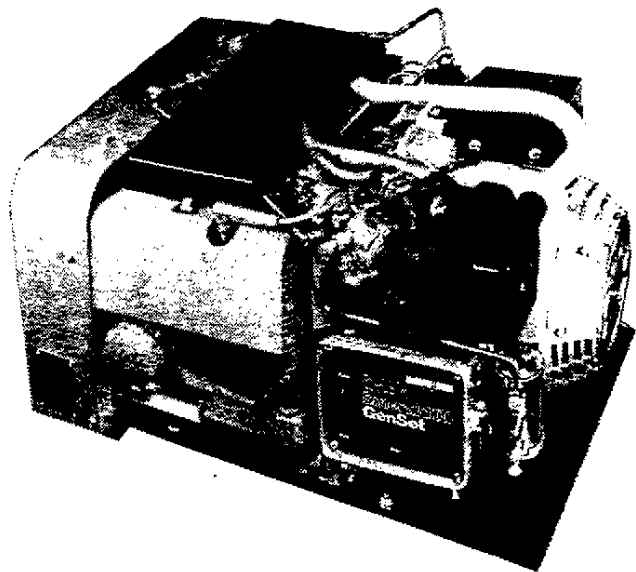


Onan

Service Manual NHE-NHEL GenSets

RV Electric Generating Set
(Spec A-C)



940-0502
7-87
Printed in U.S.A.

Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and the equipment. Safe and efficient operation can be achieved only if the unit is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

DANGER This symbol warns of immediate hazards which will result in severe personal injury or death.

WARNING This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.

CAUTION This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

FUEL AND FUMES ARE FLAMMABLE. Fire, explosion, and personal injury can result from improper practices.

- DO NOT fill fuel tanks while engine is running. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR USE AN OPEN FLAME near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible, non-conductive line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure all fuel supplies have a positive shutoff valve.

GASOLINE AND LPG FUEL MAY BE ACCIDENTALLY IGNITED BY ELECTRICAL SPARKS, presenting the hazard of fire or explosion, which can result in severe personal injury or death. When installing the generator set:

- Do not tie electrical wiring to fuel lines.
- Do not run electrical lines and fuel lines through the same compartment openings.
- Keep electrical and fuel lines as far apart as possible.
- Place a physical barrier between fuel lines and electrical lines wherever possible.
- If electrical and fuel lines must pass through the same compartment opening, make certain that they are physically separated by running them through individual channels, or by passing each line through a separate piece of tubing.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

EXHAUST GASES ARE DEADLY

- Never sleep in the vehicle with the generator set running unless vehicle is equipped with an operating carbon monoxide detector.
- Provide an adequate exhaust system to properly expel discharged gases. Inspect exhaust system daily for leaks per the maintenance schedule. Ensure that exhaust manifolds are secure and not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Before starting work on the generator set, disconnect batteries. This will prevent accidental arcing.

- Keep your hands away from moving parts.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry while working on generator sets. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Disconnect starting battery before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- DO NOT CONNECT GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved device and after building main switch is open. Consult an electrician in regard to emergency power use.

GENERAL SAFETY PRECAUTIONS

- Have a fire extinguisher nearby. Maintain extinguisher properly and become familiar with its use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.
- Hot coolants under pressure can cause severe personal injury. DO NOT open a radiator pressure cap while the engine is running. Stop the engine and carefully bleed the system pressure.
- Benzene and lead, found in some gasoline, have been identified by some state and federal agencies as causing cancer or reproductive toxicity. When checking, draining or adding gasoline, take care not to ingest, breathe the fumes, or contact gasoline.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage, which presents a potential fire hazard.
- DO NOT store anything in the generator compartment such as oil or gas cans, oily rags, chains, wooden blocks, portable propane cylinders, etc. A fire could result or the generator set operation (cooling, noise and vibration) may be adversely affected. Keep the compartment floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

Date: 8-85

Insert with -

Title: NHE/NHEL Service Manual

Number: 940-0502

This supplement includes latest starter repair information for models NHE/NHEL RV gensets.

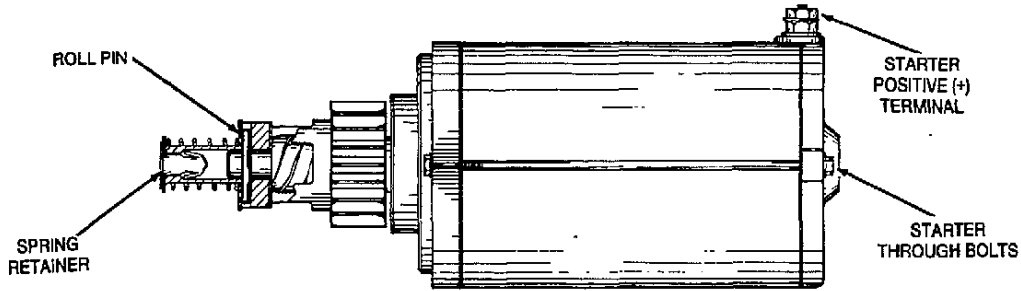


FIGURE 1. 191-1667 STARTER

ES-1608

ELECTRIC STARTER

The following procedures cover the disassembly and testing of electric starter.

Disassembly

Use the following procedure to remove and disassemble the starter.

1. Disconnect the generator set negative (-) battery cable from the set starting battery.
2. Disconnect the generator set positive (+) battery cable from the starter lug terminal.
3. Remove the starter mounting screws and then carefully disengage the starter from the stator housing.
4. Remove starter through-bolts and carefully separate the brush end cap housing and armature assembly.
5. Use a 1/8 to 5/32 inch nail set to remove roll pin. Remove return spring, gear and clutch assembly as required. When reassembling always use a new roll pin. See Figure 2.

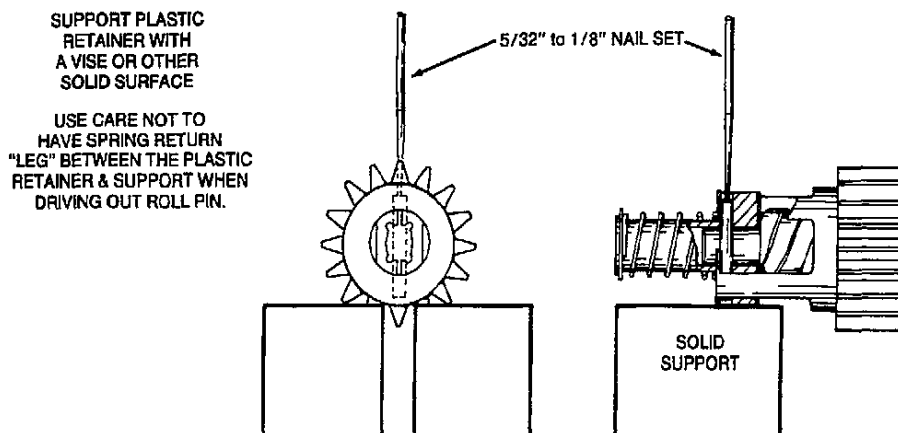


FIGURE 2. DRIVING ROLL PIN OUT

ES-1609

Testing Armature for Grounds: Touch one ohmmeter lead to a commutator bar and then touch the other lead to armature shaft and core laminations. A low resistance reading indicates a grounded armature. Replace grounded armature with a new part. See Figure 3.

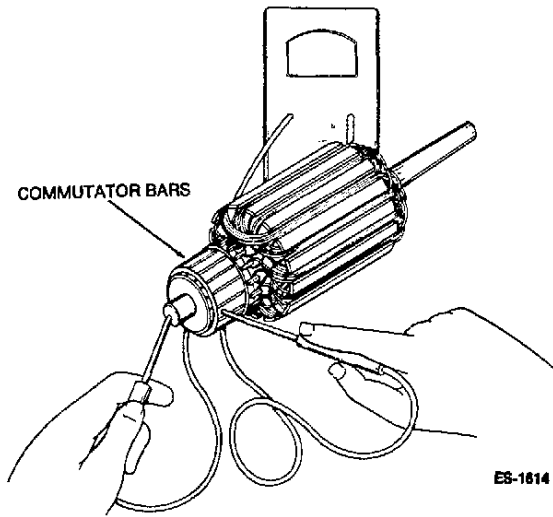


FIGURE 3. TESTING ARMATURE FOR GROUNDS

Testing for Shorts: Use a growler (Figure 4) for locating shorts in the armature. Place armature in growler and hold a thin steel blade (e.g. hacksaw blade) parallel to the core and just above the armature while slowly rotating armature in growler. A shorted armature will cause the blade to vibrate and be attracted to the core. Replace a shorted armature with a new part.

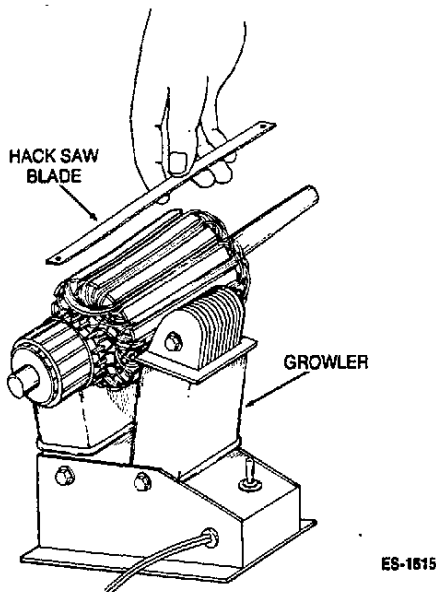


FIGURE 4. TESTING ARMATURE FOR SHORTS

Testing for Opens: Touch one ohmmeter lead to a commutator bar and then systematically touch the other lead to each of the remaining commutator bars. A high resistance reading indicates an open circuit between the commutator bars and armature windings. Replace an open armature with a new part.

Brush Inspection: Measure brushes (Figure 5) and replace if worn less than .425 inch (11 mm).

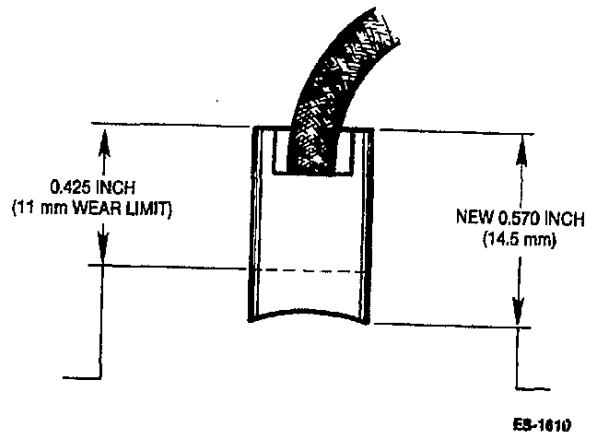


FIGURE 5. BRUSH INSPECTION

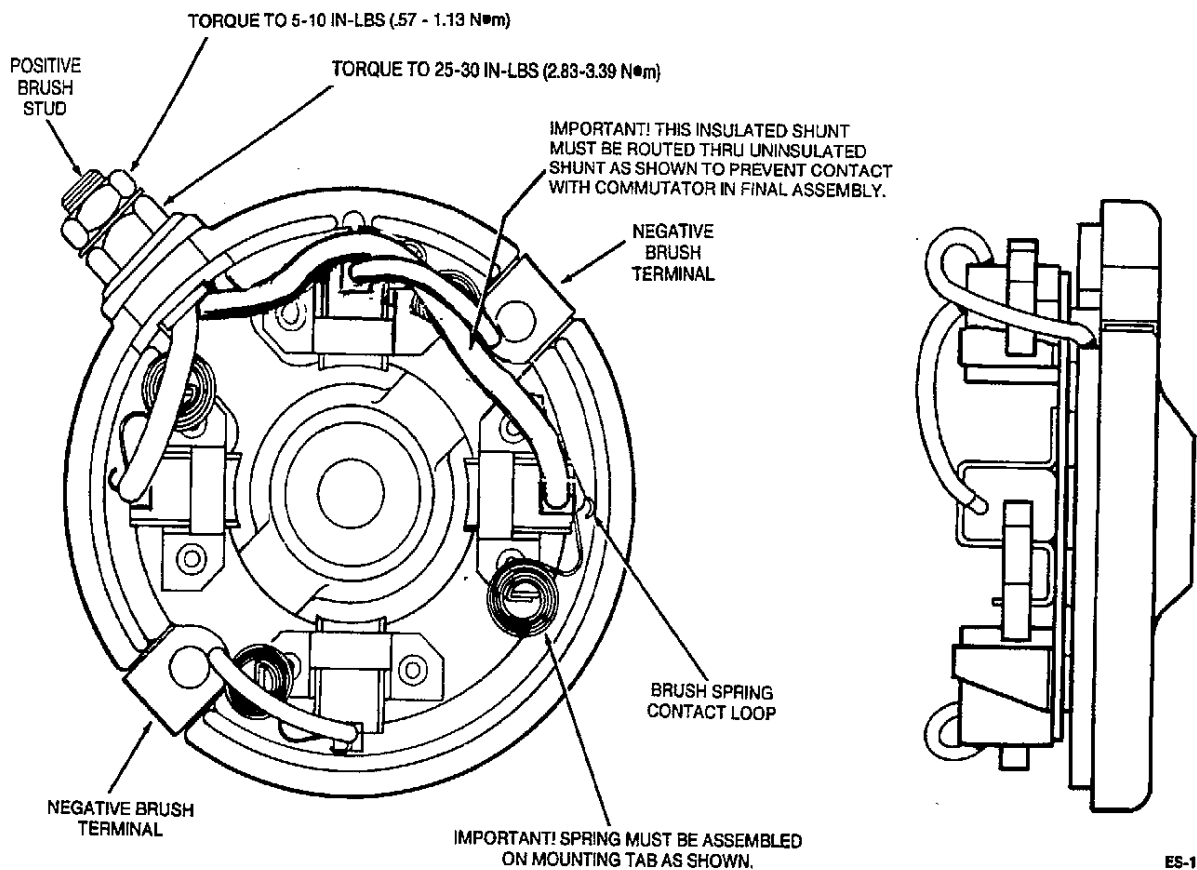


FIGURE 6. BRUSH ENDCAP

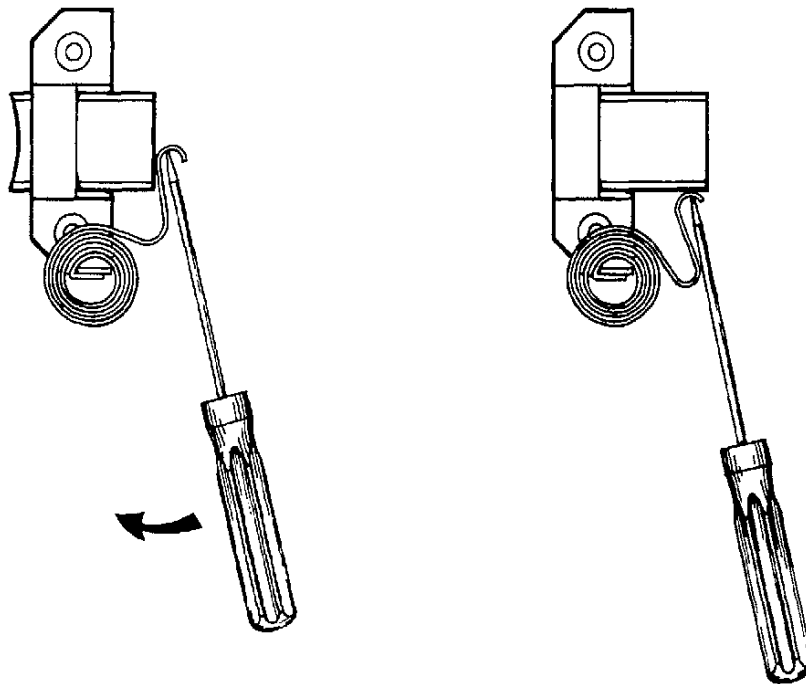
Assembly

1. Wipe off all dirt and oil from starter components using a clean cloth or blow off dirt with filtered, low pressure compressed air.

CAUTION Oil on armature will damage starter. Do not immerse bearings in cleaning fluid. Use a brush dipped in clean engine oil for removing dirt from bearings. Avoid getting oil on brushes or commutator.

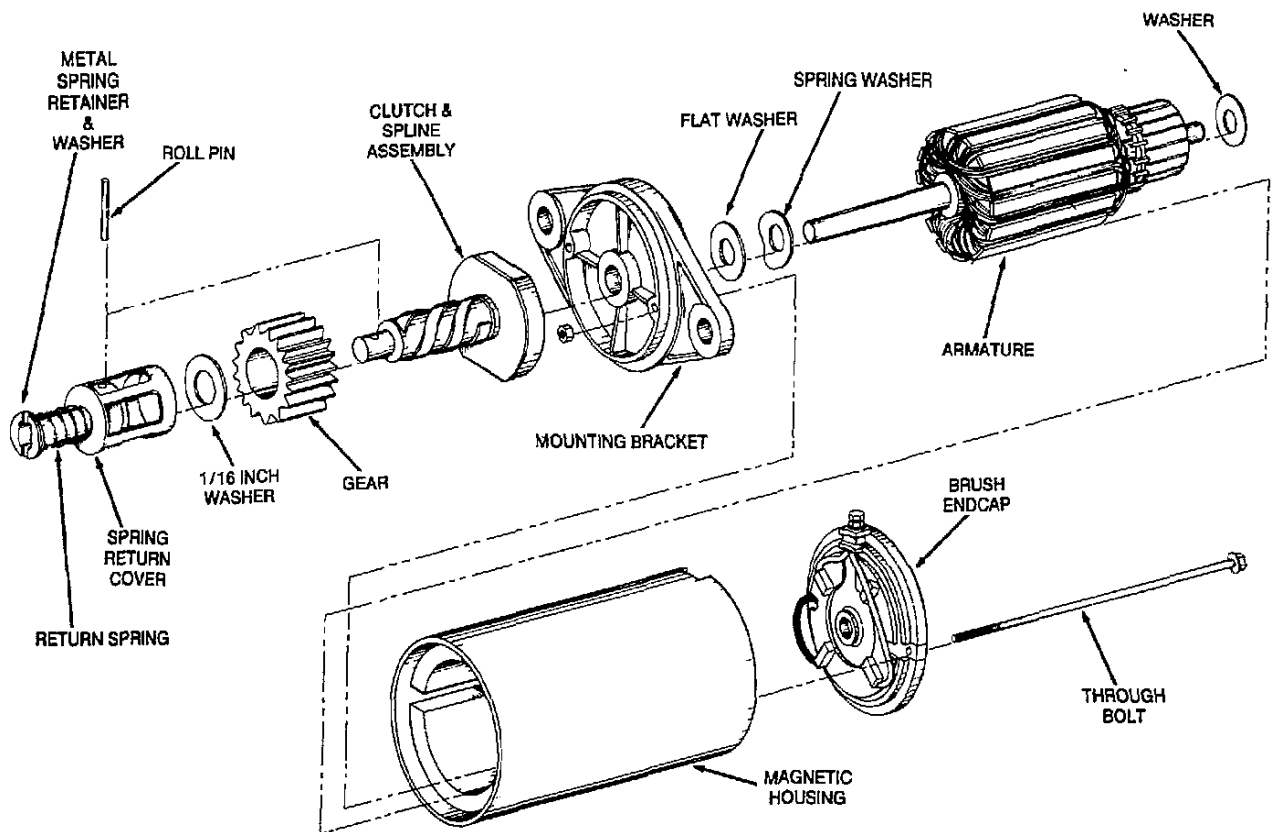
2. Mount brush springs on tabs as shown in Figure 6. Using a small screwdriver, turn spring counter-clockwise to torque so contact loop is inside of brush holder. Spring should be pushed down to mounting tab shoulder.
3. Push negative brush terminals over through-bolt holes on brush endcap.
4. Insert positive brush stud into hole and torque to 25-30 lb.-in. (2.83-3.39 N•m).
5. Using a small screwdriver inserted into brush spring contact loop, bend the spring back to allow each brush to be inserted into holder. Be sure all brush wires are facing up.

6. If the brushes are at least 0.430 inch (10.9 mm) long, rest the brush springs against the sides of brushes to keep them clear during armature installation. See Figure 7.
7. Place washer on commutator end of shaft and put armature into brush endcap. Push the four brushes toward commutator, making sure springs are properly positioned on brushes. Recheck to be sure spring is pushed all the way down on mounting tab.
8. Make sure all brush wires are clear of commutator and that uninsulated portions of insulated wires do not touch inside diameter of housing. Uninsulated portions of wires must also not touch adjacent brush boxes.
9. Place magnetic housing over armature. Use a nut driver over the end of shaft to hold down armature and endcap.
10. Place spring washer and flat washer on shaft as shown in Figure 8.
11. Place mounting bracket on motor with exposed end of sleeve bearing and through-bolt "lead-ins" to the inside of motor. The "flat" near one mounting hole should line up with the positive stud on end cap so through-bolts will line up.
12. Insert the through-bolts and torque to 35-45 lb. in. (3.96-5.09 N•m).
13. Wipe dust from helix and gear and apply a light coat of GE Versilube 322-L on outside diameter of helix, inside diameter of gear and unchamfered end of gear. Place clutch and helix assembly on motor shaft with flats engaged in clutch hole.



ES-1611

FIGURE 7. RESTING BRUSH SPRING ON BRUSH SIDE



ES-1813

FIGURE 8. STARTER ASSEMBLY

14. If Return Spring is Unassembled:

- A. Place 1-1/16 inch O.D. washer over end of shaft.
- B. With chamfered side of shaft hole up, place plastic retainer on shaft and line up hole with hole in shaft.
- C. Support the plastic retainer with a vise or other solid surface. Using a 5/32 to 1/8 inch nail set and hammer, drive in a new roll pin. The pin should be driven in about 1/10th of an inch (2.5 mm) from the edge of the plastic retainer or so its is evenly spaced from each side.

- D. Place spring cover over top of plastic retainer, then the return spring on top of the retainer.
- E. With washer placed over point of plastic retainer, push metal retainer into hole of plastic retainer as far as it will go.

15. Mount starter on generator stator housing using capscrews, lockwashers and nuts. Tighten mounting screws to 30-33 lb-ft (41-45 Nm).
16. Connect generator set positive (+) battery cable to starter terminal. Connect generator set negative (-) terminal to generator set starting battery.

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