STARTING SYSTEM

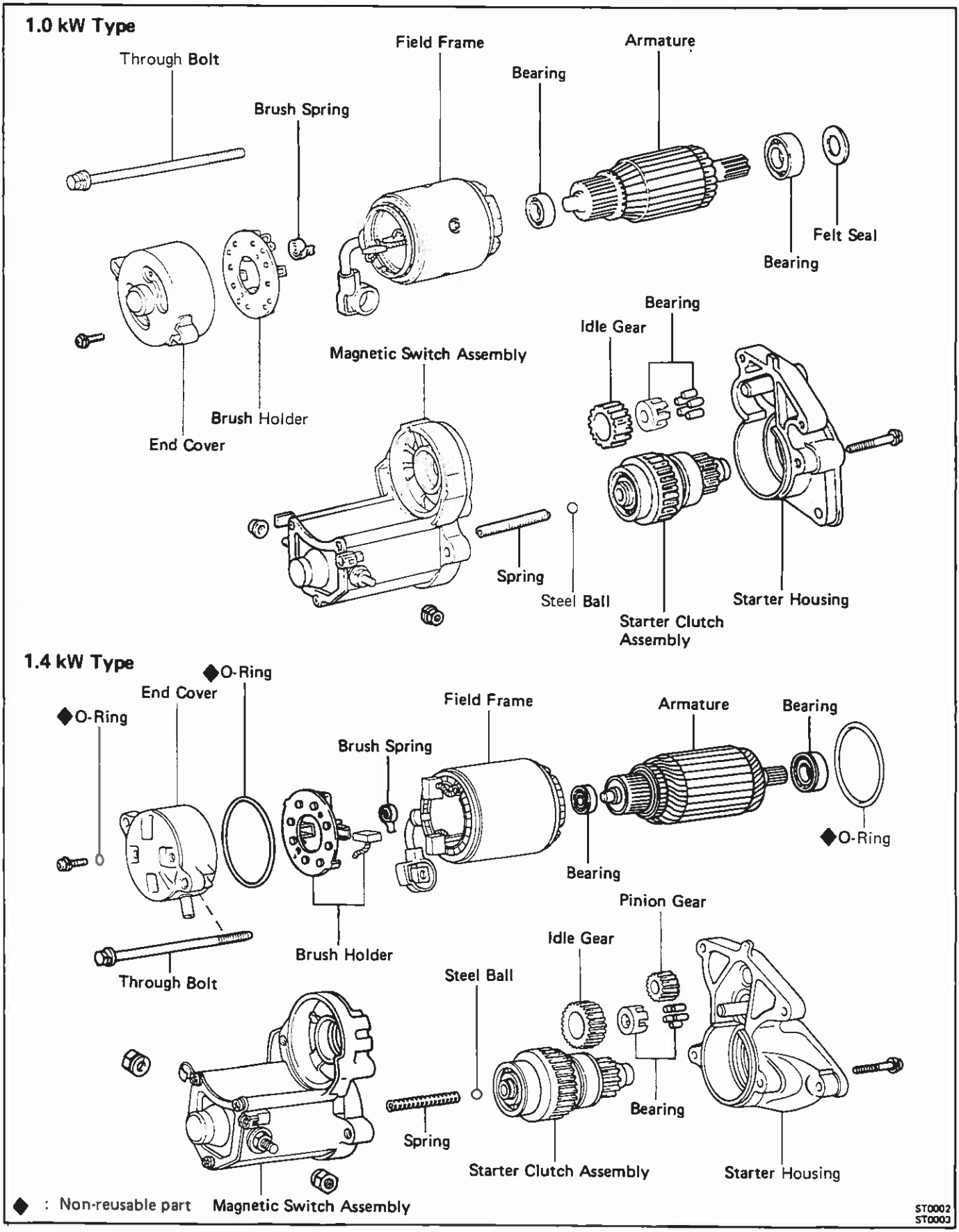
ST

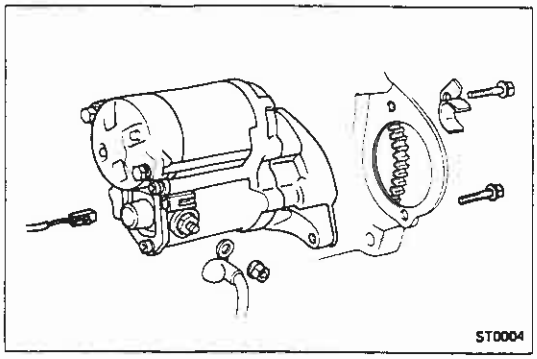
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity Charge or replace battery	CH-3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Neutral start switch faulty (A/T)	Replace switch	
	Fusible link blown	Replace fusible link	
	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
Engine cranks slowly	Battery charge low	Check battery specific gravity Charge or replace battery	CH-3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Starter faulty	Repair starter	ST-3
Starter keeps running	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
	Short in wiring	Repair wiring	
Starter spins — engine will not crank	Pinion gear teeth broken or faulty starter	Repair starter	ST-3
	Flywheel teeth broken	Replace flywheel	

STARTER

COMPONENTS





REMOVAL OF STARTER

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

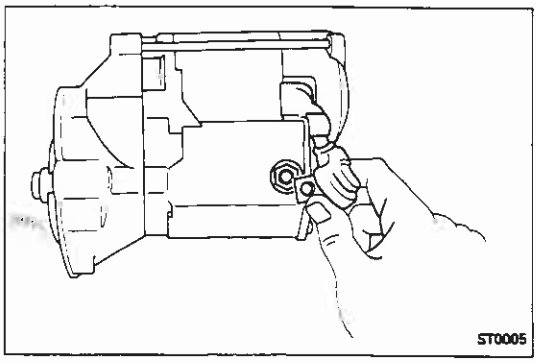
2. **REMOVE TRANSMISSION OIL FILLER TUBE (A/T only)**

3. **DISCONNECT TWO WIRES FROM STARTER**

   Remove the nut and disconnect the battery cable from the magnetic switch on the starter motor. Disconnect the other wire from terminal 50.

4. **REMOVE STARTER MOTOR**

   Remove the two bolts, and remove the starter motor from the flywheel bellhousing.



DISASSEMBLY OF STARTER

(See page ST-3)

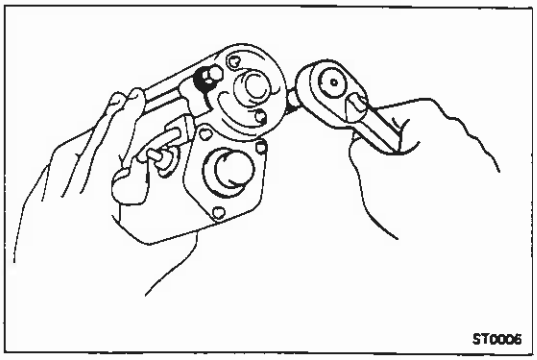
1. **REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY**

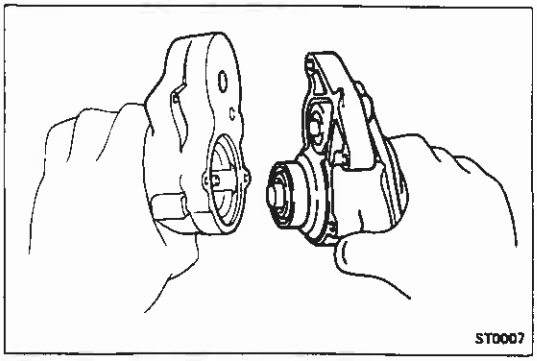
   (a) Disconnect the lead wire from the magnetic switch terminal.

   (b) Remove the two through bolts. Pull out the field frame with the armature from the magnetic switch assembly.

   (c) Remove the felt seal. (1.0 kW type only)

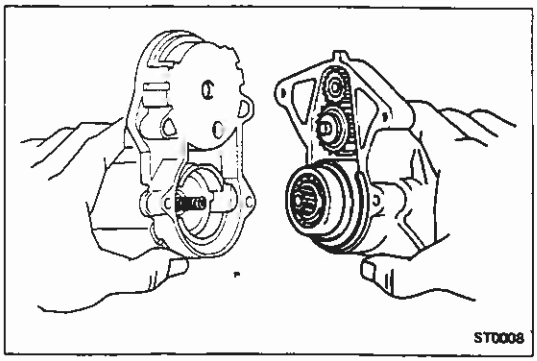
   (d) Remove the O-ring. (1.4 kW type only)



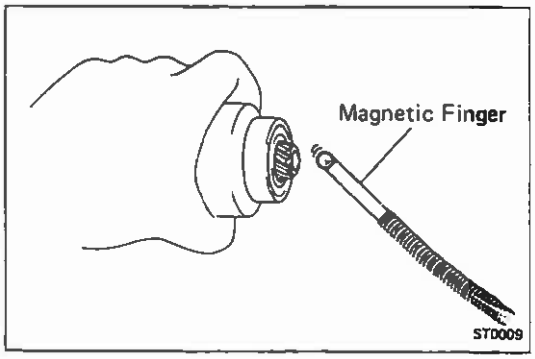


2. **REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY**

   [1.0 kW type]
   Remove the two screws and remove the starter housing with the idler gear and clutch assembly.



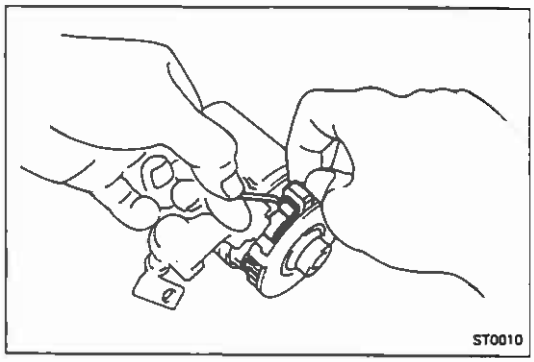
[1.4 kW type]
Remove the two screws and remove the starter housing with the pinion gear, idler gear and clutch assembly.



3. REMOVE CLUTCH ASSEMBLY AND GEARS FROM STARTER HOUSING

4. REMOVE STEEL BALL AND SPRING

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



5. REMOVE BRUSHES AND BRUSH HOLDER

(a) Remove the end cover from the field frame.

(b) Remove the O-ring. (1.4 kW type only)

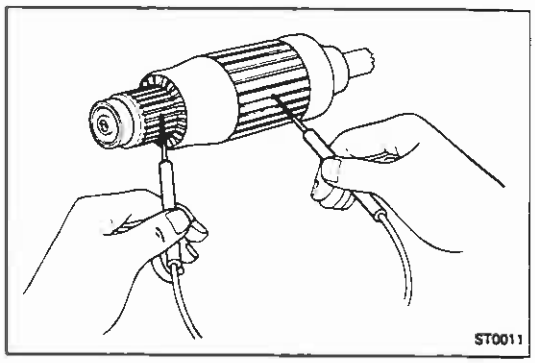
(c) Using a screwdriver or steel wire, separate the brush springs, and remove the brushes from the brush holder.

(d) Pull the brush holder off the field frame.

6. REMOVE ARMATURE FROM FIELD FRAME

INSPECTION OF STARTER

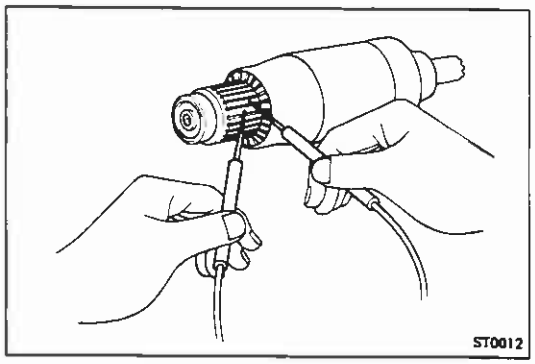
Armature Coil



1. INSPECT THAT COMMUTATOR IS NOT GROUNDED

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

If there is continuity, replace the armature.

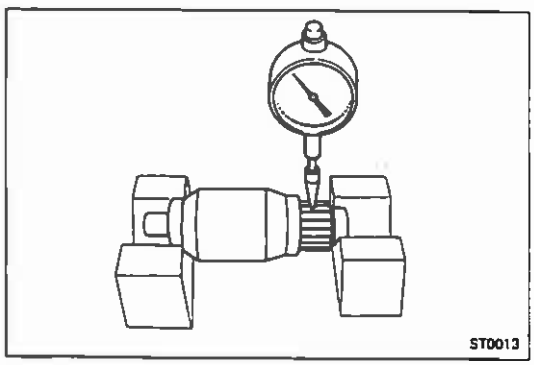


2. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the segments of the commutator.

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

Commutator



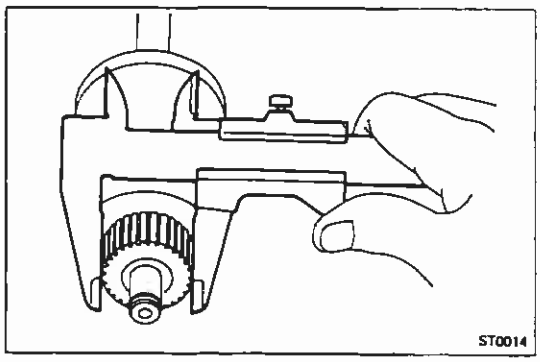
1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

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

2. INSPECT COMMUTATOR CIRCLE RUNOUT

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

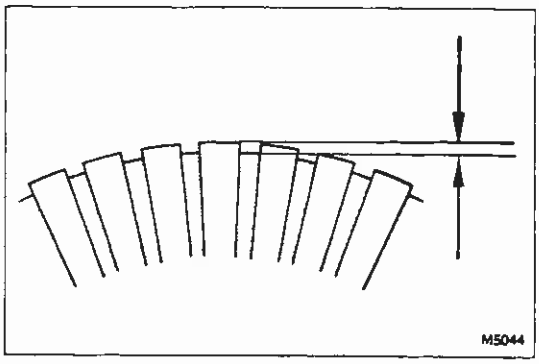
Maximum circle runout: 0.05 mm (0.0020 in.)



3. MEASURE DIAMETER OF COMMUTATOR

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

Standard diameter: 30 mm (1.18 in.)
Minimum diameter: 29 mm (1.14 in.)

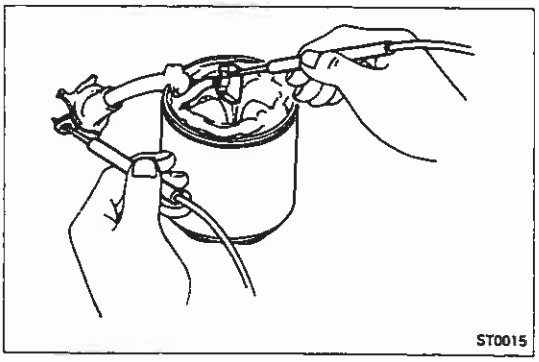


4. INSPECT UNDERCUT DEPTH

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

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

Standard undercut depth: 0.5 – 0.8 mm (0.020 – 0.031 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)

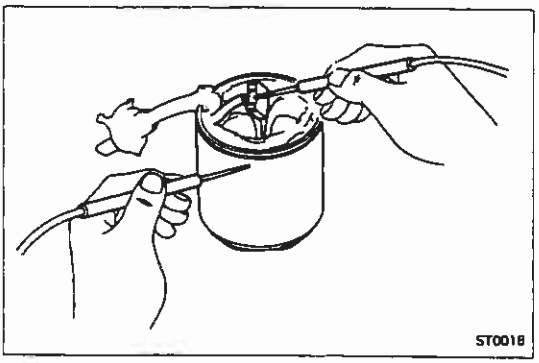


Field Coil

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the lead wire and field coil brush lead.

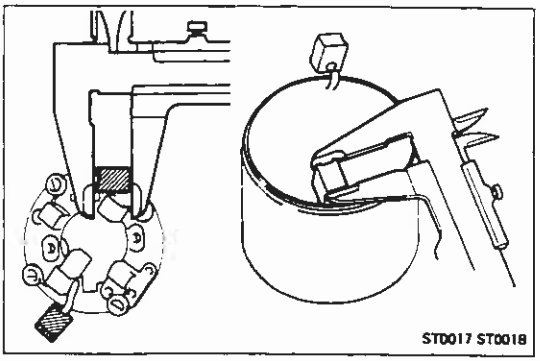
If there is no continuity, replace the field frame.



2. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check for continuity between the field coil end and field frame.

If there is continuity, replace the field frame.

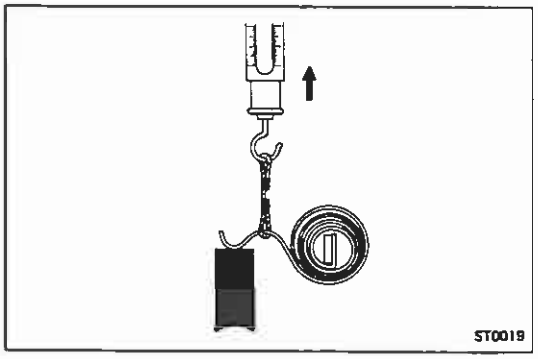


Brushes

MEASURE BRUSH LENGTH

If length is less than the minimum, replace the brush and dress with an emery cloth.

Standard length: 1.0 kW 13.5 mm (0.531 in.)
1.4 kW 14.5 mm (0.571 in.)
Minimum length: 1.0 kW 8.5 mm (0.335 in.)
1.4 kW 10.0 mm (0.394 in.)



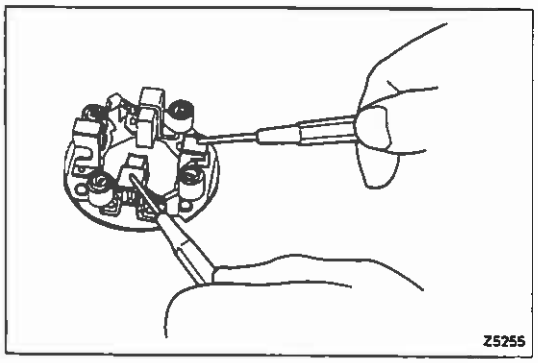
Brush Spring

MEASURE BRUSH SPRING LOAD WITH A PULL SCALE

If the reading is below standard, replace the brush spring.

Spring installed load: 1.785 — 2.415 kg (3.9 — 5.3 lb, 18 — 24 N)

NOTE: Take the pull scale reading at the very instant the brush spring separates from the brush.

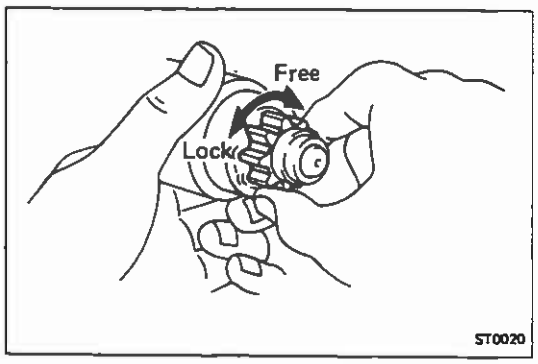


Brush Holder

INSPECT INSULATION OF BRUSH HOLDER

Using an ohmmeter, check for continuity between the positive and negative brush holders.

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



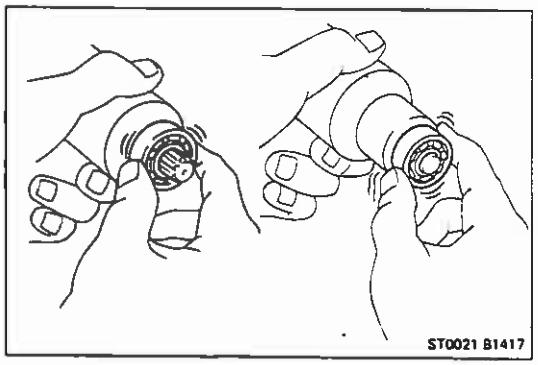
Clutch and Gears

1. **INSPECT GEAR TEETH**

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage. Replace if damaged. If damaged, also check the flywheel ring gear for wear or damage.

2. **INSPECT CLUTCH**

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

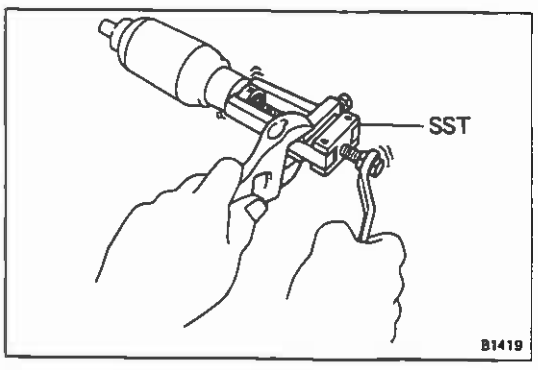


Bearings

1. **INSPECT BEARINGS**

Turn each bearing by hand while applying inward force.

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

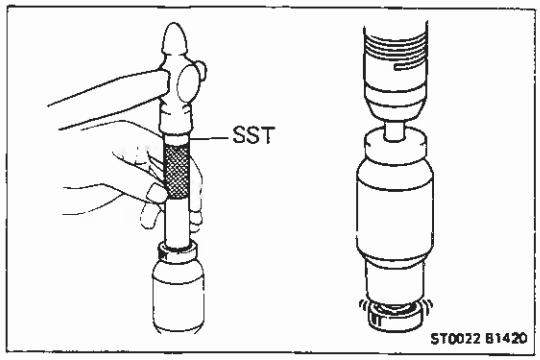


2. **IF NECESSARY, REPLACE BEARINGS**

(a) Using SST, remove the bearing from the armature shaft.

(b) Using SST, remove the other bearing on the opposite side.

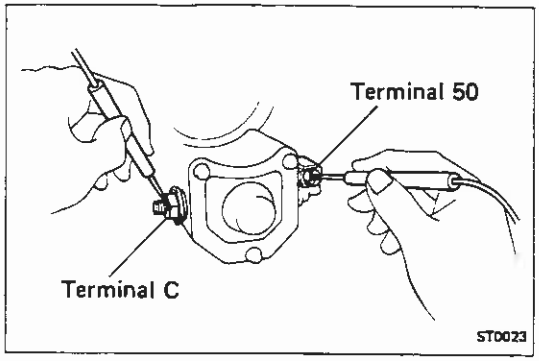
SST 09286-46011



(c) Using SST and a hammer, tap a new large bearing onto the shaft.

SST 09285-76010

(d) Using a press, install a new small bearing onto the shaft.

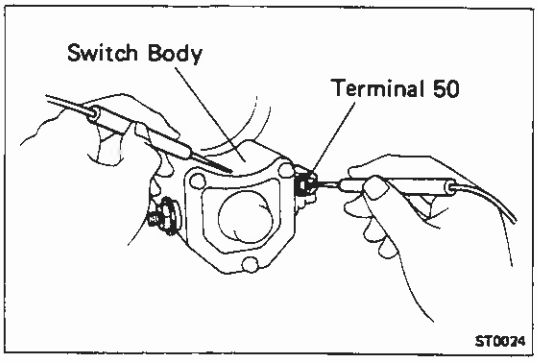


Magnetic Switch

1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check for continuity between terminal 50 and terminal C.

If there is no continuity, replace the magnetic switch.



2. PERFORM HOLD-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check for continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.

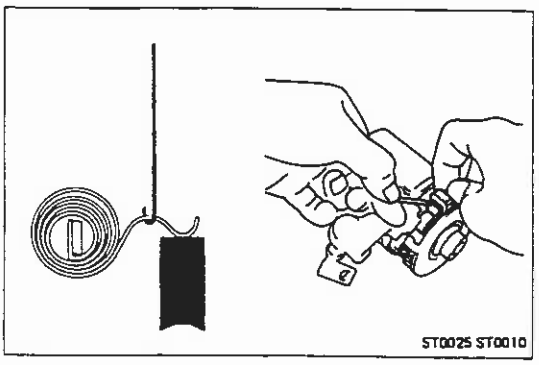
ASSEMBLY OF STARTER

(See page ST-3)

NOTE: 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.



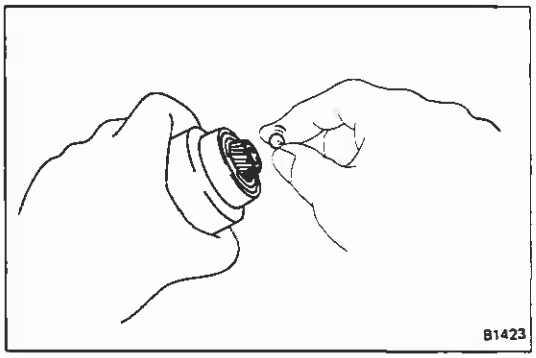
2. INSTALL BRUSH HOLDER AND BRUSHES

(a) Using a screwdriver or steel wire, hold the brush spring back, and install the brush into the brush holder. Install four brushes.

NOTE: Make sure that the positive lead wires are not grounded.

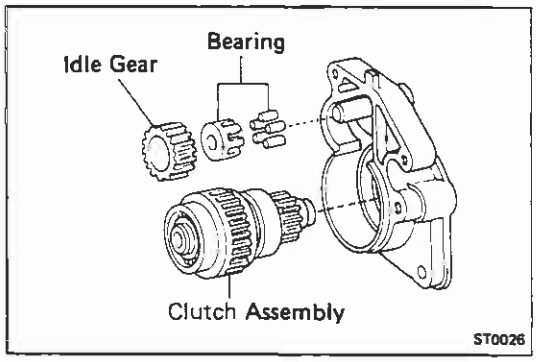
(b) Place the O-ring on the field frame. (1.4 kW type only)

(c) Install the end cover to the field frame.



3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

Apply grease to the ball and spring, and insert them into the clutch shaft hole.

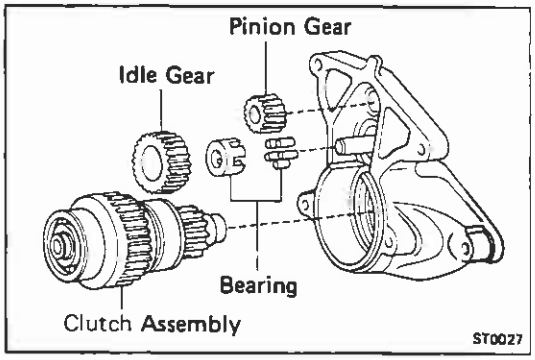


4. INSTALL GEARS AND CLUTCH ASSEMBLY TO STARTER HOUSING

[1.0 kW type]

(a) Apply grease to the gear and clutch assembly.

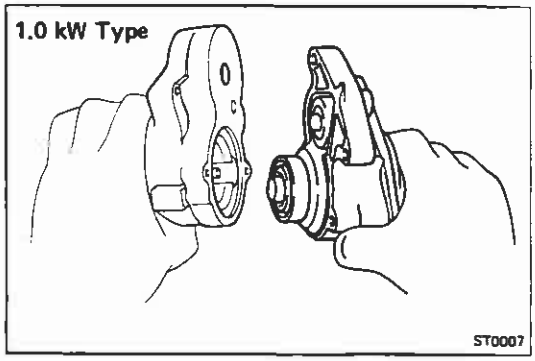
(b) Place the clutch assembly, idle gear and bearing in the starter housing.



[1.4 kW type]

(a) Apply grease to the gears and clutch assembly.

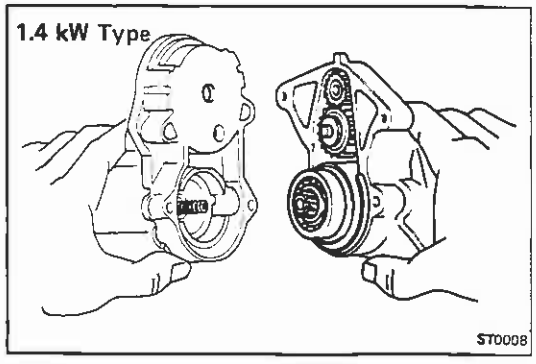
(b) Place the clutch assembly, idle gear, bearing and pinion gear in the starter housing.

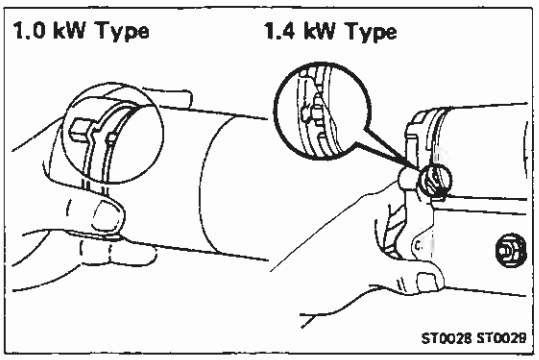


5. INSTALL STARTER HOUSING

(a) Insert the spring into the clutch shaft hole.

(b) Place the starter housing on the magnetic switch and install the two screws.



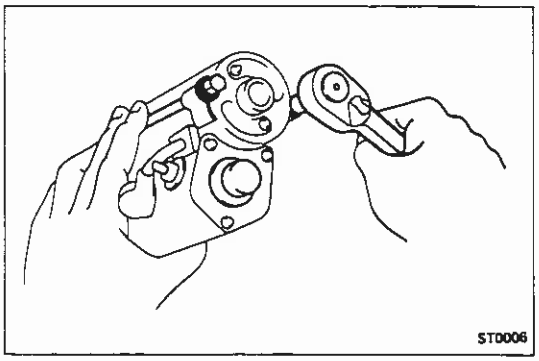


6. **INSTALL FIELD FRAME WITH ARMATURE IN MAGNETIC SWITCH ASSEMBLY**

(a) Place the felt seal on the armature shaft (1.0 kW type only).

(b) Place the O-ring on the field frame (1.4 kW type only).

(c) Match the protrusion of the field frame with the magnetic switch assembly.



(d) Install the two through bolts.

(e) Connect the coil lead to the terminal on the magnetic switch assembly.

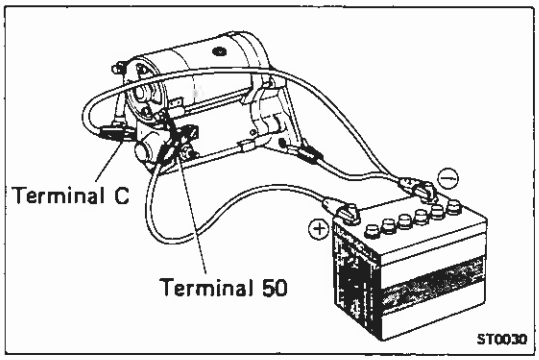
PERFORMANCE TEST OF STARTER

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

1. **PERFORM PULL-IN TEST**

(a) Disconnect the field coil lead from terminal C.

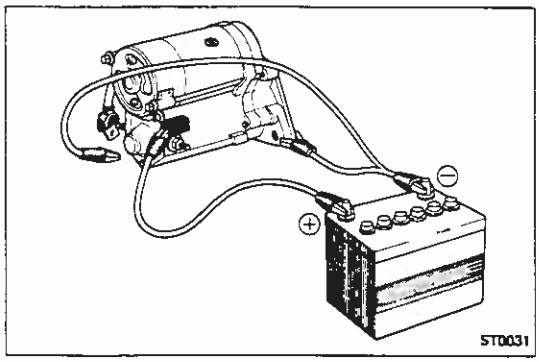
(b) Connect the battery to the magnetic switch as shown. Check that the plunger moves outward. If the plunger does not move, replace the magnetic switch.



2. **PERFORM HOLD-IN TEST**

While connected as above with the plunger out, disconnect the negative lead from terminal C. Check that the plunger remains out.

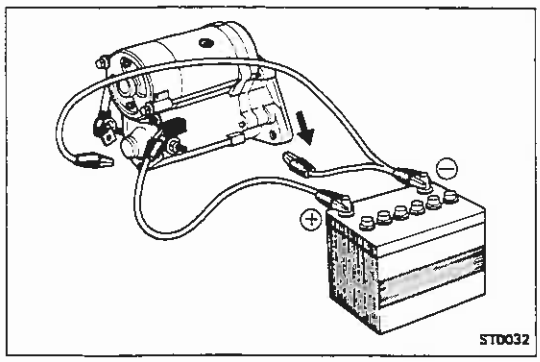
If the plunger returns inward, replace the magnetic switch.

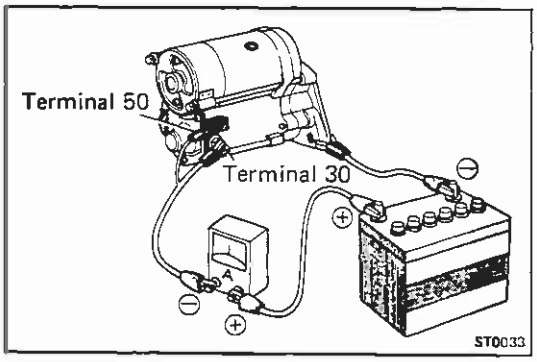


3. **INSPECT PLUNGER RETURN**

Disconnect the negative lead from the switch body. Check that the plunger returns inward.

If the plunger does not return, replace the magnetic switch.



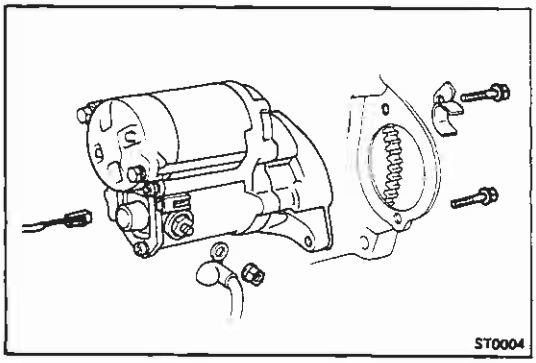


4. **PERFORM NO-LOAD PERFORMANCE TEST**

   (a) Connect the battery and ammeter to the starter as shown.

   (b) Check that the starter rotates smoothly and steadily with the pinion moving out. Check that the ammeter reads the specified current.

   Specified current: Less than 90 A at 11.5 V



INSTALLATION OF STARTER

1. **INSTALL STARTER MOTOR IN FLYWHEEL BELL-HOUSING**

   Place the starter motor in the flywheel bellhousing. Install and torque the two bolts.

   Torque: 400 kg-cm (29 ft-lb, 39 N·m)

2. **CONNECT TWO WIRES TO STARTER**

   Connect the connector to the terminal on the magnetic switch. Connect the cable from the battery to the terminal on the switch, and install the nut.

3. **INSTALL TRANSMISSION OIL FILLER TUBE (A/T only)**

4. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

   Check that the car starts.