See Pages 2, 3, and 4 for Technical Specifications

1. Mount alternator on a suitable bracket and secure with hardware per alternator drawing on page 2 of these instructions.

2. Remove anti-drive end (ADE) louvered end cover from the alternator.

3. One of the following two alternator circuits described below is required to operate alternator.
   a. If alternator is to be self-energized, be sure the link is connected between B+ stud and IGN terminal (as shipped). This alternator relies on residual magnetism to operate. Observe all applicable safety procedures when performing the following operation: If necessary, restore lost magnetism by connecting test light between B+ stud and R terminal for 1-3 seconds while alternator shaft IS NOT TURNING and battery is connected to illuminate test light. Check for magnetic field at pulley. If magnetized, remove test light, start alternator, and test.
   b. If the alternator is to be energized through ignition key, connect energizing signal lead directly to IGN terminal and remove link between B+ stud and IGN terminal. Torque IGN terminal bolt to 2 Nm/18 lb. in. This alternator relies on residual magnetism to operate. Ensure battery voltage is present at IGN terminal. Observe all applicable safety procedures when performing the following operation: If necessary, restore lost magnetism by connecting test light between B+ stud and R terminal for 1-3 seconds while alternator shaft IS NOT TURNING and battery is connected to illuminate test light. Check for magnetic field at pulley. If magnetized, remove test light, start alternator, and test.

4. Connect B+ cable to B+ stud on alternator. See wire chart on page 3 for correct cable size and length. Torque terminal nut to 9 Nm/80 lb. in.

5. Connect R lead to R terminal on alternator if required for vehicle operation (optional connection). Torque R terminal bolt to 2 Nm/18 lb. in.

6. Connect B– cable to B– terminal stud on alternator (B– is an isolated ground). B– cable gauge should be same as gauge of battery positive cable. Torque terminal nut to 9 Nm/80 lb. in.

7. Perform a final inspection on the installation.

8. Re-install ADE louvered end cover on alternator. Position louvers consistent with deflection of rain or fluids during normal operating conditions. Fasten with screws and washers in four places. Use a suitable adhesive such as Loc-tite® 222. Follow manufacturer’s instructions. Torque screws to 3.4 Nm/30 lb. in.

9. Install suitable alternator drive belt.

10. Start engine. Confirm operation of charging system meets specification.
ALTERNATOR CHARACTERISTICS FOR 28 VOLTS/60 AMPS:

APPLICABLE MODELS: C130, C132

OUTPUT CURVE: OUTPUT AMPERES VERSUS ALTERNATOR SHAFT SPEED IN RPM AT 28.0 VOLTS.

TORQUE CURVE: DRIVE TORQUE IN Nm VERSUS ALTERNATOR SHAFT SPEED IN RPM REQUIRED TO PRODUCE OUTPUT CURVE.

ALL MEASUREMENTS DEPICTED ON PERFORMANCE CURVES ARE TAKEN AT 22°C/72°F AMBIENT TEMPERATURE (UNLESS OTHERWISE SPECIFIED) AND A STABILIZED MACHINE TEMPERATURE AT MAXIMUM OUTPUT CURRENT WITH VOLTAGE CONSTANT AS SPECIFIED PER SAE J56/ISO 8854.

ABBREVIATIONS:

RPM REVOLUTIONS PER MINUTE
N\text{m} NEWTON-METER

Conversion: 1 Nm = 8.85 Pound Inch (LB\text{IN})
ALTERNATOR CHARACTERISTICS FOR 14 VOLTS/ 70 AMP:
APPLICABLE MODELS: C131

OUTPUT CURVE: OUTPUT AMPERES VERSUS ALTERNATOR SHAFT SPEED IN RPM AT 13.8 VOLTS.

TORQUE CURVE: DRIVE TORQUE IN Nm VERSUS ALTERNATOR SHAFT SPEED IN RPM REQUIRED TO PRODUCE OUTPUT CURVE.

ALL MEASUREMENTS DEPICTED ON PERFORMANCE CURVES ARE TAKEN AT 104°F (40°C) AMBIENT TEMPERATURE (UNLESS OTHERWISE SPECIFIED) AND A STABILIZED MACHINE TEMPERATURE AT MAXIMUM OUTPUT WITH VOLTAGE CONSTANT AS SPECIFIED.

ABBREVIATIONS:
RPM  REVOLUTIONS PER MINUTE
Nm   NEWTON-METER

Conversion: 1 Nm = 8.85 Pound Inch (LBIN)
Parts Replacement Instructions

Pulley Replacement
Remove existing pulley (see Figure 1):
1. Remove pulley nut and washer.
2. Remove and discard pulley.

Install new pulley (see Figure 1):
1. Install new pulley and fasten with pulley nut and washer.
2. Keep pulley, fan, and shaft from spinning while torquing pulley nut to 68 Nm/50 lb. ft.

Drive End (DE) Fan Replacement
Remove existing DE fan (see Figure 1):
1. Remove pulley nut and washer.
2. Remove pulley.
3. Remove woodruff key and discard fan.

Install new DE fan (see Figure 1):
1. Place new fan on shaft.
2. Install woodruff key.
3. Install pulley and fasten with pulley nut and washer.
4. Keep pulley, fan, and shaft from spinning while torquing pulley nut to 68 Nm/50 lb. ft.

Anti-drive End (ADE) Louvered End Cover Replacement
Remove ADE Cover on Alternator (see Figure 1):
1. Remove hardware and ADE cover.

Install new ADE Cover on Alternator (see Figure 1):
1. Install new ADE cover. Position louvers consistent with deflection of rain or fluids during normal operating conditions.
2. Fasten in four places with screws and washers. Use a suitable adhesive such as Loctite® 222. Follow manufacturer's instructions. Torque screws to 3.4 Nm/30 lb. in.

Figure 1 – Parts Replacement
Anti-drive End (ADE) Regulator Replacement

Remove ADE Regulator on Alternator (see Figures 1 and 2):
1. Remove hardware and ADE cover.
2. Remove and discard hardware attaching regulator to plate.
3. Unplug alternator-to-regulator harness from regulator.

Install new ADE Regulator on Alternator (see Figures 1 and 2):
1. Plug alternator-to-regulator harness securely into new regulator.
2. Install new regulator on plate using new screws from kit. Use a suitable adhesive such as Loctite® 222. Follow manufacturer’s instructions. Torque screws to 2.8 Nm/25 lb. in.
3. Install ADE louvered end cover. Position louvers consistent with deflection of rain or fluids during normal operating conditions.
4. Fasten cover in four places with screws and washers. Use a suitable adhesive such as Loctite® 222. Follow manufacturer’s instructions. Torque screws to 3.4 Nm/30 lb. in.

Figure 2 – Regulator Replacement
Troubleshooting

Tools and Equipment for Bench Testing
• Testing Electrical Components, page 12.
• Digital Multimeter (DMM)
• Ammeter (digital, inductive)
• Test bench with 5–10 hp motor able to drive alternator to 8000 rpm. Mount alternator per test bench manufacturer’s instructions. Make sure test bench batteries are charged at 95% or higher.

Bench Tests
• Voltage at regulator setpoint ±0.2 V is considered “normal.”
• Alternator rated output (listed on nameplate) ±10% is determined at 6000 rpm at 72ºF.
• Run alternator for 15 minutes to stabilize readings.
• Alternator/regulator should be connected to test bench per schematic diagram on page 3.

When connecting alternator to test bench, make sure batteries are connected per schematic diagram on page 3. Alternator/regulator will not function without being properly connected to power source.

**CAUTION**

**NOTICE**

BENCH TEST 1: NO-LOAD TEST
With battery connected and nominal electrical load set as shown in Table 1, run alternator at 2000-2500 rpm shaft speed.

- If alternator passes No-Load Test, go to Full Load Test.
- If alternator fails No-Load Test, go to Static Tests.

<table>
<thead>
<tr>
<th>TABLE 1 No-Load Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT.</td>
</tr>
<tr>
<td>CI30, CI31, CI32</td>
</tr>
</tbody>
</table>

* Regulator setpoint is listed on page 10 by alternator model or shown on regulator nameplate.

BENCH TEST 2: FULL LOAD TEST
With battery connected and electrical load set as shown in Table 2, run alternator at 5000-8000 rpm shaft speed.

- If alternator passes Full Load Test, alternator is functioning properly.
- If alternator fails Full Load Test, go to Static Tests.

<table>
<thead>
<tr>
<th>TABLE 2 Full Load Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT.</td>
</tr>
<tr>
<td>CI30</td>
</tr>
<tr>
<td>CI32</td>
</tr>
<tr>
<td>CI31</td>
</tr>
</tbody>
</table>

* Regulator setpoint is listed on page 10 by alternator model or shown on regulator nameplate.

Tools and Equipment for Static Testing
• Testing Electrical Components, page 12.
• Digital Multimeter (DMM)
• Ammeter (digital, inductive)
• Regulator tester

Regulator Test
• Regulator tester tests all regulator functions.
• If regulator tester is used, follow regulator tester manufacturer’s instructions.
• If regulator tester is not available, regulator can only be tested for a shorted field-switching transistor. Follow Regulator Test below.

**REGULATOR TEST: CHECK FOR SHORTED FIELD-SWITCHING TRANSISTOR**
1. Set DMM to diode test scale.
2. See Figure 3. Connect one meter lead to pin C in regulator receptacle and connect other lead to pin A in regulator receptacle. Observe meter reading. Reverse leads and observe meter reading. If DMM reads zero in either direction, field-switching transistor is shorted. Replace regulator. If regulator failure is indicated, field coil failure must also be suspected.

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

**NOTICE**
Static tests should confirm on-vehicle and on-bench tests.

**TABLE 1 No-Load Test**

**TABLE 2 Full Load Test**

**Figure 3 Regulator Harness Connections**
Internal Circuit Tests
• Internal Circuit Tests will show the condition of internal circuits through the alternator via alternator-to-regulator harness.
• Some disassembly will be necessary to access the components. Do not disassemble the alternator beyond what the tests require.
• Before performing Internal Circuit Tests, check for visible signs of damaged components.
• The expected reading/result listed for each test must be obtained. Replace any component that fails the test.

**TABLE 3 Pin-to-Pin Tests (See Figure 4)**

<table>
<thead>
<tr>
<th>TEST NO.</th>
<th>METER SCALE &amp; SYMBOL</th>
<th>METER (+) LEAD CONNECTION</th>
<th>METER (-) LEAD CONNECTION</th>
<th>TESTED CIRCUIT</th>
<th>EXPECTED READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ohms Ω</td>
<td>Socket A</td>
<td>Alternator Case</td>
<td>Isolated ground</td>
<td>OL (infinity)</td>
</tr>
<tr>
<td>2</td>
<td>Ohms Ω</td>
<td>Socket E</td>
<td>Socket C</td>
<td>Field coil resistance</td>
<td>4.8±0.2 ohms</td>
</tr>
<tr>
<td>3</td>
<td>Ohms Ω</td>
<td>Socket E</td>
<td>Alt. B– Terminal</td>
<td>Field coil insulation</td>
<td>OL (infinity)</td>
</tr>
<tr>
<td>4</td>
<td>Ohms Ω</td>
<td>Socket C</td>
<td>Alt. B– Terminal</td>
<td>Field coil insulation</td>
<td>OL (infinity)</td>
</tr>
<tr>
<td>5</td>
<td>Diode Test 🌟</td>
<td>Socket D</td>
<td>Alt. B+ Terminal</td>
<td>Phase winding and diode</td>
<td>&lt;0.7 volts (flow)</td>
</tr>
<tr>
<td>6</td>
<td>Diode Test 🌟</td>
<td>Alt. B+ Terminal</td>
<td>Socket D</td>
<td>Phase winding and diode</td>
<td>OL (blocking)</td>
</tr>
<tr>
<td>7</td>
<td>Diode Test 🌟</td>
<td>Socket D</td>
<td>Alt. B– Terminal</td>
<td>Phase winding and diode</td>
<td>OL (blocking)</td>
</tr>
<tr>
<td>8</td>
<td>Diode Test 🌟</td>
<td>Alt. B– Terminal</td>
<td>Socket D</td>
<td>Phase winding and diode</td>
<td>&lt;0.7 volts (flow)</td>
</tr>
<tr>
<td>9</td>
<td>Ohms Ω</td>
<td>Socket E</td>
<td>Alt. B+ Terminal</td>
<td>Regulator power circuit</td>
<td>0 ohms</td>
</tr>
<tr>
<td>10</td>
<td>Ohms Ω</td>
<td>Socket A</td>
<td>Alt. B– Terminal</td>
<td>Regulator ground circuit</td>
<td>0 ohms</td>
</tr>
<tr>
<td>11</td>
<td>Diode Test 🌟</td>
<td>Alt. B+ Terminal</td>
<td>Alt. B– Terminal</td>
<td>All diodes in parallel</td>
<td>OL (blocking)</td>
</tr>
<tr>
<td>12</td>
<td>Diode Test 🌟</td>
<td>Alt. B– Terminal</td>
<td>Alt. B+ Terminal</td>
<td>All diodes in parallel</td>
<td>&lt;0.8 volts (flow)</td>
</tr>
<tr>
<td>13</td>
<td>Ohms Ω</td>
<td>R Terminal</td>
<td>Alternator Case</td>
<td>Stator insulation</td>
<td>OL (infinity)</td>
</tr>
</tbody>
</table>

* Applies only when field coil is attached to rectifier/housing assembly. The same field coil is used in all alternator models, so expected reading will be the same for all models.

**NOTICE**
Service technicians should understand and follow all information in the service manual when servicing the product.

**CAUTION**
Failure to perform the complete series of Internal Circuit Tests can result in improper diagnosis of alternator condition.
Exploded Parts View

C130/C131/C132 Parts View

- Fan
- Pulley
- Regulator
- Alternator
- Woodruff Key
- ADE Louvered End Cover

Contact CEN Service Dealer, CEN Warehouse Dealer, or CEN Service Department for current exploded view and parts list.
### C130/C131/C132

<table>
<thead>
<tr>
<th>ALTERNATOR MODEL</th>
<th>VOLTS</th>
<th>AMPS</th>
<th>WATTS</th>
<th>Model</th>
<th>Steps</th>
<th>REGULATOR Settings</th>
<th>Temp. Comp.(2)</th>
<th>ALT. WEIGHT kg/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>C130</td>
<td>24</td>
<td>60</td>
<td>1680</td>
<td>A2-139</td>
<td>N/A</td>
<td>28.0</td>
<td>Flat</td>
<td>10.17/22.4</td>
</tr>
<tr>
<td>C130-1/C130-4/C130-5</td>
<td>28.0</td>
<td>60</td>
<td>1680</td>
<td>A2-139</td>
<td>N/A</td>
<td>28.0</td>
<td>Flat</td>
<td>10.17/22.4</td>
</tr>
<tr>
<td>C130-3</td>
<td>27.6</td>
<td>60</td>
<td>1680</td>
<td>A2-161</td>
<td>N/A</td>
<td>27.6</td>
<td>Flat</td>
<td>10.17/22.4</td>
</tr>
<tr>
<td>C131/C131-1/C131-2</td>
<td>14.2</td>
<td>70</td>
<td>980</td>
<td>A2-152</td>
<td>N/A</td>
<td>14.2</td>
<td>Flat</td>
<td>10.17/22.4</td>
</tr>
<tr>
<td>C131-3</td>
<td>13.8</td>
<td>70</td>
<td>980</td>
<td>A2-162</td>
<td>N/A</td>
<td>13.8</td>
<td>Flat</td>
<td>10.17/22.4</td>
</tr>
<tr>
<td>C131-4</td>
<td>13.2</td>
<td>70</td>
<td>980</td>
<td>A2-168</td>
<td>N/A</td>
<td>13.2</td>
<td>Flat</td>
<td>10.17/22.4</td>
</tr>
<tr>
<td>C132/C132-1</td>
<td>28.0</td>
<td>60</td>
<td>1680</td>
<td>A2-139</td>
<td>N/A</td>
<td>28.0</td>
<td>Flat</td>
<td>10.17/22.4</td>
</tr>
</tbody>
</table>

#### NOTES
1. The alternator has an isolated ground.
2. Temperature compensation—see definition below.

**Flat temperature compensation:** Regulator controls voltage range in a near-constant state during the vehicle operating conditions. CEN flat-temperature compensated regulators have preset voltage setpoints.

**Setpoint:** Voltage value to which regulator is set. Voltage value is established by battery type and vehicle duty cycle. Setpoint value is fixed (flat compensation).
Testing Electrical Components

Testing Guidelines
Professional service technicians rely on these 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.

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 70ºF. 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.
- Be sure to directly and securely jumper leads to source terminals of the component being tested.
- Be sure to touch the contact end of jumper leads only to the power supply or battery terminals. Touching a contact end to component terminals may create an arc and damage component terminals.