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.

Table of Contents

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 N1388 Alternator Description and Operation

N1388 28 V (300 A) alternator is self-rectifying. All windings and current-transmitting components are non-moving, so there are no brushes or slip rings to wear out. Load-dump protection limits peak voltage to less than 55 volts during maximum load change over speed range in batteryless operation. Peak amplitude of voltage including ripple during normal batteryless operation is less than 40 volts. Radio noise suppression is in accordance with Mil-Std 461A, Notice 4 RE05 and CE07. Alternator output has soft start feature after energize.

Ignition switch energizes regulator, and then field coil is energized.

Voltage setpoint adjustment is available on alternator control unit:

- Tropic= 27.4±0.25V
- Normal= 28.1±0.15V
- Arctic= 28.8±0.25V

N3012 regulator furnished with some of these units is flat temperature compensated at 28.1±0.15 V at 72° F. See page 3 for troubleshooting.

N3210 regulator furnished with some of these units is flat temperature compensated at 28.1±0.15 V at 72° F. The alternator voltage adjust plug must be set in the TROPIC position. Regulator features OVCO, which activates if B+ voltage exceeds setpoint by +3 V for more than 3 seconds. Manual reset by interruption of energize signal. Automatic reset when B+ voltage falls to 5 V below setpoint. Regulator shuts down if B+ signal is disconnected. See page 4 for OVCO troubleshooting.

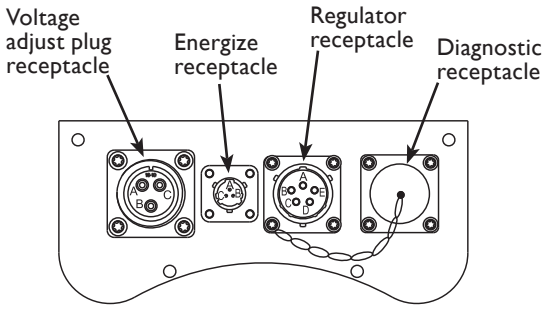

Figure 1 — N1388 Control Assembly

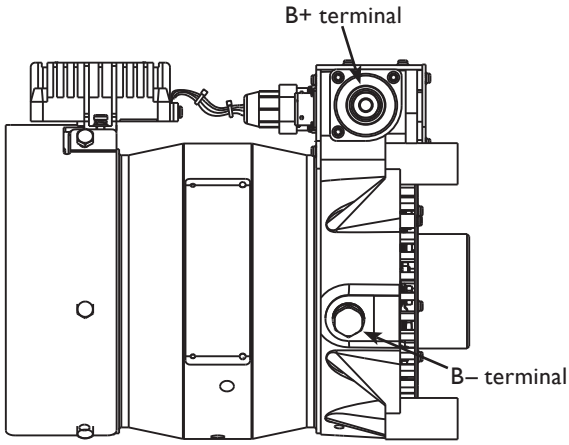

Figure 2 — N1388 Alternator Terminals

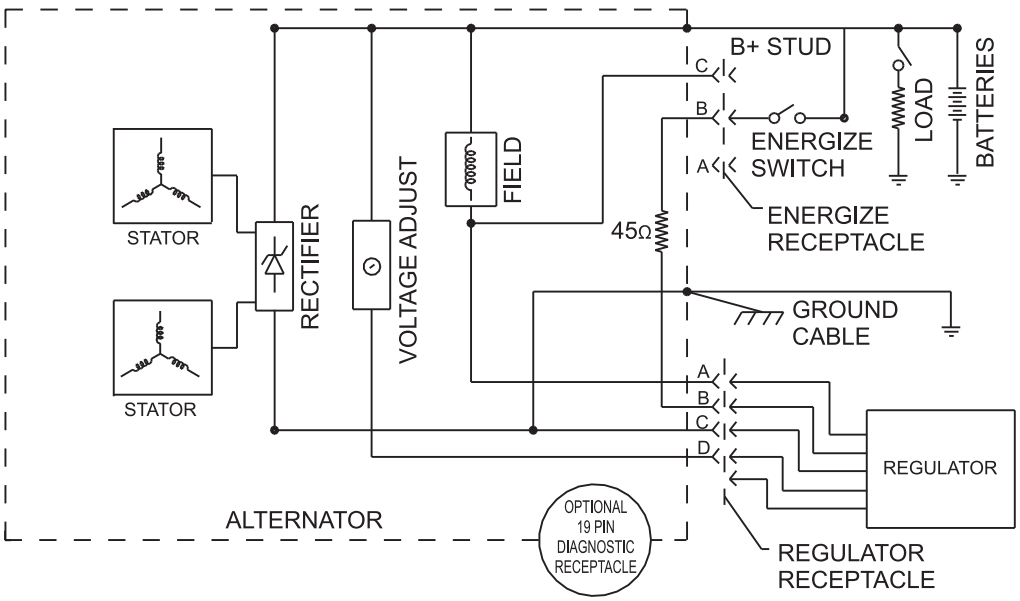

Figure 3 — Schematic Diagram

Chart 1 – No Output

Before starting diagnostic sequence, verify the following and repair/replace if not to spec:

— batteries for state-of-charge (24.5-25.5 V), condition, and secure connections

— energize switch for function

— N3210: Voltage select plug on alternator must be set to "tropic" position

Energize switch on, engine on: Disconnect harness from energize receptacle. Test for battery voltage at B+ terminal on alternator to ground, and then between B– terminal on alternator and socket B on energize harness plug end. Does battery voltage exist at both locations?

- Yes
- No → Repair vehicle wiring to energize receptacle.

CAUTION

When performing the following test, first connect jumper to socket A in regulator receptacle. Make circuit connection with other end of jumper to B- terminal on alternator. Connecting at ground side will prevent a spark from damaging the socket in the receptacle.

Energize switch off, engine off: Reconnect energize harness. Disconnect regulator-to-alternator harness. Momentarily (1 sec.) jumper socket A in regulator receptacle to B– terminal on alternator. Touch shaft with steel tool to detect any magnetism. Is shaft magnetized?

- Yes
- No

Run engine and re-test charging circuit. Is charging system performing properly?

- Yes → System is operative.
- No

With regulator-to-alternator harness and energize harness disconnected, perform series of tests with DMM:

1) With meter set on ohms, connect red lead to pin B of energize receptacle and black lead to socket B of regulator receptacle. Meter should read 40-55 ohms.
2) With meter set on ohms, check field coil resistance across socket A of regulator receptacle and B+ terminal on alternator. Resistance should measure nominal 1.0-3.0 ± 0.2 ohms. Field coil is defective if reading is less than 0.5 ohms or greater than 3.5 ohms.
3) With meter set on ohms, check for continuity between socket C of regulator receptacle and B– terminal on alternator.

Did all three tests provide correct readings?

- Yes → Regulator is defective.
- No → Alternator is defective.

ENERGIZE PIN CONNECTIONS

Pin A	Not used
Pin B	Energize
Pin C	Not used

REGULATOR SOCKET CONNECTIONS

Socket A	F –
Socket B	Energize
Socket C	Ground
Socket D	B+
Socket E	Not used

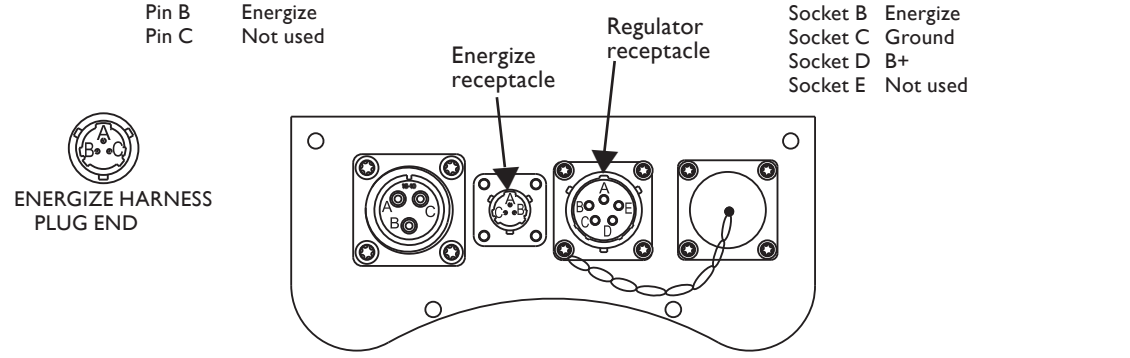

Figure 4 — N1388 Control Assembly

N3210: OVCO Troubleshooting

Shut down vehicle and restart engine. If alternator functions normally after restart, a "no output condition" was normal response of voltage regulator to "high voltage" condition. Inspect condition of electrical system, including loose battery cables, both positive and negative. If battery disconnects from system, it could cause "high voltage" condition in electrical system, causing OVCO circuit to trip.

If you have reset alternator once, and electrical system returns to normal charge voltage condition, there may have been a one time, high voltage spike, causing OVCO circuit to trip.

If OVCO circuit repeats cutout a second time in short succession and shuts off alternator field circuit, try third restart. If OVCO circuit repeats cutout, check that socket A in alternator-to-regulator harness is not shorted to B–. If it is shorted, alternator is defective. If not, regulator 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:
C. E. Niehoff & Co.• 2021 Lee Street • Evanston, IL 60202 USA
TEL: 800.643.4633 USA and Canada • TEL: 847.866.6030 outside USA and Canada • FAX: 847.492.1242
E-mail us at *service@CENiehoff.com*