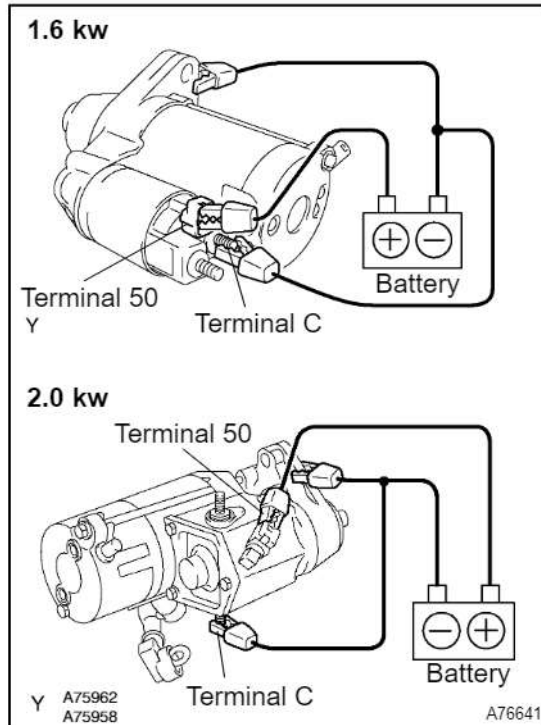


STARTING SYSTEM (1GR-FE)

INSPECTION

190KW-02

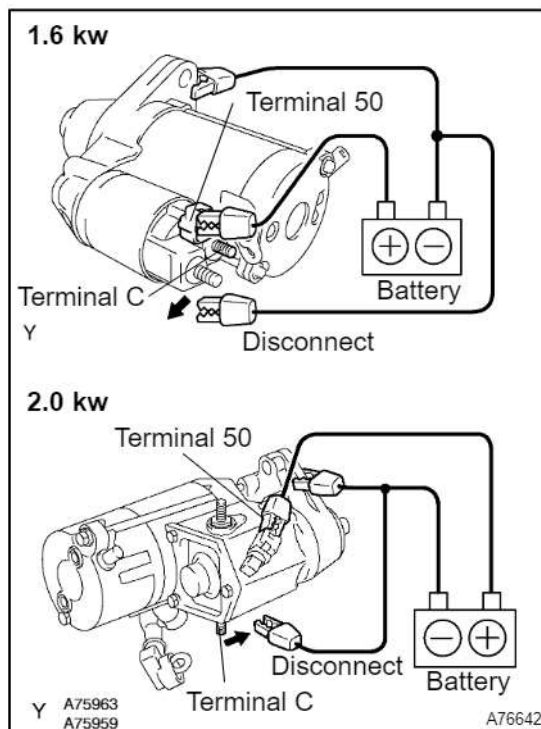


1. INSPECT STARTER ASSY

NOTICE:

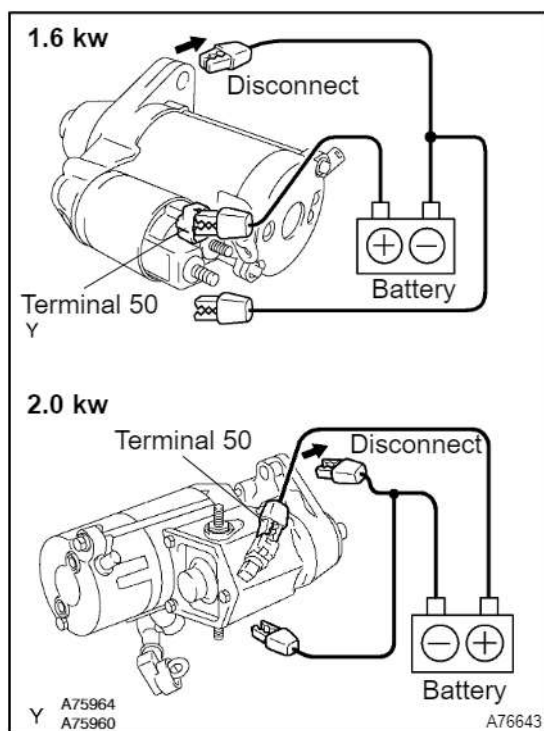
These tests must be done within 3 to 5 seconds to avoid burning out the coil.

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

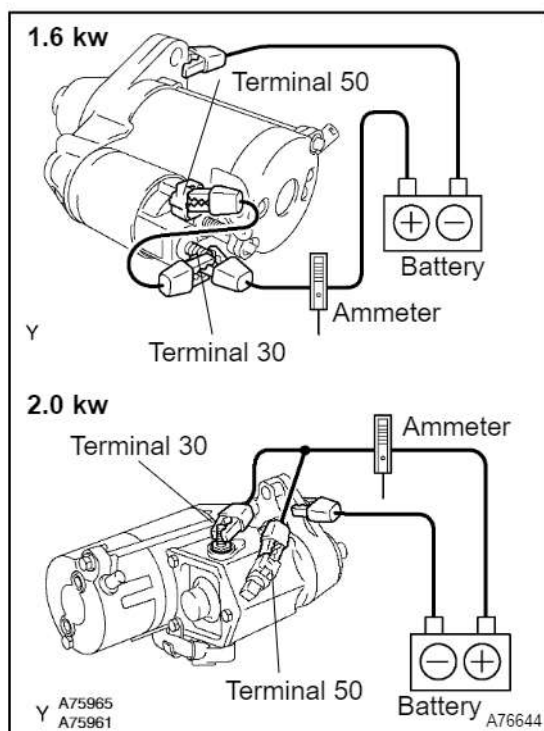


- (b) Do holding test.
- (1) Disconnect the negative (-) lead from the terminal C with the above condition (a) is being sustained. Check that the pinion gear remains protruded.

cardiagn.com



- (c) Inspect clutch pinion gear return.
- (1) Disconnect the negative (-) lead from the switch body. Check that the clutch pinion gear returns inward.

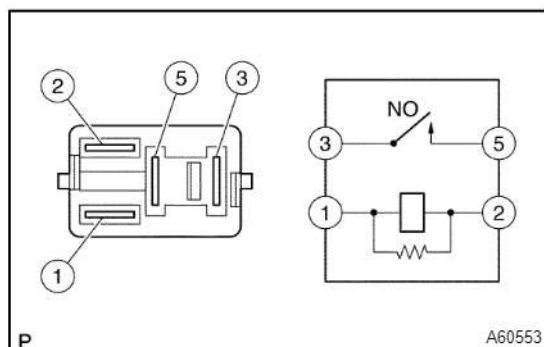


- (d) Perform the operation test without load.
- (1) Connect the field coil lead wire to terminal C.
- Torque:**
- 1.6kw 10 N·m (102 kgf·cm, 89 ft·lbf)**
- 2.0 kw 5.9 N·m (60 kgf·cm, 52 in·lbf)**
- (2) Hold the starter with a vise.
 - (3) Connect the battery and ammeter to the starter as shown.
 - (4) Check that the ammeter indicates the specified current.

Specified current:

1.6kw 90 A or less at 11.5 V

2.0kw 100 A or less at 11.5 V



2. INSPECT STARTER RELAY ASSY

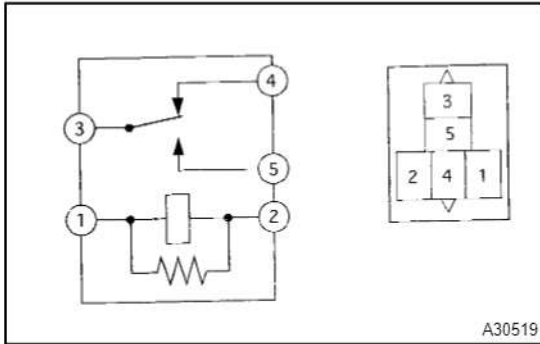
- (a) Continuity inspection.
- (1) Using an ohmmeter, check for continuity between each terminal.

Specified condition:

Between terminals	Specified condition
1 - 2	Continuity
3 - 5	No continuity

- (2) Using an ohmmeter, check for continuity between terminals 3 and 5 when the voltage is applied across terminals 1 and 2.

Specified condition: Continuity



3. INSPECT ACC RELAY

- (a) Continuity inspection.

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

Specified condition:

Between terminals	Specified condition
1 - 2	Continuity
3 - 4	
3 - 5	No continuity

- (2) Using an ohmmeter, check for continuity between terminals 3 and 5 when the between voltage is applied across terminals 1 and 2.

Specified condition: Continuity

STARTER ASSY (1GR-FE (FR))

190KT-02

REPLACEMENT

1. REMOVE ENGINE UNDER COVER ASSY REAR

- (a) Remove the 4 bolts and engine under cover assy rear.

2. REMOVE MANIFOLD STAY NO.2

- (a) Remove the 3 bolts and manifold stay No. 2.

3. DISCONNECT WIRE HARNESS

- (a) Remove the bolt and disconnect the wire harness from the cylinder block.

4. REMOVE STARTER ASSY

- (a) Disconnect the terminal 50 connector from the starter assy.
- (b) Remove the nut and disconnect the wire harness from the terminal 30.
- (c) Remove the 2 bolts and starter assy.

5. INSTALL STARTER ASSY

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

- (c) Connect the terminal 50 to the starter assy.

6. CONNECT WIRE HARNESS

- (a) Connect the wire harness to the cylinder block and install the bolt.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)

7. INSTALL MANIFOLD STAY NO.2

- (a) Install the manifold stay No. 2 with the 3 bolts.
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)

8. INSTALL ENGINE UNDER COVER ASSY REAR

- (a) Install the engine under cover assy rear with the 4 bolts.
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)

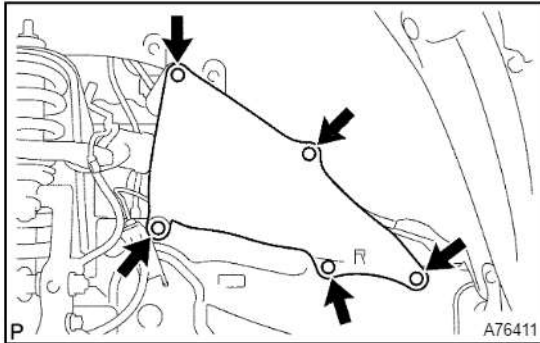
STARTER ASSY (1GR-FE (4WD))

REPLACEMENT

1. REMOVE ENGINE UNDER COVER ASSY REAR

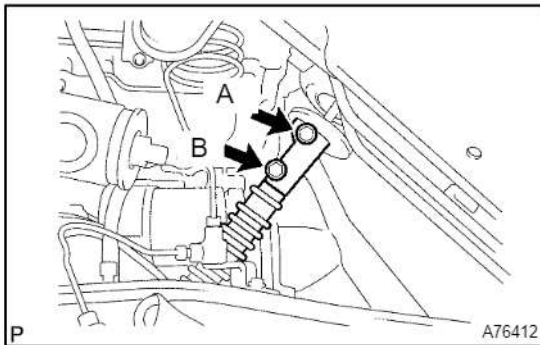
- (a) Remove the 4 bolts and engine under cover assy rear.

2. REMOVE EXHAUST FRONT PIPE ASSY NO.2 (See page 15-2)



3. REMOVE FRONT FENDER SPLASH SHIELD REAR LH

- (a) Remove the 5 clips and front fender splash shield rear LH.



4. SEPARATE STEERING INTERMEDIATE SHAFT SUB-ASSY NO.2

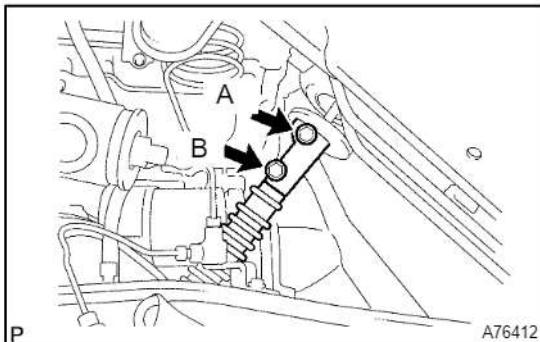
- (a) Loosen the bolt A and remove the bolt B, then separate the steering intermediate shaft No. 2.

5. REMOVE STARTER ASSY

- (a) Disconnect the terminal 50 connector from the starter assy.
 (b) Remove the nut and disconnect the wire harness from the terminal 30.
 (c) Remove the 2 bolts and starter assy.

6. INSTALL STARTER ASSY

- (a) Install the starter assy with the 2 bolts.
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)
 (b) Connect the wire harness to the terminal 30 and install the nut.
Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)
 (c) Connect the terminal 50 to the starter assy.



7. INSTALL STEERING INTERMEDIATE SHAFT SUB-ASSY NO.2

- (a) Install the steering sliding yoke to steering intermediate shaft No. 2.
 (b) Install the bolt B and tighten the bolt B and A.
Torque: 36 N·m (370 kgf·cm, 27 ft·lbf) for bolt A, B

8. INSTALL FRONT FENDER SPLASH SHIELD REAR LH

- (a) Install the front fender splash shield rear LH with the 5 clips.

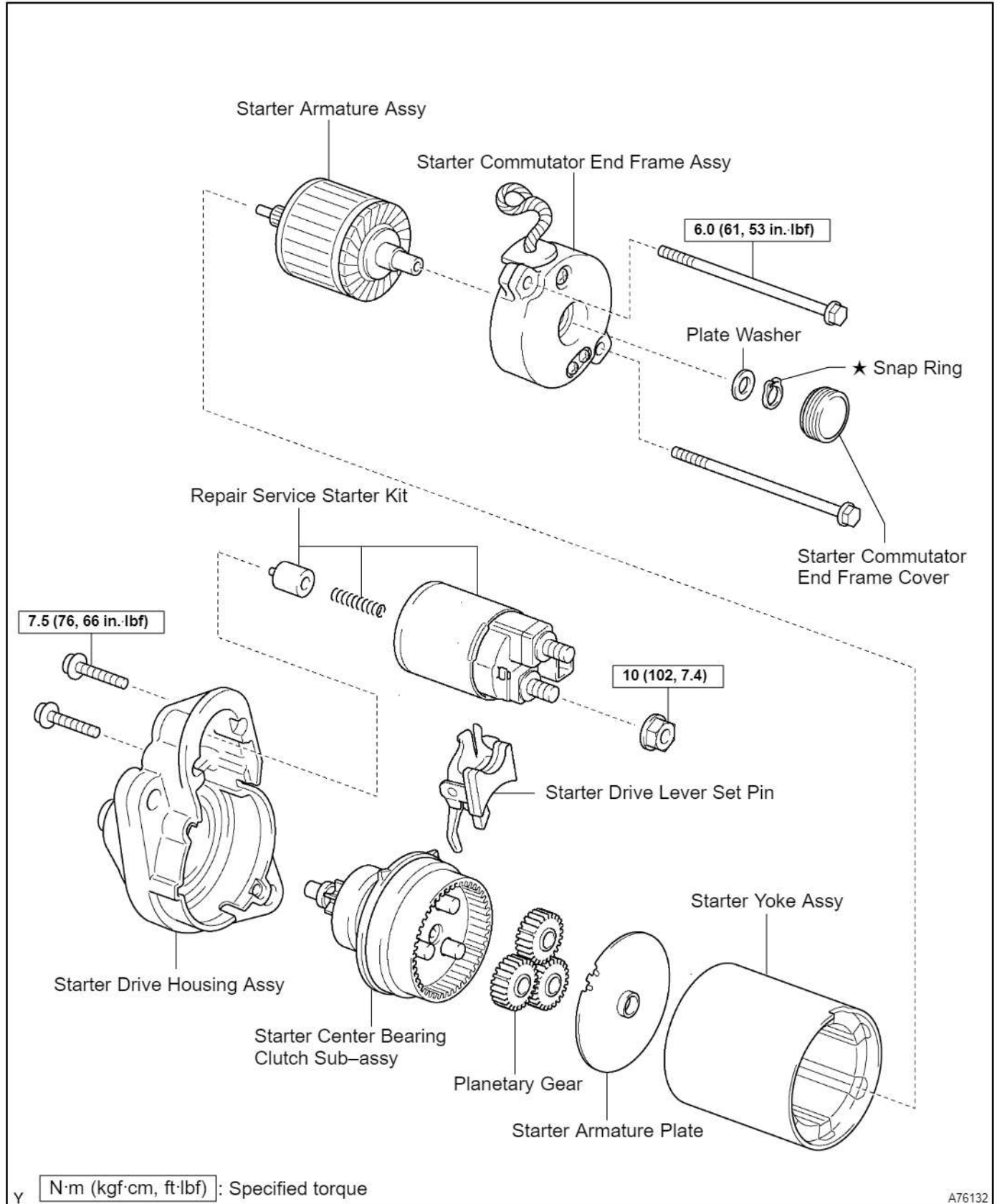
9. INSTALL EXHAUST FRONT PIPE ASSY NO.2 (See page 15-2)**10. INSTALL ENGINE UNDER COVER ASSY REAR**

- (a) Install the engine under cover assy rear with the 4 bolts.

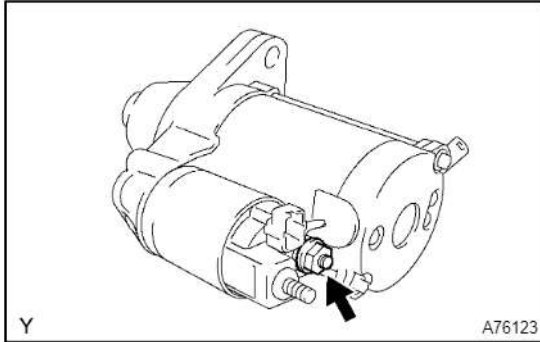
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)

STARTER ASSY(1.6KW) (1GR-FE) COMPONENTS

190KP-02

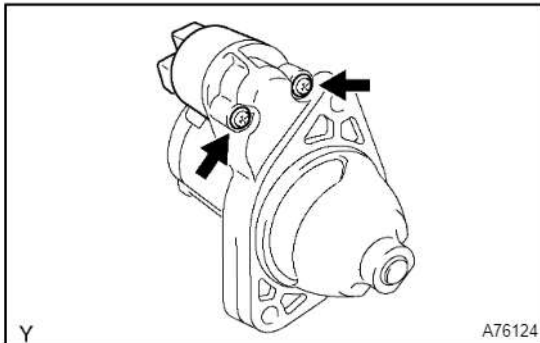


OVERHAUL

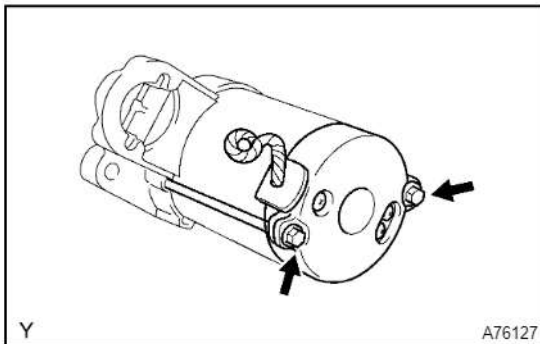


1. REMOVE REPAIR SERVICE STARTER KIT

- (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 starter drive housing.
- (c) Remove the repair service starter kit.
- (d) Remove the return spring and plunger.



2. REMOVE STARTER YOKE ASSY

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

3. REMOVE STARTER COMMUTATOR END FRAME ASSY

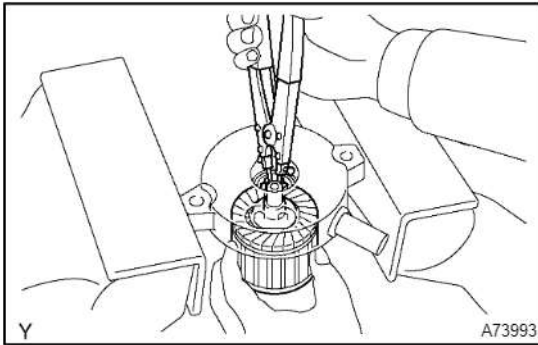
- (a) Remove the commutator end frame assy from the starter yoke assy.

4. REMOVE STARTER ARMATURE PLATE

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

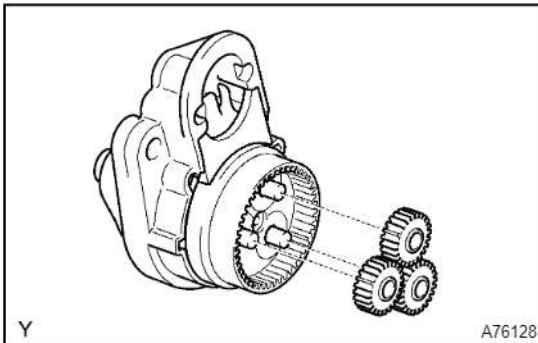
5. REMOVE STARTER COMMUTATOR END FRAME COVER

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



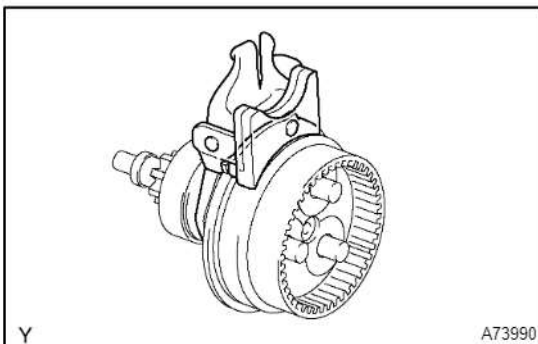
6. REMOVE STARTER ARMATURE ASSY

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



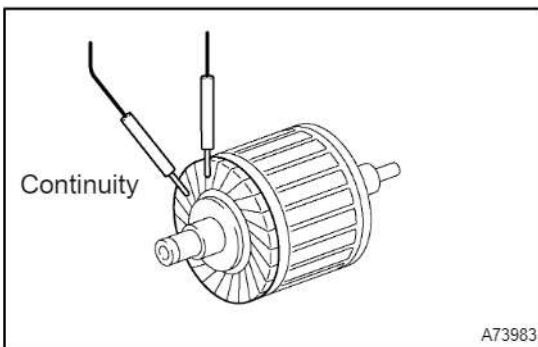
7. REMOVE PLANETARY GEAR

- (a) Remove the 3 planetary gears.



8. REMOVE STARTER CENTER BEARING CLUTCH SUB-ASSY

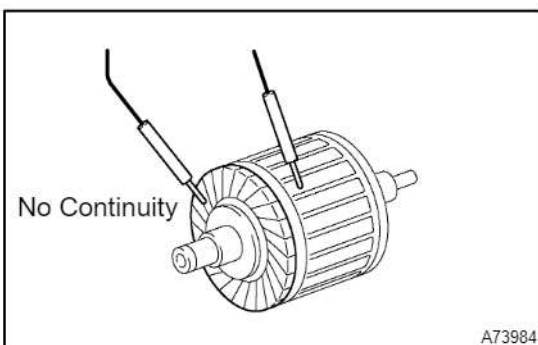
- (a) Remove the starter center bearing clutch and drive lever set pin together from the starter drive housing.
- (b) Remove the drive lever set pin from the starter center bearing clutch.



9. 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.

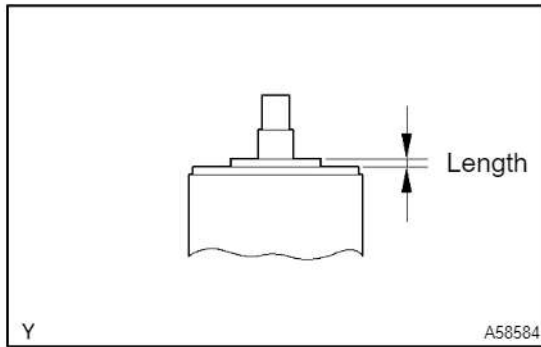
If there is no continuity between any segments, replace the armature.



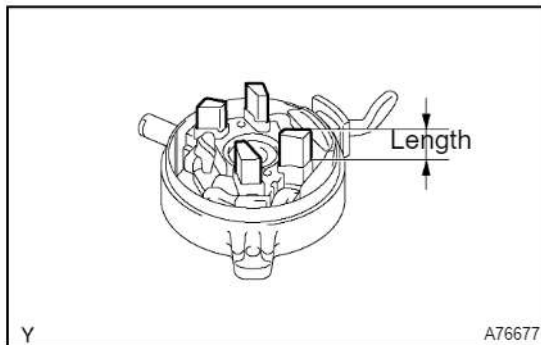
- (b) Check the commutator for ground.
 - (1) Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

- (c) Check the commutator for dirty and burn on surface. If the surface is dirty or burnt, correct it with sandpaper (No.400) or a lathe.

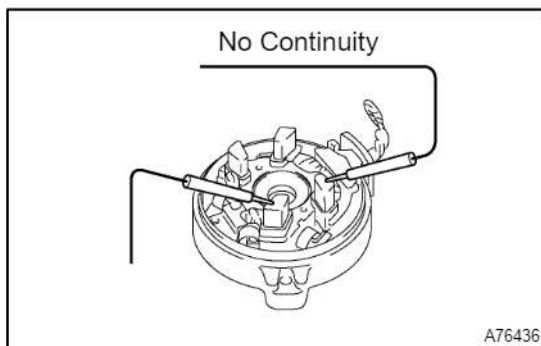


- (d) Using vernier calipers, measure the commutator length.
Standard length: 3.1 mm (0.122 in.)
Maximum length: 3.8 mm (0.150 in.)
 If the length is greater than maximum, replace the armature.



10. INSPECT STARTER COMMUTATOR END FRAME ASSY

- (a) Using vernier calipers, measure the brush holder length.
Standard length: 9.0 mm (0.354 in.)
Maximum length: 4.0 mm (0.158 in.)
 If the length is less than minimum, replace the starter commutator end frame assy.



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

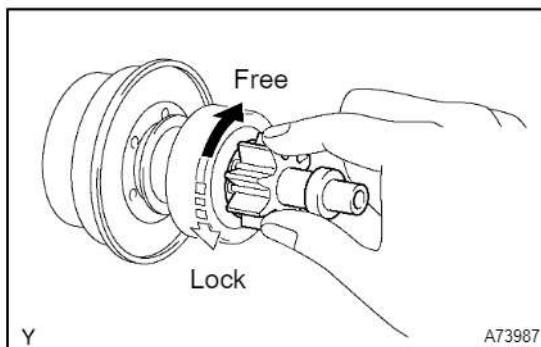
If there is continuity, repair or replace the starter commutator end frame assy.

11. INSPECT STARTER CENTER BEARING CLUTCH SUB-ASSY

- (a) Inspect the gear teeth of the planetary gear, and the starter center bearing clutch for wear or damage.

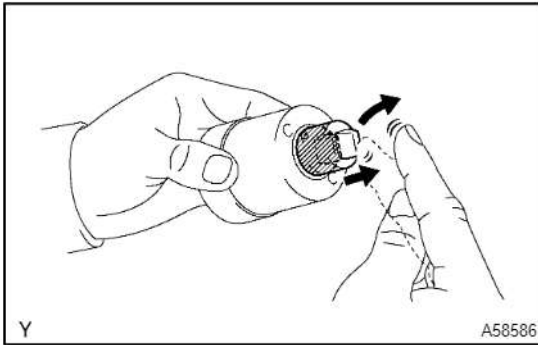
If any one of the planetary gear is damaged, replace the planetary gear assembly.

If any one of the gears of the starter center bearing clutch is damaged, replace the clutch.



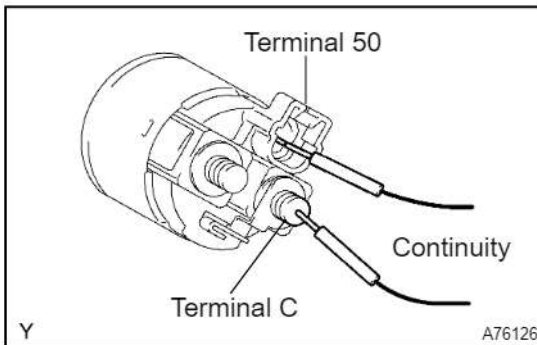
- (b) Check the clutch pinion gear.
 (1) Rotate the clutch pinion gear clockwise and check that it turns freely.
 (2) Try to rotate the clutch pinion gear counterclockwise and check that it locks.

If necessary, replace the center bearing clutch sub-assy.

**12. INSPECT REPAIR SERVICE STARTER KIT**

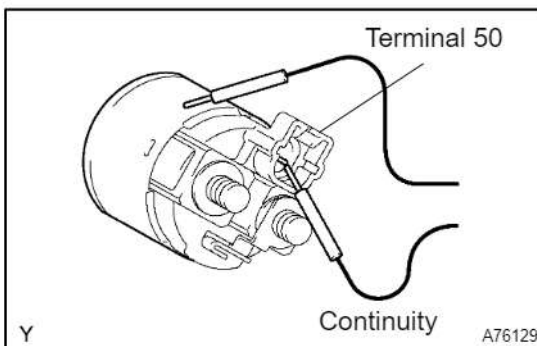
- (a) Check the plunger.
- (1) Push in the plunger and check that it returns quickly to its original position.

If necessary, replace the repair service starter kit.



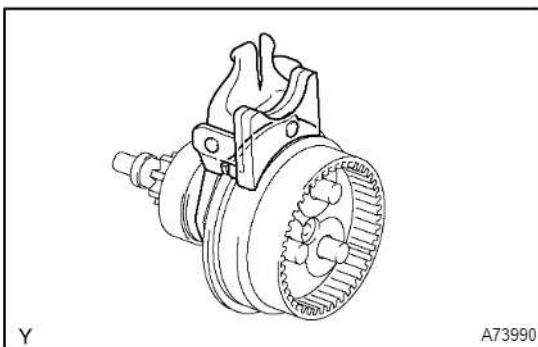
- (b) Check the pull-in coil for open circuit.
- (1) Using an ohmmeter, check that there is continuity between terminal 50 and C.

If there is no continuity, replace the repair service starter kit.

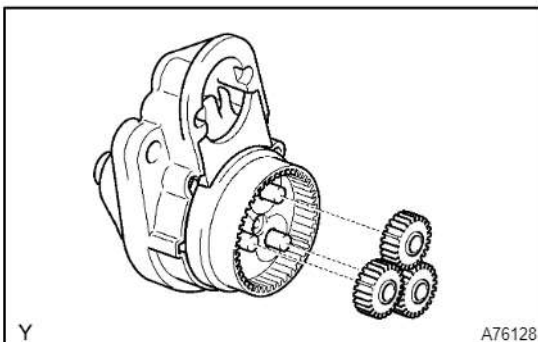


- (c) Check whether or not the hold-in coil has an open circuit.
- (1) Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

If there is no continuity, replace the repair service starter kit.

**13. INSTALL STARTER CENTER BEARING CLUTCH SUB-ASSY**

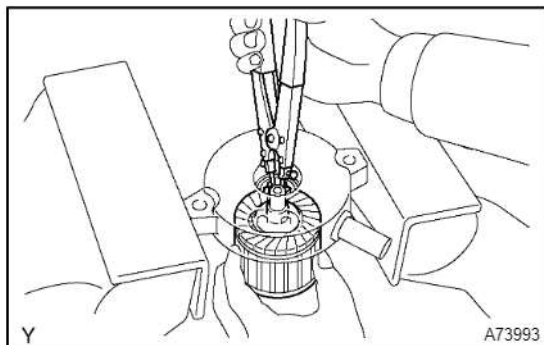
- (a) Install the drive lever set pin to the starter center bearing clutch.
- (b) Install the starter center bearing clutch and drive lever set pin together to the starter drive housing.

**14. INSTALL PLANETARY GEAR**

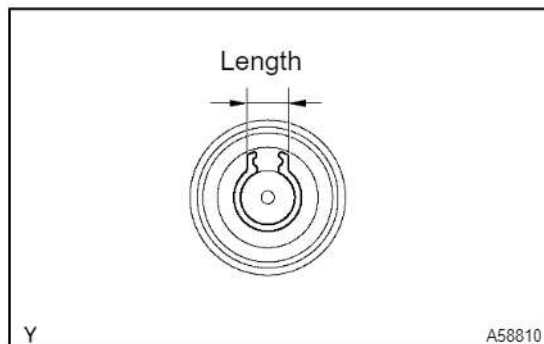
- (a) Apply grease to the planetary gears and pin parts of the planetary shaft.
- (b) Install the 3 planetary gears.

15. INSTALL STARTER ARMATURE ASSY

- (a) Apply grease to the plate washer and armature shaft.
- (b) Install the armature shaft to the starter commutator end frame assy.



- (c) Using snap ring pliers, install the plate washer and new snap ring.



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

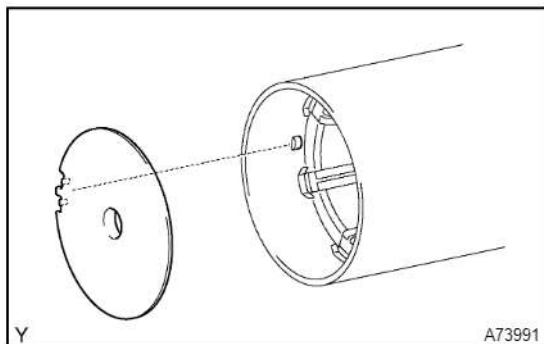
Maximum length: 5.0 mm (0.197 in.)

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

16. INSTALL STARTER COMMUTATOR END FRAME COVER

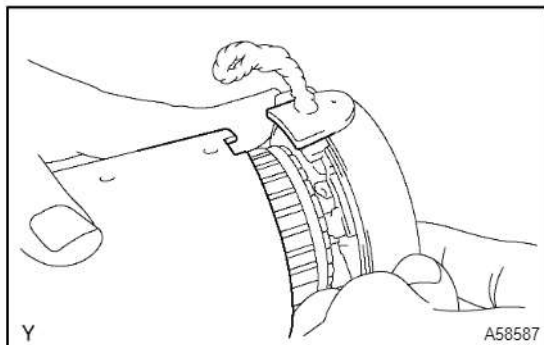
17. INSTALL STARTER ARMATURE PLATE

- (a) Insert the starter armature plate to the starter yoke assy.

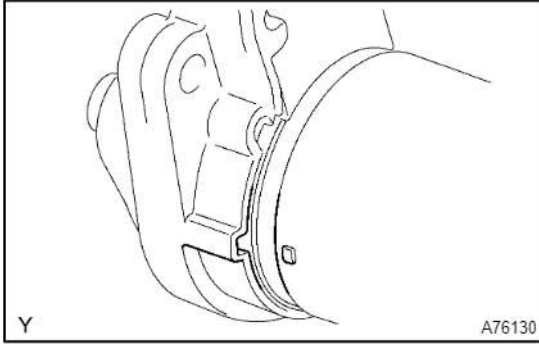


- (b) Align the keyway of the plate with the key inside the starter yoke, and install the plate.

18. INSTALL STARTER COMMUTATOR END FRAME ASSY

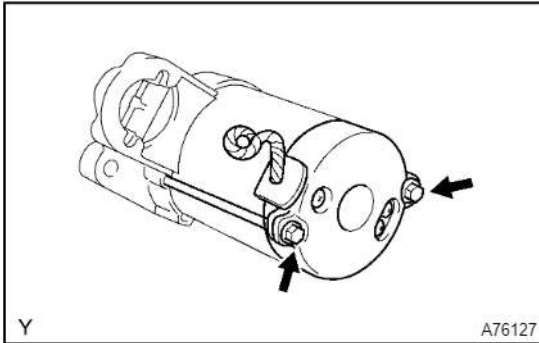


- (a) Align the starter-commutator-rubber-end frame with the convex cutout of starter yoke.
 (b) Install starter-commutator-end-frame to starter yoke assy.



19. INSTALL STARTER YOKE ASSY

- (a) Align the key of the starter yoke assy with the keyway of starter drive housing.

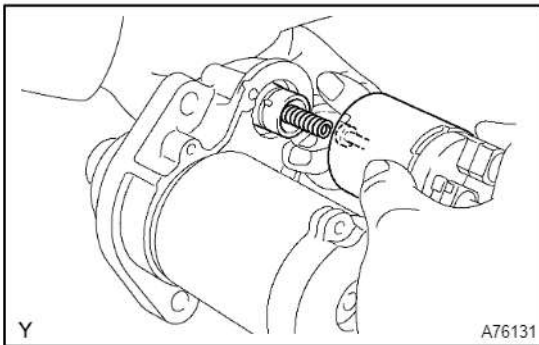


- (b) Install the starter yoke assy with the 2 through bolts.

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

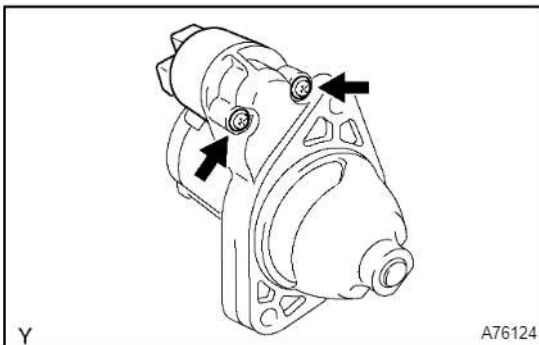
20. INSTALL REPAIR SERVICE STARTER KIT

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



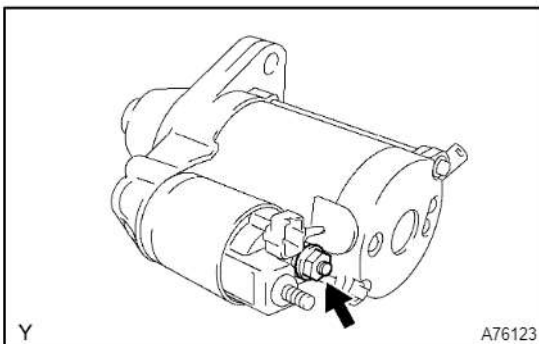
- (b) Hang the plunger hook of the repair service starter kit to the drive lever.

- (c) Install the plunger and return spring.



- (d) Install the repair service starter kit with the 2 screws.

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



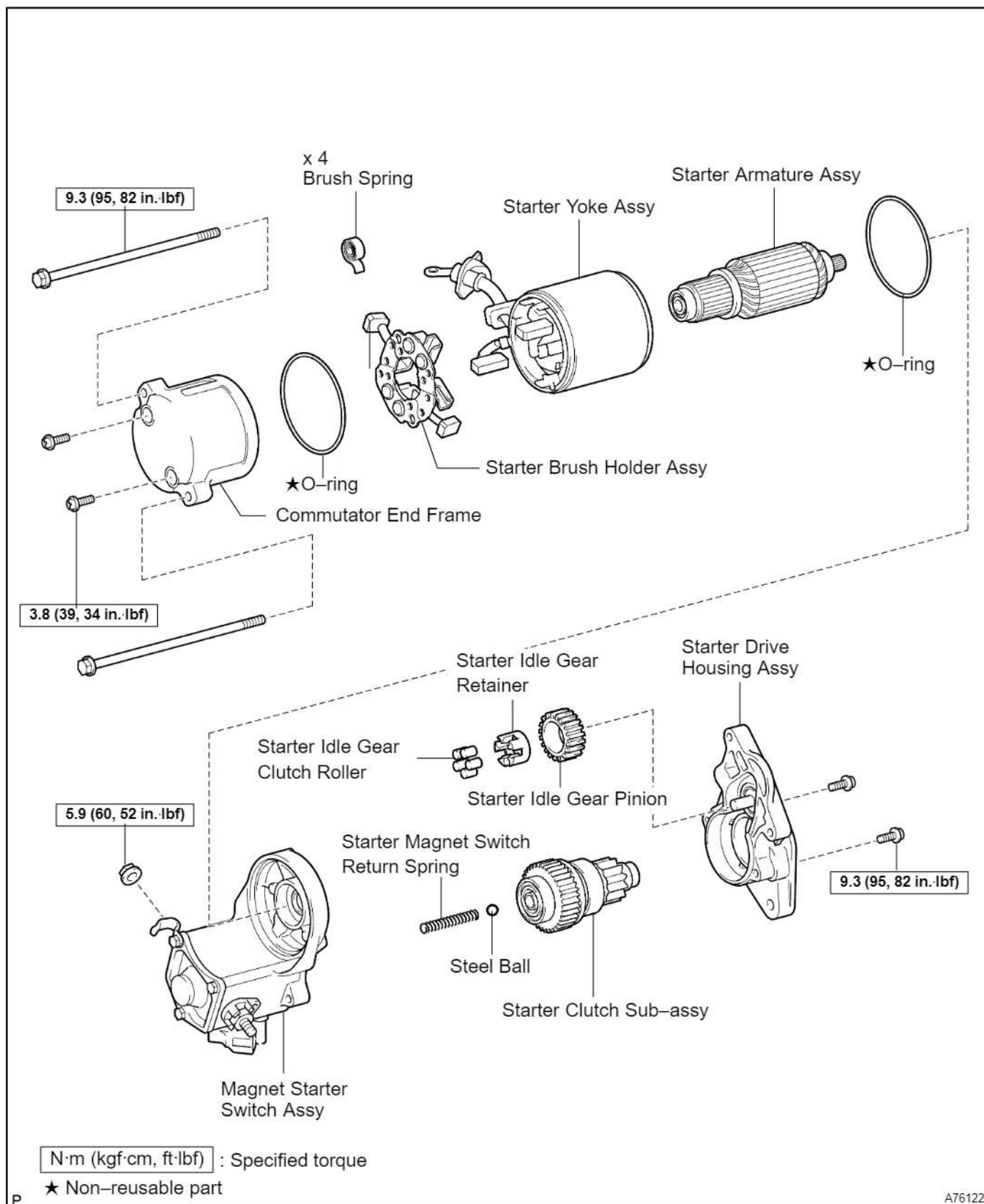
- (e) Connect the lead wire to the terminal with the nut.

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

STARTER ASSY(2.0KW) (1GR-FE)

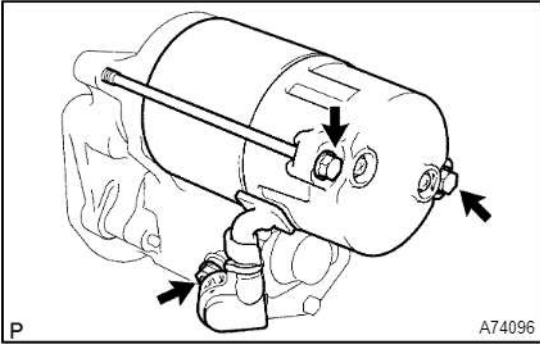
COMPONENTS

190KR-02



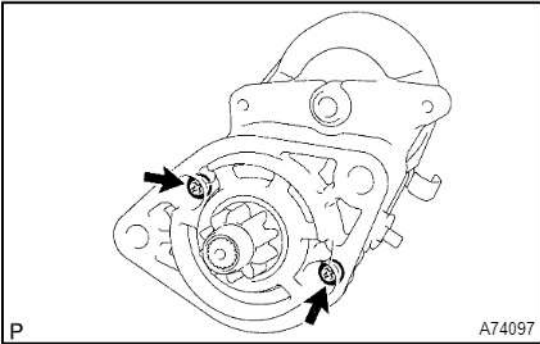
cardiagn.com

OVERHAUL



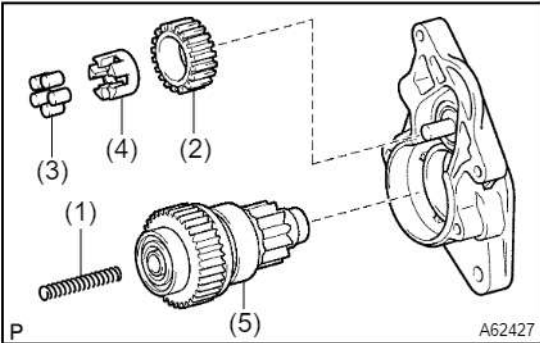
1. REMOVE STARTER YOKE ASSY

- (a) Remove the nut, and disconnect the lead wire from the C terminal.
- (b) Remove the 2 through bolts.
- (c) Pull out the starter yoke and the armature together.
- (d) Remove the O-ring from the starter yoke.



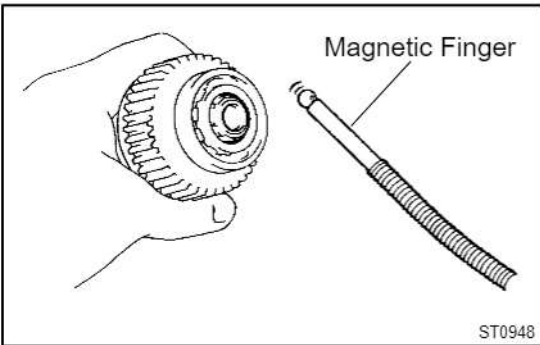
2. REMOVE MAGNET STARTER SWITCH ASSY

- (a) Remove the 2 screws and magnet starter switch.



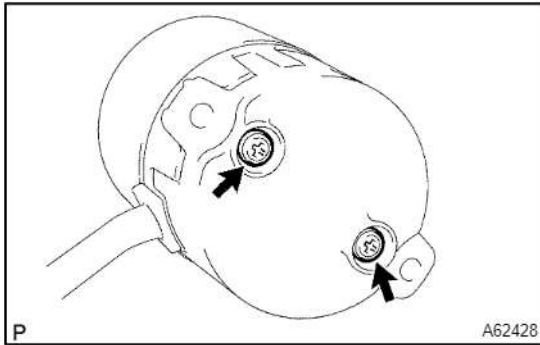
- (b) Remove these parts from the starter drive housing.

(1)	Starter magnet switch return spring
(2)	Starter idle gear pinion
(3)	Starter idle gear clutch roller
(4)	Starter idle gear retainer
(5)	Starter clutch

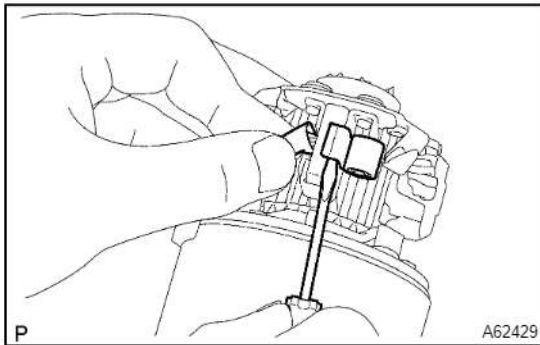


- (c) Using a magnetic finger, remove the steel ball from the clutch shaft hole.

3. REMOVE STARTER BRUSH HOLDER ASSY

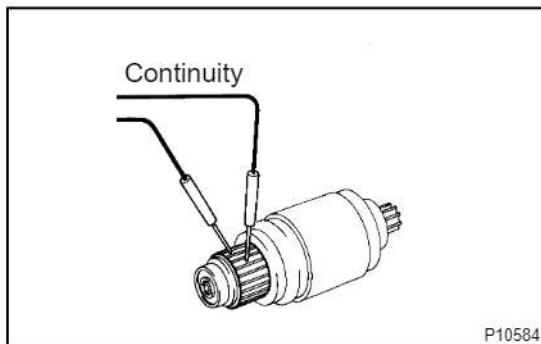


- (a) Remove the 2 screws and end cover from the starter yoke.
- (b) Remove the O-ring from the starter yoke.



- (c) Using a screwdriver, hold the spring back and disconnect the 4 brushes from the brush holder.
- (d) Remove the brush holder from the armature.

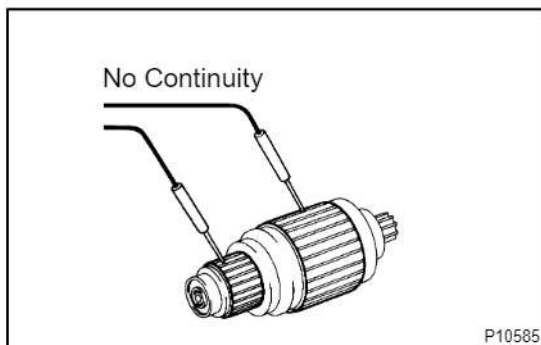
4. REMOVE STARTER ARMATURE ASSY



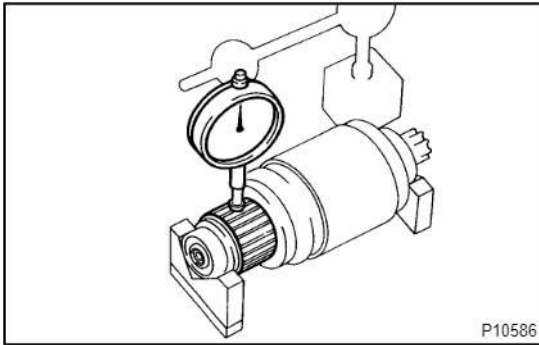
5. INSPECT STARTER ARMATURE ASSY

- (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 segment, replace the armature.



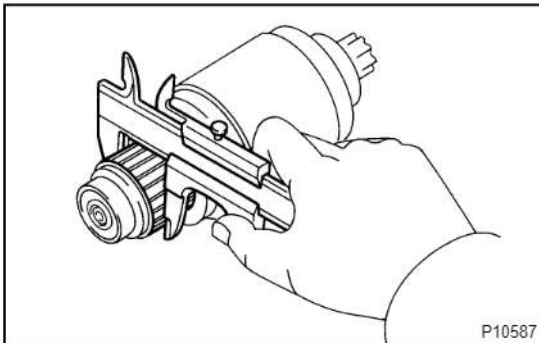
- (b) Check the commutator for ground.
 - (1) Using an ohmmeter, check that there is no continuity between the commutator and armature coil core. If there is continuity, replace the armature.
- (c) Check the commutator for dirty and burn on surface. If the surface is dirty or burnt, correct it with sandpaper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



- (d) Check for the commutator runout.
 (1) Place the commutator on V-blocks.
 (2) Using a dial gauge, measure the runout.

Maximum runout: 0.05 mm (0.0020 in.)

If the runout is greater than maximum, correct it on a lathe.

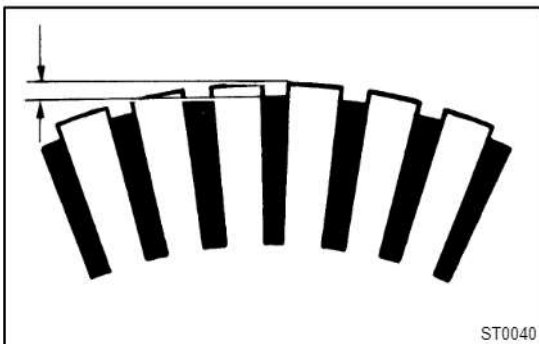


- (e) Using vernier calipers, measure the commutator diameter.

Standard diameter: 35.0 mm (1.378 in.)

Minimum diameter: 34.0 mm (1.339 in.)

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

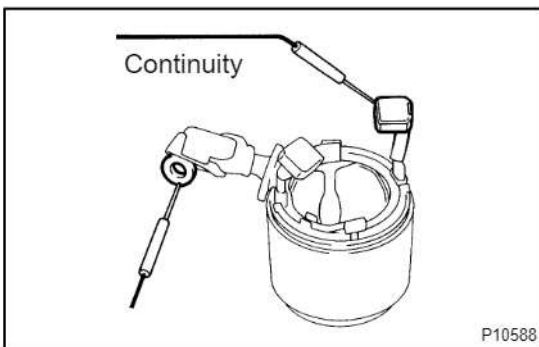


- (f) Check that the undercut depth is clean and free of foreign objects. Smooth out the edge.

Standard undercut depth: 0.7 mm (0.028 in.)

Minimum undercut depth: 0.2 mm (0.008 in.)

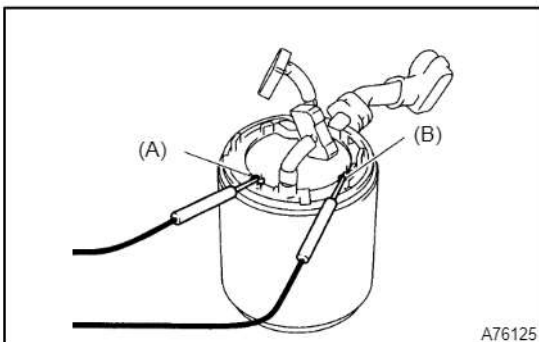
If the undercut depth is less than minimum, correct it with a hacksaw blade.



6. INSPECT STARTER YOKE ASSY

- (a) Check the starter yoke for open circuit.
 (1) Using an ohmmeter, check that there is continuity between the lead wire and brushes.

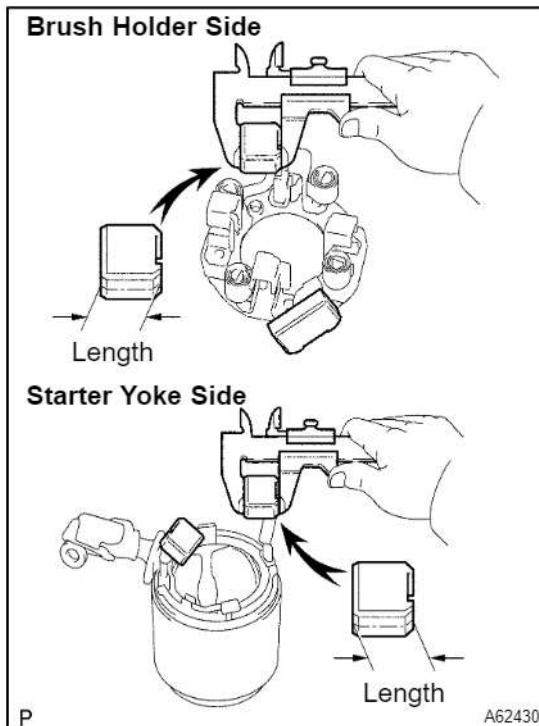
If there is no continuity, replace the starter yoke.



- (b) Check the shunt coil for open circuit.
 (1) Using an ohmmeter, measure the resistance between shunt coil terminals (A) and (B).

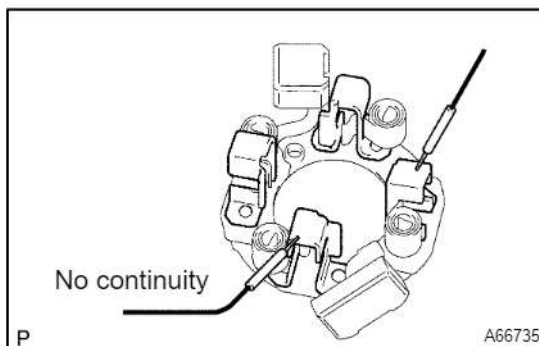
Resistance: 1.5 – 1.9 Ω at 20°C (68°F)

If the resistance is not as specified, replace the starter yoke.



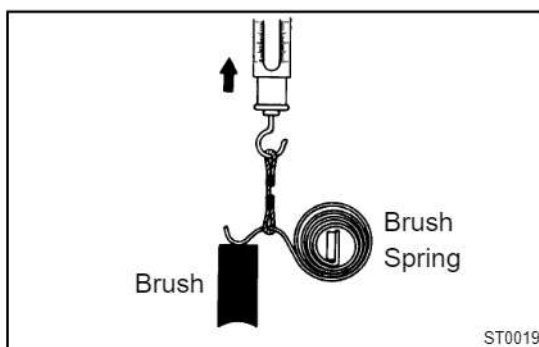
7. INSPECT BRUSH

- (a) Check the brushes length
- (1) Using vernier calipers, measure the brush length.
Standard length: 15.0 mm (0.591 in.)
Minimum length: 9.0 mm (0.354 in.)
- If the length is less than minimum, replace the brush holder and starter yoke.

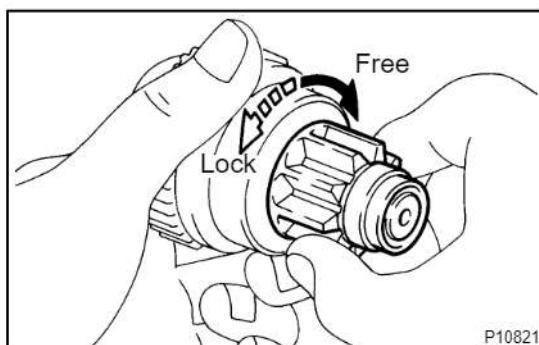


8. INSPECT STARTER BRUSH HOLDER ASSY

- (a) Check the brush holder insulation
- (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 brush holder.

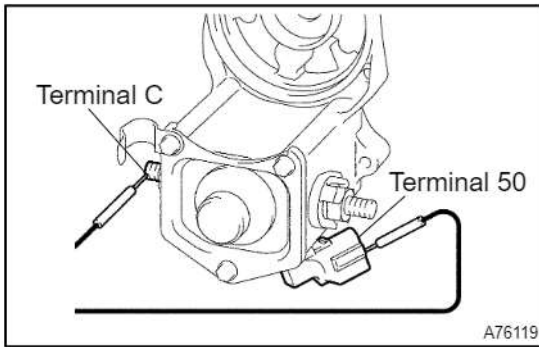


- (b) Check the brush spring load.
- (1) Take a pull scale reading at the instant the brush spring separates from the brush.
- Standard spring load:**
21.5 – 27.5 N (2.2 – 2.8 kgf, 4.8 – 6.2 lbf)
Minimum spring load: 12.7 N (1.3 kgf, 2.9 lbf)
- If the spring load is less than the minimum, replace the brush holder.



9. INSPECT STARTER CLUTCH SUB-ASSY

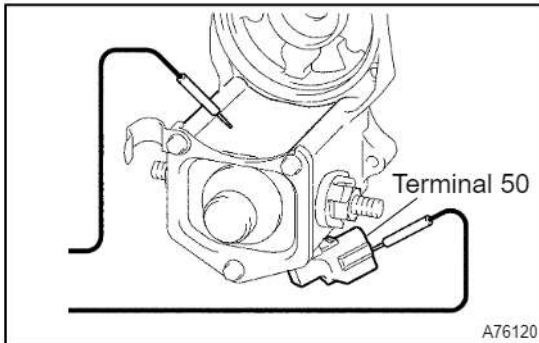
- (a) Check the clutch pinion gear.
- (1) Hold the starter clutch and rotate the pinion gear clockwise, and check that it turns freely.
- (2) Try to rotate the pinion gear counterclockwise and check that it locks.
- If necessary, replace the starter clutch.



10. INSPECT MAGNET STARTER SWITCH ASSY

- (a) 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 magnet starter switch.



- (b) Check the holding coil for open circuit.
 - (1) Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

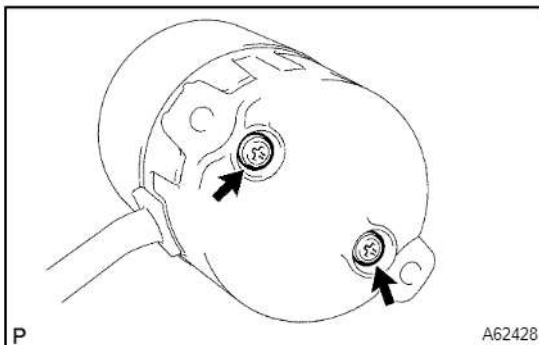
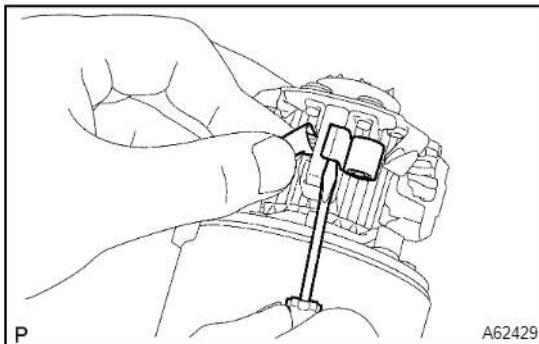
If there is no continuity, replace the magnet starter switch.

11. INSTALL STARTER ARMATURE ASSY

- (a) Apply grease to the bearings, and install it to the starter yoke.

12. INSTALL STARTER BRUSH HOLDER ASSY

- (a) Place the brush holder on the armature.
- (b) Using a screwdriver, install the 4 brushes.
- (c) Install a new O-ring to the groove of the field frame.

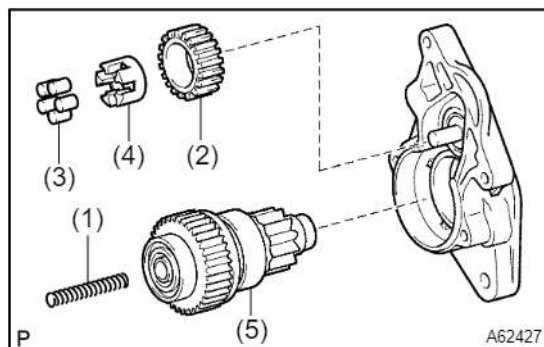


- (d) Install the end frame with the 2 screws.

Torque: 3.8 N·m (39 kgf·cm, 34 in.·lbf)

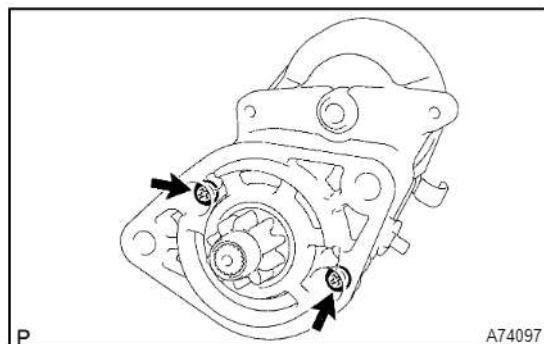
13. INSTALL MAGNET STARTER SWITCH ASSY

- (a) Apply grease to the steel ball, and install it to the clutch shaft hole.



- (b) Apply grease to the these parts (2) – (5), and install them to the starter drive housing.

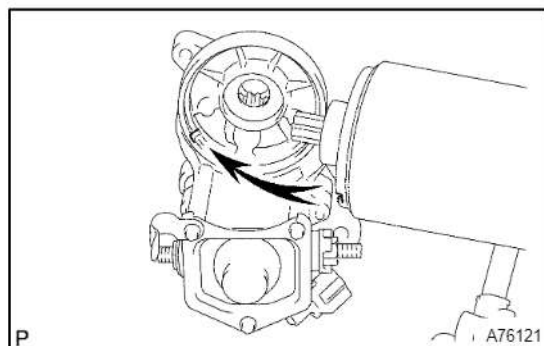
(1)	Starter magnet switch return spring
(2)	Starter idle gear pinion
(3)	Starter idle gear clutch roller
(4)	Starter idle gear retainer
(5)	Starter clutch



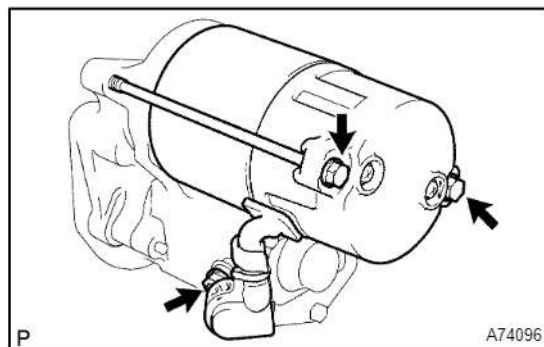
- (c) Install the magnet starter switch with the 2 screws.
Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

14. INSTALL STARTER YOKE ASSY

- (a) Install a new O-ring to the groove of the starter yoke.



- (b) Align the key of the starter yoke with the groove of the magnet starter switch.



- (c) Install the starter yoke and armature with the 2 through bolts.

Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

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

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

CHARGING SYSTEM (1GR-FE)

190KX-02

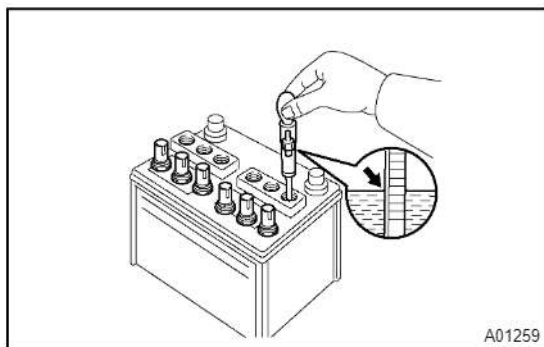
PRECAUTION

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 check whether the generator or not with connecting terminal **F** to the other terminal.

ON-VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

- (a) Check the electrolyte quantity of each cell (Maintenance-Free Battery).
 - (1) If under the lower level, replace the battery (or add distilled water if possible) and check the charging system.
- (b) Check the electrolyte quantity of each cell (Except Maintenance-Free Battery).
 - (1) If under the lower level, add distilled water.

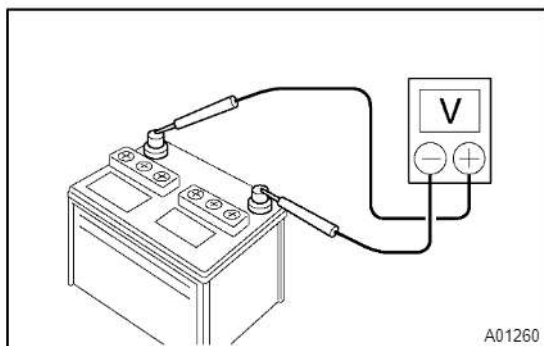


2. CHECK BATTERY SPECIFIC GRAVITY (Except Maintenance-Free Battery)

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

HINT:

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



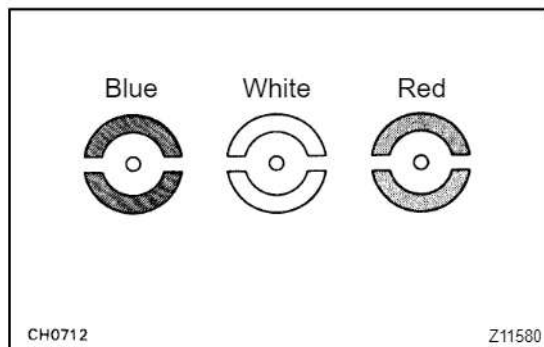
3. CHECK BATTERY VOLTAGE

- (a) After having driven the vehicle and in the case that 20 minutes have not passed after having stopped the engine, turn the ignition switch ON and turn on the electrical system (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
- (b) Turn the ignition switch OFF and turn off the electrical systems.
- (c) Measure the battery voltage between the negative (–) and positive (+) terminals of the battery.

Standard voltage: 12.5 – 12.9 V at 20 C (68 F)

HINT:

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



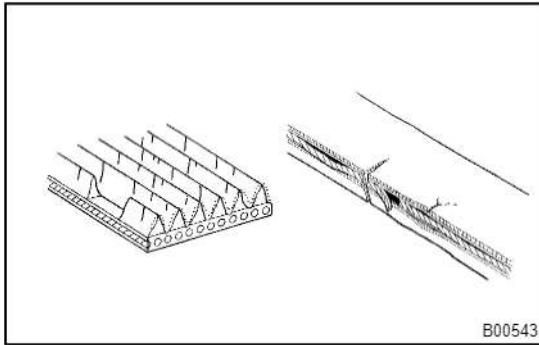
- (d) Check the indicator as shown in the illustration.

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 loose or corroded.
- (b) Check the fusible link, H-fuses and fuses for continuity.

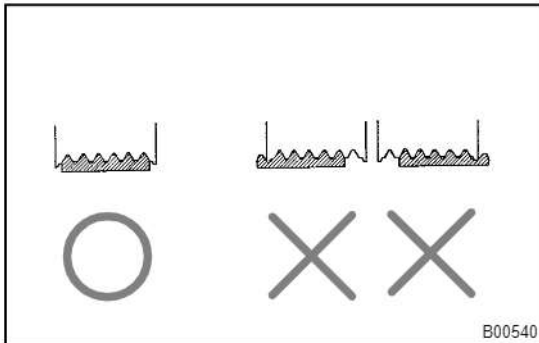


5. INSPECT DRIVE BELT

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

HINT:

- ★ If any defect has been 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

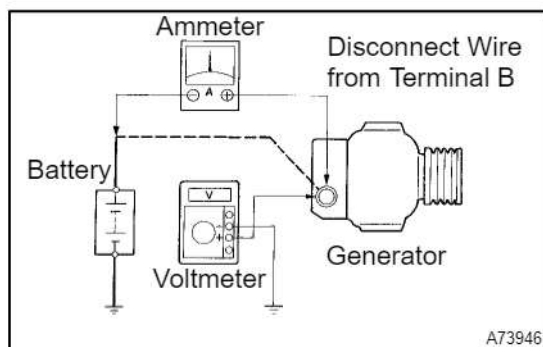
- (a) Turn the ignition switch ON. Check that the charge warning light comes on.
 (b) Start the engine. Check that the light goes off.

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/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) With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.2 – 14.8 V

HINT:

- ★ If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- ★ If the voltmeter reading is less than the standard voltage, check the voltage regulator and generator as follows:

10. INSPECT CHARGING CIRCUIT WITH LOAD

- (a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "HI".
- (b) Check the reading on the ammeter.

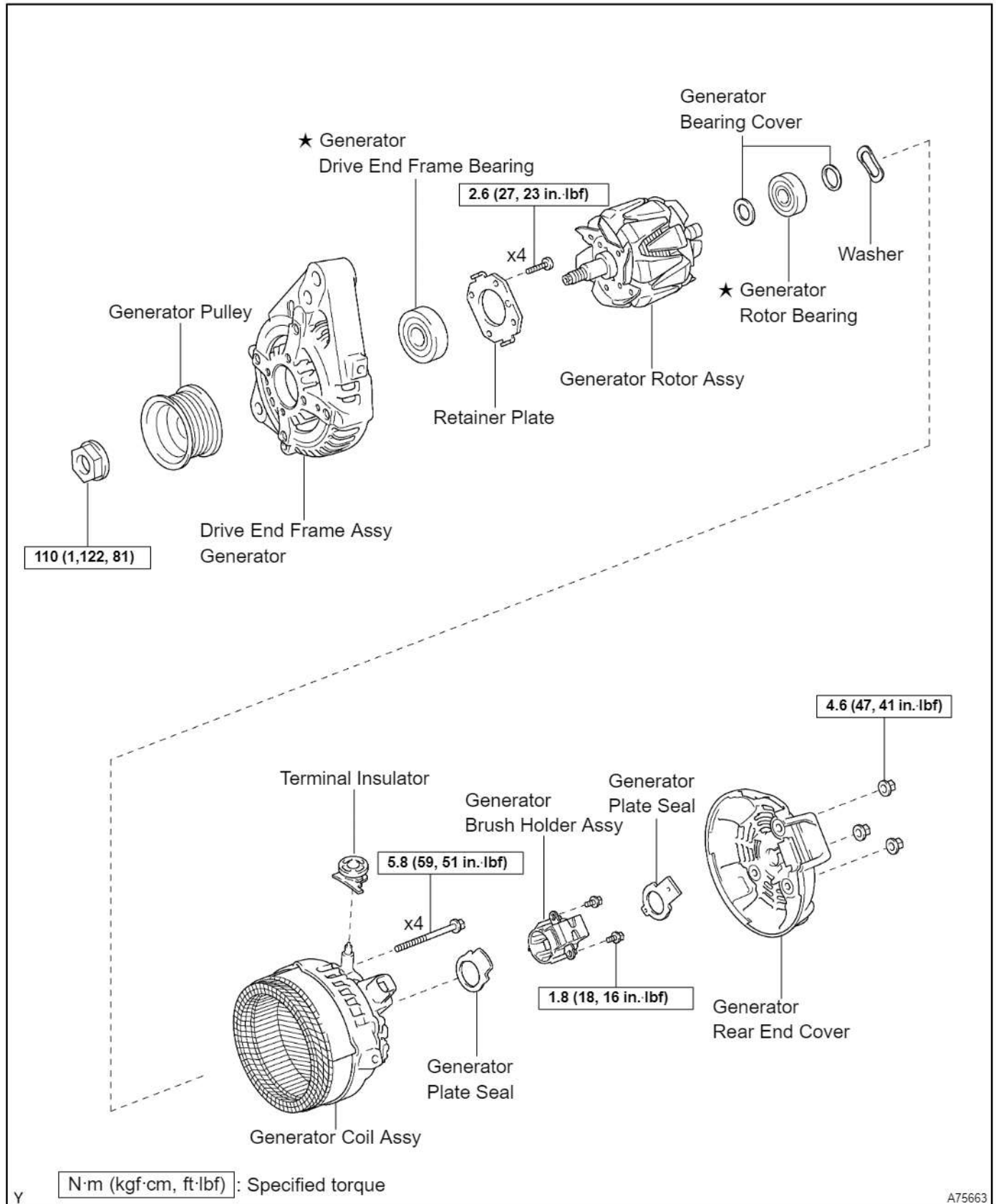
Standard amperage: 30 A or more

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.

GENERATOR ASSY (1GR-FE) COMPONENTS

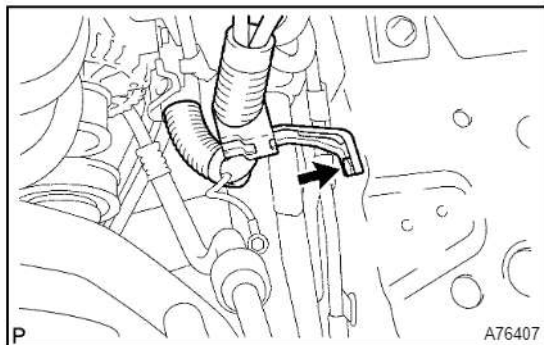
190KZ-03



cardiagn.com

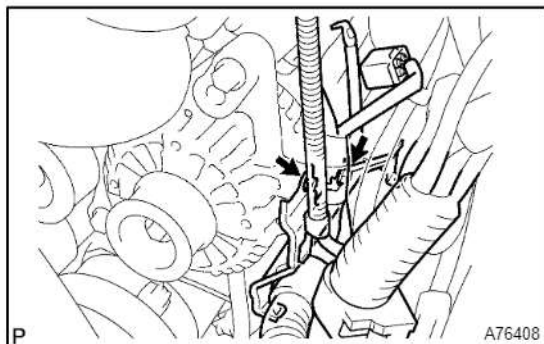
REPLACEMENT

1. REMOVE V-BANK COVER (See page 10-7) 
2. REMOVE ENGINE UNDER COVER SUB-ASSY NO.1
 - (a) Remove the 4 bolts and engine under cover sub-assy No.1.
3. REMOVE FAN AND GENERATOR V BELT (See page 14-5)
4. REMOVE BATTERY

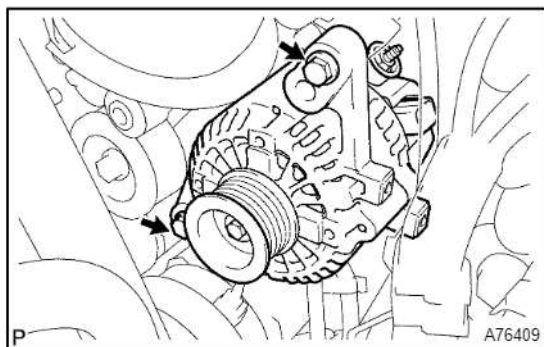


5. REMOVE GENERATOR ASSY

- (a) Disconnect the wire harness.
 - (1) Remove the bolt and wire harness stay.
 - (2) Disconnect the connector from the generator assy.
 - (3) Remove the terminal cap and nut.
 - (4) Disconnect the wire harness from the terminal B.



- (b) Remove the 2 bolts and wire harness clamp bracket from the generator assy.



- (c) Remove the 2 bolts and generator assy.

6. INSTALL GENERATOR ASSY

- (a) Install the generator assy with the 2 bolts.
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
- (b) Install the wire harness clamp bracket with the 2 bolts.
Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)
- (c) Connect the wire harness.
 - (1) Connect the wire harness to the terminal B and install the nut.
Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)
 - (2) Connect the connector to the generator assy.

(3) Install the wire harness stay with the bolt.

Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)

7. INSTALL BATTERY

8. INSTALL FAN AND GENERATOR V BELT (See page 14-5)

9. INSTALL ENGINE UNDER COVER SUB-ASSY NO.1

(a) Install the engine under cover sub-assy No. 1 with the 4 bolts.

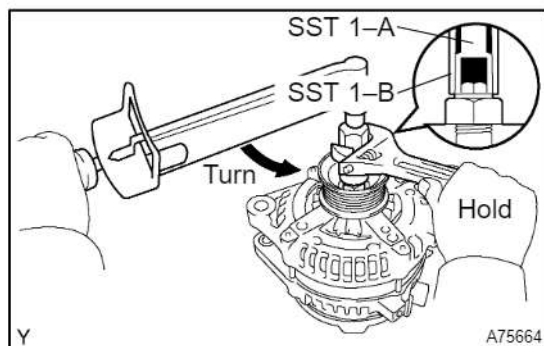
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)

10. INSTALL V-BANK COVER

(a) Install the V-bank cover with the 2 nuts.

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

OVERHAUL



1. REMOVE GENERATOR PULLEY

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

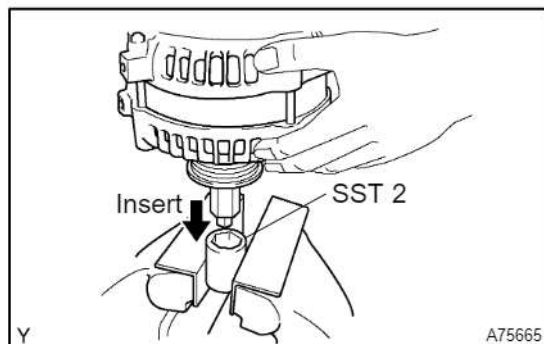
HINT:

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 with the specified torque.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**NOTICE:****Check that SST is secured to the rotor shaft.**

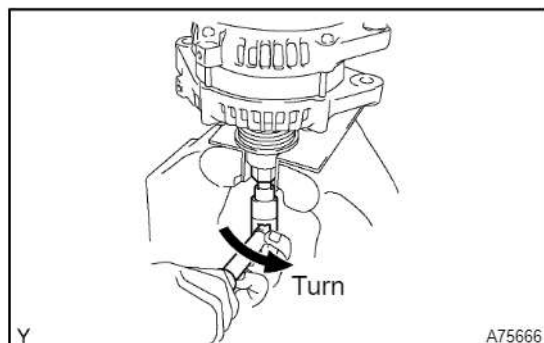
- (b) Mount SST 2 in a vise.
 (c) Insert SST 1-A and B into SST 2, and attach the pulley nut to SST 2.



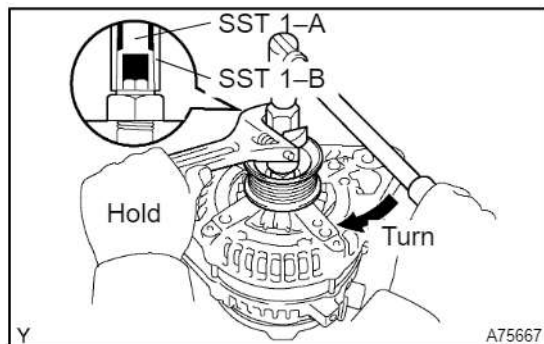
- (d) To loosen the pulley nut, turn SST 1-A in the direction shown in the illustration.

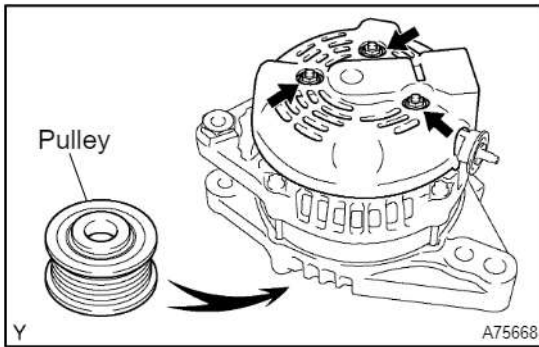
NOTICE:**To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half turn.**

- (e) Remove the generator from SST 2.



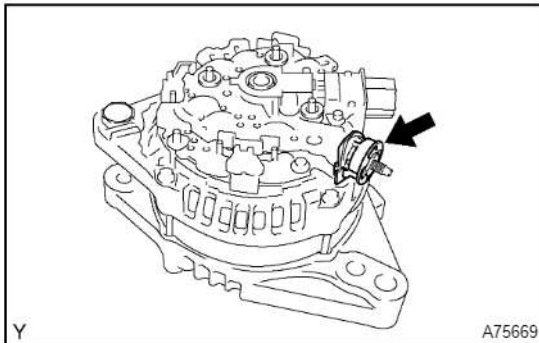
- (f) Turn SST 1-B, and remove SST 1-A and B.
 (g) Remove the pulley nut and pulley.



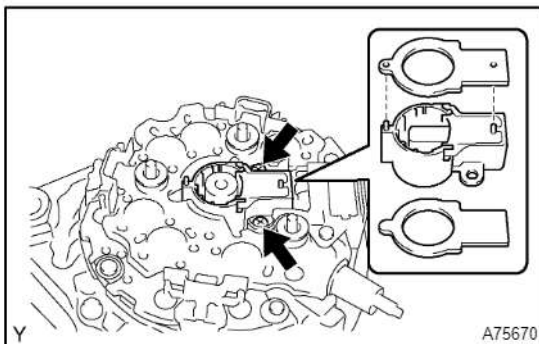


2. REMOVE GENERATOR REAR END COVER

- Place the generator on the pulley.
- Remove the 3 nuts and rear end cover.

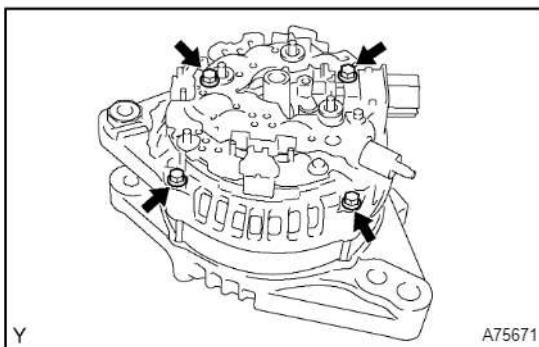


3. REMOVE TERMINAL INSULATOR



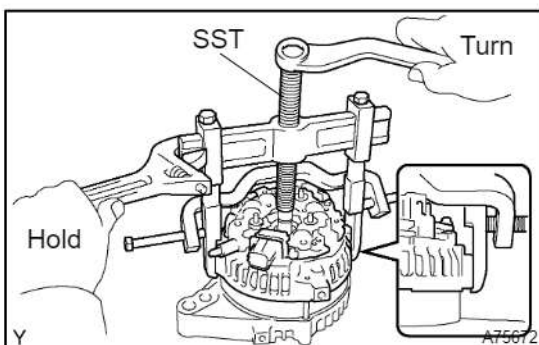
4. REMOVE GENERATOR BRUSH HOLDER ASSY

- Remove the plate seal.
- Remove the 2 nuts and brush holder.
- Remove the plate seal.

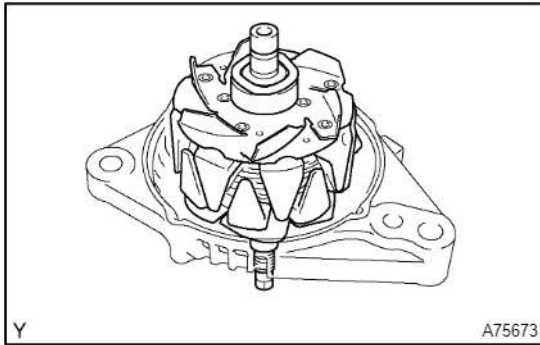


5. REMOVE GENERATOR COIL ASSY

- Remove the 4 bolts.

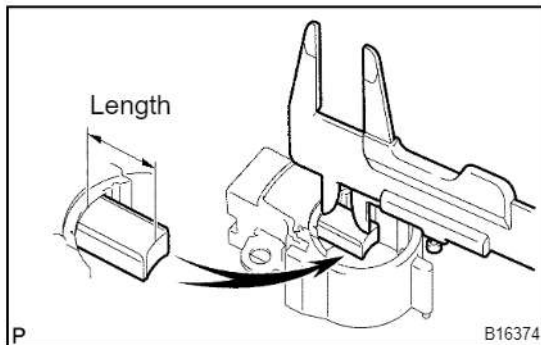


- Using SST, remove the coil.
SST 09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04071, 09957-04010, 09958-04011)



6. REMOVE GENERATOR ROTOR ASSY

- (a) Remove the washer and rotor.



7. INSPECT GENERATOR BRUSH HOLDER ASSY

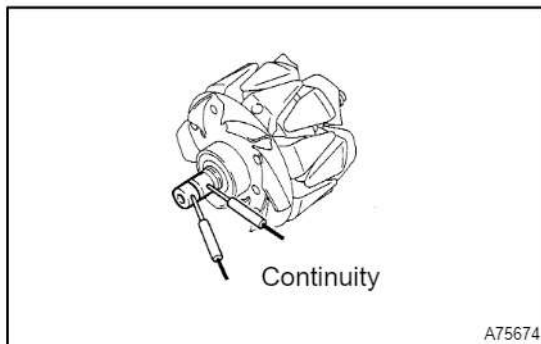
- (a) Using vernier calipers, measure the exposed brush length.

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 brush holder.



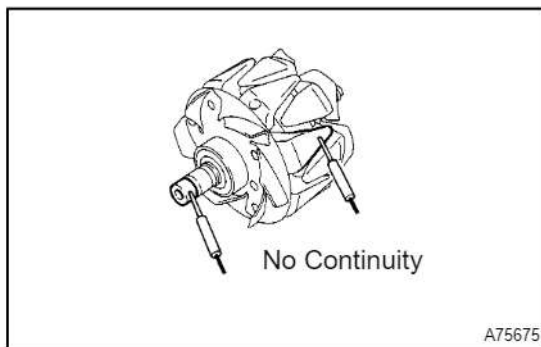
8. INSPECT GENERATOR ROTOR ASSY

- (a) Check the rotor open circuit.

- (1) Using an ohmmeter, measure the resistance between the slip ring.

Resistance: 2.3 – 2.7Ω at 20°C (68°F)

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



- (b) Check the rotor ground.

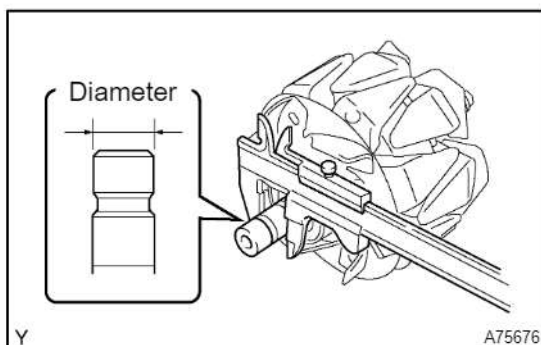
- (1) Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.

- (c) Inspect slip rings.

- (1) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.



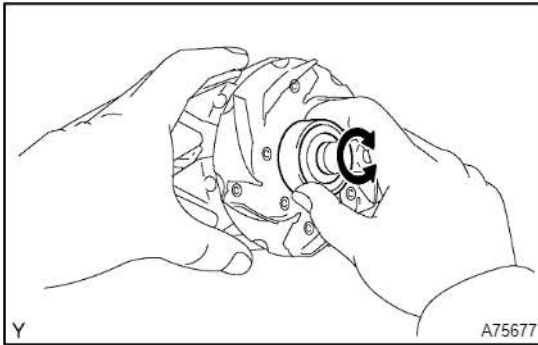
- (2) Using vernier calipers, measure the slip ring diameter.

Standard diameter:

14.2 – 14.4 mm (0.559 – 0.567 in.)

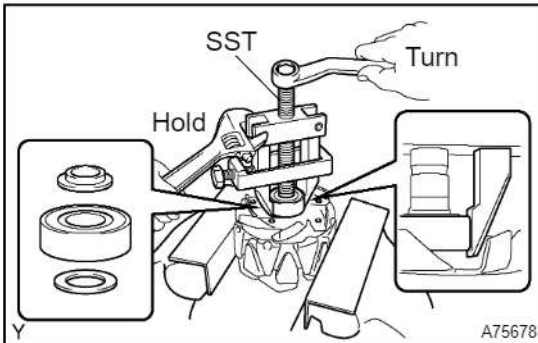
Minimum diameter: 14.0 mm (0.551 in.)

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



9. INSPECT GENERATOR ROTOR BEARING

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



10. REMOVE GENERATOR ROTOR BEARING

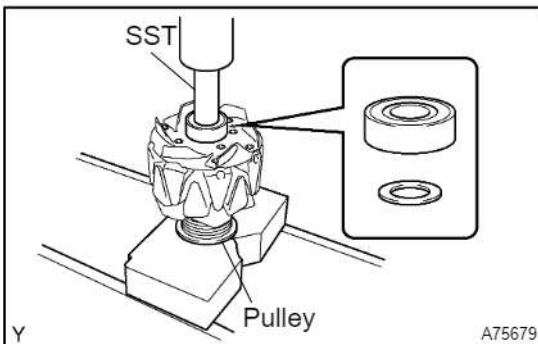
- (a) Using SST, remove the bearing cover (outside) and bearing.

SST 09820-00021

NOTICE:

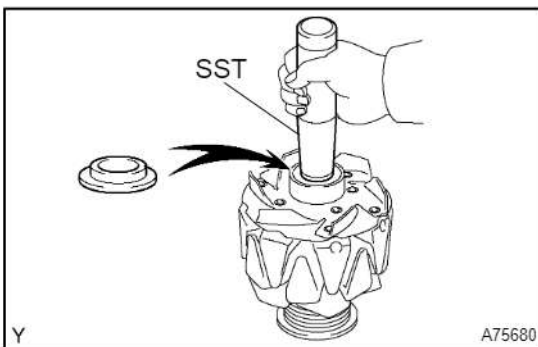
Be careful not to damage the fan.

- (b) Remove the bearing cover (Inside).

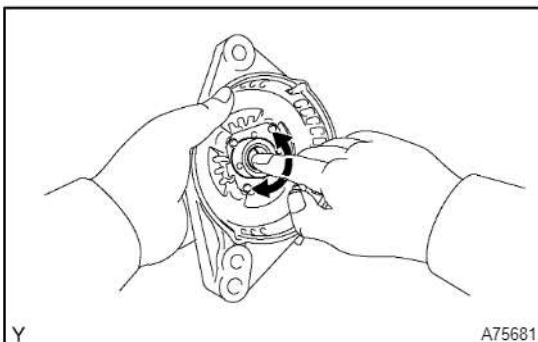


11. INSTALL GENERATOR ROTOR BEARING

- (a) Place the rotor on the pulley.
(b) Install the bearing cover (Inside).
(c) Using SST and a press, press in a new bearing.
SST 09820-00031

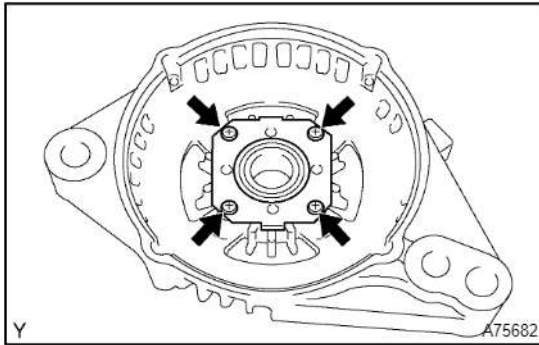


- (d) Using SST, push in the bearing cover (outside).
SST 09285-76010

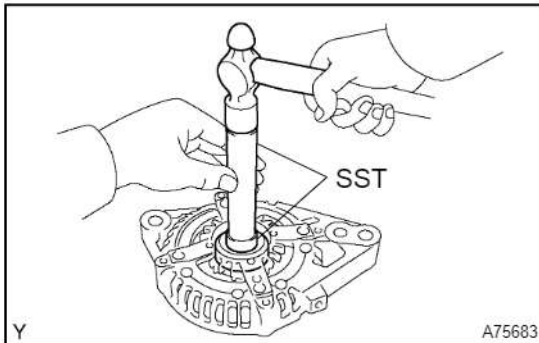


12. INSPECT GENERATOR DRIVE END FRAME BEARING

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

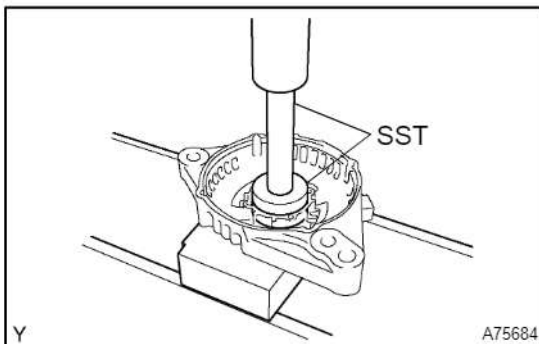
**13. REMOVE GENERATOR DRIVE END FRAME BEARING**

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



- (b) Using SST, tap out the bearing.

SST 09950-60010 (09951-00250), 09950-70010 (09951-07100)

**14. 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)

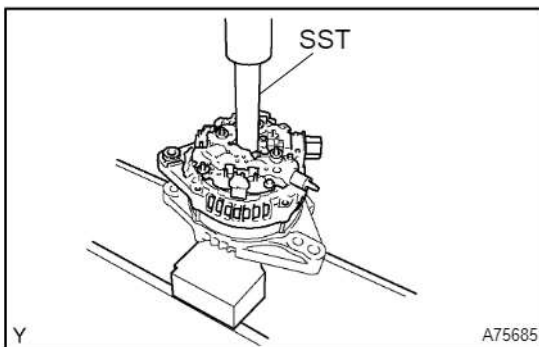
- (b) Install the retainer plate with the 4 screws.

Torque: 2.6 N·m (27 kgf·cm, 23 in.·lbf)

15. INSTALL GENERATOR ROTOR ASSY

- (a) Place the drive end frame on the rotor.

- (b) Install the rotor and washer.

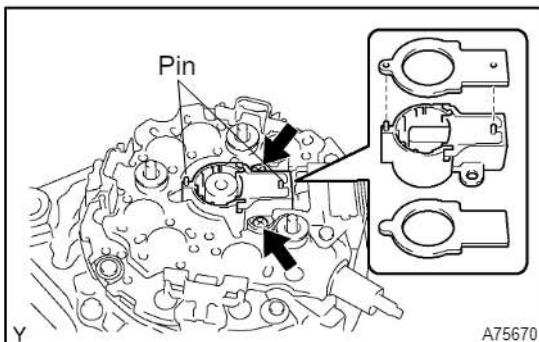
**16. INSTALL GENERATOR COIL ASSY**

- (a) Using SST and a press, press in the coil carefully.

SST 09285-76010

- (b) Install the 4 bolts.

Torque: 5.8 N·m (59 kgf·cm, 51 in.·lbf)

**17. INSTALL GENERATOR BRUSH HOLDER ASSY**

- (a) Install the plate seal (Inside).

- (b) Place the brush holder with the pin facing upward.

NOTICE:

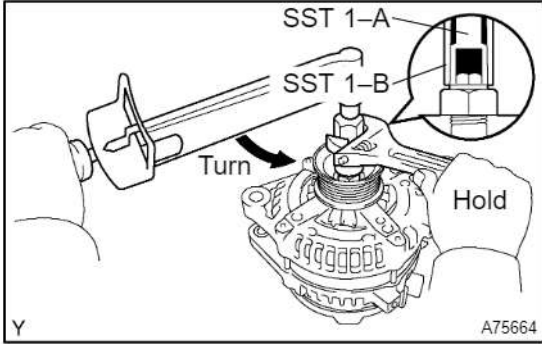
Be careful of the brush holder installing direction.

- (c) Install the 2 screws.

Torque: 1.8 N·m (18 kgf·cm, 16 in.·lbf)

- (d) Align the pins of the brush holder with the holes of the plate seal (outside), and install the plate seal (outside).

18. **INSTALL TERMINAL INSULATOR**
19. **INSTALL GENERATOR REAR END COVER**
 - (a) Install the rear end cover with the 3 nuts.
Torque: 4.6 N·m (47 kgf·cm, 41 in·lbf)

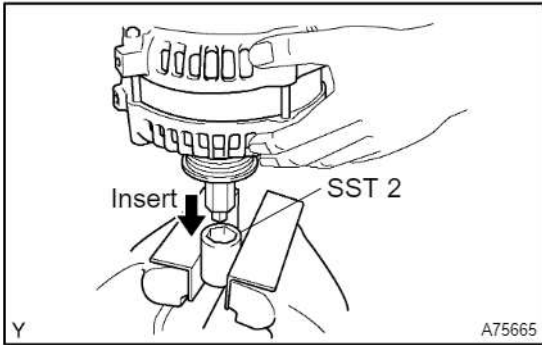


20. **INSTALL GENERATOR PULLEY**
SST 09820-63010 (09820-06010, 09820-06020)
HINT:

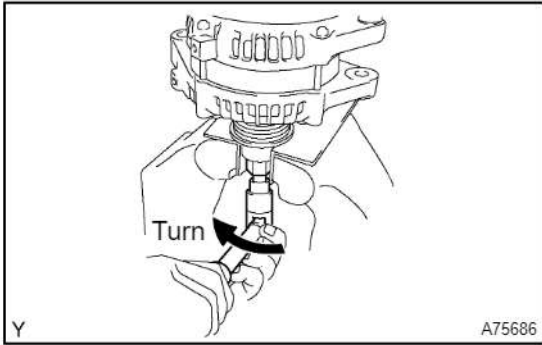
SST 1-A and B	09820 - 06010
SST 2	09820 - 06020

 - (a) Install the 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 with the specified torque.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

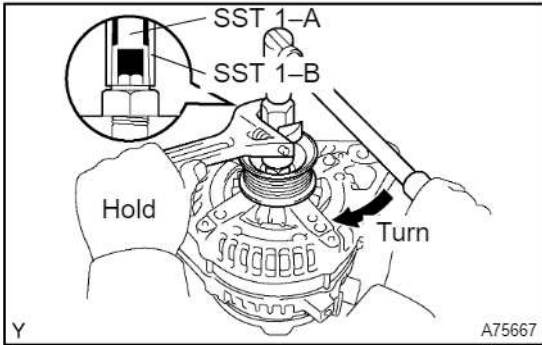
NOTICE:
Check that SST is secured to the rotor shaft.



- (c) Mount 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.

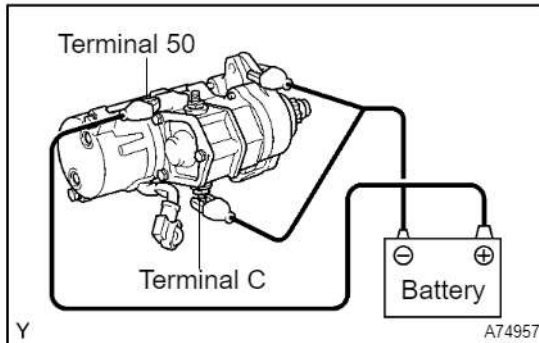


- (g) Turn SST 1-B, and remove SST 1-A, B.
- (h) Turn the pulley, and check that the pulley moves smoothly.

STARTING SYSTEM (2UZ-FE)

INSPECTION

190F4-03

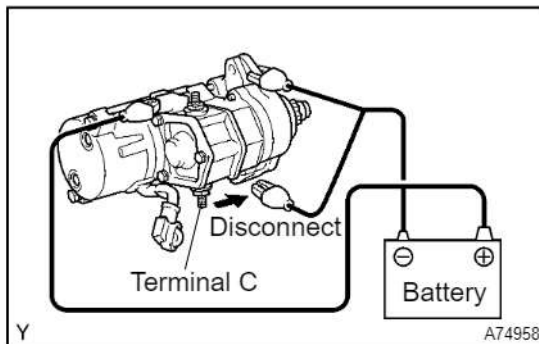


1. STARTER ASSY

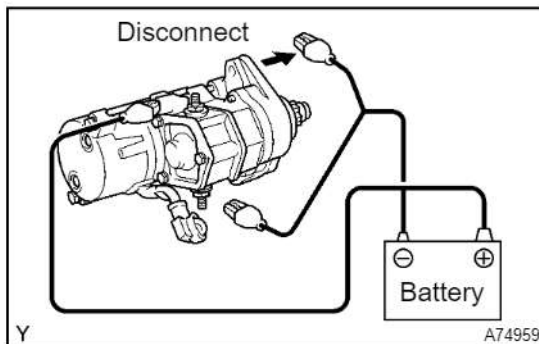
NOTICE:

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

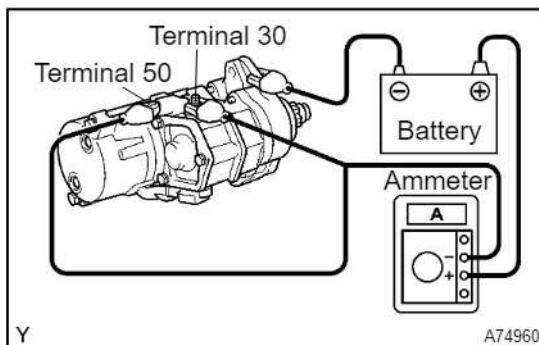
- (a) Do pull-in test.
- (1) Disconnect the field coil lead wire from terminal C.
 - (2) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.



- (b) Do holding test.
- (1) With battery connected as above with the clutch pinion gear out, disconnect the negative (-) lead from terminal C. Check that the pinion gear remains out.



- (c) Inspect clutch pinion gear return.
- (1) Disconnect the negative (-) lead from the switch body. Check that the clutch pinion gear returns inward.

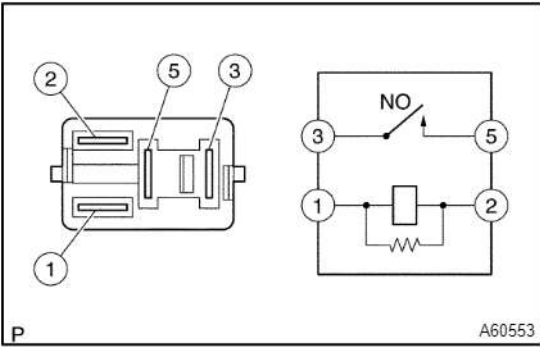


- (d) Perform the operation test without road.
- (1) Connect the field coil lead wire to terminal C.
 - (2) Grip the starter with a vise.
 - (3) Connect the battery and ammeter to the starter as shown.
 - (4) Check that the ammeter reads the specified current.

Specified current:

1.4kw 90 A or less at 11.5 V

2.0kw 100 A or less at 11.5 V



2. STARTER RELAY ASSY

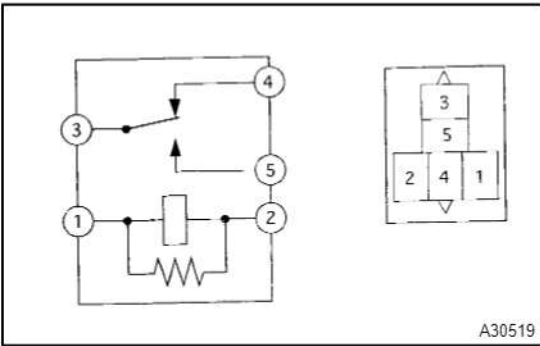
- (a) Continuity inspection.
- (1) Using an ohmmeter, check that there is continuity between each terminal.

Specified condition:

Between terminals	Specified condition
1 - 2	Continuity
3 - 5	No continuity

- (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5 when the between voltage is applied across terminals 1 and 2.

Specified condition: Continuity



3. ACC RELAY

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

Specified condition:

Between terminals	Specified condition
1 - 2	Continuity
3 - 4	
3 - 5	No continuity

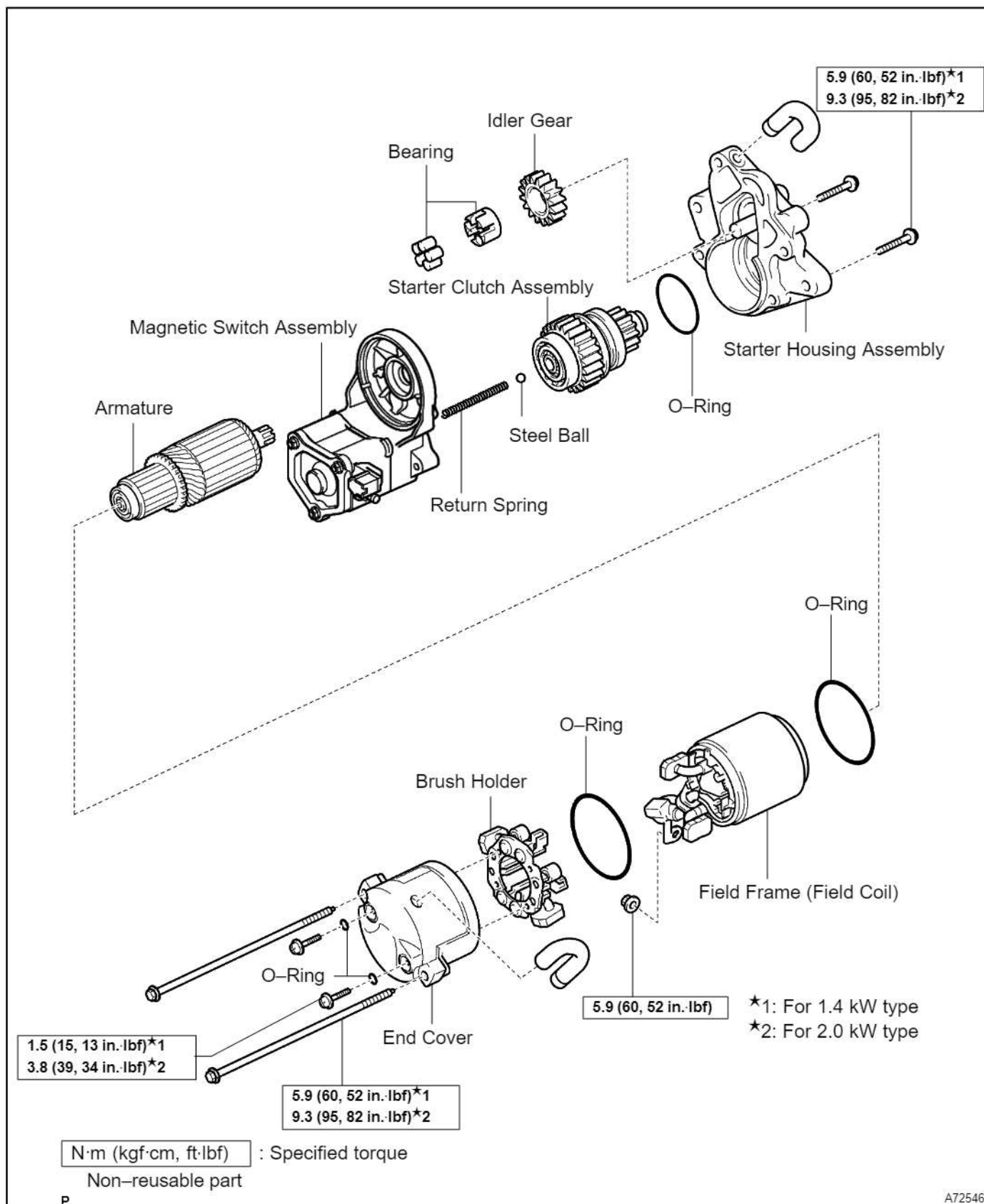
- (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5 when the between voltage is applied across terminals 1 and 2.

Specified condition: Continuity

STARTER ASSY (2UZ-FE)

COMPONENTS

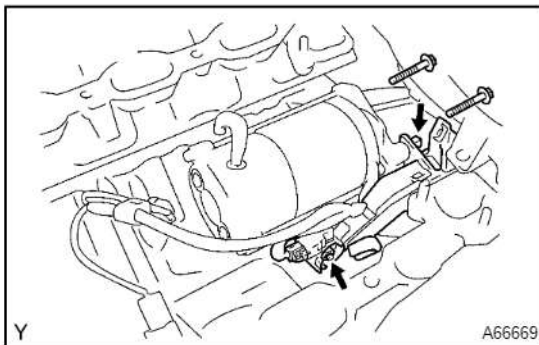
190FJ-03



A72546

REPLACEMENT

1. **WORK FOR PREVENTING GASOLINE FROM SPILLING OUT** (See page 11-31)
2. **DRAIN ENGINE COOLANT** (See page 16-17)
3. **SEPARATE BATTERY NEGATIVE TERMINAL**
4. **REMOVE THROTTLE BODY COVER SUB-ASSY**
 - (a) Remove the 2 cap nuts and throttle body cover sub-assy.
5. **REMOVE AIR CLEANER HOSE ASSY**
6. **DISCONNECT FUEL HOSE**
7. **DISCONNECT FUEL HOSE NO.2**
8. **DISCONNECT FUEL VAPOR FEED HOSE ASSY**
9. **SEPARATE ENGINE WIRE**
 - (a) Disconnect 8 fuel injector connectors.
 - (b) Disconnect throttle position sensor connector.
 - (c) Disconnect water temperature sensor connector.
 - (d) Remove the 3 bolts and separate engine wire harness.
10. **DISCONNECT WATER BY-PASS HOSE NO.7**
11. **DISCONNECT WATER BY-PASS HOSE**
12. **REMOVE INTAKE MANIFOLD ASSY**
 - (a) Remove the 6 bolts and 4 nuts.
 - (b) Remove the intake manifold assy and 2 gaskets.
13. **REMOVE WATER BY-PASS PIPE SUB-ASSY**
 - (a) Separate the engine wire No. 2.
 - (b) Remove the nut and water by-pass pipe sub-assy.
14. **REMOVE WATER BY-PASS JOINT RR**
 - (a) Remove the 4 nuts, water by-pass joint and 2 gaskets.



15. REMOVE STARTER ASSY

- (a) Disconnect the starter connector.
- (b) Remove the nut and disconnect the starter cable.
- (c) Remove the bolt and disconnect the engine wire protector.
- (d) Remove the 2 bolts and starter.

16. INSTALL STARTER ASSY

- (a) Install the starter assy with the 2 bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
- (b) Connect the engine wire protector with the bolt.
- (c) Connect the starter cable with the nut.
Torque: 9.8 N·m (100 kgf·cm, 86 in·lbf)
- (d) Connect the starter connector.

17. INSTALL WATER BY-PASS JOINT RR

- (a) Install 2 new gaskets to the cylinder head.
- (b) Install the 4 nuts holding the water by-pass joint to the cylinder heads. Alternately tighten the nuts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

18. INSTALL WATER BY-PASS PIPE SUB-ASSY

- (a) Install a new O-ring to the water by-pass pipe.
- (b) Apply soapy water to the O-ring.
- (c) Push in the water by-pass pipe end into the pipe hole of the water pump.
- (d) Install the water by-pass pipe with the bolt.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

- (e) Install the wire clamp to the bracket of the water by-pass pipe.

19. INSTALL INTAKE MANIFOLD ASSY

- (a) Install the 2 new gaskets to cylinder head.
- (b) Install the intake manifold assy with the 6 bolts and 2 nuts.

Torque:

Bolt 18 N·m (185 kgf·cm, 13 ft·lbf)

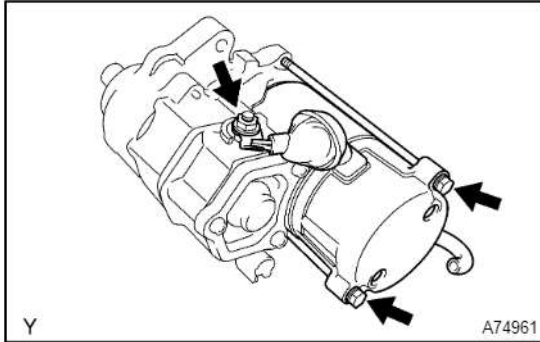
Nut 18 N·m (185 kgf·cm, 13 ft·lbf)

20. CONNECT WATER BY-PASS HOSE**21. CONNECT WATER BY-PASS HOSE NO.7****22. INSTALL ENGINE WIRE**

Torque: 8.2 N·m (83 kgf·cm, 72 in·lbf)

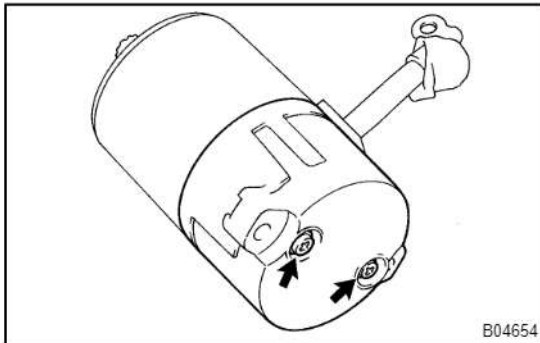
23. CONNECT FUEL VAPOR FEED HOSE ASSY**24. CONNECT FUEL HOSE NO.2****25. CONNECT FUEL HOSE****26. INSTALL AIR CLEANER HOSE ASSY****27. INSTALL THROTTLE BODY COVER SUB-ASSY****28. REFILL ENGINE COOLANT (See page 16-17)****29. CHECK FOR ENGINE COOLANT LEAKS (See page 16-13)****30. INSPECT FUEL LEAK (See page 11-31)**

OVERHAUL



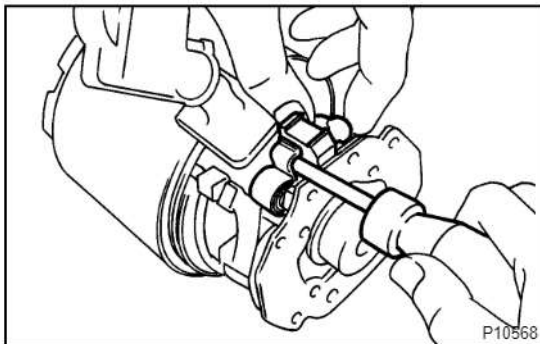
1. REMOVE STARTER YOKE ASSY

- Remove the nut and disconnect the terminal C wire.
- Remove the 2 through bolts.
- Pull out the starter yoke assy with the armature assy.
- Remove the O-ring from the starter yoke assy.



2. REMOVE STARTER BRUSH HOLDER ASSY

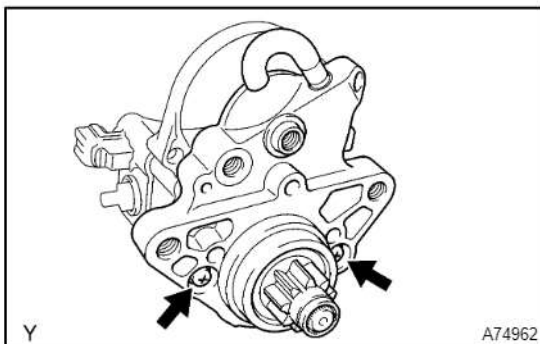
- Remove the 2 screws w/ O-ring and end cover from the field frame.
- Remove the O-ring from the field frame.



- Using a screwdriver, hold the spring back and disconnect the brush from the brush holder.
- Disconnect the 4 brushes, and remove the brush holder.

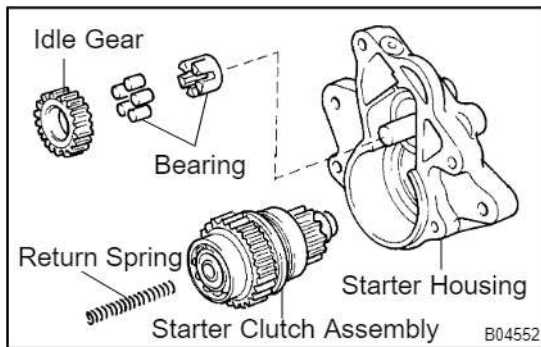
3. REMOVE STARTER ARMATURE ASSY

- Remove the starter armature assy from starter yoke assy.

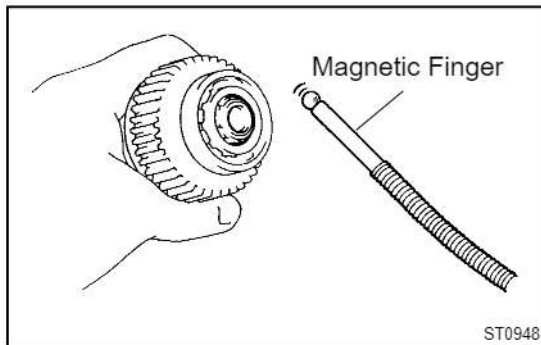


4. REMOVE STARTER CLUTCH

- Remove the 2 screws and starter drive housing.



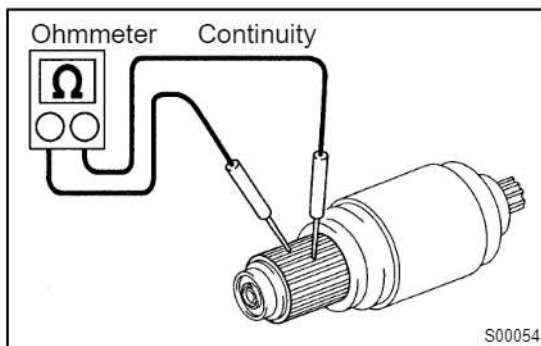
- (b) Remove return spring idler gear, bearing and starter clutch assembly from the starter housing.



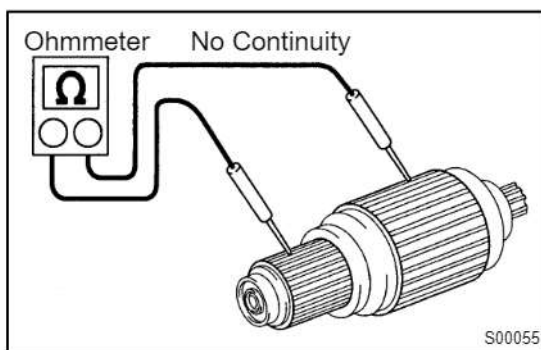
- (c) Using a magnetic finger, remove the steel ball from the clutch shaft hole.

5. INSPECT STARTER ARMATURE ASSY

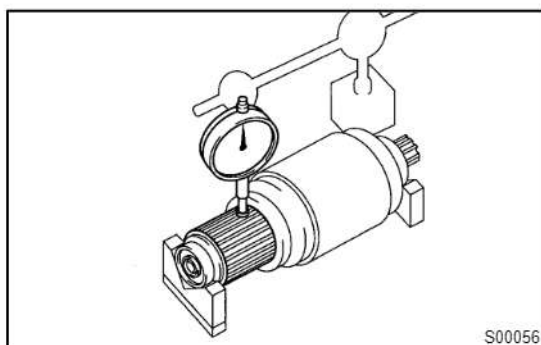
- (a) Inspect commutator for dirty and burnt surface. If the surface of the commutator is dirty or burned, polish the part with sandpaper (#400) or replace the armature.



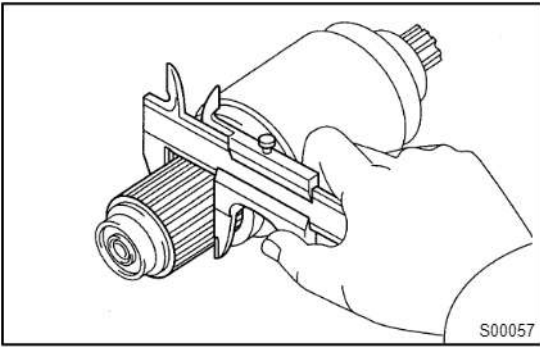
- (b) Inspect commutator for open circuit.
(1) Using an ohmmeter, check that there is continuity between the segments of the commutator. If there is no continuity between any segment, replace the armature.



- (c) Inspect commutator for ground.
(1) Using an ohmmeter, check that there is no continuity between the commutator and armature core. If there is continuity, replace the armature assy.



- (d) Inspect commutator circle runout.
(1) Place the armature on the V-blocks.
(2) Using a dial gauge, measure the circle runout.
Maximum circle runout: 0.05 mm (0.0020 in.)
If the circle runout is greater than maximum, correct it on a lathe.



- (e) Using vernier calipers, measure the commutator diameter.

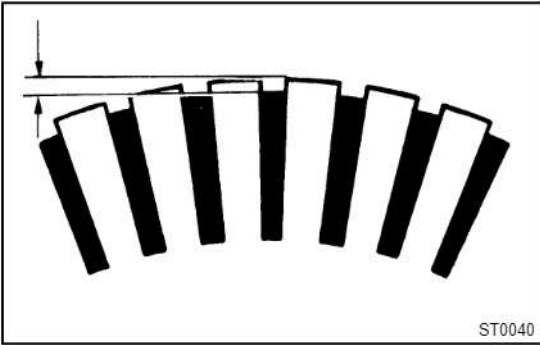
Standard diameter:

1.4 kW type	30.0 mm (1.181 in.)
2.0 kW type	35.0 mm (1.378 in.)

Minimum diameter:

1.4 kW type	29.0 mm (1.142 in.)
2.0 kW type	34.0 mm (1.339 in.)

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



- (f) Measure the undercut depth of commutator.

Standard undercut depth:

1.4 kW type	0.6 mm (0.024 in.)
2.0 kW type	0.7 mm (0.028 in.)

Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than the minimum, correct it with a hacksaw blade.

- (g) Inspect the bearings.

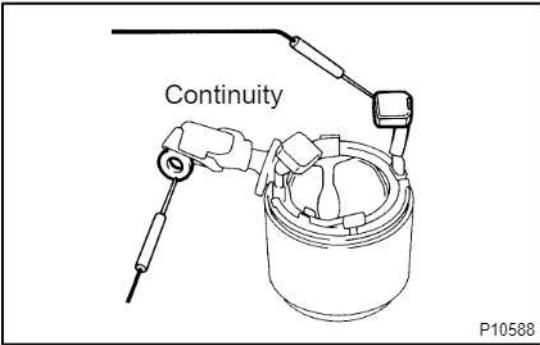
- (1) Check that the bearing rotates smoothly.

6. INSPECT STARTER YOKE ASSY

- (a) Inspect field coil for open circuit.

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

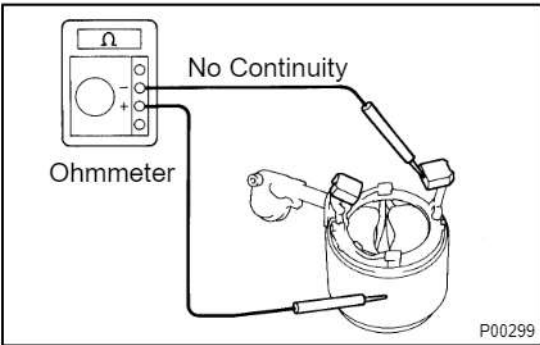
If there is no continuity, replace the starter yoke assy.



- (b) Inspect that field coil is not grounded (1.4 kW type).

- (1) Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, replace the starter yoke assy.



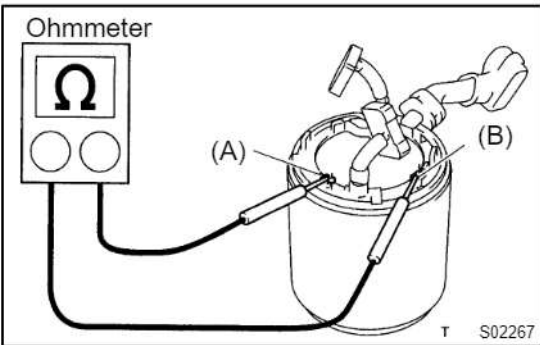
- (c) Inspect shunt coil for open circuit (2.0 kW type).

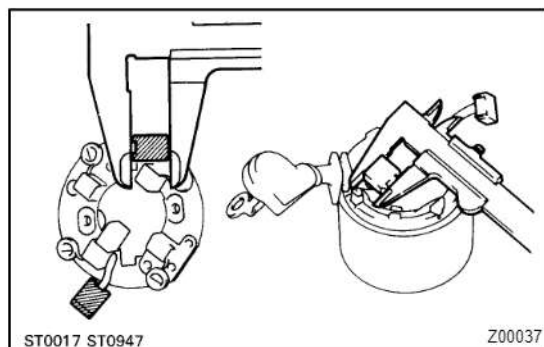
- (1) Using an ohmmeter, measure the resistance between shunt coil terminals (A) and (B).

Resistance:

1.5 - 1.9 Ω at 20°C (68°F)

If the resistance is not as specified, replace the starter yoke assy.





7. INSPECT BRUSH

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

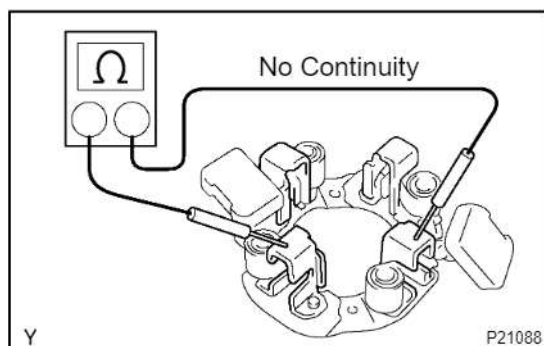
Standard length:

1.4 kW type	15.5 mm (0.610 in.)
2.0 kW type	15.0 mm (0.591 in.)

Minimum length:

1.4 kW type	10.0 mm (0.394 in.)
2.0 kW type	9.0 mm (0.354 in.)

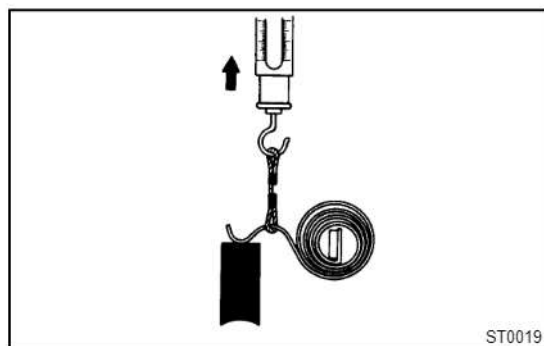
If the length is less than the minimum, replace the brush holder and starter yoke assy.



8. INSPECT STARTER BRUSH HOLDER ASSY

- (a) Using an ohmmeter, check that there is no continuity between the positive and negative brush holders.

If there is continuity, replace the brush holder.



- (b) Take the pull scale reading the instant the brush spring separates from the brush.

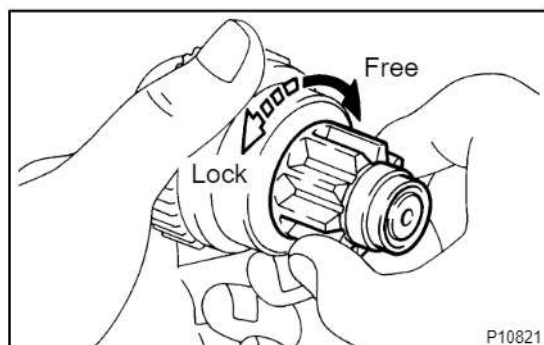
Standard spring installed load:

1.4 kW type	17.6 – 23.5 N (1.8 – 2.4 kgf, 4.0 – 5.3 lbf)
1.2 kW type	21.5 – 27.5 N (2.2 – 2.8 kgf, 4.8 – 6.2 lbf)

Minimum spring installed load:

1.4 kW type	11.8 N (1.2 kgf, 2.7 lbf)
1.2 kW type	12.7 N (1.3 kgf, 2.9 lbf)

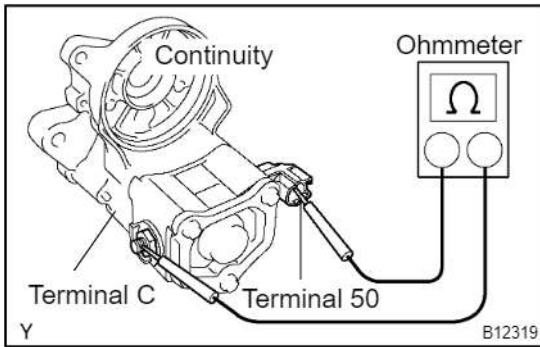
If the spring load is less than the minimum, replace the brush springs.



9. INSPECT STARTER CLUTCH

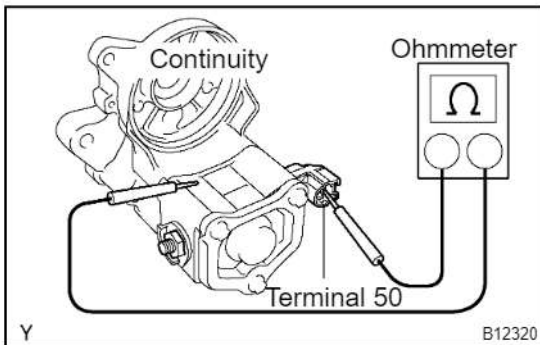
- (a) Rotate the pinion gear clockwise, and check that it turns freely. Try to rotate the pinion gear counterclockwise and check that it locks.

If necessary, replace the clutch assembly.

**10. INSPECT STARTER MAGNETIC SWITCH ASSY**

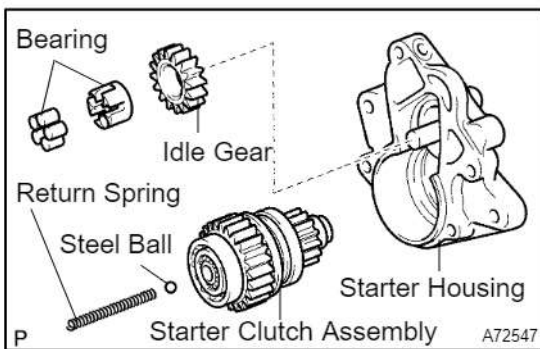
- (a) Check the pull-in coil continuity.
 (1) Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, replace the magnet starter switch assy.

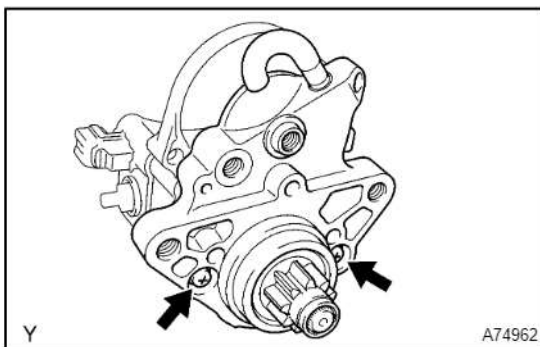


- (b) Check the holding coil continuity.
 (1) Using an ohmmeter, check that there is continuity between terminals 50 and switch body.

If there is no continuity, replace the magnet starter switch assy.

**11. INSTALL STARTER DRIVE HOUSING**

- (a) Apply grease to the steel ball, return spring, clutch rollers and starter idler pinions.
 (b) Install the steel ball.
 (c) Install a new O-ring to the starter housing.
 (d) Insert the return spring into the magnet starter switch hole.
 (e) Install the starter clutch assembly, idler gear and bearing.

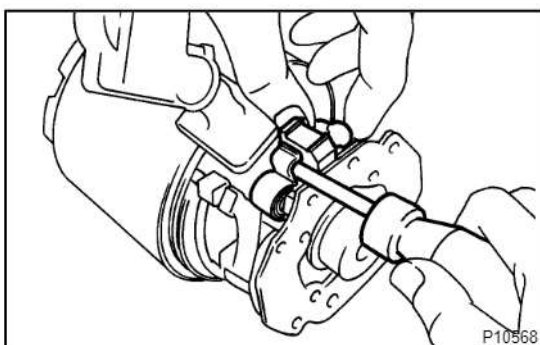


- (f) Install the starter housing to the magnet magnet switch assy with the 2 screws.

Torque:

1.4 kW type 5.9 N·m (60 kgf·cm, 52 in.·lbf)

2.0 kW type 9.3 N·m (95 kgf·cm, 82 in.·lbf)

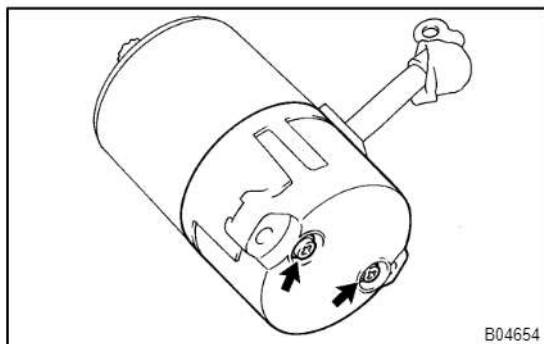
**12. INSTALL STARTER BRUSH HOLDER ASSY**

- (a) Align the claw of the brush holder with the claw groove of the starter yoke assy.
 (b) Place the brush holder on the starter yoke assy.
 (c) Using a screwdriver, hold the brush spring back.
 (d) Connect the brush into the brush holder.
 (e) Connect the 4 brushes.

NOTICE:

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

- (f) Install a O-ring to the groove of the starter yoke.

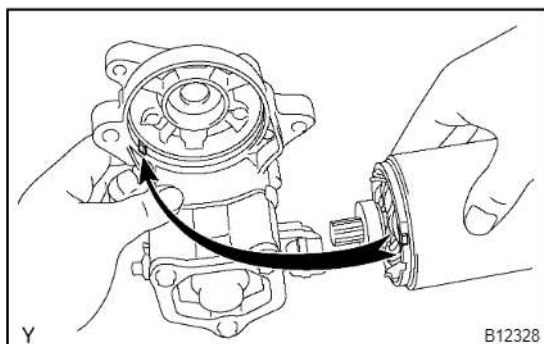


- (g) Install new 2 O-rings and the end cover with the 2 screws.

Torque:

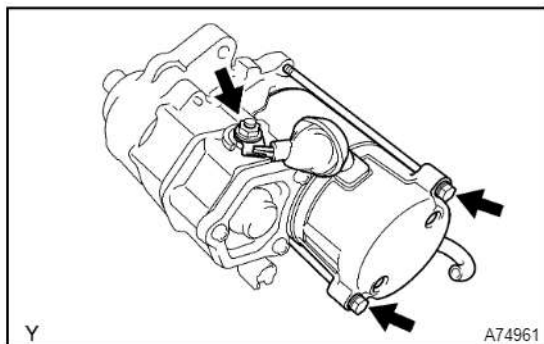
1.4 kW type 1.5 N·m (15 kgf·cm, 13 in.·lbf)

2.0 kW type 3.8 N·m (39 kgf·cm, 34 in.·lbf)



13. INSTALL STARTER YOKE ASSY

- (a) Install a O-ring to the groove of the starter yoke assy.
 (b) Align the protrusion of the starter yoke assy with the groove of the magnetic switch.



- (c) Install the starter yoke assy with the 2 through bolts.

Torque:

1.4 kW type 5.9 N·m (60 kgf·cm, 52 in.·lbf)

2.0 kW type 9.3 N·m (95 kgf·cm, 82 in.·lbf)

- (d) Connect the terminal C wire with the nut.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

CHARGING SYSTEM (2UZ-FE)

190F5-03

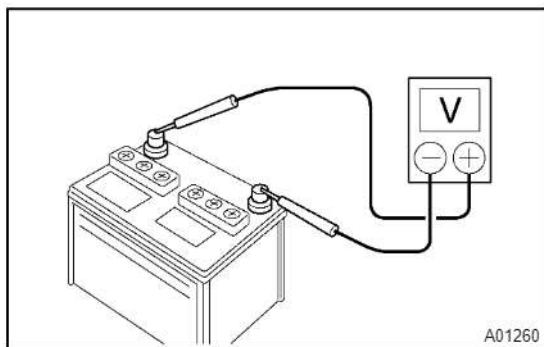
PRECAUTION

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 alternator and the fuse box.
6. Do not check whether the alternator generators or not with connecting terminal **F** to the other terminal.

ON-VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

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



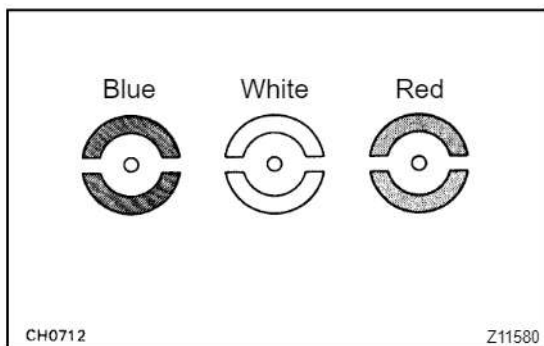
2. CHECK BATTERY VOLTAGE

- (a) After having driven the vehicle and in the case that 20 minutes have not passed after having stopped the engine, turn the ignition switch ON and turn on the electrical system (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
- (b) Turn the ignition switch OFF and turn off the electrical systems.
- (c) Measure the battery voltage between the negative (-) and positive (+) terminals of the battery.

Standard voltage: 12.5 – 12.9 V at 20 C (68 F)

HINT:

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



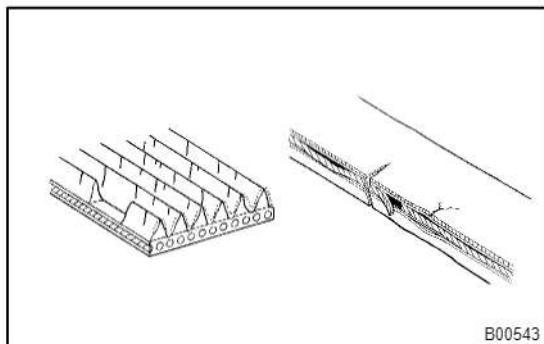
- (d) Check the indicator as shown in the illustration.

HINT:

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

3. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

- (a) Check that the battery terminals are not loose or corroded.
- (b) Check the fusible link, H-fuses and fuses for continuity.

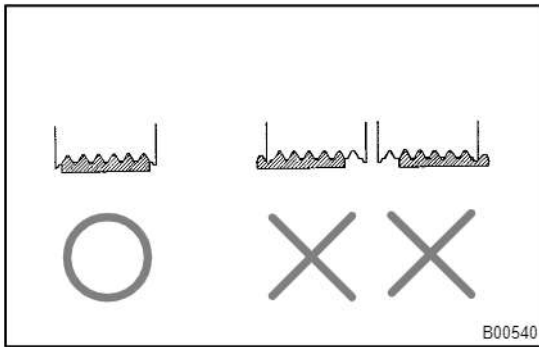


4. INSPECT DRIVE BELT

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

HINT:

- ★ If any defect has been 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.

5. VISUALLY CHECK GENERATOR WIRING

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

6. LISTEN FOR ABNORMAL NOISES FROM GENERATOR

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

7. INSPECT CHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch ON. Check that the charge warning light comes on.

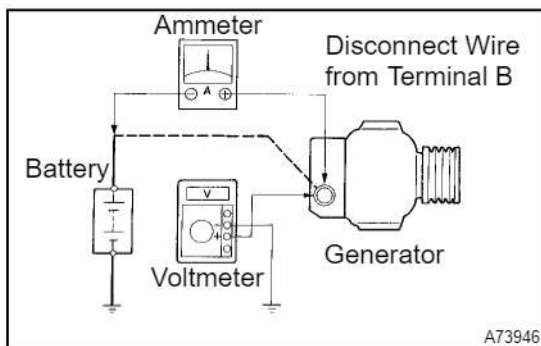
(b) Start the engine. Check that the light goes off.

HINT:

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

8. INSPECT CHARGING CIRCUIT WITHOUT LOAD

(a) If a battery/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) With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.2 – 14.0 V

HINT:

- ★ If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- ★ If the voltmeter reading is less than the standard voltage, check the voltage regulator and generator as follows:

9. INSPECT CHARGING CIRCUIT WITH LOAD

- (a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "HI".
- (b) Check the reading on the ammeter.

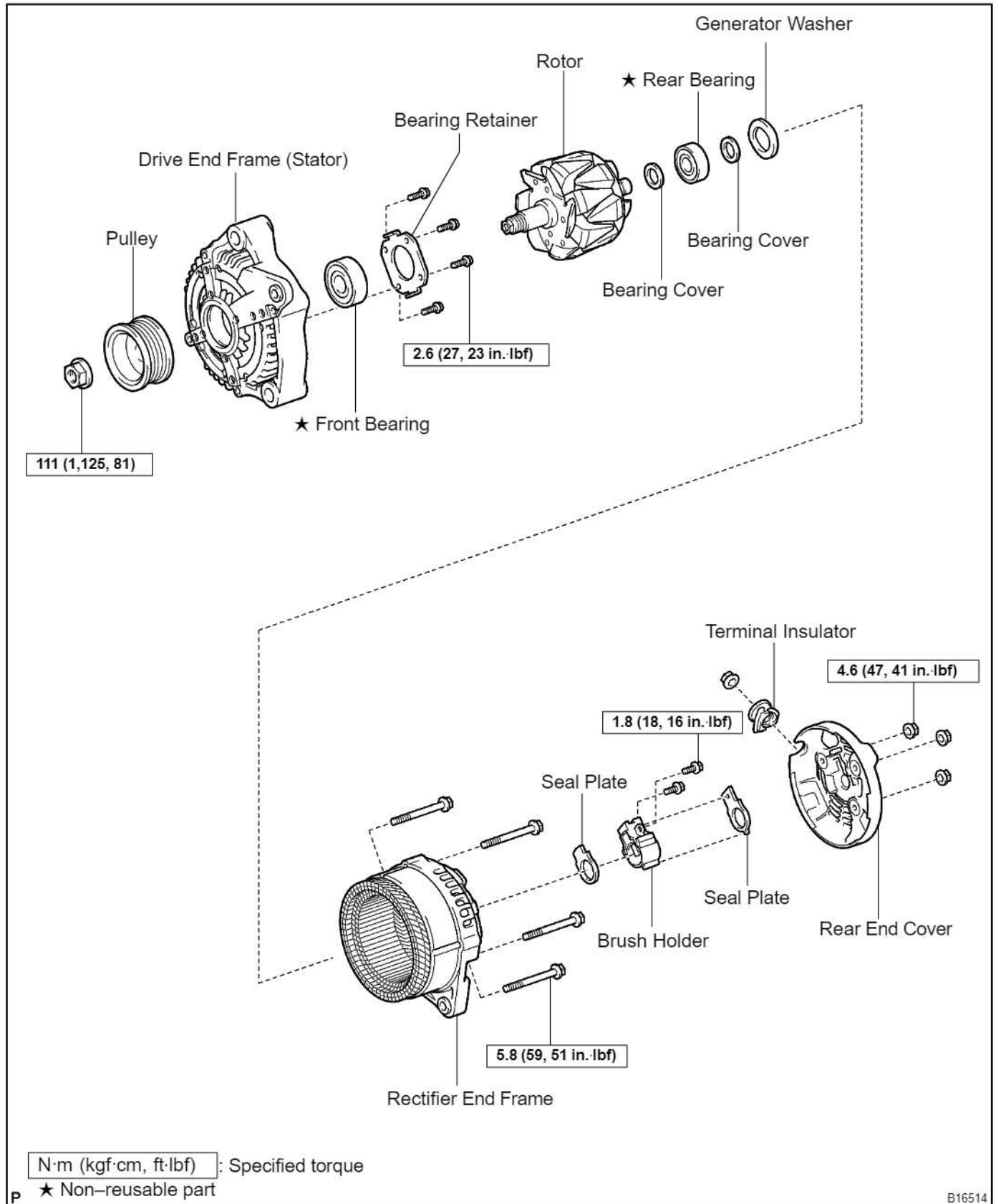
Standard amperage: 30 A or more

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.

GENERATOR ASSY (2UZ-FE) COMPONENTS

190FH-03



cardiagn.com

B16514

REPLACEMENT

1. SEPARATE BATTERY NEGATIVE TERMINAL

2. REMOVE RADIATOR SUPPORT SEAL UPPER

- (a) Remove the 11 clips and radiator support seal upper.

3. REMOVE FAN AND GENERATOR V BELT (See page 14-194)

4. REMOVE FAN W/ FLUID COUPLING

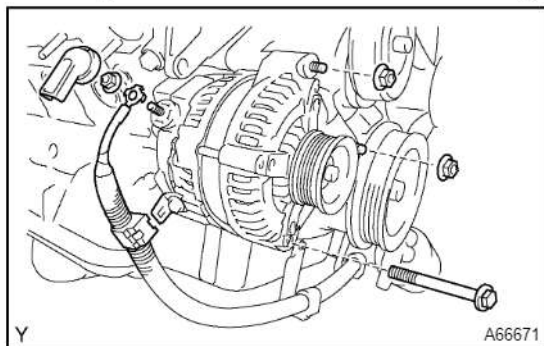
- (a) Separate the 2 oil cooler hoses from fan shroud.
 (b) Remove the 3 bolts and separate the fan shroud from radiator.
 (c) Remove the 4 nuts and separate the fan w/ fluid coupling from engine.
 (d) Remove the fan shroud and fan w/fluid coupling from the vehicle at the same time.

5. SEPARATE VANE PUMP ASSY

- (a) Disconnect the vacuum hose.
 (b) Remove the nut, 2 bolts and vane pump assy.

HINT:

Hand up the hoses instead of detaching.



6. REMOVE GENERATOR ASSY

- (a) Disconnect the generator connector.
 (b) Remove the terminal cap and nut, and disconnect the generator wire.
 (c) Disconnect the alternator wire clamp from the cord clip on the generator.
 (d) Remove the bolt, 2 nuts and generator.

7. INSTALL GENERATOR ASSY

- (a) Install the generator with the bolt and 2 nuts.

Torque:

Bolt 39 N·m (400 kgf·cm, 29 ft·lbf)

Nut (M10) 39 N·m (400 kgf·cm, 29 ft·lbf)

Nut (M8) 16 N·m (158 kgf·cm, 11 ft·lbf)

- (b) Connect the generator connector.
 (c) Connect the generator wire with the nut and rubber cap.
Torque: 9.8 N·m (100 kgf·cm, 86 in·lbf)
 (d) Install the generator wire clamp to the cord clip on the generator.

8. INSTALL VANE PUMP ASSY

- (a) Install the vane pump assy with the nut and 2 bolts.

Torque:

Nut 43 N·m (438 kgf·cm, 32 ft·lbf)

Bolt 43 N·m (438 kgf·cm, 32 ft·lbf)

- (b) Connect the vacuum hose.

9. INSTALL FAN W/ FLUID COUPLING

- (a) Put the fan w/ fluid coupling and fan shroud into the engine room at the same time.
 (b) Install the fan shroud with 3 bolts.

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

- (c) Install the fan w/ fluid coupling with 4 nuts.

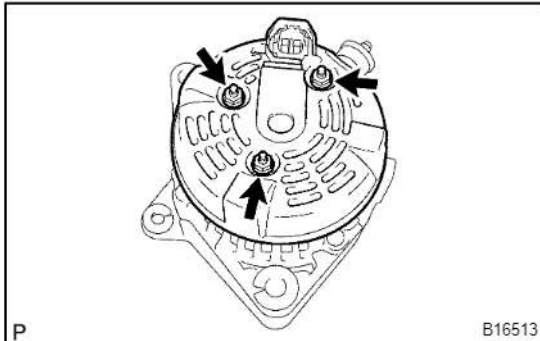
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)

10. INSTALL FAN AND GENERATOR V BELT (See page 14-194)

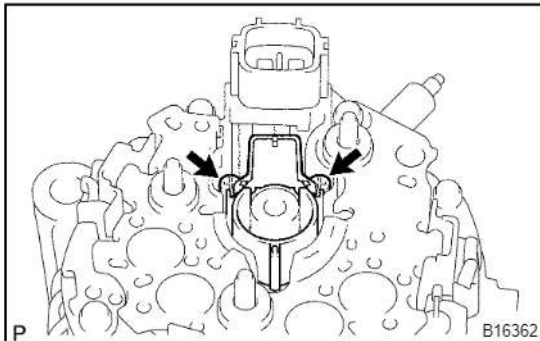
11. INSTALL RADIATOR SUPPORT SEAL UPPER

OVERHAUL

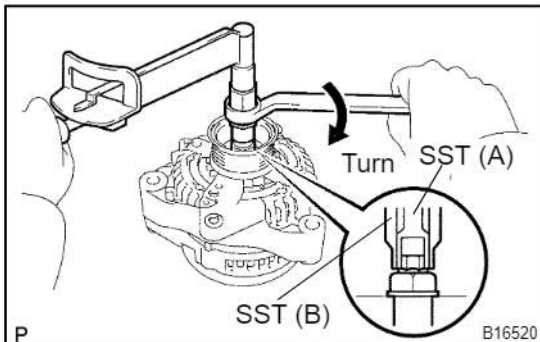
190F9-03

**1. REMOVE GENERATOR REAR END COVER**

- (a) Remove the 3 nuts and end cover.
- (b) Remove the terminal insulator.

**2. REMOVE GENERATOR BRUSH HOLDER ASSY**

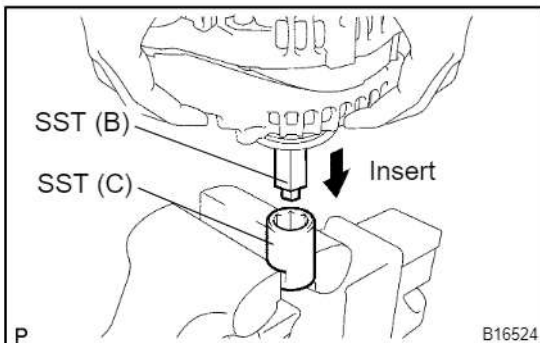
- (a) Remove the rear seal plate from the brush holder.
- (b) Remove the 2 screws and brush holder.
- (c) Remove the front seal plate from the coil assembly.

**3. REMOVE GENERATOR PULLEY**

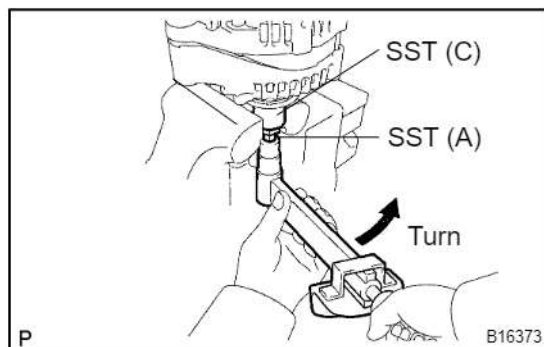
- (a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820-63011

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

- (b) Check that SST (A) is secured to the rotor shaft.



- (c) Mount SST (C) in a vise.
- (d) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).

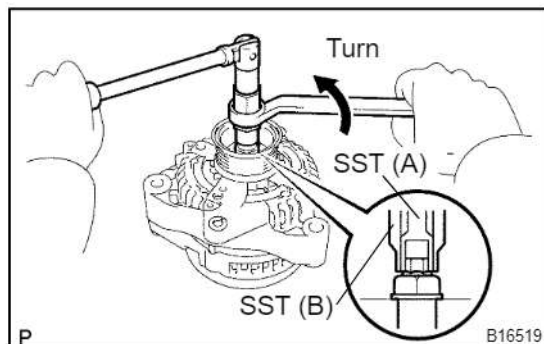


- (e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

NOTICE:

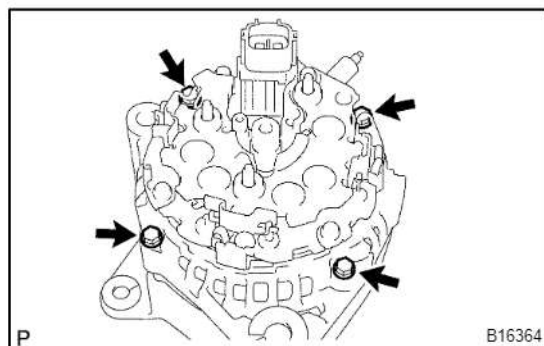
To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

- (f) Remove the generator from SST (C).

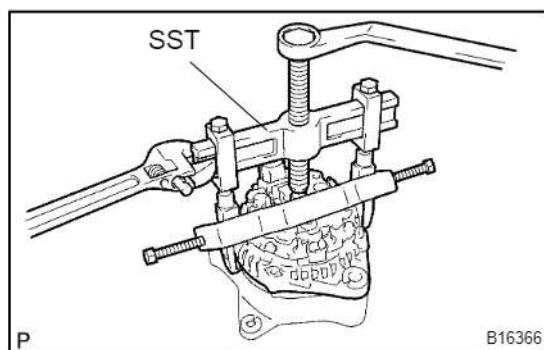


- (g) Turn SST (B), and remove SST (A and B).

- (h) Remove the pulley nut and pulley.

**4. REMOVE GENERATOR COIL ASSY**

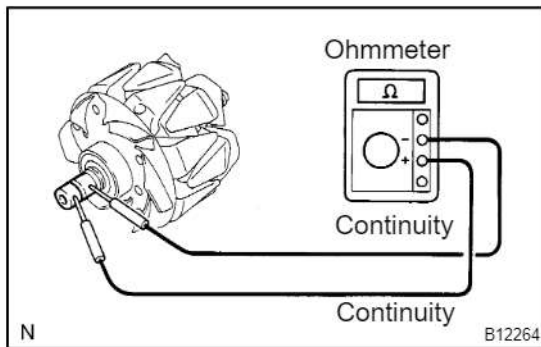
- (a) Remove the 4 bolts.



- (b) Using SST, remove the coil assembly.
SST 09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04071, 09957-04010, 09958-04011)

- (c) Remove the generator washer.

5. REMOVE GENERATOR ROTOR ASSY



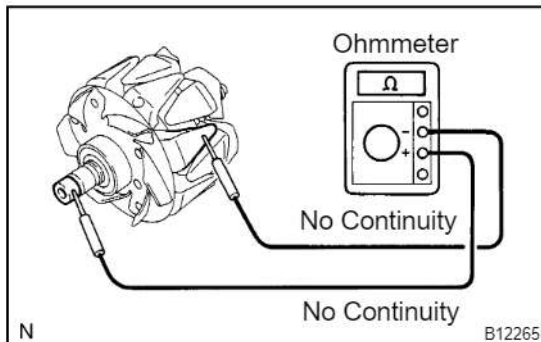
6. INSPECT GENERATOR ROTOR ASSY

- (a) Check the rotor for open circuit.

(1) Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance: 2.3 – 2.7 Ω at 20°C (68°F)

If there is no continuity, replace the rotor.

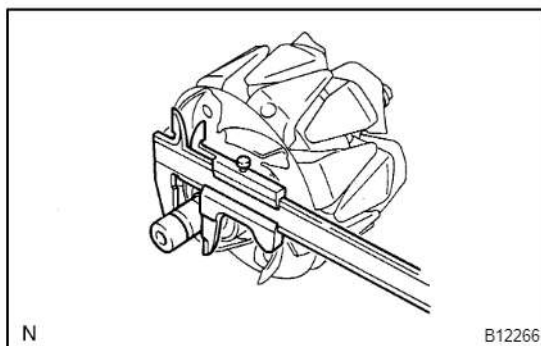


- (b) Check the rotor for ground.

(1) Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.

- (c) Check that the slip rings are not rough or scored. If rough or scored, replace the rotor.

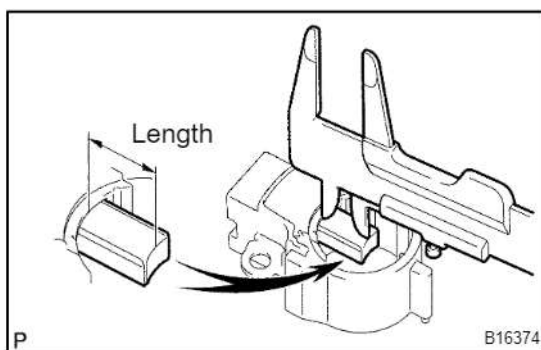


- (d) Using vernier calipers, measure the slip ring diameter.

Standard diameter: 14.2 – 14.4 mm (0.559 – 0.567 in.)

Minimum diameter: 14.0 mm (0.551 in.)

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



7. INSPECT GENERATOR BRUSH HOLDER ASSY

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

Standard exposed length: 10.5 mm (0.413 in.)

Minimum exposed length: 4.5 mm (0.177 in.)

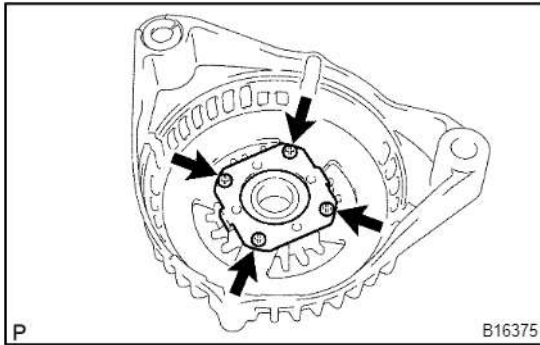
If the exposed length is less than minimum, replace the brushes and brush holder assembly.

8. INSPECT GENERATOR ROTOR BEARING

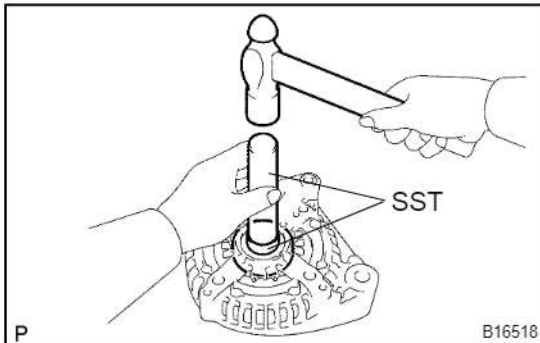
- (a) Check the bearing is not rough or worn. If necessary, replace the bearing.

9. INSPECT GENERATOR DRIVE END FRAME BEARING

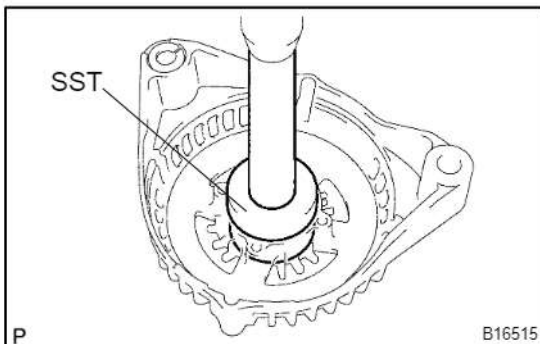
- (a) Check the bearing is not rough or worn. If necessary, replace the bearing.

**10. REMOVE GENERATOR ROTOR BEARING**

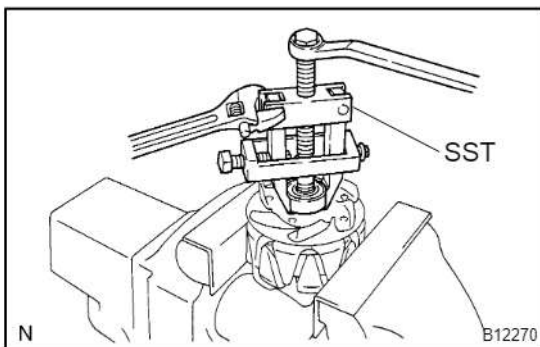
- (a) Remove the 4 screws, bearing retainer and bearing.



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

**11. INSTALL GENERATOR ROTOR BEARING**

- (a) Using SST and a press, press in a new bearing.
SST 09950-60010 (09951-00470), 09950-70010 (09951-07100)
- (b) Install the bearing retainer with the 4 screws.
Torque: 2.6 N·m (27 kgf·cm, 23 in.-lbf)

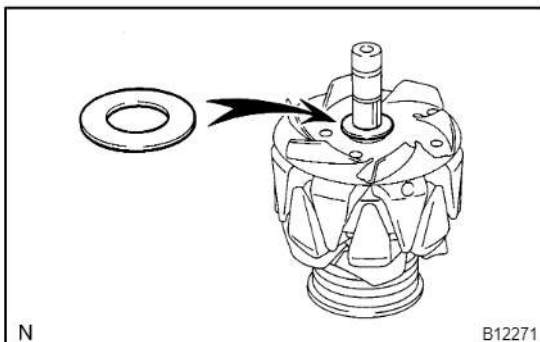
**12. REMOVE GENERATOR DRIVE END FRAME BEARING**

- (a) Using SST, remove the bearing cover (outside) and bearing.
SST 09820-00021

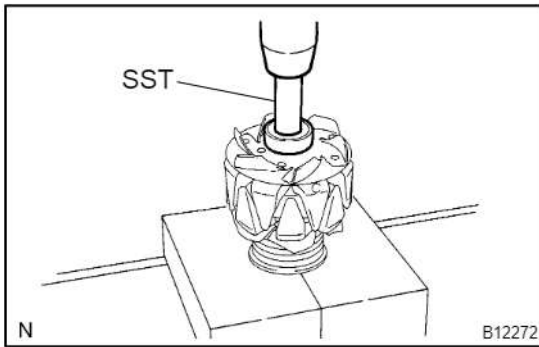
NOTICE:

Be careful not to damage the fan.

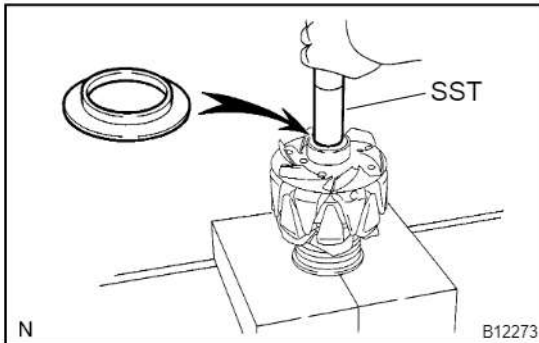
- (b) Remove the bearing cover (inside).



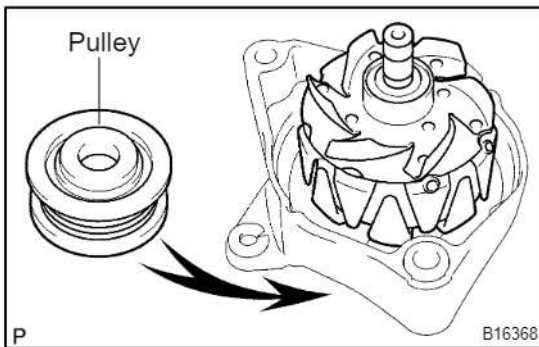
- (c) Place the bearing cover (inside) on the rotor.

**13. INSTALL GENERATOR DRIVE END FRAME BEARING**

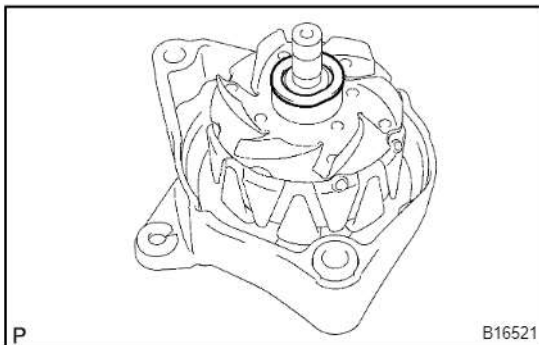
- (a) Using SST and a press, press in a new bearing.
SST 09820-00031



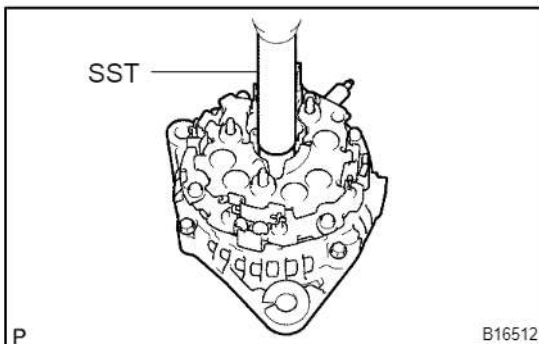
- (b) Using SST, push in the bearing cover (outside).
SST 09285-76010

**14. INSTALL GENERATOR ROTOR ASSY**

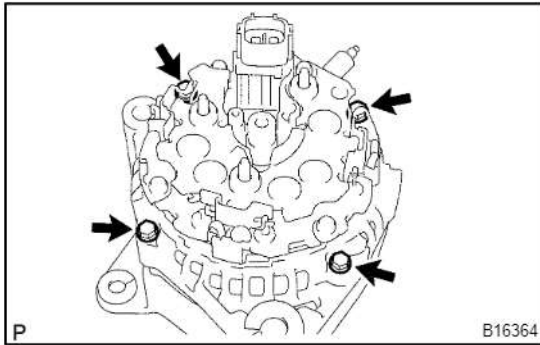
- (a) Place the drive end frame on the pulley.
(b) Install the rotor to the drive end frame.

**15. INSTALL GENERATOR COIL ASSY**

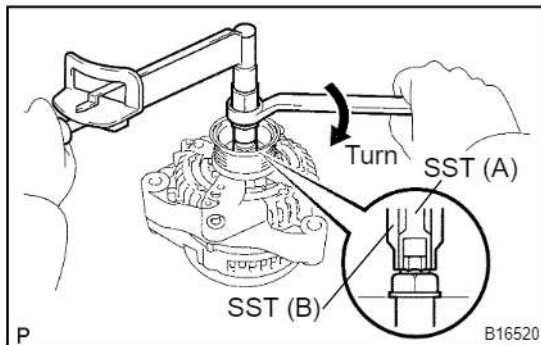
- (a) Place the generator washer on the rotor.



- (b) Using SST and a press, slowly press in the coil assembly.
SST 09285-76010

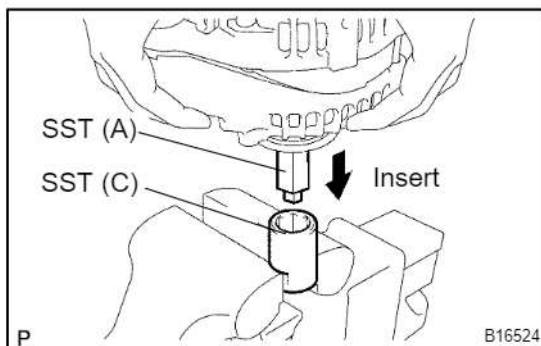


- (c) Install the coil assembly with the 4 bolts.
Torque: 5.8 N·m (59 kgf·cm, 51 in·lbf)

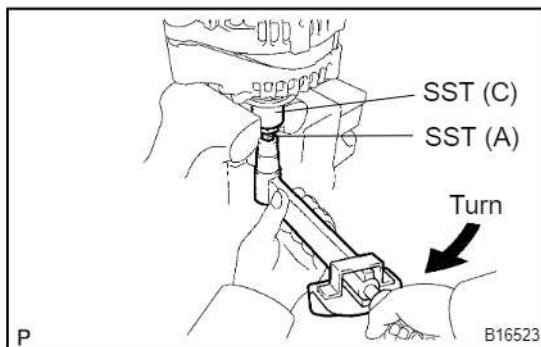


16. INSTALL GENERATOR PULLEY

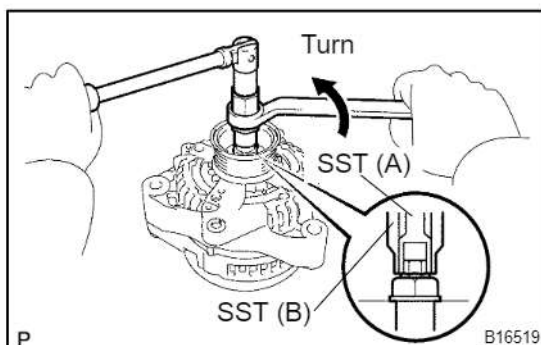
- (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
 (b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820-63011
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
 (c) Check that SST (A) is secured to the pulley shaft.



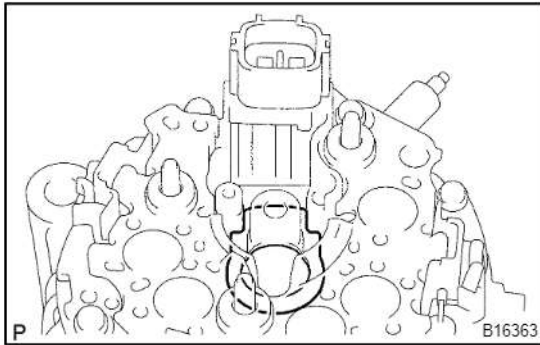
- (d) Mount SST (C) in a vise.
 (e) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



- (f) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.
Torque: 111 N·m (1,125 kgf·cm, 81 ft·lbf)
 (g) Remove the generator from SST (C).

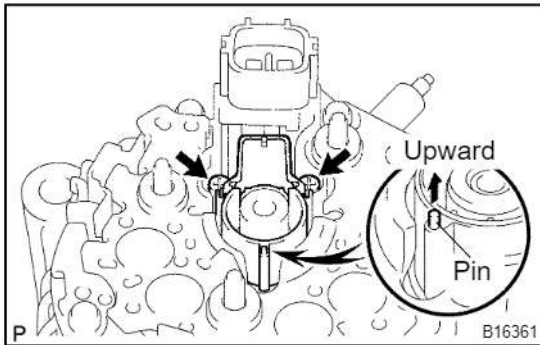


- (h) Turn SST (B), and remove SST (A and B).



17. INSTALL GENERATOR BRUSH HOLDER ASSY

- (a) Place the front seal plate on the coil assembly.



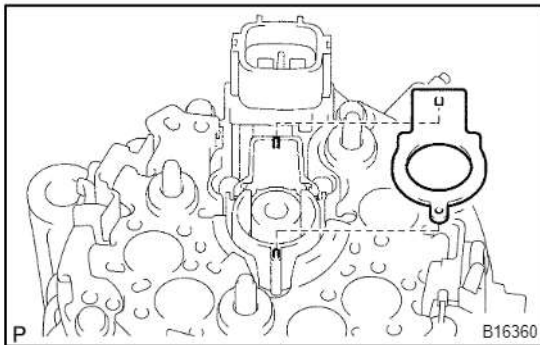
- (b) Place the brush holder on the coil assembly with the pin facing upward.

NOTICE:

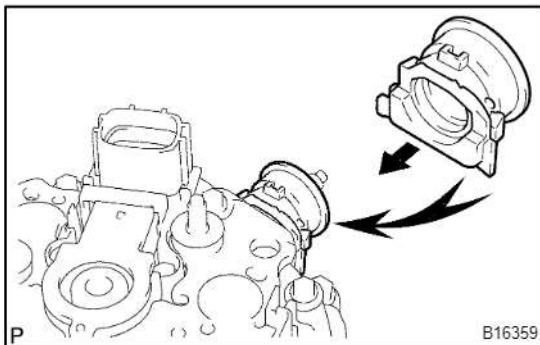
Be careful of the holder installation direction.

- (c) Install the 2 screws.

Torque: 1.8 N·m (18 kgf·cm, 16 in·lbf)



- (d) Align the pins of the brush holder with the holes of the rear seal plate, and install the rear seal plate.

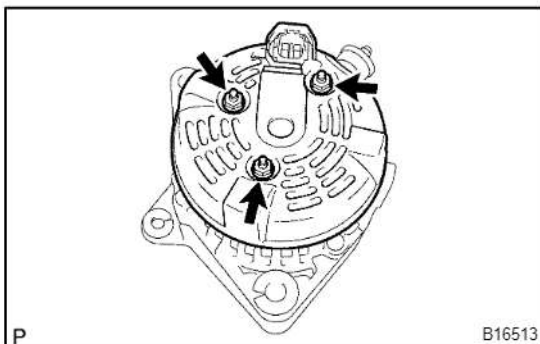


18. INSTALL GENERATOR REAR END COVER

- (a) Install the terminal insulator.

NOTICE:

Be careful of the terminal insulator installation direction.



- (b) Install the end cover with the 3 nuts.

Torque: 4.6 N·m (47 kgf·cm, 41 in·lbf)