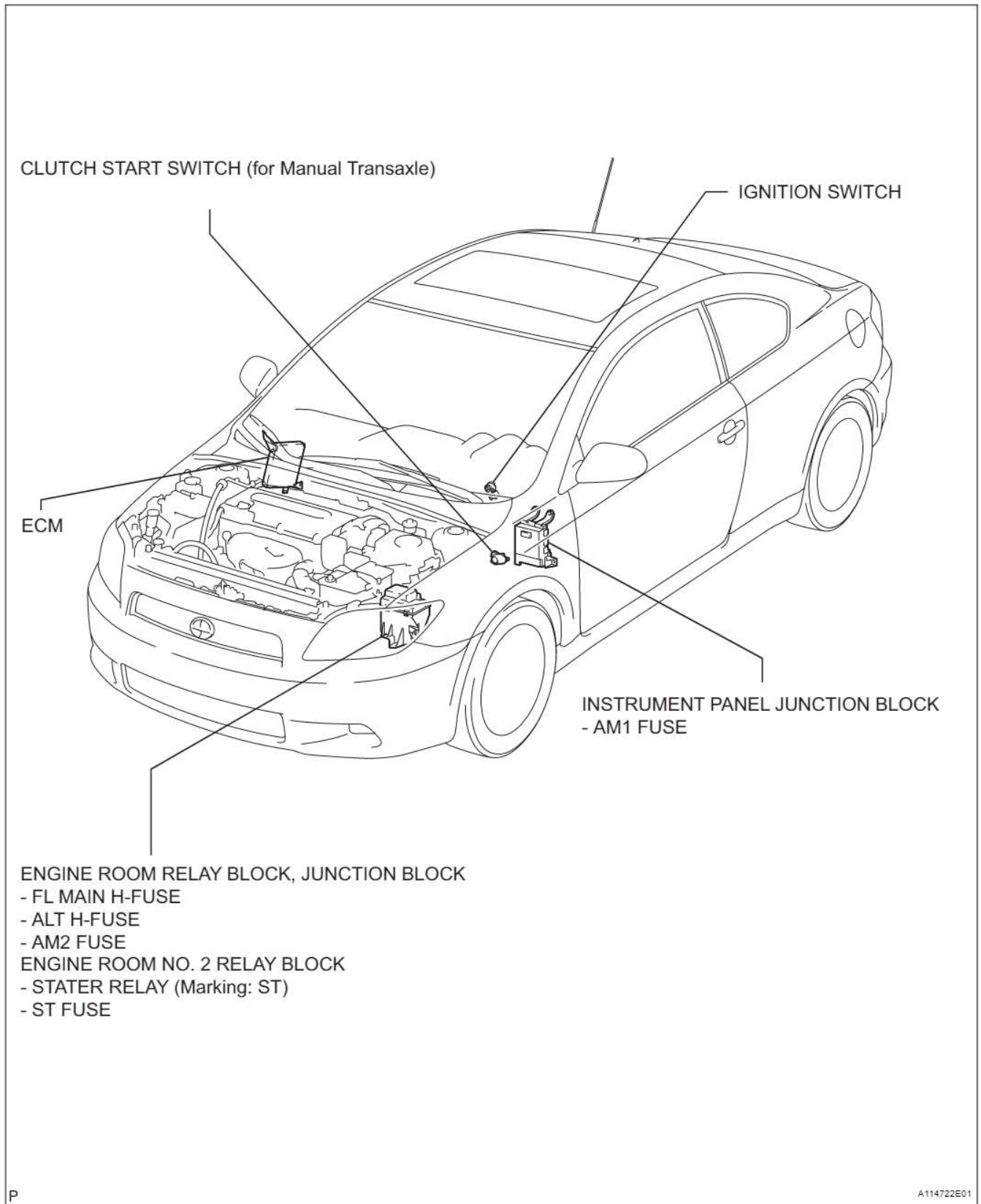


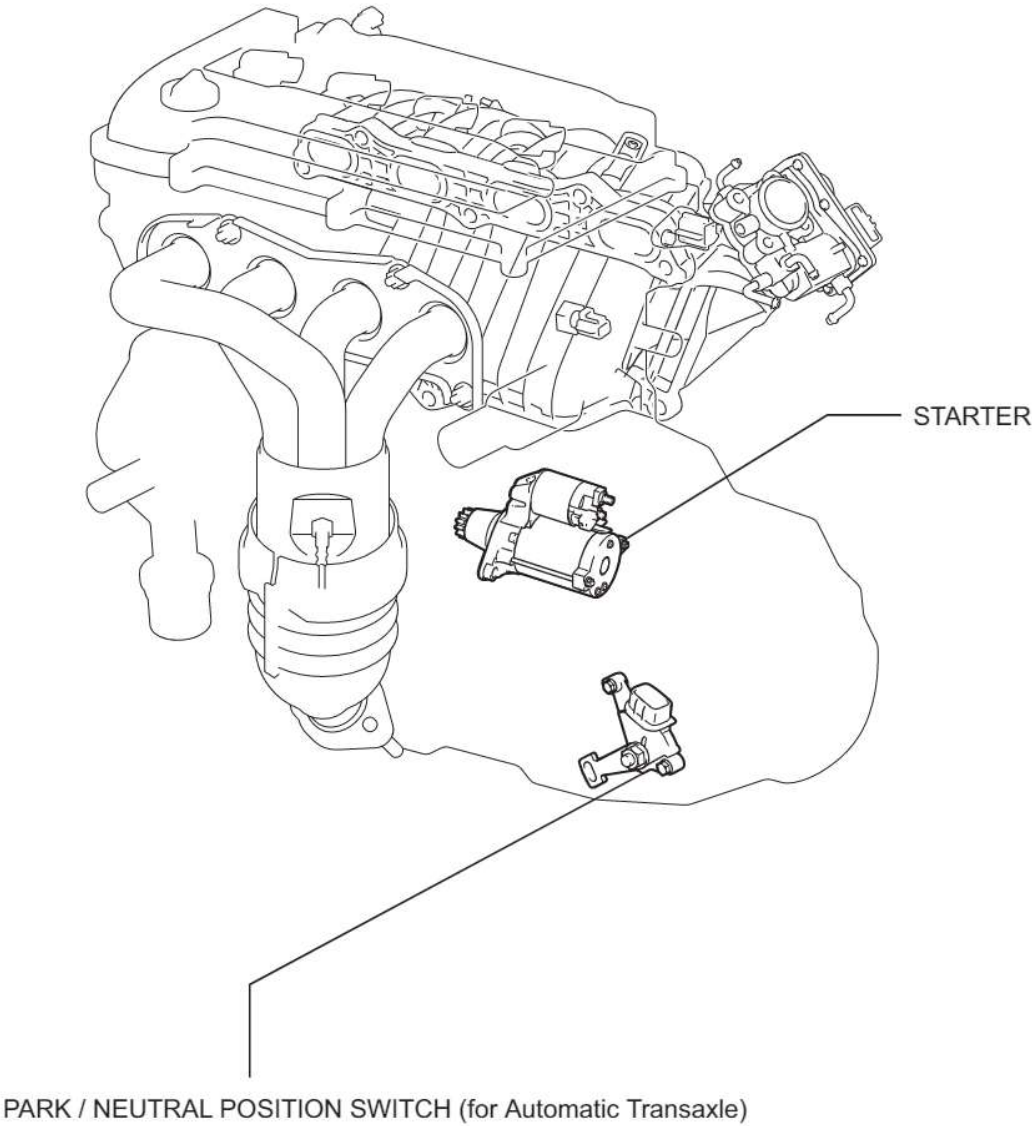
STARTING SYSTEM

PARTS LOCATION



ST-2

2AZ-FE STARTING – STARTING SYSTEM

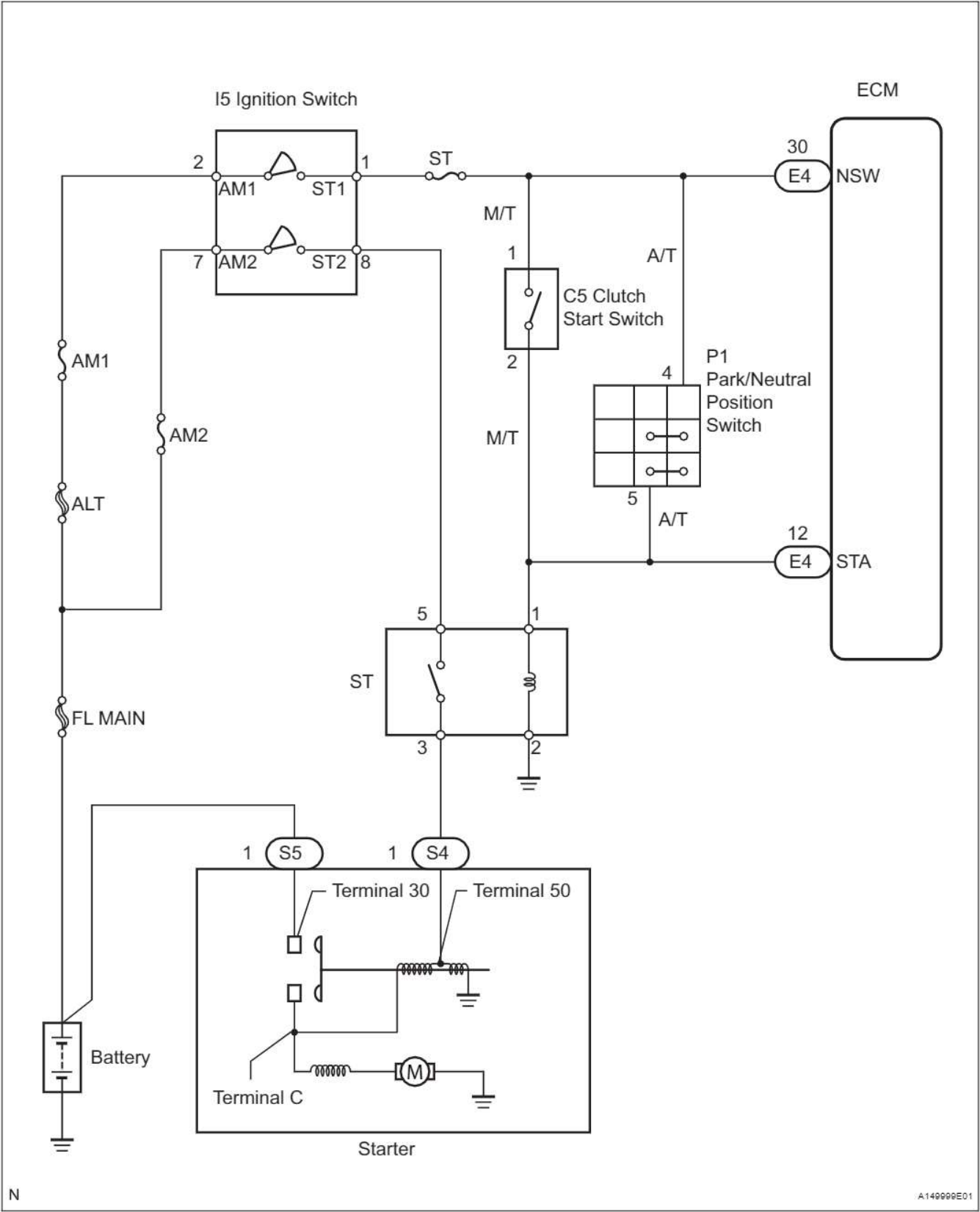


ST

2AZ-FE STARTING – STARTING SYSTEM

ST-3

SYSTEM DIAGRAM

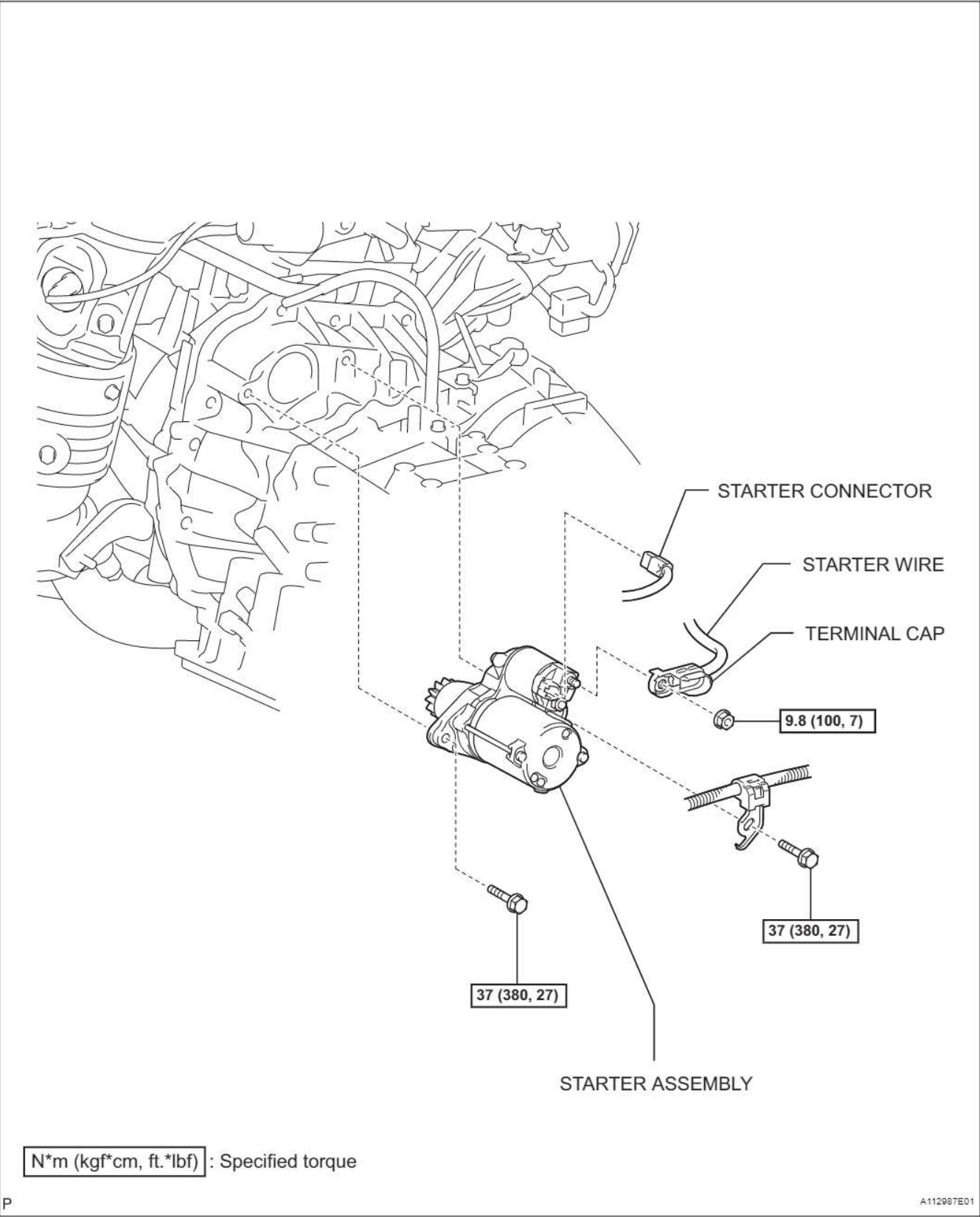


ST

ST-4

2AZ-FE STARTING – STARTER

STARTER
COMPONENTS



2AZ-FE STARTING – STARTER

ST-5

ST

STARTER ARMATURE PLATE

STARTER YOKE ASSEMBLY

STARTER COMMUTATOR END
FRAME ASSEMBLY

STARTER ARMATURE ASSEMBLY

STARTER
COMMUTATOR
END FRAME
COVER

STARTER MAGNETIC SWITCH ASSEMBLY

PLATE WASHER

● SNAP RING

7.5 (76, 66 in.*lbf)

x 2

6.0 (60, 53 in.*lbf)

x 2

x 3

STARTER DRIVE HOUSING ASSEMBLY

STARTER PLANETARY GEAR

10 (100, 7)

N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

← Apply grease

P

A112988E01

ST-6

2AZ-FE STARTING – STARTER

REMOVAL

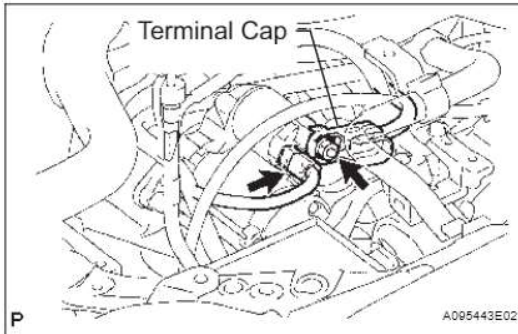
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION:

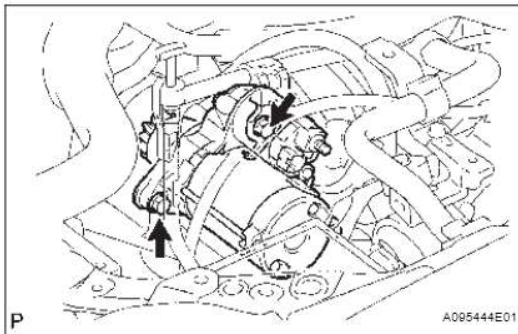
Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **REMOVE STARTER ASSEMBLY**

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



- (d) Remove the 2 bolts and starter.

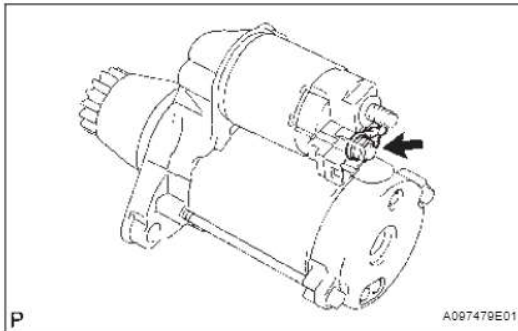


ST

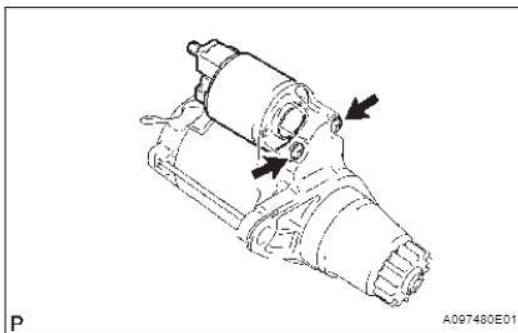
DISASSEMBLY

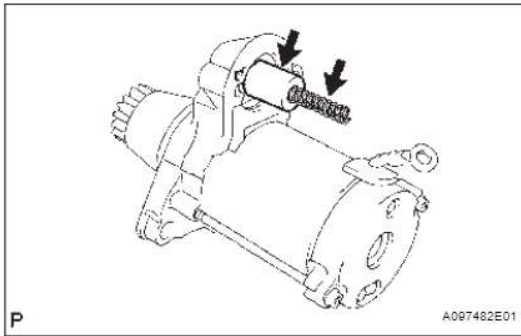
1. **REMOVE STARTER MAGNETIC SWITCH ASSEMBLY**

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

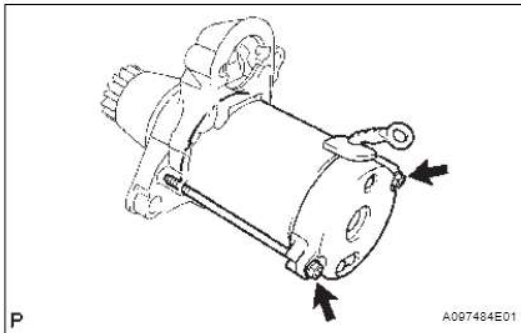


- (b) Remove the 2 screws and starter magnetic switch.



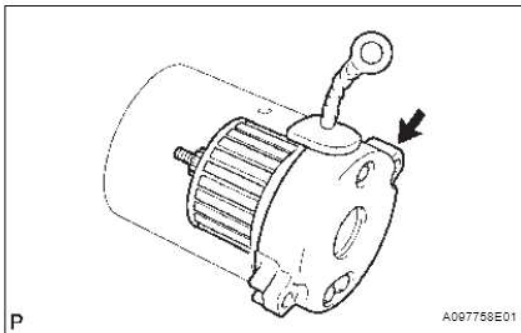
2AZ-FE STARTING – STARTER**ST-7**

- (c) Remove the return spring and plunger from the starter drive housing.



2. REMOVE STARTER COMMUTATOR END FRAME ASSEMBLY

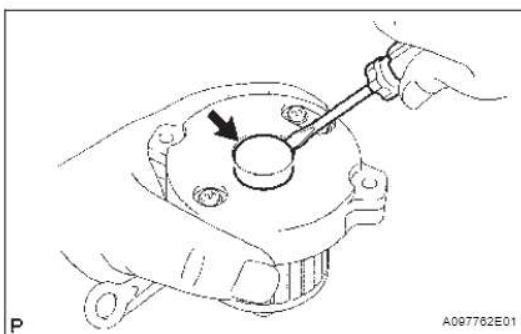
- (a) Remove the 2 bolts and the starter commutator end frame together with the starter yoke.



- (b) Remove the starter commutator end frame from the starter yoke.



- (c) Remove the starter armature plate from the starter yoke.



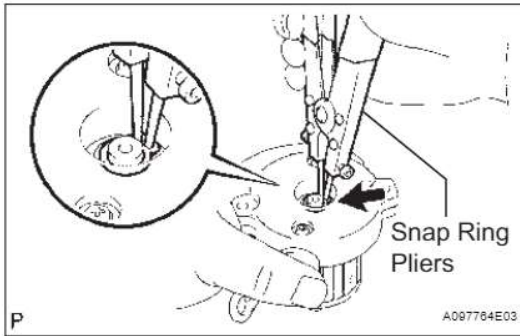
3. REMOVE STARTER ARMATURE ASSEMBLY

- (a) Using a thin-bladed screwdriver, remove the starter commutator end frame cover.

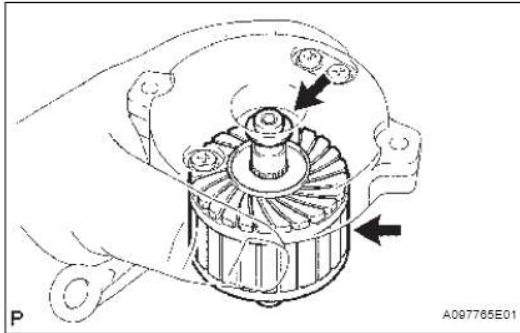
ST

ST-8

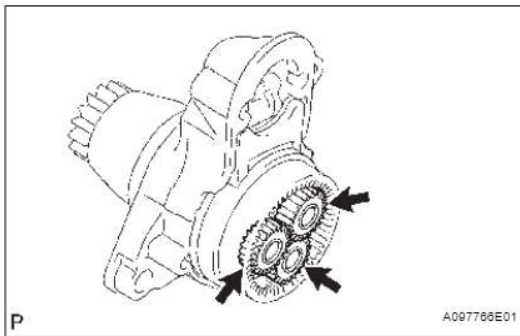
2AZ-FE STARTING – STARTER



(b) Using snap ring pliers, remove the snap ring.

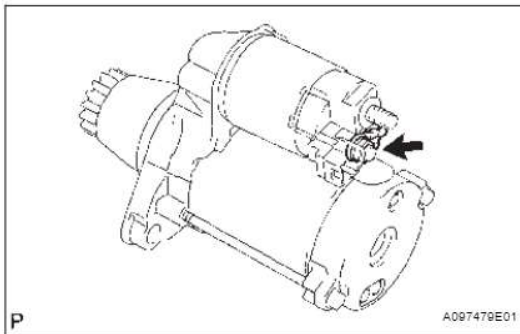


(c) Remove the plate washer and starter armature from the starter commutator end frame.



4. REMOVE STARTER PLANETARY GEAR

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



INSPECTION

1. INSPECT STARTER ASSEMBLY

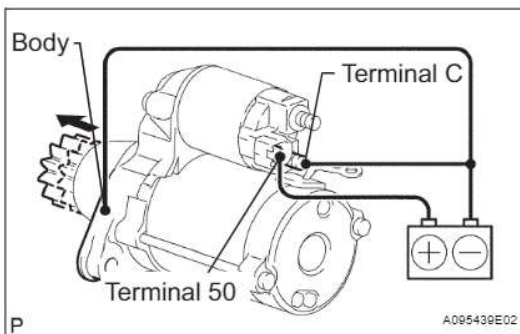
NOTICE:

These tests must be performed within 3 to 5 seconds to prevent burnout of the coil.

(a) Perform the pull-in test.

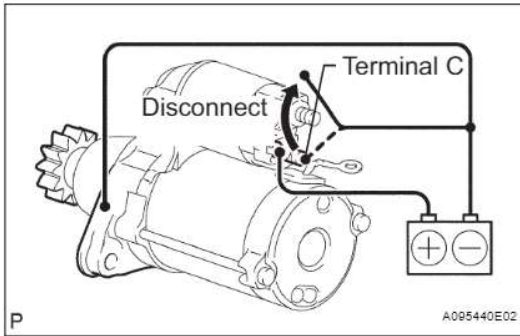
(1) Remove the nut and disconnect the lead wire from terminal C.

(2) Connect the battery to the starter magnetic switch as shown in the illustration. Check that the clutch pinion gear is extended. If the clutch pinion gear does not move, replace the starter assembly.



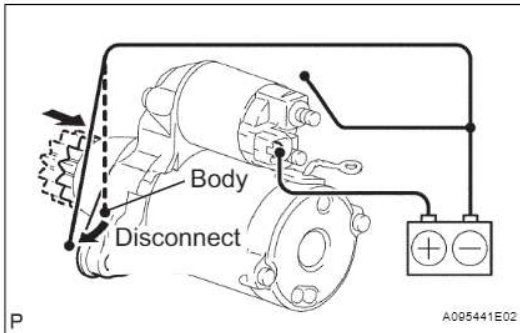
2AZ-FE STARTING – STARTER

ST-9



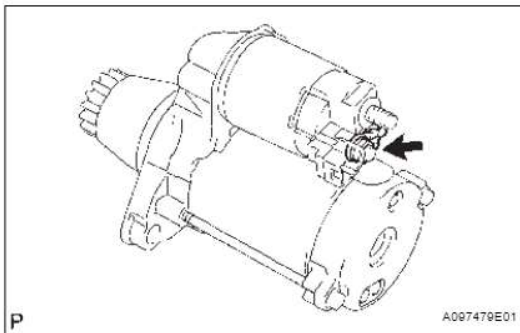
(b) Perform the hold-in test.

- (1) Disconnect the negative (-) lead from terminal C. Check that the clutch pinion gear remains extended.
If the clutch pinion gear returns inward, replace the starter assembly.



(c) Check the operation.

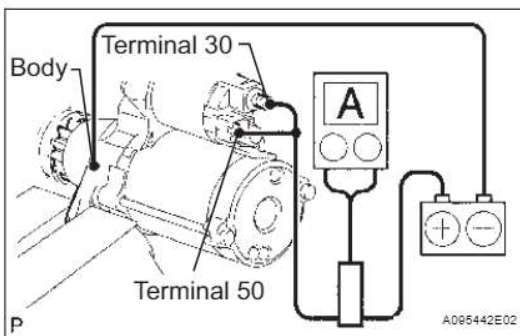
- (1) Disconnect the negative (-) lead from the starter body. Check that the clutch pinion gear returns.
If the clutch pinion gear does not return inward, replace the starter assembly.



(d) Perform the no-load performance test.

- (1) Connect the lead wire to terminal C. Make sure that the lead is not grounded.

Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)



- (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.

Standard current:

90 A or less at 11.5 V

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

2. INSPECT STARTER MAGNETIC SWITCH ASSEMBLY

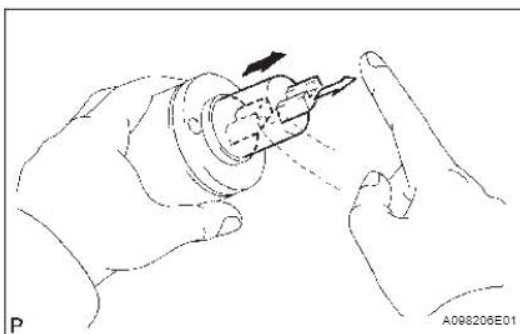
(a) Check the plunger.

- (1) Push in the plunger, and then check that it returns quickly to its original position.

OK:

The plunger moves smoothly.

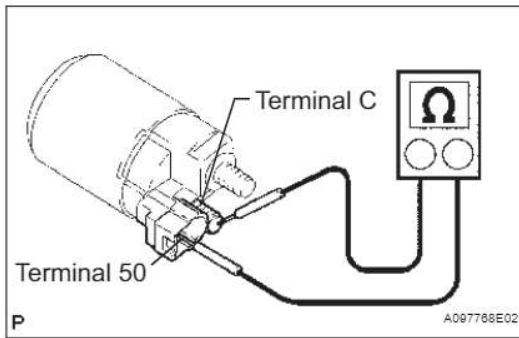
If the result is not as specified, replace the starter assembly.



ST

ST-10

2AZ-FE STARTING – STARTER



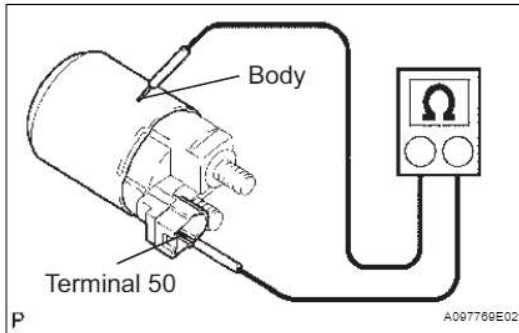
(b) Check the resistance.

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

Standard resistance:

Below 1 Ω

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

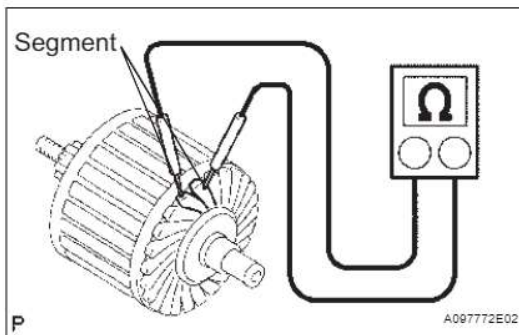


- (2) Measure the resistance between terminals 50 and the body.

Standard resistance:

Below 2 Ω

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



3. INSPECT STARTER ARMATURE ASSEMBLY

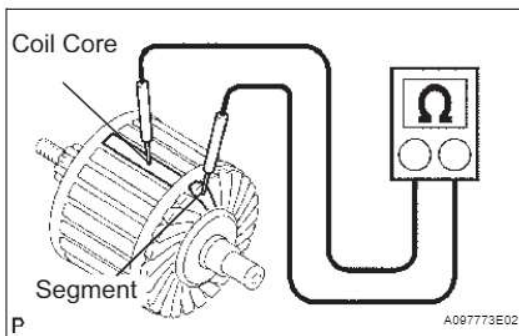
(a) Check the resistance.

- (1) Measure the resistance between the segments.

Standard resistance:

Below 1 Ω

If the results is not as specified, replace the starter armature.

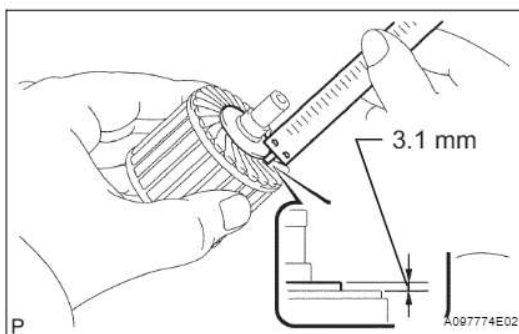


- (2) Measure the resistance between the segments and coil core.

Standard resistance:

10 k Ω or higher

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



(b) Check the commutator.

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

Standard depth:

3.1 mm (0.122 in.)

Maximum depth:

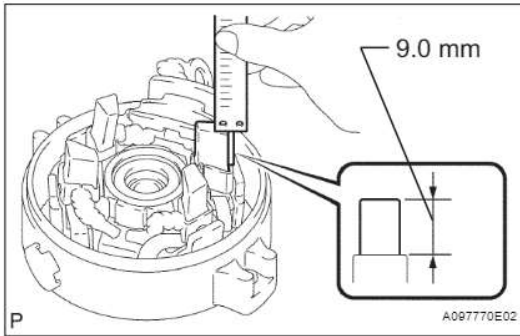
3.8 mm (0.150 in.)

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

ST

2AZ-FE STARTING – STARTER

ST-11



4. INSPECT STARTER COMMUTATOR END FRAME ASSEMBLY

(a) Check the brush length.

(1) Using vernier calipers, 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 assembly.

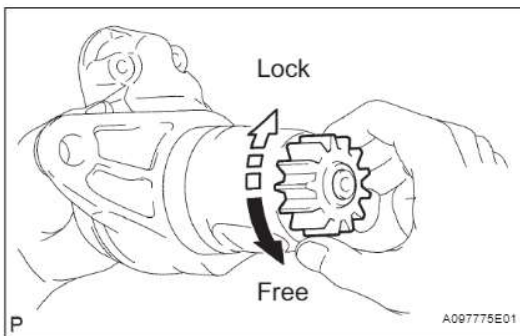
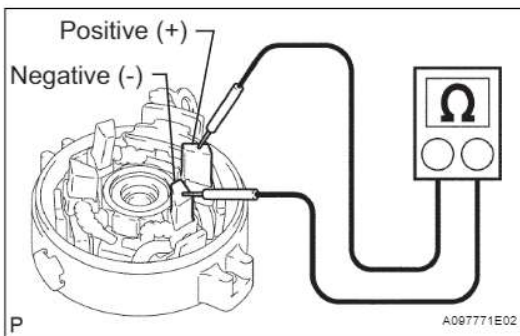
(b) Check the resistance.

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

Standard resistance:

10 kΩ or higher

If the results is not as specified, replace the starter assembly.

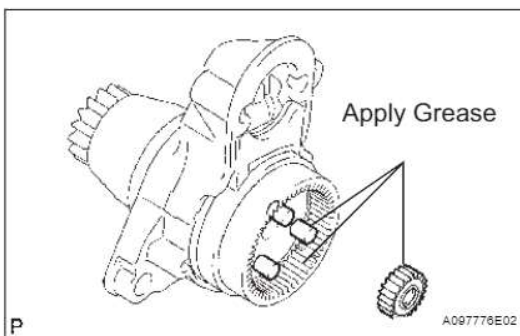


5. INSPECT STARTER DRIVE HOUSING ASSEMBLY

(a) Check the starter clutch.

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

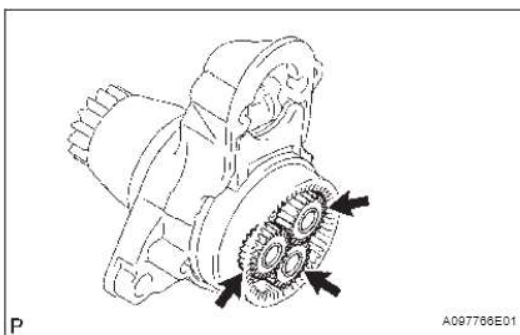
If necessary, replace the starter assembly.



REASSEMBLY

1. INSTALL STARTER PLANETARY GEAR

(a) Apply grease to the planetary gears and pins parts of the planet shaft.

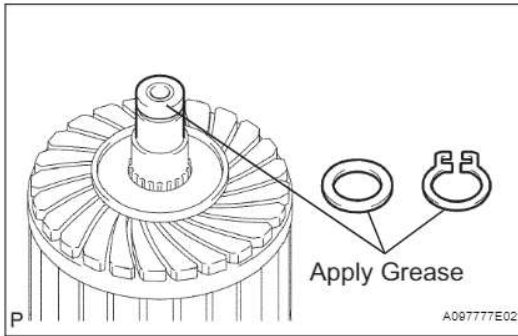


(b) Install the 3 planetary gears into the pin of the planet shaft.

ST

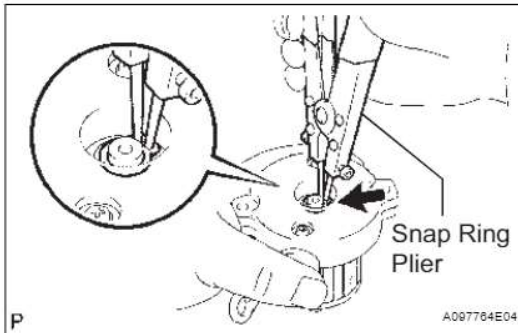
ST-12

2AZ-FE STARTING – STARTER

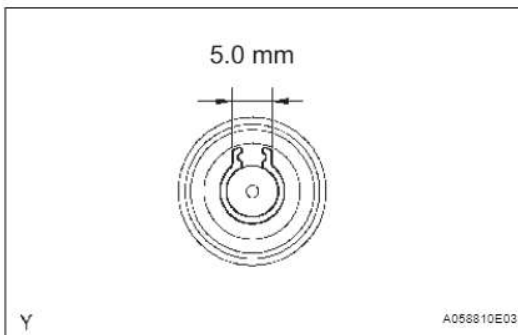


2. INSTALL STARTER ARMATURE ASSEMBLY

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



- (c) Using snap ring pliers, install the snap ring.



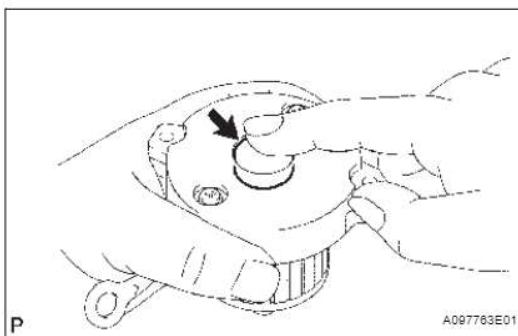
- (d) Check the snap ring length.

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

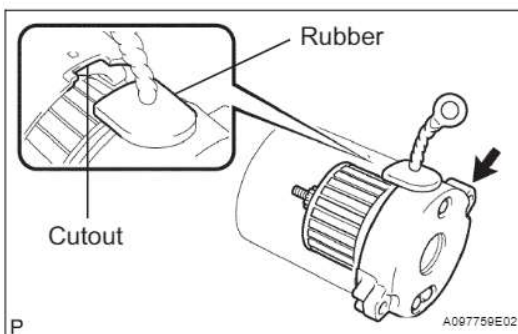
Maximum length:

5.0 mm (0.197 in.)

If the snap ring length is greater than the maximum, replace the snap ring.



- (e) Install the commutator end frame cover into the starter commutator end frame.

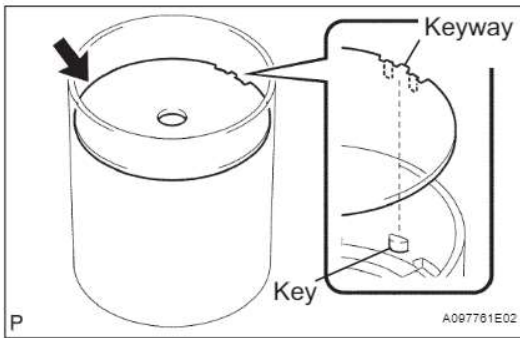


3. INSTALL STARTER COMMUTATOR END FRAME ASSEMBLY

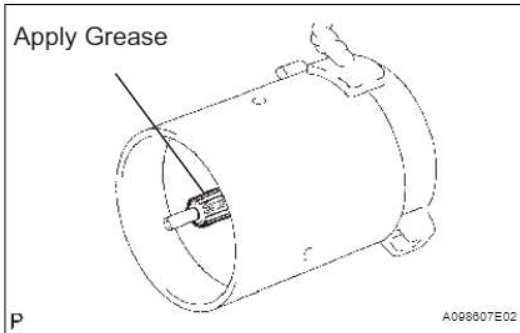
- (a) Align the rubber of the starter commutator end frame with the convex cutout of the starter yoke, and then install the starter commutator end frame into the starter yoke.

2AZ-FE STARTING – STARTER

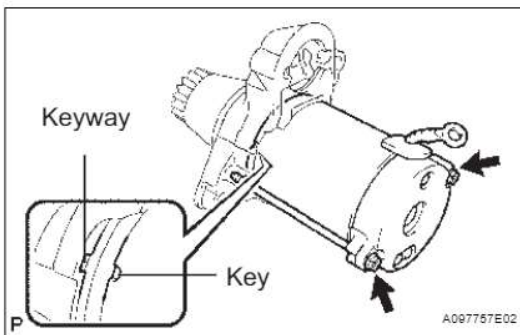
ST-13



- (b) Align the keyway of the starter armature plate with the key inside the starter yoke, and then install the starter armature plate into the starter yoke.



- (c) Apply grease to the starter armature gear.

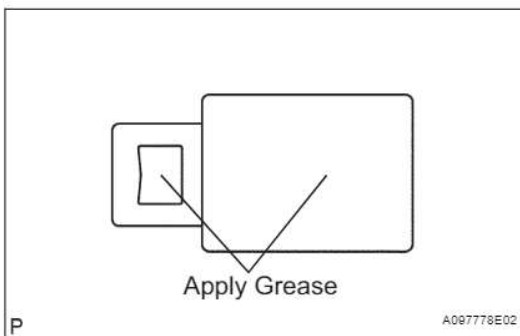


- (d) Align the key of the starter yoke with the keyway of the starter drive housing, and then install the starter commutator end frame together with the starter yoke into the starter drive housing.
 (e) Install the 2 bolts.
Torque: 6.0 N*m (60 kgf*cm, 53 in.*lbf)

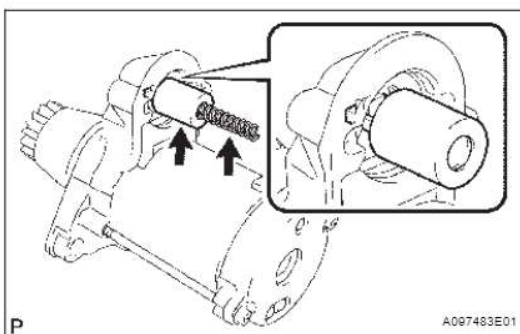
ST

4. INSTALL STARTER MAGNETIC SWITCH ASSEMBLY

- (a) Apply grease to the plunger and hook.

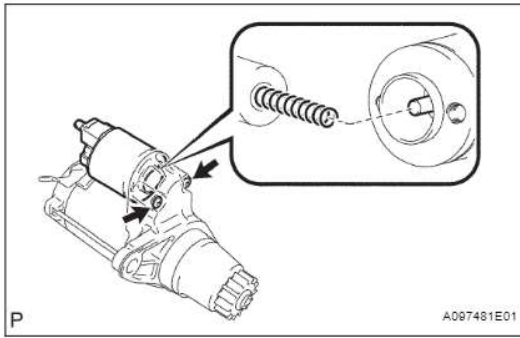


- (b) Install the plunger and return spring into the starter drive housing.



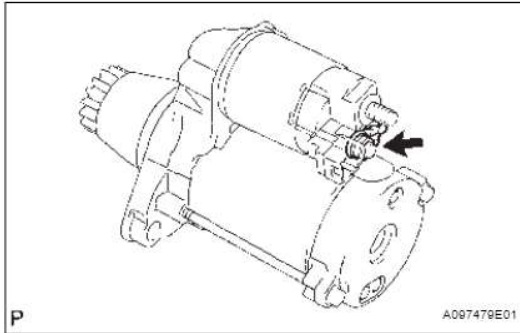
ST-14

2AZ-FE STARTING – STARTER

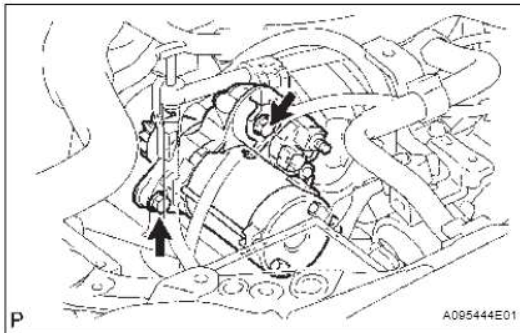


- (c) Install the starter magnetic switch into the starter drive housing.
- (d) Install the 2 screws.

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



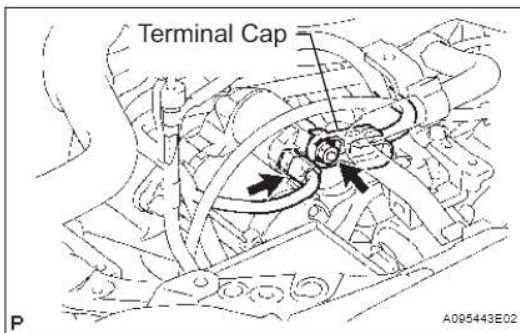
- (e) Connect the lead wire with the nut.
- Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)**



INSTALLATION

1. INSTALL STARTER ASSEMBLY

- (a) Install the starter with the 2 bolts.
- Torque: 37 N*m (380 kgf*cm, 27 ft.*lbf)**



- (b) Connect the starter wire with the nut.
 - (c) Cover the terminal cap.
 - (d) Connect the starter connector.
- Torque: 9.8 N*m (100 kgf*cm, 7 ft.*lbf)**

2. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

3. PERFORM INITIALIZATION

- (a) Perform initialization (see page [IN-23](#)).

NOTICE:

Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

ST

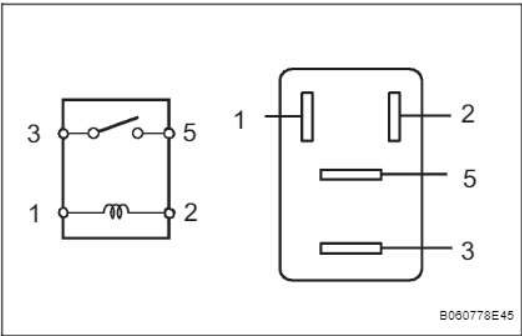
STARTER RELAY

ON-VEHICLE INSPECTION

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 STARTER RELAY (Marking: ST)
- (a) Remove the engine room No. 2 relay box cover.
- (b) Remove the starter relay.

3. INSPECT STARTER RELAY
- (a) Measure the resistance of the 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 resistance is not as specified, replace the relay.

4. INSTALL STARTER RELAY (Marking: ST)
5. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
6. PERFORM INITIALIZATION
- (a) Perform initialization (see page IN-23).

NOTICE:

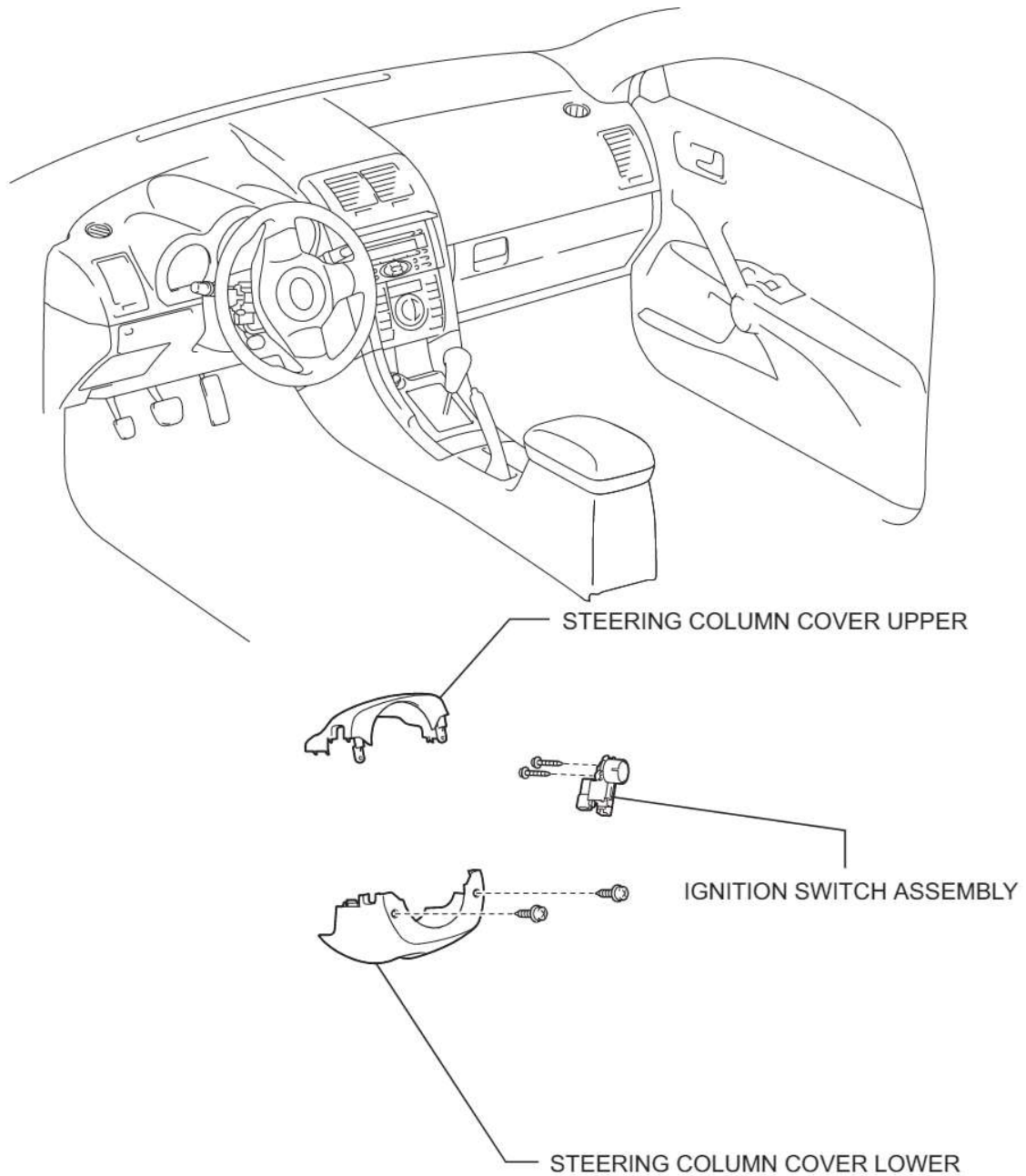
Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

ST

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2AZ-FE STARTING – IGNITION SWITCH

IGNITION SWITCH COMPONENTS



P

A114711E01

REMOVAL

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

CAUTION:

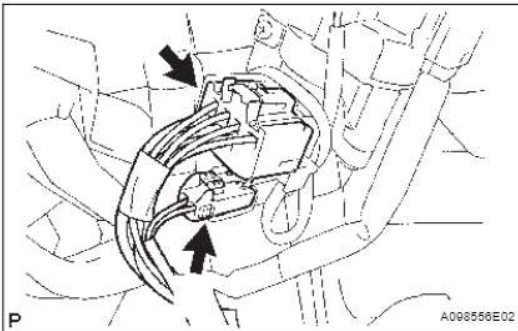
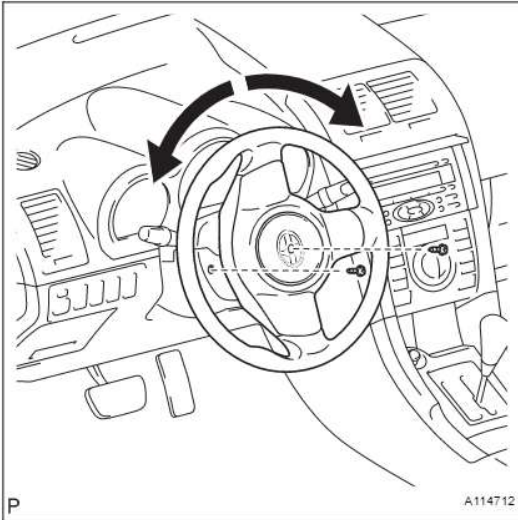
Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **REMOVE STEERING COLUMN COVER**

- (a) Remove the 2 screws and cover lower.

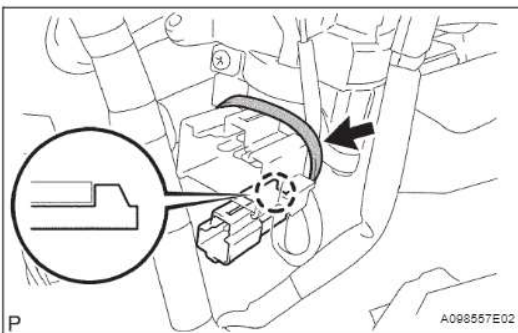
HINT:

Turn the steering wheel to the right and left as necessary to remove the 2 screws and cover lower.



3. **REMOVE IGNITION SWITCH ASSEMBLY**

- (a) Disconnect the ignition switch connector.
- (b) Disconnect the unlock warning switch connector.

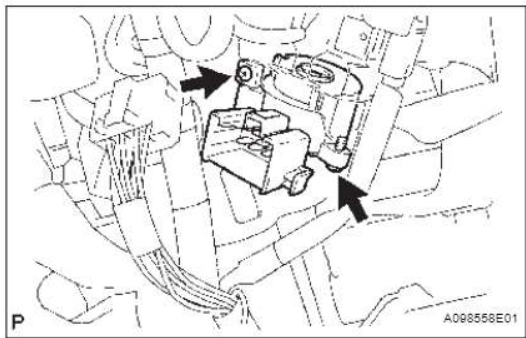


- (c) Remove the cable tie.
- (d) Using a small screwdriver, disconnect the claw fitting, and then remove the connector of the unlock warning switch.

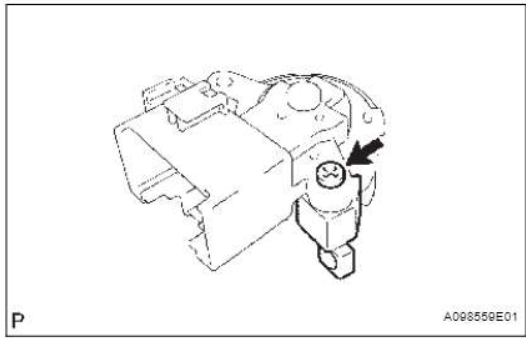
ST

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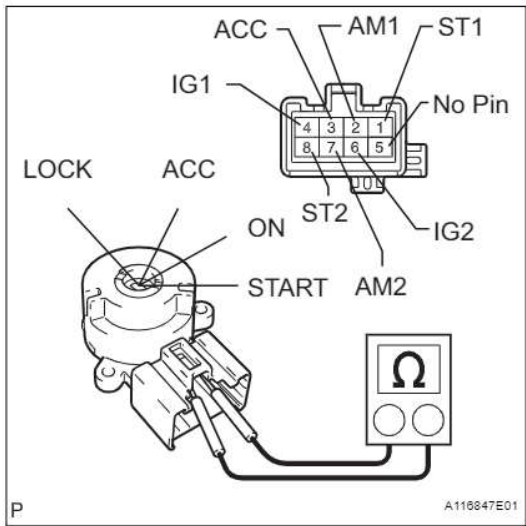
2AZ-FE STARTING – IGNITION SWITCH



(e) Remove the 2 screws and ignition switch.



(f) Remove the screw and lock stopper.



INSPECTION

1. INSPECT IGNITION SWITCH ASSEMBLY

- (a) Check the resistance.
(1) Measure the resistance between the terminals.
Standard resistance

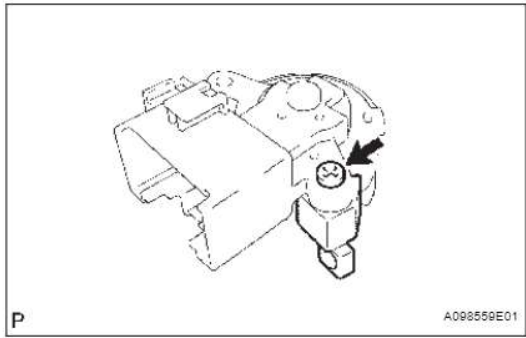
Switch Condition	Tester Connection	Specified Condition
LOCK	-	10 kΩ or higher
ACC	2 (AM1) - 3 (ACC)	Below 1 Ω
ON	2 (AM1) - 3 (ACC) 3 (ACC) - 4 (IG1) 7 (AM2) - 6 (IG2)	Below 1 Ω
START	2 (AM1) - 4 (IG1) 4 (IG1) - 1 (ST1) 7 (AM2) - 6 (IG2) - 8 (ST2)	Below 1 Ω

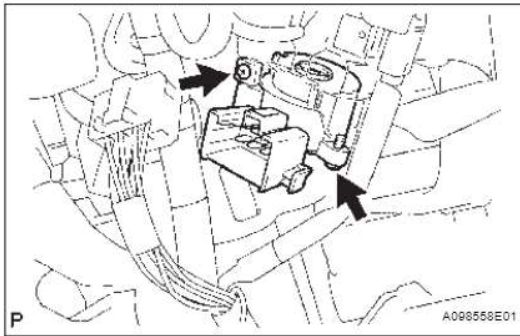
If the result is not as specified, replace the ignition switch assembly.

INSTALLATION

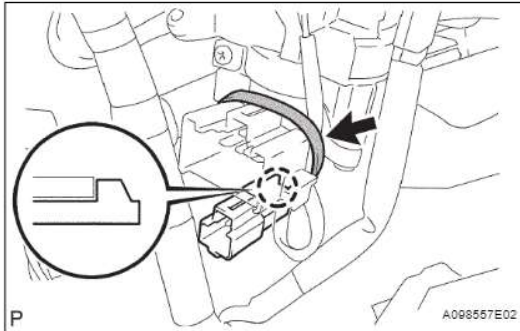
1. INSTALL IGNITION SWITCH ASSEMBLY

- (a) Install the lock stopper with the screw.



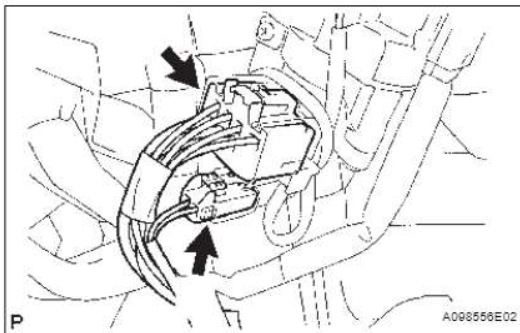
2AZ-FE STARTING – IGNITION SWITCH**ST-19**

(b) Install the ignition switch with the 2 screws.



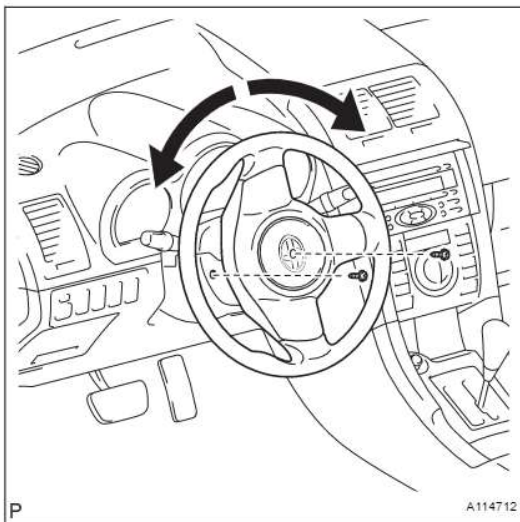
(c) Align the claw position, and then install the connector of the unlock warning switch.

(d) Install the cable tie.



(e) Connect the unlock warning switch connector.

(f) Connect the ignition switch connector.

**2. INSTALL STEERING COLUMN COVER**

(a) Install the cover lower with the 2 screws.

HINT:

Turn the steering wheel to the right and left as necessary to install the 2 screws and cover lower.

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**4. PERFORM INITIALIZATION**

(a) Perform initialization (see page [IN-23](#)).

NOTICE:

Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

ST