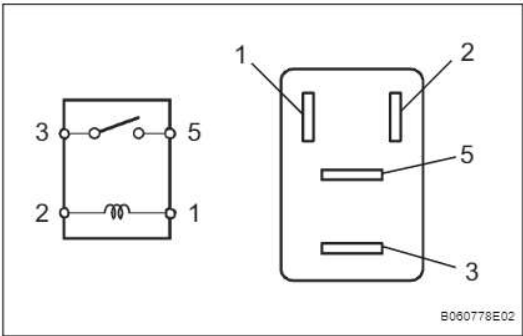




INSPECTION

1. INSPECT STARTER RELAY ASSEMBLY
- (a) Remove the ST relay from the engine room R/B.
 - (b) Check the resistance of the relay.

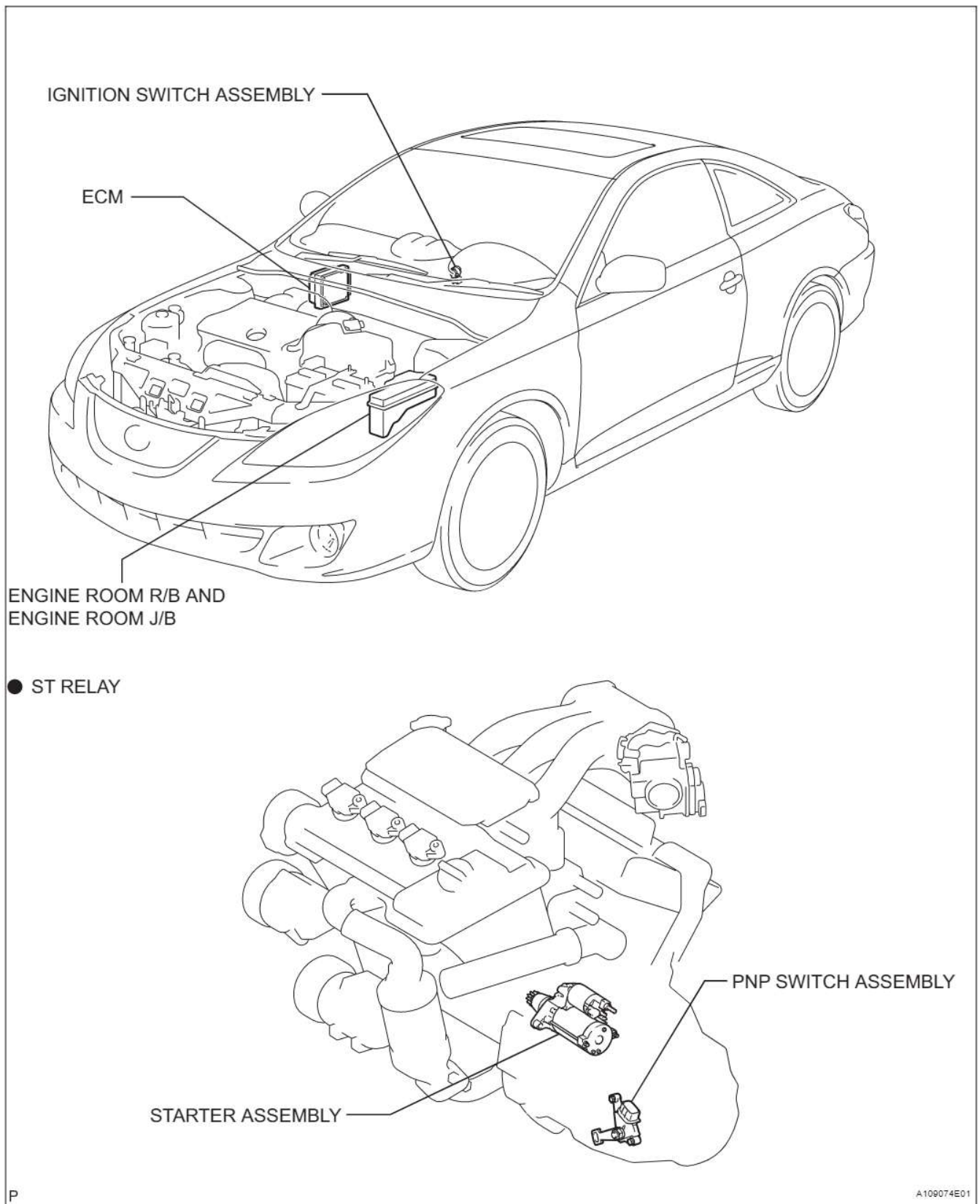
Resistance

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (when battery voltage is applied to terminals 1 and 2)

If the result is not as specified, replace the relay.

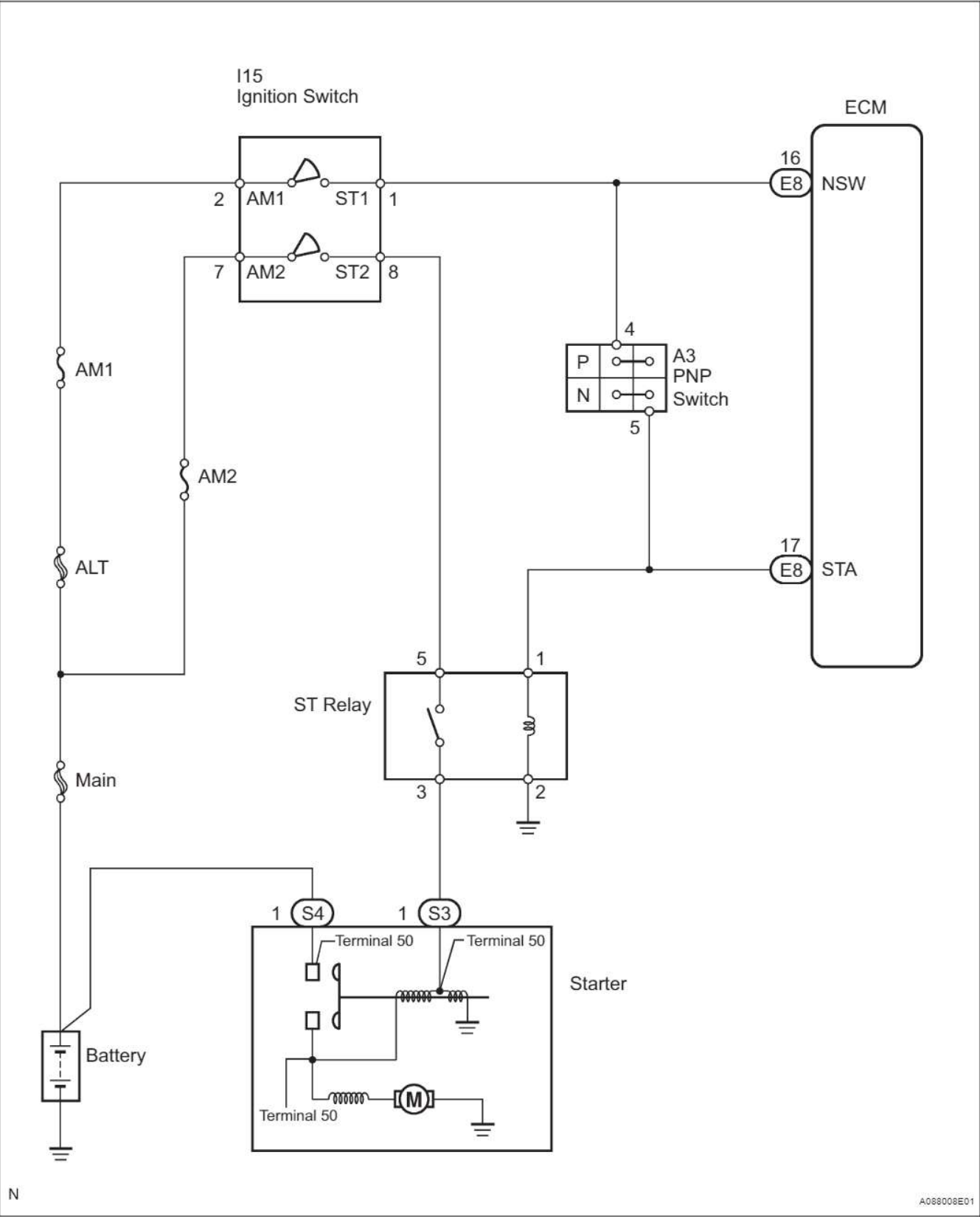
3MZ-FE STARTING – STARTING SYSTEM

ST-1

STARTING SYSTEM**PARTS LOCATION****ST**

SYSTEM DIAGRAM

The starting system rotates the starter motor according to the signals from the ignition switch and PNP switch.



3MZ-FE STARTING – STARTER

ST-9

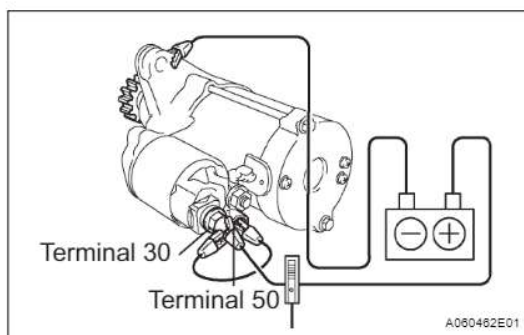
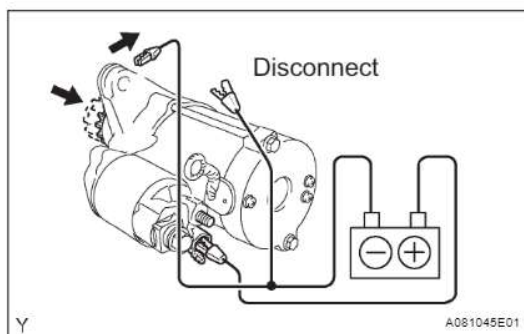
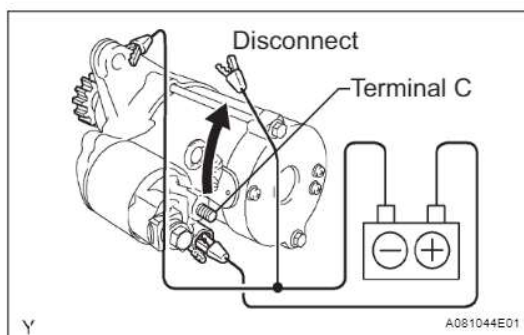
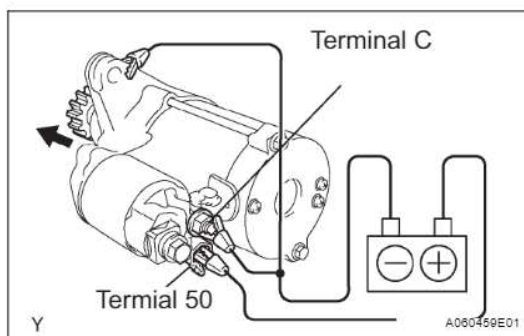
INSPECTION

1. INSPECT STARTER ASSEMBLY

NOTICE:

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

- (a) Perform the pull-in test.
- (1) Disconnect the lead wire from terminal C.
 - (2) Connect the battery to the magnetic switch as shown in the illustration on the left. Check that the clutch pinion gear extends. If the clutch pinion gear does not move, replace the magnetic switch.



- (b) Perform the hold-in test.
- (1) Maintain the battery connections in step (a), but disconnect the negative (-) lead from terminal C. Check that the pinion gear remains extended. If the clutch pinion gear returns inward, replace the magnetic switch.
- (c) Check the clutch pinion gear return.
- (1) Disconnect the negative (-) lead from the switch body. Check that the clutch pinion gear returns. If the clutch pinion gear does not return, replace the magnetic switch.
- (d) Perform the no-load performance test.
- (1) Connect the lead wire to terminal C. Make sure that the lead is not grounded.
 - (2) Clamp the starter in a vise.
 - (3) Connect the battery and an ammeter to the starter as shown in the illustration.
 - (4) Check that the starter rotates smoothly and steadily with the clutch pinion gear extended. Check that the ammeter reads the specified current.

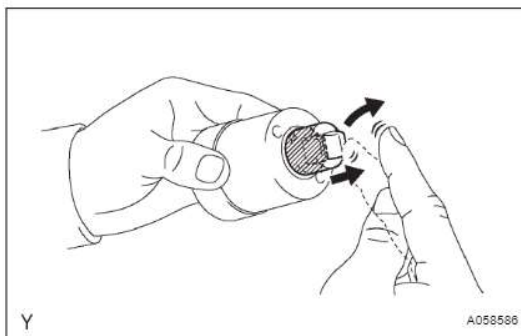
Specified current:

90 A or less at 11.5 V

ST

ST-10

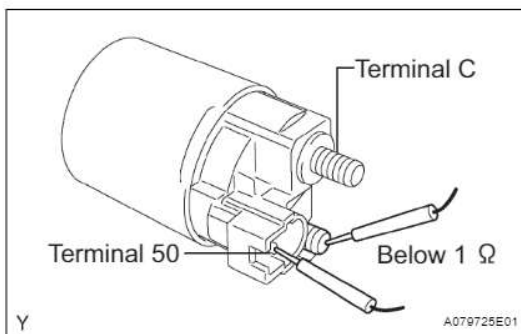
3MZ-FE STARTING – STARTER



2. INSPECT MAGNETIC SWITCH ASSEMBLY

(a) Check the plunger.

- (1) Push in the plunger and check that it returns quickly to its original position.
If necessary, replace the magnetic switch assembly.

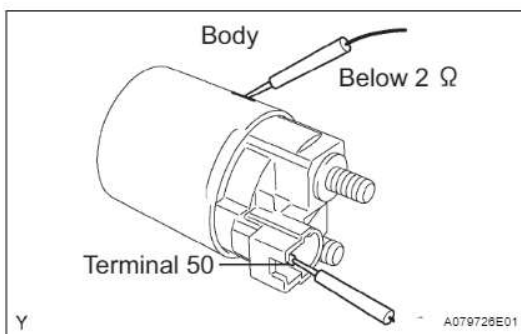


(b) Check if the pull-in coil has an open circuit.

- (1) Measure the resistance between terminals 50 and C.

Resistance:**Below 1 Ω**

If the result is not as specified, replace the magnetic switch assembly.

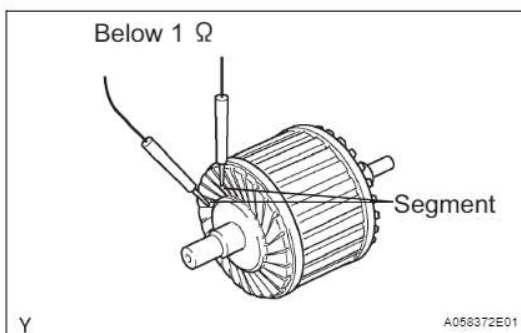


(c) Check if the hold-in coil has an open circuit.

- (1) Measure the resistance between terminal 50 and the switch body.

Resistance:**Below 2 Ω**

If the result is not as specified, replace the magnetic switch assembly.



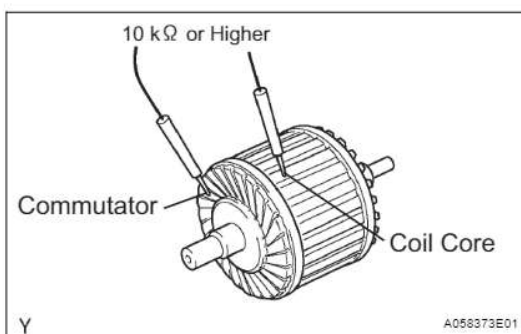
3. INSPECT STARTER ARMATURE ASSEMBLY

(a) Measure if the commutator has an open circuit.

- (1) Check the resistance between the segments of the commutator.

Resistance:**Below 1 Ω**

If the result is not as specified, replace the armature assembly.



(b) Check if the commutator is grounded.

- (1) Measure the resistance between the commutator and armature coil core.

Resistance:**10 kΩ or higher**

If the result is not as specified, replace the armature assembly.

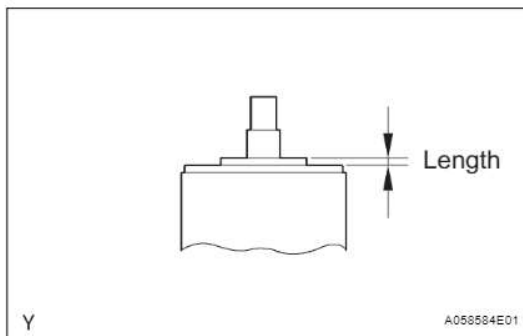
(c) Check the commutator for contamination and burns on its surface.

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

ST

3MZ-FE STARTING – STARTER

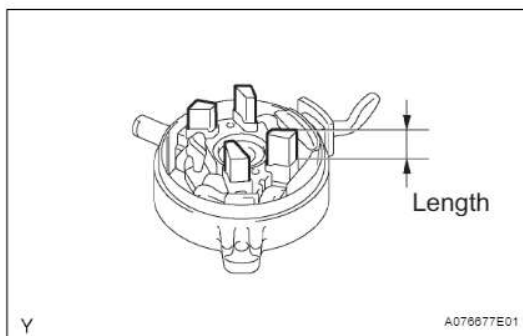
ST-11



- (d) Using a vernier caliper, measure the commutator's length.

Standard length:**3.1 to 3.8 mm (0.122 to 0.150 in.)**

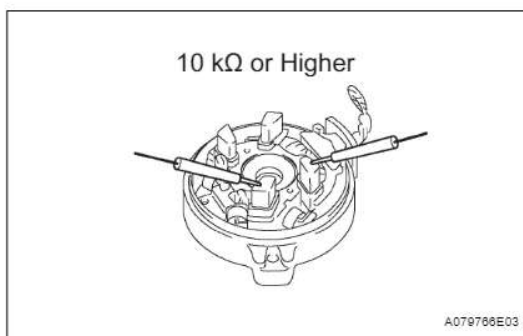
If the length is greater than the maximum, replace the starter armature.

**4. INSPECT STARTER COMMUTATOR END FRAME ASSEMBLY**

- (a) Using a vernier caliper, measure the brush length.

Specified length:**4.0 to 9.0 mm (0.158 to 0.359 in.)**

If the length is less than the minimum, replace the end frame assembly.

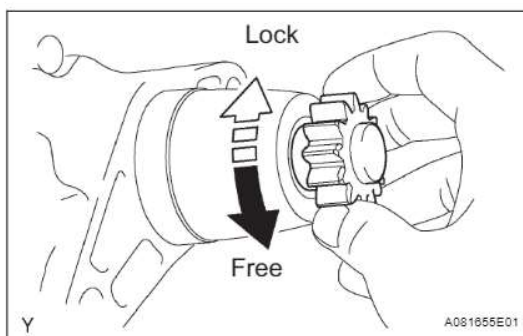


- (b) Check the brush insulation.

- (1) Measure the resistance between the positive (+) and negative (-) brush.

Resistance:**10 kΩ or higher**

If the result is not as specified, repair or replace the end frame assembly.

**5. INSPECT STARTER CLUTCH**

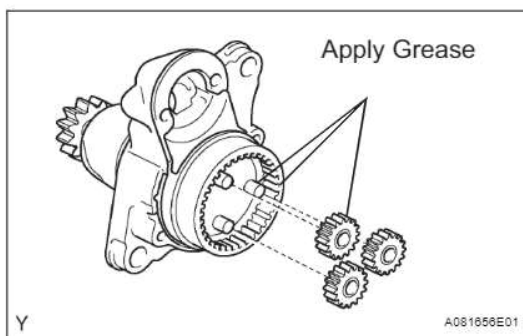
- (a) Check the starter clutch.

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

If necessary, replace the clutch & bearing center.

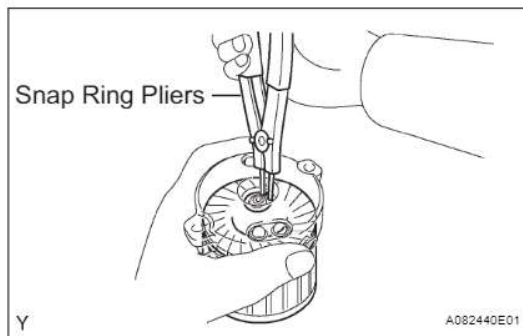
REASSEMBLY**1. INSTALL PLANETARY GEAR**

- (a) Apply grease to the planetary gears and pin parts of the planetary shaft.
- (b) Install the 3 planetary gears.

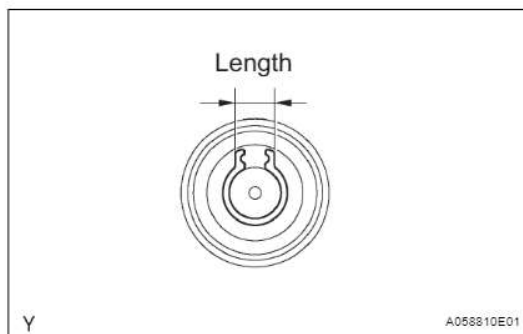
**ST**

ST-12

3MZ-FE STARTING – STARTER

**2. INSTALL STARTER ARMATURE ASSEMBLY**

- (a) Apply grease to the plate washer and the armature shaft.
- (b) Install the starter armature to the starter commutator end frame.
- (c) Using snap ring pliers, install the plate washer and a new snap ring.

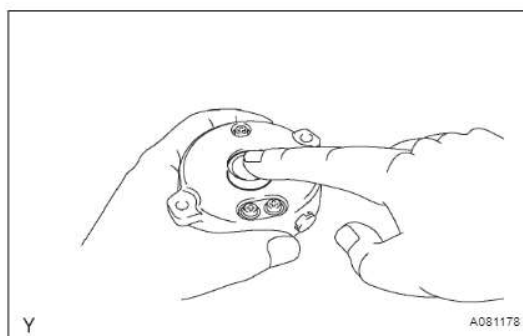


- (d) Using a vernier caliper, measure length of the snap ring.

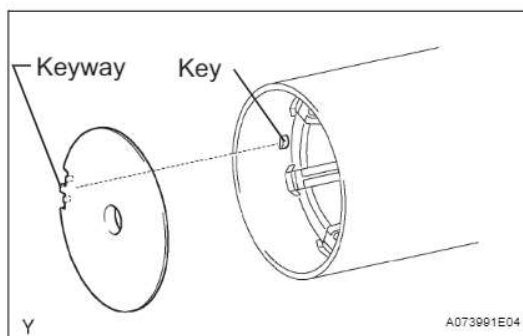
Maximum length:

5.0 mm (0.197 in.)

If the length is greater than the maximum, replace it with a new snap ring.

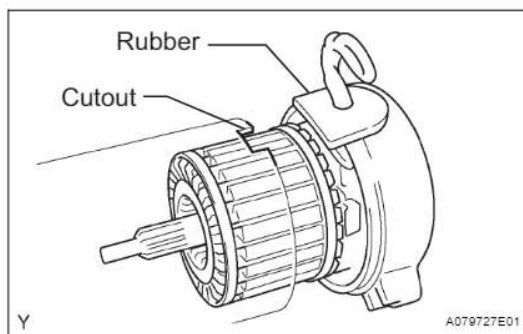
**3. INSTALL STARTER COMMUTATOR END FRAME COVER**

- (a) Install the end frame cover to the commutator end frame.

**4. INSTALL STARTER ARMATURE PLATE**

- (a) Insert the armature plate to the starter field frame.
- (b) Align the keyway of the starter plate with the key inside the starter field frame, and install the starter plate.

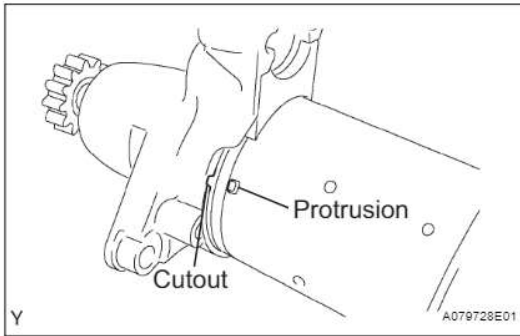
ST

**5. INSTALL STARTER COMMUTATOR END FRAME ASSEMBLY**

- (a) Align the rubber of the end frame with the cutout of the field frame.
- (b) Install the end frame to the field frame.

3MZ-FE STARTING – STARTER

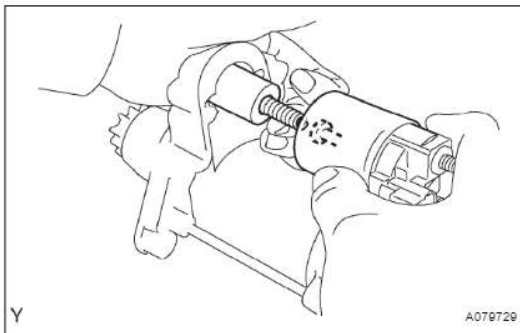
ST-13

**6. INSTALL STARTER FIELD FRAME ASSEMBLY**

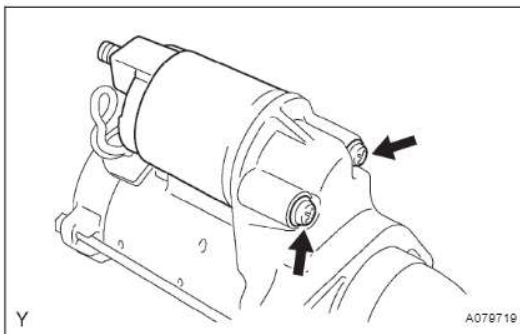
- (a) Align the protrusion of the starter field frame with the cutout of the starter drive housing.



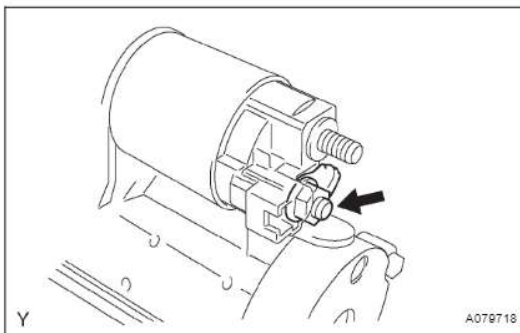
- (b) Install the field frame with the 2 through bolts.
Torque: 6.0 N*m (61 kgf*cm, 53 in.*lbf)

**7. INSTALL MAGNETIC SWITCH ASSEMBLY**

- (a) Apply grease to the plunger and the hook.
(b) Hang the plunger hook of the magnetic switch to the drive lever.
(c) Install the plunger and return spring.



- (d) Install the magnetic switch with 2 screws.
Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)



- (e) Connect the lead wire to the magnetic switch with the nut.
Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

ST

ST-14

3MZ-FE STARTING – STARTER

INSTALLATION

1. INSTALL STARTER ASSEMBLY

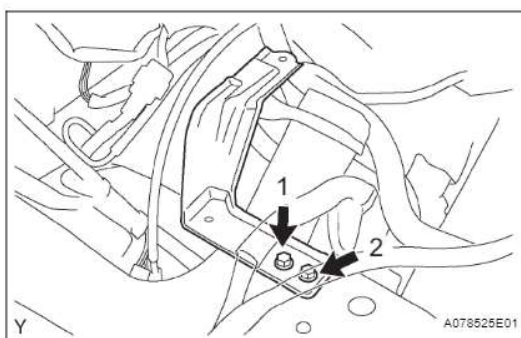
- (a) Install the starter with the 2 bolts.
Torque: 37 N*m (380 kgf*cm, 26 ft.*lbf)
- (b) Connect the starter wire with the nut.
Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)
- (c) Connect the starter connector.
- (d) Install the terminal nut and cover the nut with the cap.
Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)

2. INSTALL AIR CLEANER INLET NO.1

- (a) Install the cleaner inlet with the bolt.
Torque: 7.0 N*m (71 kgf*cm, 62 in.*lbf)

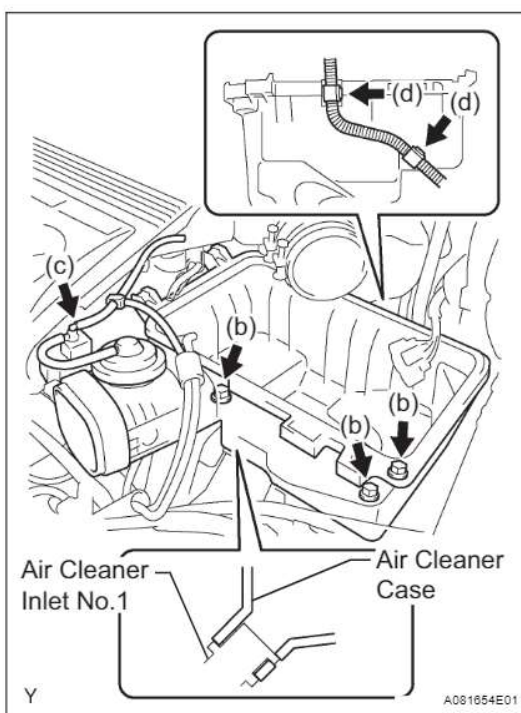
3. INSTALL AIR CLEANER BRACKET

- (a) Install the air cleaner bracket with the 2 bolts.
Tighten the 2 bolts uniformly in the numerical order shown in the illustration.
Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)
NOTICE:
Fully tightening each bolt one by one may damage the air cleaner bracket and bolts.



4. INSTALL AIR CLEANER ASSEMBLY

- (a) Install the air cleaner case to the air cleaner inlet No.1, as shown in the illustration.
- (b) Tighten the 3 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)
NOTICE:
Fully tightening each bolt one by one may damage the air cleaner case and bolts.
- (c) Connect the vacuum hose.
- (d) Install the 2 wire harness clamps.
- (e) Install the air cleaner filter element.
- (f) Connect the air cleaner hose No.1 and tighten the air cleaner hose clamp bolt.
- (g) Tighten the 2 air cleaner cap bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)
- (h) Connect the 4 vacuum hoses.
- (i) Connect the MAF meter connector.



5. INSTALL AIR CLEANER INLET ASSEMBLY

Torque: 7.0 N*m (71 kgf*cm, 62 in.*lbf)

6. CHECK CONNECTION OF VACUUM HOSE

7. INSTALL BATTERY TRAY

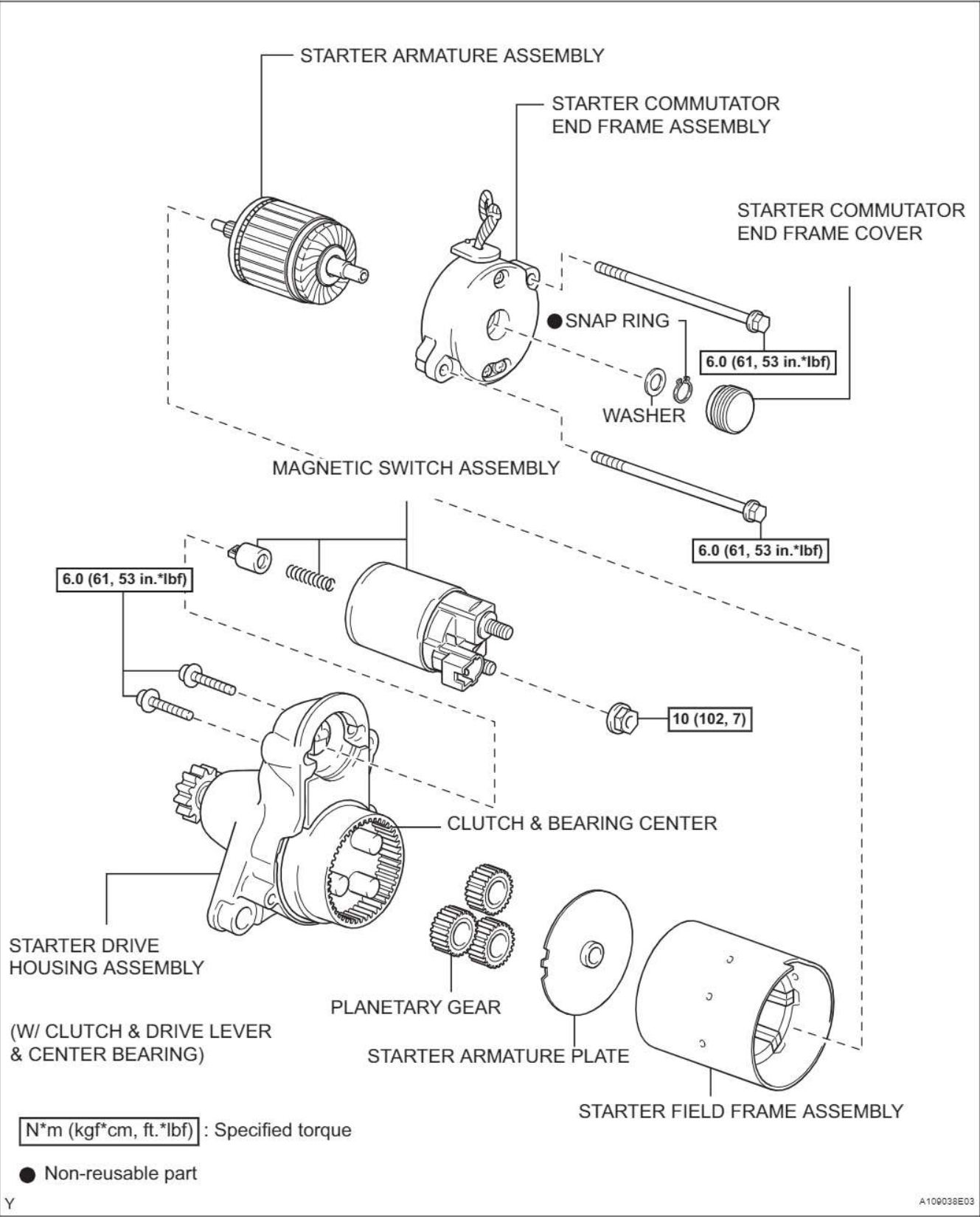
8. INSTALL BATTERY

- (a) Install the battery clamp with the bolt and nut.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)
- (b) Connect the cables to the battery terminals.
Torque: 3.5 N*m (36 kgf*cm, 31 in.*lbf)

ST

STARTER

COMPONENTS



3MZ-FE STARTING – STARTER

ST-5

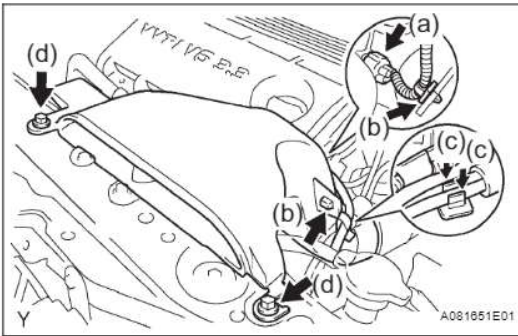
REMOVAL**NOTICE:**

Before changing the starter, check these items again:

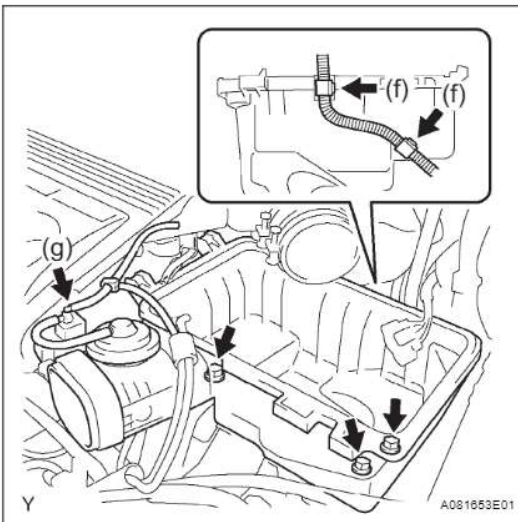
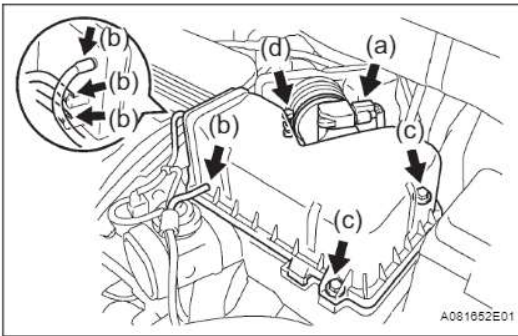
- Connector connection
- Accessory installation

1. REMOVE BATTERY**2. REMOVE BATTERY TRAY****3. REMOVE AIR CLEANER INLET ASSEMBLY**

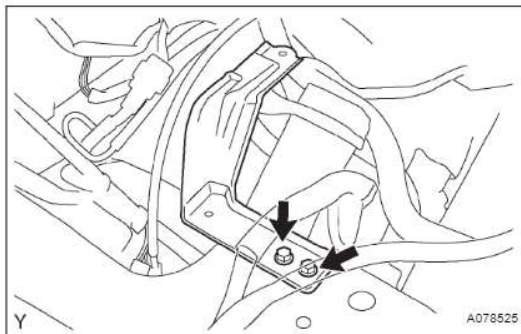
- (a) Disconnect the VSV connector.
- (b) Remove the 2 wire harness clamps.
- (c) Remove the vacuum hoses from the hose clamp.
- (d) Remove the 2 bolts and air cleaner inlet.

**4. REMOVE AIR CLEANER ASSEMBLY**

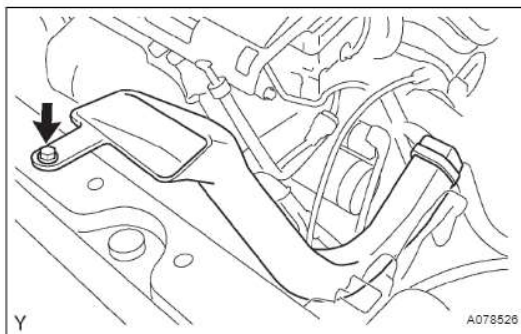
- (a) Disconnect the MAF meter connector.
- (b) Disconnect the 4 vacuum hoses.
- (c) Loosen the 2 air cleaner cap bolts.
- (d) Loosen the air cleaner hose clamp bolt and remove the air cleaner cap.
- (e) Remove the air cleaner filter element.
- (f) Remove the wire harness from the 2 wire harness clamps.
- (g) Disconnect the vacuum hose.
- (h) Remove the 3 bolts and air cleaner case.



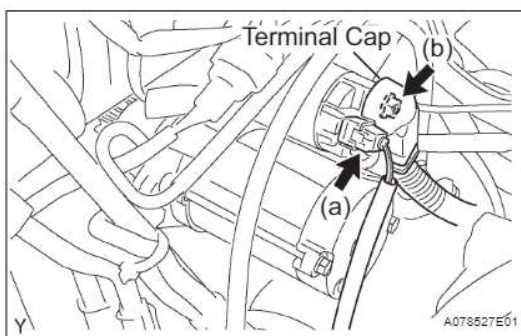
ST

ST-6**3MZ-FE STARTING – STARTER****5. REMOVE AIR CLEANER BRACKET**

- (a) Remove the 2 bolts and air cleaner bracket.

**6. REMOVE AIR CLEANER INLET NO.1**

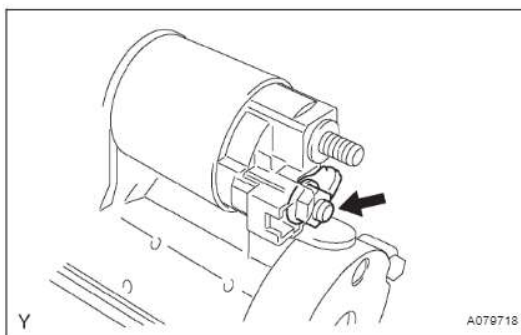
- (a) Remove the bolt and cleaner inlet.

**7. REMOVE STARTER ASSEMBLY**

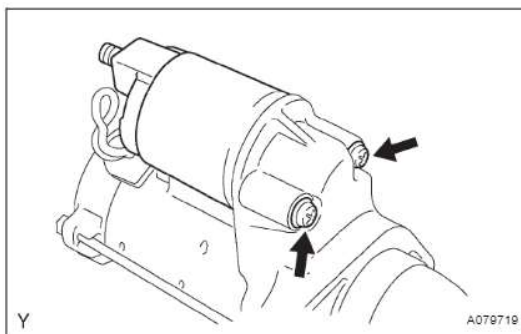
- (a) Disconnect the starter connector.
 (b) Open the terminal cap, and remove the nut and disconnect the starter wire.
 (c) Remove the 2 bolts and starter.

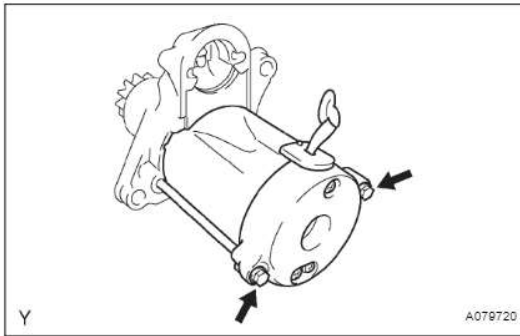
DISASSEMBLY**1. REMOVE MAGNETIC SWITCH ASSEMBLY**

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

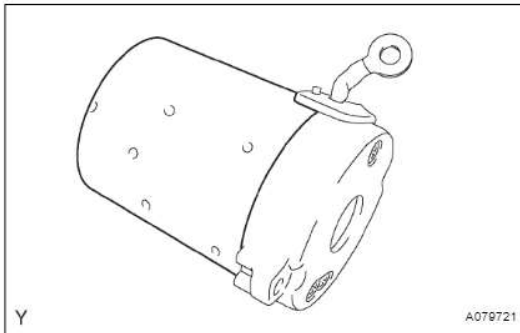


- (b) Remove the 2 screws holding the magnetic switch to the starter drive housing.
 (c) Remove the magnetic switch.
 (d) Remove the return spring and plunger from starter drive housing.

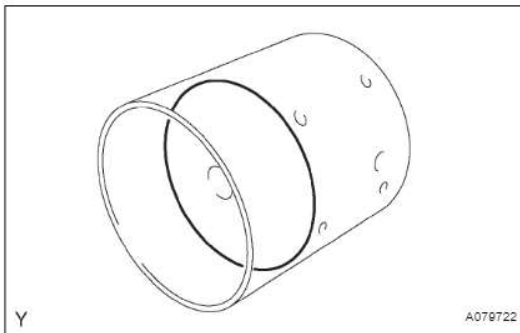
**ST**

3MZ-FE STARTING – STARTER**ST-7****2. REMOVE STARTER FIELD FRAME ASSEMBLY**

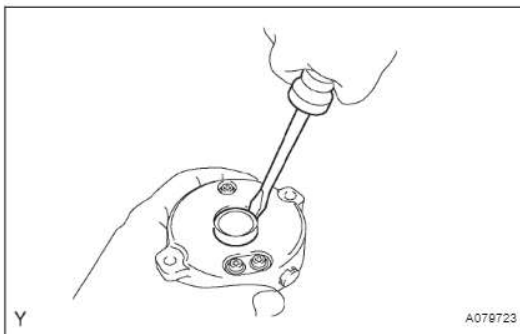
- (a) Remove the 2 through-bolts, and pull out the field frame together with the commutator end frame.



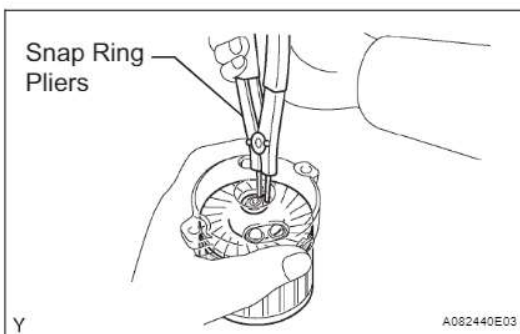
- (b) Remove the field frame from the commutator end frame.

**3. REMOVE STARTER ARMATURE PLATE**

- (a) Remove the armature plate from the field frame.

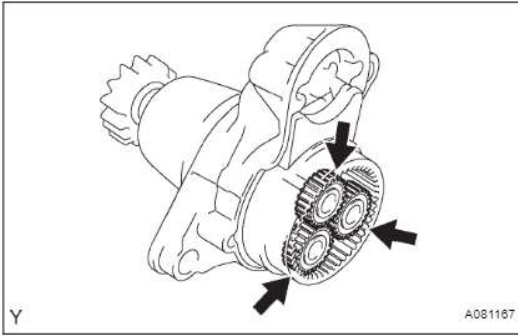
**4. REMOVE STARTER COMMUTATOR END FRAME COVER**

- (a) Using a screwdriver, pry out the commutator end frame cover.

**5. REMOVE STARTER ARMATURE ASSEMBLY**

- (a) Using snap ring pliers, remove the snap ring and plate washer.
(b) Remove the armature from the commutator end frame.

ST

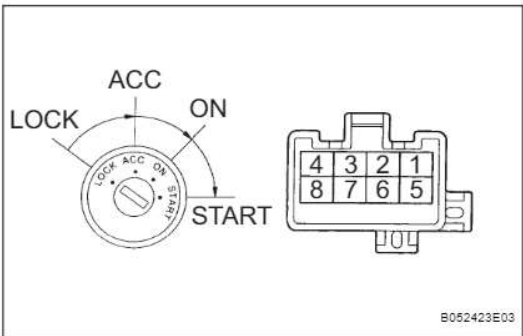
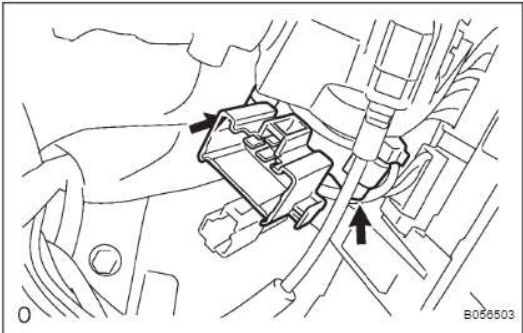
ST-8**3MZ-FE STARTING – STARTER****6. REMOVE PLANETARY GEAR**

- (a) Remove the 3 planetary gears from the starter drive housing.

IGNITION SWITCH

REMOVAL

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. REMOVE INSTRUMENT PANEL FINISH LOWER PANEL LH
HINT:
See page [IP-7](#)
3. REMOVE IGNITION OR STARTER SWITCH ASSEMBLY
(a) Disconnect the ignition switch connector and unlock warning switch connector.
(b) Remove the clamp.
(c) Remove the 2 screws and ignition switch.



INSPECTION

1. INSPECT IGNITION OR STARTER SWITCH ASSEMBLY
(a) Inspect the resistance of the switch.

Resistance

Tester Connection	Switch Condition	Specified Condition
-	LOCK	10 kΩ or higher
2 - 3	ACC	Below 1 Ω
2 - 3 2 - 4 6 - 7	ON	Below 1 Ω
1 - 2 1 - 4 6 - 7 6 - 8	START	Below 1 Ω

If the result is not as specified, replace the switch assembly.

ST-16**3MZ-FE STARTING – IGNITION SWITCH**

INSTALLATION

1. **INSTALL IGNITION OR STARTER SWITCH ASSEMBLY**
2. **INSTALL INSTRUMENT PANEL FINISH LOWER PANEL LH**
3. **CONNECT BATTERY NEGATIVE TERMINAL**

ST