

SERVICE MANUAL

SERVICE MANUAL SECTION

Diamond Logic® PowerPack 3 Dynamic Power System Service/ Troubleshooting Guide

Model: 4100

Model: 4200

Model: 4300

Model: 4400

Model: 7300

Model: 7400

Model: 7500

Model: 7600

Model: 7700

Unit Code: 60AAC

Unit Code: 60AAE

S08308

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1. SAFETY INFORMATION

IMPORTANT – Read the following before starting the service or troubleshooting procedure.

The information contained in this International Service Manual Section was current at the time of printing and is subject to change without notice or liability.

You must follow your company safety procedures when you service or repair equipment. Be sure to understand all of the procedures and instructions before you begin work on the unit.

International uses the following types of notations to give warning of possible safety problems and to give information that will prevent damage to the equipment being serviced or repaired.



WARNING – A warning indicates procedures that must be followed exactly. Personal injury or possible death can occur if the procedure is not followed.

CAUTION – A caution indicates procedures that must be followed exactly. If the procedure is not followed, damage to equipment or components can occur.

NOTE – A note indicates an operation, procedure or instruction that is important for correct service.

Some procedures require the use of special tools for safe and/or correct service. Failure to use these special tools when required can cause injury to service personnel or damage to vehicle components.

This service manual section is intended for use by professional technicians, NOT a “do-it-yourselfer.” It is written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the service section applies to your vehicle. See your International Truck Dealer for information on whether this service section applies to your vehicle.

2. INTRODUCTION

Servicing of the PowerPack 3 system is limited to the replacement of major components, repair of connectors and cabling and replacement of the fan mounted to the unit.

For detailed wiring information, refer to the S08315 Electrical Circuit Diagram Manual.



WARNING – DO NOT OPEN the PowerPack 3. Hazardous voltages exist internally even after the PowerPack 3 is removed from the vehicle. Only a Qualified Technician may perform service inside the PowerPack 3. Failure to follow this warning may result in property damage, personal injury or death.

Troubleshoot the PowerPack 3 while it is still in the vehicle – do not remove it.

Do not attempt to run the dynamic PowerPack 3 from a DC power supply or battery charger.

3. SPECIAL TOOLS REQUIRED

Digital Volt/Ohm Meter, ZTSE4357

Clamp-on Ammeter, ZTSE4575

EZ-Tech III Electronic Service Tool

4. GENERAL TROUBLESHOOTING PROCEDURES



WARNING – To avoid property damage, personal injury or death, park the vehicle on a flat level surface, set the parking brake, turn the engine off, and chock the wheels.

To properly check PowerPack 3 system operation, the truck must be stationary with the engine running.

1. Place the transmission in neutral.
2. Set the Park Brake.
3. Start the engine.
4. Release the service brake pedal.
5. Make sure any PTO controls that could potentially override the system engine speed control are turned off.
6. Set the 120 VAC switch to ON.

At this point, the engine should automatically ramp to 935 rpm and the 120 VAC switch indicator should be ON solid (no flashing).

If the switch indicator is flashing, or the engine does not ramp to and maintain 935 rpm or more, turn the switch off and check that all the interlock conditions (transmission in neutral, park brake set, engine running, PTO control OFF) are met. Turn the switch on again.

If the switch indicator light continues to flash, check for fault codes SPN 168, FMI 4 or FMI 8. If one of these fault codes is present, check for proper connection of the 3 phase cables from the alternator to the PowerPack.

If a communication fault is present, check for open circuits in the CAN bus and/or Ignition connections to the system.

The switch indicator will flash to indicate a problem. It can flash slow (once per second) or fast (twice per second) to indicate the severity as shown in the diagnostic trouble code chart below.

Table 1 PowerPack 3 Diagnostic Trouble Codes

SPN	FMI	Byte 7	Byte 8	Switch Indicator Blink Rate	Condition Description/ Comments/ Probable Cause(s)
168	2	0	0	Fast	Communication fault from ESC to the PowerPack. Check for open circuit or short in J1939 datalink. If switch is not blinking, verify vehicle is programmed for Powerpack feature and the switchpack is operating correctly.
168	3	0	0	Fast	DC module over voltage condition on vehicle DC bus. System detected voltage over 15 volts. Remove any external power supply/charger from vehicle.
168	3	0	0	Slow	AC module over voltage condition on high voltage DC bus. Likely an internal failure for AC output. AC has been shut down. DC output remains on.
168	4	0	0	Fast	DC module under voltage condition on vehicle DC Bus. System detected low DC voltage. This could be due to insufficient input power from the alternator. Check the 3 phase wires from the alternator to the PowerPack.
168	4	0	0	Slow	AC module under voltage condition on high voltage DC bus. System detected low internal voltages. This could be due to insufficient input power from the alternator. Check the 3 phase wires from the alternator to the PowerPack.
168	6	0	0	Slow	AC module has shut down due to overload condition. AC overloaded, remove some or all of AC load.
168	8	0	0	Fast	Phase missing fault/alternator fault. One of the three 3-phase wires has an open circuit. Check the 3 phase wires from the alternator to the PowerPack.
168	16	0	0	Fast	DC module over temperature condition. PowerPack is experiencing extremely high internal temperatures. AC and DC has been shut down. Allow the system to cool down.
168	16	0	0	Slow	AC module over temperature condition. PowerPack has detected high internal temperatures although less severe. AC inverter has shutdown, but DC output remains on. Shut the system down to allow it to cool down or remove some of the loads.
168	17	0	0	Fast	PowerPack Fuse Open. Check DC battery charging connections from Powerpack. Check 150A fuse.
639	14	37	255	Fast	Communication fault between PowerPack and the ESC. Check for open circuit or short in J1939 datalink. Also, check the ignition circuit to the Powerpack module.

The following are the most common symptoms and solutions encountered.

Prior to any troubleshooting, always check and verify that all PowerPack 3 and alternator connections are tight and secure.

SYMPTOM:

PowerPack 3 is turned on but no output power is available.

SOLUTION:

- A. Verify that the vehicle is running and all interlock conditions are met (see above).
- B. Verify that the PowerPack 3 switch is turned on. Switch indicator should be ON solid. If it's flashing, then the system is indicating a problem and may have a diagnostic code.
- C. Verify that the PowerPack 3 is getting 12 Volts on the Ignition wire when the key is on. If not, check the fuse and interconnects.
- D. Verify that the CAN bus cable is connected to both the PowerPack 3 and the vehicle connectors.
- E. Verify that the 30-Amp breaker on the side of the PowerPack 3 enclosure is not open.
- F. Verify that the GFCI outlet is not open. The GFCI should have a green light on if 120VAC power is available. A red light on the GFCI indicates a ground fault and needs reset (verify the short circuit has been removed). Reset button is located on the GFCI.

NOTE – If the circuit breaker or GFCI was open, be sure to examine all grounding, and load conditions to determine the cause.

SYMPTOM:

PowerPack 3 won't support the desired load.

SOLUTION:

- A. Verify that the engine ramps to the proper RPM (935) when the system is enabled.
- B. Verify that the total PowerPack 3 load (AC Watts plus DC Watts) is less than 4100 total Watts. (AC Volts x AC Amps = AC Watts + DC Volts x DC Amps = DC Watts.)
- C. Verify that all 3 AC input cables from alternator are securely connected to PowerPack 3 and alternator.
- D. Verify that the alternator field cable is securely connected to PowerPack 3 and to the alternator. Also check that the special fuse for the alternator field circuit is not open.
- E. Verify alternator is working properly. See Alternator Checkout Procedure below.

5. ALTERNATOR CHECKOUT PROCEDURE

! WARNING – The alternator may generate high voltage, particularly at high rpm, which can be harmful. Do not touch the 3 phase outputs terminals. Failure to follow this warning may result in property damage, personal injury or death.

In order to determine if the alternator is functioning properly, perform the following troubleshooting procedure.

NOTE – Before continuing with this procedure insure that the batteries and associated truck wiring is in good working order.

A. Check field voltage by turning the ignition switch to the run mode - do not start the engine. Measure the voltage at each of the alternator F+ and F- terminals (see Figure 1). Voltage will be from .5V to 1.5V. If the voltage is not present then faulty wiring or the inverter is the problem. If voltage is present on one of the alternator's F terminals and not present on the other, then the alternator's field is open and the alternator is defective. See Figure 1 to properly test voltage at the alternator's field terminals.

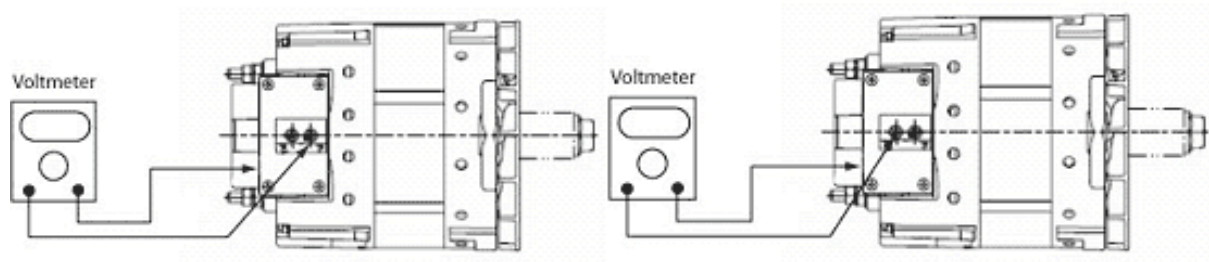


Figure 1

B. Turn off the ignition switch, ensure that the Inverter switch is in the OFF position and any loads are disconnected from the Inverter.

C. Disconnect the two (2) field leads from the alternator, tape the end of each lead individually with electrical tape and tie back out of the way (see Figure 2).

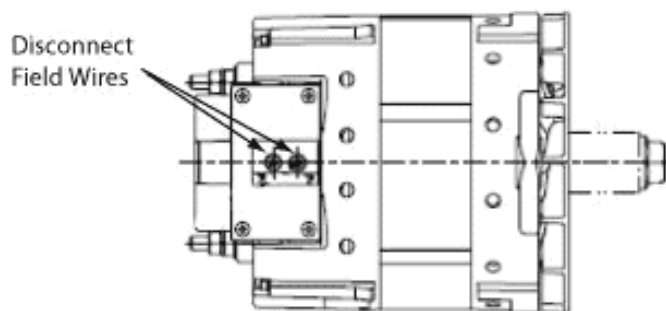


Figure 2

D. Disconnect the three (3) phase leads marked AC on the back of the alternator (see Figure 3) and tape the end of each lead individually with electrical tape and tie back out of the way.

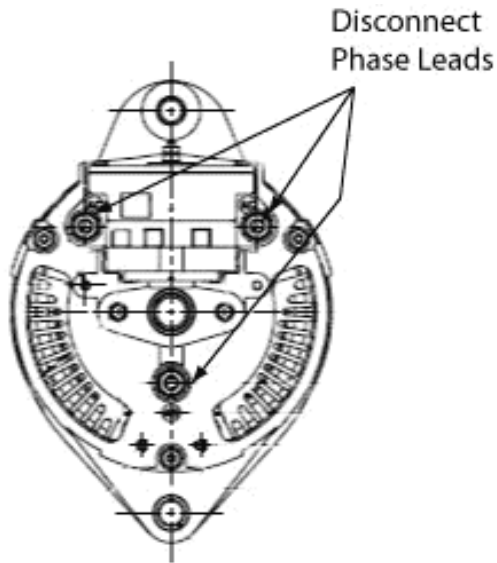


Figure 3

E. Connect the alternator field terminals directly to the 12V batteries (see Figure 4).

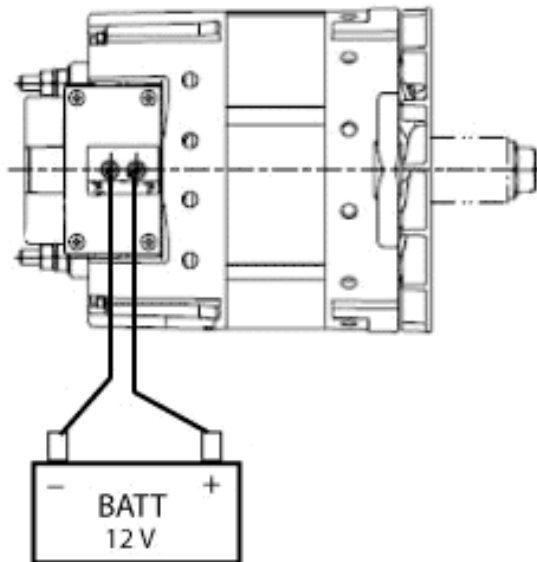


Figure 4

F. Start the truck and run the engine at idle.

! WARNING – The Alternator output is a hazardous 3 phase AC voltage – Do not cut the cable or touch the terminals. Failure to follow this warning could result in property damage, personal injury or death.

G. With the engine idling, measure the AC terminal voltages (alternator AC taps) 1 to 2, 2 to 3 and 1 to 3 (see Figure 5). All three readings should be within one volt (1V).

NOTE – The AC terminal voltage output varies directly with field input voltage and engine RPM. Therefore the important reading is that each AC inter-phase reading is the same within one volt.

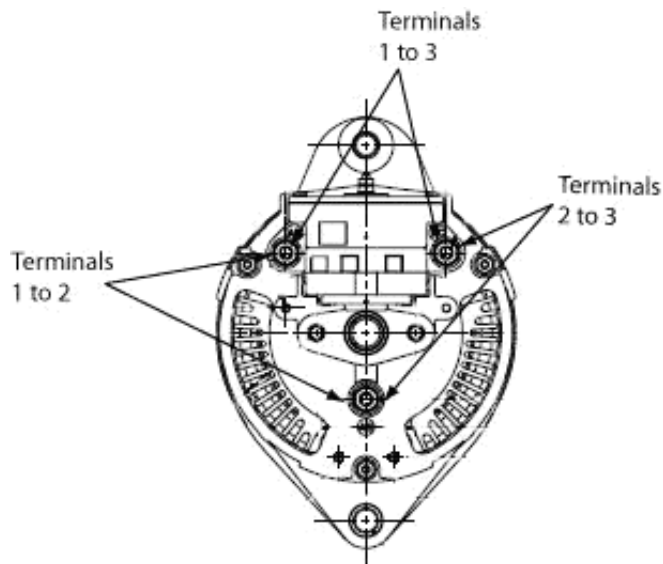


Figure 5

H. If the AC phase voltages fall within the specification listed above then the alternator is good.

I. If the AC phase voltages fall outside the specification then the alternator is defective and needs to be replaced.

IF YOU HAVE ANY QUESTIONS ABOUT THIS TEST PLEASE CONTACT THE LEECE-NEVILLE TECHNICAL SERVICES HOT LINE AT 866-288-9853.

6. FAN REPLACEMENT

If the PowerPack 3 12 VDC cooling fan does not operate, it can be replaced using the following procedure. Do not attempt to replace the fan with the engine running.

- A. Remove 4 screws retaining the orange plenum to the PowerPack 3. Keep all hardware.
- B. Remove 4 screws from the black fan shroud/retainer. Remove the bracket and set it aside. Keep all hardware.
- C. Carefully extract the fan. Disconnect the water tight connector for the fan and set the fan aside.

NOTE – The gasket on the fan connection should be retained on the remaining plug on the PowerPack 3.

D. Plug the new fan into the connector (the connector is keyed) and install fan in the center of the cutout.

NOTE – Make sure the fan harness is NOT underneath the fan as this will cause the fan to not operate correctly.

E. Re-install the black fan shroud/retainer with the original hardware and tighten to 8 lb-in. Do not over-torque.

F. Re-install the orange plenum using the original hardware. Install the first screw in the hole that is not slotted for ease of alignment. Tighten to 15 lb-in. Do not over-torque.