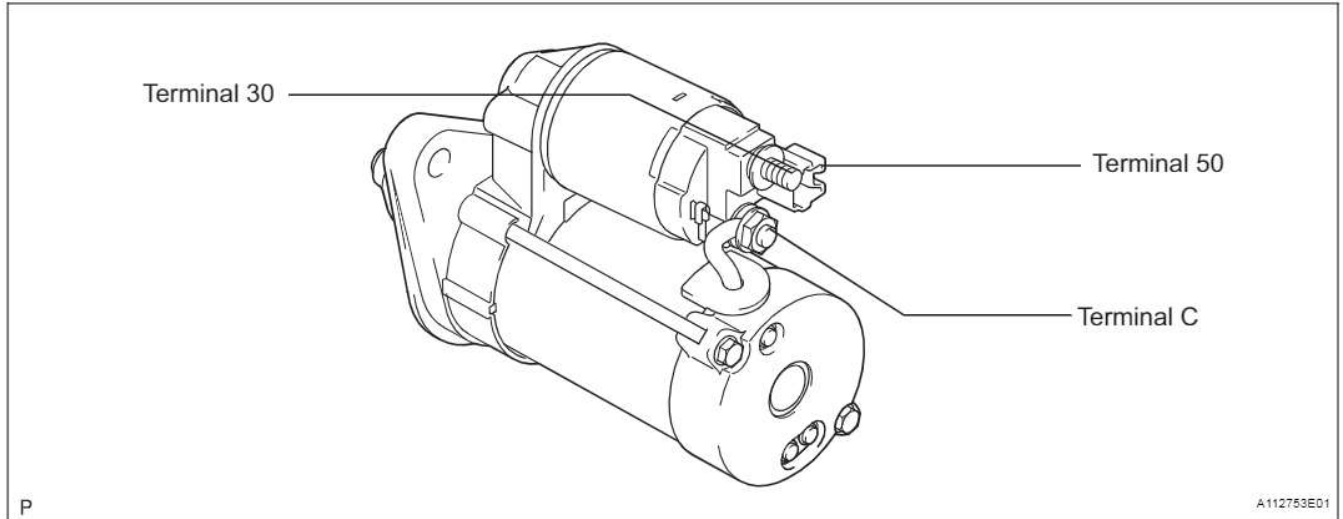


1NZ-FE STARTING – STARTING SYSTEM

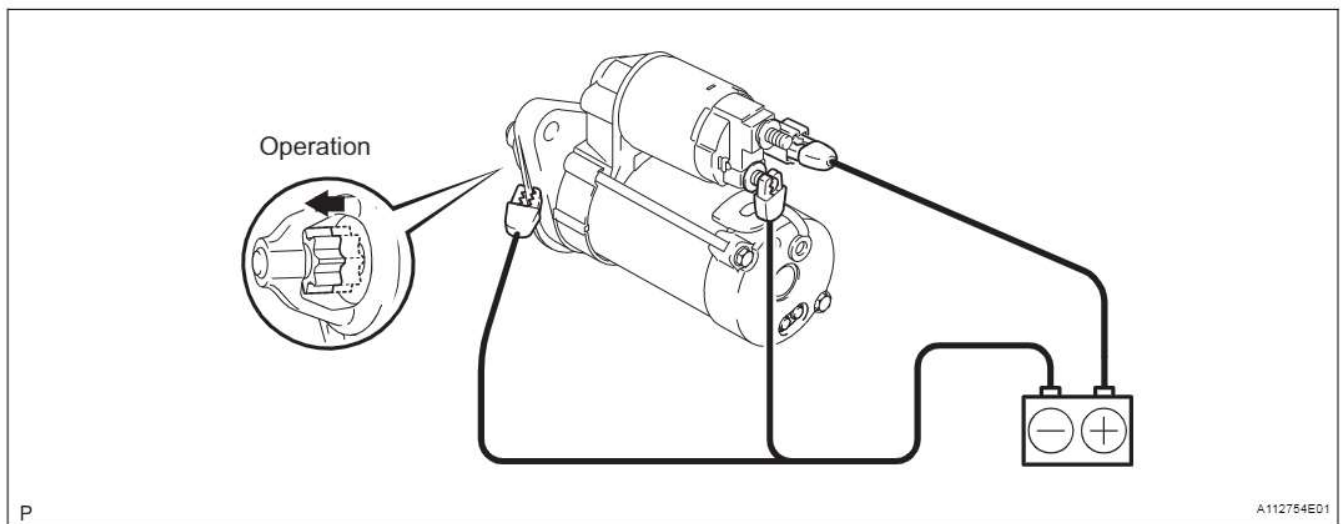
ST-3

INSPECTION**1. INSPECT STARTER ASSEMBLY****NOTICE:**

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

**(a) Perform pull-in/holding test.**

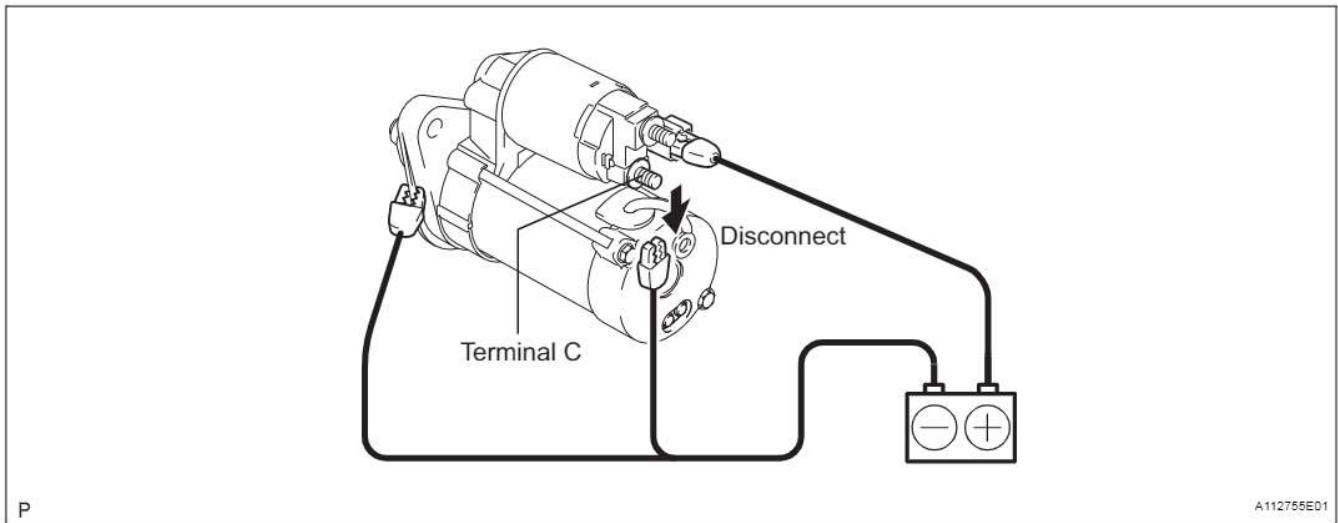
- (1) Disconnect the field coil lead wire from terminal C.
- (2) Connect the battery to the magnet switch as shown in the illustration. Then check that the clutch pinion gear moves outward.

**ST**

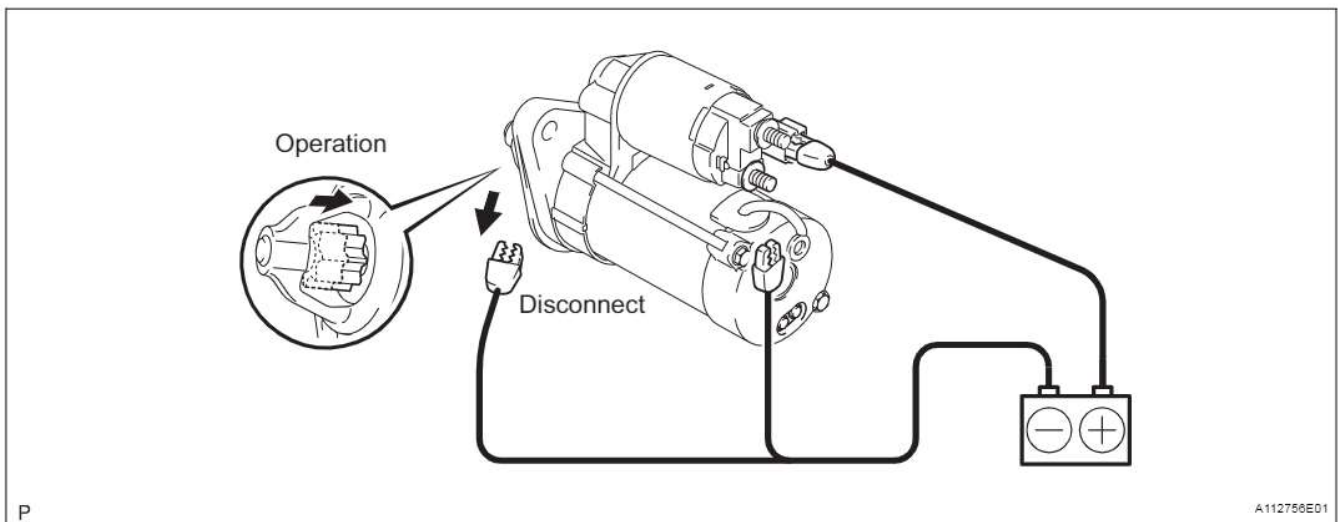
ST-4

1NZ-FE STARTING – STARTING SYSTEM

- (3) Disconnect the negative (-) lead from terminal C. Check that the pinion gear remains out.



- (4) Disconnect the negative (-) lead from the starter body. Check that the clutch pinion gear returns inward.

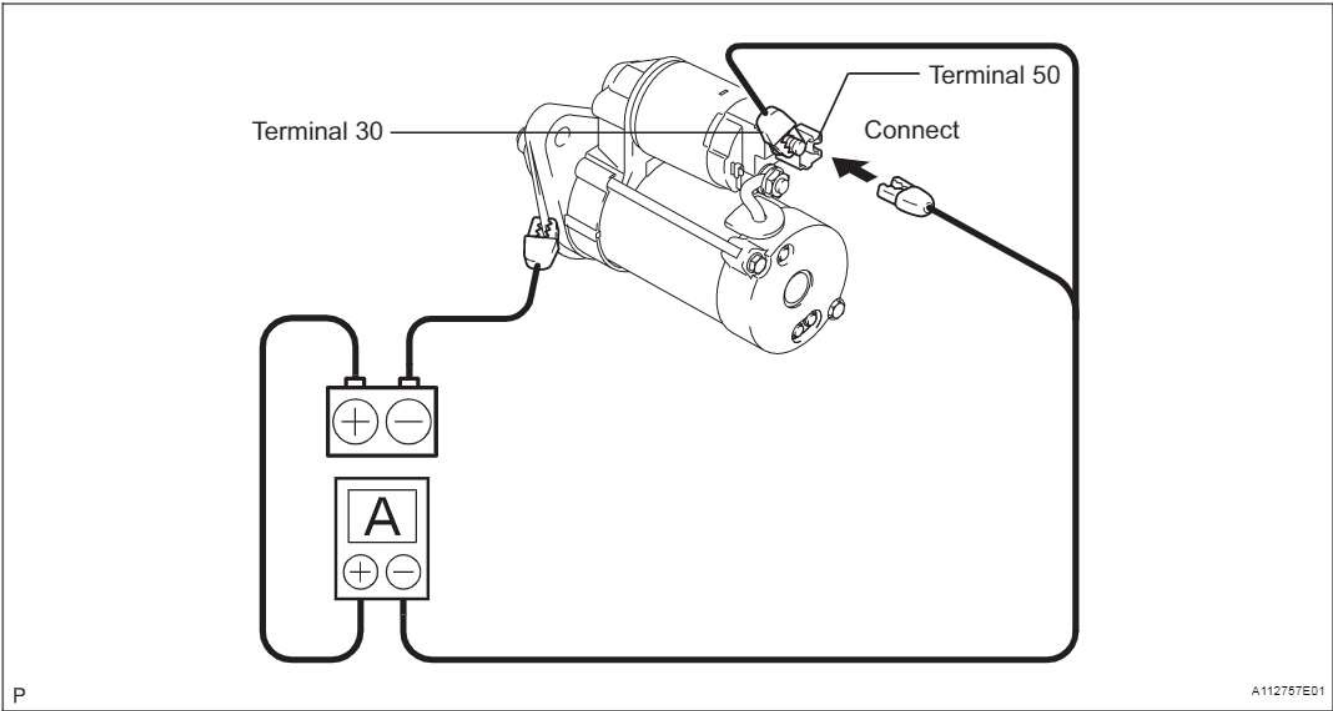


If the result is not as specified, replace the magnet switch body.

- (b) Perform operation test without load.
- (1) Connect the field coil lead wire to terminal C.
Torque: 5.9 N*m (60 kgf*cm, 52 in.*lbf)
 - (2) Grip the starter with a vise.
 - (3) Connect the battery and ammeter to the starter as shown in the illustration.
 - (4) Check that the starter rotates smoothly and steadily while the pinion gear is moving outward. Then measure the current.
Standard current:
90 A or less at 11.5 V

1NZ-FE STARTING – STARTING SYSTEM

ST-5



If the result is not as specified, replace the magnet switch body.

ST

ST-8

1NZ-FE STARTING – STARTER

REMOVAL

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

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **REMOVE ENGINE UNDER COVER LH**

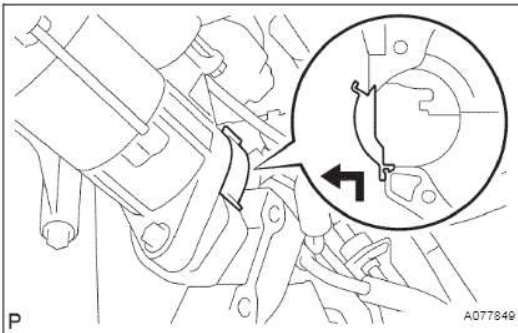
(a) Remove the 4 bolts, nut and cover.

3. **REMOVE ENGINE UNDER COVER RH**

(a) Remove the 4 bolts and cover.

4. **REMOVE FLYWHEEL HOUSING SIDE COVER**

(a) Remove the flywheel housing side cover by pulling it out as shown in the illustration.

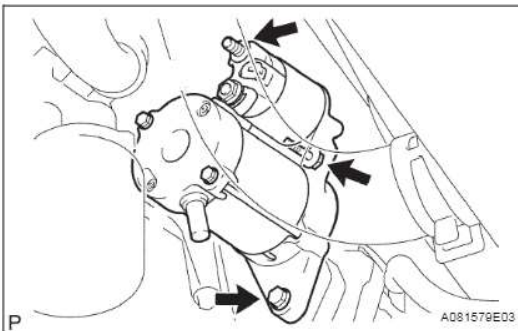


5. **REMOVE STARTER ASSEMBLY**

(a) Remove the nut and starter wire.

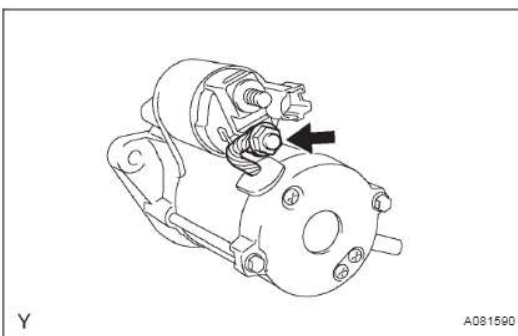
(b) Disconnect the starter connector.

(c) Remove the 2 bolts and starter.

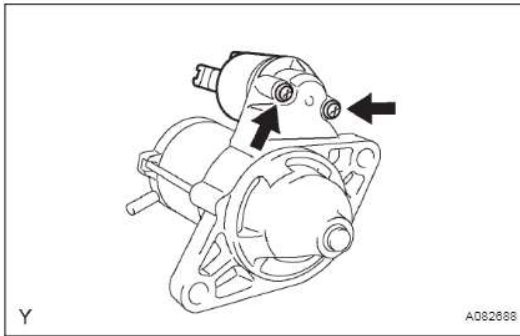
**DISASSEMBLY**

1. **REMOVE MAGNET SWITCH BODY**

(a) Remove the nut, and disconnect the lead wire from the magnet starter switch body.



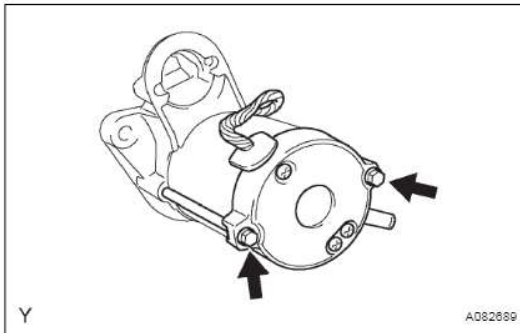
ST

1NZ-FE STARTING – STARTER**ST-9**

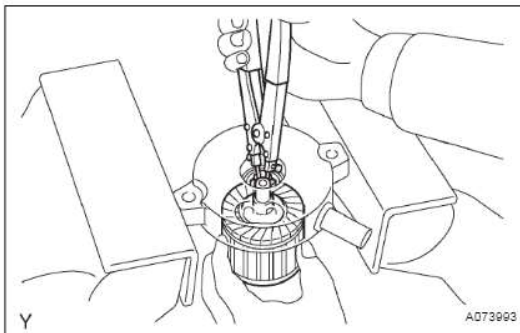
- (b) Remove the 2 screws holding the magnet starter switch body.
- (c) Remove the magnet starter switch body.
- (d) Remove the return spring and plunger.

2. REMOVE STARTER COMMUTATOR END FRAME COVER

- (a) Using a screwdriver, remove the cover.

**3. REMOVE STARTER ARMATURE ASSEMBLY**

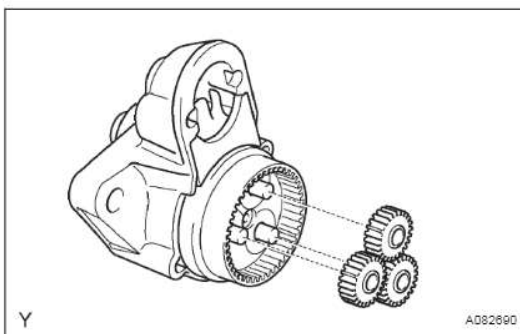
- (a) Remove the 2 through bolts, and pull out the starter yoke and commutator end frame together.
- (b) Remove the starter yoke from the commutator end frame.



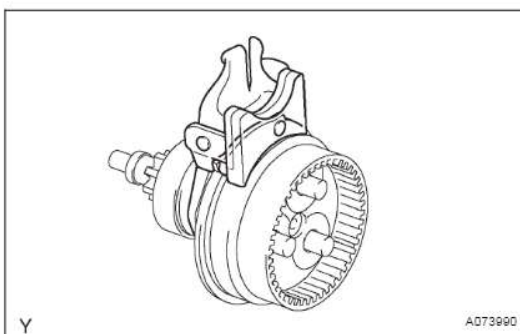
- (c) Using snap ring pliers, remove the snap ring and plate washer.
- (d) Remove the starter armature from the commutator end frame.

4. REMOVE STARTER ARMATURE PLATE

- (a) Remove the plate from the starter yoke.

ST**5. REMOVE PLANET GEAR**

- (a) Remove the 3 planet gears.

**6. REMOVE STARTER CENTER BEARING CLUTCH SUB-ASSEMBLY**

- (a) Remove the starter center bearing clutch with drive lever set pin from the starter drive housing.
- (b) Remove the drive lever set pin from the starter center bearing clutch.

ST-10

1NZ-FE STARTING – STARTER

INSPECTION

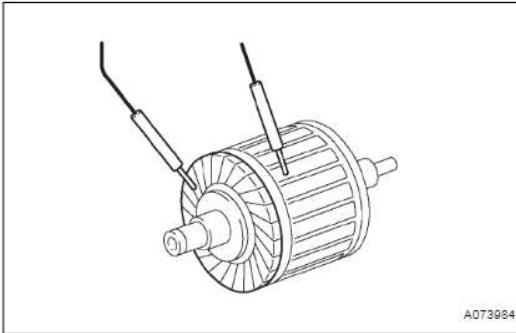
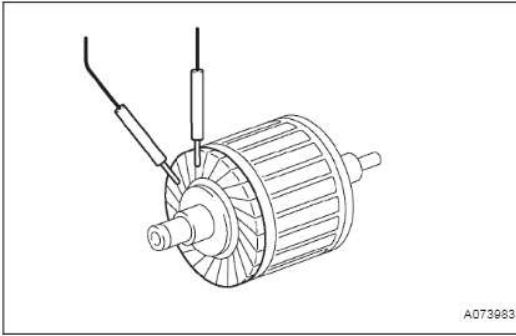
1. INSPECT STARTER ARMATURE ASSEMBLY

- (a) Measure the resistance between any 2 segments of the commutator.

Standard resistance:

Below 1 Ω

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

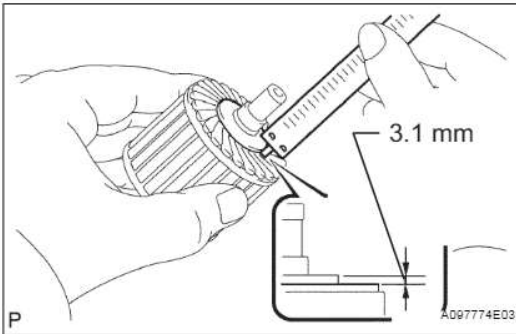


- (b) Measure the resistance between each segment of the commutator and armature coil core.

Standard resistance:

10 k Ω or higher

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



- (c) Using a vernier caliper, measure the depth indicated in the illustration.

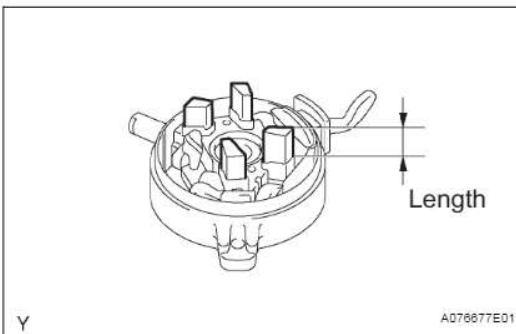
Standard depth:

3.1 mm (0.122 in.)

Maximum depth:

3.8 mm (0.150 in.)

If the depth is greater than the maximum, replace the armature assembly.



2. INSPECT STARTER COMMUTATOR END FRAME ASSEMBLY

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

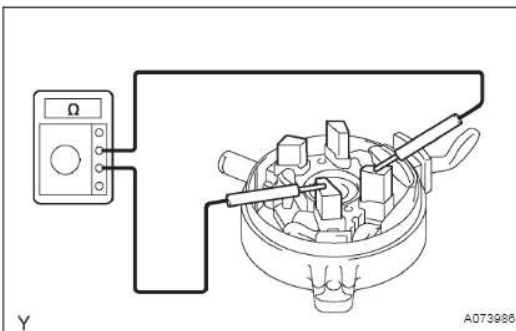
Standard length:

9.0 mm (0.354 in.)

Minimum length:

4.0 mm (0.158 in.)

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



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

Standard resistance:

10 k Ω or higher

If the result is not as specified, replace the starter commutator end frame assembly.

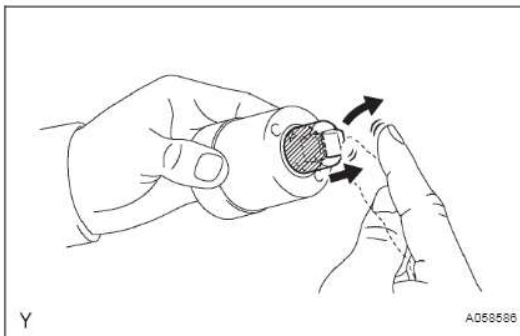
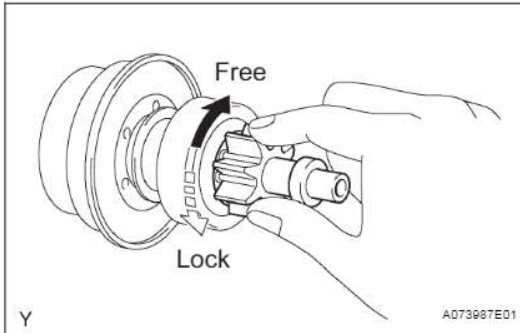
ST

1NZ-FE STARTING – STARTER

ST-11

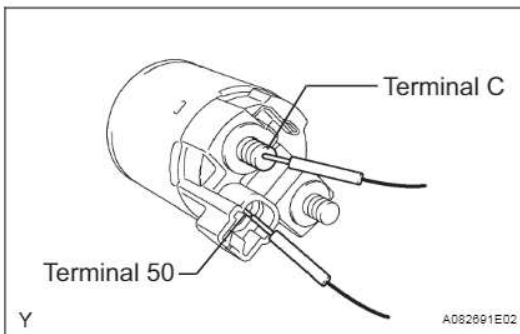
3. INSPECT STARTER CENTER BEARING CLUTCH SUB-ASSEMBLY

- (a) Check the gear teeth on the planetary gear, internal gear and starter clutch for wear or damage. If damaged, replace the gear or clutch assembly. Also check the drive plate ring gear for wear or damage.
- (b) Rotate the pinion gear clockwise, and check that it turns freely. Try to rotate the pinion gear counterclockwise and check that it locks. If necessary, replace the center bearing clutch sub-assembly.

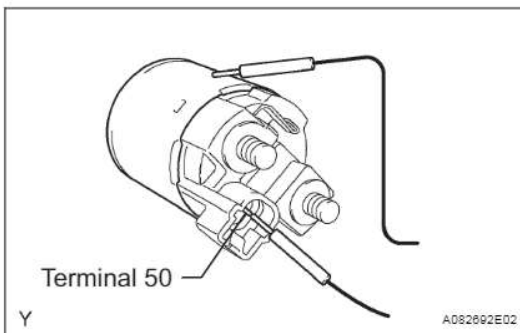


4. INSPECT MAGNET SWITCH BODY

- (a) Check the operation.
 - (1) Push in the plunger, and then check that it returns quickly to its original position. If necessary, replace the magnet switch body.



- (b) Check the pull-in coil.
 - (1) Measure the resistance between terminals 50 and C.
Standard resistance:
Below 2 Ω
 If the result is not as specified, replace the magnet switch body.

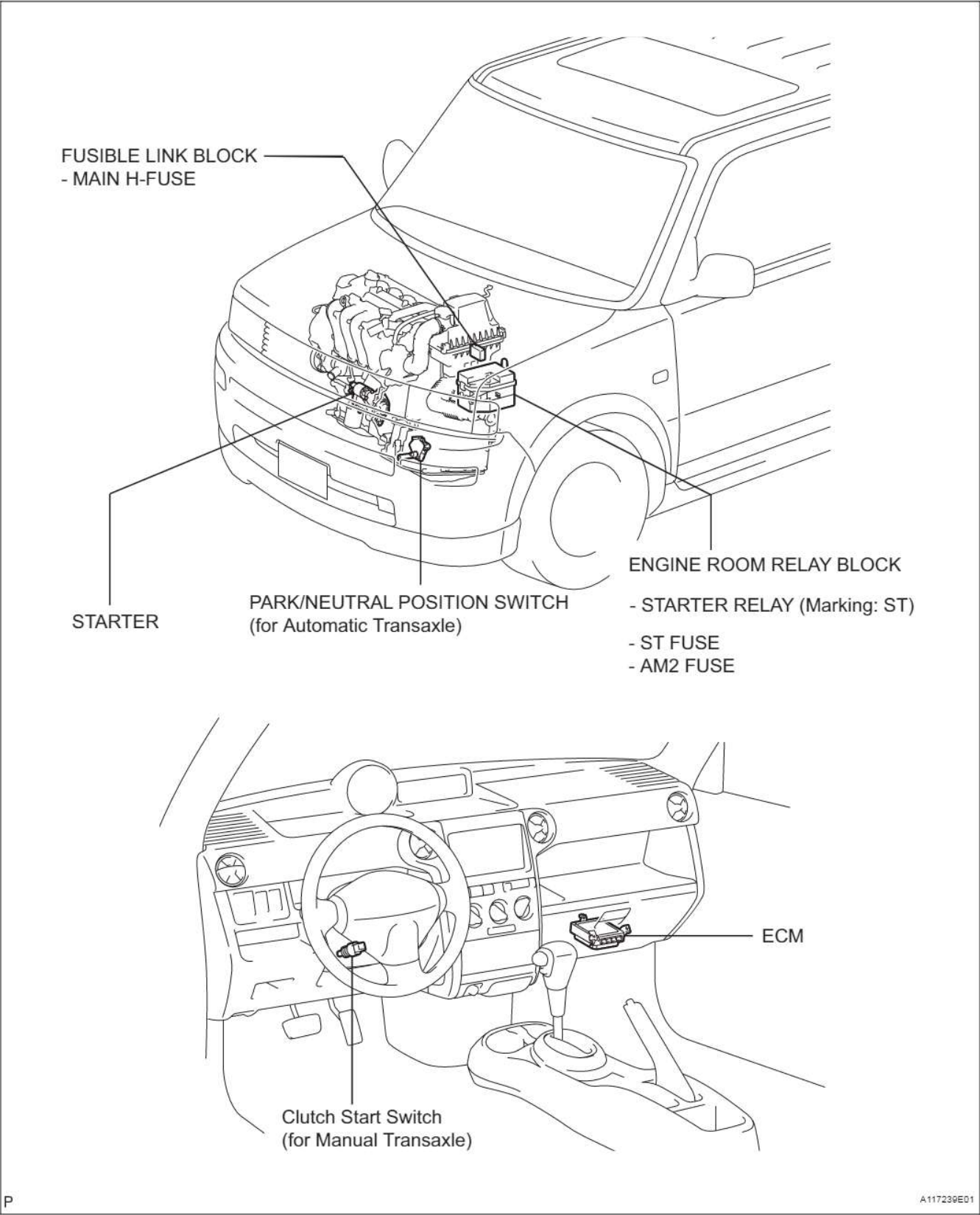


- (c) Check the holding coil.
 - (1) Measure the resistance between terminals 50 and the switch body.
Standard resistance:
Below 1 Ω
 If the result is not as specified, replace the magnet switch body.

ST

STARTING SYSTEM

PARTS LOCATION

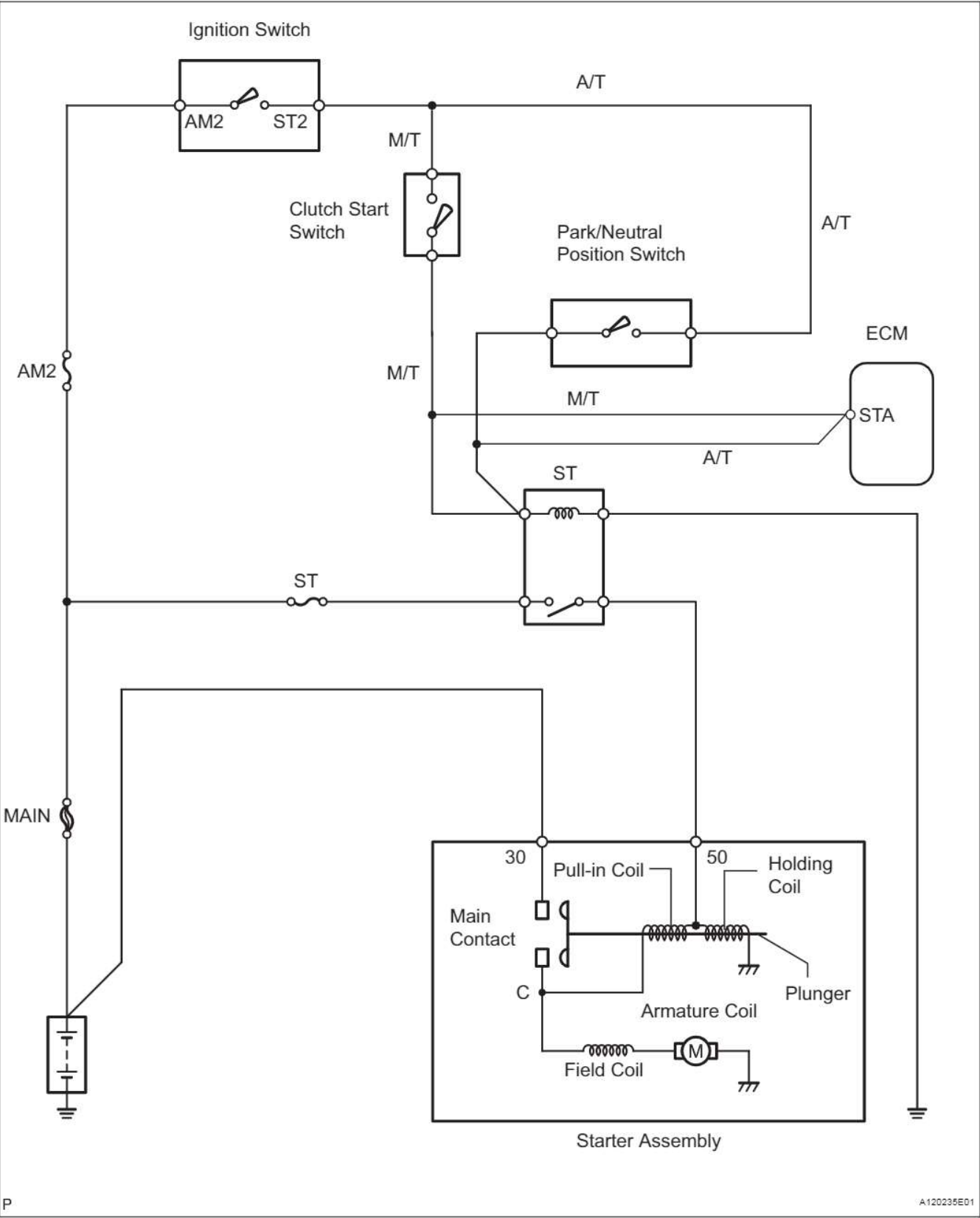


ST

ST-2

1NZ-FE STARTING - STARTING SYSTEM

SYSTEM DIAGRAM

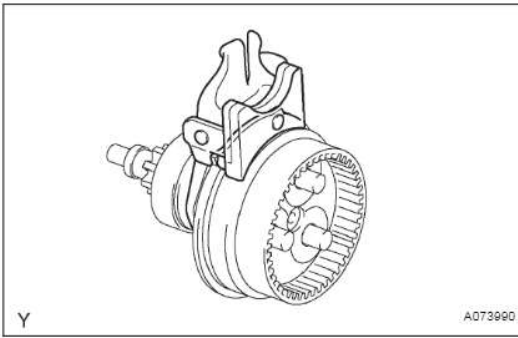


ST-12

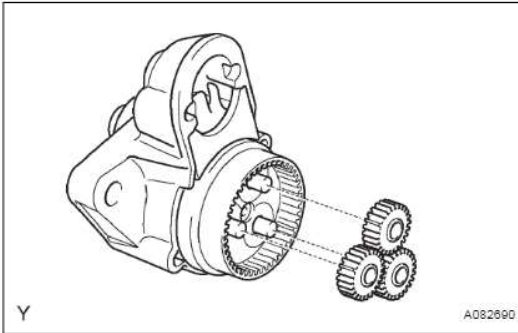
1NZ-FE STARTING – STARTER

REASSEMBLY**1. INSTALL STARTER CENTER BEARING CLUTCH SUB-ASSEMBLY**

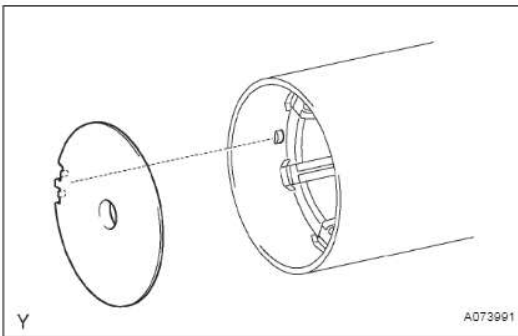
- (a) Install the drive lever set pin onto the starter center bearing clutch.
- (b) Install the starter center bearing clutch with drive lever set pin to the starter drive housing.

**2. INSTALL PLANET GEAR**

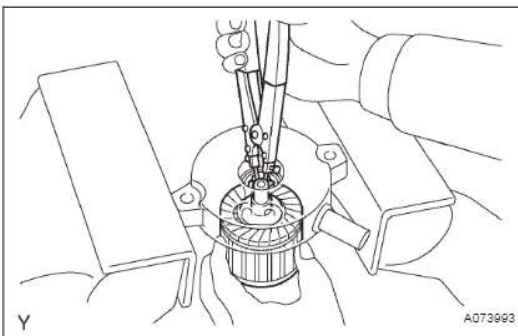
- (a) Apply grease to the planet gears and planet shaft pins.
- (b) Install the 3 planet gears.

**3. INSTALL STARTER ARMATURE PLATE**

- (a) Insert the starter armature plate into the starter yoke.
- (b) Align the cutout of the plate with the inside protrusion of the starter yoke, and install the plate.

**4. INSTALL STARTER ARMATURE ASSEMBLY**

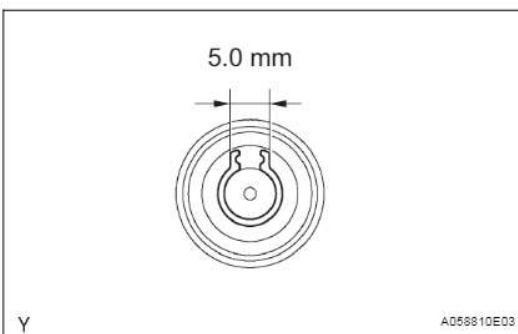
- (a) Apply grease to the washer plate and armature shaft.
- (b) Install the armature shaft onto the starter commutator end frame.
- (c) Using snap ring pliers, install the plate washer and snap ring.



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

Maximum length:**5.0 mm (0.197 in)**

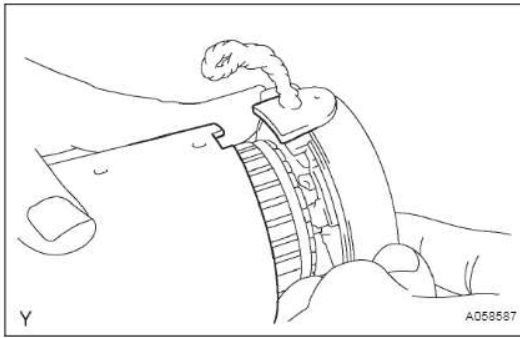
If the length is greater than the maximum, replace the snap ring with a new one.

5. INSTALL STARTER COMMUTATOR END FRAME COVER

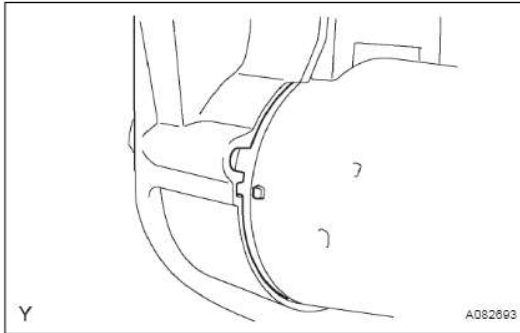
ST

1NZ-FE STARTING – STARTER

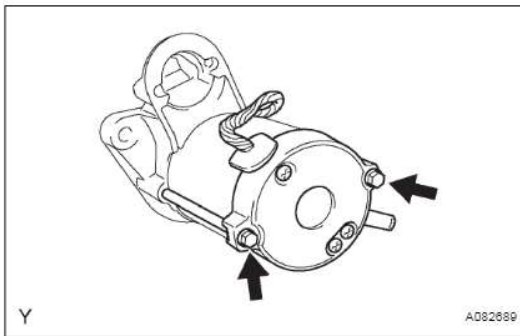
ST-13

**6. INSTALL STARTER YOKE ASSEMBLY**

- (a) Align the rubber of the starter commutator end frame with the cutout of the starter yoke.
- (b) Install the starter yoke onto the starter commutator end frame.



- (c) Align the key located on the starter yoke with the keyway of the starter housing.

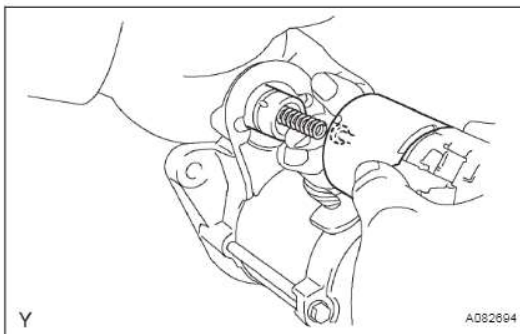


- (d) Install the starter yoke and commutator end frame with the 2 through bolts.

Torque: 6.0 N*m (61 kgf*cm, 53 in.*lbf)

7. INSTALL MAGNET STARTER SWITCH BODY

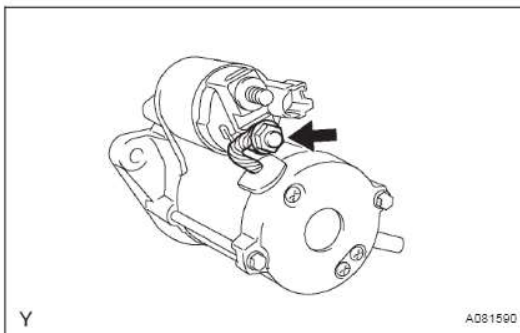
- (a) Apply grease to the plunger and hook.
- (b) Put the plunger hook of the magnet switch body on the drive lever.

ST

- (c) Install the plunger and return spring as shown in the illustration.

- (d) Install the magnet switch body with the 2 screws.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)



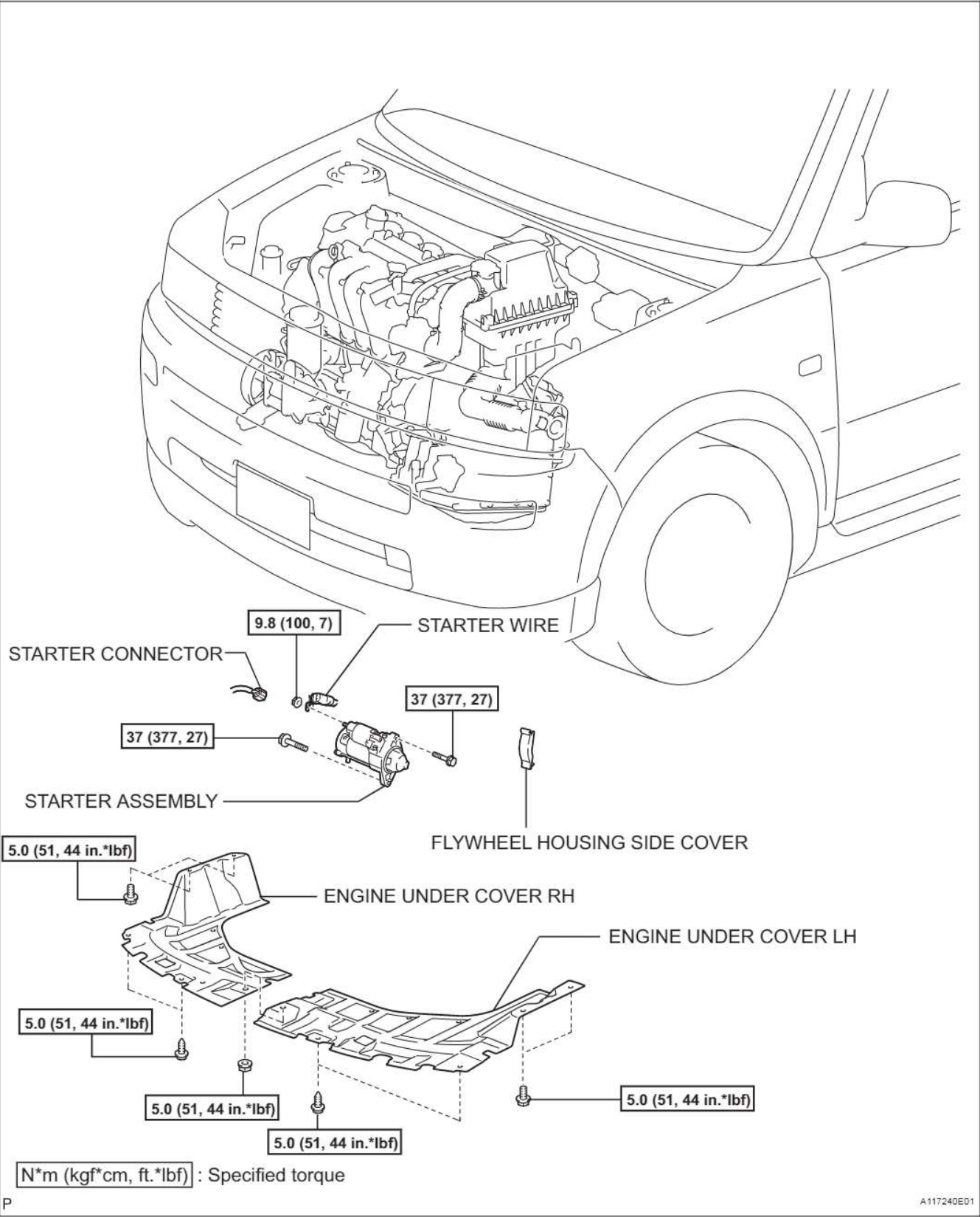
- (e) Connect the lead wire to the terminal with the nut.

Torque: 10 N*m (102 kgf*cm, 7.4 ft.*lbf)

ST-6

1NZ-FE STARTING – STARTER

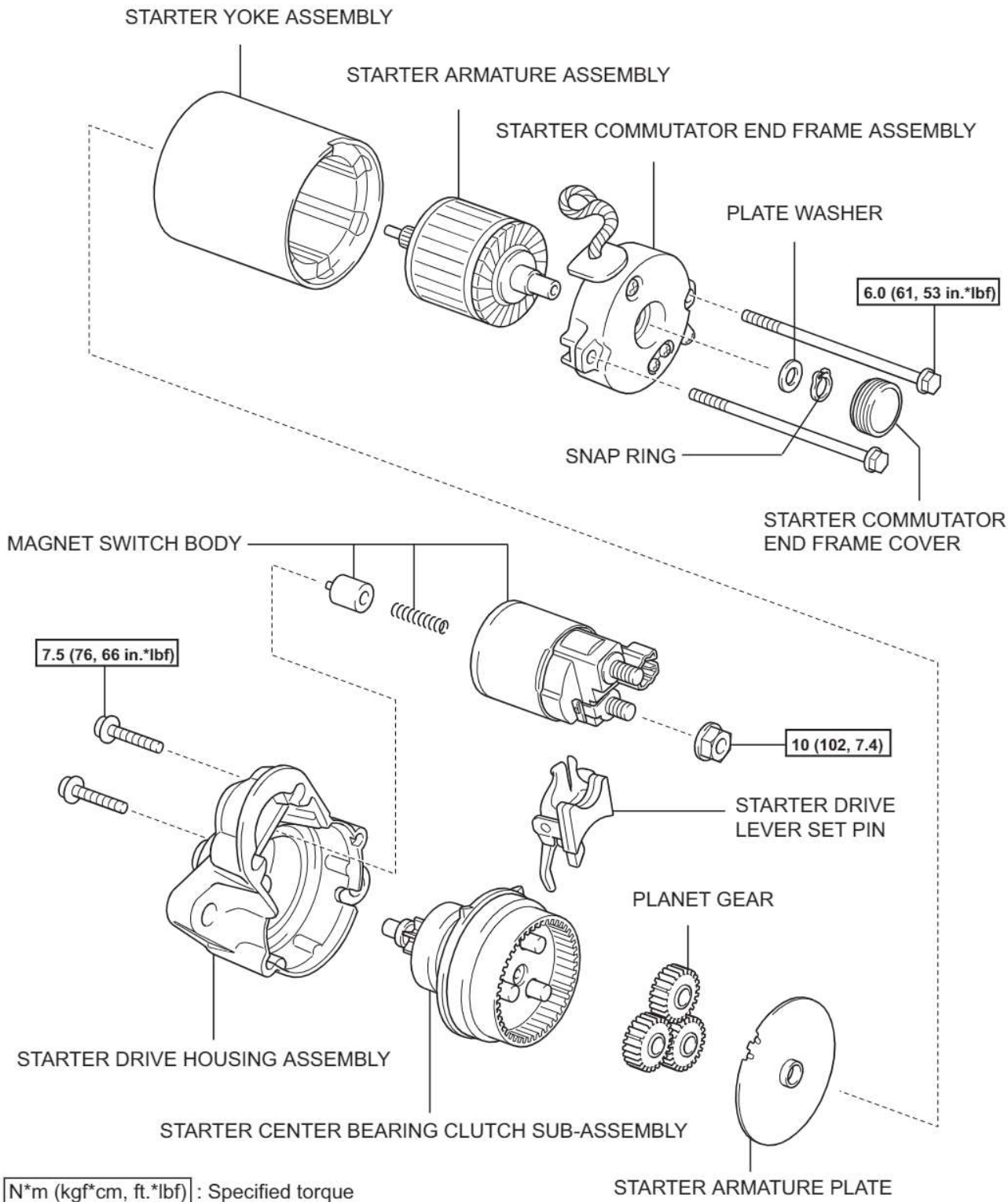
STARTER
COMPONENTS



1NZ-FE STARTING – STARTER

ST-7

ST

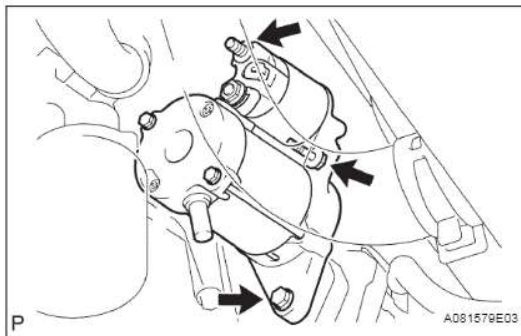


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ST-14

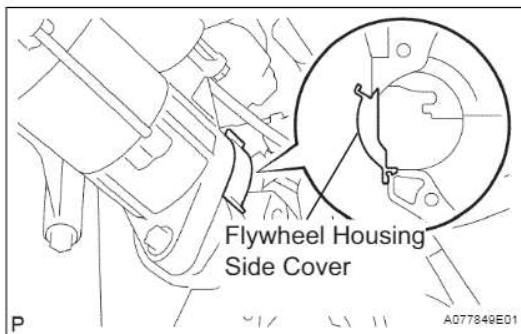
1NZ-FE STARTING – STARTER



INSTALLATION

1. INSTALL STARTER ASSEMBLY

- (a) Install the starter with the 2 bolts.
Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf)
- (b) Install the starter wire to terminal 30 with the nut.
Torque: 9.8 N*m (100 kgf*cm, 7 ft.*lbf)
- (c) Connect the starter connector.



2. INSTALL FLYWHEEL HOUSING SIDE COVER

NOTICE:

- Insert the claw until it makes a "click" sound when installing the flywheel housing side cover.
- If the claw is deformed, replace the flywheel housing side cover.

3. INSTALL ENGINE UNDER COVER RH

- (a) Install the cover with the 4 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)

4. INSTALL ENGINE UNDER COVER LH

- (a) Install the cover with the nut and 4 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)

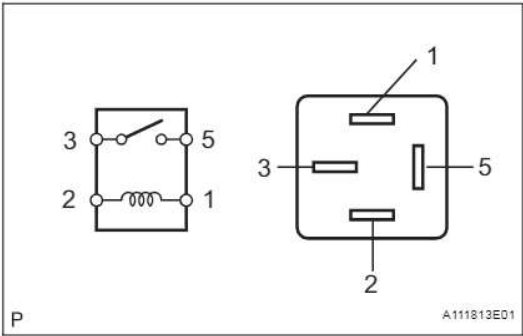
5. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

ST

STARTER RELAY

ON-VEHICLE INSPECTION

- 1. REMOVE STARTER RELAY (Marking: ST)
 - (a) Remove the engine room relay block cover.
 - (b) Remove the starter relay from the engine room relay block.



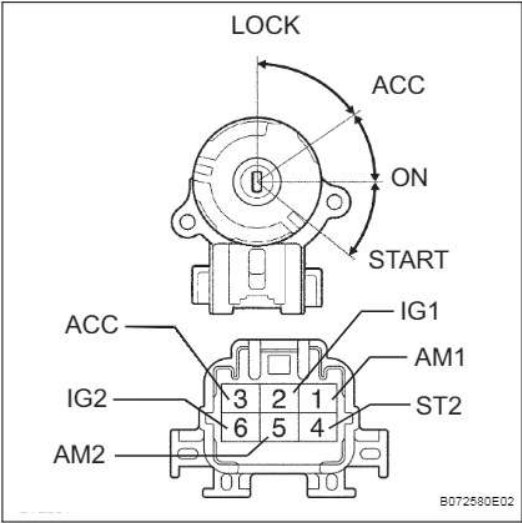
- 2. INSPECT STARTER RELAY
 - (a) Measure the resistance of the starter relay.
- Standard resistance

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.

- 3. INSTALL STARTER RELAY

ST



INSPECTION

1. INSPECT IGNITION SWITCH ASSEMBLY

- (a) Measure the resistance of the switch.

Standard resistance

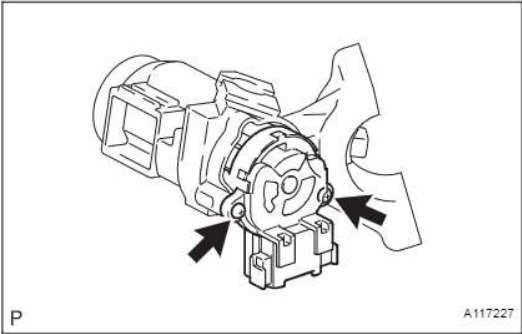
Tester Connection	Switch Condition	Specified Condition
Between all terminals	LOCK	10 kΩ or higher
1 (AM1) - 3 (ACC)	ACC	Below 1 Ω
1 (AM1) - 2 (IG1) 1 (AM1) - 3 (ACC) 5 (AM2) - 6 (IG2)	ON	Below 1 Ω
1 (AM1) - 2 (IG1) 4 (ST2) - 5 (AM2) 5 (AM2) - 6 (IG2)	START	Below 1 Ω

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

INSTALLATION

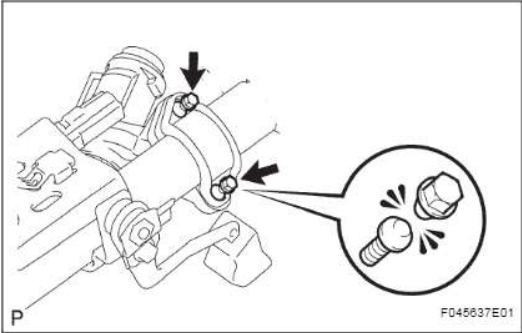
1. INSTALL IGNITION SWITCH ASSEMBLY

- (a) Install the switch to the steering column bracket with the 2 screws.



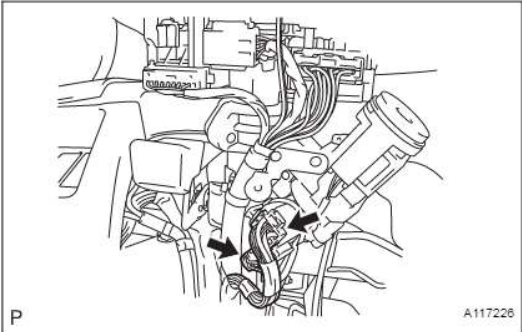
2. REMOVE STEERING COLUMN UPPER WITH SWITCH BRACKET ASSEMBLY

- (a) Temporarily install the steering column upper with switch bracket and steering column clamp upper with 2 new steering lock set bolts.
(b) Tighten the 2 steering lock set bolts until the bolt heads break off.

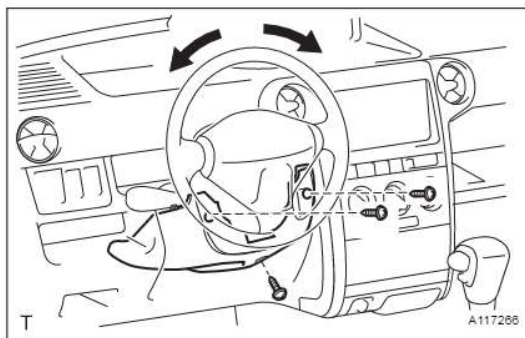


3. CONNECT CONNECTOR

- (a) Connect the 2 connectors as shown in the illustration.
(b) Secure the wire harness with the clamps.



ST

1NZ-FE STARTING – IGNITION SWITCH**ST-19****4. INSTALL STEERING COLUMN COVER**

- (a) Install the cover lower and upper with the 3 screws.

HINT:

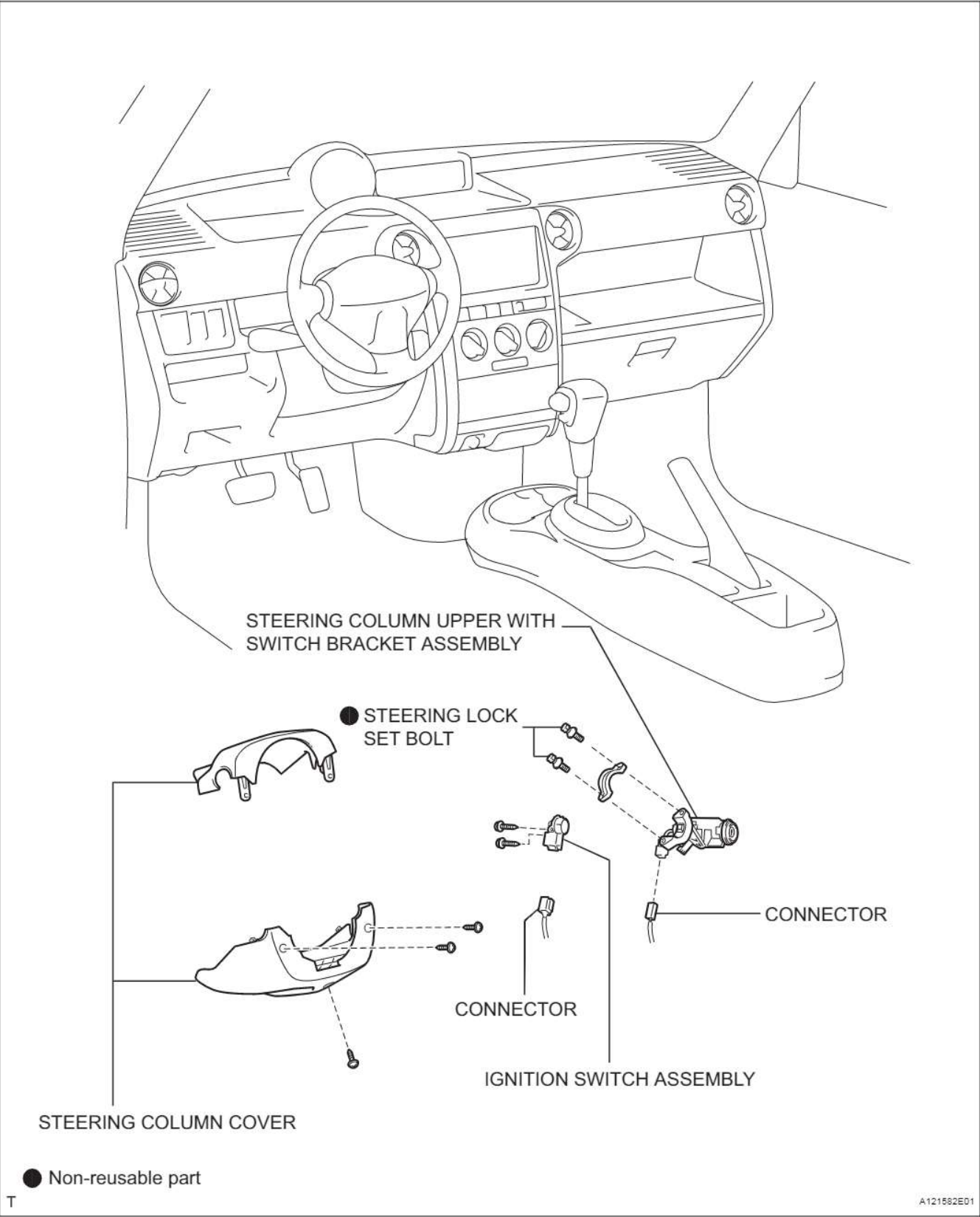
Turn the steering wheel to the right and left as necessary to install the 3 screws and cover lower.

5. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**ST**

ST-16

1NZ-FE STARTING – IGNITION SWITCH

IGNITION SWITCH
COMPONENTS



REMOVAL

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

CAUTION:

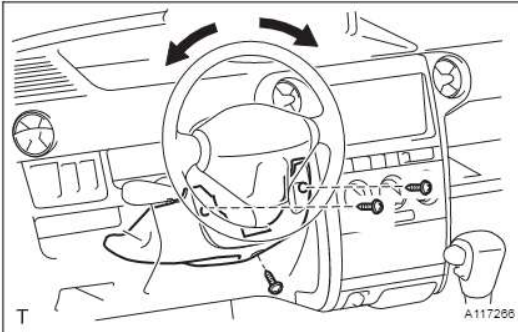
Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **REMOVE STEERING COLUMN COVER**

- (a) Remove the 3 screws, cover lower and upper.

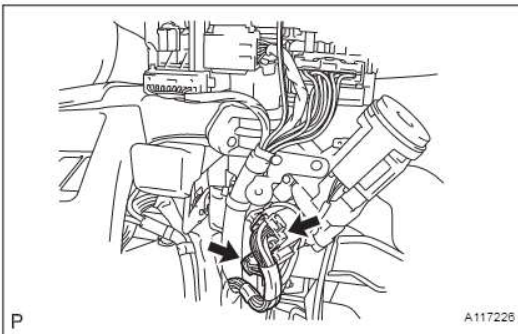
HINT:

Turn the steering wheel to the right and left as necessary to remove the 3 screws and cover lower.



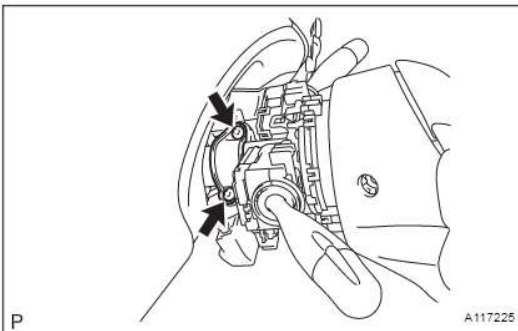
3. **DISCONNECT CONNECTOR**

- (a) Disconnect the 2 connectors and wire harness clamps from the steering column.



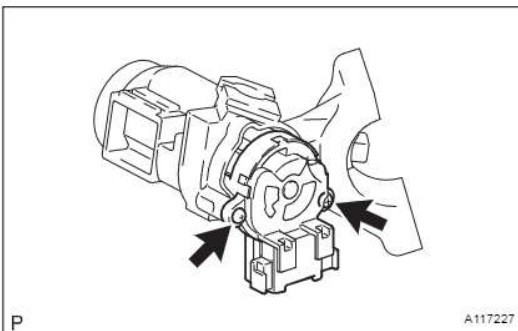
4. **REMOVE STEERING COLUMN UPPER WITH SWITCH BRACKET ASSEMBLY**

- (a) Using a centering punch, mark the center of the 2 tapered-head bolts.
- (b) Using a 3 to 4 mm (0.12 to 0.16 in.) drill, drill a hole in the 2 bolt heads.
- (c) Using a screw extractor, remove the 2 bolts, clamp and steering column upper with switch bracket.



5. **REMOVE IGNITION SWITCH ASSEMBLY**

- (a) Remove the 2 screws and switch from the steering column bracket.


ST