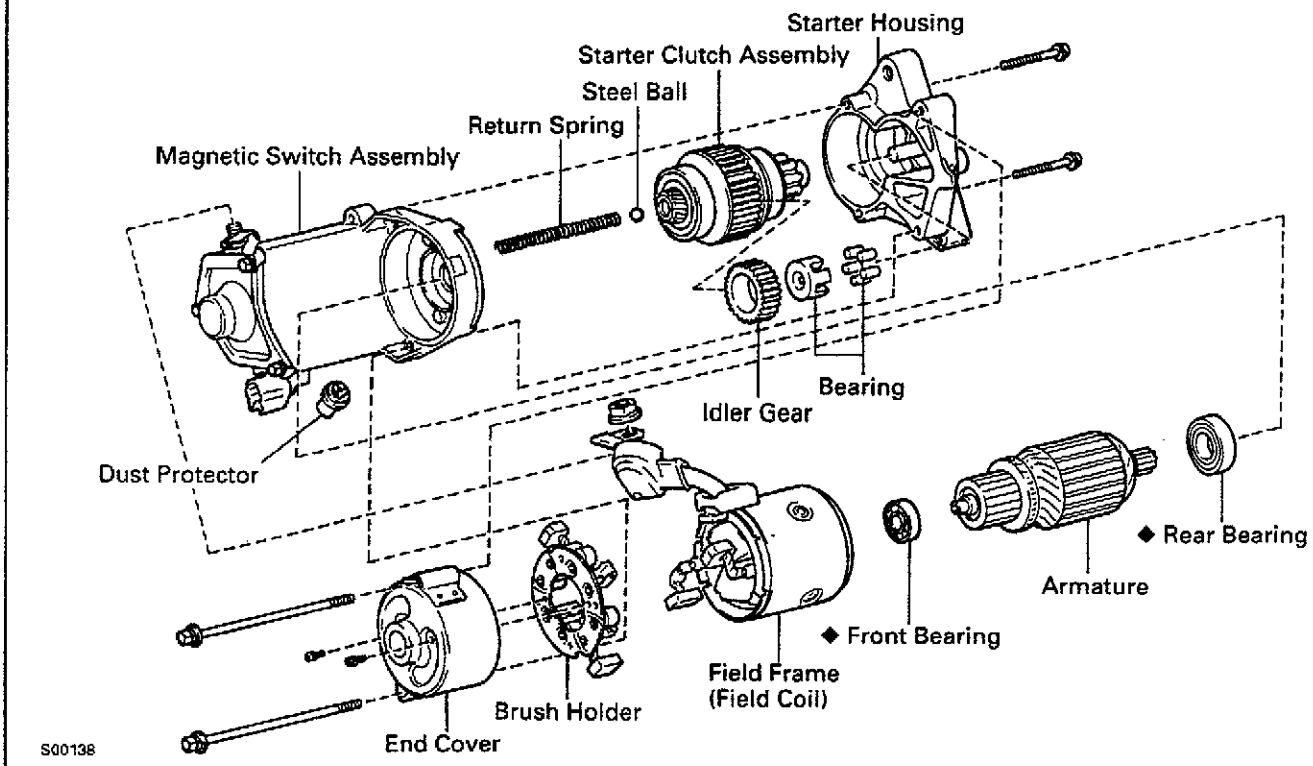
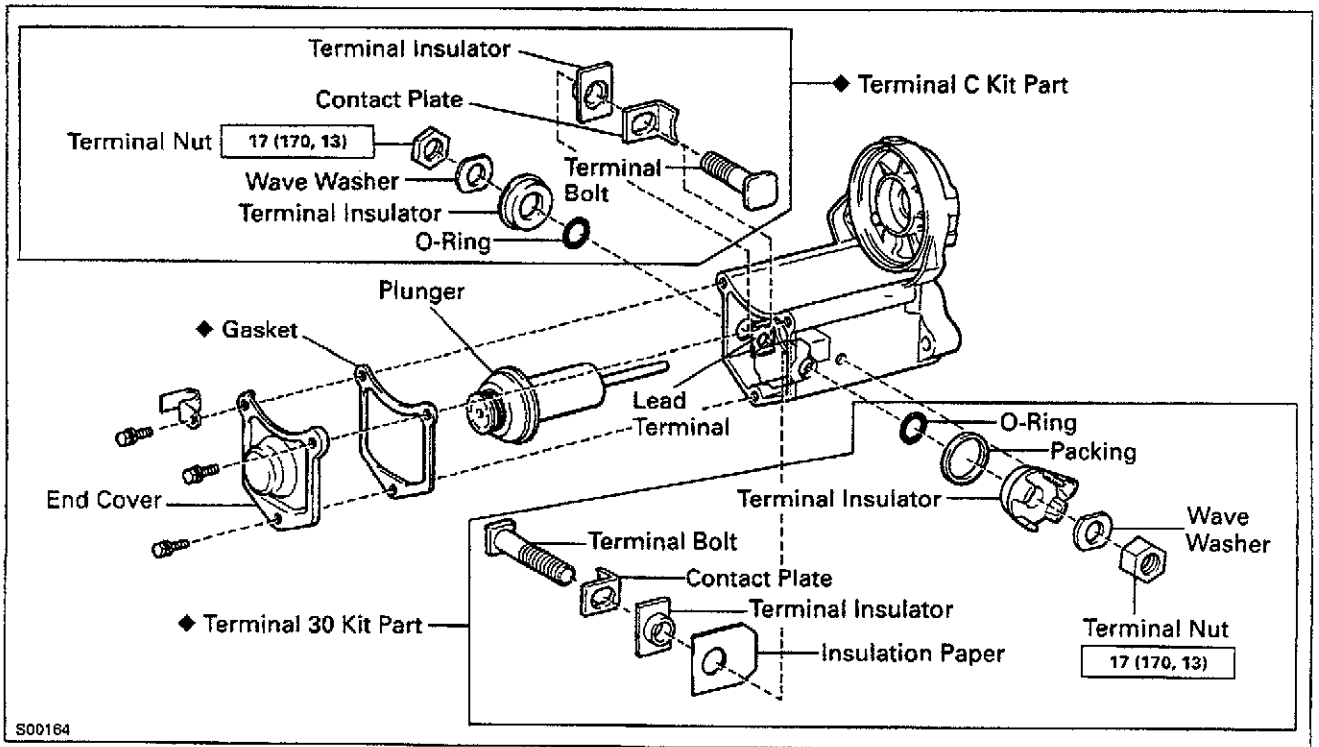
STARTER

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

ST00W-1N



Magnetic Switch Assembly

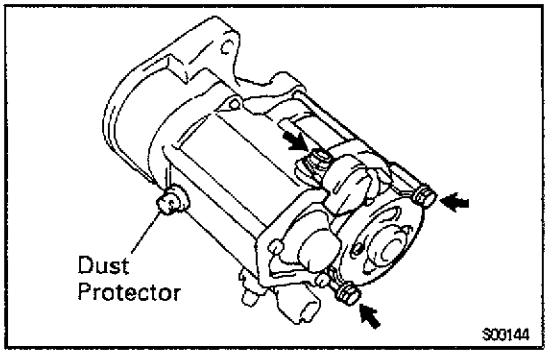


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

Z15817

STARTER DISASSEMBLY



1. REMOVE DUST PROTECTOR

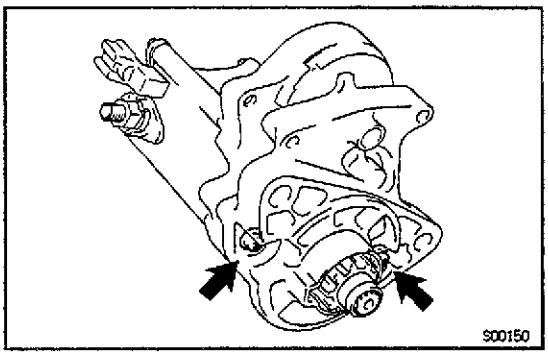
2. REMOVE FIELD FRAME AND ARMATURE

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

(b) Remove the 2 through bolts.

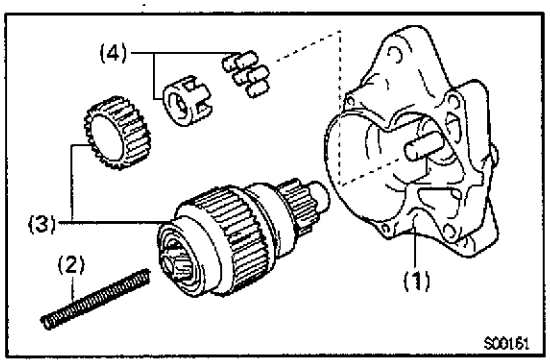
(c) Pull out the field frame together with the armature from the magnetic switch.

ST

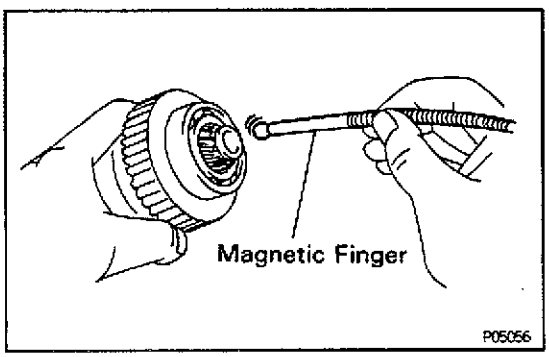


3. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Remove the 2 screws.

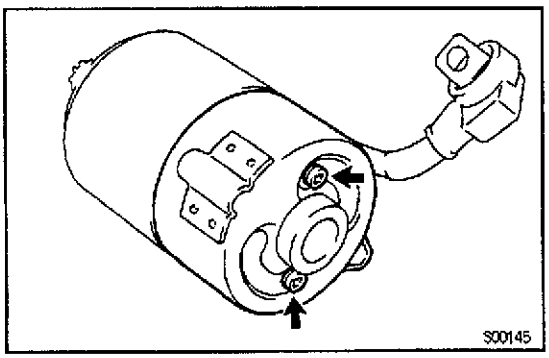


(b) Remove these parts from the magnetic switch:
- (1) Starter housing
- (2) Return spring
- (3) Starter clutch assembly and idler gear
- (4) Bearing



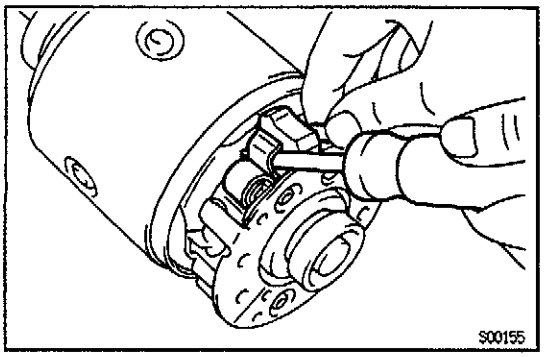
4. REMOVE STEEL BALL

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



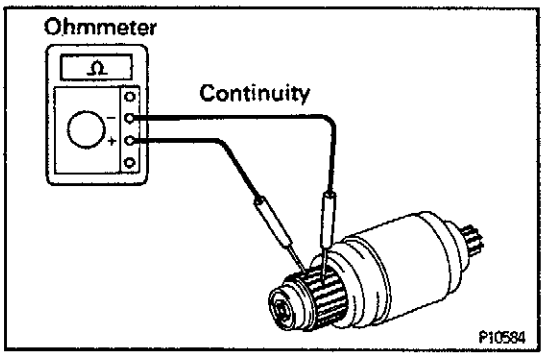
5. REMOVE BRUSH HOLDER

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



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

6. **REMOVE ARMATURE FROM FIELD FRAME**



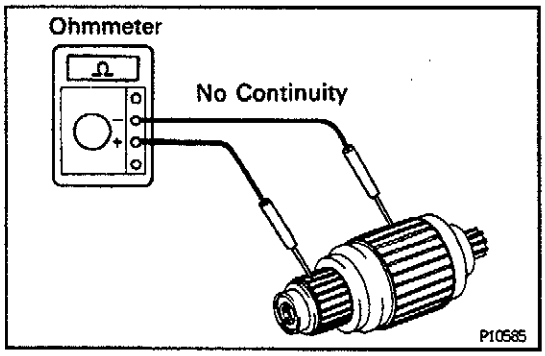
STARTER INSPECTION AND REPAIR

47OCP-02

ST

Armature Coil

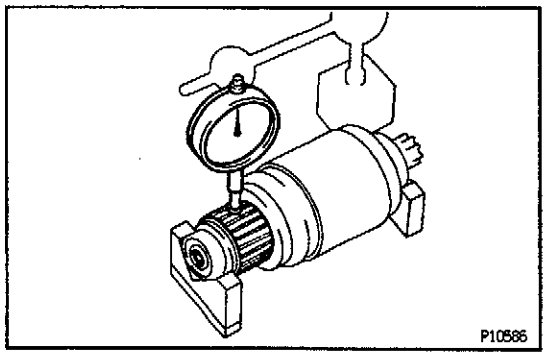
1. **INSPECT COMMUTATOR FOR OPEN CIRCUIT**
Using an ohmmeter, check that there is continuity between the segments of the commutator.
If there is no continuity between any segment, replace the armature.



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**

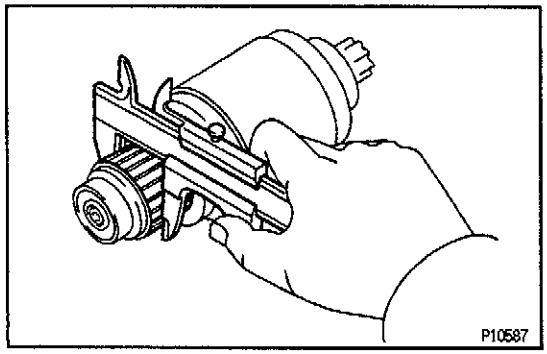
(a) Place the commutator on V—blocks.

(b) Using a dial 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.



3. **INSPECT COMMUTATOR DIAMETER**
Using vernier calipers, measure the commutator diameter.

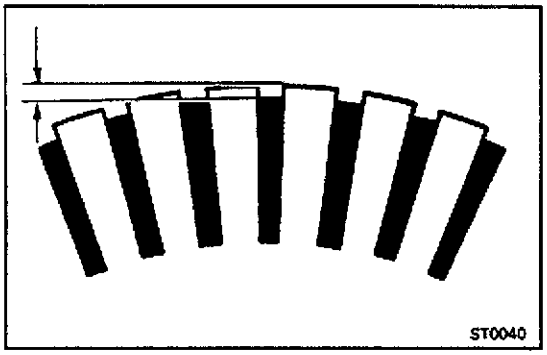
Standard diameter:

30.0 mm (1.181 in.)

Minimum diameter:

29.0 mm (1.142 in.)

If the diameter is less than 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:

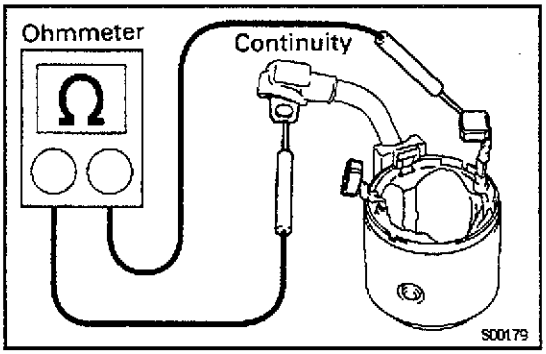
0.6 mm (0.024 in.)

Minimum undercut depth:

0.2 mm (0.008 in.)

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

ST

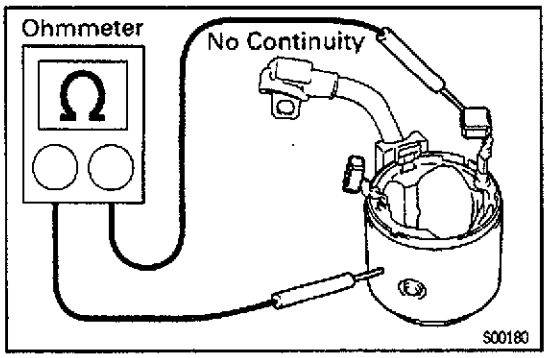


Field Coil (Field frame)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

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

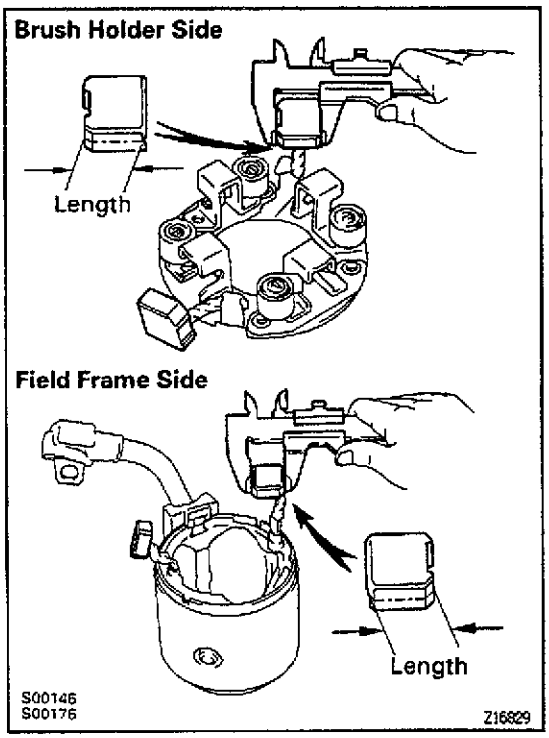
If there is no continuity, replace the field frame.



2. INSPECT FIELD COIL FOR GROUND

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

If there is continuity, replace the field frame.



Brushes

INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

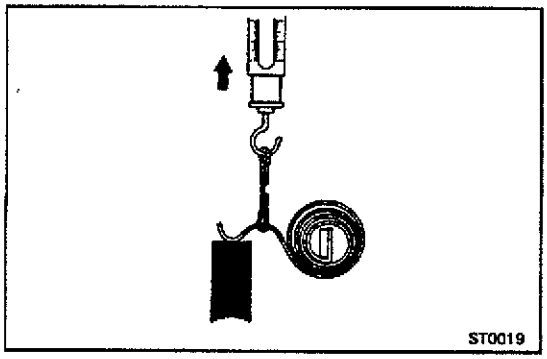
Standard length:

13.5 mm (0.531 in.)

Minimum length:

8.5 mm (0.335 in.)

If the length is less than 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.

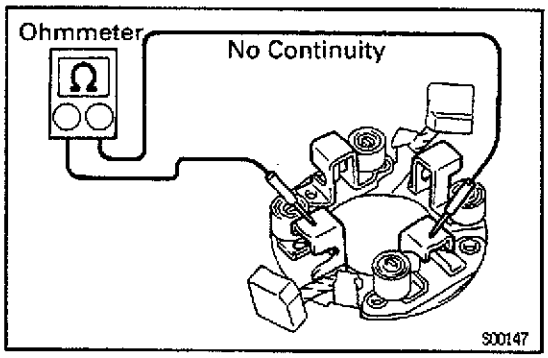
Standard spring installed load:

17.6 – 23.5 N (1.8 – 2.4 kgf, 4.0 – 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.



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.

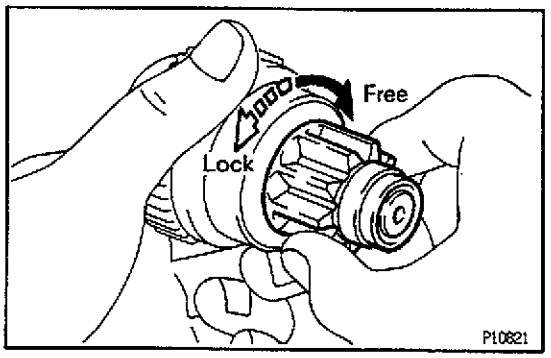
Clutch and Gears

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.

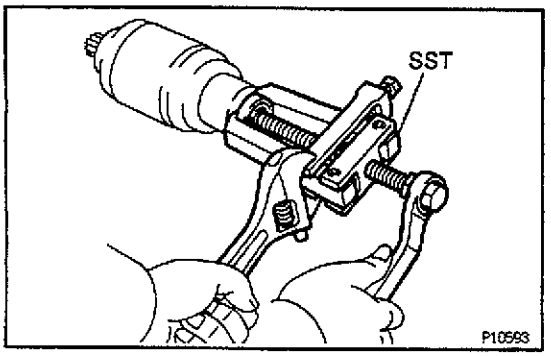
If damaged, also check the ring gear of the flywheel for wear or damage.



2. **INSPECT CLUTCH PINION GEAR**

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

1. **INSPECT FRONT BEARING**

Turn the bearing by hand while applying inward force.

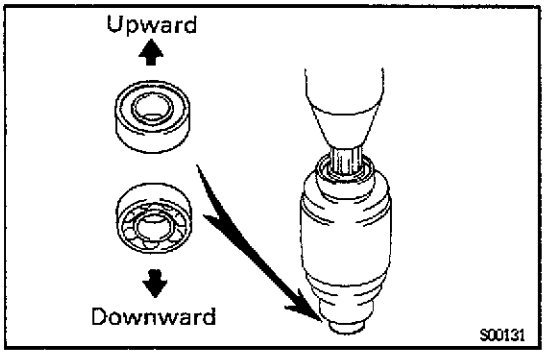
If resistance is felt or the bearing sticks, replace the bearing.

2. **IF NECESSARY, REPLACE FRONT BEARING**

(a) Using SST, remove the bearing.

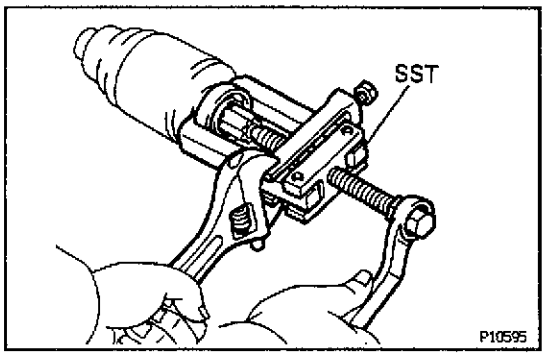
SST 09286–46011

ST



(b) Using a press, press in a new bearing.
NOTICE: Be careful of the installation direction.

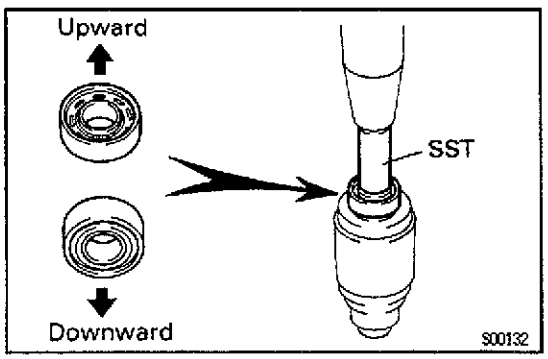
ST



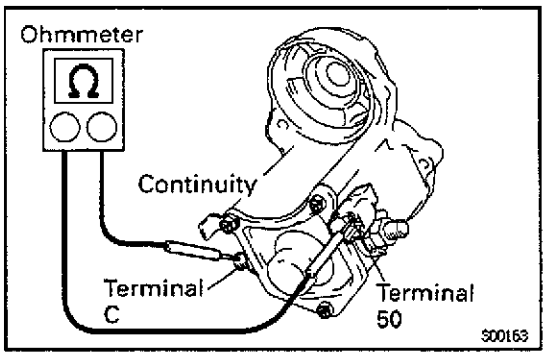
3. INSPECT REAR BEARING
Turn the bearing by hand while applying inward force. If resistance is felt or the bearing sticks, replace the bearing.

4. IF NECESSARY, REPLACE REAR BEARING

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

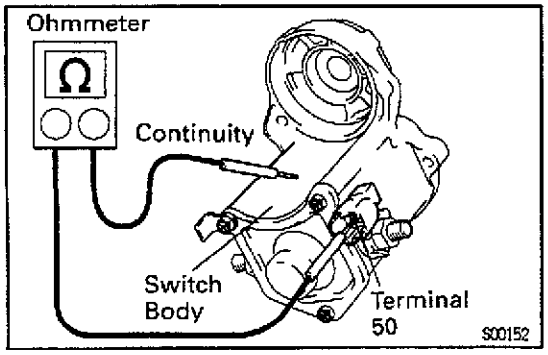


(b) Using SST and a press, press in a new bearing.
SST 09820–00030
NOTICE: Be careful of the installation direction.

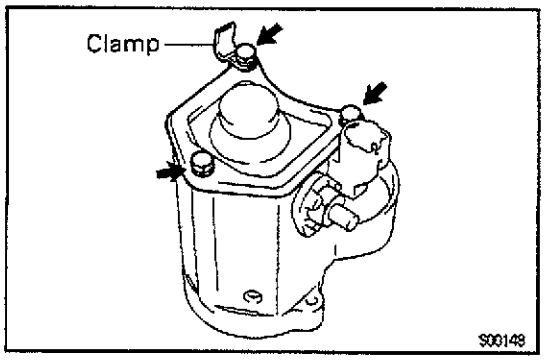


Magnetic Switch

1. PERFORM 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.



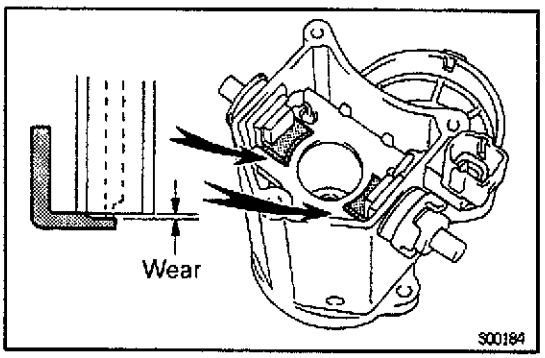
2. PERFORM HOLD–IN COIL OPEN CIRCUIT TEST
Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch.



MAGNETIC SWITCH TERMINAL KIT PARTS REPLACEMENT

1. REMOVE MAGNETIC SWITCH END COVER

Remove the 3 bolts, lead clamp, end cover, gasket and plunger.



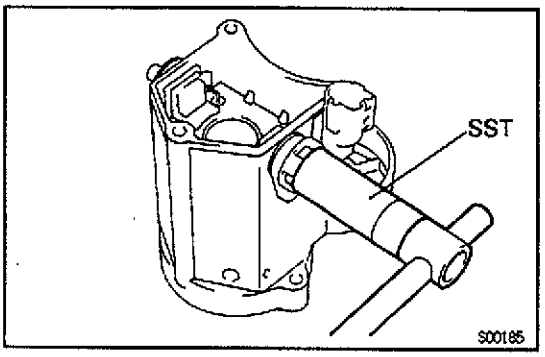
2. INSPECT CONTACT PLATE FOR WEAR

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.

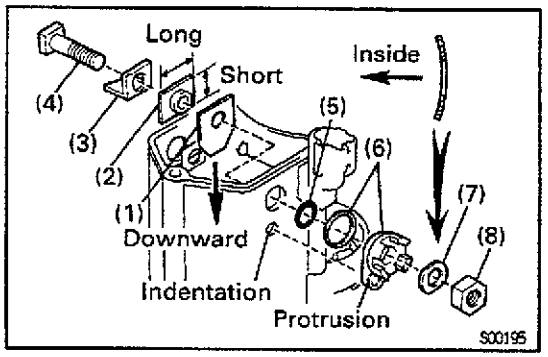


3. REMOVE TERMINAL KIT PARTS

(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.



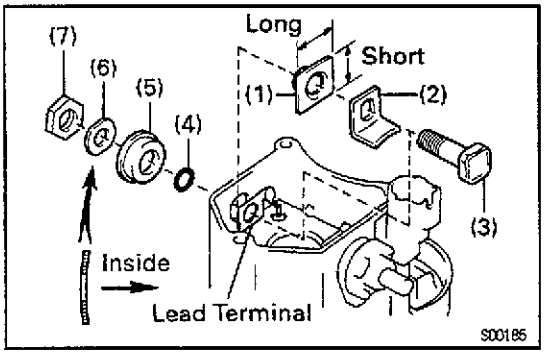
4. REINSTALL TERMINAL KIT PARTS

(a) Install these new parts:
Terminal 30:
(1) Insulation paper
(2) Terminal insulator (inside)
(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 insulator (inside) and wave washer in the correct direction.



Terminal C:
(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.

(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:

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

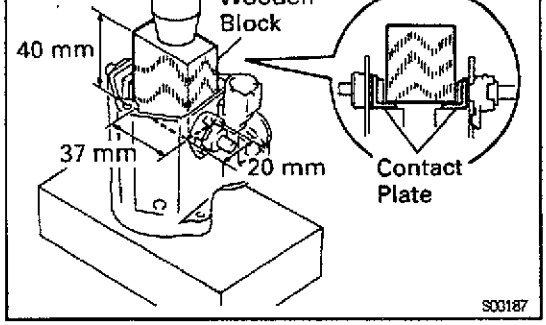
$$(psi) = \frac{221\ lbf}{\left(\frac{\text{Ram diameter (in.)}}{2}\right)^2 \times 3.14\ (\pi)}$$

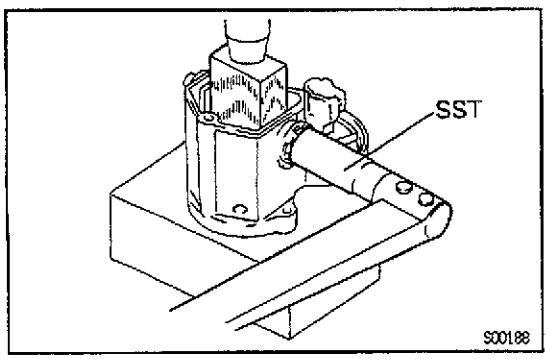
(kPa) = (kgf/cm²) x 98.1

(kPa) = (psi) x 6.9

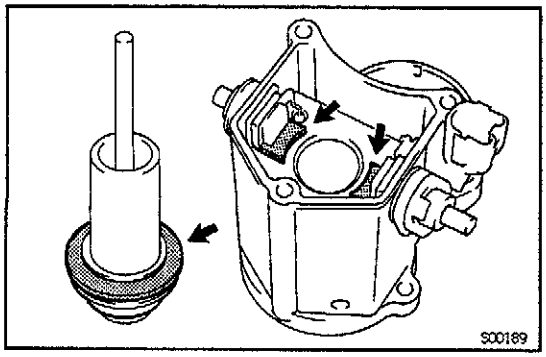
V06796

- **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, 13 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 with the 3 bolts.
Torque: 3.6 N·m (37 kgf·cm, 32 in.·lbf)

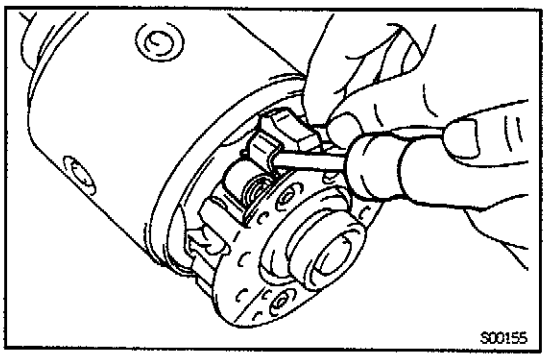
STARTER ASSEMBLY

ST0CR-02

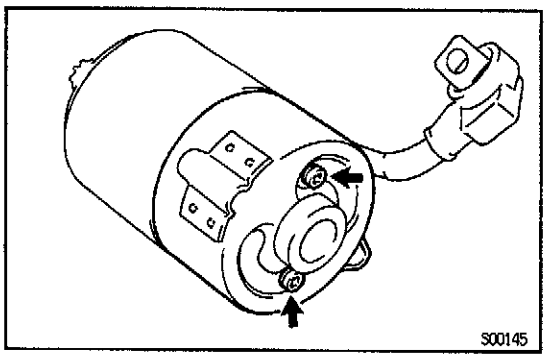
ST

HINT: Use high–temperature grease to lubricate the bearings and gears when assembling the starter.

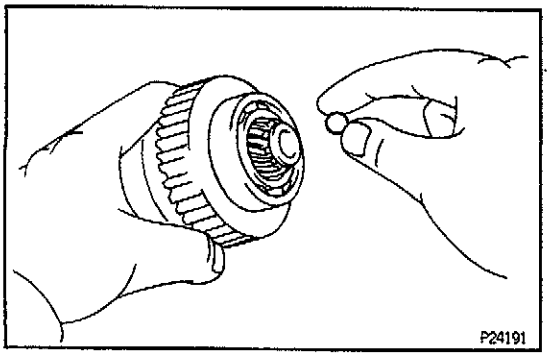
1. **PLACE ARMATURE INTO FIELD FRAME**
Apply grease to the armature bearings, and insert the armature into the field frame.



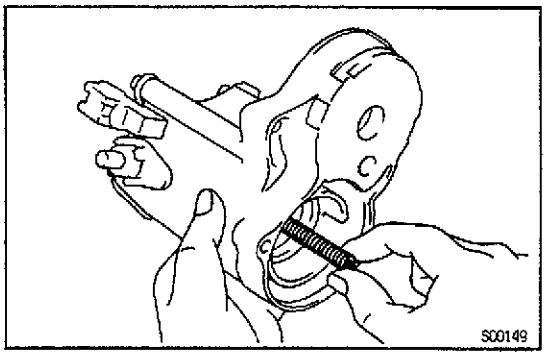
2. **INSTALL BRUSH HOLDER**
(a) Place the brush holder on the armature.
(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the 4 brushes.
NOTICE: Check that the positive (+) lead wires are not grounded.



(c) Install the end cover to the field frame with the 2 screws.
Torque: 1.5 N·m (15 kgf·cm, 13 in.·lbf)



3. **INSERT STEEL BALL INTO CLUTCH SHAFT HOLE**
(a) Apply grease to the steel ball.
(b) Insert the steel ball into the clutch shaft hole.

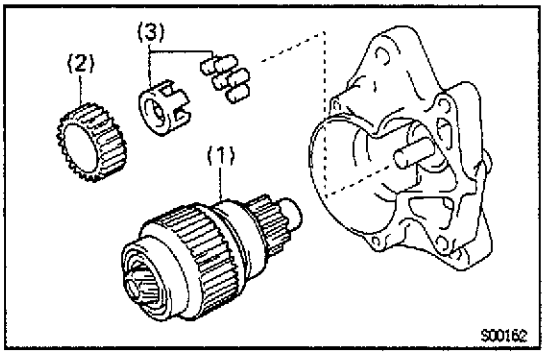


4. INSTALL STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

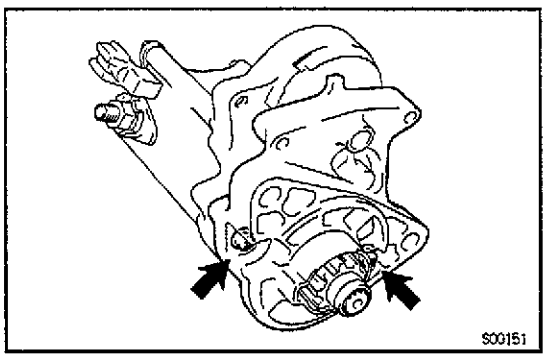
(a) Apply grease to the return spring.

(b) Insert the return spring into the magnetic switch hole.

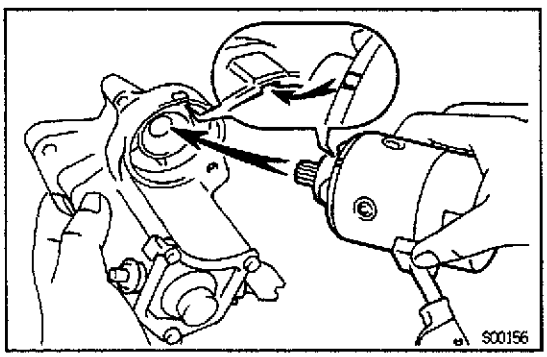
ST



(c) Place these parts on the starter housing:
- (1) Starter clutch assembly
- (2) Idler gear
- (3) Bearing

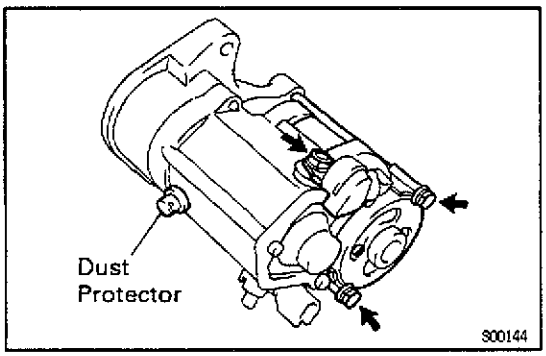


(d) Install the starter housing to the magnetic switch with the 2 screws.
Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)



5. INSTALL FIELD FRAME AND ARMATURE ASSEMBLY

(a) Align the protrusion of the field frame with the cutout of the magnetic switch.



(b) Install the field frame and armature assembly with the 2 through bolts.
Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

(c) Connect the lead wire to terminal C, and install the nut.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

6. INSTALL DUST PROTECTOR