

Technical Note
Freedom/Fleet Power
 512-0084-01-01 Rev 1

Troubleshooting Guide, Freedom and Fleet Power Inverter/Chargers

Overview

This document is a guide for troubleshooting inverters, battery chargers, transfer switches and remote controls for Xantrex **Freedom 10, 15, 20, 25, 30** and **Fleet Power 1000, 1500, 2000** and **2500** inverter/chargers.

CAUTION:

Risk of electrical shock. Lethal voltages are terminated inside of the inverter/charger. **Use extreme caution when working inside of the unit.** Refer work to a qualified service technician.

Wire Identification

Model	Hot/Line	Neutral/Return	Ground
Domestic (120 VAC, 60 Hz)	Black	White	Green
International (240 VAC 50/60 Hz)	Brown	Blue	Green with yellow stripe

Inverter

The inverter is a device that changes (inverts) DC power stored in a battery bank to AC power. This power can then be distributed to various AC appliances. The requirements for proper inverter operation include:

- Batteries within the voltage range described below
- Clean and tight connections to the batteries and AC distribution system

Voltage Range

Model	Lower voltage limit*	Upper voltage limit
12 V	10 VDC	15 VDC
24 V	20 VDC	31 VDC
32 V	26.7 VDC	41 VDC

A high or low battery voltage condition occurs if the voltages are outside of these limits. This will cause the inverter to shut down.

Equipment required to test the Inverter:

- Digital Multimeter that measures true RMS* AC voltage, such as a Fluke 87

- Light with 100-watt incandescent light bulb
- Battery cable (2 feet) terminated with standard ring terminals

(*If the meter used is not capable of measuring True RMS voltage, the voltage readings will be inaccurate. An averaging type meter may read from 90–140 VAC. The reading will vary depending on the load applied to the inverter).

Checking the Battery Voltage and DC Fuse will help to determine if the inverter is operating properly.

1. Using a multimeter set to read DC VOLTS, check the battery voltage as close to the DC input of the inverter as possible. Checking the voltage near the inverter enables you to verify the connections of all battery cables, switches, fuses, etc. See the table on previous page for voltage required for inverter to operate.
2. Verify that any fuses and/or switches between the batteries and the inverter are intact and operating properly. This can be accomplished by removing the fuses or switches from the circuit. A short length of battery cable may also be used to temporarily bypass a fuse or battery switch.

Checking AC Output

1. After the battery voltage and connections have been checked, disconnect the inverter's AC output wires from the power distribution system and connect a light to the AC output of the inverter/charger.
2. Disconnect the remote panel to eliminate it as a possible problem.
3. Turn the inverter ON using the power switch on the front panel of the inverter. The 100-watt light should illuminate. Measure the voltage at the AC output wires using the multimeter. The reading should be 114–126 VAC or approximately 230 VAC if the unit is an international model. If the light does not illuminate, there is a problem with the inverter. Contact Xantrex technical support.

Battery Charger

The battery charger function requires AC INPUT power from a generator or shorepower (utility). The input voltage should be greater than 115 VAC (200 VAC for international models) and have the proper polarity.

Equipment Required to Test the Battery Charger:

- Digital Multimeter that measures true RMS AC voltage, such as a Fluke 87
 - Freedom Remote (P/N 82-0101-01) or Fleet Power Remote (P/N 82-0107-01)
 - 4 conductor RJ11 cable to connect inverter to remote panel
1. Disconnect unit from AC Power
 2. Check battery cable connections.
 3. Measure the battery voltage across the positive and negative terminals on the battery with digital multimeter set to read DC VOLTS.

4. Check the voltage as close to the DC input of the inverter as possible to ensure that any cable extensions used are connected properly. The battery voltage should measure 12 VDC for 12-volt models, 24 VDC for 24-volt models, 32 VDC for 32-volt models (or slightly less) to ensure the charger will detect that the batteries need to be charged.
5. Connect the unit to AC power. After 10 seconds, the transfer switch will engage and the charging cycle will begin. Check the AC input voltage with the multimeter at the inverter's AC INPUT connections. The voltage should be ≥ 115 VAC (≥ 200 VAC for international models). Any wiring should also be checked for proper connections.
 - The transfer switch **must** engage before the charger will operate. The AC INPUT LED on the remote panel will illuminate when the transfer switch has engaged. If the transfer switch does not engage, please refer to the Transfer Switch section of this document. During charge mode, the AC INPUT LED and the INV/CHRG LED will be illuminated on the remote panel.
6. Measure the battery voltage again in the same location as measured in step 4. The voltage will gradually increase. It should peak at the approximate voltages listed in the table below:

Model	Acceptance Voltage	Float Voltage
12 volt	14.4 VDC	13.5 VDC
24 volt	28.8 VDC	27 VDC
32 volt	38.1 VDC	35.7 VDC

The voltages shown in the above table are for a cool wet cell battery setting. If the remote panel dip-switches are set differently, the voltages measured from the batteries will be different than shown in the table above. Refer to the inverter/charger owner's manual for dip-switch settings and the various voltages associated with different battery type/temperature selections. After the batteries are fully charged, the voltage will drop to the float voltage and continue to hold at this voltage indefinitely.

Contact Xantrex for assistance if necessary.

Transfer Switch

The transfer switch function in the inverter/charger transfers incoming AC power to the output of the inverter/charger. This occurs at a maximum of 30 amps (15 amps on international and Fleet Power 1000 models).

The AC input voltage must be greater than 90 VAC, between 45 and 70 Hz, and have the proper polarity for the inverter/charger transfer switch to engage.

The Freedom 25 and Fleet Power 2500 must have AC power at both the CHARGE and TRANSFER INPUT for the transfer switch to engage. The transfer switch will function when the inverter is turned ON or OFF.

Equipment Required to test the Transfer Switch:

- Digital Multimeter that measures True RMS AC voltage, such as a Fluke 87 or a light with a 100 watt incandescent light bulb
1. Disconnect the inverter from AC power and turn the inverter and remote panel power switch OFF.

2. Connect the multimeter or light to the hot and neutral wires on the AC output.
 3. Reconnect shorepower.
 4. After 7 to 12 seconds, you should hear a relay click and be able to measure or observe AC voltage on the AC OUTPUT of the inverter with the multimeter.
- If the transfer switch does not engage, check for the presence of AC power at the AC INPUT connections to the inverter.

The Freedom 25 and Fleet Power 2500 require AC power on both TRANSFER and CHARGER AC INPUT connections to engage the transfer switch.

- If there is AC power present at the AC INPUT and the transfer switch does not engage, follow the steps in the next section to check fuse F2.

Checking the Fuse F2

F2 is a ¼-amp fuse located inside the inverter/charger on the AC circuit board (the smaller of the two circuit boards). Subjecting the inverter to an over-voltage on the AC INPUT can cause fuse F2 to fail. If this occurs, the inverter/charger will invert, but it will no longer charge or transfer when AC power is applied to the AC INPUT.

The F2 fuse can be tested without removing it from the inverter/charger.

- Disconnect AC input wires from the inverter/charger (Charger AC input on Freedom 25 and Fleet Power 2500). Using an ohmmeter, check the resistance between the hot and neutral AC INPUT wires. The resistance should measure from 150–170 ohms, indicating the fuse has not blown.

Possible causes of overvoltage resulting in blown F2 fuse:

- The shorepower receptacle that is providing AC INPUT power to the inverter/charger is miswired in a manner that causes 220–240 volts between the hot and neutral AC INPUT (CHARGER INPUT on 2500 models) wires.
- The incoming AC power has a large voltage surge or spike (nearby lightning strike for example).
- A miswired "cheater cord" or adapter is used to allow a 30 amp-shorepower cord to be connected to a 50-amp receptacle.
- If neutral becomes open in a 50-amp or larger service with two legs of AC power that are out of phase (220/240 volts), an over-voltage will occur. This is caused by an imbalance between the two legs of power.

NOTE: These failures will void the product warranty.

Other Causes of Overvoltage Condition:

- An inoperable AC board transformer. This can also be damaged by the causes for an over-voltage.
- Loss of spring tension in the F2 fuse holder. This causes the fuse assembly to become resistive and overheat, resulting in fuse failure.

If the fuse is blown, replace it with the same type and rating. If the replacement fuse blows, the small transformer on the AC circuit boards is shorted, requiring replacement of the circuit board by an authorized service center. Contact Xantrex for assistance.

Remote Panel

The remote panel features an inverter ON/OFF switch and displays the inverter/charger's mode of operation. Dip switches on the back of the panel allow custom programming of inverter sensitivity, battery type, power sharing and equalize charging. Refer to the inverter/charger owner's manual for dip-switch programming.

Remote Panel Status LED Indications:

BATTERY

1. A steady Battery LED illumination (not blinking) during inverter or charger mode indicates high or low battery warning. The LED will illuminate prior to the inverter or charger shutting down at the voltage limits shown in the table below:

	Inverter mode		Charger mode	
Model	Upper Voltage Limit	Lower Voltage Limit	Upper Voltage Limit	Lower Voltage Limit
12 volt	15.25 VDC	10.5 VDC	15.25 VDC	10 VDC
24 volt	30.5 VDC	21 VDC	30.5 VDC	20 VDC
32 volt	41.3 VDC	28.0 VDC	41.3 VDC	26.7 VDC

2. A blinking battery indicator during inverter mode indicates the inverter has shut down because of a high or low battery voltage condition. This will occur at the voltages listed in the table below:

Model	Lower Voltage Limit	Upper Voltage Limit
12 volt	10 VDC	15.5 VDC
24 volt	20 VDC	31 VDC
32 volt	26.7 VDC	41.3 VDC

3. If low battery voltage causes the inverter to shut down, it will reset automatically when the battery voltage rises to the float voltage level or if AC input is supplied to the inverter/charger.

CHARGER mode

Several things can cause the Battery LED to blink during charger mode:

- High battery voltage caused the charger to shut down
- The charger is in equalize mode
- The battery voltage is lower than the voltage listed:

Model	Voltage
12 volt	8.0 VDC
24 volt	16 VDC
32 volt	22 VDC

If the battery voltage is lower than what is listed above, the charger will turn ON and attempt to charge the batteries.

If the battery voltage does not rise within 1 minute, the unit will shut down.

The unit will also shut down if the DC fuse between the inverter and battery bank has failed. If a shutdown occurs, ensure that all DC loads are turned OFF and reset the unit by cycling the remote panel power switch OFF and then ON.

OVERLOAD

A steady Overload LED indicates the inverter/charger has shut down because of high temperature. The unit will need to cool before it resets automatically.

A blinking Overload LED can have a number of different causes. The DC AMPS bar graph will display the cause. The bottom LED will illuminate and another LED on the scale will illuminate to provide detail. Refer to the troubleshooting table in the inverter/charger owner's manual.

AC INPUT

The AC Input LED illuminates when the internal transfer switch has engaged. The transfer switch will engage 7 to 12 seconds after AC input power is connected. If the LED does not illuminate, refer to the Transfer Switch section of this document.

INV/CHRG

The Inv/Chrg LED displays the inverter/charger's mode of operation. If no external AC is available, the unit will be in inverter mode. If external AC is available, the unit will be in charger mode.

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