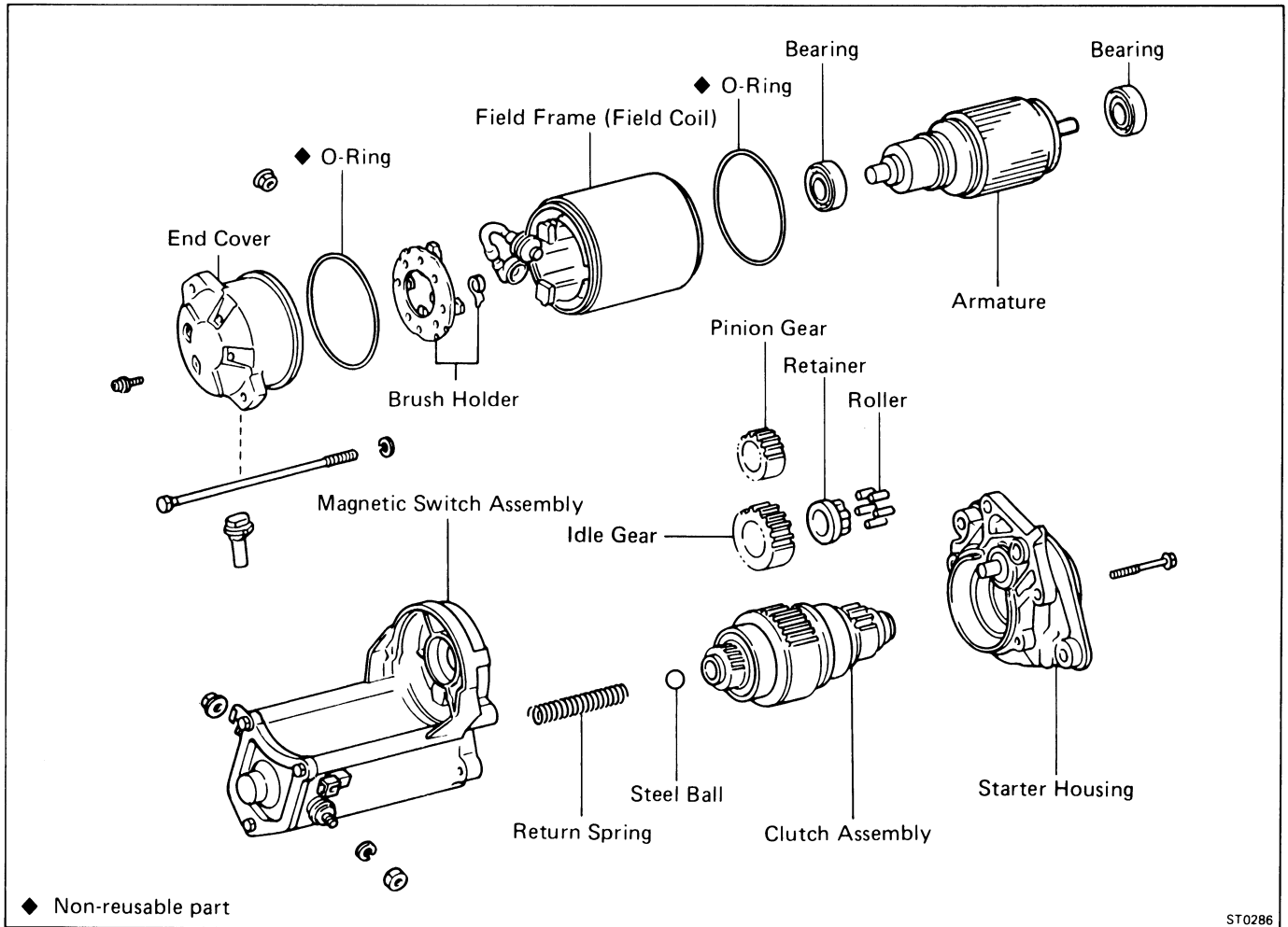

STARTING SYSTEM

	Page
TROUBLESHOOTING	ST-2
STARTER	ST-3
STARTER RELAY	ST-12
CLUTCH START SWITCH	ST-12

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity	CH-2
	Battery cables loose, corroded or worn	Charge or replace battery	
	Starter relay faulty (ex. Canada A/T)	Repair or replace cables	
	Clutch start switch faulty (M/T only)	Replace starter relay	CL-4
	Neutral start switch faulty (A/T only)	Adjust switch position or replace switch	
	Fusible link blown	Adjust or repair switch	
	Starter faulty	Replace fusible link	ST-3
Engine cranks slowly	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
Starter keeps running	Battery charge low	Check battery specific gravity	CH-2
	Battery cables loose, corroded or worn	Charge or replace battery	
	Starter faulty	Repair or replace cables	ST-3
Starter spins — engine will not crank	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**

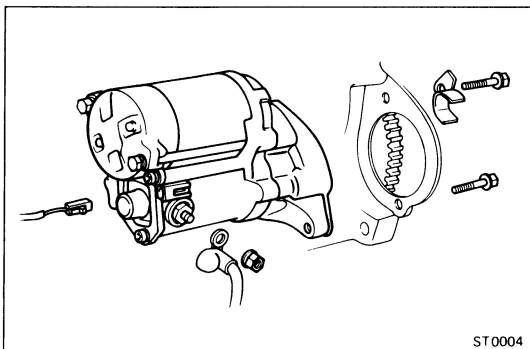
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (—) terminal cable is disconnected from the battery.

2. **DISCONNECT TWO WIRES FROM STARTER**

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

3. **REMOVE STARTER**

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



DISASSEMBLY OF STARTER

(See page ST-3)

1. REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY

- (a) Remove the nut and, 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 O-ring.

2. REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY

- (a) Remove the two screws.

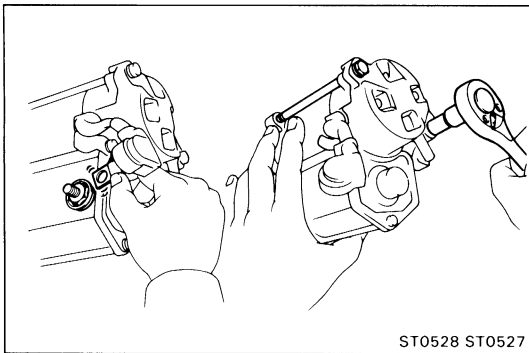
- (b) Remove the starter housing with the pinion gear, idle gear, bearing and clutch assembly.

3. REMOVE CLUTCH ASSEMBLY AND GEARS FROM STARTER HOUSING**4. REMOVE STEEL BALL AND SPRING**

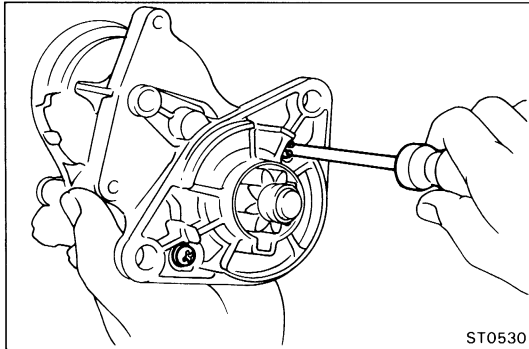
Using a magnetic finger, remove the spring and steel ball from the clutch shaft hole.

5. REMOVE BRUSHES AND BRUSH HOLDER

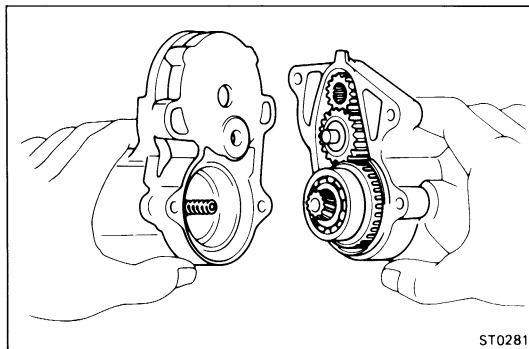
- (a) Remove the end cover from the field frame.
- (b) Remove the O-ring.
- (c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes and remove the brush holder.

6. REMOVE ARMATURE FROM FIELD FRAME

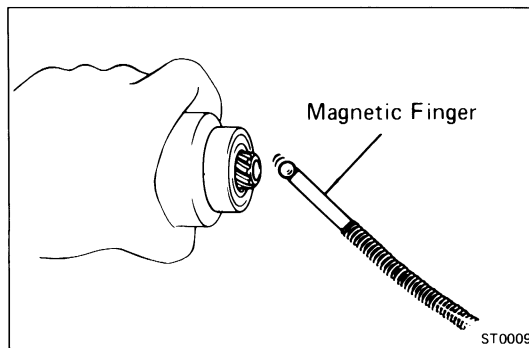
ST0528 ST0527



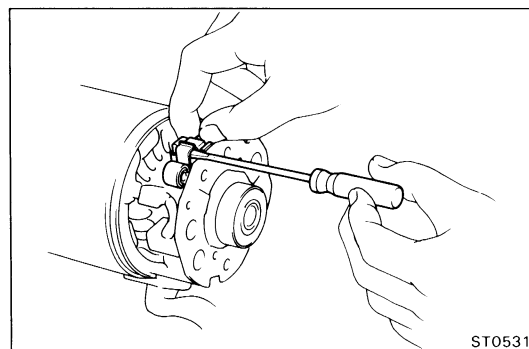
ST0530



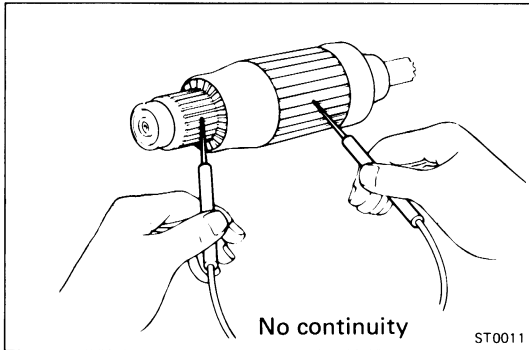
ST0281



ST0009



ST0531



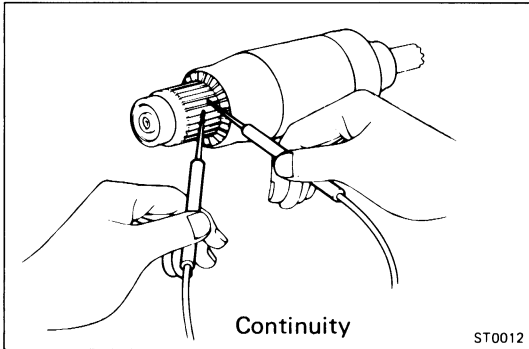
INSPECTION OF STARTER

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

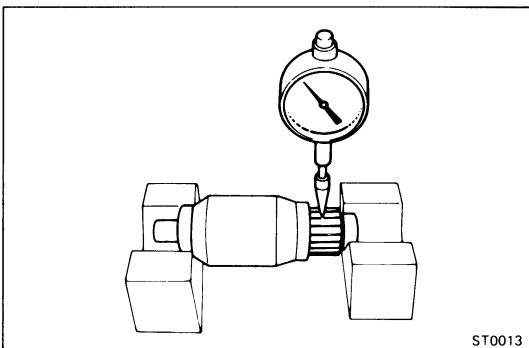
Using an ohmmeter, check that there is continuity between the segments of the commutator.

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 it with sandpaper (No.400) or on a lathe.



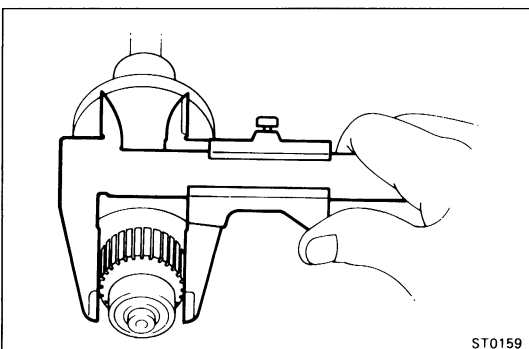
2. INSPECT COMMUTATOR CIRCLE RUNOUT

(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 maximum, correct it on a lathe.



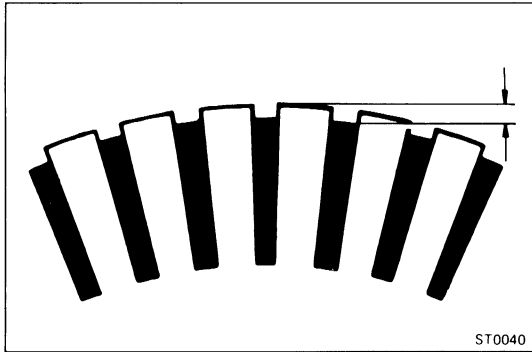
3. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.

Standard diameter: 30 mm (1.18 in.)

Minimum diameter: 29 mm (1.14 in.)

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



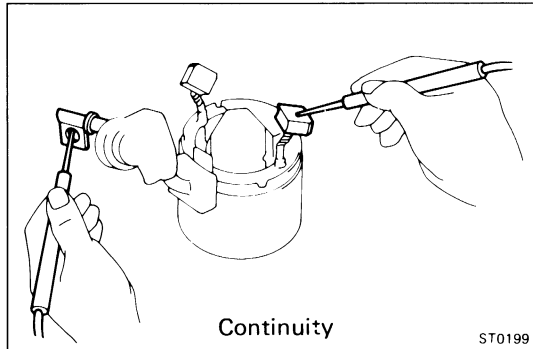
4. INSPECT UNDERCUT DEPTH OF SEGMENT

Check that the undercut depth is clean and free of foreign material. 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.

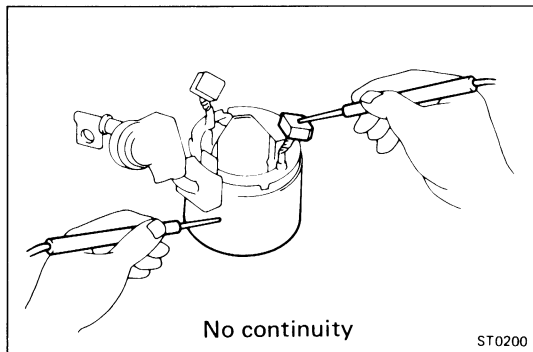


Field Frame (Field Coil)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

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

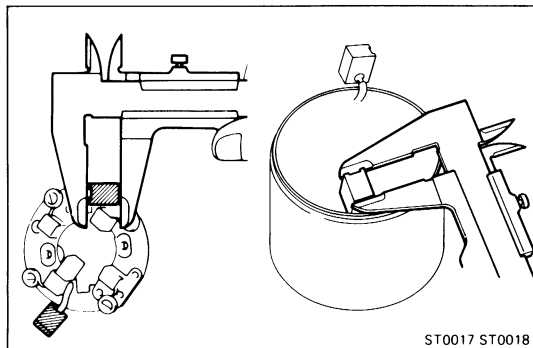
If there is no continuity, replace the field frame.



2. INSPECT THAT FIELD COIL IS NOT GROUNDED

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

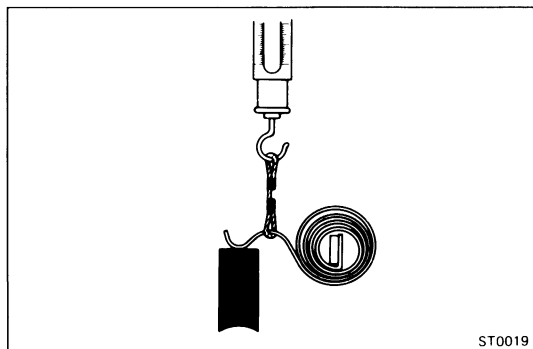
INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

Standard length: 15.5 mm (0.610 in.)

Minimum length: 10.0 mm (0.394 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.

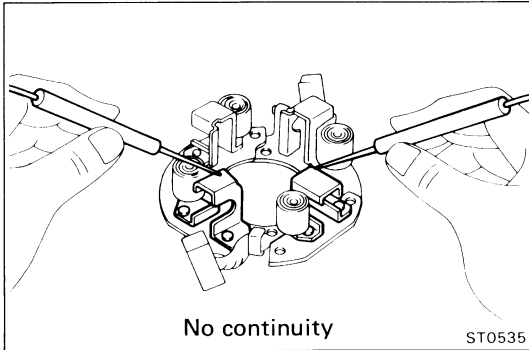
Standard installed load:

1,785 — 2,415 kg (3.9 — 5.3 lb, 18 — 24 N)

Minimum installed load:

1.2 kg (2.6 lb, 12 N)

If the installed load is less than minimum, replace the brush springs.



Brush Holder

INSPECT INSULATION OF BRUSH HOLDER

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.

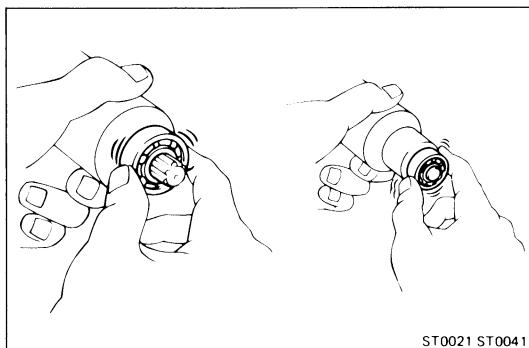
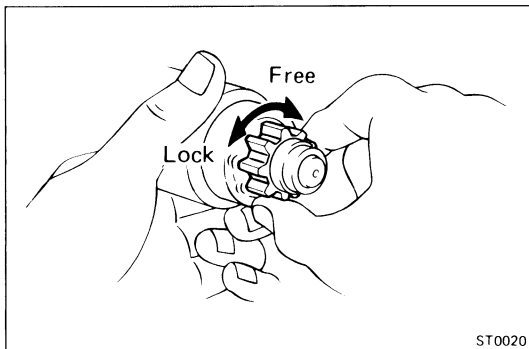
If damaged, replace the gear or clutch assembly.

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

2. INSPECT CLUTCH

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

If necessary, replace the clutch assembly



Bearings

1. INSPECT BEARINGS

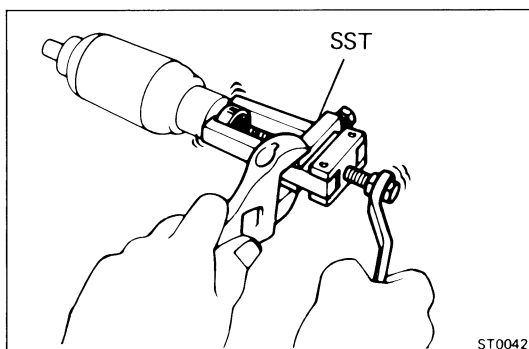
Turn each bearing by hand while applying inward force.

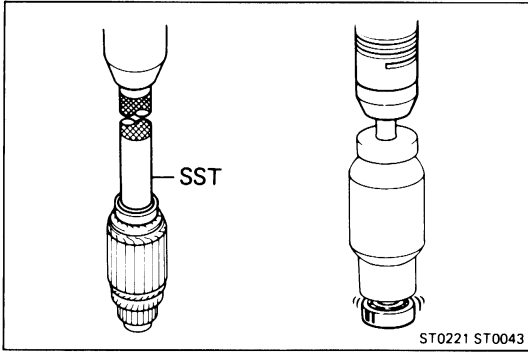
If resistance is felt or if the bearing sticks, replace the bearing.

2. IF NECESSARY, REPLACE BEARINGS

(a) Using SST, remove the bearing.

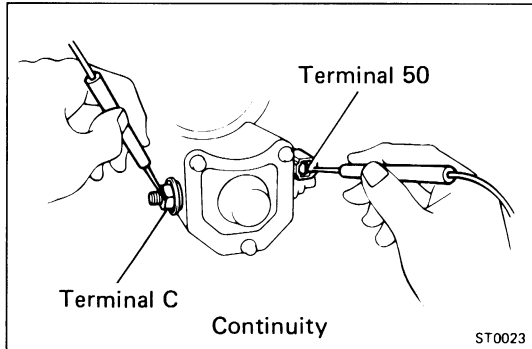
SST 09286-46011





(b) Using SST and a press, press in a new front bearing.
SST 09201-41020

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

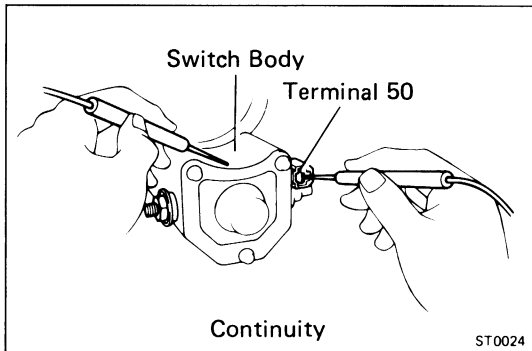


Magnetic Switch

1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and C.

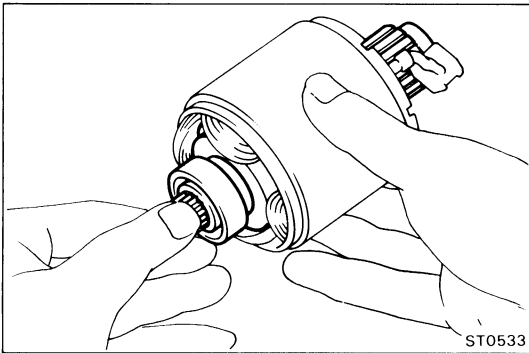
If there is no continuity, replace the magnetic switch assembly.



2. PERFORM HOLD-IN COIL 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 assembly.



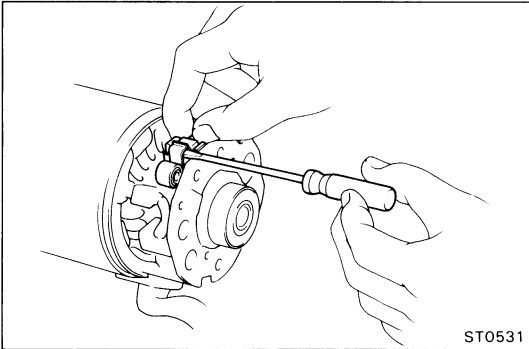
ASSEMBLY OF STARTER

(See page ST-3)

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.

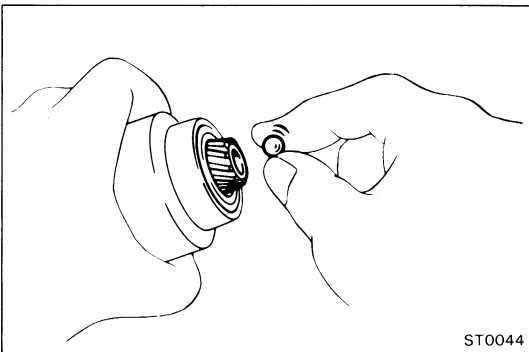


2. INSTALL BRUSH HOLDER

(a) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the four brushes.

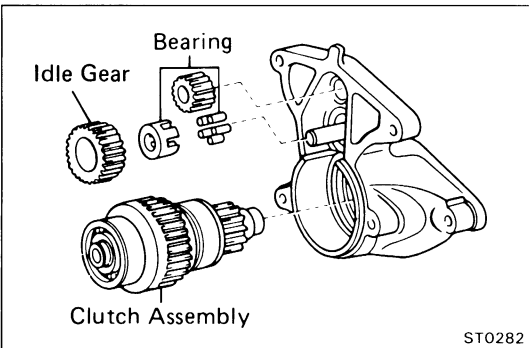
HINT: Check that the positive (+) lead wires are not grounded.

(b) Place a new O-ring on the field frame.
(c) Install the end cover to the field frame.



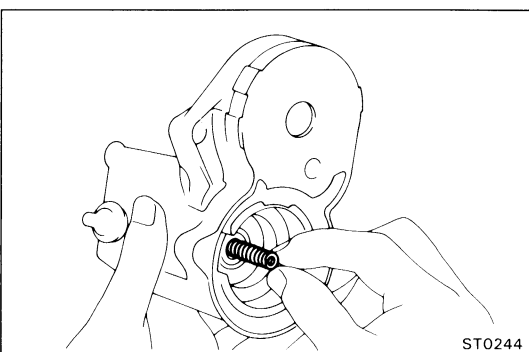
3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.
(b) Insert the steel ball into the clutch shaft hole.



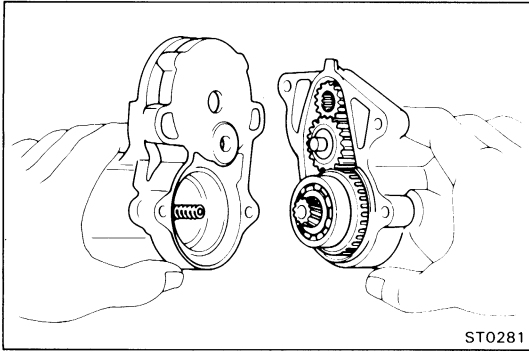
4. INSTALL GEARS AND CLUTCH ASSEMBLY

(a) Apply grease to the gears and clutch assembly.
(b) Place the clutch assembly, idle gear, bearing and pinion gear in the starter housing.

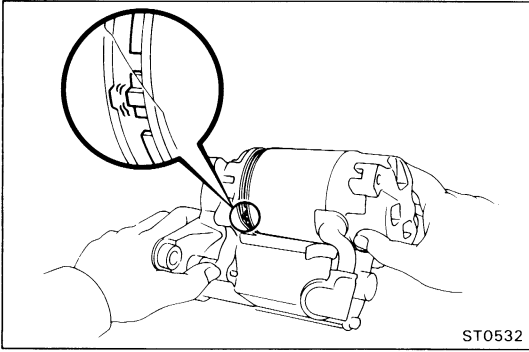


5. INSTALL STARTER HOUSING

(a) Apply grease to the return spring.
(b) Insert the return spring into the magnetic hole.

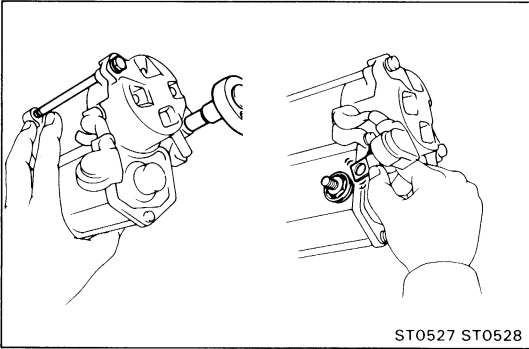


- (c) Place the starter housing on the magnetic switch and install the two screws.

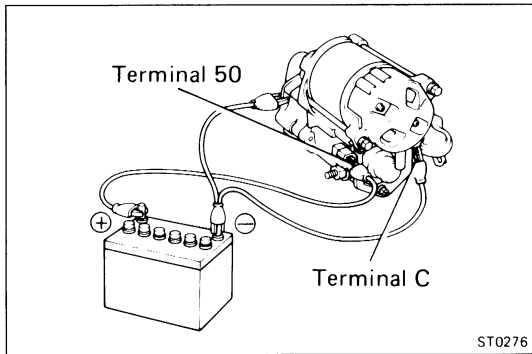


6. INSTALL FIELD FRAME WITH ARMATURE TO MAGNETIC SWITCH ASSEMBLY

- (a) Place a new O-ring on the field frame.
 (b) Align the protrusion of the field frame with the cutout of the magnetic switch.



- (c) Install the two through bolts.
 (d) Connect the lead wire to the magnetic switch terminal C, and install the nut.



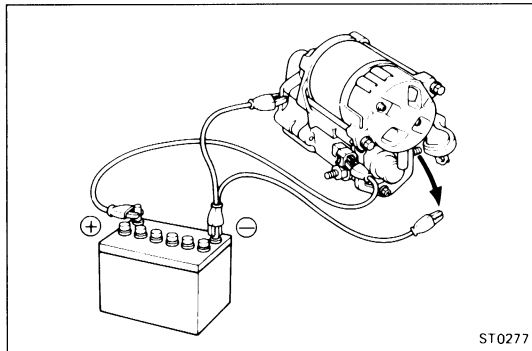
PERFORMANCE TEST OF STARTER

NOTICE: 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 wire from terminal C.
- (b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.

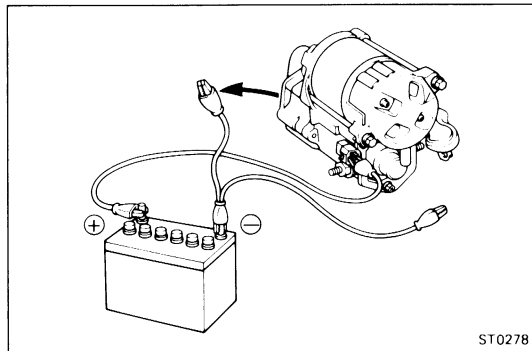
If the clutch pinion gear does not move, replace the magnetic switch assembly.



2. PERFORM HOLD-IN TEST

While connected as above with the clutch pinion gear out, disconnect the negative (—) lead from terminal C. Check that the pinion gear remains out.

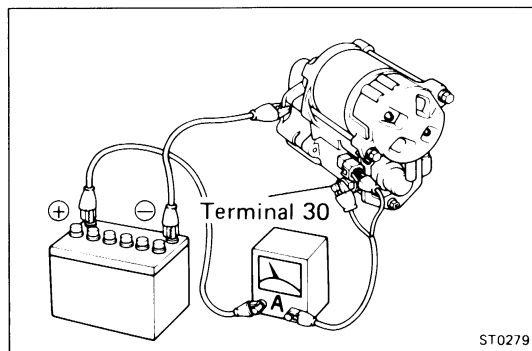
If the clutch pinion gear returns inward, replace the magnetic switch assembly.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (—) lead from the switch body. Check that the clutch pinion gear returns inward.

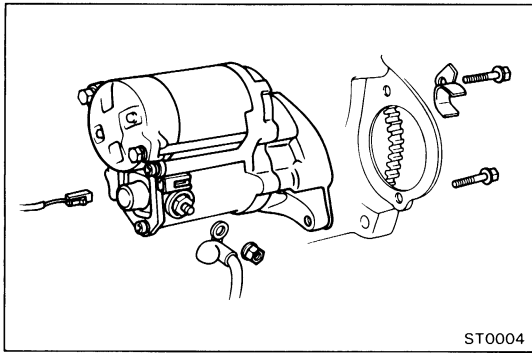
If the clutch pinion gear does not return, replace the magnetic switch assembly.



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 gear moving out. Check that the ammeter reads the specified current.

Specified current: 90 A or less at 11.5 V



INSTALLATION OF STARTER

1. INSTALL STARTER ON TRANSAXLE

Place the starter in the flywheel bellhousing, and install and torque the starter mounting bolts.

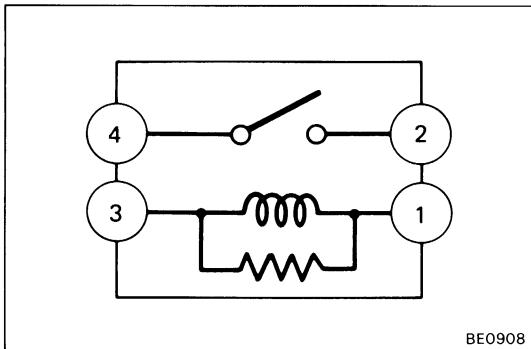
Torque: 400 kg-cm (29 ft-lb, 39 N·m)

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. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Check that the engine starts.

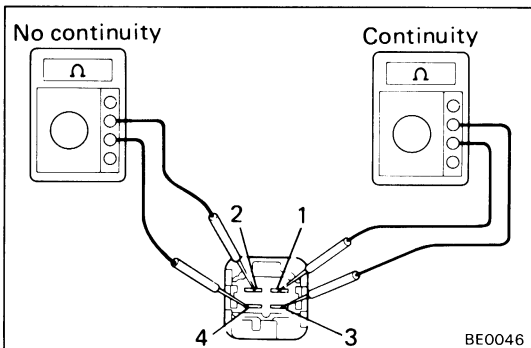


STARTER RELAY (ex. Canada A/T)

INSPECTION OF STARTER RELAY

INSPECT STARTER RELAY

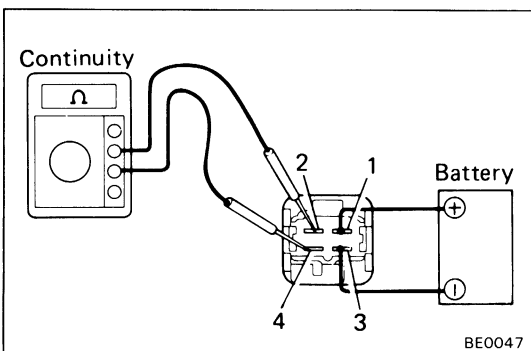
LOCATION: The relay located in the passenger's kick panel.



Inspect Relay Continuity

- Using an ohmmeter, check that there is continuity between terminals 1 and 3.
- Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.



Inspect Relay Operation

- Apply battery voltage across terminals 1 and 3.
- Check that there is continuity between terminals 2 and 4.

If operation is not as described, replace the relay.

CLUTCH START SWITCH (M/T)

(See page CL-4)