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 if ignored.

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 measure lower than regulator setpoint and system amps measure at a medium level.
  - — 3-5 minutes into charge cycle, volts increase and amps decrease.
  - — 5-10 minutes into charge cycle, volts reach regulator setpoint or very close, 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 measure lower than regulator setpoint with low charging amps.
  - — Once the charge cycle begins, low volts and low amps are still present.
  - — After the 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.

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 N1335 Alternators
Description and Operation

N1335 28 V 300 A alternators are internally rectified. All windings and current-conducting components are non-moving, so there are no brushes or slip rings to wear out.

After engine is running, **N3234** regulator receives energize signal. Regulator monitors alternator rotation and provides field current only when it detects alternator shaft rotating at or above idle speed.

After regulator detects alternator rotation, it gradually applies field current, preventing an abrupt mechanical load on accessory drive system. The soft start may take up to 5 seconds.

N3234 regulator used with these units also

- is negative temperature compensated. Setpoint is 28.8 ± 0.5 V at 72 F when configured to operate with 6TMF type batteries.
- provides overvoltage cutout (OVCO). Regulator will trip OVCO when system voltage rises above setpoint by 3 V for longer than 3 seconds. OVCO feature detects high voltage and reacts by opening alternator field circuit and turning off alternator. Restarting engine or waiting until system voltage drops 5 V below setpoint will reset OVCO circuit.
- maintains alternator steady-state output voltage at regulated settings as vehicle electrical loads are switched on and off.

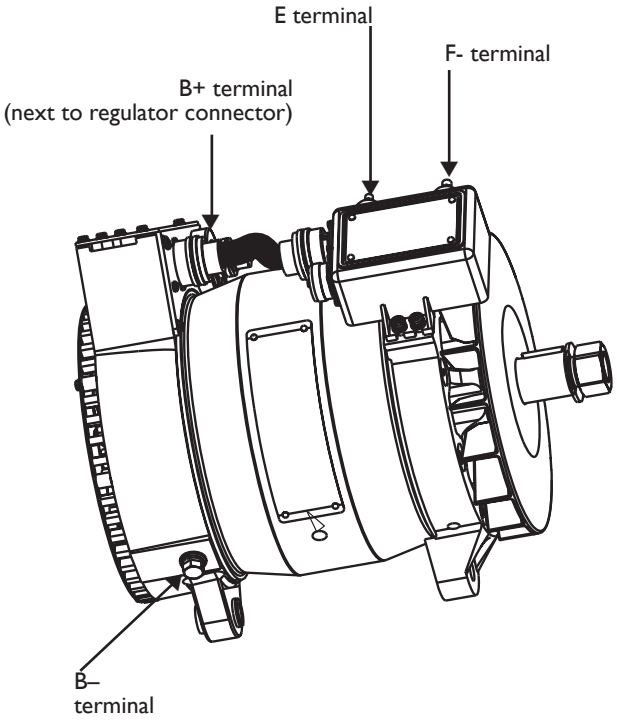


Figure 1 — N1335 Alternator and N3234 Regulator Terminals

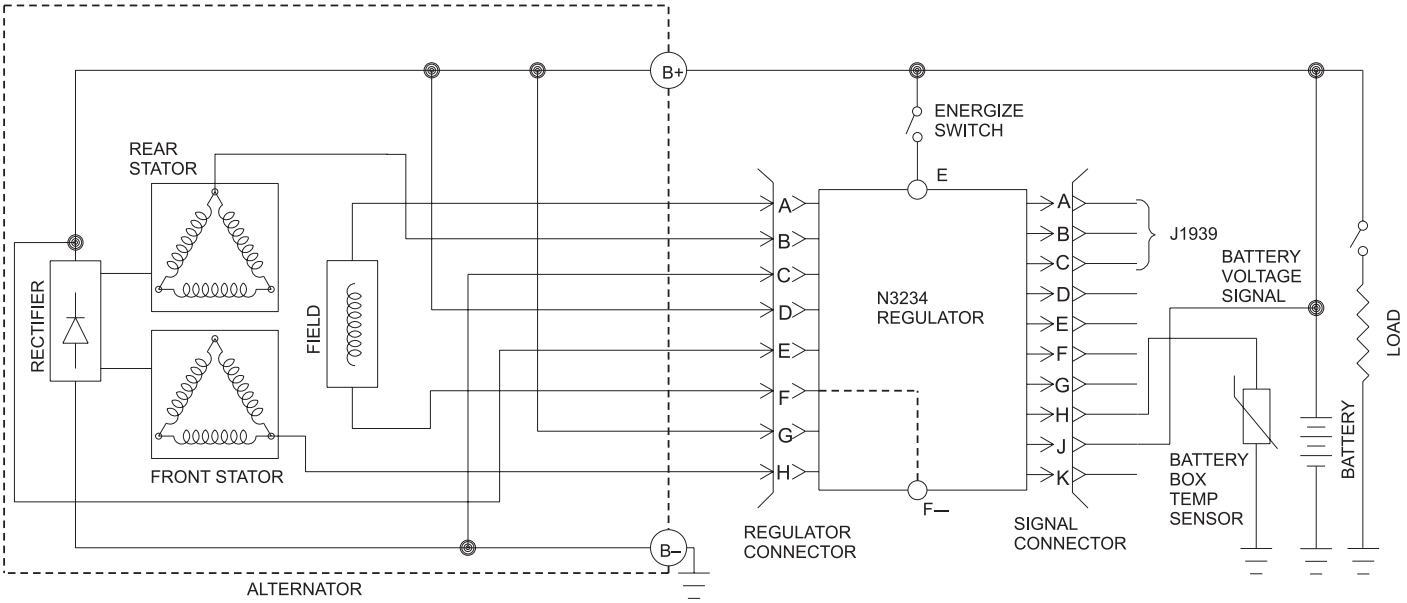


Figure 2 — N1335 Alternators with N3234 Regulator

CAN/J1939 Interface

DESCRIPTION AND OPERATION

The CEN N3234 digital regulator is compatible with SAE J1939 communications standard for vehicle networking.

CEN uses MIL-C-26482 to interface between the N3234 and the vehicle J1939 databus and battery box sensors. Mating connector is MS3116E12-10S or equivalent. If this connection is not used, it must be sealed with connector cover MS3181-12CA or equivalent. Connector pinout is shown in Table 1. Message content is shown in Table 2.

Battery box sensing inputs connect to battery pack positive terminal (pin J) and battery box thermistor (pin H). Thermistor is 10K NTC with 32650Ω at 0°C, 10000Ω at 25°C, 3601Ω at 50°C and 1% interchangeability. Thermistor location should be chosen so that it closely represents battery case temperature. Thermistor connects between pin H and vehicle chassis, battery pack negative terminal, or negative bus bar. If either sensing input (pin H or J) is not used, regulator will default to internal temperature and alternator voltage.

TABLE 1 – J1939 Connector Circuit Identification

Pin	Identification
A	J1939+
B	J1939–
C	J1939/SHLD
D	B–/GND
E	Mfr use only
F	Mfr use only
G	Mfr use only
H	Ext. Temp. Sense
J	Ext. Voltage Sense
K	unused

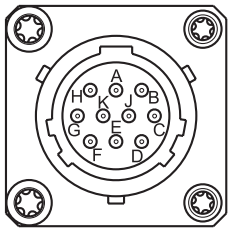


Figure 3 – J1939 Connector Pins

TABLE 2 – N3234 Regulator/J1939 Readout Diagnostics (see Table 3)

Regulator Readout	Expected Reading	Action If Expected Reading Not Present
Alternator Speed	1500 to 8000 RPM	Check belts and pulley.
Alternator Voltage	26 to 30 V (when charging)	Check alternator drive and regulator IGN signal.
Battery Voltage	26 to 30 V (when charging)	Check battery box voltage sense signal.
Regulator Temp.	–40 to 125°C	Check regulator.
Alternator Current	0 to 300 A	Check alternator output cabling.
Alternator Load	0 to 100%	Check alternator output cabling.
Battery Temp.	–40 to 80°C	Check battery box thermistor.
Stator Voltages	10 to 18 V (when charging)	Check alternator belts and output.

Table 3 — Message Data

PGN	Name	1 (1)	2	3	4	5	6	7	8
FED5	Alt. Speed	Alt. RPM							
FEF7	Alt. Voltage			Alt. Voltage				Batt. Voltage	
FEA7	Alt. Temp.				Alt. Temp.				
FFC8	Proprietary #1				Warning Light	Regulator Hrs.		Load	Batt. Temp.
FFC9	Proprietary #2				OVCO Count		Software Version		

Notes:
(1) Byte 1 broadcast closest to CAN frame ID.

A. Tools and Equipment for Job

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

B. Identification Record

List the following for proper troubleshooting:

❒ Alternator model number _____

❒ Regulator model number _____

C. Preliminary Check-out

Check symptoms in Table 4 and correct as necessary.

TABLE 4 – 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. Check: defective alternator and/or regulator.
High Voltage Output	Check: defective regulator. Check: alternator.
No Voltage Output	Check: presence of energize signal to E terminal on regulator. Check: battery voltage at alternator output terminal. Check: defective alternator and/or regulator.

D. Basic Troubleshooting

1. **Inspect charging system components**
   Check connections at ground cables, positive cables, and regulator harness. Repair or replace any damaged component before troubleshooting.
2. **Inspect connections of vehicle batteries**
   Connections must be clean and tight.
3. **Determine battery type, voltage, and state of charge**
   Batteries must be all the same type for system operation. If batteries are discharged, recharge or replace batteries as necessary. Electrical system cannot be properly tested unless batteries are charged 95% or higher. See page 1 for details.
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.

   CAUTION

   If charge voltage is above 33 volts, immediately shut down system. Electrical system damage may occur if charging system is allowed to operate at excessive voltage. Go to Table 4 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 5.

TROUBLESHOOTING

Shut down vehicle and restart engine. If alternator functions normally after restart, a “no output condition” was normal response of voltage regulator to overvoltage condition. Inspect condition of electrical system.

If you have reset alternator once, and electrical system returns to normal charge voltage condition, there may have been a one time, overvoltage spike that caused 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 a third time, go to Chart 1, page 5.

Chart 1 – No Alternator Output – Quick Diagnostic

With engine running: Does battery voltage exist at alternator B+ terminal and regulator IGN terminal?

- Yes
- No → Repair vehicle harness circuit to IGN terminal on regulator or B+ terminal on alternator.

With key off, engine off: Does battery voltage exist at alternator B+ terminal?

- Yes
- No → Repair vehicle harness circuit to B+ terminal on alternator.

With key off, engine off: Unplug alternator-to-regulator harness at alternator and regulator connectors. Check for continuity at both ends of harness. Does continuity exist at each pin-to-pin?

- Yes
- No → Harness is defective.

Plug in alternator-to-regulator harness at regulator connector. Connect DMM on DC volt scale across pins C and D at alternator connector. Does battery voltage exist?

- Yes
- No → Alternator is defective.

With DMM on resistance scale, does field resistance between pins F and A in harness plug measure ~1.4 (±0.2)Ω?

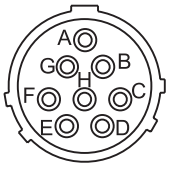
- Yes
- No → Alternator is defective.

Set DMM to diode test. Check continuity of rear stator diodes: Connect red lead to pin B in harness plug. Connect black lead to alternator B+ terminal. Meter should read one diode drop (approx. 0.6 to 0.9 V). Disconnect leads. Connect red lead to alternator B– terminal. Connect black lead to pin B. Meter should read one diode drop (approx. 0.6 to 0.9 V).

- Yes
- No → Alternator is defective.

Set DMM to diode test. Check continuity of front stator diodes: Connect red lead to pin H in harness plug. Connect black lead to alternator B+ terminal. Meter should read one diode drop (approx. 0.6 to 0.9 V). Disconnect leads. Connect red lead to alternator B– terminal. Connect black lead to pin H. Meter should read one diode drop (approx. 0.6 to 0.9 V).

- Yes → Go to Page 6 to continue.
- No → Alternator is defective.



PIN CONNECTIONS

Pin A	F–
Pin B	Phase 1
Pin C	GND/B–
Pin D	B+
Pin E	Kelvin +
Pin F	F+
Pin G	Kelvin –
Pin H	Phase 2

Figure 4 – Alternator-to-Regulator Harness Plug

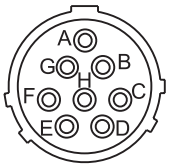
Chart 1 cont'd from Page 5 – No Alternator Output – **Quick Diagnostic**

With DMM on resistance scale: Connect red lead to pin E in harness plug. Connect black lead to alternator B+ terminal. Meter should read 0 ohms. Change pin E to pin G. Meter should read 0 ohms.

- Yes
- No → Alternator is defective.

Momentarily (1 sec.) jumper pin F in harness plug to alternator B+ terminal and jumper pin A in harness plug to B- terminal. Touch shaft with steel tool to detect significant magnetism. Is shaft magnetized?

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



PIN CONNECTIONS

Pin A	F–
Pin B	Phase 1
Pin C	GND/B–
Pin D	B+
Pin E	Kelvin +
Pin F	F+
Pin G	Kelvin –
Pin H	Phase 2

Figure 5 – Alternator-to-Regulator Harness Plug