



Hazard Definitions

NOTICE

This term indicates special instructions on installation, operation or maintenance that are important but not related to personal injury hazards.

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Battery Conditions

NOTICE

Until temperatures of electrical system components stabilize, these conditions may be observed during cold-start voltage tests.

- **Maintenance/Low Maintenance Battery**
 - Immediately after engine starts, system volts are lower than regulator setpoint, amps are medium.
 - 3–5 minutes into charge cycle, system volts increase, amps decrease.
 - 5–10 minutes into charge cycle, system volts increase to, or near, regulator setpoint and amps decrease to a minimum.
 - Low maintenance battery has same characteristics with slightly longer recharge times.
- **Maintenance-free Battery**
 - Immediately after engine starts, system volts are lower than regulator setpoint, low charging amps.
 - Once charge cycle begins, low volts and low amps are still present.
 - After alternator energizes, voltage will increase several tenths. Amps will increase gradually, then quickly, to medium to high amps.
 - Finally, volts will increase to setpoint and amps will decrease.

The time it takes to reach optimum voltage and amperage will vary with engine speed, load, and ambient temperature.
- **High-cycle Maintenance-free Battery**
These batteries respond better than standard maintenance-free. Charge acceptance of these batteries may display characteristics similar to maintenance batteries.
- **AGM (Absorbed Glass Mat) Maintenance-free Battery**
These dry-cell batteries respond better than standard maintenance-free. If battery state of charge drops to 75% or less, batteries should be recharged to 95% or higher separately from the engine's charging system to avoid damaging charging system components and to provide best overall performance. Charge acceptance of these batteries may display characteristics similar to maintenance batteries.

Battery Charge Volt and Amp Values

Volt and amp levels fluctuate depending on the battery state of charge. If batteries are in a state of discharge—as after extended cranking time to start the engine—system volts will measure lower than the regulator setpoint after the engine is restarted and system amps will measure higher. This is a normal condition for the charging system; the greater the battery discharge level, the lower the system volts and the higher the system amps. The volt and amp readings will change as batteries recover and become fully charged: system volts will increase to regulator setpoint and system amps will decrease to low level (depending on other loads).

- **Low Amps:** Minimum or lowest charging system amp value required to maintain battery state of charge, obtained when testing the charging system with a fully charged battery and no other loads applied. This value will vary with battery type.
- **Medium Amps:** System amps value which can cause the battery temperature to rise above adequate charging temperature within 4-8 hours of charge time. To prevent battery damage, the charge amps should be reduced when battery temperature rises. Check battery manufacturer's recommendations for proper charge amp rates.
- **High Amps:** System amps value which can cause the battery temperature to rise above adequate charging temperature within 2-3 hours of charge time. To prevent battery damage, the charge amps should be reduced when battery temperature rises. Check battery manufacturer's recommendations for proper charge amp rates.
- **Battery Voltage:** Steady-state voltage value as measured with battery in open circuit with no battery load. This value relates to battery state of charge.
- **Charge Voltage:** Voltage value obtained when the charging system is operating. This value will be higher than battery voltage and must never exceed the regulator voltage setpoint.
- **B+ Voltage:** Voltage value obtained when measuring voltage at battery positive terminal or alternator B+ terminal.
- **Surface Charge:** Higher than normal battery voltage occurring when the battery is disconnected from battery charger. The surface charge must be removed to determine true battery voltage and state of charge.
- **Significant Magnetism:** Change in strength or intensity of a magnetic field present in alternator rotor shaft when the field coil is energized. The magnetic field strength when the field coil is energized should feel stronger than when the field is not energized.
- **Voltage Droop or Sag:** Normal condition occurring when the load demand on alternator is greater than rated alternator output at given rotor shaft RPM.

Section A: Component Description and Operation



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N2013 Battery Isolator Description and Operation

N2013 battery isolator used with this charging system:

- allows alternator to charge two battery banks at the same time.
- allows one battery bank to discharge without draining the other.
- is rated for 14 V or 28 V DC nominal. 600 A max. current.
- operates optimally between -40°C to 65°C (-40°F to 149°F) ambient temperature.
- includes voltage ripple filter connected to negative ground.

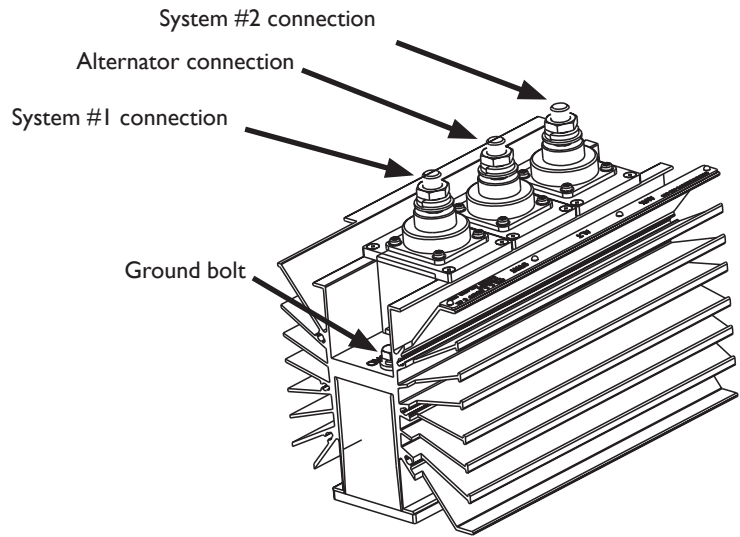


Figure 1 - N2013 Battery Isolator

Section B: Basic Troubleshooting



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BRUSHLESS ALTERNATORS

Tools and Equipment for Job

- Digital Multimeter (DMM)
- Ammeter (digital, inductive)
- Jumper wires

Basic Troubleshooting

1. **Inspect charging system components**
Check connections at ground cables, positive cables, and regulator harness. Repair or replace any damaged component before troubleshooting.
2. **Inspect N2013 battery isolator connections**
Connections must be in proper sequence and clean and tight.
3. **Inspect connections of vehicle batteries**
Connections must be clean and tight.
4. **Determine battery type, voltage, and state of charge**
Batteries in each bank must be all the same type for proper system operation. If batteries are discharged, recharge or replace batteries as necessary. Electrical system cannot be properly tested unless batteries are charged 95% or higher. See page 1 for details.

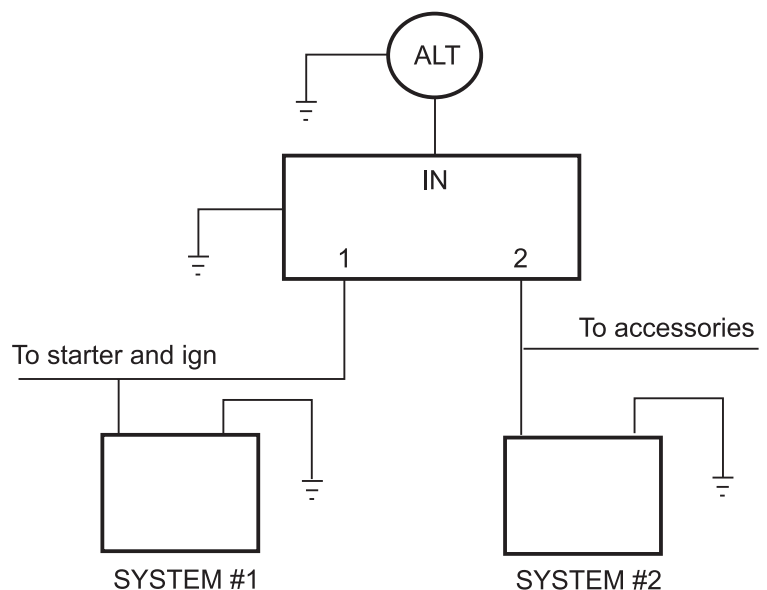


Figure 2 - Generic Wiring Schematic for Reference Only—
See Vehicle Manufacturer Specifications



Chart 1 – No Power to System #1 or #2 with Engine Running

Before Troubleshooting, Check Batteries for Proper Charge Voltage. See Page I.

Disconnect battery master switches.

Check for 0.1 V diode voltage drop between System 1 terminal on isolator and alternator terminal on isolator. Then check for 0.1 V diode voltage drop between System 2 terminal on isolator and alternator terminal on isolator.

Does the voltage drop exist at each set of tests?

Yes

No

Go to alternator troubleshooting guide to troubleshoot alternator and regulator.

Battery isolator is defective.

If you have questions about your alternator or any of these test procedures, or if you need to locate a Factory Authorized Service Dealer, please contact us at:

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