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

**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
Section A: Wiring Diagram ......................................2
Section B: Basic Troubleshooting ............................3
Section C: Advanced Troubleshooting ..................4–5

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 with medium amps.
  - 3-5 minutes into charge cycle, higher system volts and reduced amps.
  - 5-10 minutes into charge cycle, system volts are at, or nearly at, regulator setpoint, and amps are reduced to a minimum.
  - Low maintenance battery has same characteristics with slightly longer recharge times.

- Maintenance-free battery:
  - Immediately after engine start, system volts are lower than regulator setpoint with low amps.
  - 15-30 minutes into charge cycle, still low volts and low amps.
  - 15-30 minutes into charge cycle, volts increase several tenths. Amps increase gradually, then quickly to medium to high amps.
  - 20-35 minutes into charge cycle, volts increase to setpoint and amps decrease.

- 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.

Charge Volt and Amp Values

The volt and amp levels are a function of the battery state of charge. If batteries are in a state of discharge, as after extended cranking time to start the engine, the system volts, when measured after the engine is started will be lower than the regulator setpoint and the system amps will be high. This is a normal condition for the charging system. The measured values of system volts and amps will depend on the level of battery discharge. In other words, the greater the battery discharge level the lower the system volts and higher the system amps will be. The volt and amp readings will change, system volts reading will increase up to regulator setpoint and the system amps will decrease to low level (depending on other loads) as the batteries recover and become fully charged.

- **Low Amps**: A 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**: A system amps value which can cause the battery temperature to rise above the 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 rates of charge amps.

- **High Amps**: A system amps value which can cause the battery temperature to rise above adequate charging temperature within 2-3 hours. To prevent battery damage the charge amps should be reduced when the battery temperature rises. Check battery manufacturer’s recommendations for proper rates of charge amps.

- **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**: A voltage value obtained when the charging system is operating. This value will be higher than battery voltage and must never exceed the regulator voltage set point.

- **B+ Voltage**: A voltage value obtained when measuring voltage at battery positive terminal or alternator B+ terminal.

- **Surface Charge**: A higher than normal battery voltage occurring when the battery is removed from a battery charger. The surface charge must be removed to determine true battery voltage and state of charge.

- **Significant Magnetism**: A change in the strength or intensity of a magnetic field present in the 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**: A normal condition which occurs when the load demand on the alternator is greater than rated alternator output at given rotor shaft RPM.
CEN C714 Alternator
Description and Operation

C714 14 V (400 A) alternators are self-rectifying. All windings and current-transmitting components are non-moving, so there are no brushes or slip rings to wear out.

When controlled by the A2-155 regulator, this alternator becomes externally energized through the IGN terminal connected to a switched power source to turn on regulator. See wiring diagram below. A2-155 regulator has a P terminal to provide an optional AC voltage tap.
Basic Troubleshooting
1. **Inspect charging system components for damage**
   Check connections at B– cable, B+ cable, and alternator-to-regulator harness. Repair or replace any damaged component before troubleshooting.

2. **Inspect all vehicle battery connections**
   Connections must be clean and tight.

3. **Determine battery voltages and states of charge**
   If batteries are discharged, recharge or replace batteries as necessary. Electrical system cannot be properly tested unless batteries are charged 95% or higher. In addition, open circuit voltages must be within ± 0.2 V.

4. **Connect meters to alternator**
   Connect red lead of DMM to alternator B+ terminal and black lead to alternator B– terminal. Clamp inductive ammeter on B+ cable.

5. **Operate vehicle**
   Observe charge voltage.
   If charge voltage is above 16 volts, immediately shut down system. Electrical system damage may occur if charging system is allowed to operate at high voltage. Go to Table 1 at left.
   If voltage is at or below regulator setpoint, let charging system operate for several minutes to normalize operating temperature.

6. **Observe charge volts and amps**
   Charge voltage should increase and charge amps should decrease. If charge voltage does not increase within ten minutes, continue to next step.

7. **Batteries** are considered fully charged if charge voltage is at regulator setpoint and charge amps remain at lowest value for 10 minutes.

8. **If charging system** is not performing properly, go to Chart 1, page 4.

---

**Tools and Equipment for Job**
- Digital Multimeter (DMM)
- Ammeter (digital, inductive)
- Jumper wires

**Identification Record**
List the following for proper troubleshooting:
- Alternator model number ______________________
- Regulator model number ______________________
- Setpoints listed on regulator ___________________

**Preliminary Check-out**
Check symptoms in Table 1 and correct if necessary.

<table>
<thead>
<tr>
<th>TABLE 1 – System Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SYMPTOM</strong></td>
</tr>
<tr>
<td>Low Voltage Output</td>
</tr>
</tbody>
</table>
**Section C: Advanced Troubleshooting**

**Chart 1 – No Output**

<table>
<thead>
<tr>
<th>With engine running, does battery voltage exist at alternator B+ terminal and regulator IGN terminal?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repair vehicle harness circuit to IGN terminal on regulator or B+ terminal on alternator.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CAUTION**

When conducting this step, ensure that the probes do not touch other pins, as an arc may damage the wiring in the harness.

With engine off: Unplug alternator-to-regulator harness. Connect DMM across pin C and pin D in harness plug. Does battery voltage exist?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternator is defective.</td>
<td></td>
</tr>
</tbody>
</table>

Turn off battery switch. Disconnect B+ battery cable at alternator. Set DMM to diode test. Connect black lead of DMM to pin E in harness plug. Connect red lead to B+ terminal on alternator. DMM should read OL. Reverse leads. DMM should also read OL.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternator is defective.</td>
<td></td>
</tr>
</tbody>
</table>

Connect B+ battery cable to alternator. Turn on battery switch. Install a jumper from pin F in harness plug to B+ terminal on alternator. Momentarily (1 sec.) jumper pin A in harness plug to alternator B– terminal. Touch shaft with steel tool to detect significant magnetism. Is shaft magnetized?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Go to Chart 2, page 5. Alternator is defective.</td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 3 – Alternator-to-Regulator Harness Plug**

**PIN CONNECTIONS**

- Pin A: F–
- Pin B: Phase
- Pin C: B–
- Pin D: B+
- Pin E: D+
- Pin F: F+
### Chart 2 – Continuation of Chart 1 as Noted

<table>
<thead>
<tr>
<th>Regulator is defective.</th>
<th>Alternator is defective.</th>
<th>Thermal switch in control unit is defective.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Set DMM to diode test. Connect black lead of DMM to B+ terminal on alternator. Connect red lead to pin B on harness plug. DMM should read voltage drop. Reverse leads. DMM should read OL.

Check continuity of thermal switch inside control unit: Remove drive end cover on alternator. With DMM, check continuity between pin B on harness plug and diode shown in Figure 4 below. Does continuity exist?

![Figure 4 – Diode Arrangement Inside Drive End Housing](image-url)