



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.

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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, amps are medium.
 - 3–5 minutes into charge cycle, system volts increase, amps decrease.
 - 5–10 minutes into charge cycle, system volts increase to, or near, regulator setpoint and amps decrease to a minimum.
 - Low maintenance battery has same characteristics with slightly longer recharge times.
- **Maintenance-free Battery**
 - Immediately after engine starts, system volts are lower than regulator setpoint, low charging amps.
 - Once charge cycle begins, low volts and low amps are still present.
 - After alternator energizes, voltage will increase several tenths. Amps will increase gradually, then quickly, to medium to high amps.
 - Finally, volts will increase to setpoint and amps will decrease.

The time it takes to reach optimum voltage and amperage will vary with engine speed, load, and ambient temperature.
- **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.
- **AGM (Absorbed Glass Mat) Maintenance-free Battery**
 These dry-cell batteries respond better than standard maintenance-free. If battery state of charge drops to 75% or less, batteries should be recharged to 95% or higher separately from the engine's charging system to avoid damaging charging system components and to provide best overall performance. Charge acceptance of these batteries may display characteristics similar to maintenance batteries.

Battery Charge Volt and Amp Values

Volt and amp levels fluctuate depending on the battery state of charge. If batteries are in a state of discharge—as after extended cranking time to start the engine—system volts will measure lower than the regulator setpoint after the engine is restarted and system amps will measure higher. This is a normal condition for the charging system; the greater the battery discharge level, the lower the system volts and the higher the system amps. The volt and amp readings will change as batteries recover and become fully charged: system volts will increase to regulator setpoint and system amps will decrease to low level (depending on other loads).

- **Low Amps:** 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:** System amps value which can cause the battery temperature to rise above 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 charge amp rates.
- **High Amps:** System amps value which can cause the battery temperature to rise above adequate charging temperature within 2-3 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 charge amp rates.
- **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:** Voltage value obtained when the charging system is operating. This value will be higher than battery voltage and must never exceed the regulator voltage setpoint.
- **B+ Voltage:** Voltage value obtained when measuring voltage at battery positive terminal or alternator B+ terminal.
- **Surface Charge:** Higher than normal battery voltage occurring when the battery is disconnected from battery charger. The surface charge must be removed to determine true battery voltage and state of charge.
- **Significant Magnetism:** Change in strength or intensity of a magnetic field present in 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:** Normal condition occurring when the load demand on alternator is greater than rated alternator output at given rotor shaft RPM.



CEN C612/C617/C624 Alternators

Description and Operation

C612/C617/C624 28 V (240 A) alternators are self-rectifying and self-energized. All windings and current-transmitting components are non-moving, so there are no brushes or slip rings to wear out.

When controlled by the **A2-141** regulator, these alternators become self-energizing through internal diode trios. Residual magnetic field induces small voltage in stator and energizes field coil. Field coil continues receiving incremental voltage until full voltage is achieved. AC is rectified into DC output through diodes. Regulator controls voltage output. Regulator has:

- D+ terminal to provide a signal to vehicle electrical system, confirming alternator operation
- P terminal to provide an optional AC voltage tap.

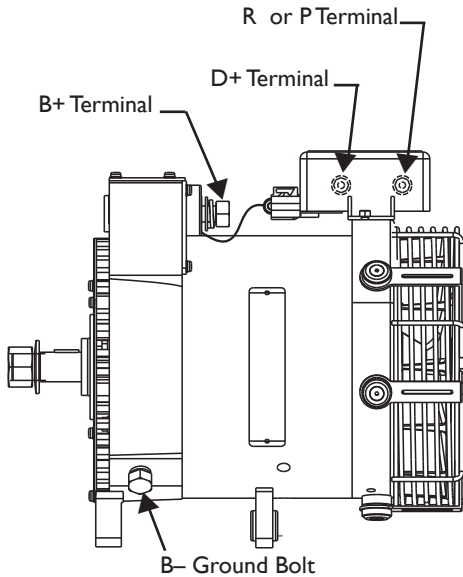


Figure 1 — C612/C617 Alternator Terminals

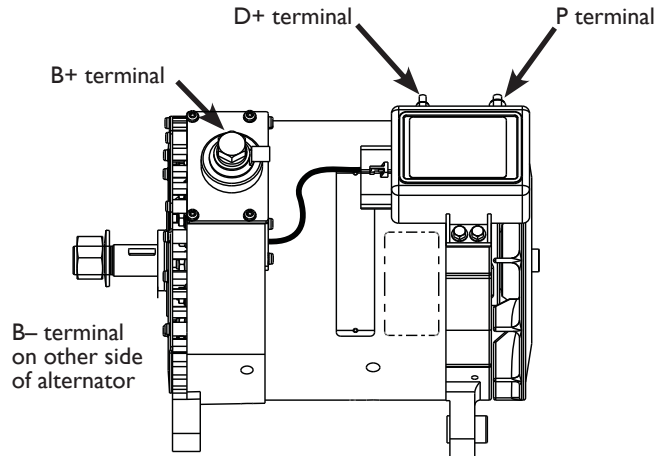
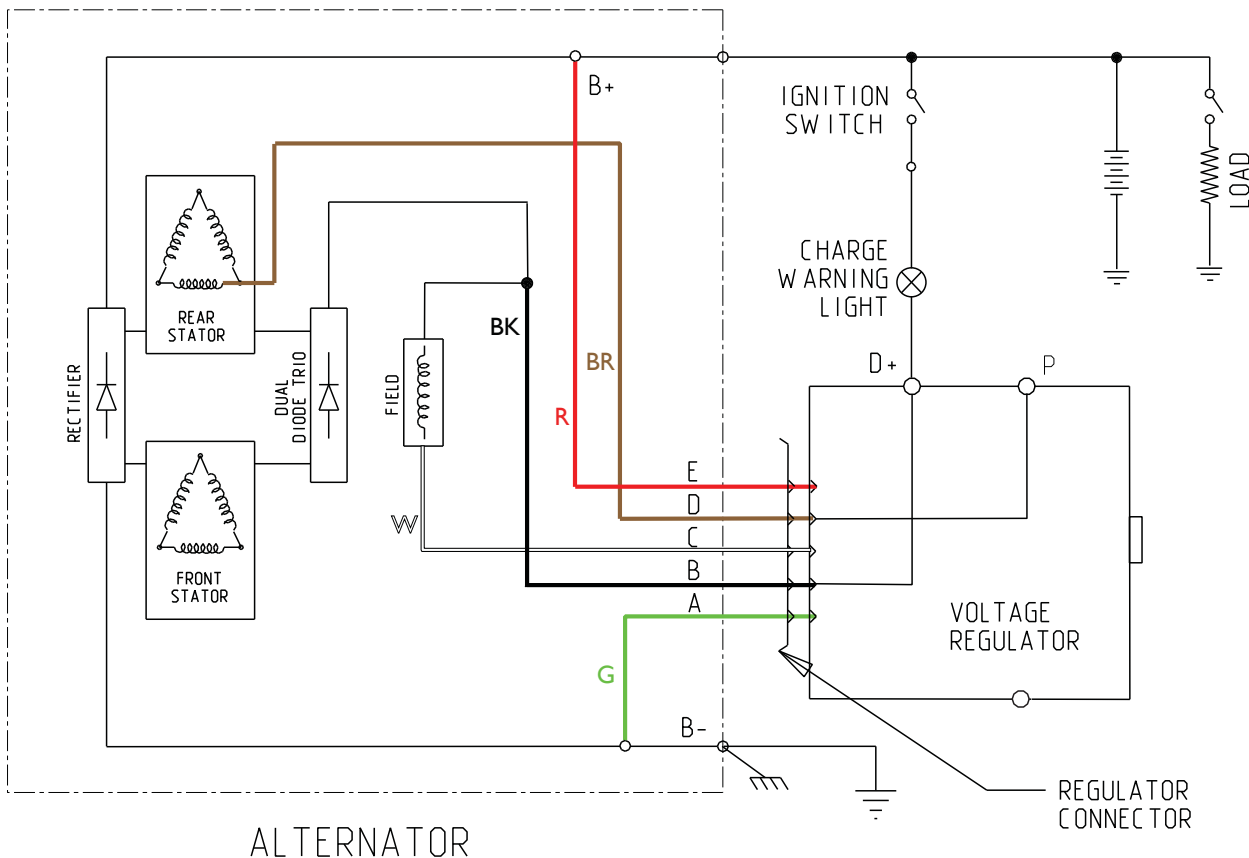


Figure 2 — C624 Alternator Terminals



ALTERNATOR

Figure 3 — C612/C617/C624 Alternator Wiring Diagram



CEN C621 Alternator
Description and Operation

C621 28 V (220 A) alternators are self-rectifying and self-energized. All windings and current-transmitting components are non-moving, so there are no brushes or slip rings to wear out.

When controlled by the **A2-141** regulator, these alternators become self-energizing through internal diode trios. Residual magnetic field induces small voltage in stator and energizes field coil. Field coil continues receiving incremental voltage until full voltage is achieved. AC is rectified into DC output through diodes. Regulator controls voltage output. Regulator has:

- D+ terminal to provide a signal to vehicle electrical system, confirming alternator operation
- P terminal to provide an optional AC voltage tap.

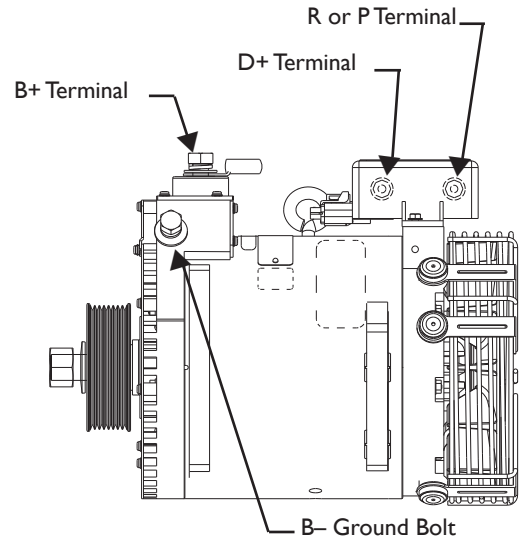


Figure 4 — C621 Alternator Terminals

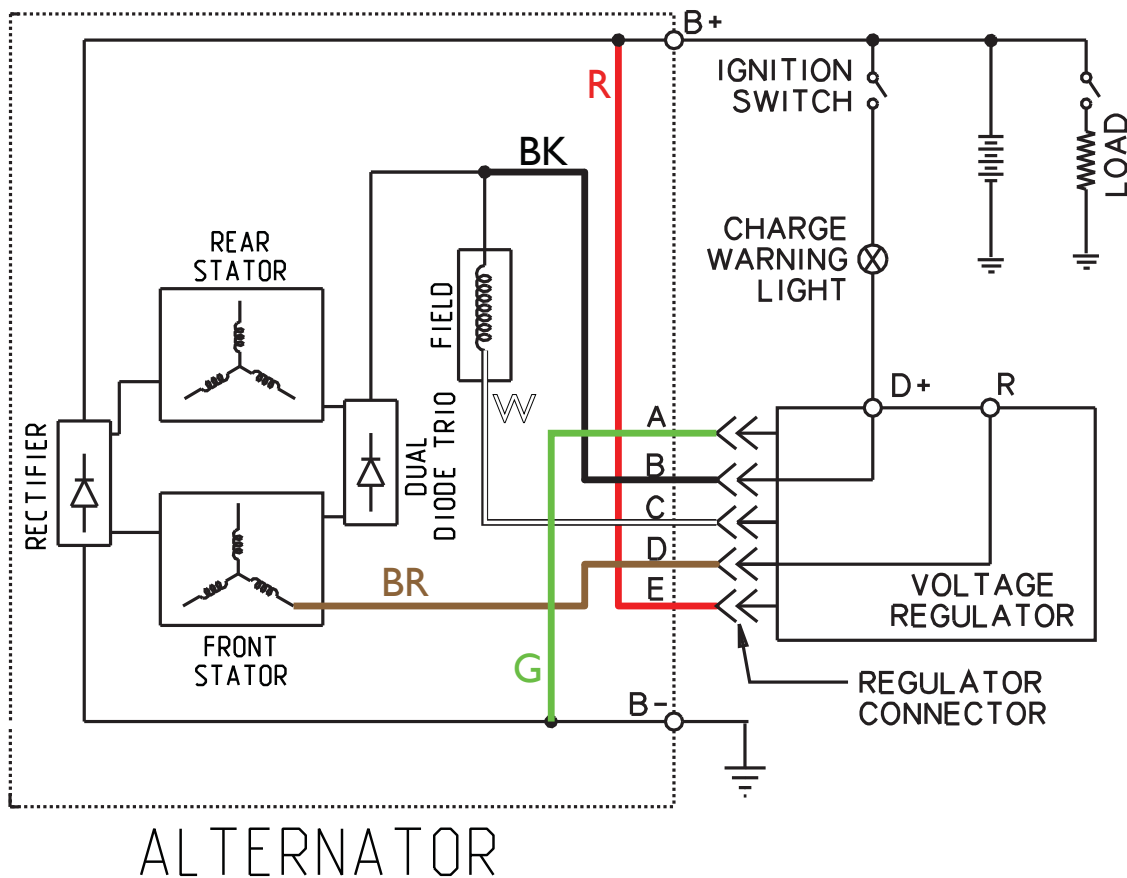


Figure 5 — C621 Alternator Wiring Diagram

Section B: Basic Troubleshooting



Tools and Equipment for Job

- Digital Multimeter (DMM)
- Ammeter (digital, inductive)
- Jumper wires
- CEN Regulator Bypass Adapter A10-129

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 I – System Conditions	
SYMPTOM	ACTION
Low Voltage Output	Check: loose drive belt; low battery state of charge. Check: current load on system is greater than alternator can produce. Check: defective wiring or poor ground path; low regulator setpoint. Check: defective alternator or regulator. Check: wrong regulator.
High Voltage Output	Check: high regulator setpoint. Check: defective regulator. Check: alternator.
No Voltage Output	Check: broken drive belt. Check: battery voltage at alternator output terminal. Check: defective alternator or regulator. Check: lost residual magnetism in self-energizing alternator. Go to Chart 1, page 5.

NOTICE

Failure to check for the following conditions will result in erroneous test results in the troubleshooting charts.

Basic Troubleshooting

- Inspect charging system components for damage**
Check connections at B– cable, B+ cable, and regulator harness. Also check connections at regulator terminal wiring from regulator to vehicle components. Repair or replace any damaged component before electrical troubleshooting.
- Inspect vehicle battery connections**
Connections must be clean and tight.
- Check drive belt**
Repair or replace as necessary.
- Determine battery voltage and state 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.
- 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.
- Operate vehicle**
Observe charge voltage.

CAUTION

 If charge voltage is above 32 volts, immediately shut down system. Electrical system damage may occur if charging system is allowed to operate at high voltage. Go to Table I.
- 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.
- Battery** is considered fully charged if charge voltage is at regulator setpoint and charge amps remain at lowest value for 10 minutes.
- If charging system** is not performing properly, go to Chart 1, page 5.

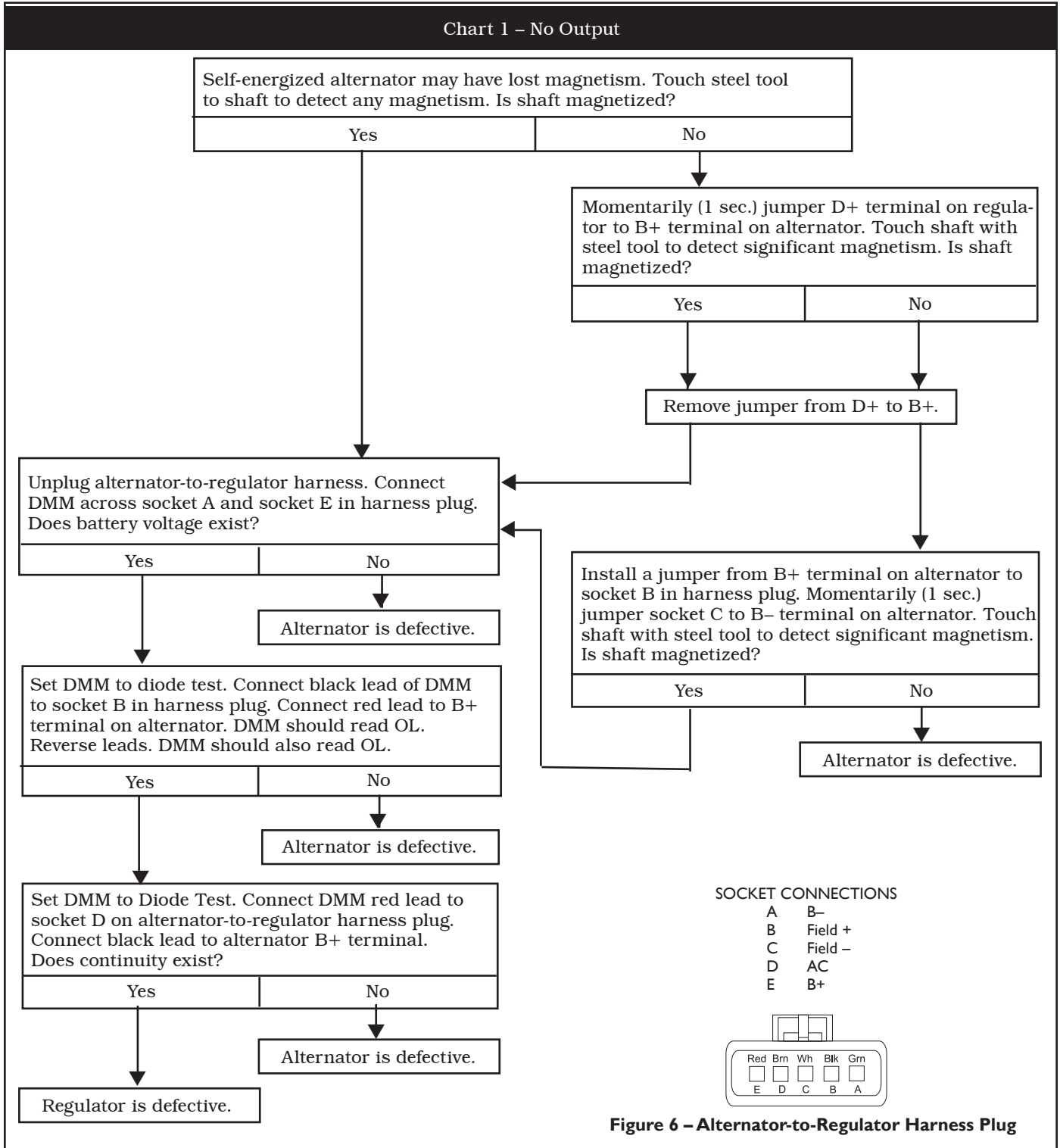


Figure 6 – Alternator-to-Regulator Harness Plug

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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