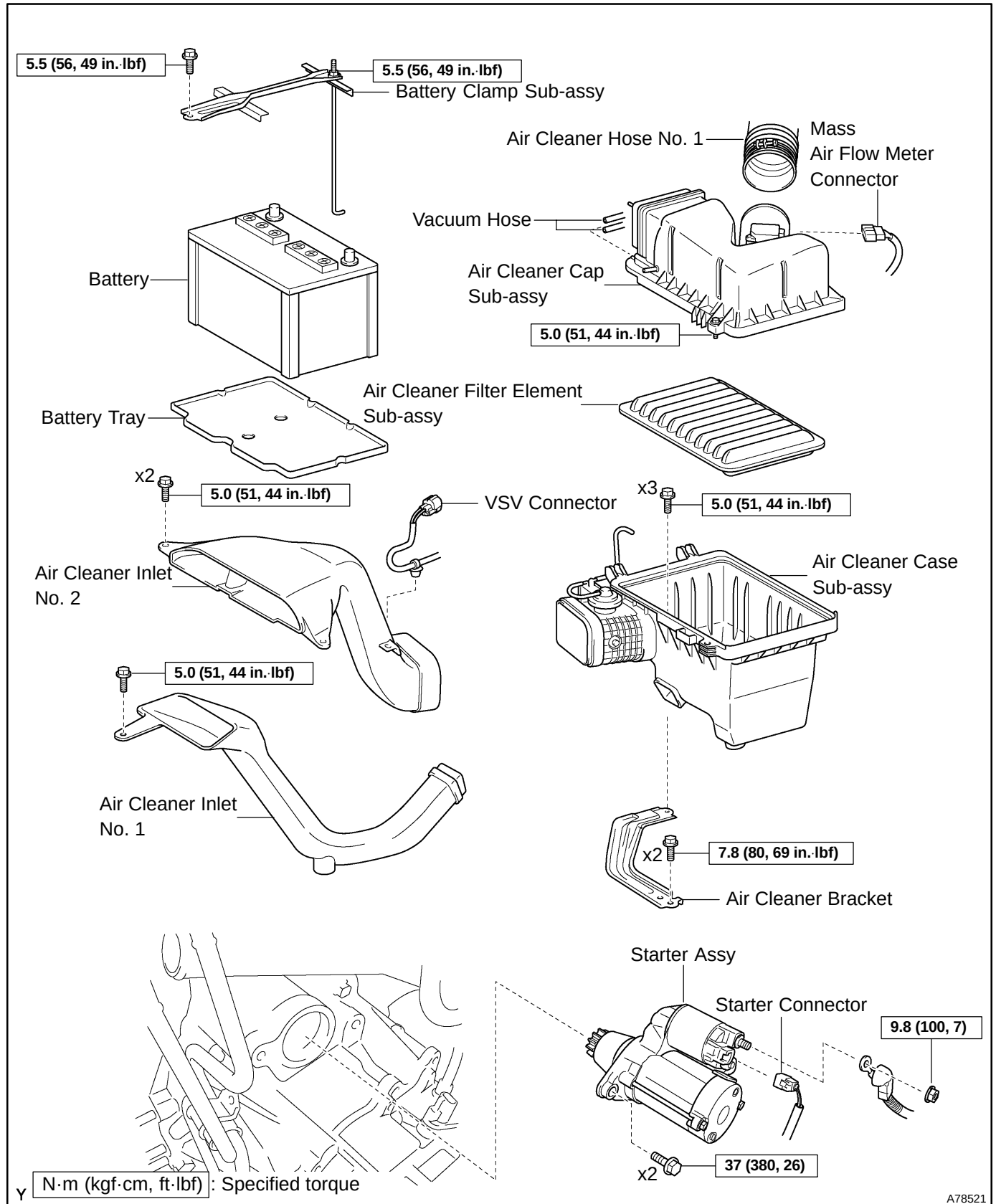
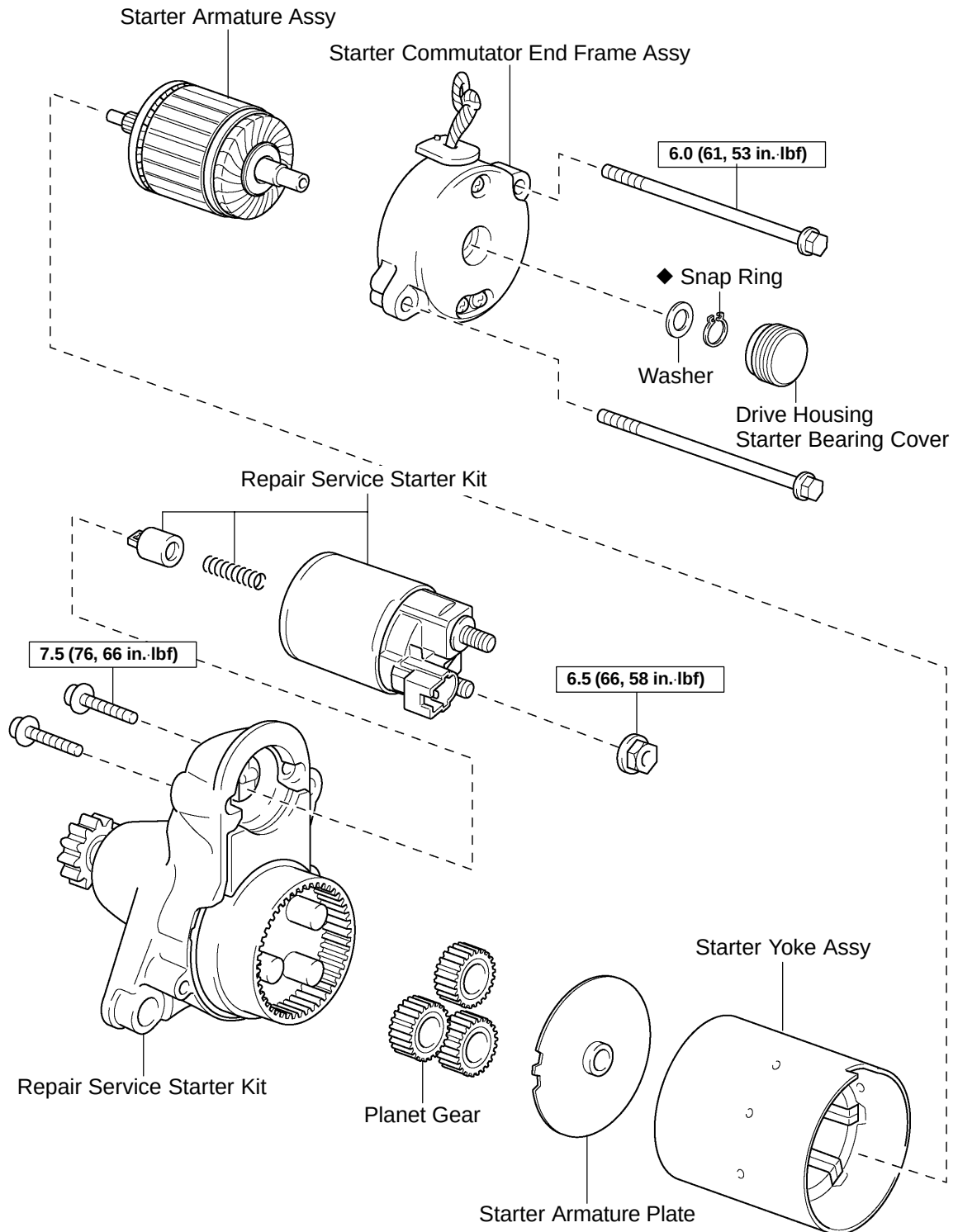


STARTER ASSY COMPONENTS

190N7-01



A78521



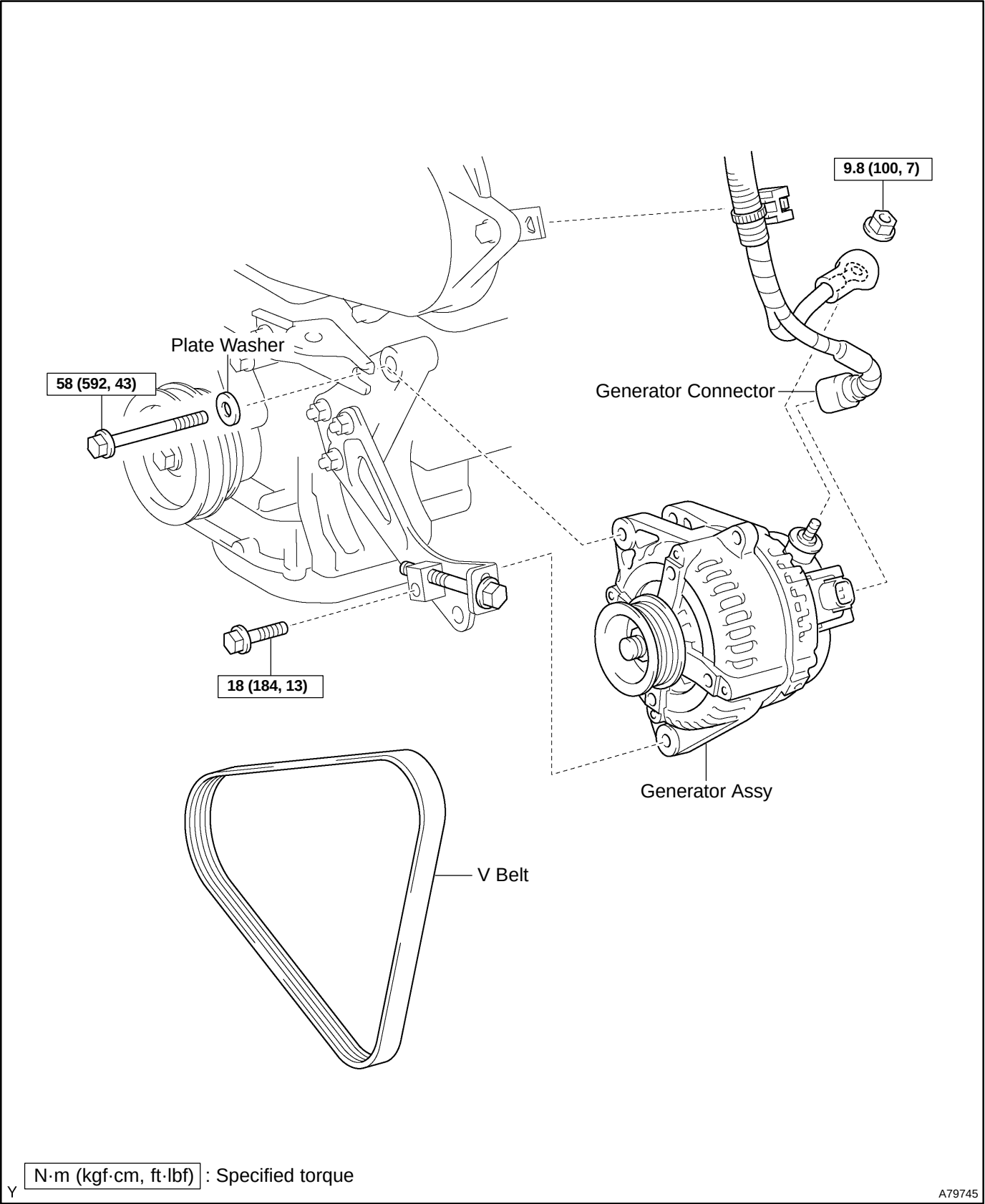
N·m (kgf·cm, ft·lbf) : Specified torque

Y ◆ Non-reusable part

A79717

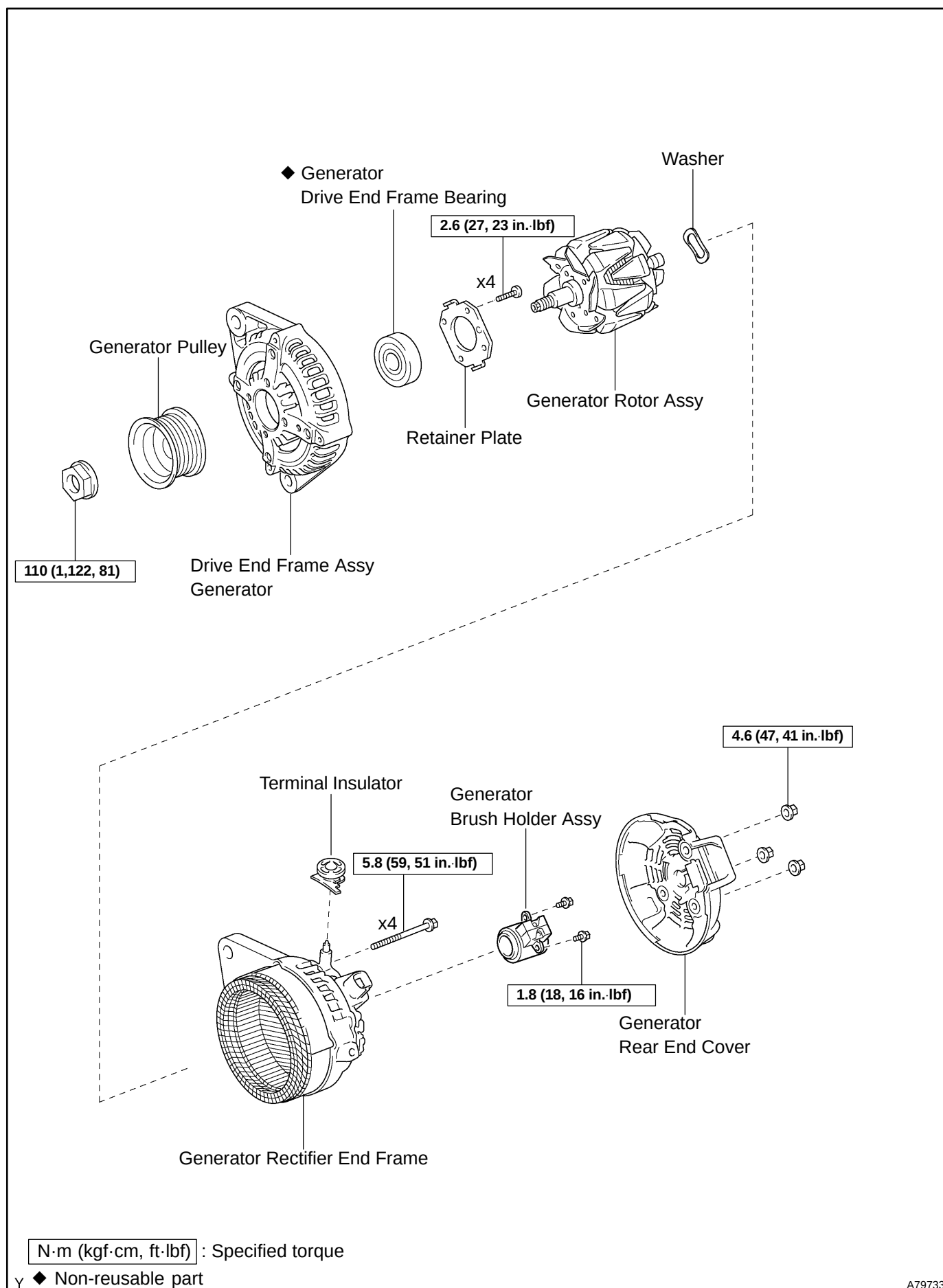
GENERATOR ASSY COMPONENTS

190NA-01



Y

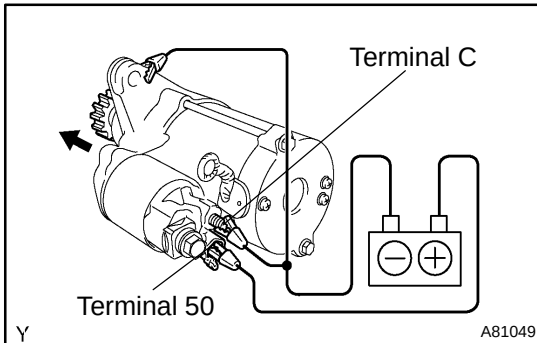
A79745



A79733

STARTING SYSTEM INSPECTION

190N4-02



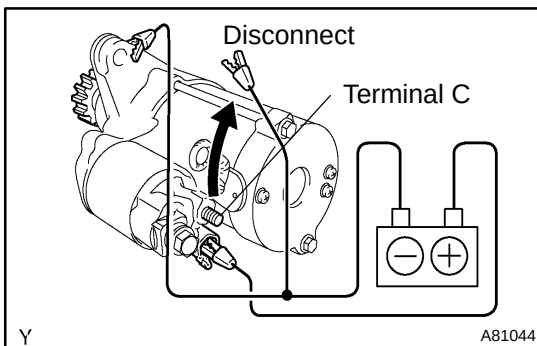
1. INSPECT STARTER ASSY

NOTICE:

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

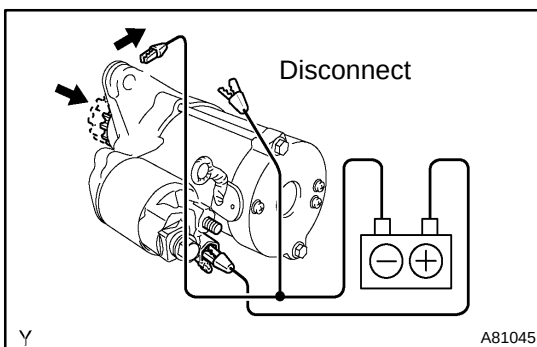
- (a) Do pull-in test
- (1) Disconnect the field coil lead from terminal C.
 - (2) Connect the battery to the magnetic switch as shown in the illustration on the left. Check that the clutch pinion gear is extended.

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

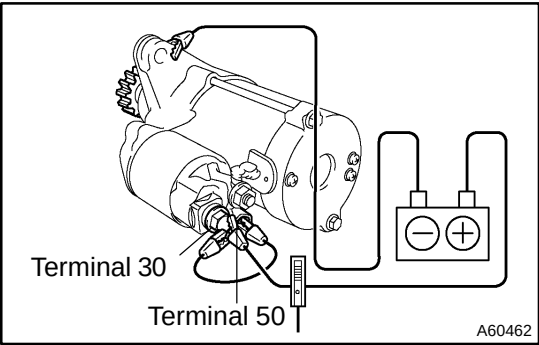


- (b) Do hold-in test
- (1) Disconnect the negative (-) lead from the terminal C with the above condition (a) is being maintained. Check that the pinion gear remains extended.

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



- (c) Inspect 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) Do no-load performance test
- (1) Connect the field coil 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.

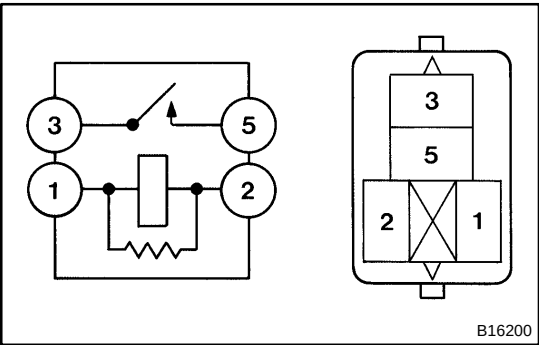
Specified current: 90 A or less at 11.5 V

2. INSPECT STARTER RELAY ASSY

- (a) Continuity inspection.
- (1) Using an ohmmeter, check for continuity between each terminal.

Specified condition:

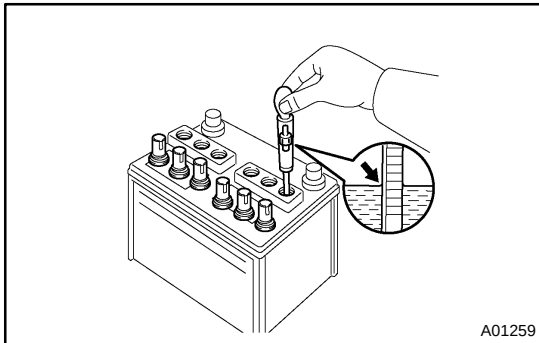
Terminal No.	Specified condition
1 - 2	Continuity
3 - 5	No continuity
	Continuity (Applying battery voltage terminals 1 and 2)



ON-VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

- (a) Check the electrolyte quantity of each cell.
- (1) If the electrolyte is under the low level, replace the battery (or add distilled water if possible) and check the charging system.

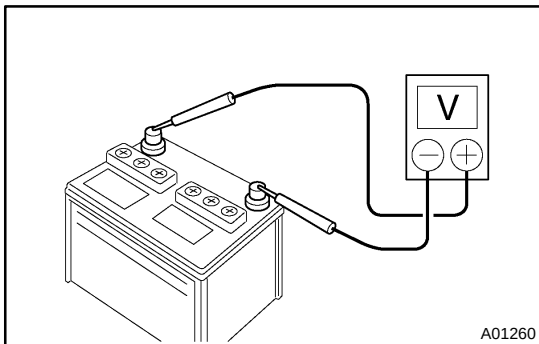


2. CHECK BATTERY SPECIFIC GRAVITY

- (a) Check the specific gravity of each cell.
- Standard specific gravity: 1.25 to 1.29 at 20°C (68°F)**

HINT:

If the specific gravity is less than specification, charge the battery.



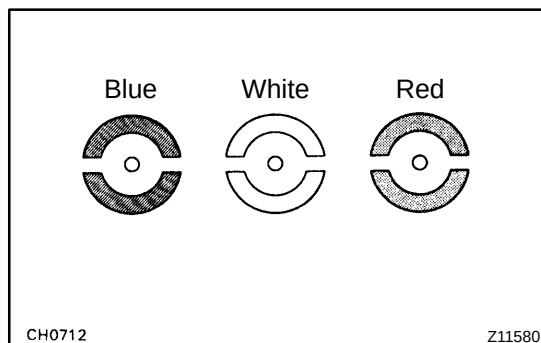
3. CHECK BATTERY VOLTAGE

- (a) If it has not been 20 minutes since you drove the vehicle or since the engine was stopped, turn the ignition switch and the electrical system (headlight, blower motor, rear defogger etc.) to the on position for 60 seconds. This will remove the surface charge on the battery.
- (b) Turn off the ignition switch and the electrical systems.
- (c) Measure the battery voltage between the negative (-) and positive (+) terminals of the battery.

Standard voltage: 12.6 to 12.8 V at 20°C (68°F)

HINT:

If the voltage is less than specification, charge the battery.



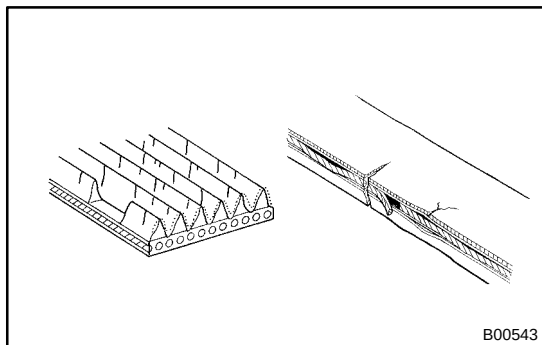
- (d) Check the indicator as shown in the illustration.

HINT:

- Blue: OK
- White: Charging Necessary
- Red: Insufficient Water

4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

- (a) Check that the battery terminals are not loosened or corroded.
- (b) Check the fusible links, high-current fuses and regular fuses for continuity.

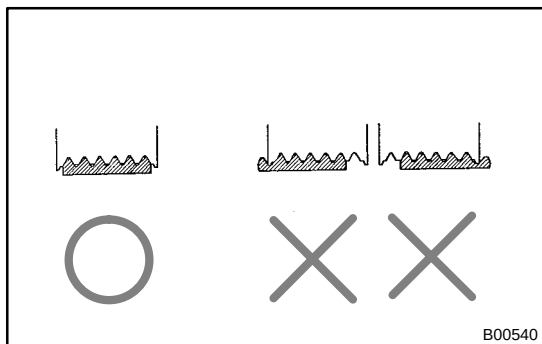


5. INSPECT DRIVE BELT

- (a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

- If any defect found, replace the drive belt.
- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



- (b) Check that it fits properly in the ribbed grooves.

HINT:

Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.

6. VISUALLY CHECK GENERATOR WIRING

- (a) Check that the wiring is in good condition.

7. LISTEN FOR ABNORMAL NOISES FROM GENERATOR

- (a) Check that there is no abnormal noise from the generator while the engine is running.

8. INSPECT CHARGE WARNING LIGHT CIRCUIT

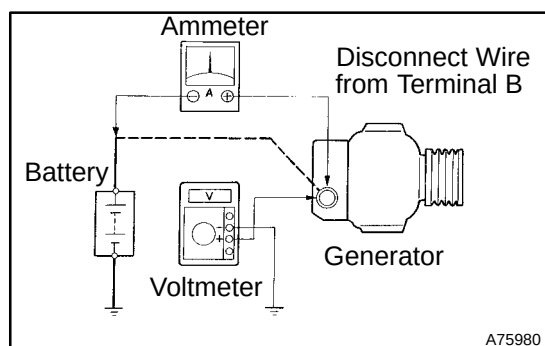
- (a) Turn the ignition switch ON. Check that the charge warning light comes on.
 (b) Start the engine and check that the light goes off.

HINT:

If the light does not operate as specified, troubleshoot the charge warning light circuit.

9. INSPECT CHARGING CIRCUIT WITHOUT LOAD

- (a) If a battery or generator tester is available, connect the tester to the charging circuit as per manufacturer's instructions.



- (b) If a tester is not available, connect a voltmeter to the charging circuit as follows.

- (1) Disconnect to the wire from terminal B of the generator and connect it to the negative (-) lead of the ammeter.
- (2) Connect the positive (+) lead of the ammeter to terminal B of the generator.
- (3) Connect the positive (+) lead of the voltmeter to terminal B of the generator.
- (4) Ground the negative (-) lead of the voltmeter.

(c) Check the charging circuit.

(1) Keep the engine speed at 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.2 to 14.8 V

10. INSPECT CHARGING CIRCUIT WITH LOAD

(a) Keep the engine speed at 2,000 rpm, turn on the high beam headlights and turn the heater blower switch to the "HI" position.

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

HINT:

- If the ammeter reading is less than standard amperage, repair the generator.
- If the battery is fully charged, the indication will sometimes be less than standard amperage.

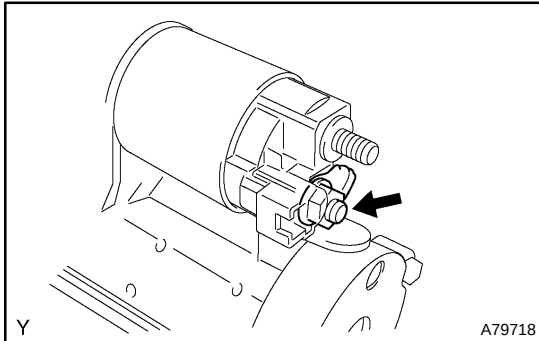
CHARGING SYSTEM

190N5-02

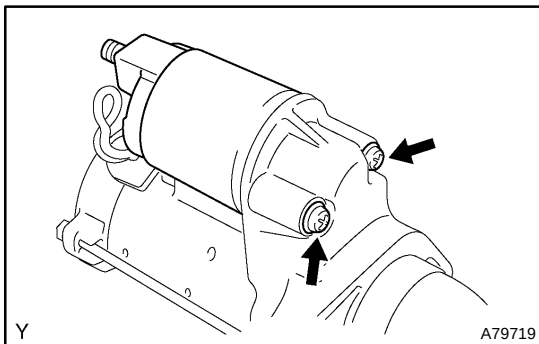
PRECAUTION

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery while the engine is running.
5. Check that the charging cable is tightened on terminal B of the generator and the fuse box.
6. Do not perform inspection of the generator in which terminal F is connected to the other terminals.

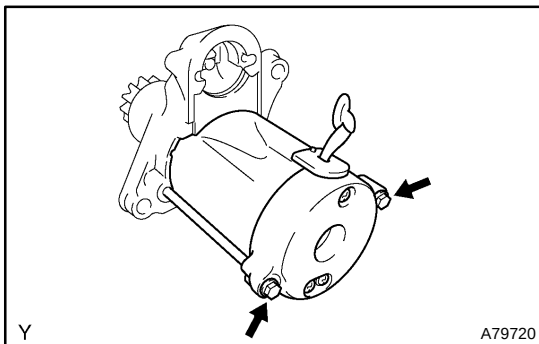
OVERHAUL

**1. REMOVE REPAIR SERVICE STARTER KIT**

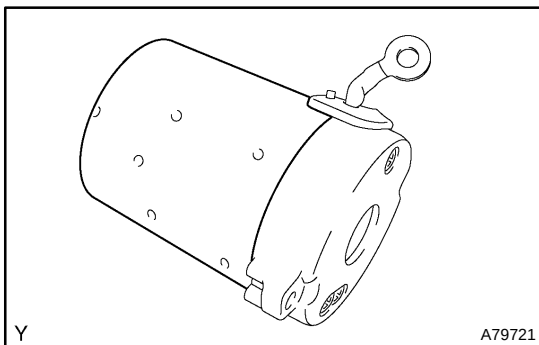
- (a) Remove the nut and disconnect the lead wire from the repair service starter kit.



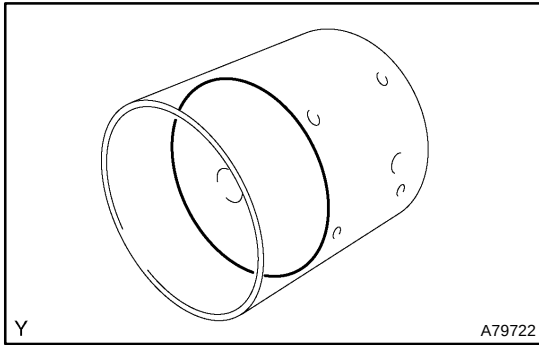
- (b) Remove the 2 screws which are used to secure the repair service starter kit to the repair service starter kit.
 (c) Remove the repair service starter kit.
 (d) Remove the return spring and the plunger from the repair service starter kit.

**2. REMOVE STARTER YOKE ASSY**

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

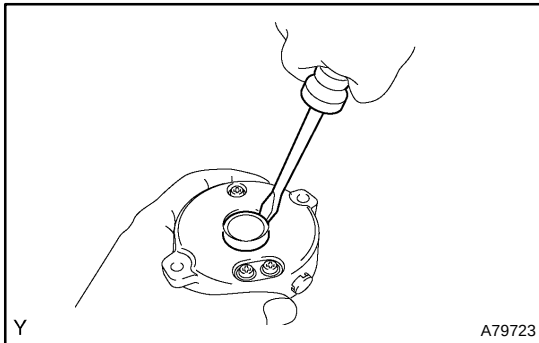


- (b) Remove the starter yoke from the starter commutator end frame.



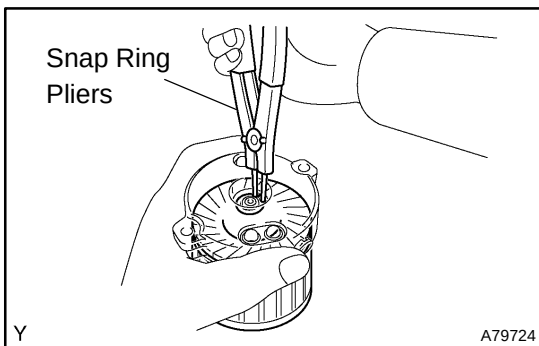
3. REMOVE STARTER ARMATURE PLATE

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



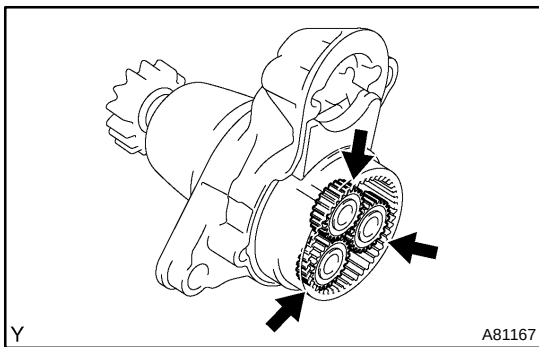
4. REMOVE DRIVE HOUSING STARTER BEARING COVER

- (a) Using a screwdriver, remove the drive housing starter bearing cover.



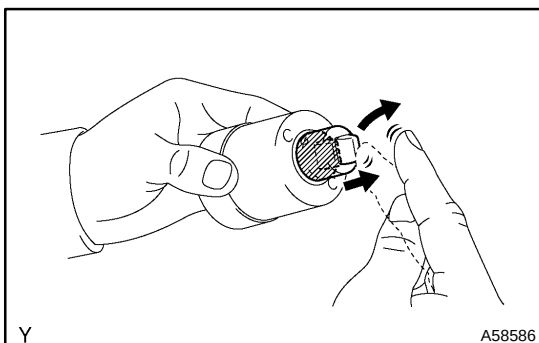
5. REMOVE STARTER ARMATURE ASSY

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



6. REMOVE PLANET GEAR

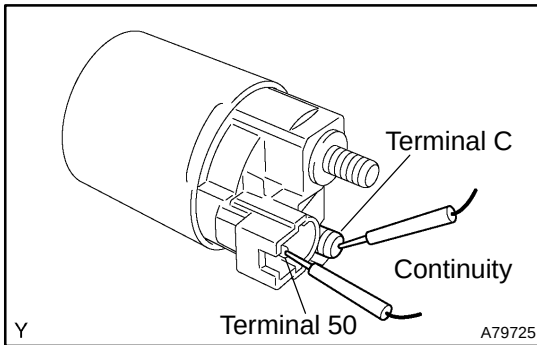
- (a) Remove the 3 planet gears from the repair service starter kit.



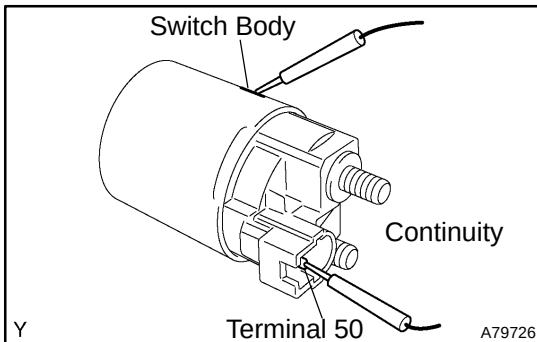
7. INSPECT REPAIR SERVICE STARTER KIT

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

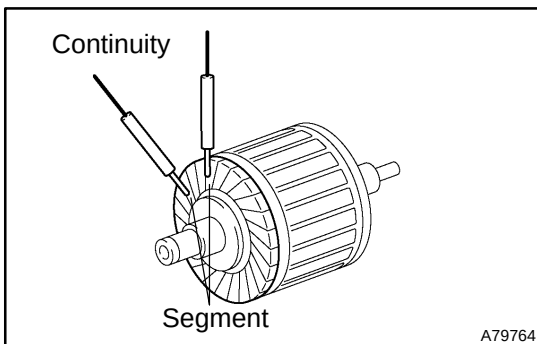
If necessary, replace the repair service starter kit.



- (b) Check the pull-in coil for open circuit.
- (1) Using an ohmmeter, check that there is continuity between terminals 50 and C.
- If there is no continuity, replace the repair service starter kit.

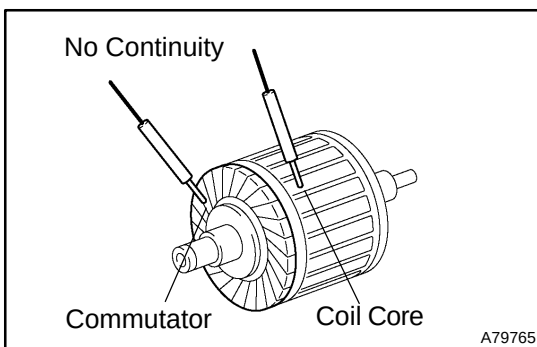


- (c) Check whether or not the hold-in coil has an open circuit.
- (1) Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
- If there is no continuity, replace the repair service starter kit.

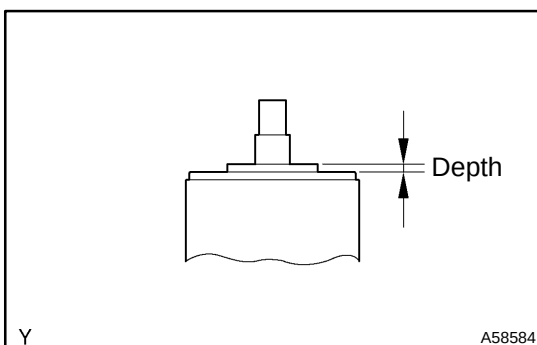


8. INSPECT STARTER ARMATURE ASSY

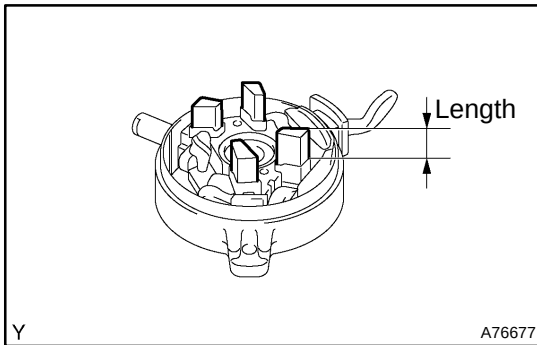
- (a) Check the commutator for open circuit.
- (1) Using an ohmmeter, check that there is continuity between the segments of the commutator.
- If there is no continuity between any segments, replace the starter armature.



- (b) Check the commutator for ground.
- (1) Using an ohmmeter, check that there is no continuity between the commutator and the armature coil core.
- If there is continuity, replace the starter armature.
- (c) Check the commutator for dirty and burned surface.
- If the surface is dirty or burned, correct it with sandpaper (No. 400) or lathe.



- (d) Check the commutator depth.
- (1) Using vernier calipers, measure the commutator depth.
- Standard length: 3.3 mm (0.1299 in.)**
- Maximum length: 4.0 mm (0.1575 in.)**
- If the depth is greater than maximum, replace the starter armature.



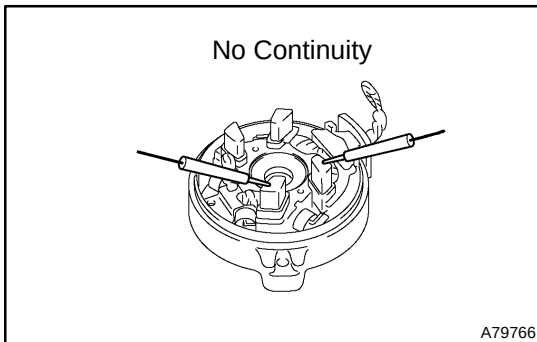
9. INSPECT STARTER COMMUTATOR END FRAME ASSY

- (a) Check the brush holder length.
 (1) Using vernier calipers, measure the brush holder length.

Standard length: 9.0 mm (0.354 in.)

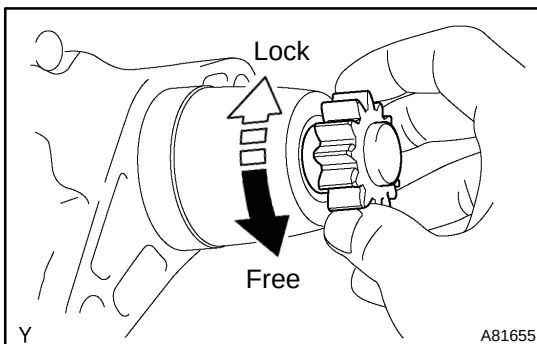
Minimum length: 4.0 mm (0.158 in.)

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



- (b) Check the brush holder.
 (1) Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.

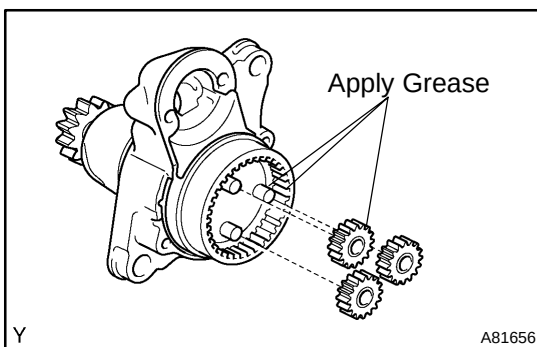
If there is continuity, repair or replace the starter commutator end frame.



10. INSPECT REPAIR SERVICE STARTER KIT

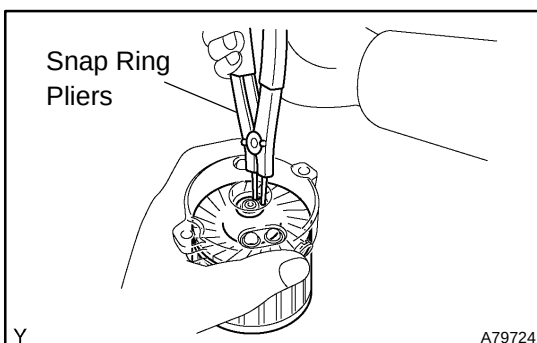
- (a) Check the starter clutch.
 (1) Rotate the clutch pinion gear counterclockwise and check that it turns freely. Try to rotate the clutch pinion gear clockwise and check that it locks.

If necessary, replace the repair service starter kit.



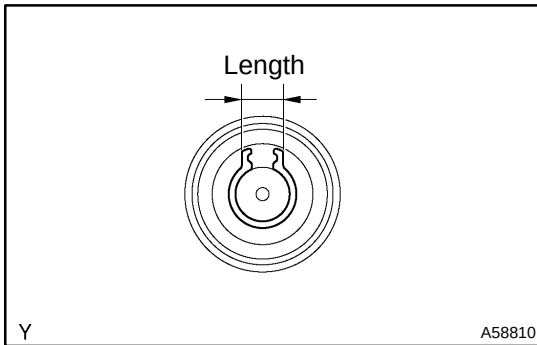
11. INSTALL PLANET GEAR

- (a) Apply grease to the planet gears and pin parts of the planetary shaft.
 (b) Install the 3 planet gears to the repair service starter kit.



12. INSTALL STARTER ARMATURE ASSY

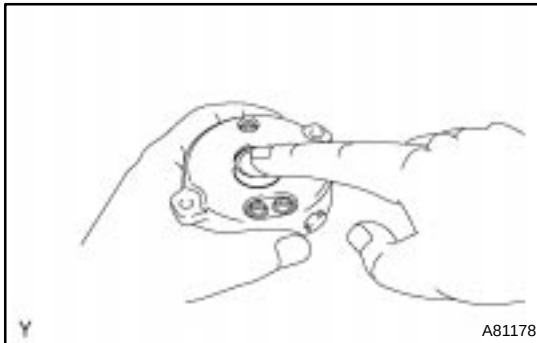
- (a) Apply grease to the plate washer and the armature shaft.
 (b) Install the starter armature to the starter commutator end frame.
 (c) Using snap ring pliers, install the plate washer and a new snap ring.



- (d) Using vernier calipers, measure the snap ring.

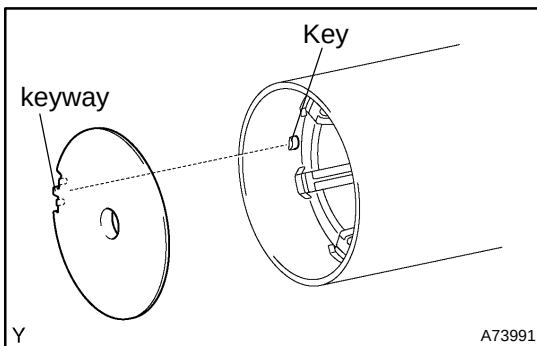
Maximum length: 5.0 mm (0.197 in.)

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



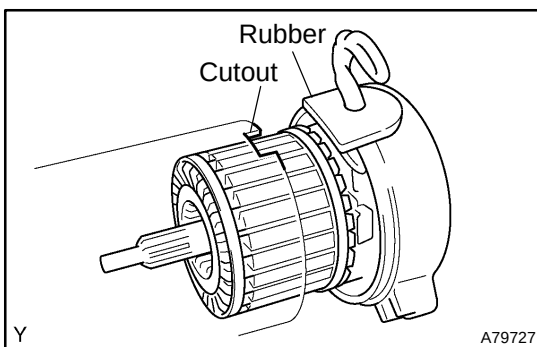
13. INSTALL DRIVE HOUSING STARTER BEARING COVER

- (a) Install the drive housing starter bearing cover to the starter commutator end frame.



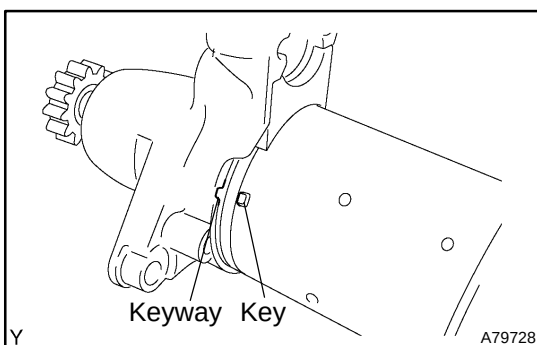
14. INSTALL STARTER ARMATURE PLATE

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



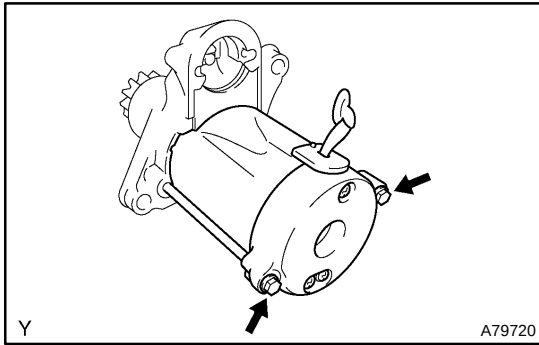
15. INSTALL STARTER COMMUTATOR END FRAME ASSY

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

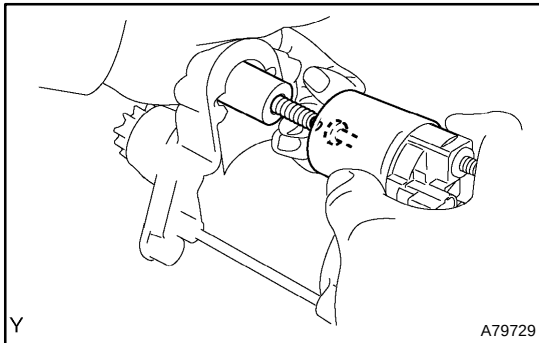


16. INSTALL STARTER YOKE ASSY

- (a) Align the key of the starter yoke with the keyway of repair service starter kit.

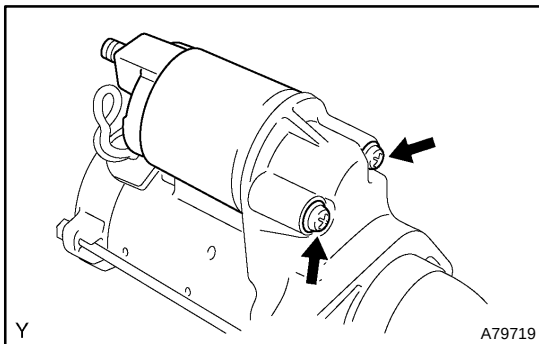


- (b) Install the starter yoke with the 2 through bolts.
Torque: 6.0 N·m (61 kgf·cm, 53 in·lbf)

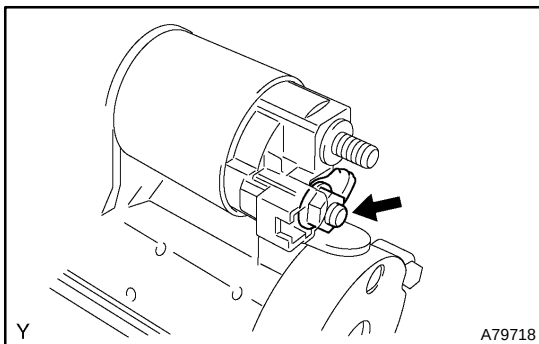


17. INSTALL REPAIR SERVICE STARTER KIT

- (a) Apply grease to the plunger and the hook.
 (b) Hang the plunger hook of the repair service starter kit to the drive lever.
 (c) Install the plunger and the return spring.

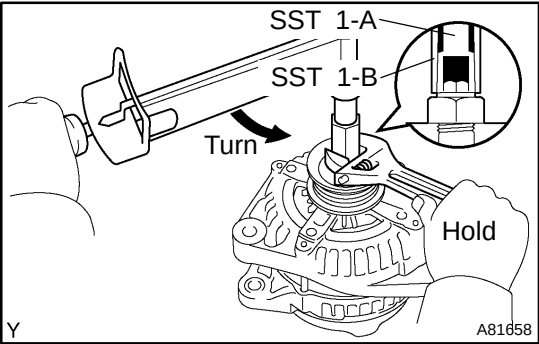


- (d) Install repair service starter kit with the 2 screws.
Torque: 7.5 N·m (76 kgf·cm, 66 in·lbf)



- (e) Connect the lead wire to the repair service starter kit with the nut.
Torque: 6.5 N·m (66 kgf·cm, 58 in·lbf)

OVERHAUL



1. REMOVE GENERATOR PULLEY

SST 09820-63010 (09820-06010, 09820-06020)

HINT:

SST 1-A and B	09820 - 06010
SST 2	09820 - 06020

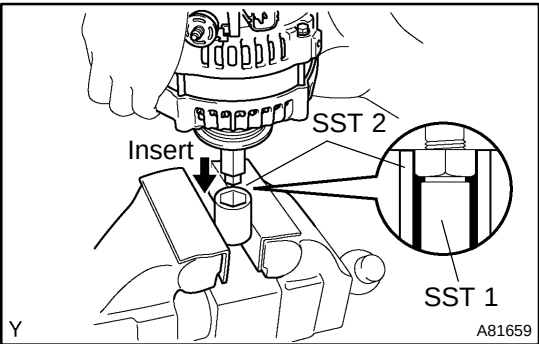
- (a) Hold SST 1-A with a torque wrench, and tighten SST 1-B clockwise to the specified torque.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

NOTICE:

Check that SST is secured to the rotor shaft.

- (b) Clamp SST 2 in a vise.
(c) Insert SST 1-A and B into SST 2, and attach the pulley nut to SST 2.

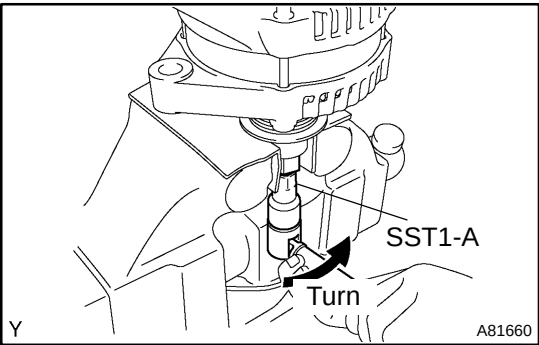


- (d) To loosen the pulley nut, turn SST 1-A in the direction shown in the illustration.

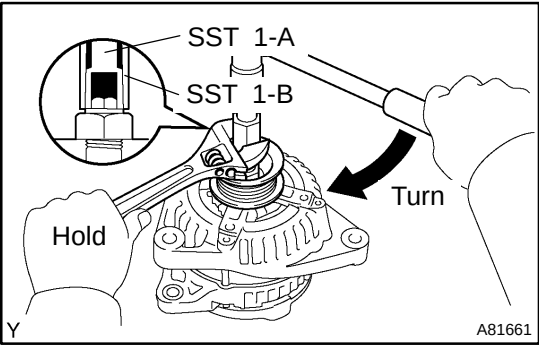
NOTICE:

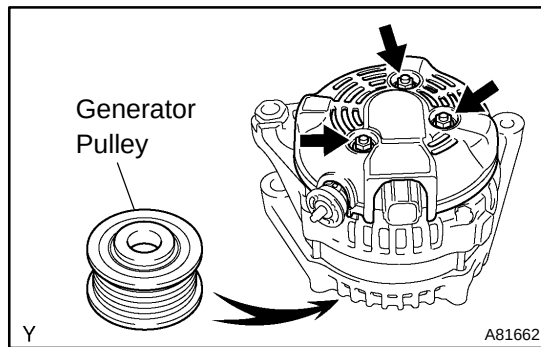
To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half turn.

- (e) Remove the generator from SST 2.



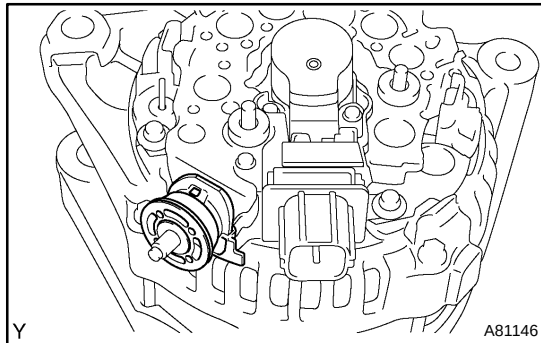
- (f) Turn SST 1-B, and remove SST 1-A and B.
(g) Remove the pulley nut and generator pulley.





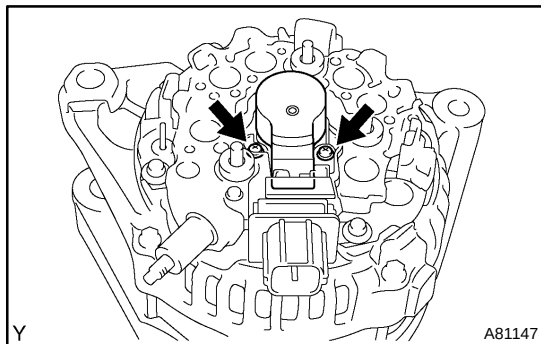
2. REMOVE GENERATOR REAR END COVER

- (a) Place the generator on the generator pulley.
- (b) Remove the 3 nuts and the generator rear end cover.



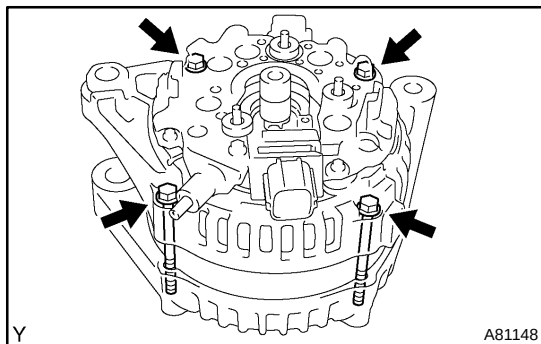
3. REMOVE TERMINAL INSULATOR

- (a) Remove the terminal insulator from the generator rectifier end frame.



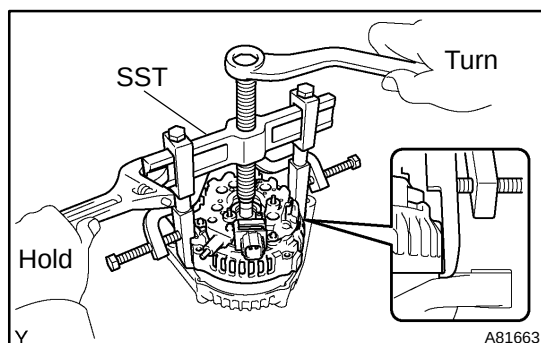
4. REMOVE GENERATOR BRUSH HOLDER ASSY

- (a) Remove the 2 screws and the generator brush holder.

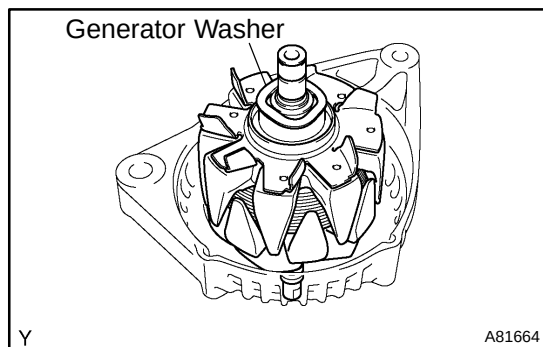


5. REMOVE GENERATOR RECTIFIER END FRAME

- (a) Remove the 4 bolts.

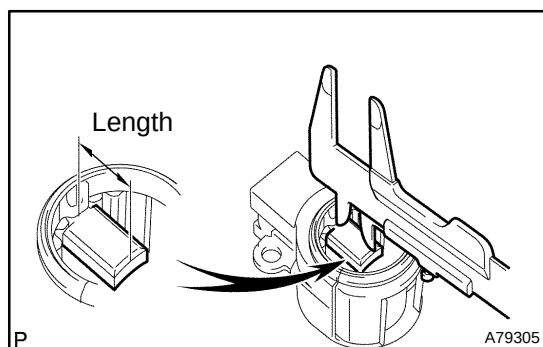


- (b) Using SST, remove the generator rectifier end frame.
SST 09950-4001 1 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04071, 09957-04010, 09958-04011)



6. REMOVE GENERATOR ROTOR ASSY

- (a) Remove the generator washer and the generator rotor.



7. INSPECT GENERATOR BRUSH HOLDER ASSY

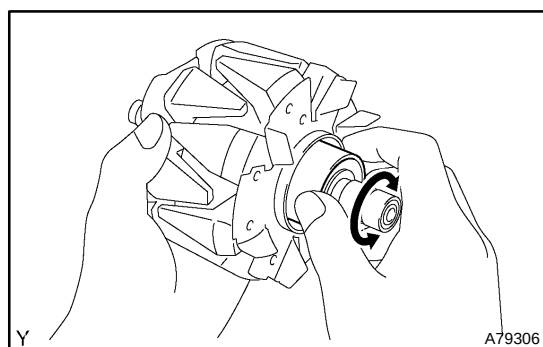
- (a) Check the brush length.
- (1) Using vernier calipers, measure the exposed brush length.

Standard exposed brush length:

10.5 mm (0.413 in.)

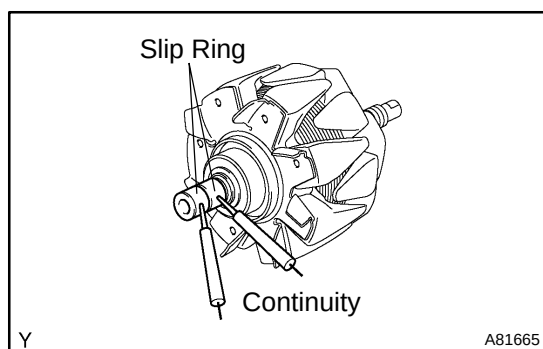
Minimum exposed brush length: 4.5 mm (0.177 in.)

If the exposed brush length is less than minimum, replace the generator brush holder.



8. INSPECT GENERATOR ROTOR ASSY

- (a) Check the bearing is not rough or worn.
- If necessary, replace the generator rotor.



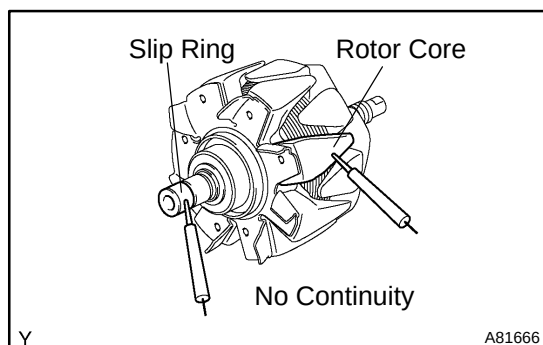
- (b) Check the rotor for open circuit.
- (1) Using an ohmmeter, measure the resistance between the slip ring.

Resistance:

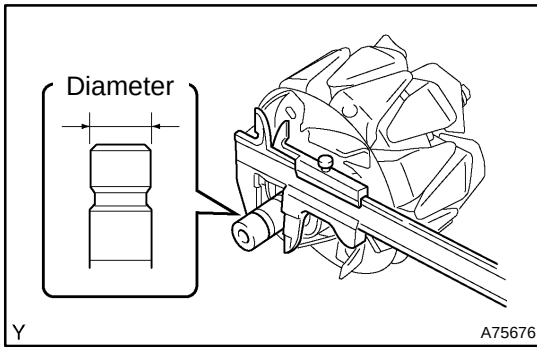
2.3 to 2.7 Ω at 20°C (68°F) for 130A

1.5 to 1.9 Ω at 20°C (68°F) for 150A

If the resistance is not as specified, replace the generator rotor.



- (c) Check the rotor for ground.
- (1) Using an ohmmeter, check that there is no continuity between the slip ring and the rotor core.
- If there is continuity, replace the generator rotor.
- (d) Inspect slip rings.
- (1) Check that the slip rings are not rough or scored.
- If rough or scored, replace the generator rotor.



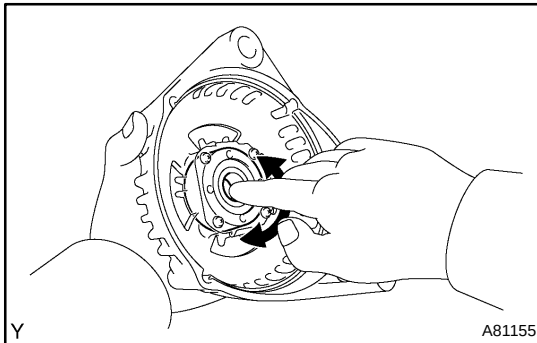
- (e) Check the slip ring diameter.
 (1) Using vernier calipers, measure the slip ring diameter.

Standard diameter:

14.2 to 14.4 mm (0.559 to 0.567 in.)

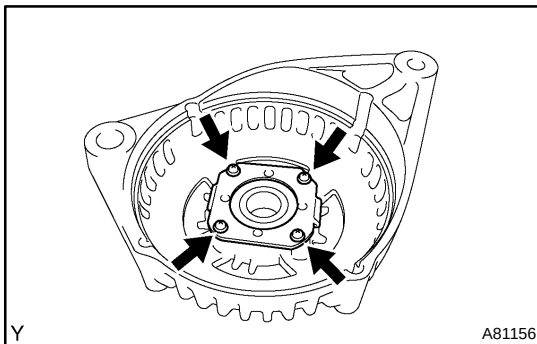
Minimum diameter: 14.0 mm (0.551 in.)

If the diameter is less than minimum, replace the generator rotor.



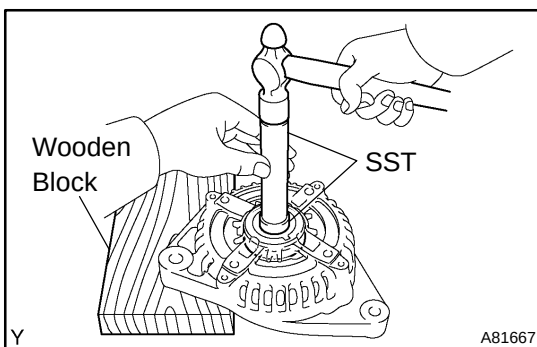
9. INSPECT GENERATOR DRIVE END FRAME BEARING

- (a) Check the bearing is not rough or worn.
 If necessary, replace the bearing.

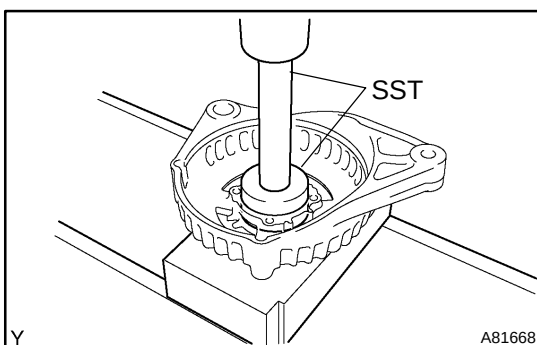


10. REMOVE GENERATOR DRIVE END FRAME BEARING

- (a) Remove the 4 screws and the retainer plate.

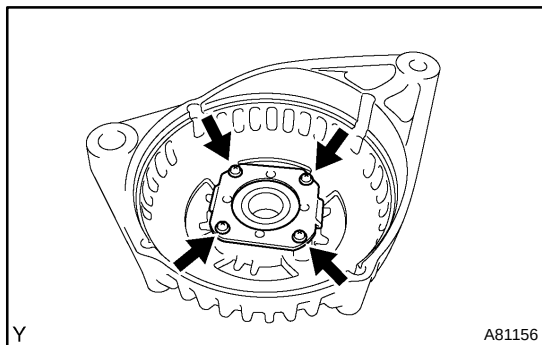


- (b) Using SST, tap out the bearing.
 SST 09950-60010 (09951-00250), 09950-70010 (09951-07100)

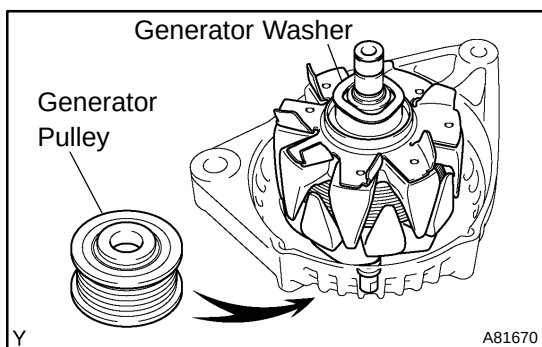


11. INSTALL GENERATOR DRIVE END FRAME BEARING

- (a) Using SST and a press, press in a new bearing.
 SST 09950-60010 (09951-00470), 09950-70010 (09951-07100)

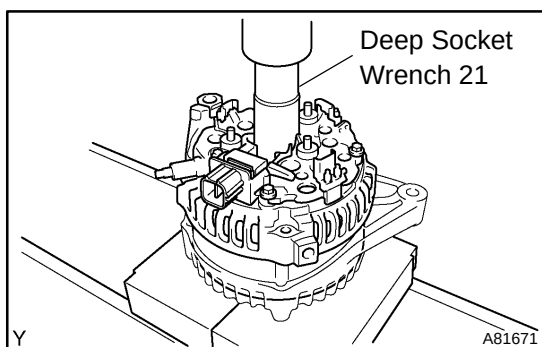


- (b) Install the retainer plate with the 4 screws.
Torque: 2.6 N·m (27 kgf·cm, 23 in·lbf)



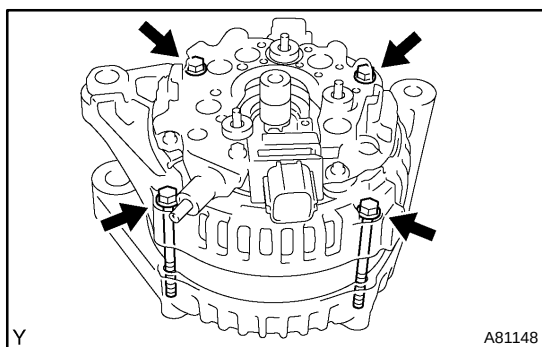
12. INSTALL GENERATOR ROTOR ASSY

- (a) Place the generator drive end frame on the generator pulley.
 (b) Install the generator rotor and the generator washer.

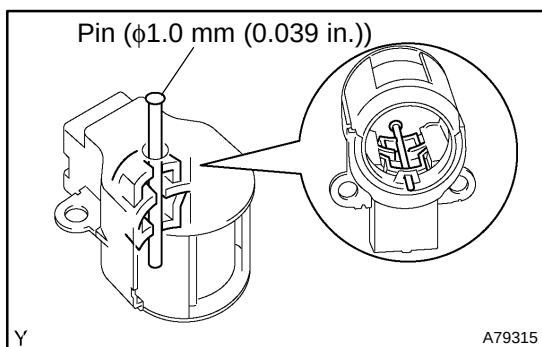


13. INSTALL GENERATOR RECTIFIER END FRAME

- (a) Using deep socket wrench 21 and a press, press in the generator rectifier end frame carefully.

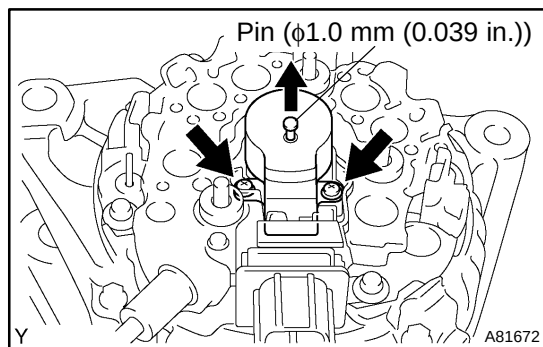


- (b) Tighten the 4 bolts.
Torque: 5.8 N·m (59 kgf·cm, 51 in·lbf)

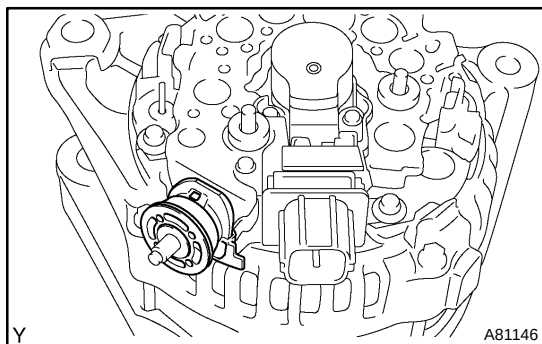


14. INSTALL GENERATOR BRUSH HOLDER ASSY

- (a) While pushing the 2 brushes to inside the brush holder, insert a pin (φ1.0 mm (0.039 in.)) into the brush holder hole.



- (b) Install the generator brush holder with the 2 screws.
Torque: 1.8 N·m (18 kgf·cm, 16 in.-lbf)
- (c) Pull out the pin (φ1.0 mm (0.039 in.)) from the generator brush holder.

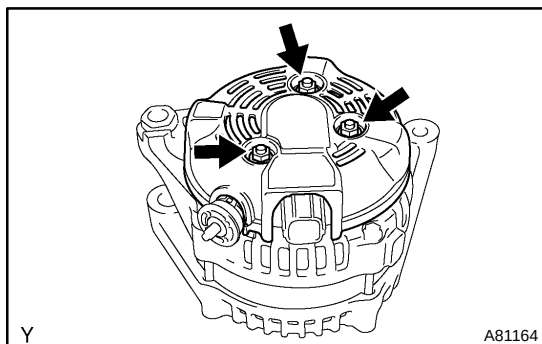


15. INSTALL TERMINAL INSULATOR

- (a) Install the terminal insulator to the generator rectifier end frame.

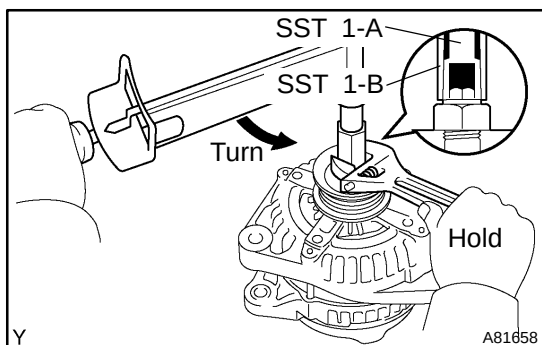
NOTICE:

pay attention the mounting orientation of the terminal insulator.



16. INSTALL GENERATOR REAR END COVER

- (a) Install the generator rear end cover with the 3 nuts.
Torque: 4.6 N·m (47 kgf·cm, 41 in.-lbf)



17. INSTALL GENERATOR PULLEY

SST 09820-63010 (09820-06010, 09820-06020)

HINT:

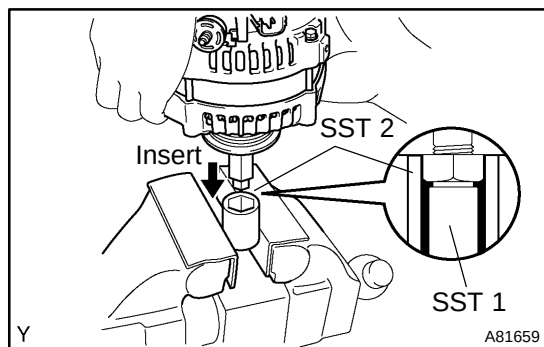
SST 1-A and B	09820 - 06010
SST 2	09820 - 06020

- (a) Install the generator pulley to the rotor shaft by tightening the pulley nut by hand.
- (b) Hold SST 1-A with a torque wrench, and tighten SST 1-B clockwise to the specified torque.

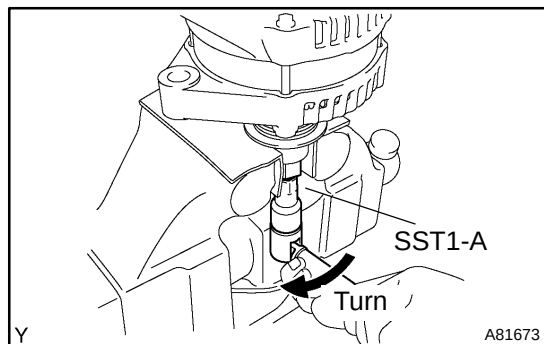
Torque: 39 N·m (400 kgf·cm, 29 ft-lbf)

NOTICE:

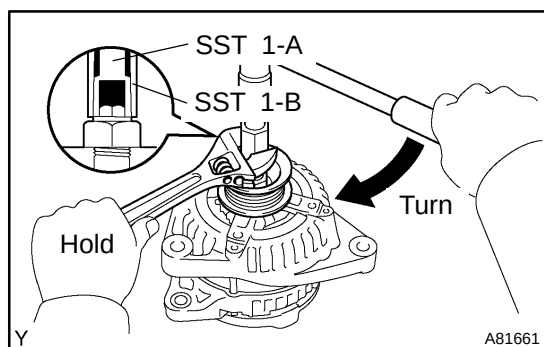
Check that SST is secured to the rotor shaft.



- (c) Clamp SST 2 in a vise.
- (d) Insert SST 1-A and B into SST 2, and attach the pulley nut to SST 2



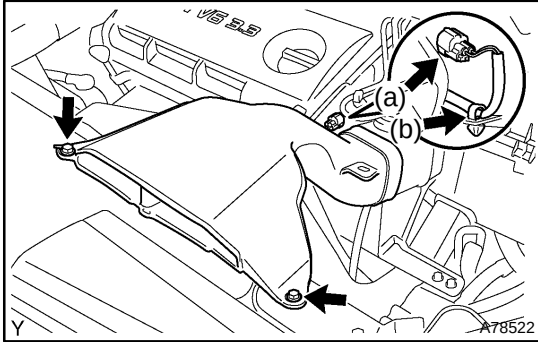
- (e) Tighten the pulley nut by turning SST 1-A in the direction shown in the illustration.
Torque: 111 N·m (1,125 kgf·cm, 81 ft·lbf)
- (f) Remove the generator from SST 2.



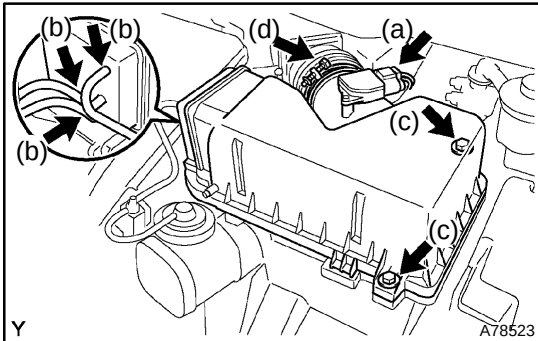
- (g) Turn SST 1-B, and remove SST 1-A, B.
- (h) Turn the generator pulley, and check that the generator pulley moves smoothly.

REPLACEMENT

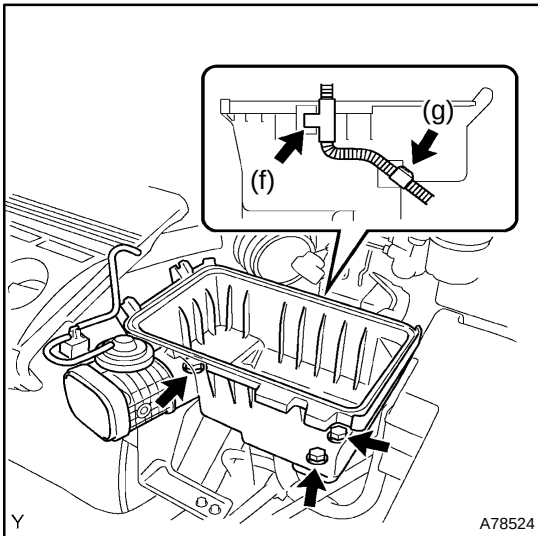
1. REMOVE BATTERY
2. REMOVE BATTERY TRAY



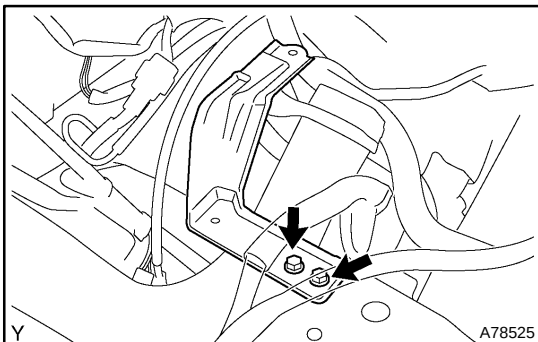
3. REMOVE AIR CLEANER INLET NO.2
 - (a) Disconnect the VSV connector.
 - (b) Remove the wire harness clamp.
 - (c) Remove the 2 bolts and the air cleaner inlet No. 2.



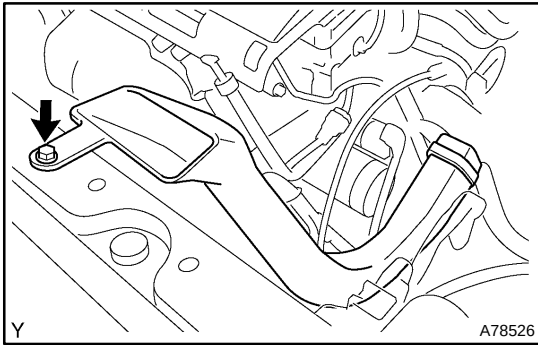
4. REMOVE AIR CLEANER ASSY
 - (a) Disconnect the mass air flow meter connector.
 - (b) Disconnect the 3 vacuum hoses.
 - (c) Loosen the 2 air cleaner cap bolts.
 - (d) Loosen the air cleaner hose clamp bolt and remove the air cleaner cap together with the air cleaner hose No. 1.
 - (e) Remove the air cleaner filter element.



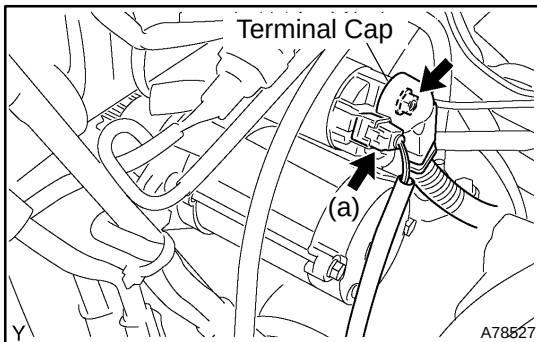
- (f) Remove the wire harness clamp.
- (g) Remove the wire harness from the wire harness clamp.
- (h) Remove the 3 bolts and the air cleaner case.



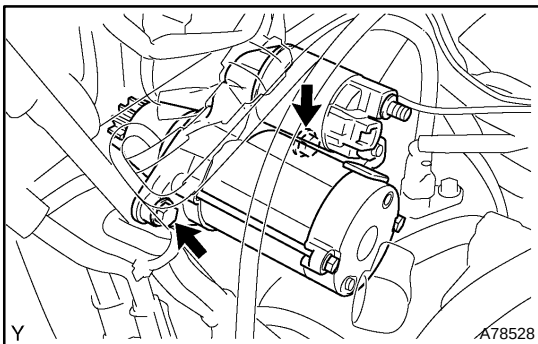
5. REMOVE AIR CLEANER BRACKET
 - (a) Remove the 2 bolts and the air cleaner bracket.

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

- (a) Remove the bolt and the air cleaner inlet No. 1.

**7. REMOVE STARTER ASSY**

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



- (c) Remove the 2 bolts and the starter.

8. INSTALL STARTER ASSY

Torque:

37 N·m (380 kgf·cm, 26 ft·lbf) for bolt

9.8 N·m (100 kgf·cm, 7 ft·lbf) for nut

9. INSTALL AIR CLEANER INLET NO.1

Torque: 5.0 N·m (51 kgf·cm, 44 in·lbf)

10. INSTALL AIR CLEANER BRACKET

Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)

11. INSTALL AIR CLEANER ASSY

Torque: 5.0 N·m (51 kgf·cm, 44 in·lbf)

12. INSTALL AIR CLEANER INLET NO.2

Torque: 5.0 N·m (51 kgf·cm, 44 in·lbf)

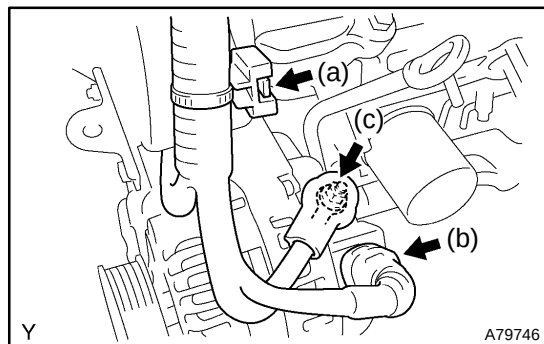
13. INSTALL BATTERY TRAY**14. INSTALL BATTERY**

Torque:

5.5 N·m (56 kgf·cm, 49 in·lbf) for bolt and nut

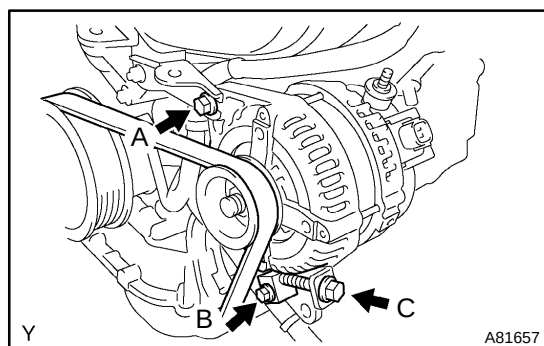
3.5 N·m (36 kgf·cm, 31 in·lbf) for terminal

REPLACEMENT

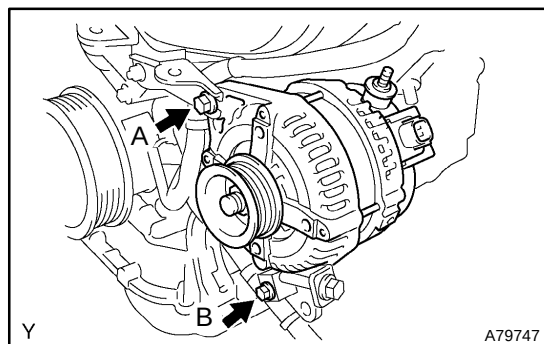


1. REMOVE GENERATOR ASSY

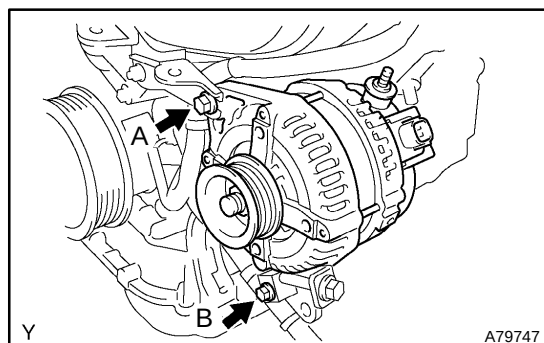
- (a) Remove the wire harness clamp.
- (b) Disconnect the generator connector.
- (c) Open the terminal cap and remove the nut and the generator wire.



- (d) Loosen bolts A and B.
- (e) Loosen bolt C to lessen the tension of the V belt No. 1.

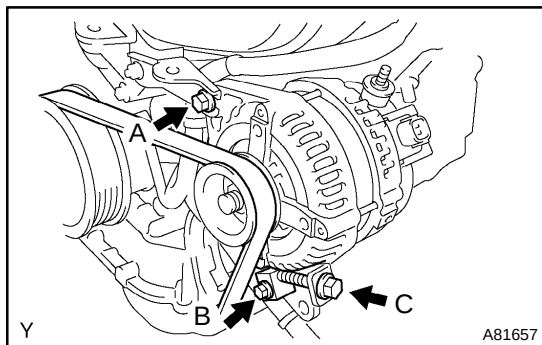


- (f) Remove bolts A, B and the generator.



2. INSTALL GENERATOR ASSY

- (a) Temporarily install generator with bolts A and B.



- (b) Adjust the V belt No. 1 tension by tightening bolt C.
(See page [14-1](#))
- (c) Tighten bolts A and B.
Torque:
58 N·m (592 kgf·cm, 43 ft·lbf) for bolt A
18 N·m (184 kgf·cm, 13 ft·lbf) for bolt B
- (d) install the generator wire with the nut.
Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)
- (e) Connect the generator connector.
- (f) Install the wire harness clamp.

3. INSPECT DRIVE BELT (See page [14-1](#))