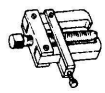
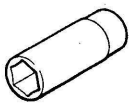
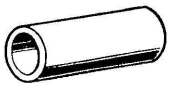
STARTING

PREPARATION ..... ST– 2
STARTER ..... ST– 3
SERVICE SPECIFICATIONS ..... ST– 16

PREPARATION

SST (SPECIAL SERVICE TOOLS)

ST01A-0N

	09286-46011	Injection Pump Spline Shaft Puller	Armature bearing
	09810-38140	Starter Magnet Switch Nut Wrench 14	Terminal nut
	09820-00030	Alternator Rear Bearing Replacer	Armature front bearing

ST

RECOMMENDED TOOLS

ST01C-0R

	09082-00050	TOYOTA Electrical Tester Set.	

EQUIPMENT

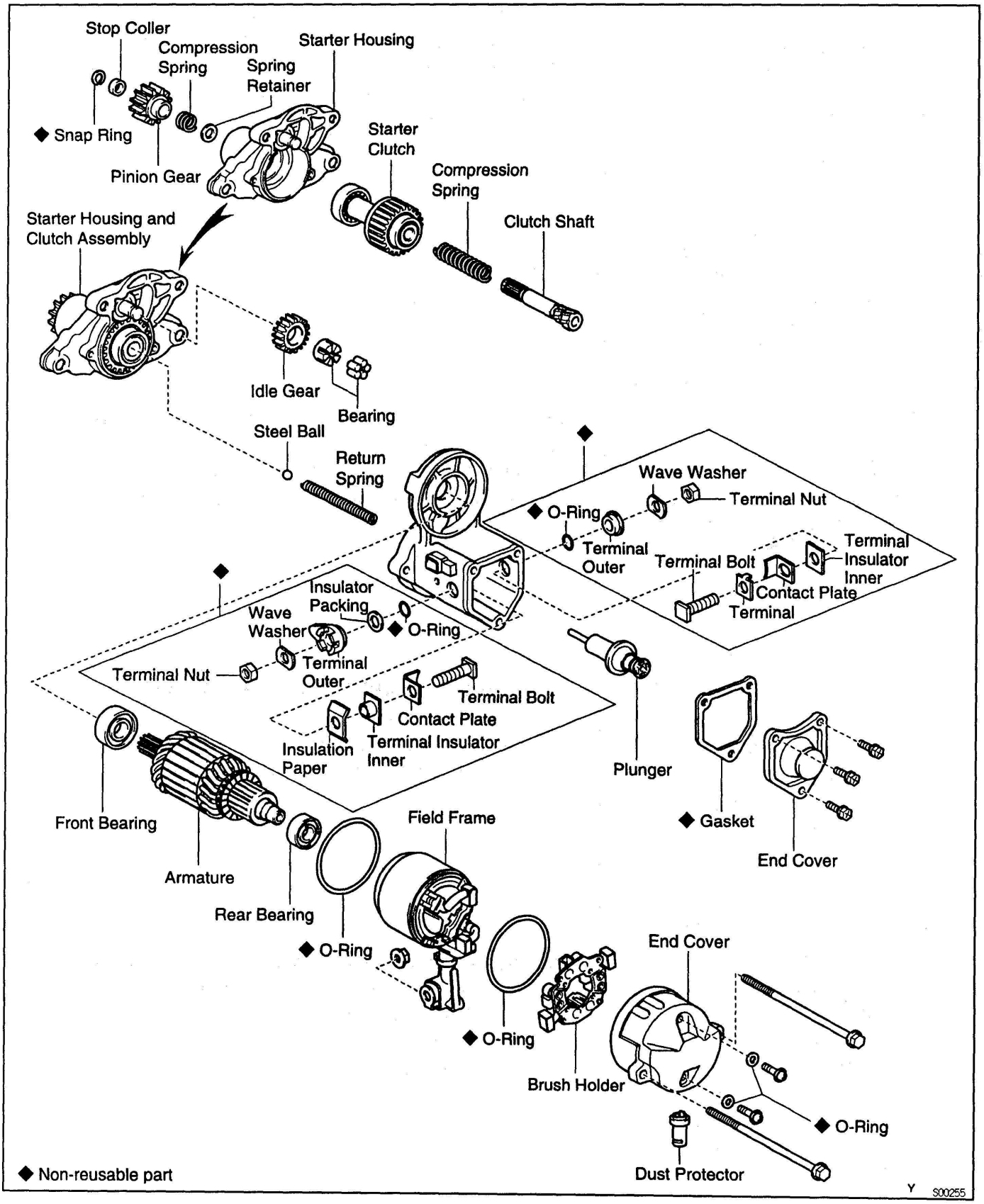
ST01E-0C

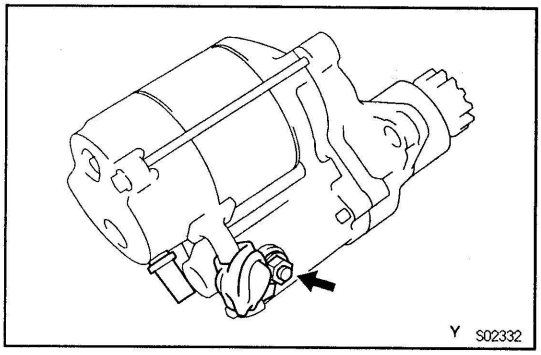
Dial indicator	Commutator
Magnetic finger	Steel ball
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V-block	Commutator
Vernier calipers	Commutator, Brush
Press	Magnetic switch terminal kit

STARTER

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

ST01D-08





STARTER DISASSEMBLY

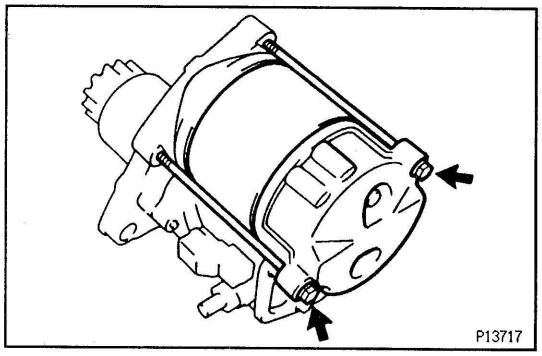
ST0F8-01

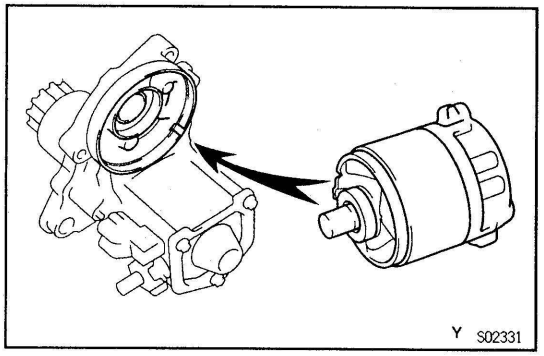
ASSEMBLY HINT: Use high–temperature grease to lubricate the bearings, springs, steel ball, and gears when assembling the starter.

1. **REMOVE DUST PROTECTOR**
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)

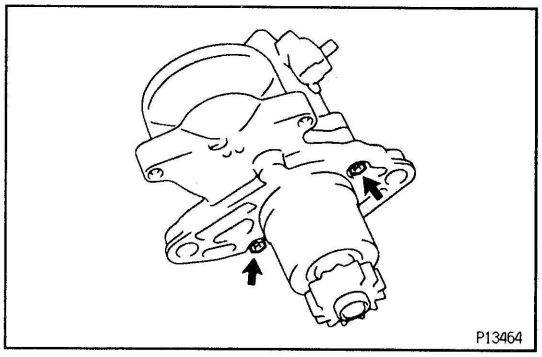
(b) Remove the 2 through bolts.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)





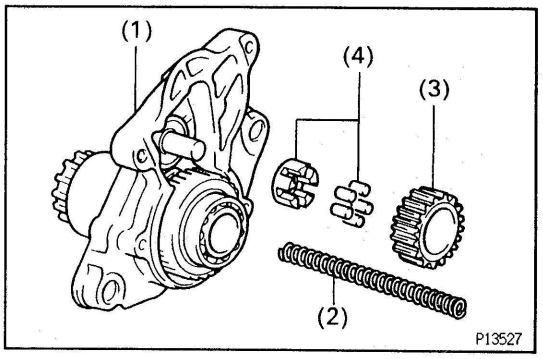
(c) Pull out the field frame together with the armature.

(d) Remove the O–ring from the field frame.
ASSEMBLY NOTICE: Align the protrusion of the field frame with the groove of the magnetic switch.

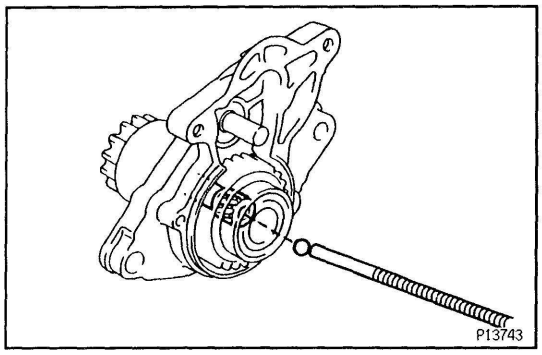


3. **REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR**

(a) Remove the 2 screws.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

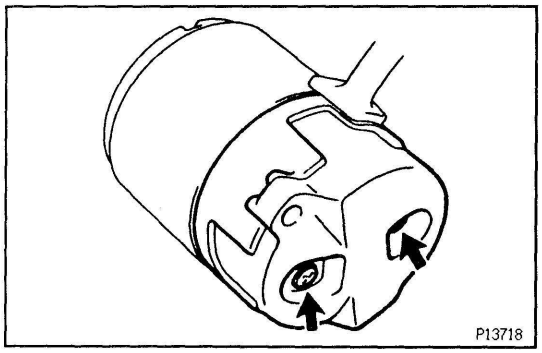


(b) Remove these parts from the magnetic switch:
(1) Starter housing and clutch assembly
(2) Return spring
(3) Idler gear
(4) Bearing



4. REMOVE STEEL BALL

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

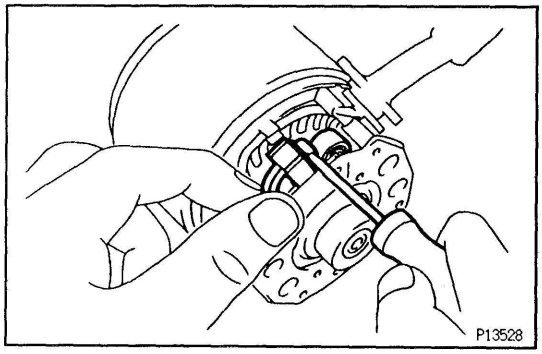


5. REMOVE BRUSH HOLDER

(a) Remove the 2 screws, 2 O–rings 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.

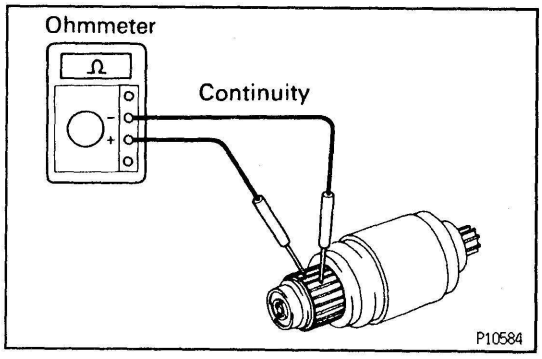


(c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder.

Disconnect the 4 brushes, and remove the brush holder.

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

6. REMOVE ARMATURE FROM FIELD FRAME



STARTER INSPECTION AND REPAIR

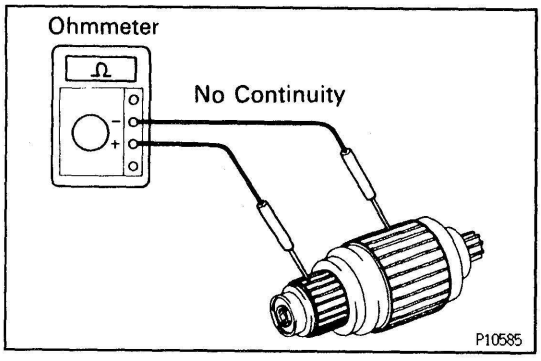
ST0F7-01

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

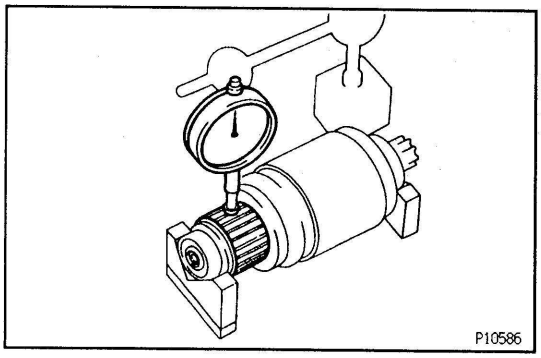
Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

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**

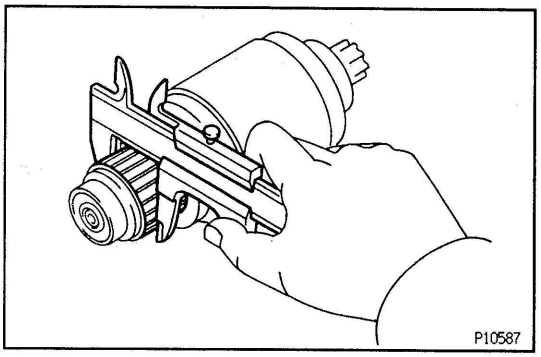
(a) Place the commutator on V–blocks.

(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 a vernier caliper, measure the commutator diameter.

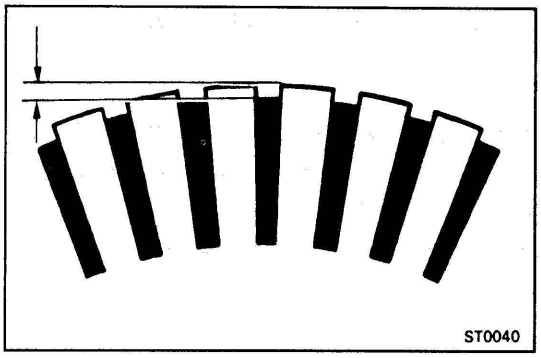
Standard diameter:

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.

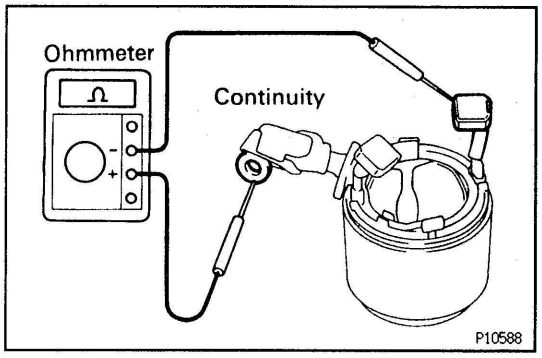
Standard undercut depth:

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.

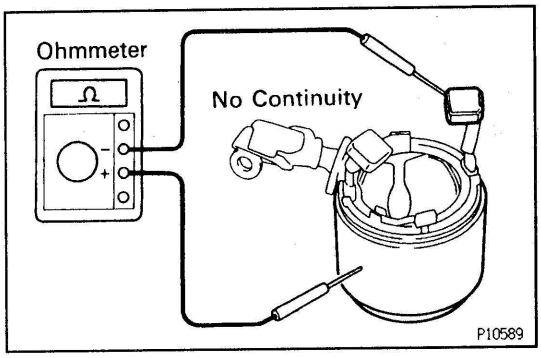


Field Frame (Field Coil)

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

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

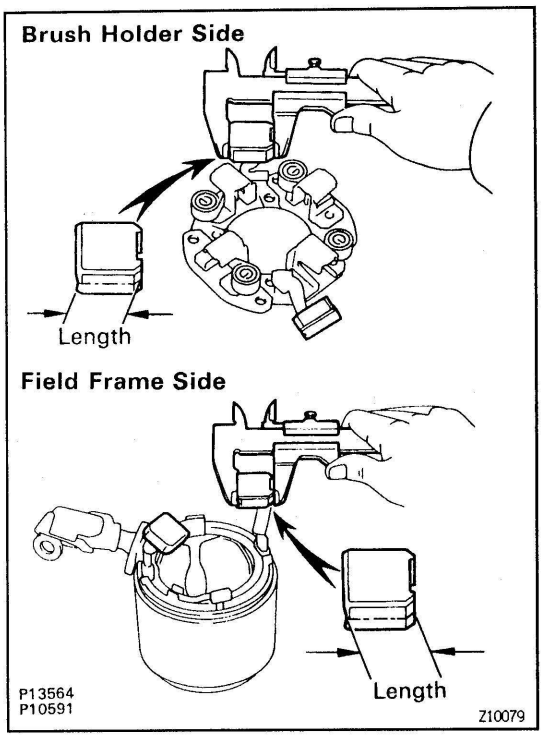
If there is no continuity, replace the field frame.



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.



Brushes

INSPECT BRUSH LENGTH

Using a vernier caliper, measure the brush length.

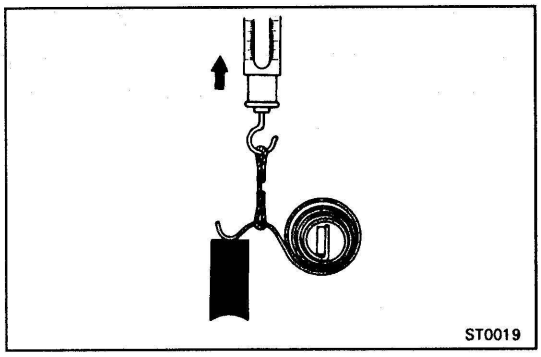
Standard length:

15.5 mm (0.610 in.)

Minimum length:

10 mm (0.393 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:

1.2 kW type:

13.7 – 19.6 N (1.4 – 2.0 kgf, 3.1 – 4.4 bf)

1.4 kW type:

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

Minimum spring installed load:

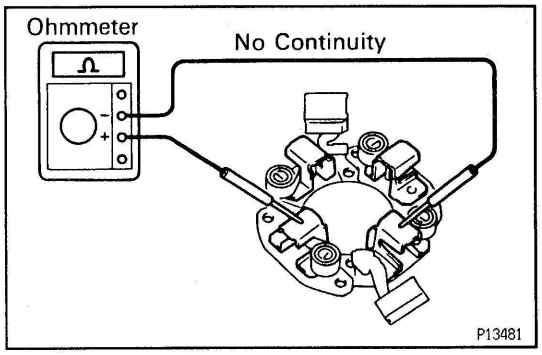
1.2 kW type:

9.8 N (1.0 kgf, 2.2 lbf)

1.4 kW type:

11.8 N (1.2 kgf, 2.6 lbf)

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.

ST

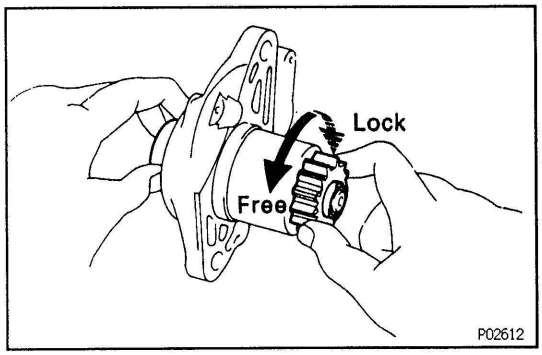
Clutch and Gears

1. INSPECT GEAR TEETH

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

If damaged, replace the gear or clutch assembly.

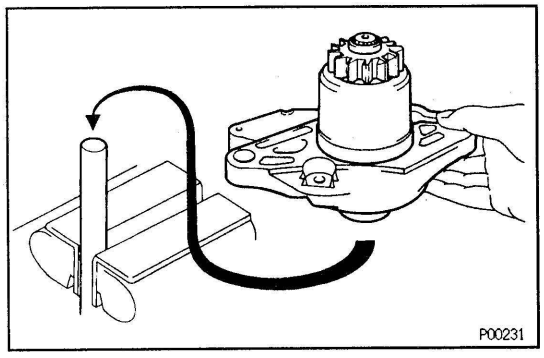
If damaged, also check the drive plate ring gear for wear or damage.



2. INSPECT CLUTCH PINION GEAR

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

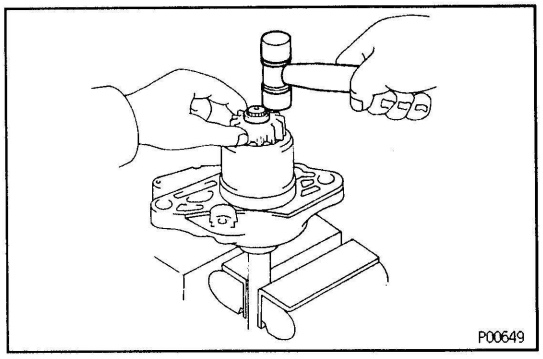
If necessary, replace the clutch assembly.



3. IF NECESSARY, REPLACE CLUTCH ASSEMBLY

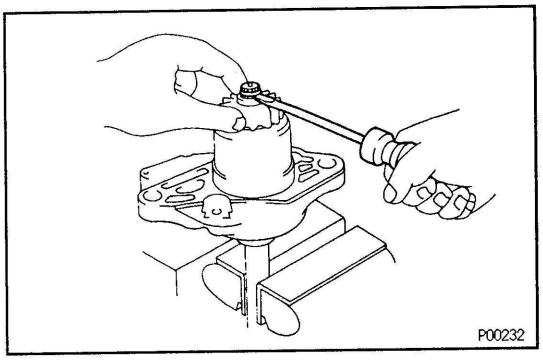
A. Disassembly of starter housing and clutch assembly

(a) Mount a brass bar in a vise, and install the starter housing and clutch assembly to the brass bar.

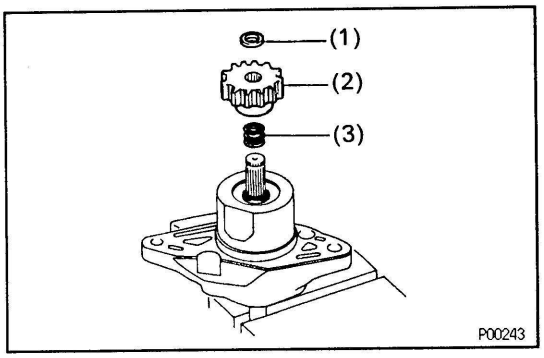


(b) Push down the pinion gear.

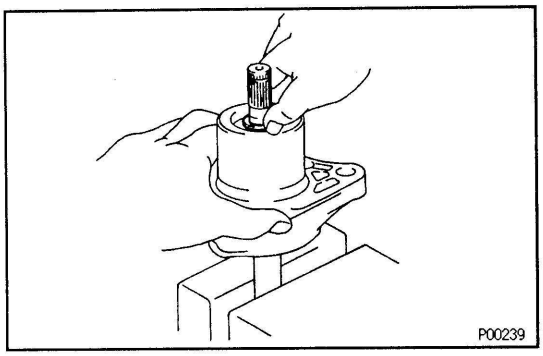
(c) Using a plastic−faced hammer, tap down the stop collar.



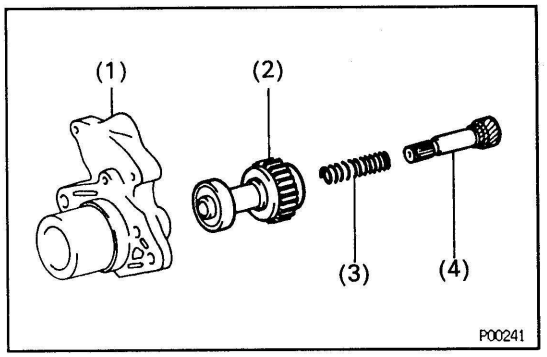
(d) Using a screwdriver, pry out the snap ring.



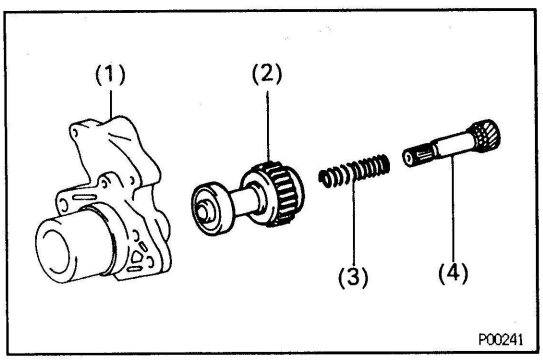
(e) Remove these parts:
(1) Stop collar
(2) Pinion gear
(3) Compression spring



(f) Push down the starter housing, and remove the spring retainer.

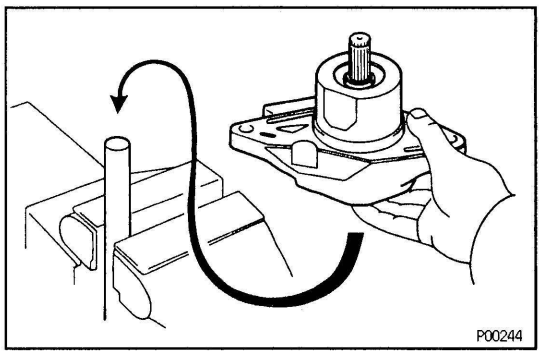


(g) Disassemble these parts:
(1) Starter housing
(2) Starter clutch
(3) Compression spring
(4) Clutch shaft



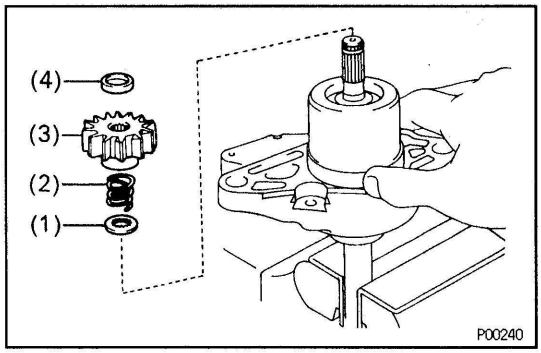
B. Assemble starter housing and clutch assembly

(a) Assemble these parts:
(1) Starter housing
(2) Starter clutch
(3) Compression spring
(4) Clutch shaft

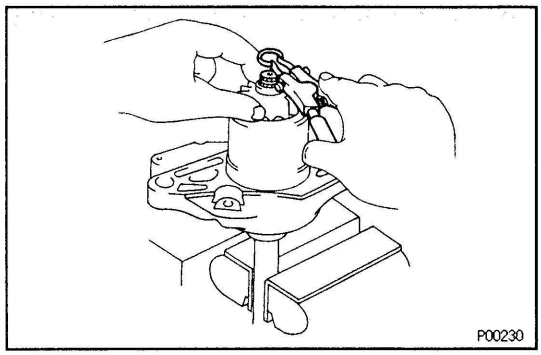


(b) Mount a brass bar in a vise, install the starter housing and clutch assembly to the brass bar.

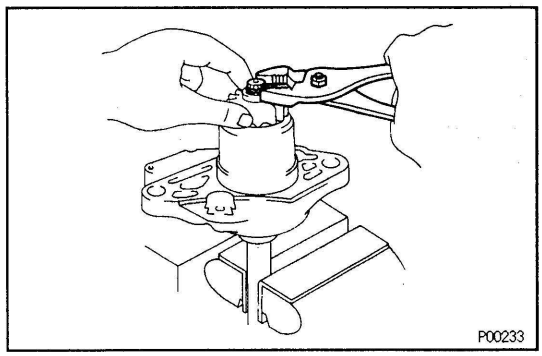
ST



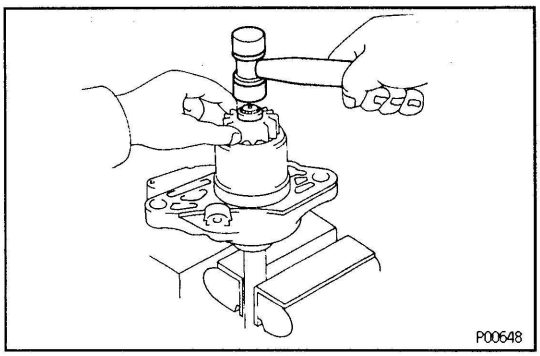
(c) Push down the starter housing, and install these parts:
(1) Spring retainer
(2) Compression spring
(3) Pinion gear
(4) Stop collar



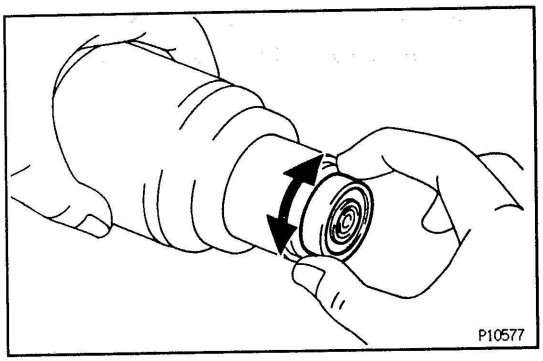
(d) Push down the pinion gear.
(e) Using snap ring pliers, install a new snap ring.



(f) Using pliers, compress the snap ring.
(g) Check that the snap ring fits correctly.

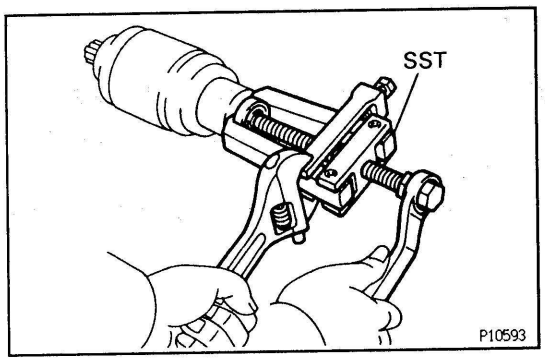


(h) Remove the starter housing and clutch assembly from the brass bar.
(i) Using a plastic–faced hammer, tap the clutch shaft and install the stop collar onto the snap ring.

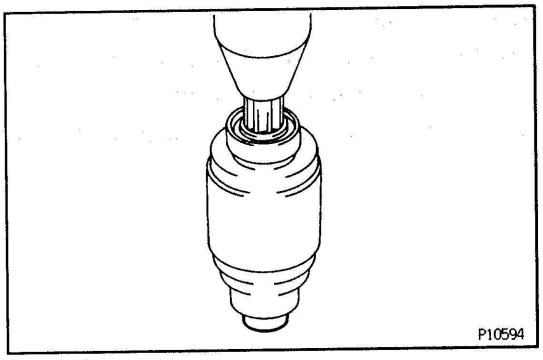


Bearings

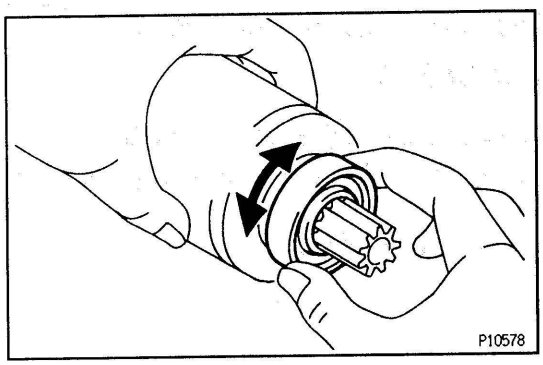
1. **INSPECT REAR BEARINGS**
   Turn each bearing by hand while applying inward force.
   If resistance is felt or the bearing sticks, replace the bearing.



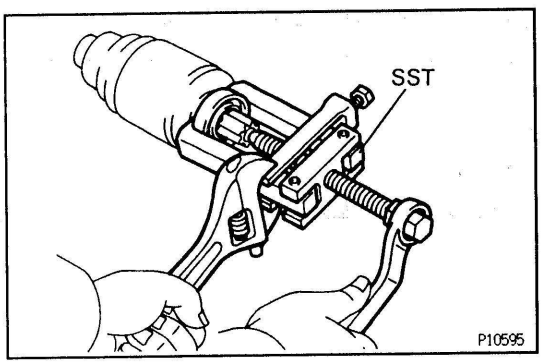
2. **IF NECESSARY, REPLACE REAR BEARING**
   (a) Using SST, remove the bearing.
   SST 09286–46011



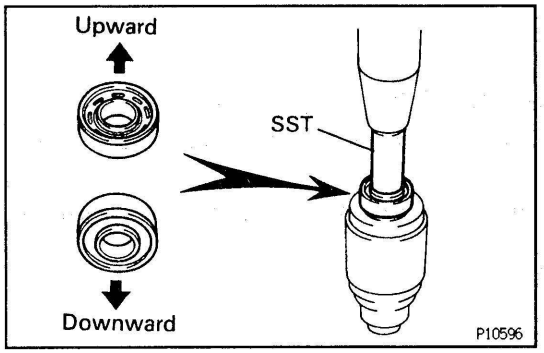
(b) Using a press, press in a new front bearing.



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

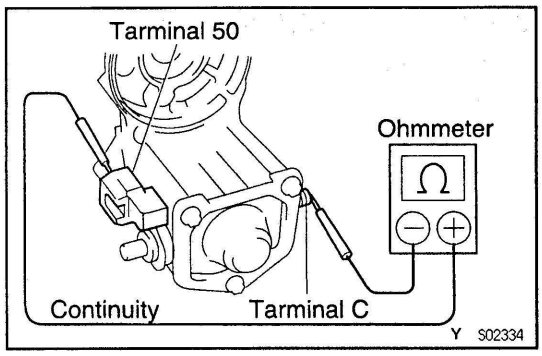


4. **IF NECESSARY, REPLACE FRONT BEARING**
   (a) Using SST, remove the bearing.
   SST 09286–46011



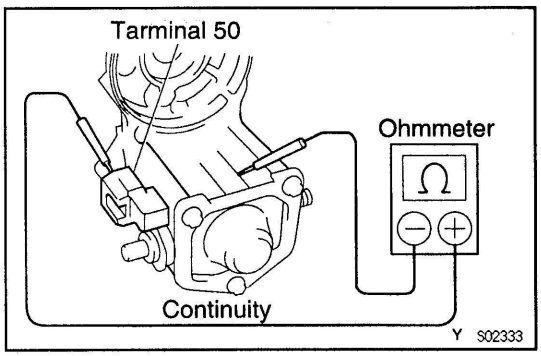
(b) Using SST and a press, press in a new bearing.
NOTICE: Be careful of the bearing installation direction.
SST 09820–00030

ST



Magnetic Switch

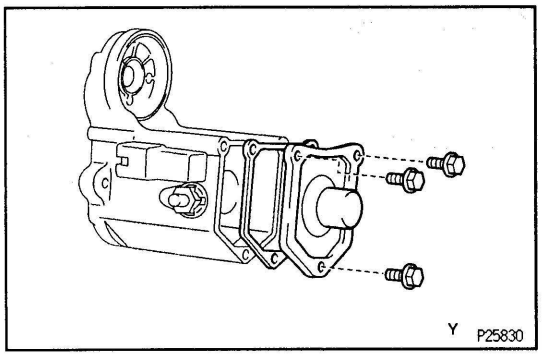
1. PERFORM PULL–IN COIL OPEN CIRCUIT TEST
Using an ohmmeter, check that there is continuity between terminals 50 and C.
If there is no continuity, replace the magnetic switch.



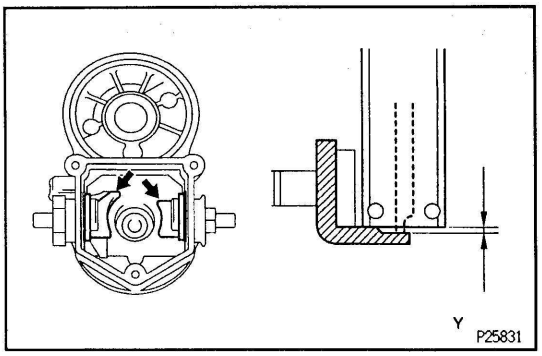
2. PERFORM HOLD–IN COIL OPEN CIRCUIT TEST
Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch.

ST0DJ–04

MAGNETIC SWITCH TERMINAL KIT PARTS REPLACEMENT



1. REMOVE MAGNETIC SWITCH END COVER
Remove the 3 bolts, lead clamp, end cover, gasket and plunger.
Torque: 2.5 N·m (26 kgf·cm, 23 in.·lbf)



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.