terminal C:

(1) Terminal insulator (inside)

NOTICE: Be careful to install the terminal insulator in the correct direction.

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

(b) Temporarily tighten the terminal nuts.

5. TIGHTEN TERMINAL NUT

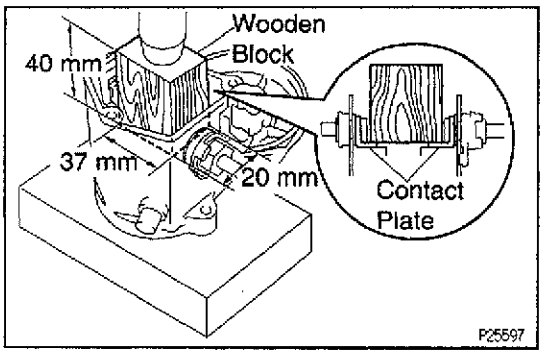
(a) Put a wooden block on the contact plate and press it down with a hand press.

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:

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

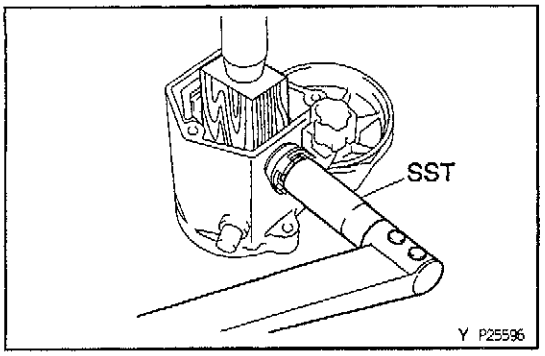
$$(\text{psi}) = \frac{221\ \text{lbf}}{\left(\frac{\text{Ram diameter (in.)}}{2}\right)^2 \times 3.14\ (\pi)}$$

(kPa) = (kgf/cm²) x 98.1

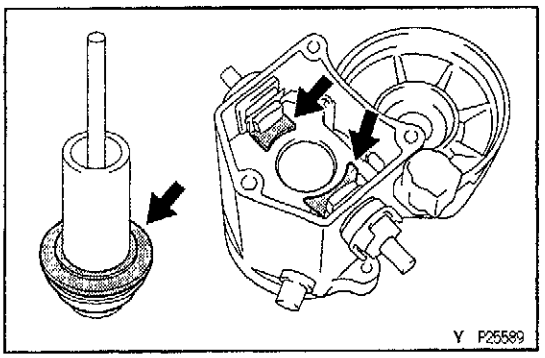
(kPa) = (psi) x 6.9

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- **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.**



(b) Using SST, tighten the nuts to the specified torque.
SST 09810–38140
Torque: 17 N·m (170 kgf·cm, 12 ft·lbf)
NOTICE: If the nut is over tightened, it may cause cracks on the inside of the insulator.



6. CLEAN CONTACT SURFACES OF CONTACT PLATE AND PLUNGER
Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag.

7. REINSTALL MAGNETIC SWITCH END COVER
Install the plunger, new gasket, end cover and lead clamp(2.0 kW type) with the 3 bolts.
Torque:
1.2 kW type: 2.5 N·m (26 kgf·cm, 23 in.·lbf)
1.4 kW type: 2.5 N·m (26 kgf·cm, 23 in.·lbf)
2.0 kW type: 3.6 N·m (37 kgf·cm, 32 in.·lbf)

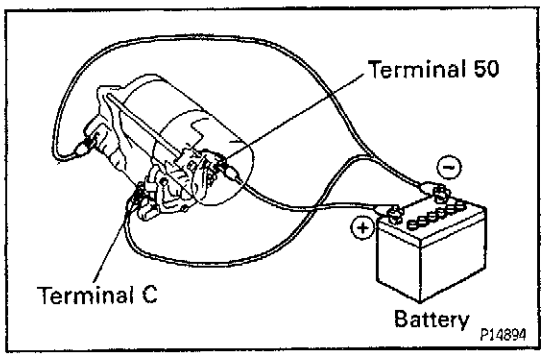
STARTER ASSEMBLY

ST0AA–03

Assembly is in the reverse order of disassembly.
HINT: Use high–temperature grease to lubricate the bearings and gears when assembling the starter.

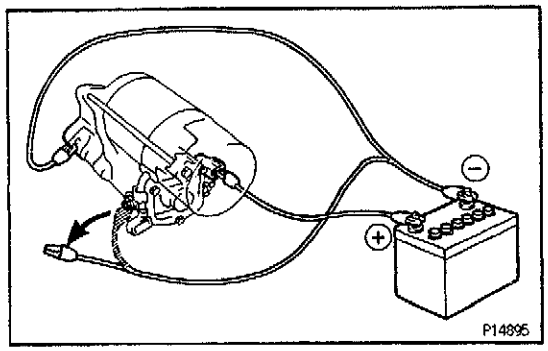
STARTER PERFORMANCE TEST

ST010–1F



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

1. DO PULL–IN TEST
(a) Disconnect the field coil lead wire from terminal C.
(b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.



2. DO HOLD–IN TEST
With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear remains out.