

2009 Toyota Highlander Limited

2009 ELECTRICAL Charging (2GR-FE) - Highlander

2009 ELECTRICAL**Charging (2GR-FE) - Highlander****CHARGING SYSTEM****PRECAUTION****1. PRECAUTION FOR DISCONNECTING THE BATTERY CABLE**

NOTE: When disconnecting the battery negative (-) terminal, initialize the following systems after the terminal is reconnected:

SYSTEM REFERENCE CHART

System Name	See Procedure
Power Back Door System	INITIALIZATION

2. IGNITION SWITCH EXPRESSIONS**HINT:**

The type of ignition switch used on this model differs according to the specifications of the vehicle. The expressions listed in the table below are used in this article.

IGNITION SWITCH EXPRESSIONS

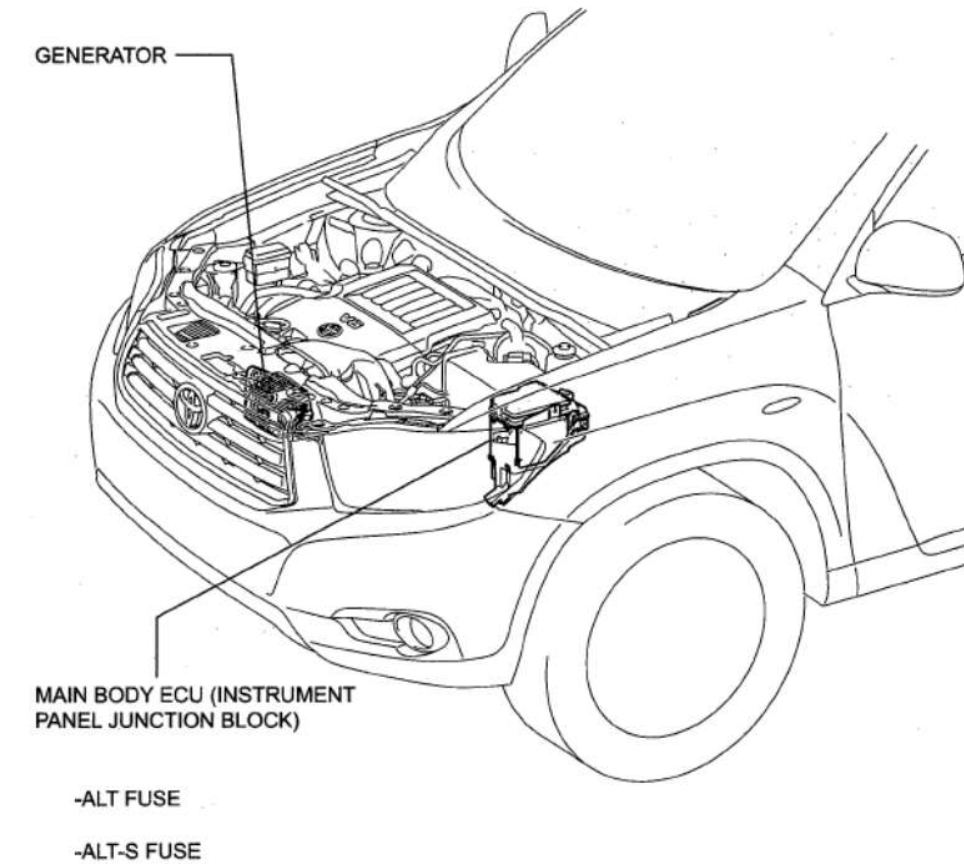
Expression	Ignition Switch (position)	Engine Switch (condition)
Ignition Switch off	LOCK	Off
Ignition Switch on (IG)	ON	On (IG)
Ignition Switch on (ACC)	ACC	On (ACC)
Engine Start	START	Start

3. Check that the battery cables are connected to the correct terminals.
4. Disconnect the battery cables when the battery is given a quick charge.
5. Do not perform tests with a high voltage insulation resistance tester.
6. Never disconnect the battery cables while the engine is running.
7. Check that the charging cable nut is tightened on terminal B of the generator and the engine room relay block.

PARTS LOCATION

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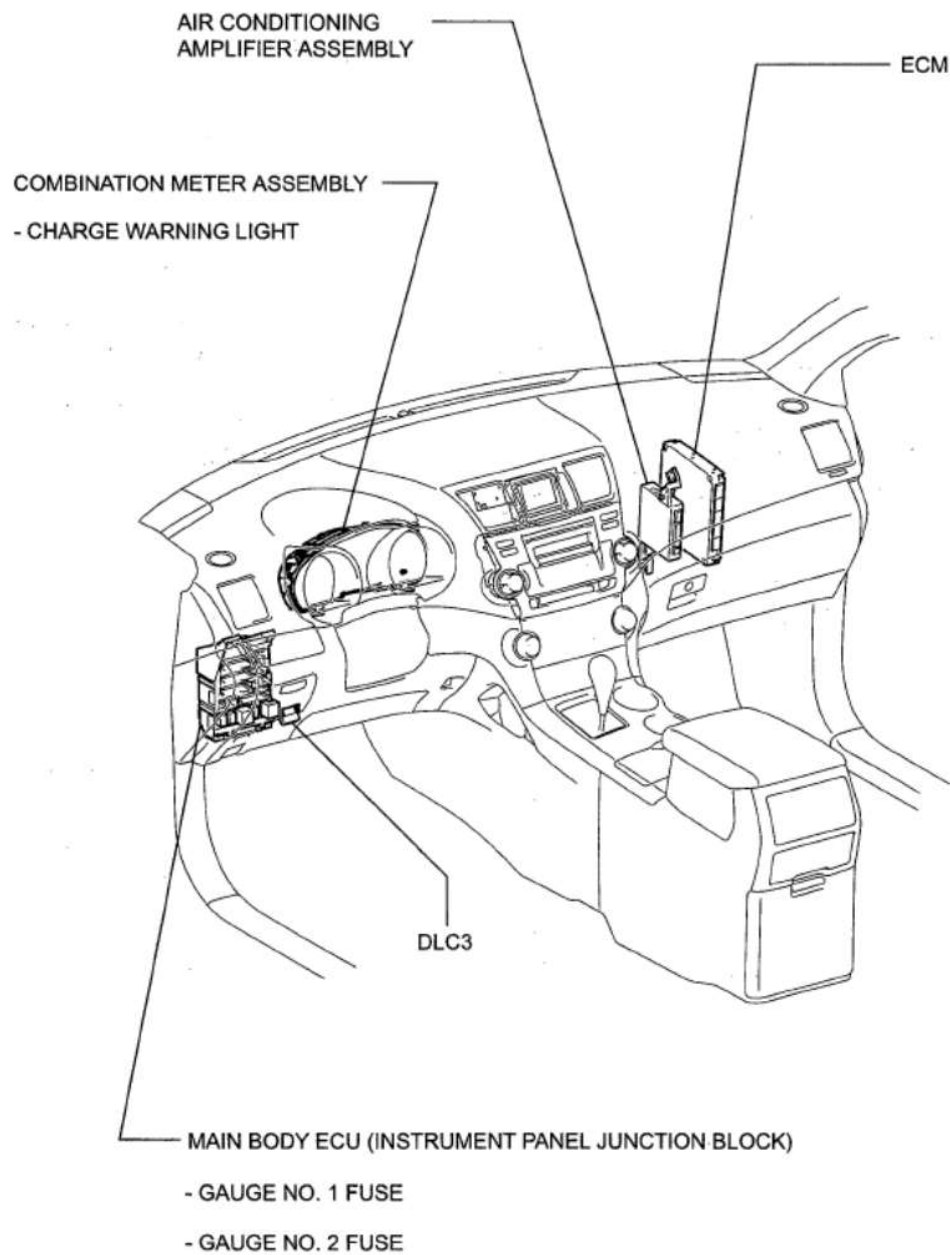
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Fig. 1: Identifying Charging System Parts Location (1 Of 2)
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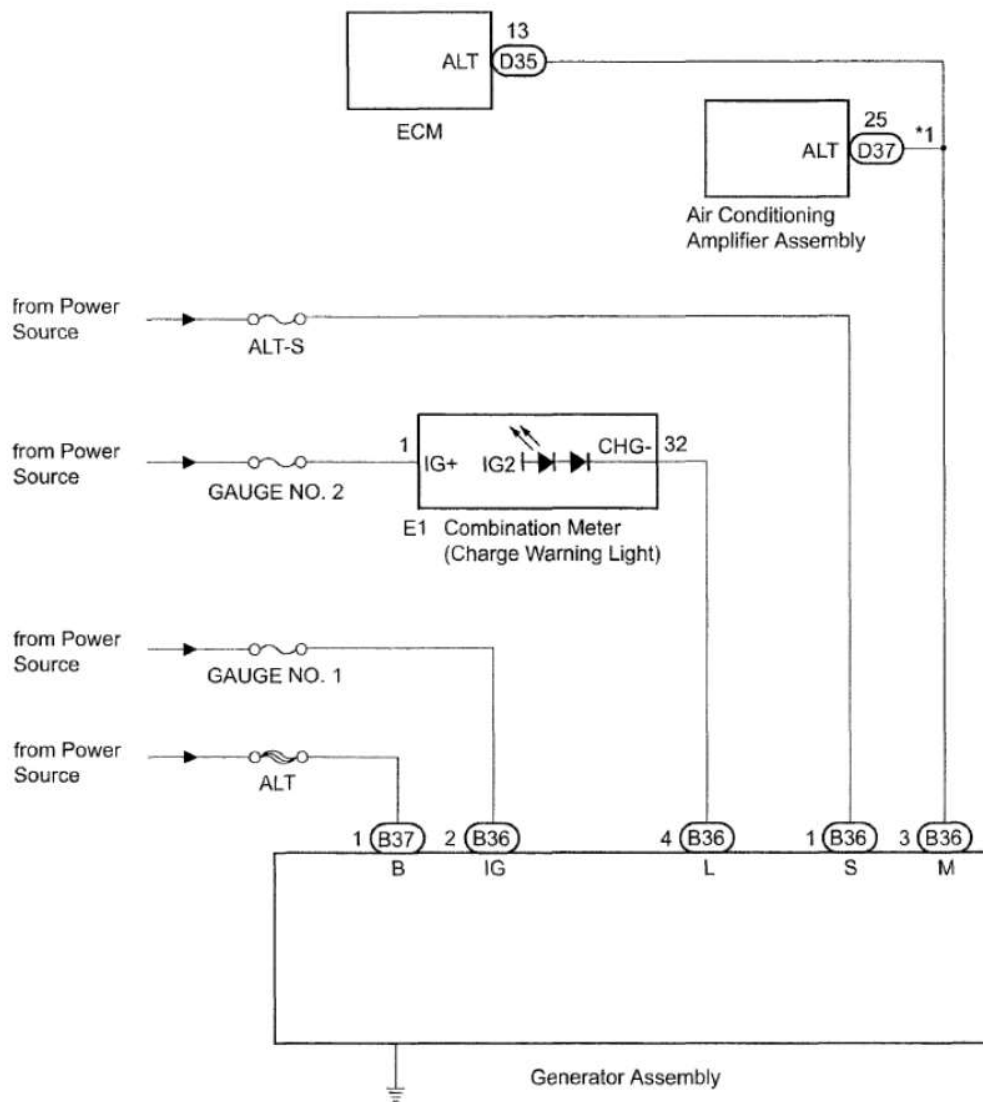
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Fig. 2: Identifying Charging System Parts Location (2 Of 2)
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SYSTEM DIAGRAM

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*1: with PTC Heater Assembly

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Fig. 3: Charging System Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

PROBLEM SYMPTOMS TABLE

Result

RESULT REFERENCE CHART

Symptom	Suspected Area	Refer to
	Clutch pulley	<u>CHARGE WARNING LIGHT COMES ON</u>

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Charge Warning Light Comes ON while Driving		<u>WHILE DRIVING</u>
	Generator assembly	<u>CHARGE WARNING LIGHT COMES ON WHILE DRIVING</u>
Noise Occurs from Generator while Engine is Running	V-ribbed belt	<u>NOISE OCCURS FROM GENERATOR WHILE ENGINE IS RUNNING</u>
	Clutch pulley	<u>NOISE OCCURS FROM GENERATOR WHILE ENGINE IS RUNNING</u>
	Generator assembly	<u>NOISE OCCURS FROM GENERATOR WHILE ENGINE IS RUNNING</u>

ON-VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

- a. Check the electrolyte level.

1. If the electrolyte level is low, replace the battery (or add distilled water) and check the charging system.

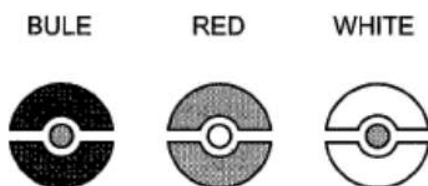
2. CHECK BATTERY SPECIFIC GRAVITY

- a. Check the color of the hydrometer.

Result

RESULT REFERENCE CHART

Hydrometer Color	Condition
Blue	Good
White	Charging necessary
Red	Add distilled water



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Fig. 4: Identifying Color Of Hydrometer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. CHECK BATTERY VOLTAGE

- a. Turn the engine switch off and turn on the headlights for 20 to 30 seconds. This will remove the surface charge from the battery.
- b. Measure the battery voltage between the negative (-) and positive (+) terminals of the battery.

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

HINT:

If the voltage is below the specification, charge the battery.

4. CHECK BATTERY TERMINAL

- a. Check that the battery terminals are not loose or corroded.

If the terminals are corroded, clean them.

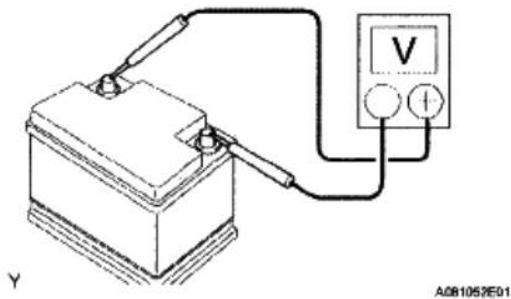


Fig. 5: Measuring Battery Voltage Between Negative (-) And Positive (+) Terminals Of Battery

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. CHECK FUSES

- a. Measure the resistance of the ALT fuse, ALT-S fuse, GAUGE NO. 1 fuse and GAUGE NO. 2 fuse.

Standard resistance: Below 1 ohms

If the results are not as specified, replace the fuses as necessary.

6. CHECK V-RIBBED BELT

- a. Check the belt for wear, cracks or other signs of damage.

If any of the following defects is found, replace the V-ribbed belt.

- The belt is worn out, cracked, or the cords are exposed.
- The cracks reach the cords in more than one place.
- The belt has chunks missing from the ribs.

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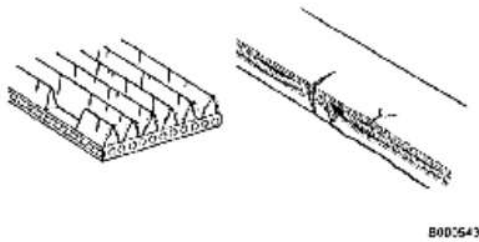


Fig. 6: Checking Belt For Wear, Cracks Or Damage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check that the belt 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.

If it has slipped out, replace the V-ribbed belt. Install a new V-ribbed belt correctly.

7. INSPECT GENERATOR WIRING

- a. Visually check the generator wiring.
 1. Check that the wiring is in good condition.

8. CHECK FOR ABNORMAL NOISES

- a. Listen for abnormal noises from the generator.
 1. Check that no abnormal noises are heard from the generator while the engine is running.

9. INSPECT CHARGE WARNING LIGHT CIRCUIT

- a. Turn the ignition switch on (IG). Check that the charge warning light comes on.
- b. Start the engine and check that the light goes off. If the light does not operate as specified, troubleshoot the charge warning light circuit.

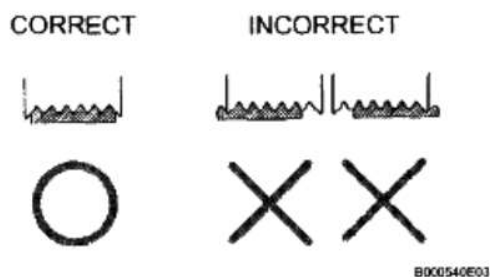


Fig. 7: Checking Belt Fits Properly In Ribbed Grooves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSPECT CHARGING CIRCUIT WITHOUT LOAD

- a. Connect a voltmeter and ammeter to the charging circuit as follows.

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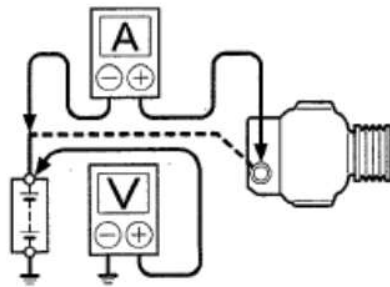
1. Disconnect the wire from terminal B of the generator, then connect it to the negative (-) lead of an ammeter.
2. Connect the positive (+) lead of the ammeter to terminal B of the generator.
3. Connect the positive (+) lead of a voltmeter to the positive (+) terminal of the battery.
4. Ground the negative (-) lead of the voltmeter.
- b. Check the charging circuit.
 1. Keep the engine speed at 2000 rpm and check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.2 to 14.8 V

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

Disconnect Wire from Terminal B



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Fig. 8: Inspecting Charging Circuit Without Load
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

If the battery is not fully charged, the ammeter reading will sometimes be more than the standard amperage.

11. INSPECT CHARGING CIRCUIT WITH LOAD

- a. With the engine running at 2000 rpm, turn the high beam headlights on and turn the heater blower switch to the "HI" position.
- b. Check the reading on the ammeter.

Standard amperage: 30 A or more

If the ammeter reading is less than the standard amperage, repair the generator.

HINT:

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If the battery is fully charged, the indication will sometimes be less than the standard amperage. If this is the case, add more electrical load (operate the wipers, rear window defogger, etc.) and check the reading on the ammeter again.

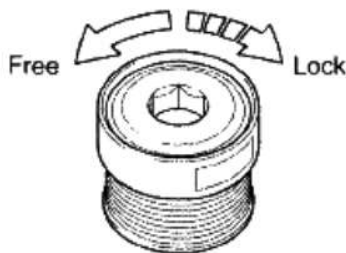
CHARGE WARNING LIGHT COMES ON WHILE DRIVING**INSPECTION PROCEDURE****1. CHECK LOCK FUNCTION OF CLUTCH PULLEY**

- a. Check the lock function with the pulley installed in the vehicle.
 1. Visually check that the rotor in the generator operates with the engine started.
- b. Check the lock function with the pulley removed from the vehicle.
 1. Remove the generator pulley cap. Using SST, hold the generator rotor.
 2. Turn the clutch pulley clockwise and check that the outer ring locks.

OK:

The outer ring locks.

SST 09820-63021



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Fig. 9: Checking Lock Function Of Clutch Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: REPLACE CLUTCH PULLEY

OK: Go to next step

2. CHECK LOCK OF CLUTCH PULLEY

- a. Start the engine and visually check for looseness of the clutch pulley.

OK: The clutch pulley is not loose.

NG: TIGHTEN CLUTCH PULLEY TO THE SPECIFIED TORQUE

OK: REPLACE GENERATOR ASSEMBLY

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NOISE OCCURS FROM GENERATOR WHILE ENGINE IS RUNNING**INSPECTION PROCEDURE****1. CHECK LOOSENESS OF V-RIBBED BELT**

- a. Check the tension of the belt by pushing it down with a finger.

OK: The tension of the belt is enough.**NG: REPLACE V-RIBBED BELT TENSIONER ASSEMBLY****OK: Go to next step****2. CHECK V-RIBBED BELT FOR WEAR**

- a. Check the V-ribbed belt for wear.

OK: The V-ribbed belt is not worn.**NG: REPLACE V-RIBBED BELT****OK: Go to next step****3. CHECK CLUTCH PULLEY FOR WEAR**

- a. Check the clutch pulley groove for wear or other defects.

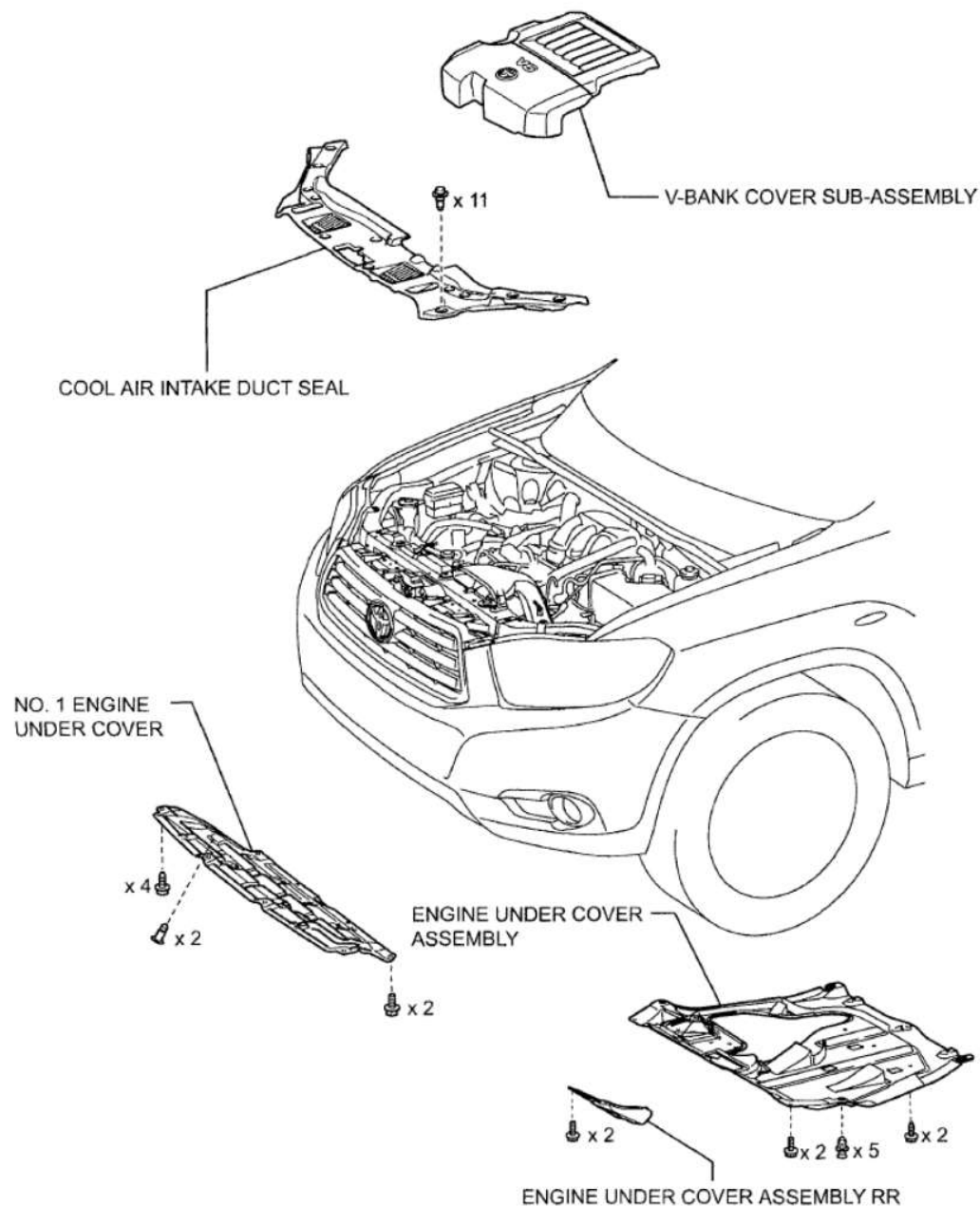
OK: The clutch pulley groove is not damaged.**NG: REPLACE CLUTCH PULLEY****OK: Go to next step****4. CHECK FOR NOISE WHILE CLUTCH PULLEY IS OPERATING**

- a. Perform a road test and check if noise occurs when decelerating.

OK: Noise does not occur.**NG: REPLACE CLUTCH PULLEY****OK: REPLACE GENERATOR ASSEMBLY****GENERATOR****COMPONENTS**

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Fig. 10: Identifying Generator Components (1 Of 6) With Torque Specifications
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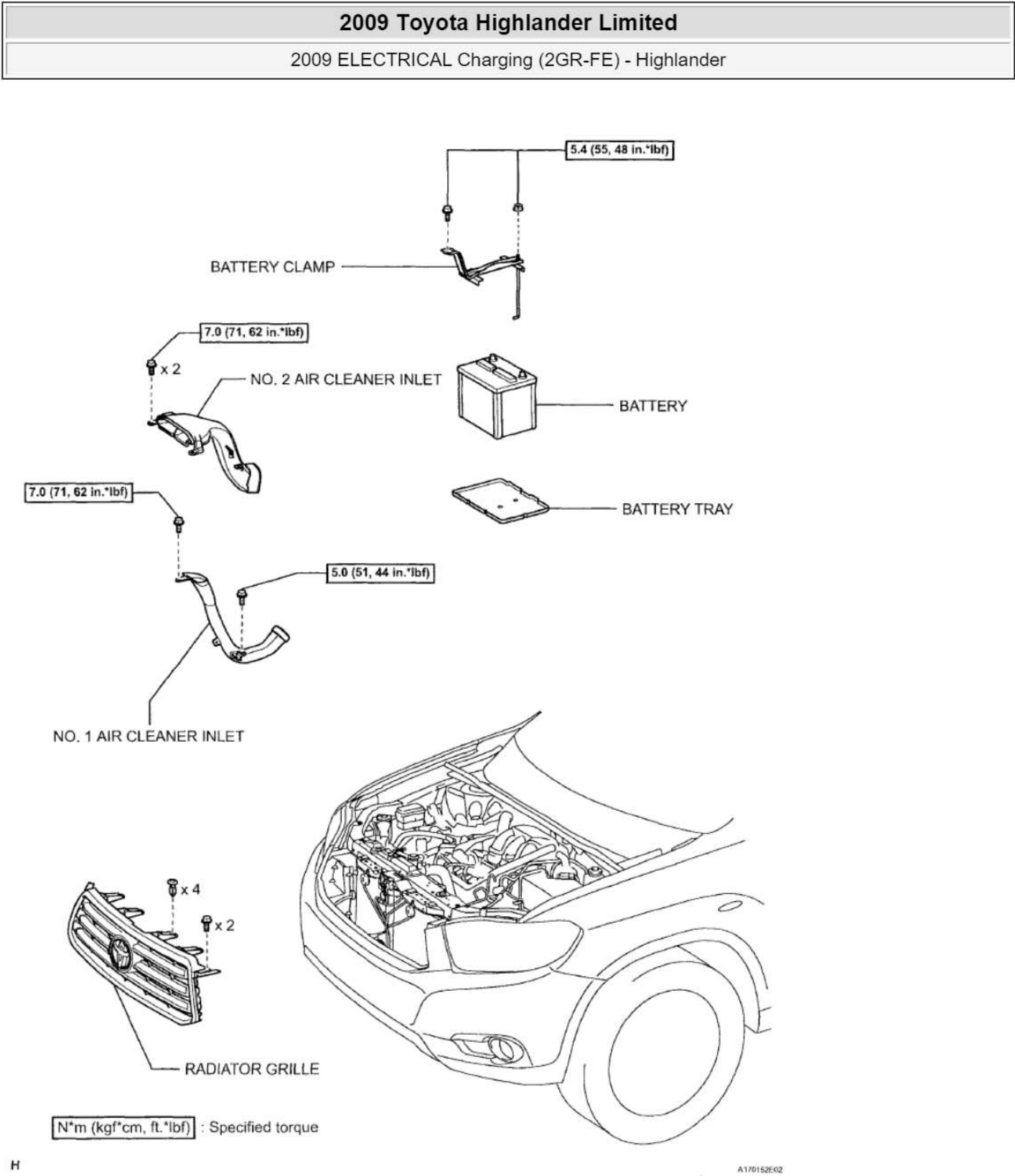


Fig. 11: Identifying Generator Components (2 Of 6) With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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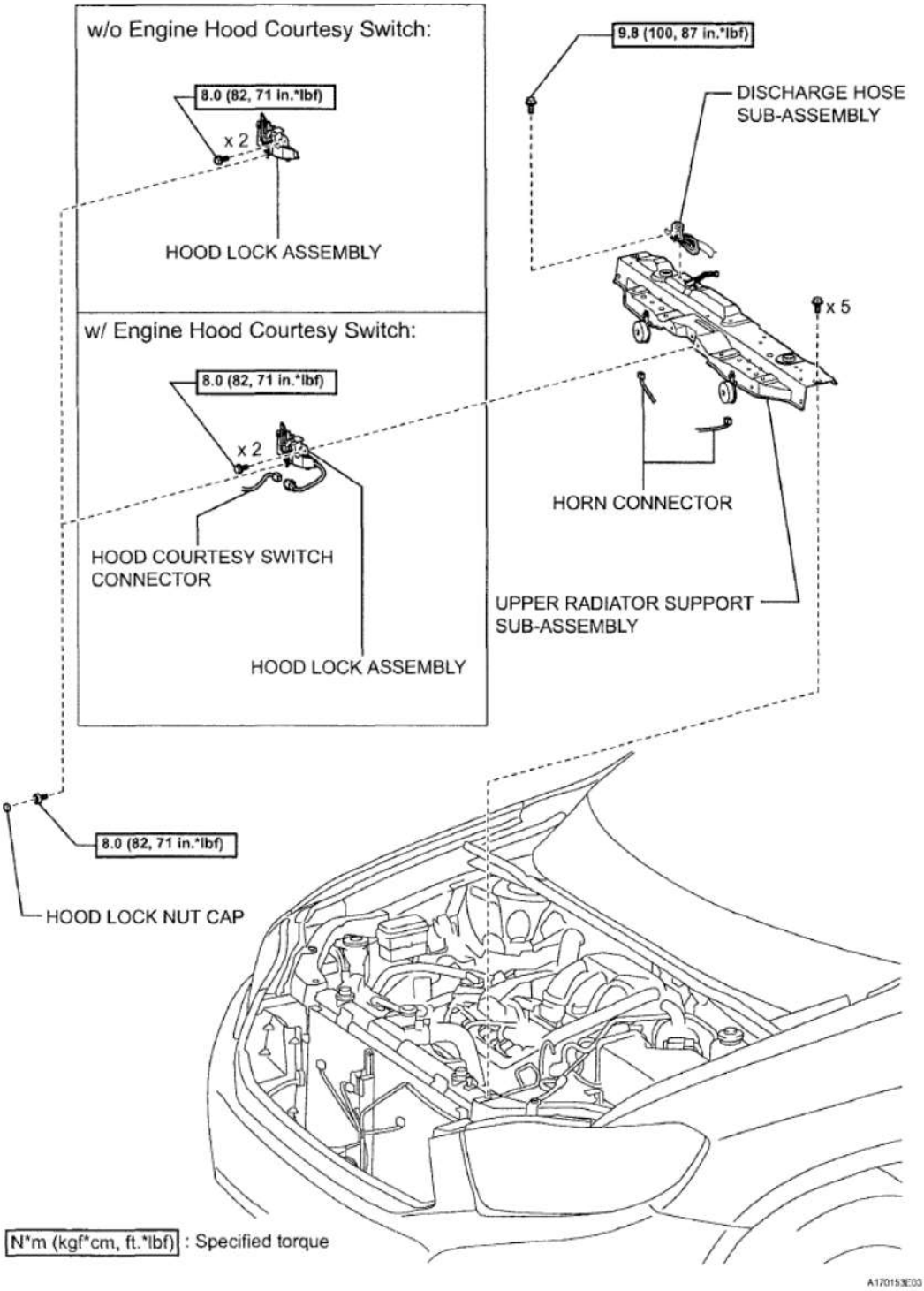


Fig. 12: Identifying Generator Components (3 Of 6) With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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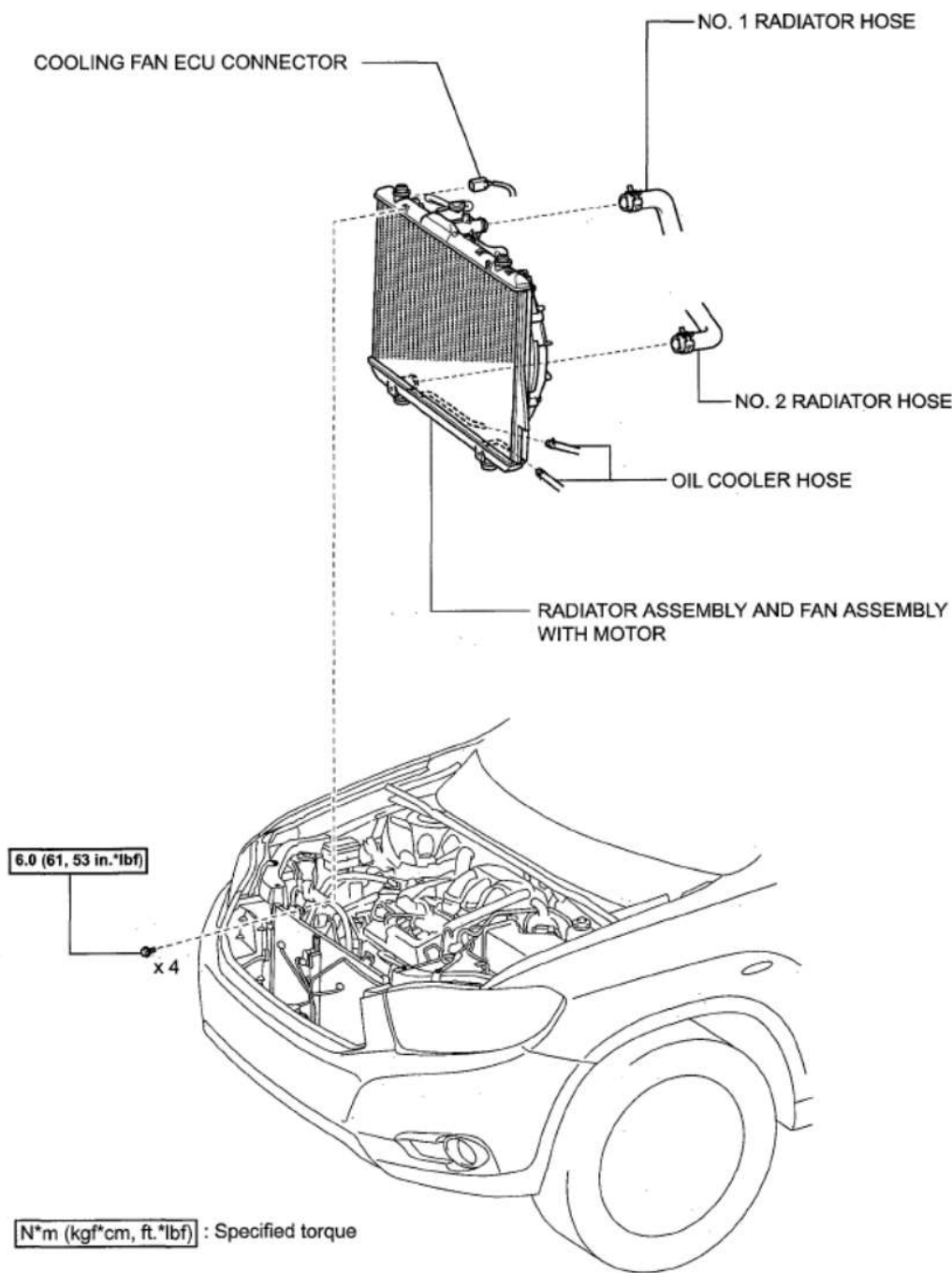


Fig. 13: Identifying Generator Components (4 Of 6) With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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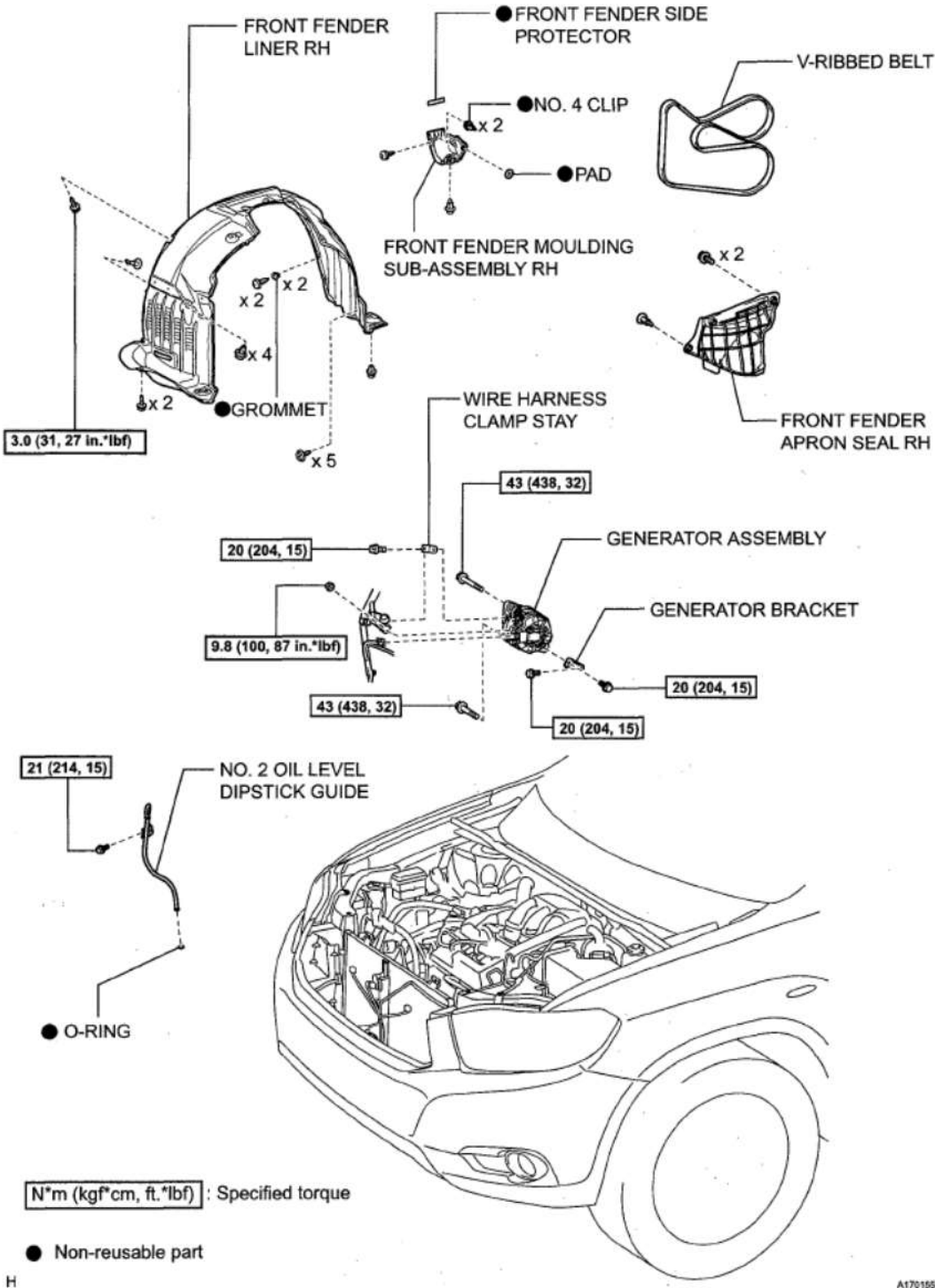
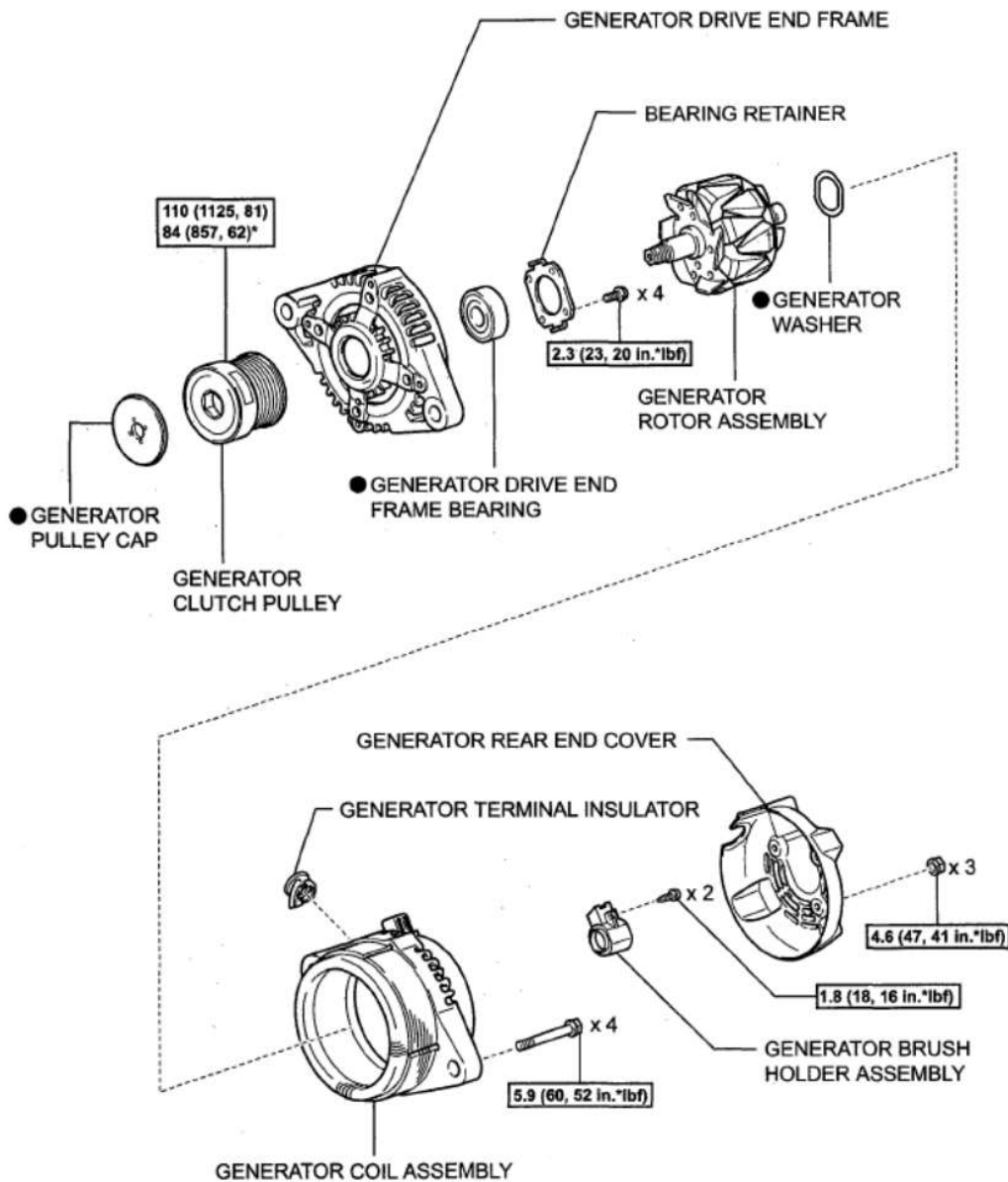


Fig. 14: Identifying Generator Components (5 Of 6) With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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[N*m (kg*cm, ft.*lbf)]: Specified torque

* For use with SST

● Non-reusable part

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Fig. 15: Identifying Generator Components (6 Of 6) With Torque Specifications
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REMOVAL

1. REMOVE FRONT WHEEL RH
2. REMOVE ENGINE UNDER COVER ASSEMBLY (See REMOVAL)

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3. **REMOVE NO. 1 ENGINE UNDER COVER** (See REMOVAL)
4. **REMOVE FRONT FENDER MOULDING SUB-ASSEMBLY RH**

HINT:

Use the same procedures for the RH side and LH side (See REMOVAL).

5. **REMOVE FRONT FENDER LINER RH** (See REMOVAL)
6. **REMOVE FRONT FENDER APRON SEAL RH** (See REMOVAL)
7. **DRAIN ENGINE COOLANT** (See COOLANT)
8. **REMOVE V-BANK COVER SUB-ASSEMBLY** (See REMOVAL)
9. **REMOVE COOL AIR INTAKE DUCT SEAL** (See REMOVAL)
10. **REMOVE BATTERY** (See REMOVAL)
11. **REMOVE NO. 2 AIR CLEANER INLET** (See REMOVAL)
12. **REMOVE NO. 1 AIR CLEANER INLET** (See REMOVAL)
13. **DISCONNECT NO. 1 RADIATOR HOSE** (See REMOVAL)
14. **DISCONNECT NO. 2 RADIATOR HOSE** (See REMOVAL)
15. **DISCONNECT OIL COOLER HOSE** (See REMOVAL)
16. **DISCONNECT COOLING FAN ECU CONNECTOR** (See REMOVAL)
17. **REMOVE RADIATOR GRILLE** (See REMOVAL)
18. **REMOVE HOOD LOCK ASSEMBLY (w/o Engine Hood Courtesy Switch)** (See REMOVAL)
19. **REMOVE HOOD LOCK ASSEMBLY (w/ Engine Hood Courtesy Switch)** (See REMOVAL)
20. **REMOVE UPPER RADIATOR SUPPORT SUB-ASSEMBLY** (See REMOVAL)
21. **SEPARATE COOLER CONDENSER ASSEMBLY** (See REMOVAL)
22. **REMOVE RADIATOR ASSEMBLY AND FAN ASSEMBLY WITH MOTOR** (See REMOVAL)
23. **REMOVE NO. 2 OIL LEVEL DIPSTICK GUIDE**
 - a. Remove the bolt and the No. 2 oil level dipstick guide.
24. **REMOVE V-RIBBED BELT** (See INSPECTION)

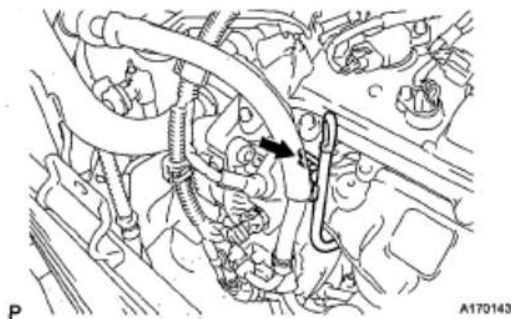
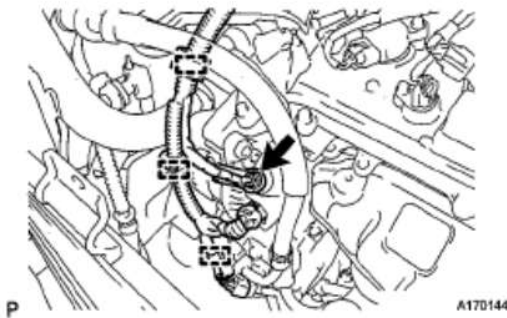


Fig. 16: Locating No. 2 Oil Level Dipstick Guide Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

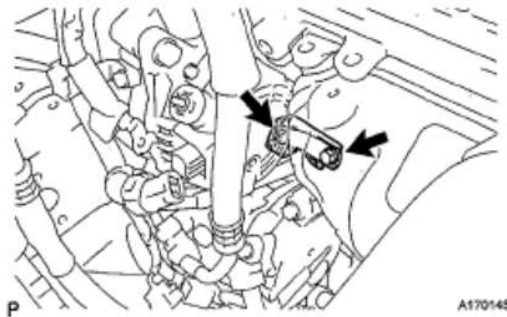
2009 Toyota Highlander Limited**2009 ELECTRICAL Charging (2GR-FE) - Highlander****25. REMOVE GENERATOR ASSEMBLY**

- a. Remove the terminal cap.
- b. Remove the nut and disconnect the wire harness from terminal B.
- c. Disconnect the generator connector from the generator assembly.
- d. Disconnect the connector from the compressor and magnetic clutch.
- e. Disconnect the 3 wire harness clamps.

**Fig. 17: Identifying Wire Harness Clamps**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Remove the 2 bolts, and then disconnect the bracket.

**Fig. 18: Locating Generator Assembly Bracket Bolts**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Remove the 2 bolts and the generator assembly.

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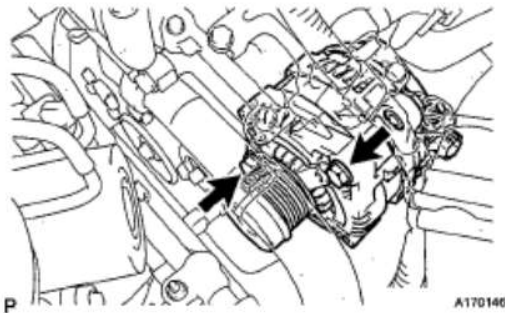


Fig. 19: Locating Generator Assembly Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Disconnect the wire harness clamp, and then remove the generator bracket.

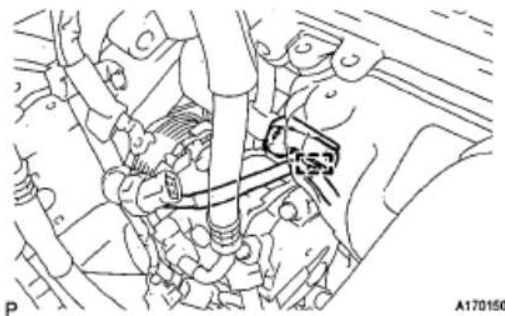


Fig. 20: Identifying Wire Harness Clamp And Generator Bracket

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Remove the bolt and the wire harness clamp stay.

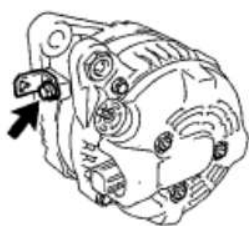


Fig. 21: Locating Wire Harness Clamp Stay Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

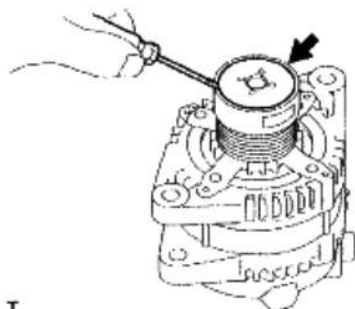
DISASSEMBLY

1. REMOVE GENERATOR CLUTCH PULLEY

- a. Using a screwdriver, remove the generator pulley cap.

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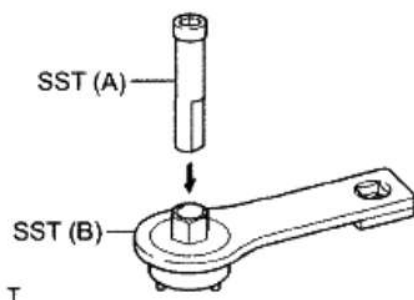
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Fig. 22: Removing Generator Pulley Cap

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Set SST (A) and (B).

SST 09820-63021



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Fig. 23: Identifying SST (A) And (B)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Clamp SST (A) in a vise.

NOTE: Be sure to fix the flat surface of SST (A) in a vise.

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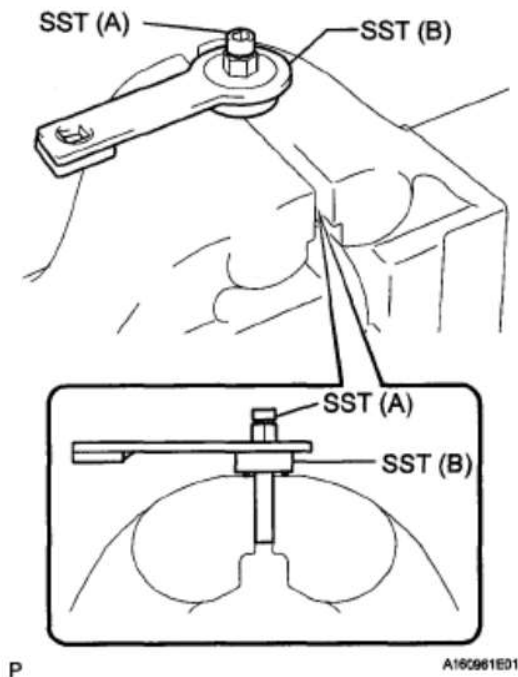


Fig. 24: Clamping SST In Vise

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Place the rotor shaft end into SST (A).

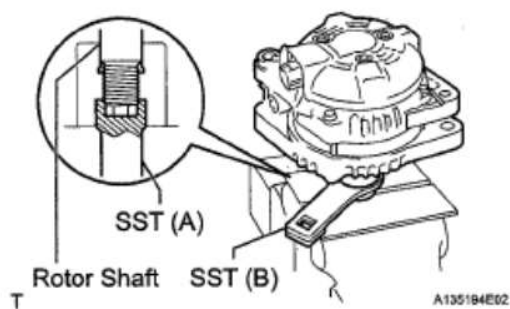


Fig. 25: Placing Rotor Shaft End Into SST (A)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Fit SST (B) to the clutch pulley.

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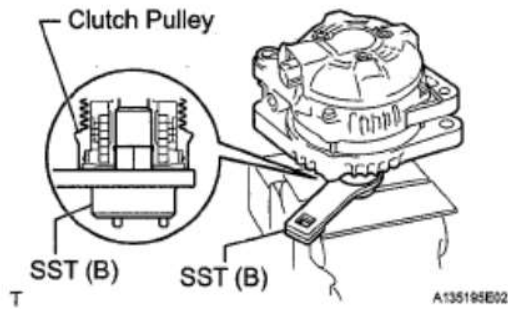


Fig. 26: Fitting SST (B) To Clutch Pulley

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Loosen the pulley by turning SST (B) in the direction shown in the illustration.

NOTE: Hold the generator assembly tightly.

- g. Remove the generator assembly from SST.
- h. Remove the clutch pulley from the rotor shaft.

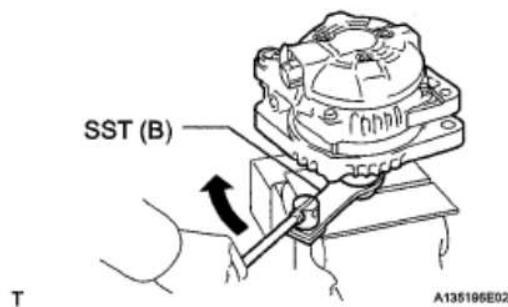


Fig. 27: Loosening Pulley By Turning SST (B)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE GENERATOR REAR END COVER

- a. Place the generator assembly on the clutch pulley.

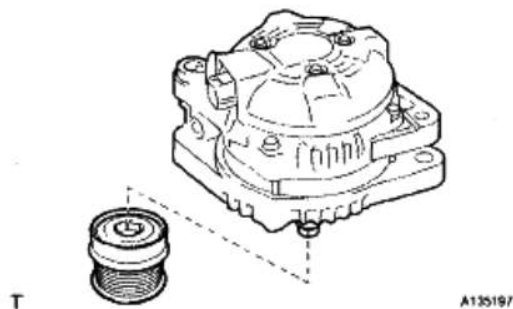
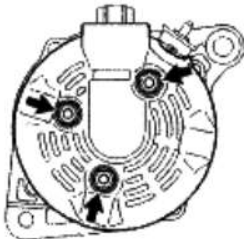


Fig. 28: Placing Generator Assembly On Clutch Pulley

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 3 nuts and generator rear end cover.



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Fig. 29: Locating Generator Rear End Cover Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE GENERATOR TERMINAL INSULATOR

- a. Remove the terminal insulator from the generator coil.



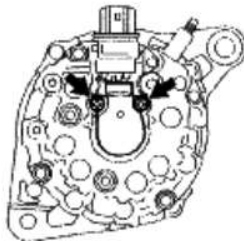
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Fig. 30: Locating Generator Coil Terminal Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE GENERATOR BRUSH HOLDER ASSEMBLY

- a. Remove the 2 screws and brush holder from the generator coil.



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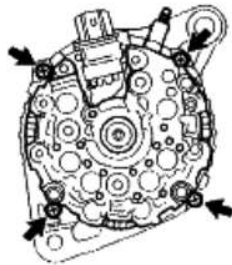
Fig. 31: Locating Generator Brush Holder Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE GENERATOR COIL ASSEMBLY

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- a. Remove the 4 bolts.



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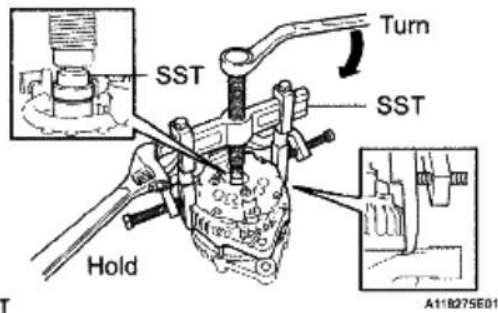
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Fig. 32: Locating Generator Coil Assembly Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, remove the generator coil assembly.

SST 09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04071, 09957-04010, 09958-04011)



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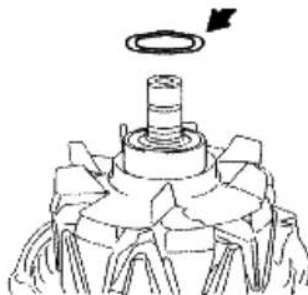
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Fig. 33: Removing Generator Coil Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE GENERATOR ROTOR ASSEMBLY

- a. Remove the generator washer.



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Fig. 34: Locating Generator Washer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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- b. Remove the generator rotor assembly.

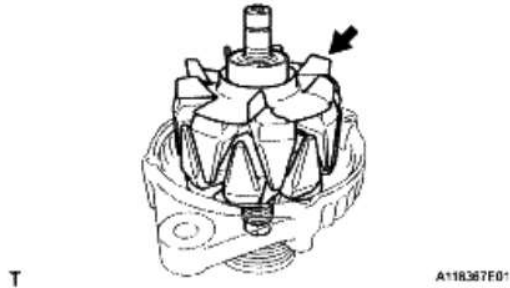


Fig. 35: Locating Generator Rotor Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT GENERATOR CLUTCH PULLEY

- a. Hold the center of the pulley, and confirm that the outer ring turns counterclockwise and does not turn clockwise.

If the result is not as specified, replace the clutch pulley.

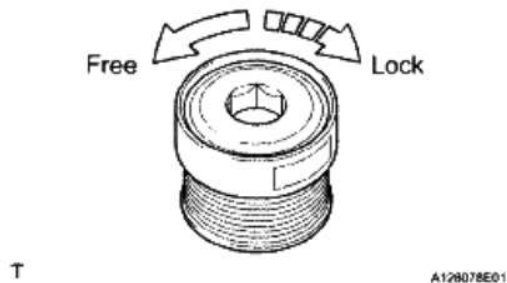


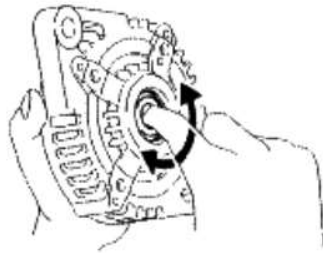
Fig. 36: Inspecting Generator Clutch Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT GENERATOR DRIVE END FRAME BEARING

- a. Check that the bearing is not rough or worn.

OK: The bearing rotates smoothly.

If the bearing does not rotate smoothly, replace the bearing.

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Fig. 37: Inspecting Generator Drive End Frame Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT GENERATOR BRUSH HOLDER ASSEMBLY

- a. Using vernier calipers, measure the length of the exposed brushes.

Standard exposed length: 9.5 to 11.5 mm (0.374 to 0.453 in.)

Minimum exposed length: 4.5 mm (0.177 in.)

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

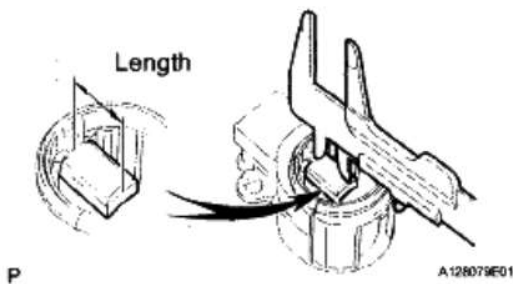


Fig. 38: Measuring Length Of Exposed Brushes
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSPECT GENERATOR ROTOR ASSEMBLY

- a. Check that the generator rotor bearing is not rough or worn.

If necessary, replace the generator rotor assembly.

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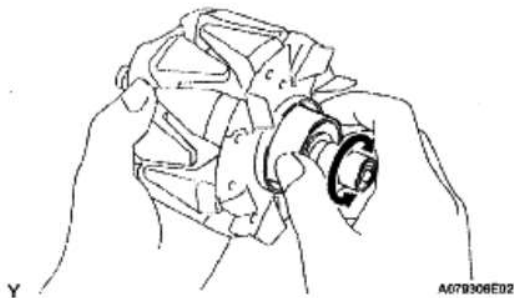


Fig. 39: Checking Generator Rotor Bearing Is Not Rough Or Worn
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

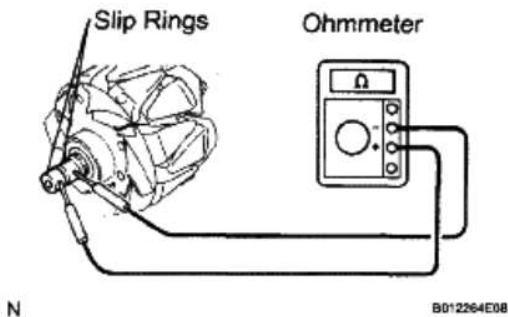


Fig. 40: Checking Generator Rotor For An Open Circuit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check the generator rotor for an open circuit.
1. Using an ohmmeter, measure the resistance between the slip rings.

Standard resistance: w/o Towing Package and Rear Heater Assembly

STANDARD RESISTANCE	
Condition	Specified Condition
Approx. 20°C (68°F)	2.3 to 2.7 ohms (100 A and 130 A type)

w/ Towing Package or Rear Heater Assembly

STANDARD RESISTANCE	
Condition	Specified Condition
Approx. 20°C (68°F)	1.5 to 1.9 ohms (150 A type)

If the result is not as specified, replace the generator rotor assembly.

- c. Check the rotor for a short to ground.
1. Using an ohmmeter, measure the resistance between the slip ring and rotor.

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Standard resistance

STANDARD RESISTANCE	
Tester Condition	Specified Condition
Slip ring - Rotor	1 Mohms or higher

If the result is not as specified, replace the generator rotor assembly.

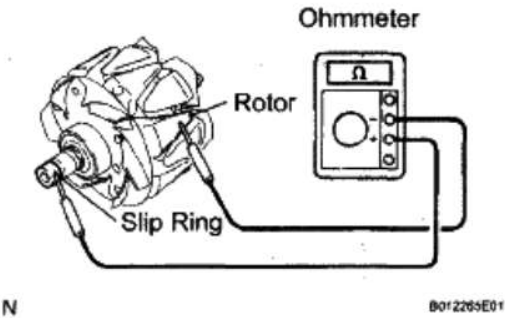


Fig. 41: Checking Rotor For Short To Ground
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. 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 the minimum, replace the generator rotor assembly.

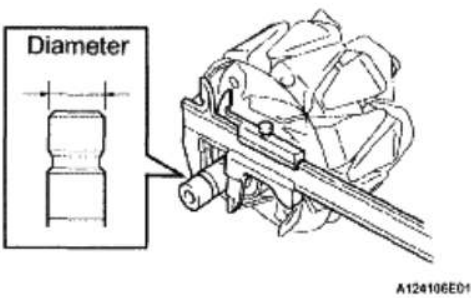


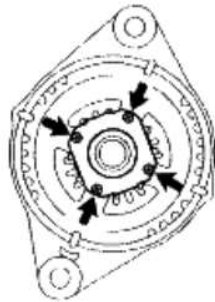
Fig. 42: Measuring Slip Ring Diameter Using Vernier Calipers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

1. REPLACE GENERATOR DRIVE END FRAME BEARING
 - a. Remove the 4 screws and retainer plate from the drive end frame.

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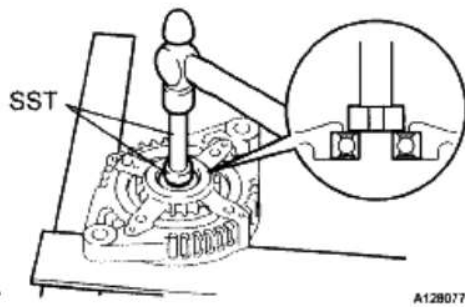
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Fig. 43: Locating Retainer Plate Screws

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST and a hammer, tap out the drive end frame bearing from the drive end frame.

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



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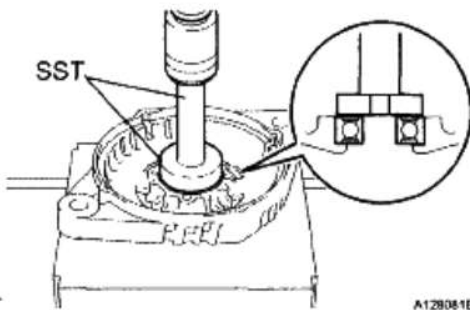
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Fig. 44: Tapping Out Drive End Frame Bearing From Drive End Frame

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST and a press, press in a new generator drive end frame bearing.

SST 09950-60010 (09951-00470), 09950-70010 (09951-07100)



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Fig. 45: Pressing In Generator Drive End Frame Bearing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Fit the tabs on the retainer plate into the cutouts on the drive end frame to install the retainer plate.

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- e. Install the 4 screws.

Torque: 2.3 N*m (23 kgf*cm, 20 in.*lbf)

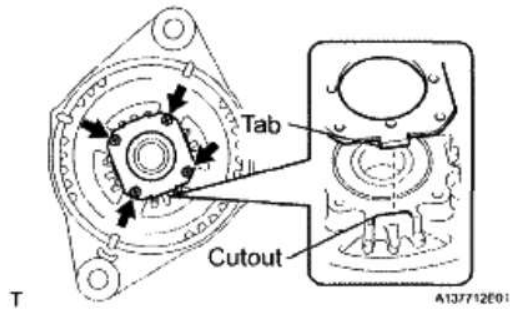


Fig. 46: Locating Retainer Plate Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL GENERATOR ROTOR ASSEMBLY

- Place the drive end frame on the clutch pulley.
- Install the generator rotor assembly to the drive end frame.

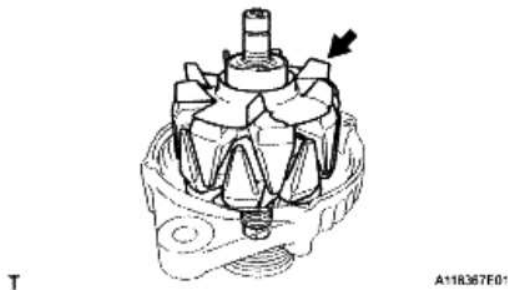
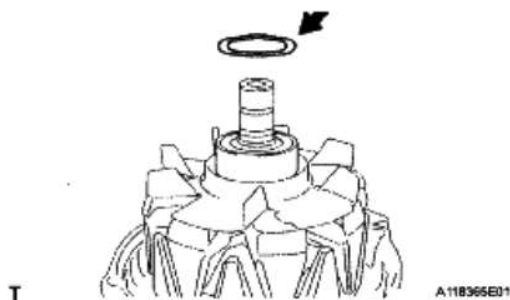


Fig. 47: Locating Generator Rotor Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Place a new generator washer on the generator rotor.



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Fig. 48: Locating Generator Washer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL GENERATOR COIL ASSEMBLY

- a. Using a deep socket wrench (21 mm) and a press, slowly press in the generator coil assembly.

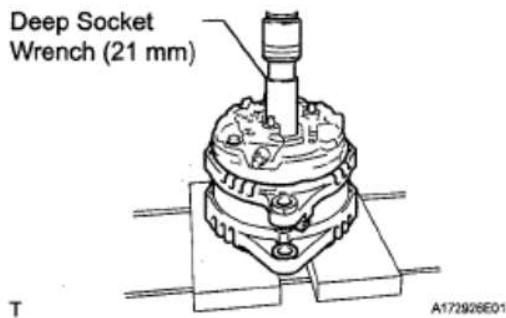


Fig. 49: Pressing In Generator Coil Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the 4 bolts.

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

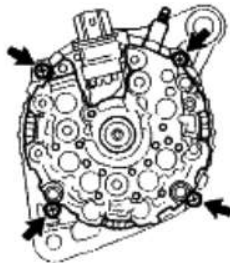


Fig. 50: Locating Generator Coil Assembly Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL GENERATOR BRUSH HOLDER ASSEMBLY

- a. While pushing the 2 brushes into the generator brush holder assembly, insert a 1.0 mm (0.039 in.) pin into the brush holder hole.

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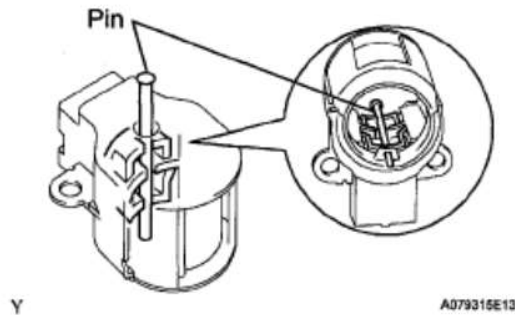


Fig. 51: Inserting Pin Into Brush Holder Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the brush holder assembly to the generator coil with the 2 screws.

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

- c. Pull out the pin from the generator brush holder.

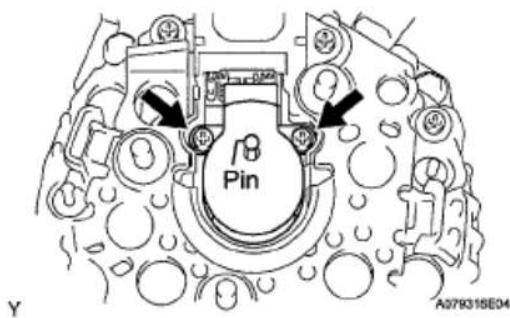


Fig. 52: Locating Brush Holder Assembly Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL GENERATOR TERMINAL INSULATOR

- a. Install the terminal insulator to the generator coil.

NOTE: Pay attention to the installation direction of the terminal insulator.

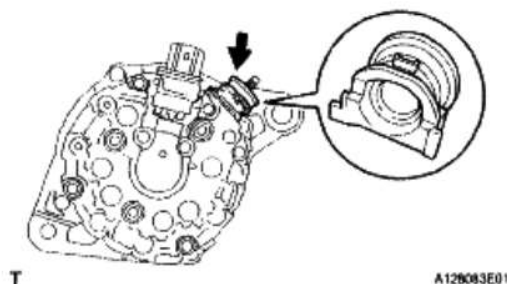


Fig. 53: Locating Generator Coil Terminal Insulator

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

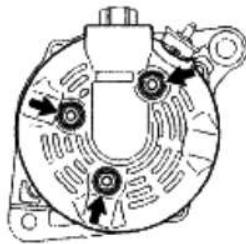
5. INSTALL GENERATOR REAR END COVER

- a. Install the generator rear end cover to the generator coil with the 3 nuts.

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

6. INSTALL GENERATOR CLUTCH PULLEY

- a. Temporarily install the clutch pulley onto the rotor shaft.



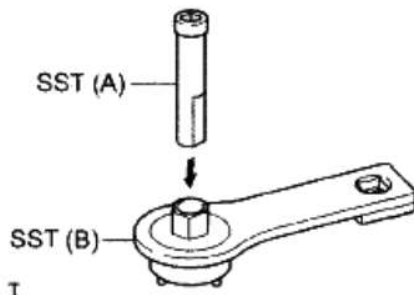
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Fig. 54: Locating Generator Rear End Cover Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Set SST (A) and (B).

SST 09820-63021



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Fig. 55: Setting SST (A) And (B)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Clamp SST (A) in a vise.

NOTE: Be sure to fix the flat surface of SST (A) in a vise.

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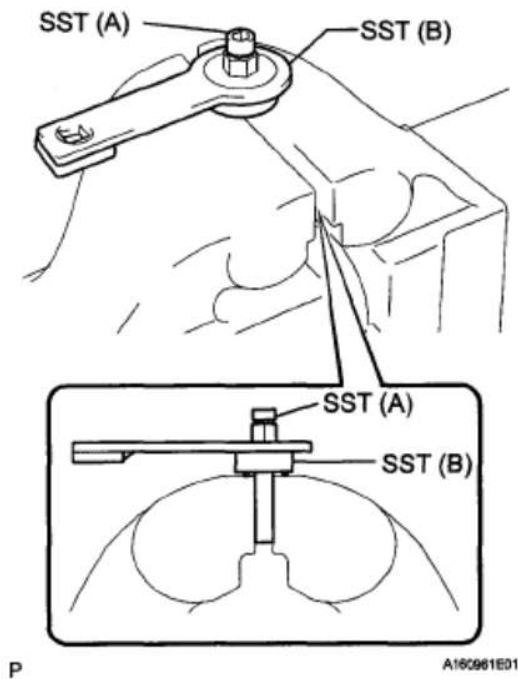


Fig. 56: Clamping SST In Vise

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Place the rotor shaft end into SST (A).

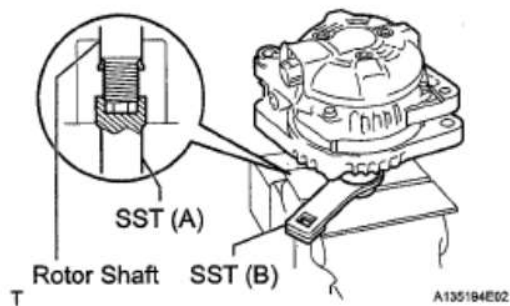


Fig. 57: Placing Rotor Shaft End Into SST (A)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Fit SST (B) to the clutch pulley.

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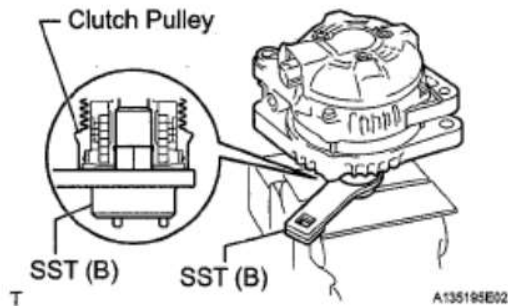


Fig. 58: Fitting SST (B) To Clutch Pulley

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Tighten the pulley by turning SST (B) in the direction shown in the illustration.

Torque: without

110 N*m (1125 kgf*cm, 81 ft.*lbf) with SST

84 N*m (857 kgf*cm, 62 ft.*lbf)

NOTE:

- Use a torque wrench with a fulcrum length of 318 mm (12.52 in.).
- This torque value is effective when SST is parallel to a torque wrench.
- Hold the generator assembly tightly.

- g. Remove the generator assembly from SST.
h. Check that the clutch pulley rotates smoothly.
i. Install a new clutch pulley cap to the clutch pulley.

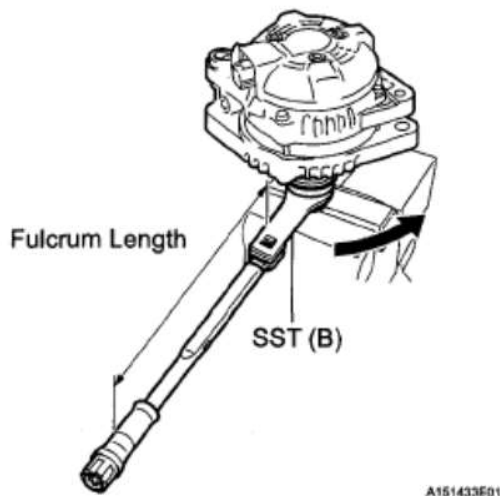


Fig. 59: Tightening Pulley By Turning SST (B)

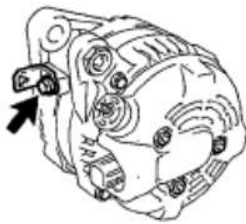
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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION**1. INSTALL GENERATOR ASSEMBLY**

- a. Install the wire harness clamp stay with the bolt.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

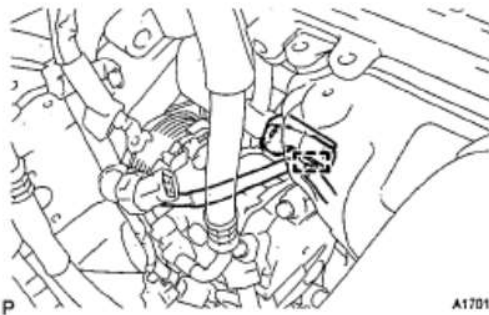
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Fig. 60: Locating Wire Harness Clamp Stay Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Connect the generator bracket with the wire harness clamp.



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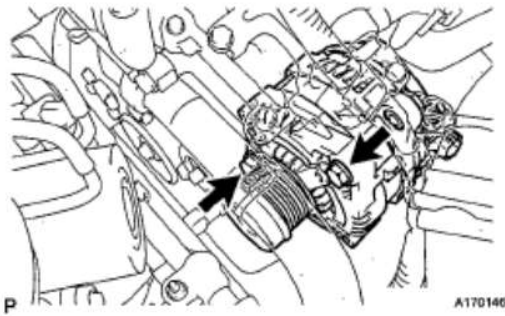
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Fig. 61: Identifying Generator Bracket And Wire Harness Clamp

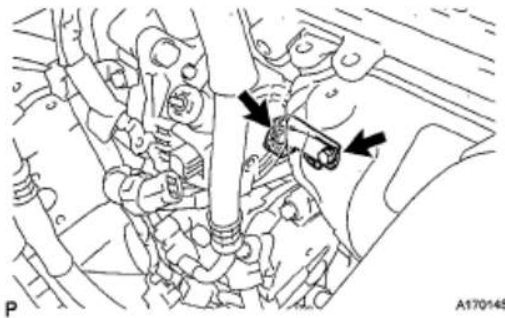
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install generator assembly with the 2 bolts.

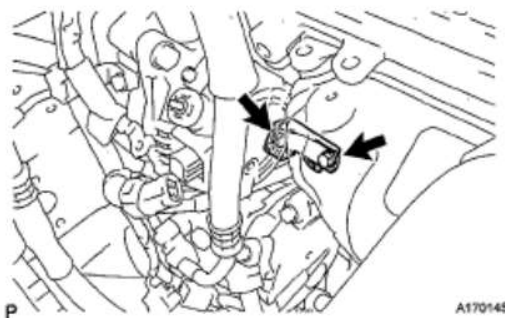
Torque: 43 N*m (438 kgf*cm, 32 ft.*lbf)

2009 Toyota Highlander Limited**2009 ELECTRICAL Charging (2GR-FE) - Highlander****Fig. 62: Locating Generator Assembly Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- d. Temporally install the 2 bolts.

**Fig. 63: Locating Generator Bracket Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- e. Fully tighten the 2 bolts.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)**Fig. 64: Locating Generator Bracket Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- f. Connect the generator connector to the generator assembly.
g. Install the generator wire with the nut.

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Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)

- h. Install the terminal cap.
- i. Connect the 3 wire harness clamps.
- j. Connect the magnetic clutch connector to the compressor and magnetic clutch.

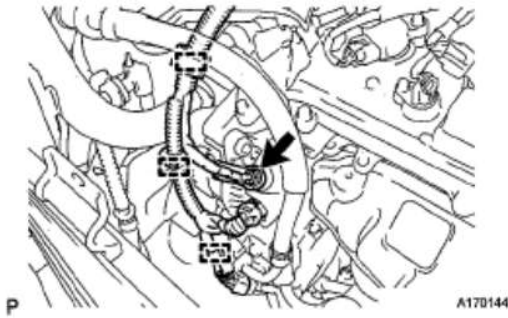


Fig. 65: Identifying Wire Harness Clamps

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL V-RIBBED BELT** (See INSTALLATION)
3. **INSTALL NO. 2 OIL LEVEL DIPSTICK GUIDE**
 - a. Install a new O-ring to the No. 2 oil level dipstick guide.
 - b. Apply a light coat of engine oil to the O-ring.
 - c. Push in the No. 2 oil level dipstick guide end into the No. 1 oil level dipstick guide.
 - d. Install the No. 2 oil level dipstick guide with the bolt.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

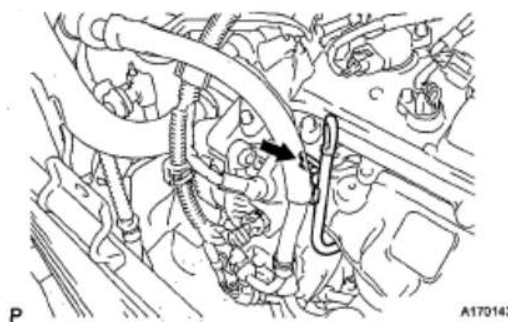


Fig. 66: Locating No. 2 Oil Level Dipstick Guide Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL RADIATOR ASSEMBLY AND FAN ASSEMBLY WITH MOTOR** (See INSTALLATION)
5. **INSTALL COOLER CONDENSER ASSEMBLY** (See INSTALLATION)
6. **INSTALL UPPER RADIATOR SUPPORT SUB-ASSEMBLY** (See INSTALLATION)

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7. **INSTALL HOOD LOCK ASSEMBLY (w/o Engine Hood Courtesy Switch)** (See **INSTALLATION**)
8. **INSTALL HOOD LOCK ASSEMBLY (w/ Engine Hood Courtesy Switch)** (See **INSTALLATION**)
9. **INSTALL RADIATOR GRILLE** (See **INSTALLATION**)
10. **CONNECT COOLING FAN ECU CONNECTOR** (See **INSTALLATION**)
11. **CONNECT OIL COOLER HOSE** (See **INSTALLATION**)
12. **CONNECT NO. 2 RADIATOR HOSE** (See **INSTALLATION**)
13. **CONNECT NO. 1 RADIATOR HOSE** (See **INSTALLATION**)
14. **INSTALL NO. 1 AIR CLEANER INLET** (See **INSTALLATION**)
15. **INSTALL NO. 2 AIR CLEANER INLET** (See **INSTALLATION**)
16. **INSTALL BATTERY** (See **INSTALLATION**)
17. **INSTALL COOL AIR INTAKE DUCT SEAL** (See **INSTALLATION**)
18. **INSTALL FRONT FENDER APRON SEAL RH** (See **INSTALLATION**)
19. **INSTALL FRONT FENDER LINER RH** (See **INSTALLATION**)
20. **INSTALL FRONT FENDER MOULDING SUB-ASSEMBLY RH**

HINT:

Use the same procedures for the RH side and LH side (See **INSTALLATION**).

21. **ADD ENGINE COOLANT** (See **REPLACEMENT**)
22. **INSPECT FOR COOLANT LEAK** (See **COOLING SYSTEM**)
23. **INSPECT AUTOMATIC TRANSAXLE FLUID** (See **INSTALLATION**)
24. **INSPECT FOR OIL LEAK**
25. **INSTALL NO. 1 ENGINE UNDER COVER** (See **INSTALLATION**)
26. **INSTALL ENGINE UNDER COVER ASSEMBLY** (See **INSTALLATION**)
27. **INSTALL FRONT WHEEL RH**

Torque: 103 N*m (1050 kgf*cm, 76 ft.*lbf)

28. **INSTALL V-BANK COVER SUB-ASSEMBLY** (See **INSTALLATION**)