

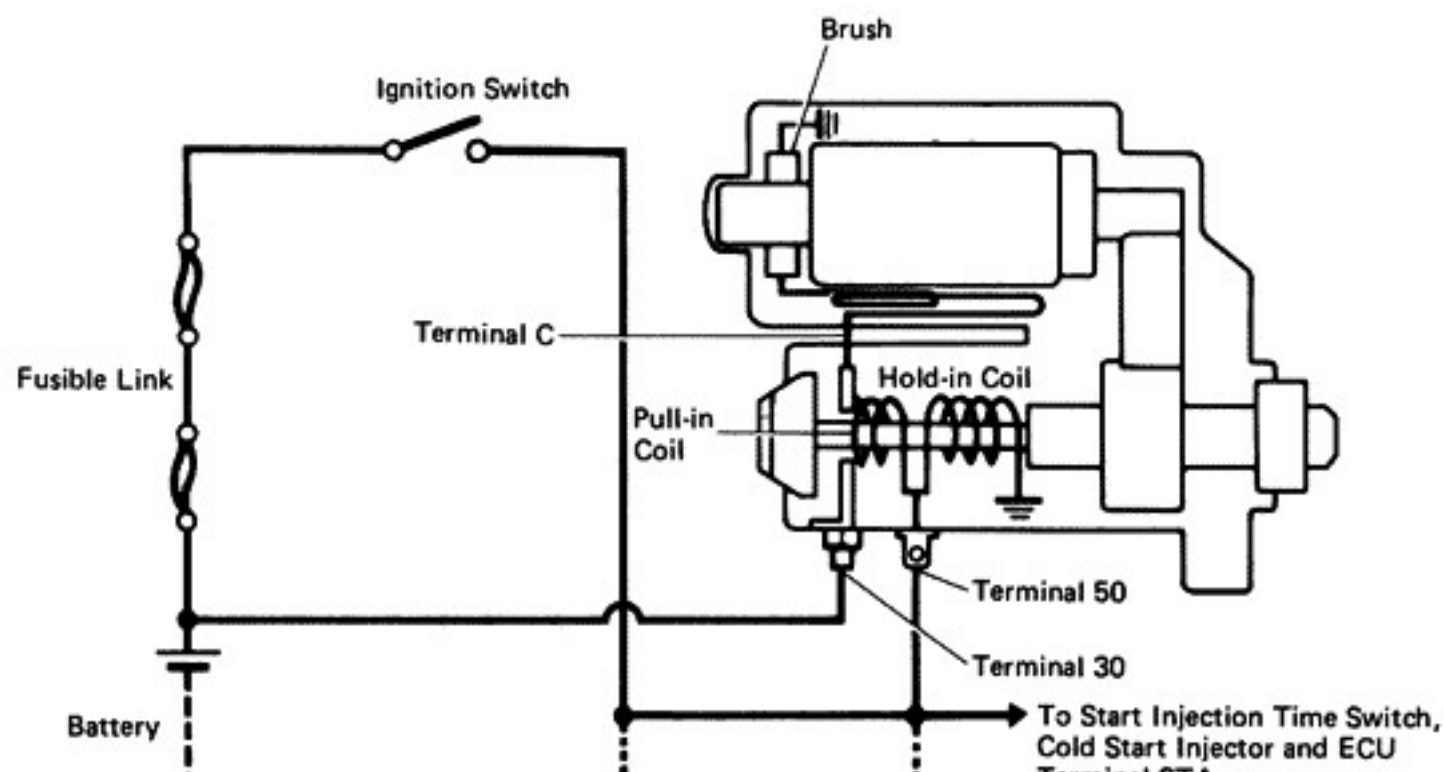
# STARTING SYSTEM

	Page
TROUBLESHOOTING .....	ST-2
STARTING SYSTEM CIRCUIT .....	ST-2
STARTER .....	ST-3

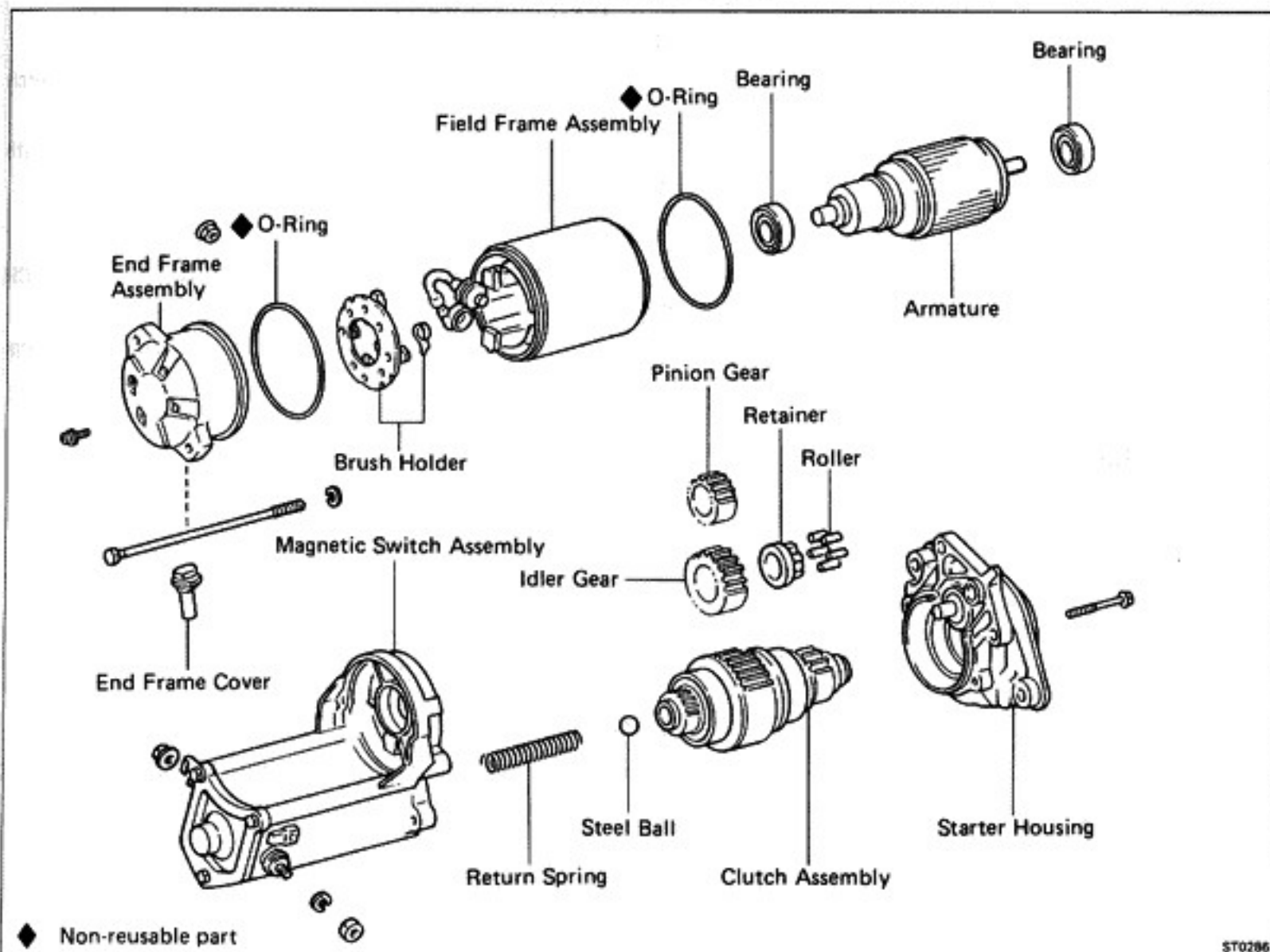
## TROUBLESHOOTING

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

## STARTING SYSTEM CIRCUIT



## STARTER COMPONENTS

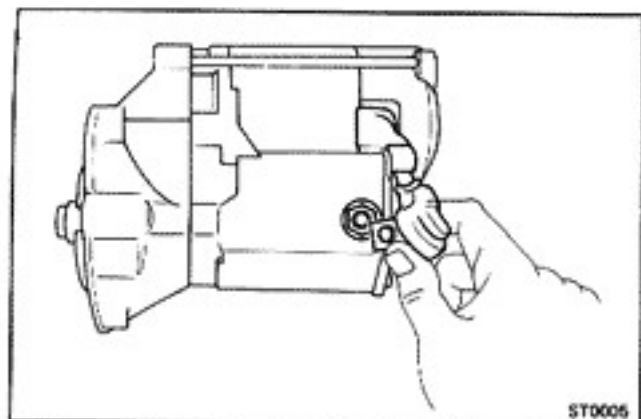


ST0286

### REMOVAL OF STARTER

- 1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
- 2. 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 the terminal.
- 3. REMOVE STARTER MOTOR**  
Remove the two bolts, and remove the starter motor from the flywheel bellhousing.





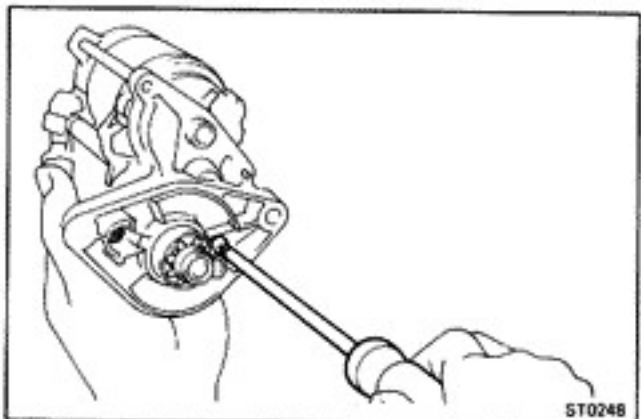
ST0005

## DISASSEMBLY OF STARTER

(See page ST-3)

### 1. REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH

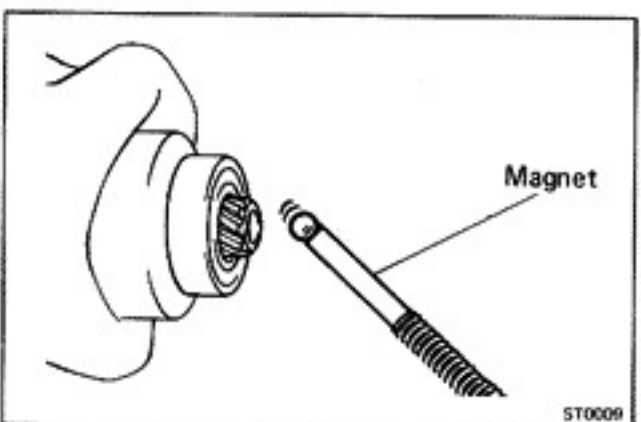
- Disconnect the lead wire from the magnetic switch terminal.
- Remove the two bolts. Pull out the field frame and the armature from the magnetic switch.
- Remove the O-ring.



ST0248

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

Remove the two screws and remove the starter housing.

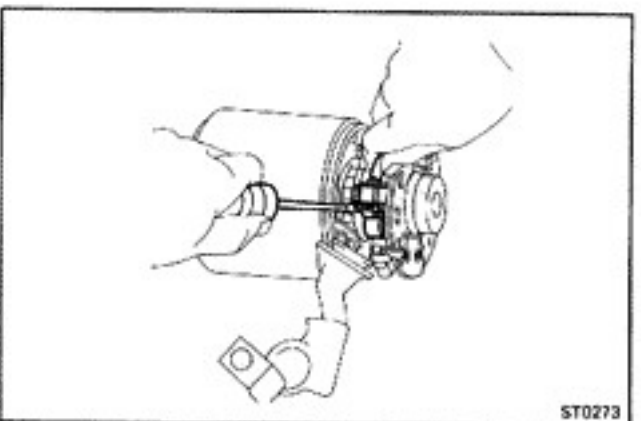


ST0009

### 3. REMOVE CLUTCH ASSEMBLY AND GEARS FROM MAGNETIC SWITCH ASSEMBLY

### 4. REMOVE STEEL BALL

Using a magnet, remove the steel ball from the clutch assembly hole.

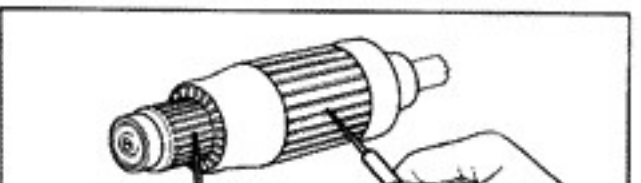


ST0273

### 5. REMOVE BRUSHES AND BRUSH HOLDER

- Remove the end cover from the field frame.
- Remove the O-ring.
- Using a screwdriver, separate the brush and brush spring, and remove the brush from the brush holder.
- Pull the brush holder off the armature.

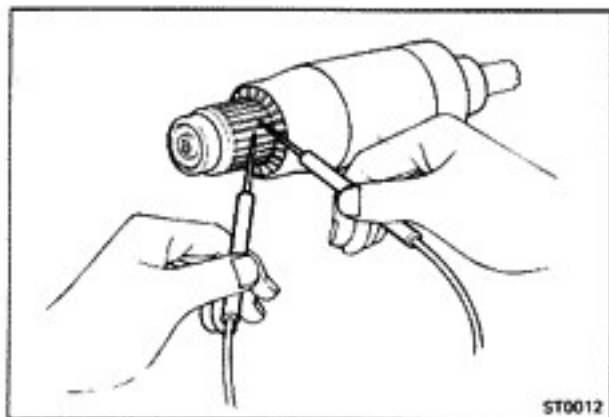
### 6. REMOVE ARMATURE FROM FIELD FRAME



## INSPECTION OF STARTER

### Armature Coil

#### 1. CHECK THAT COMMUTATOR IS NOT GROUNDED

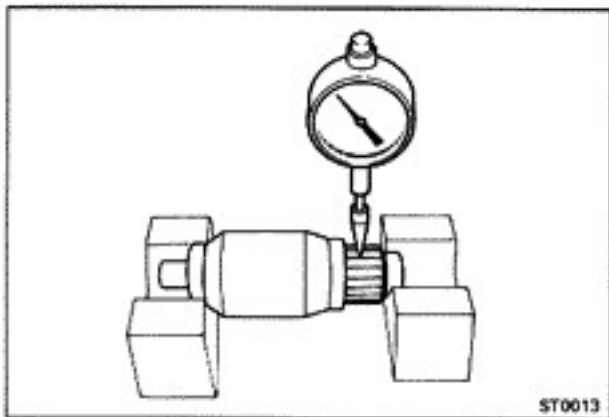


ST0012

## 2. CHECK 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.



ST0013

## Commutator

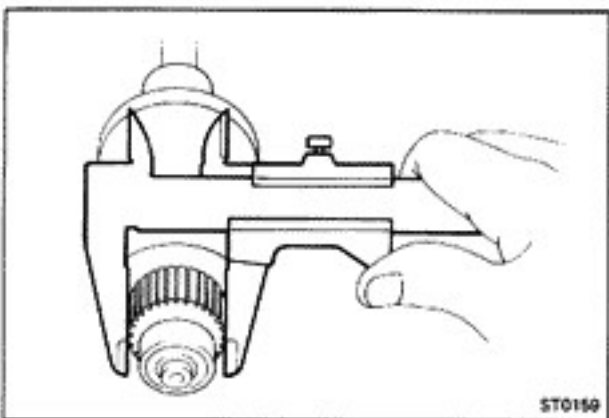
### 1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

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

### 2. CHECK COMMUTATOR RUNOUT

**Maximum circle runout: 0.05 mm (0.0020 in.)**

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



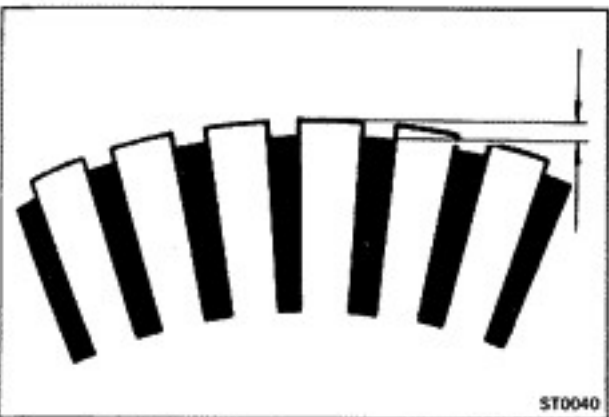
ST0159

### 3. MEASURE DIAMETER OF COMMUTATOR

**Standard diameter: 30 mm (1.18 in.)**

**Minimum diameter: 29 mm (1.14 in.)**

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



ST0040

### 4. CHECK SEGMENT

Check that the segment is clean and free of foreign particles, and smooth out the edge.

**Standard undercut depth: 0.6 mm (0.024 in.)**

**Minimum undercut depth: 0.2 mm (0.008 in.)**

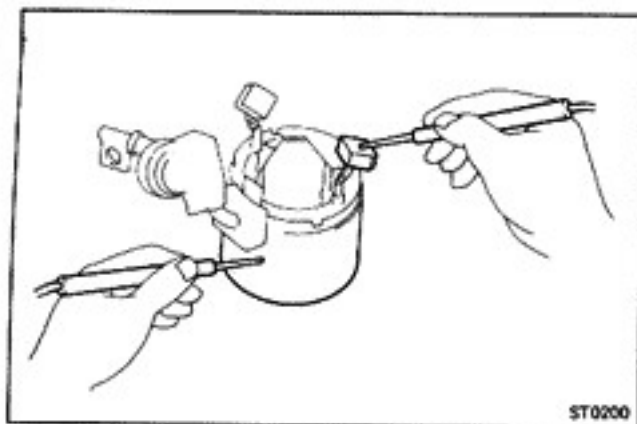
If the undercut depth is less than the minimum, correct with a hacksaw.



## Field Coil

### 1. CHECK FIELD COIL FOR OPEN CIRCUIT

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

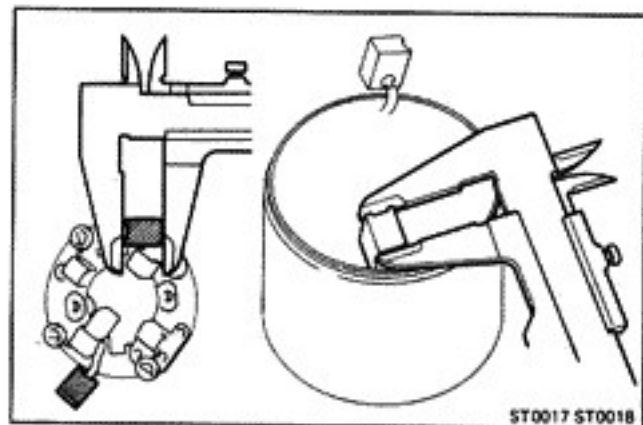


ST0200

## 2. CHECK THAT FIELD COIL IS NOT GROUNDED

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

If there is continuity, repair or replace the field frame.



ST0017 ST0018

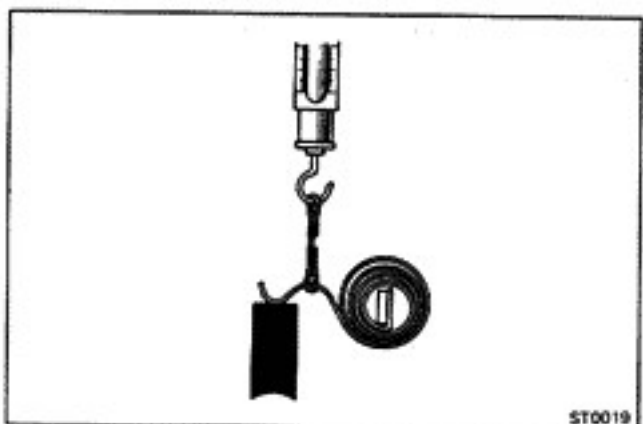
## Brushes

### MEASURE BRUSH LENGTH

Standard length: 15.5 mm (0.610 in.)

Minimum length: 10 mm (0.39 in.)

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



ST0019

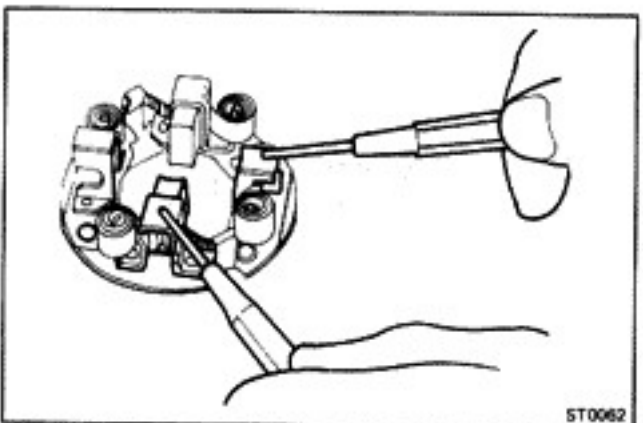
## Brush Springs

### MEASURE BRUSH SPRING LOAD WITH A PULL SCALE

Tension: 1,785 — 2,415 g (3.9 — 5.3 lb)

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

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



ST0062

## Brush Holder

### CHECK INSULATION OF BRUSH HOLDER

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

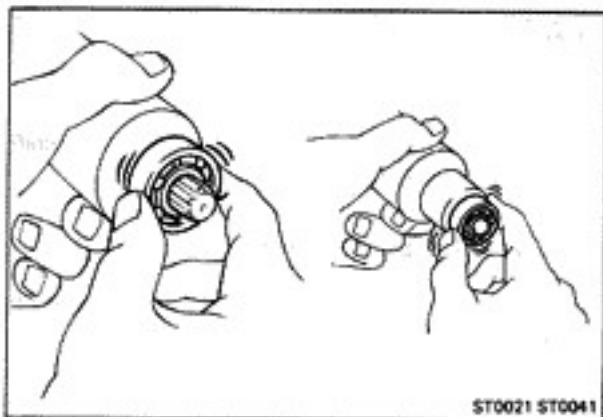
If there is continuity, repair or replace the brush holder.

## Clutch and Gears

### 1. INSPECT GEAR TEETH

Inspect the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage. Replace if damaged.

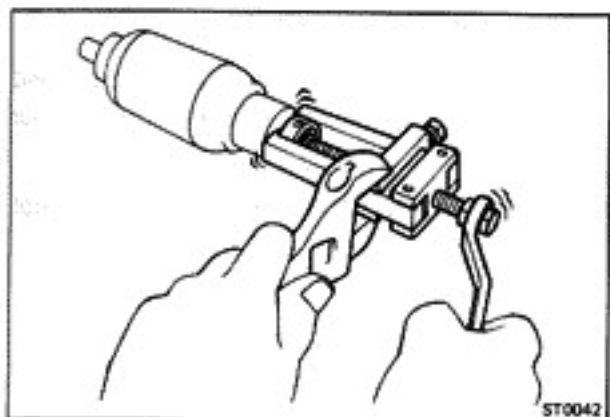




## Bearings

### 1. CHECK BEARINGS

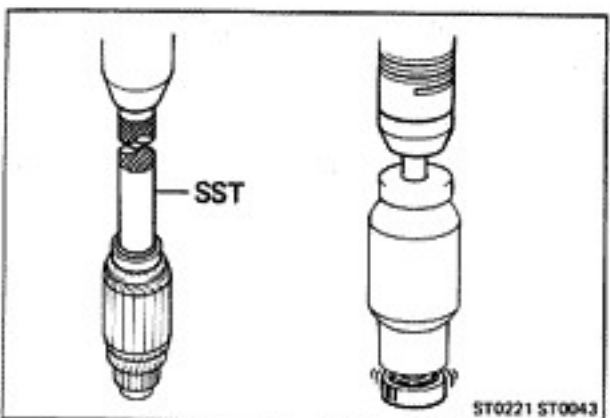
Turn each bearing by hand while applying inward force. If resistance is felt or if the bearing sticks, replace the bearing.



### 2. IF NECESSARY, REPLACE BEARINGS

- Using SST, remove the bearing from the armature shaft.
- Using SST, remove the other bearing from the opposite side.

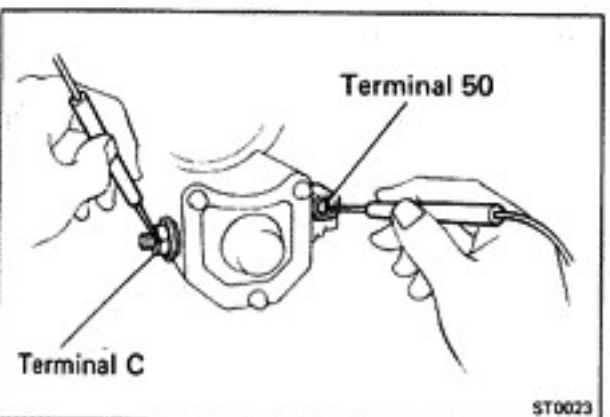
SST 09286-46011



- Using SST and press, tap the front bearing onto the shaft.

SST 09201-41020

- Using a press, install the rear bearing onto the shaft.



## Magnetic Switch

### 1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

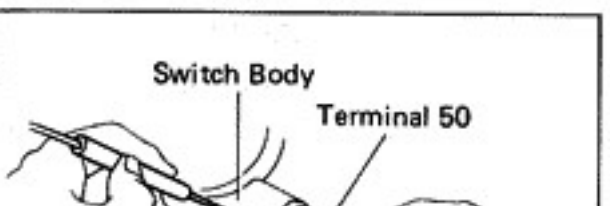
Using an ohmmeter, check for continuity between terminal 50 and the terminal C.

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 switch body.

If there is no continuity, replace the magnetic switch.





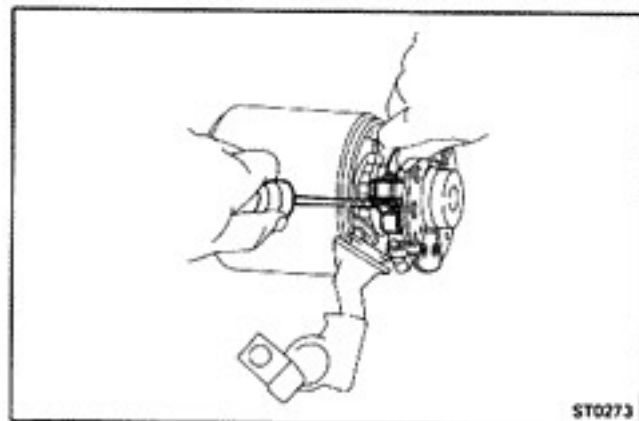
## ASSEMBLY OF STARTER

(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.



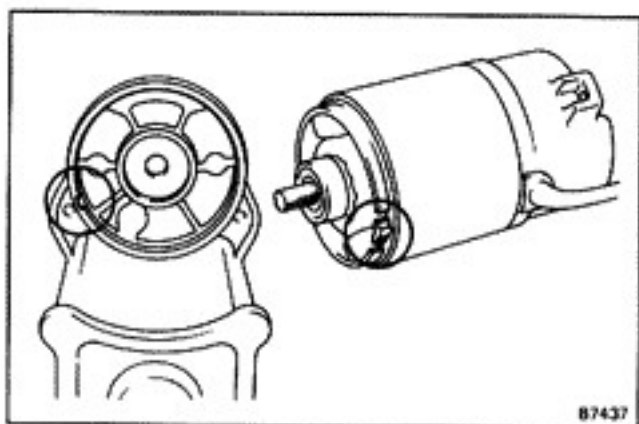
### 2. INSTALL BRUSH HOLDER AND BRUSHES

(a) Using a screwdriver, hold the brush spring back and install the brush into the brush holder. Install both brushes.

**NOTE:** Make sure that the positive lead wires are grounded.

(b) Place the O-ring on the field frame.

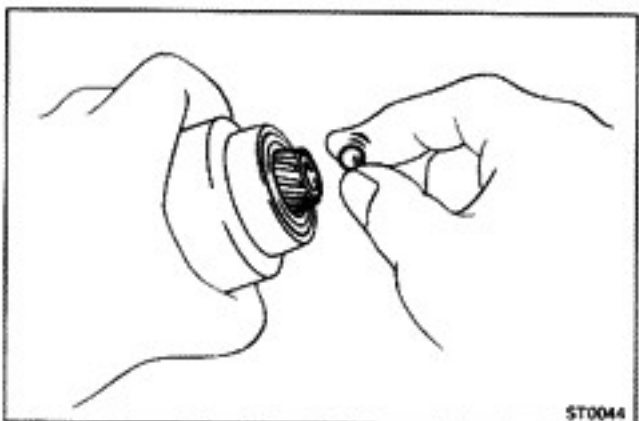
(c) Install the end cover to the field frame.



### 3. INSTALL FIELD FRAME WITH ARMATURE IN MAGNETIC SWITCH

(a) Place the O-ring on the field frame.

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



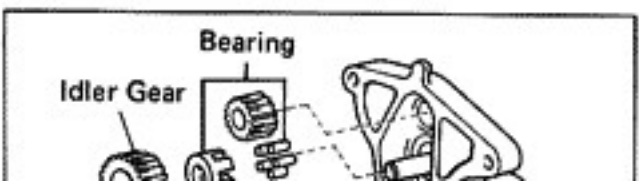
### 4. INSERT STEEL BALL AND SPRING INTO CLUTCH SHAFT HOLE

Apply grease to the ball and insert it into the clutch shaft hole.

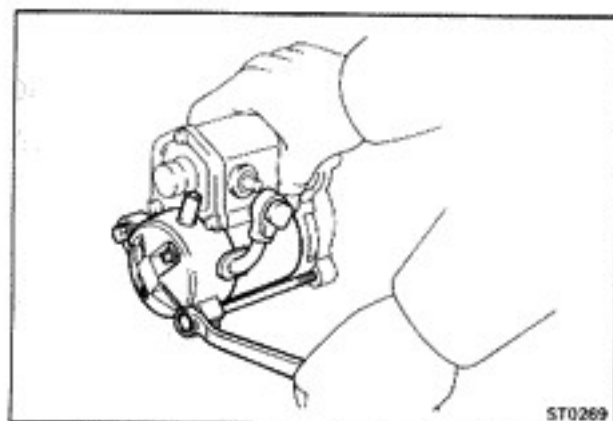
### 5. INSTALL GEARS AND CLUTCH ASSEMBLY

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

(b) Place the clutch assembly and idler gear in the starter housing.

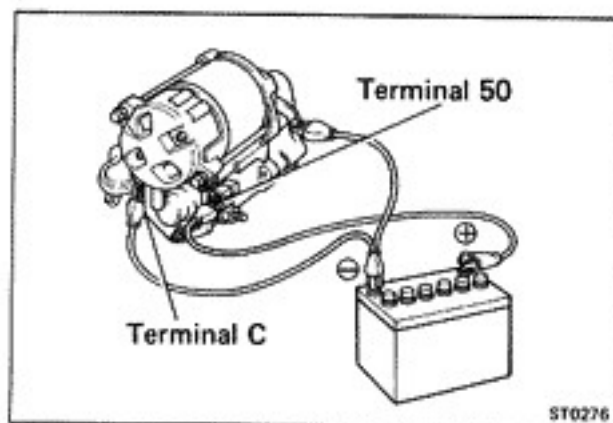






## 6. INSTALL STARTING HOUSING

- Place the starter housing on the magnetic switch and install two screws.
- Install two through bolts.
- Connect the coil lead to the terminal on the magnetic switch.



## PERFORMANCE TEST OF REDUCTION TYPE STARTER

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

### 1. PERFORM PULL-IN TEST

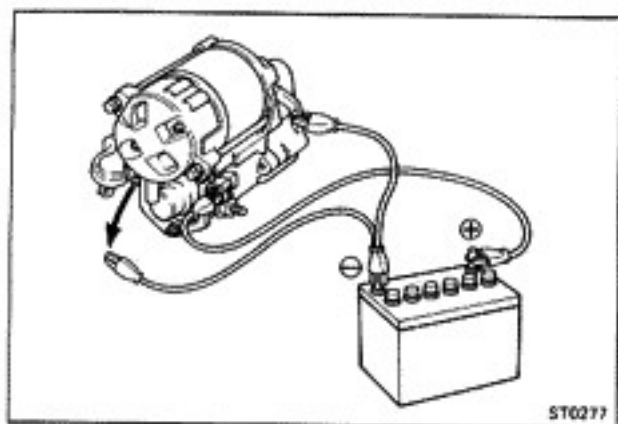
- Disconnect the field coil lead from terminal C.
- Connect the battery to the magnetic switch as shown. Check that the plunger moves outward.

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.

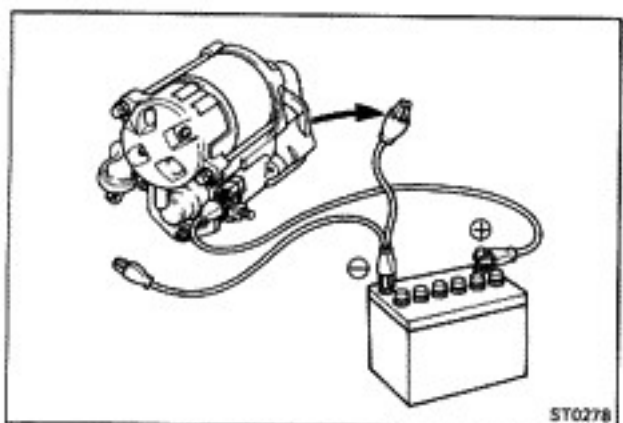
If the plunger returns inward, replace the magnetic switch.



### 3. CHECK PLUNGER RETURN

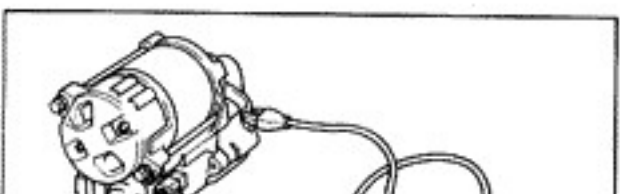
Disconnect the negative lead from the switch body. Check that the plunger returns inward.

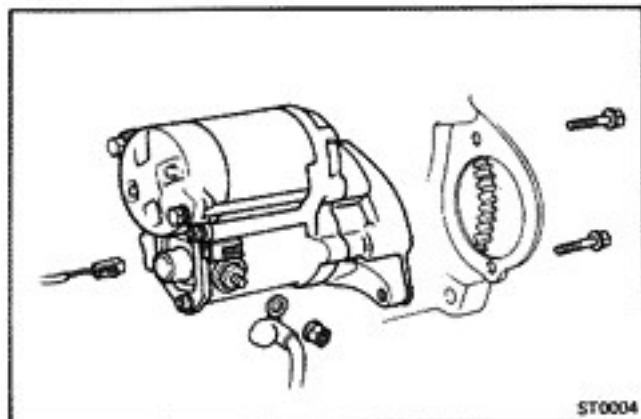
If the plunger does not return, replace the magnetic switch.



### 4. PERFORM NO-LOAD PERFORMANCE TEST

- Connect the battery and ammeter to the starter as shown.
- Check that the starter rotates smoothly and steadily.





## INSTALLATION OF STARTER

### 1. INSTALL STARTER MOTOR IN FLYWHEEL BELLHOUSING

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

### 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. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Check that the car starts.