

## 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.

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## **Tools and Equipment**

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

## **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.
- Be sure to use CEN tools designed especially for troubleshooting CEN alternators when available.
   See page 1 for more information.

#### 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.

### 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.

#### 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.

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## **Section A: Description/Operation**



### **CEN C633 Alternator/Regulator Description and Operation**

**C633** 28 V 220 A alternator with optional 28 V/14 V (50 A maximum on 14 V) is internally rectified. All windings and current-transmitting components are non-moving, so there are no brushes or slip rings to wear out.

This alternator is externally energized when the battery master switch on the vehicle is turned on and provides power to the regulator through the IGN circuit. Regulator monitors alternator rotation and provides field current only when it detects alternator shaft rotating at suitable speed.

After regulator detects alternator rotation, it gradually applies field current (soft start), preventing an abrupt mechanical load on accessory drive system. The soft start may take up to 10 seconds at full electrical load. AC is rectified into DC output through diodes in drive end rectifier housing and supplied to the battery from the alternator B+ terminal. See schematic diagram on page 3. Alternator output current is self-limiting and will not exceed rated capacity of alternator.

The regulator maintains alternator output voltage at regulated settings (see below) as vehicle electrical loads are switched on and off.

Battery type selection and battery maintenance/function are the sole responsibilities of the customer.

#### A2-355 regulators furnished with some units include:

- External IGN terminal for energize connection.
- AC terminal for optional AC voltage tap. AC terminal signal frequency (Hz) x 10 = alternator shaft rpm.
- Optional single or dual voltage operation.
  - —Allows single-voltage (28 V only). 14 V is not available as a single-voltage application with this regulator.
  - —Allows optional 28 V/14 V dual voltage operation only from this regulator when phase cable from alternator is connected to regulator and 14 V cabling from vehicle is attached to regulator 14 V terminal.
- Overvoltage cutout (OVCO) function. This regulator has OVCO (overvoltage cutout) that will trip at vehicle electrical system voltage above 32 volts in a 28 V system or 16 V in a 14 V system that exists longer than 2 seconds. OVCO feature detects high voltage and reacts by signaling relay in alternator field circuit to open. This turns off alternator. OVCO circuit is reset when engine is restarted.
- Regulator has negative temperature compensation. Setpoints are  $28.0\pm0.2$  V and  $14.0\pm0.2$  V at  $75^{\circ}$ F.

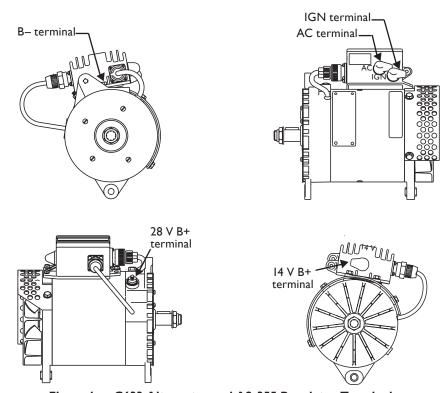


Figure I — C633 Alternator and A2-355 Regulator Terminals

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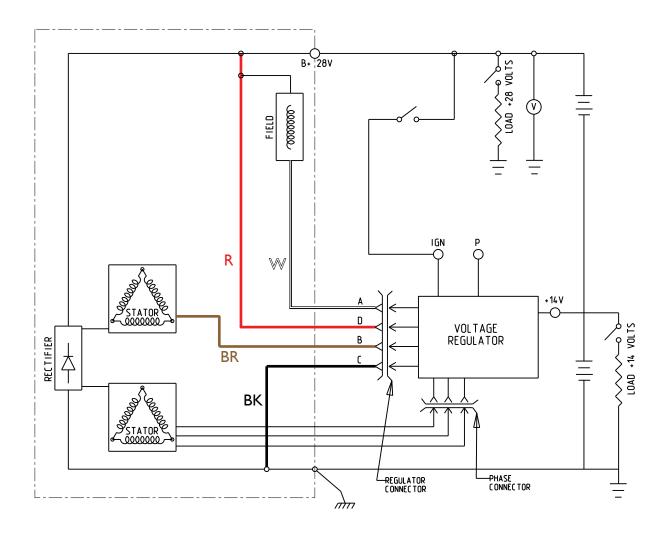


Figure 2 — C633 Schematic Diagram

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## **Section C: On-Vehicle OVCO Troubleshooting**

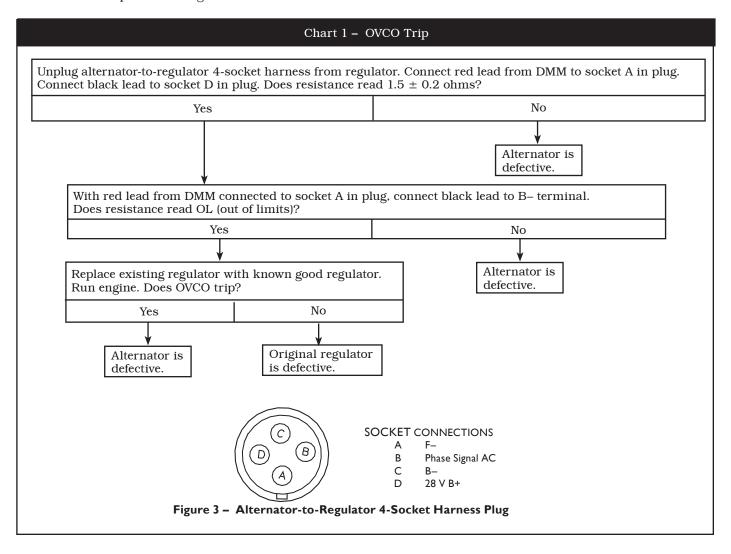


### **OVCO** Troubleshooting

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.

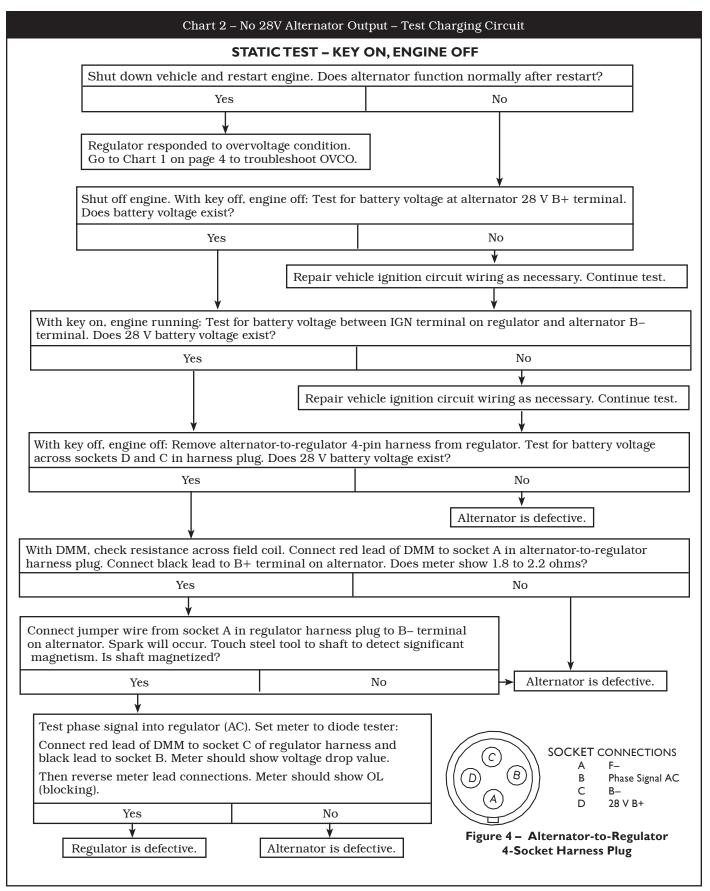
If OVCO circuit repeats cutout a second time in short succession and shuts off alternator field circuit, try third restart. If OVCO circuit repeats cutout, go to Chart 1.



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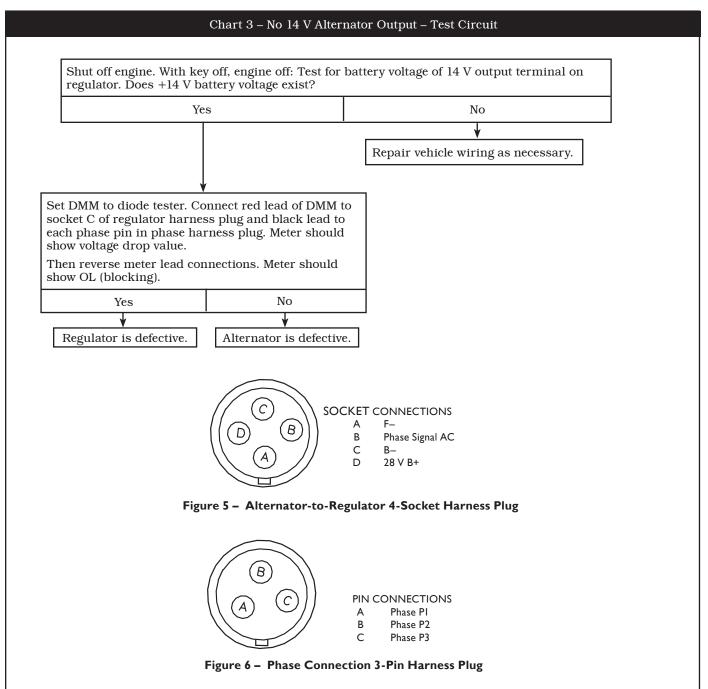
# Section D: On-Vehicle No 28 V Output Troubleshooting



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## Section E: On-Vehicle No 14 V Output Troubleshooting





If you have questions about your alternator or any of these instructions, 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

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