Troubleshooting Guide for N1450-N1451 Alternators

WARNING

Before troubleshooting any CEN products, the service technician should:
- read, understand, and agree to follow all information contained in this troubleshooting guide.
- understand the operational characteristics of the electrical charging system components to be tested.
- be proficient at the use of tools and test equipment used in troubleshooting CEN products.

Hazard Definitions

These terms are used to bring attention to presence of hazards of various risk levels or to important information concerning product life.

WARNING — Indicates presence of hazard(s) that can cause severe personal injury, death, or substantial property damage if ignored.

CAUTION — Indicates presence of hazards that will or can cause minor personal injury or property damage.

NOTICE — Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury hazards.

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Testing Guidelines

Professional service technicians rely on the following guidelines when testing electrical components.

Voltage testing:

- Set meter to proper scale and type (AC or DC).
- Be sure to zero the meter scale or identify the meter burden by touching meter leads together. Meter burden must be subtracted from final reading obtained.
- Be sure the meter leads touch source area only. Prevent short circuit damage to test leads or source by not allowing meter leads to touch other pins or exposed wires in test area.

Voltage drop testing:

- Measure voltage between B+ on alternator or source and B- (ground) on alternator or source. Record obtained reading. Move to batteries or other source and measure again between B+ and B- terminals on battery or other source. Difference between the two readings represents voltage lost within the circuit due to but not limited to inadequate cable gage or faulty connections.
- Voltage drop measurements must be taken with all electrical loads or source operating.

Resistance (ohm) testing:

- Set meter to proper scale.
- Be sure to zero the meter scale or identify the meter burden by touching meter leads together. Meter burden must be subtracted from final reading obtained.
- Be sure the meter leads touch source area only. Prevent altering the reading by not allowing fingers or body parts to touch meter leads or source during reading.
- Be sure reading is taken when source is at 70°F. Readings taken at higher temperatures will increase the reading. Conversely, readings taken at lower temperatures will decrease the reading.
- Be sure to test directly at the source. Testing through extended harnesses or cable extensions may increase the reading.

CAUTION

When testing field coil or stators, most shorts to ground will measure 0-100 ohms. Test readings may also show higher, other than OL, typically in the megaohm range, when windings are dust-covered, wet, or oily from environment. Be sure to distinguish between defective readings and surface debris readings when determining the test results.

Dynamic/Live testing:

Definition: Connecting power and ground to a component to test operation/function out of circuit.

1. Be sure to connect jumper leads directly and securely to source contacts of the component being tested.
2. Be sure to make any connection to power and ground at the power supply or battery source terminals. Do not make connection at component source terminals as that may create an arc and damage component source terminals.

CEN N1450/N1451 Alternators
Description and Operation

N1450/N1451 28 V (400 A) alternators are internally rectified. There are no brushes or slip rings to wear out. Energize switch activates regulator. Exciter stator is then energized.

After engine is running, the regulator receives energize signal. Regulator monitors alternator rotation and provides field current only when it detects alternator shaft rotating at suitable speed.

N3227 or **N3250** regulator used with some units:

- is negative temperature compensated.
- maintains alternator output voltage at regulated settings as vehicle electrical loads are switched on and off.
- provides overvoltage cutout (OVCO). Regulator will trip OVCO when system voltage rises above 32 V for longer than 3 seconds. OVCO feature detects high voltage and reacts by disconnecting field and turning off alternator. Restarting engine or waiting until system voltage drops below 24 V will reset OVCO circuit.

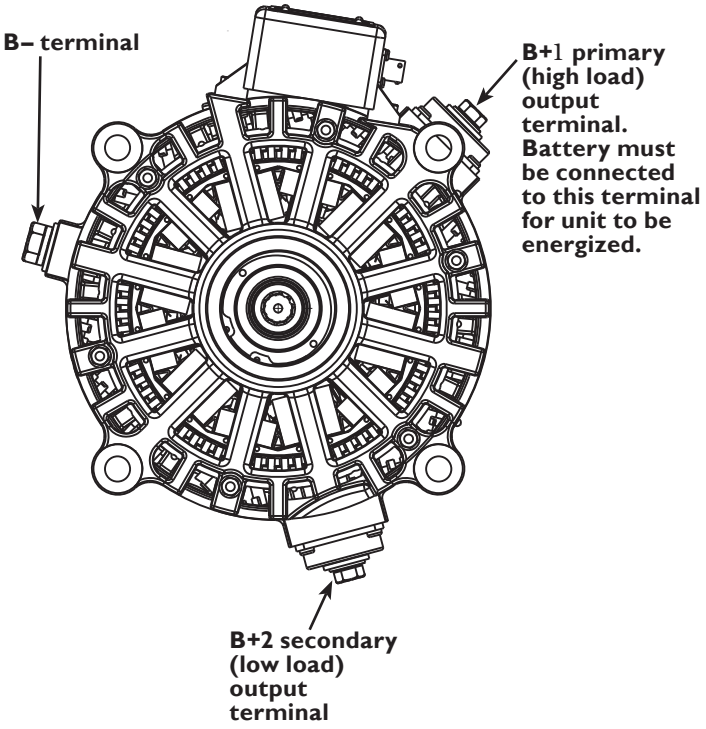


Figure 1 — Alternator Terminals

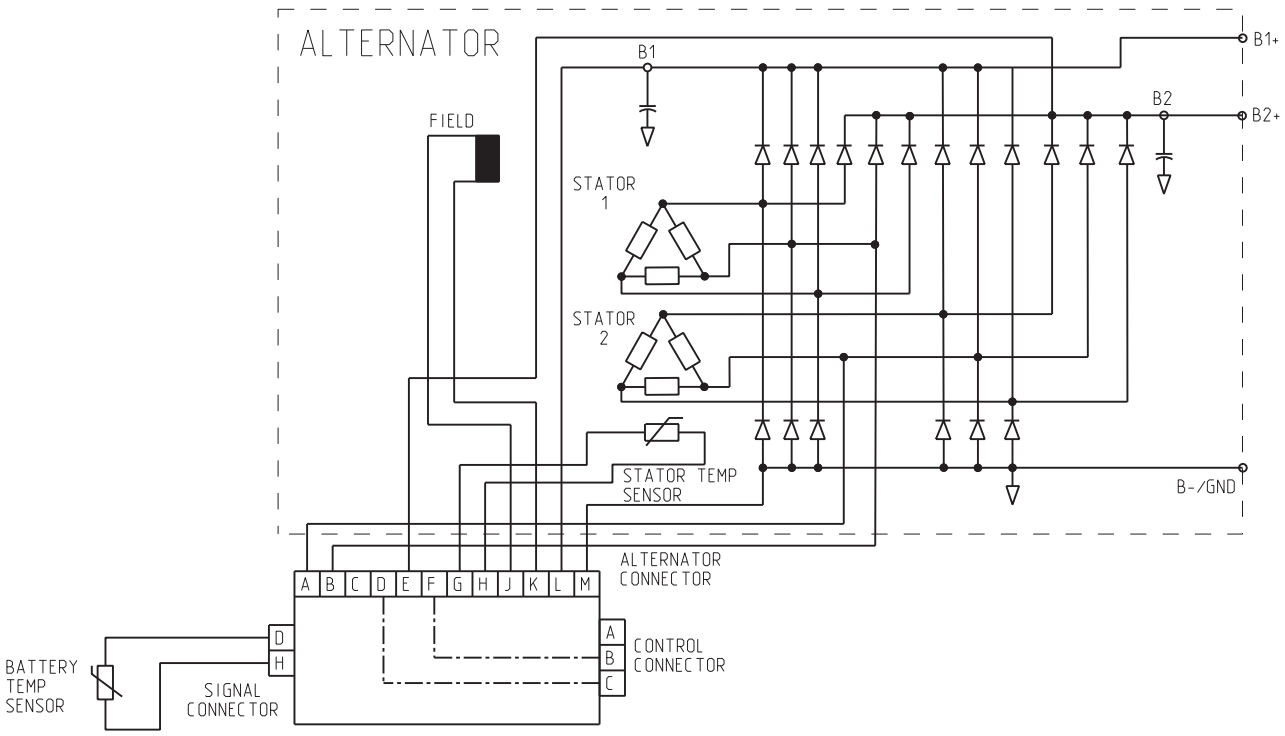


Figure 2 — Schematic Diagram

Chart 1 – No Alternator Output – Test Charging Circuit

Shut down vehicle and restart engine or wait until system voltage drops below 24 V.
Does alternator function normally after restart?

- Yes → Regulator responded to overvoltage condition. Go to Chart 2 on page 4 to troubleshoot OVCO.
- No →

Shut off engine. With key off, engine off: Test for battery voltage at alternator B+1 terminal connected to battery. Does battery voltage exist?

- Yes →
- No → Repair vehicle battery circuit wiring as necessary. Continue test.

Disconnect 3-socket harness plug from regulator. With key on, engine running: Test for battery voltage between socket B in 3-socket harness plug and alternator B– terminal. Does battery voltage exist?

- Yes →
- No → Repair vehicle ignition circuit wiring as necessary. Continue test.

MASTER BATTERY SWITCH OFF, KEY OFF, ENGINE OFF: Reconnect 3-socket harness to regulator. Disconnect alternator-to-regulator harness at regulator. Follow static tests in Table 1. Has any test result failed?

WARNING Alternator should not be powered during static tests. Connections required during testing can cause shorts and damage alternator.

TABLE 1 Pin-to-Pin Tests (See Figure 3)
DISCONNECT ALTERNATOR-TO-REGULATOR WIRING HARNESS FROM REGULATOR. TESTS MUST BE PERFORMED AT ROOM TEMPERATURE.

TEST NO.	METER SCALE & SYMBOL	METER (+) LEAD CONNECTION	METER (–) LEAD CONNECTION	TESTED CIRCUIT	EXPECTED READING
1	Ohms Ω	Pin J	Pin K	Field circuit	5–6 ohms
2	Ohms Ω	Pin M	Alt. B– Terminal	Ground circuit	<1 ohm
3	Ohms Ω	Pin L	Alt. B+ 1 Terminal	Power circuit (B+ 1)	<1 ohm
4	Ohms Ω	Pin E	Alt. B+ 2 Terminal	Power circuit (B+ 2)	<1 ohm
5	Ohms Ω	Pin G	Pin H	Stator temp sensor	90K to 120K ohms
6	Diode Test	Alt. B– Terminal	Pin A	Phase circuit (P1)	See NOTE 1
7	Diode Test	Alt. B– Terminal	Pin B	Phase circuit (P2)	See NOTE 1
8	Diode Test	Alt. B+ 1 Terminal	Alt. B– Terminal	All diodes in parallel (B+ 1)	OL*(blocking)
9	Diode Test	Alt. B– Terminal	Alt. B+ 1 Terminal	All diodes in parallel (B+ 1)	<1.0 volt**(flow)
10	Diode Test	Alt. B+ 2 Terminal	Alt. B– Terminal	All diodes in parallel (B+ 2)	OL*(blocking)
11	Diode Test	Alt. B– Terminal	Alt. B+ 2 Terminal	All diodes in parallel (B+ 2)	<1.0 volt**(flow)
12	Continuity	Pin A	Pin B	Stator-to-stator continuity	OL (blocking)
13	Continuity	Alt. B+ 1 Terminal	Alt. B+ 2 Terminal	B+ 1 to B+ 2 continuity	OL (blocking)

* Meter will show OL when capacitors are fully charged and readings stabilize.
** Meter will show voltage drop of all diodes in parallel when capacitors are fully charged and readings stabilize.

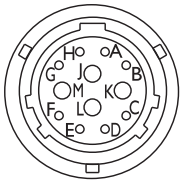
NOTE 1: If PC board is present, <0.7 volt (flow). If not present, <0.3 volt (flow).

- Yes → Alternator is defective.
- No → Replace regulator with known good regulator. Run engine. Does no-output condition still exist?
  - Yes → Alternator is defective.
  - No → Regulator is defective.

Chart 2 – No Alternator Output – Test OVCO Circuit

Unplug alternator-to-regulator harness from regulator. Connect red lead from DMM to pin J in plug. Connect black lead to pin K in plug. Does resistance read 5-6 ohms?

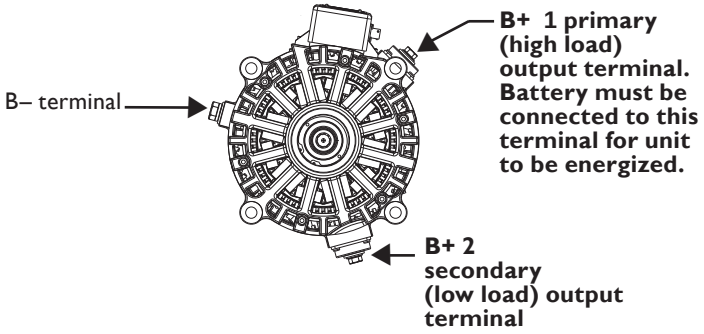
- **No** → Alternator is defective.
- **Yes** → With red lead from DMM connected to pin K in plug, connect black lead to B– terminal. Does resistance read OL (out of limits)?
  - **No** → Alternator is defective.
  - **Yes** → Replace existing regulator with known good regulator. Run engine. Does OVCO trip?
    - **Yes** → Alternator is defective.
    - **No** → Original regulator is defective.



ALTERNATOR CONNECTOR PIN CONNECTIONS

A ➡	AC 1	G ➡	T+ 1
B ➡	AC 2	H ➡	T– 1
C ➡	Not used	J ➡	F+
D ➡	Not used	K ➡	F–
E ➡	B+ 2	L ➡	B+ 1
F ➡	Not used	M ➡	B–

Figure 3 – Alternator-to-Regulator Harness Plug



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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