Novus FXM 500/1100/1500/2000

Uninterruptible Power Supply

Power

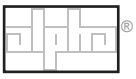
Operator's Manual

017-201-B0 Rev. E5

Effective: January 2006

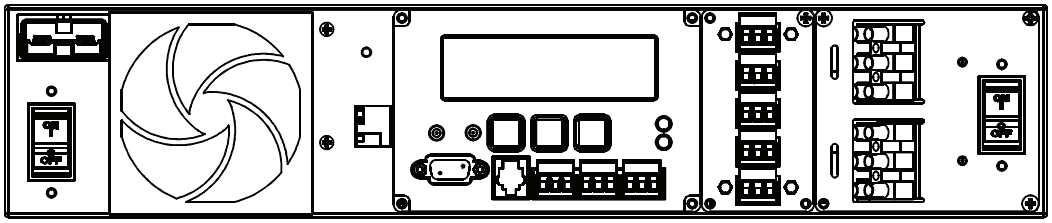
Alpha Technologies

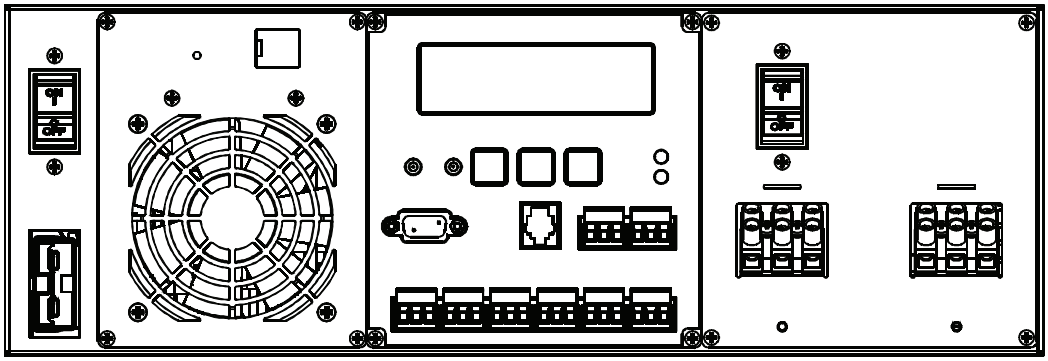
Power

Alpha Technologies 

Operator's Manual

Novus FXM 500/1100/1500/2000





Uninterruptible Power Supplies

From Alpha Technologies

017-201-B0 Rev. E5 1/06

Save This Manual: It contains important installation and operating instructions. Keep it in a safe place.

Table of Contents

The emergency shutdown procedure is on the inside rear cover

DANGER
Risk of Electrical Shock

To reduce the risk of electrical shock and to ensure the safe operation of the Novus FXM, the symbols below are used throughout this manual. Where they appear, only qualified personnel should carry out these instructions.

A dangerous voltage exists in this area. Use extreme caution at all times.

Attention: Important operating instructions. Follow them exactly.

1 Introduction

This Section Introduces the Novus FXM Uninterruptible Power Supply (UPS)

- Safety Instructions (Section 1.1)
- Unpacking and Inspection Instructions (Section 1.2)
- A Description of the FXM 500 and FXM 1100/1500/2000 Front Panels (Section 1.3)

1.1 Safety Checklists

1.1.1 UPS Safety Checklist

This Uninterruptible Power Supply (UPS) is to be installed by people trained in the safe use of high-energy power supplies and their batteries. Also assumed is knowledge of the local electrical code(s) and their safe application.

DANGER: NEVER let water from rain, a hose, tap or a sprinkler's output, road splash or other water sources enter the UPS to prevent accidental shorts, shocks or electrocutions.

- ☐ Do not work alone under hazardous conditions.
- ☐ Read this manual. If you have any questions about safe installation, operation or maintenance, contact Alpha Technologies's customer service department.
- ☐ Carefully unpack the components. Report any shipping or other damage at once.
- ☐ ***Always*** assume electrical connections or conductors are live. Turn off all circuit breakers and double-check with a voltmeter before performing installation or maintenance.
- ☐ Before installation, verify the input voltage and current requirements of the load are met by the UPS's output (*See* specifications). Verify the line voltage and current meet the UPS's input requirements.
- ☐ Place a warning label on the utility panel to tell emergency personnel a UPS is installed.
- ☐ Use proper lifting techniques when lifting or moving the UPS or its components.
- ☐ This UPS has more than one live circuit. AC power may be present at the outputs even if the UPS is disconnected from line or battery power.
- ☐ This UPS can be operated to a maximum operating temperature of 55°C. *Also see* the specifications section for temperature ratings.
- ☐ At high ambient temperature conditions, the UPS's surface can be very hot to the touch.
- ☐ There is a Lithium battery inside the UPS. There is a danger of an explosion if it is incorrectly replaced. Replace it only with the same type or an equivalent battery as recommended by the manufacturer. Dispose of the old battery as instructed by the manufacturer.

1.1 Safety Checklists (Continued)

1.1.2 Battery Safety Checklist

Battery Emergency Procedures

If electrolyte splashes on your skin, immediately wash the affected area with water. If electrolyte gets into your eyes, wash them for at least 10 minutes with clean running water or a special neutralizing eye wash solution. Seek medical attention at once.

Neutralize spilled electrolyte with special neutralizing solutions in a "spill kit" or a solution of 1 lb. (0.45 kg) of baking soda (bicarbonate of soda) in 1 gallon (3.9 L) of water.

- ☐ Battery installation and servicing should be done or supervised by personnel knowledgeable about batteries and their safety procedures.
- ☐ ***Never*** open or damage the batteries. The electrolyte is harmful to the skin and eyes and may be toxic as well as being an environmental hazard.
- ☐ ***Never*** let live battery wires touch the UPS, the enclosure or any other metal objects. This can cause a fire or explosion. ***Never*** put metal tools on top of the batteries or on their connectors.
- ☐ Lead-acid batteries can release Hydrogen gas. ***Never*** expose the UPS or enclosure to open flames or sparks to prevent a fire or explosion.
- ☐ Inspect the batteries once a year for signs of cracks, leaks or swells. Replace as needed.
- ☐ If you have batteries in storage, charge them at least once every three months for optimum performance and to extend their lifetime.
- ☐ ***Always*** replace batteries with ones of identical number, type and rating. ***Never*** install old or untested batteries. One sealed lead-acid battery is rated to a maximum voltage of 12VDC.
- ☐ Before connecting the batteries to the UPS, determine if they are accidentally grounded and unground the batteries if they are.
- ☐ ***Always*** use insulated tools to prevent accidental shocks. Wear rubber gloves and boots.
- ☐ Remove all rings, watches, jewellery or other metal items before working inside the enclosure or doing maintenance on the UPS to prevent accidental shocks.
- ☐ Follow the manufacturer's instructions for battery disposal. Recycling is the best method.
- ☐ ***Never*** burn batteries to dispose of them. They may explode. Follow the manufacturer's directions for safe battery disposal.

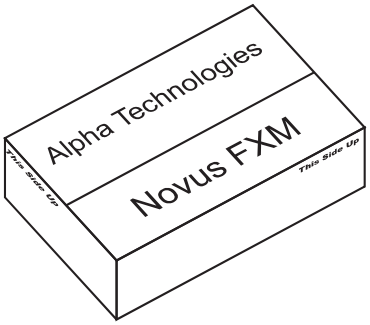
1.2 Unpacking and Inspection Checklist

If items are missing or damaged, contact Alpha Technologies and the shipping company at once. Most shippers have a short claim period.

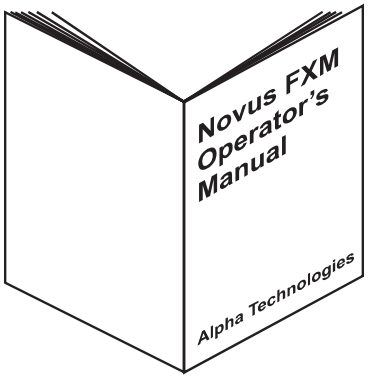
Carefully remove the UPS from the shipping container. Inspect the contents and make sure the following items are included:

- ☐ 1 Novus FXM UPS.
- ☐ 1 Novus FXM Operator's Manual.
- ☐ 8 terminal blocks and labels for the dry contacts.
- ☐ 1 temperature sensor cable.
- ☐ Any ordered options.

If ordered from Alpha, the batteries are shipped separately.



Save The Shipping Container
To return the Novus FXM for servicing, pack it in the shipping container. Alpha Technologies is not responsible for damage caused by improper packaging of returned units.



Read This Manual
Before installation become familiar with the Novus FXM by reviewing the procedures and drawings in this manual. If you have any questions about the safe installation, operation or maintenance of this UPS, contact Alpha's customer service department (go to www.alpha.com).

1.3 The FXM Front Panel

The FXM 500 and the FXM 1100/1500/2000 series look different, but all of the front panel connectors and circuit breakers are the same. All units operate in the same way unless otherwise stated in this manual. The FXM 500 is a 24VDC unit while the others are 48VDC. Some of the FXM 500's dry contacts will output 24VDC instead of 48VDC. See the specifications section for more details.

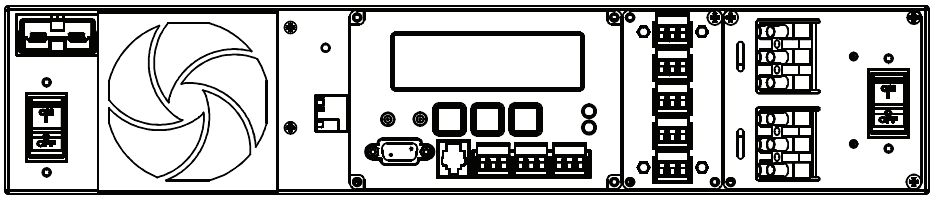


Figure 1.3.1
Novus FXM 500 Front Panel

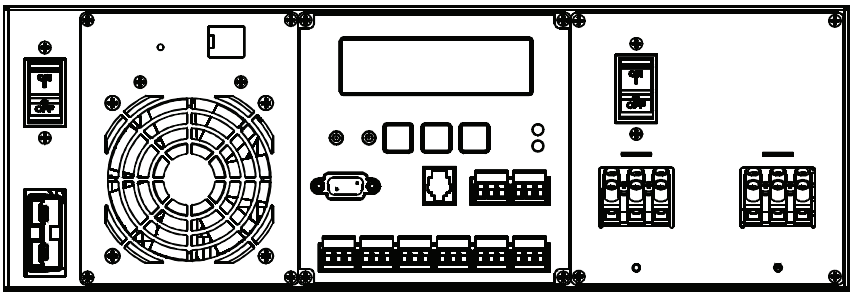
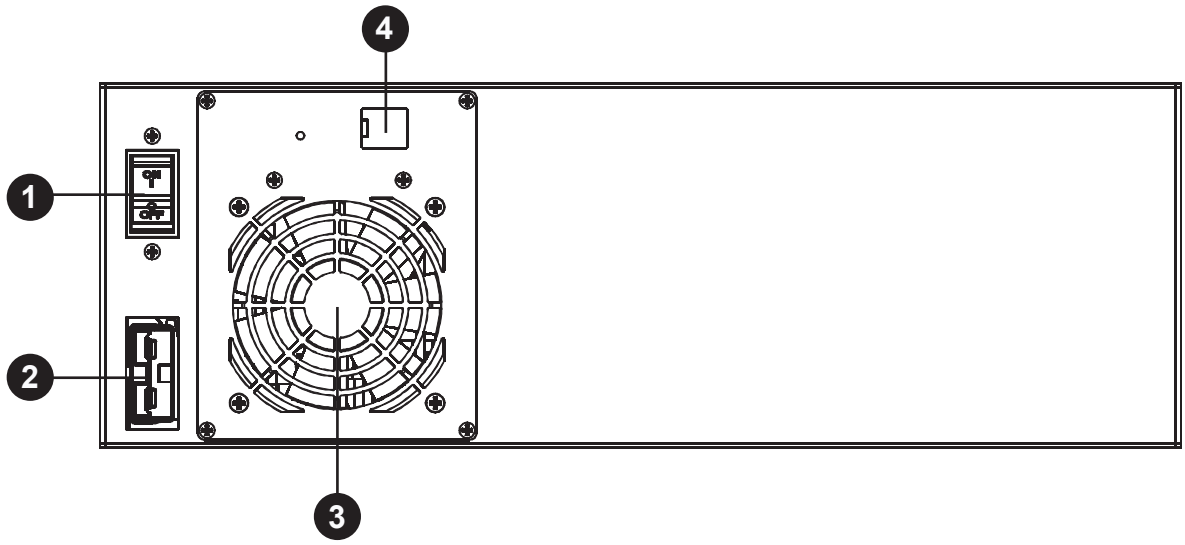


Figure 1.3.2
Novus FXM 1100/1500/2000 Front Panel

1.3 The FXM Front Panel (Continued)

1.3.1 FXM 1100, 1500, 2000



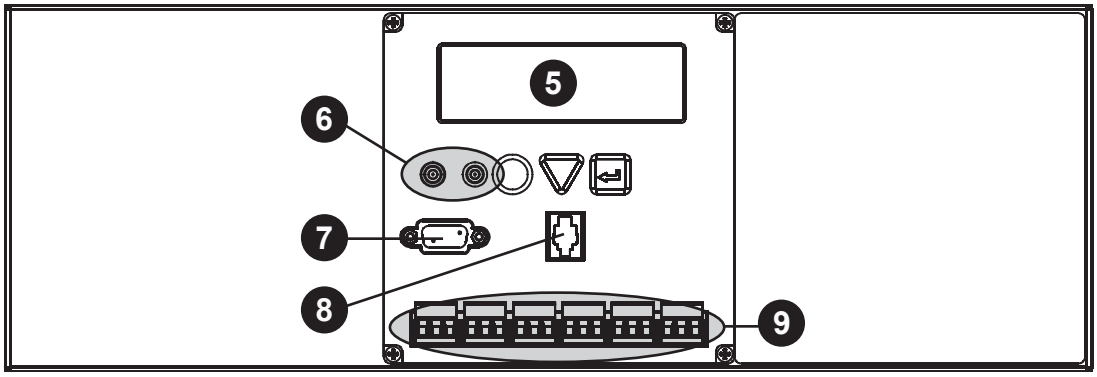
1 *Battery Circuit Breaker*
This circuit breaker provides overcurrent protection and is an on/off switch for battery power. It must be on for proper UPS operation.

2 *Battery Connector*
This connects the external batteries to the UPS.

3 *Internal Fan*
This microprocessor-controlled fan regulates the UPS's internal temperature for optimum performance. It must not be blocked. If the fan fails, an Alarm is generated (*See* Section 3.6, "Troubleshooting").

4 *Ethernet*
This optional, factory-installed RJ-45 connector is the UPS's Ethernet connector.

1.3 The FXM Front Panel (Continued)



5 *LCD Control Panel*
This panel and the cancel, scroll and select buttons below it let you monitor and control the UPS. More information is given in Section 3, “Operation.”

6 *Battery Voltage Test Points*
These let you measure the battery voltage. They accept 2mm diameter test probe tips. The battery circuit breaker must be on to measure the voltage. NOTE: It is not a power outlet.

7 *RS-232 Port*
This DB-9 connector allows you to use a standard computer cable to connect the UPS to a computer for remote control and monitoring. More information is given in Section 4, “Communiction.”

8 *Battery Temperature Sensor*
This connector attaches the battery temperature probe to the UPS so the UPS can monitor the battery temperature. The charging voltage is temperature dependant and the UPS’s microprocessor adjusts it for optimum charging.

The probe MUST be attached to the UPS for normal operation. Firmly attach the sensor end to the centre battery’s case with high-strength flameproof tape (such as duct tape) as shown in Section 2.3, “Wiring the External Batteries.” If it isn’t, a “Temperature Probe Unplugged” alarm will appear on the LCD. *See* Section 3.6, “Troubleshooting,” “Temp Probe Unplug.”

9 *Dry Contacts*
Contacts C1 to C5 allow you to connect the UPS to an external monitoring panel or to traffic control equipment. The factory default settings are as given on the next page, but you can program them to meet your requirements (*See* Section 4.4). To learn how the contacts are configured, *see* Section 4.4.1, “Programming the Dry Contacts” or Section 4.6, “FXM Monitor Graphical User Interface.”

Contact C6’s default factory configuration for the FXM 1100/1500/2000 is as a +48VDC output (the FXM 500 is +24VDC), but it can be factory configured as a dry contact.

Continued on the Next Page

1.3 The FXM Front Panel (Continued)

Figure 1.3.3A shows the dry contact's layout while Figure 1.3.3B shows the +48VDC or +24VDC terminal block layout. Figure 1.3.4 shows one way of connecting an external terminal block to these contacts.

- **C1:** This contact is energized when line power is unqualified and the UPS provides backup battery power to the load(s). It can be called the "On Battery" contact.
- **C2, C3:** These contacts are energized when the battery drops below a pre-set voltage level. They can be called the "Low Battery" contacts.

  You can change the preprogrammed level to match the batteries used and the actual operating conditions. *See* Section 4.3, "Controlling the UPS," "#35 Low Battery Warning Voltage."
- **C4:** This contact is energized after the UPS has been in Inverter mode for 2 hours. It can be called the "Timer" contact.

  You can change the preprogrammed 2 hours to match your operating conditions. *See* Section 4.4.2, "Programming the Dry Contacts and the Clock," "Setting the Timer Contact."
- **C5:** This contact is energized when the UPS has a malfunction. It can be called the "Alarm" contact.
- **C6:** The factory default layout for this contact is a relay that is energized when the UPS is in Line or Inverter modes and is de-energized when it is in Standby mode. It provides 48VDC (500mA) or 24VDC (500mA) from the external batteries to an external fan or other equipment. C6 can be factory-configured as a dry contact.

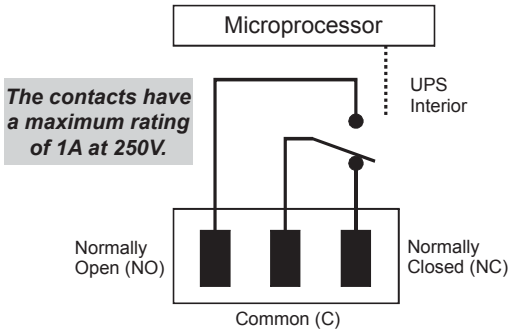


Figure 1.3.3A
Dry Contact Layout
(Standard for C1 to C5, Factory Option for C6)

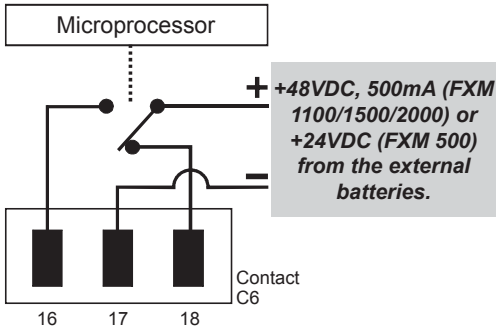


Figure 1.3.3B
48VDC/24VDC Contact Layout
(De-energized Shown, Factory Default for C6)

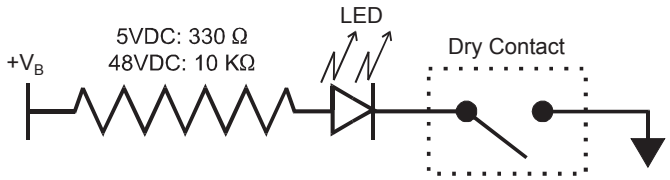
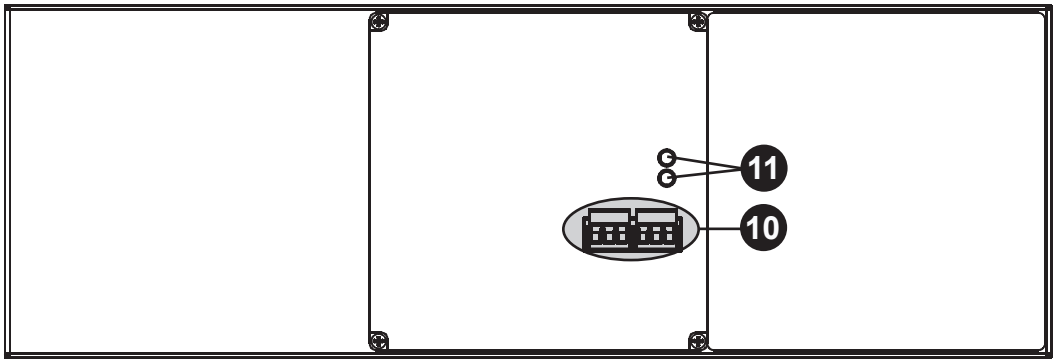


Figure 1.3.4
External Monitoring Panel Wiring

1.3 The FXM Front Panel (Continued)



10 *User Input*

These optically isolated inputs let you attach an external switch panel for remote control of the UPS or have the UPS control Alpha Technologies's optional Automatic Transfer Switch (ATS).

- **User I/P (C7):** This relay has 3 contacts to control the UPS (Figure 1.3.5A). They are:

  19 (S1): *Shorting this contact starts the UPS's self test. Also see Section 3.4, "Battery Test."*

  20 (S2): *Shorting this contact activates an alarm. Also see Section 3.6, "User Input Alarm."*

  21 (S3): *Shorting this contact shuts off the UPS.*

  22 (C): *Isolated return for contacts S1, S2 and S3.*

- **ATS (C8):** When the UPS is in Inverter mode, this normally open relay closes (Figure 1.3.5B), sending 48VDC (FXM 1100/1500/2000) or 24VDC (FXM 500) from the external batteries to this dry contact. If the optional Alpha Technologies's Automatic Transfer Switch (ATS) is connected, this causes the ATS to switch the load from line power to the UPS's battery backup power.

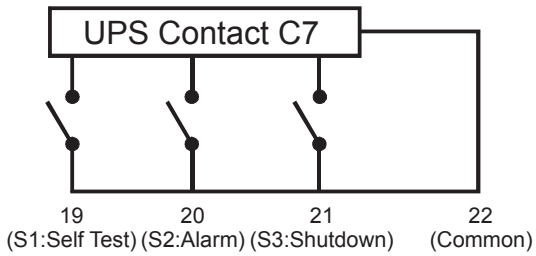


Figure 1.3.5A
User I/P Layout

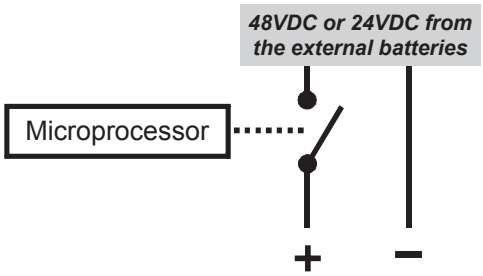
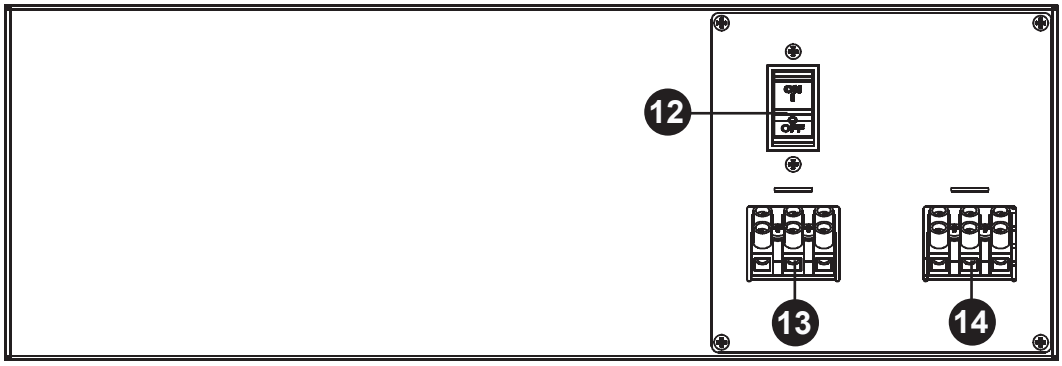


Figure 1.3.5B
ATS Contact

11 *Status and Alarm LEDs*

- **Status:** When this green LED is on, the UPS is in Line mode and line power is provided to the load. When it is flashing, it is in Inverter mode and backup battery power is provided to the load.
- **Alarm:** When this red LED is on, the UPS has a fault. When it is flashing, it has an alarm (*See* Section 3.6, "Troubleshooting").

1.3 The FXM Front Panel (Continued)



12 *Input Circuit Breaker*
This circuit breaker is an on/off switch for line power into the UPS and provides input protection. It must be on for proper UPS operation.

13 *Input*
This terminal block is the UPS's power input.

14 *Output*
This terminal block is the UPS's power output.

1.3.2 FXM 500

The layout of the front panel is shown in Figure 1.3.6. The functions of the various connectors and circuit breakers are the same as described in Section 1.3.1, "FXM 1100, 1500, 2000." The FXM 500 is a 24VDC unit, so contacts C6 and the ATS output 24VDC from the batteries (Figures 1.3.3B and 1.3.5B).

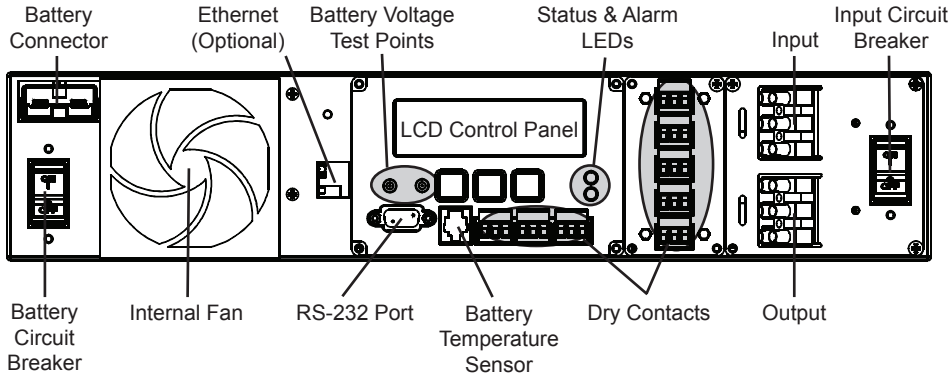


Figure 1.3.6
FXM 500 Front Panel

2
Installation

This Section Tells You How to Install and Wire the Novus FXM UPS

- Site Preparation Instructions (Section 2.1)
- How to Mount the UPS (Section 2.2)
- How to Wire the Battery String (Section 2.3)
- How to Wire the UPS to the Line and the Load (Section 2.4)

2.1 Site Preparation Checklist

☐ *Grounding*

The UPS MUST be correctly grounded for proper operation.

Older facilities may have inadequate electrical grounding. A qualified electrician should inspect it before installation to see it meets the local electrical code.

☐ *Branch Circuit Breaker Protection*

To provide branch circuit protection, the utility line attached to the UPS's input MUST be protected by a circuit breaker certified for this use as per the local electrical code.

The breaker's minimum size is calculated by the following formula:

Minimum Breaker Size= UPS's maximum input current / 0.8

The UPS's maximum input current is read off of the UPS's nameplate. For example, if the nameplate gives the maximum input current as 20A, the circuit breaker should be rated at least 25A.

For the FXM 1100, to reduce the risk of fire, connect a minimum of a 20A circuit breaker (for 120VAC units) or a 10A (for 230VAC units).

☐ *Disconnects*

The input and output lines to and from the UPS MUST have disconnect devices attached.

☐ Site Requirements

Install the UPS and batteries on a surface that supports the total weight. The input wires must reach a suitably grounded power outlet and the load's wires must reach the UPS's output terminal blocks.

☐ Backup Generator (If Used)

In Generator Mode, the UPS's range of acceptable input frequency and voltage is expanded to accept the fluctuations created by a generator (*See* Section 3.4, "Programming the UPS," "Sense Type").

Use a generator with electronic speed and voltage controls which produces less than 10% voltage Total Harmonic Distortion (THD). Mechanical governors can force the UPS to run continuously in Battery mode.

Before installation, make sure the generator's output voltage is compatible with the UPS's input voltage requirements. To make sure the system runs smoothly, use a generator that supplies twice as much power as drawn by the total load.

2.2 Mounting the UPS

The UPS can be placed on a shelf with no other parts needed. Any version of the FXM can be rack or wall mounted or secured to a shelf, such as on an outdoor enclosure's shelf, with the optional mounting brackets as shown in Figure 2.2.1. The brackets and the screws to attach them to the UPS's case are available from Alpha Technologies (part number 740-697-21).

Terminal block covers MUST be used and are available from Alpha Technologies (part number 740-698-21). If the UPS end application is mounted inside an enclosure or in an area restricted to authorized personnel, then the covers may or may not be needed.

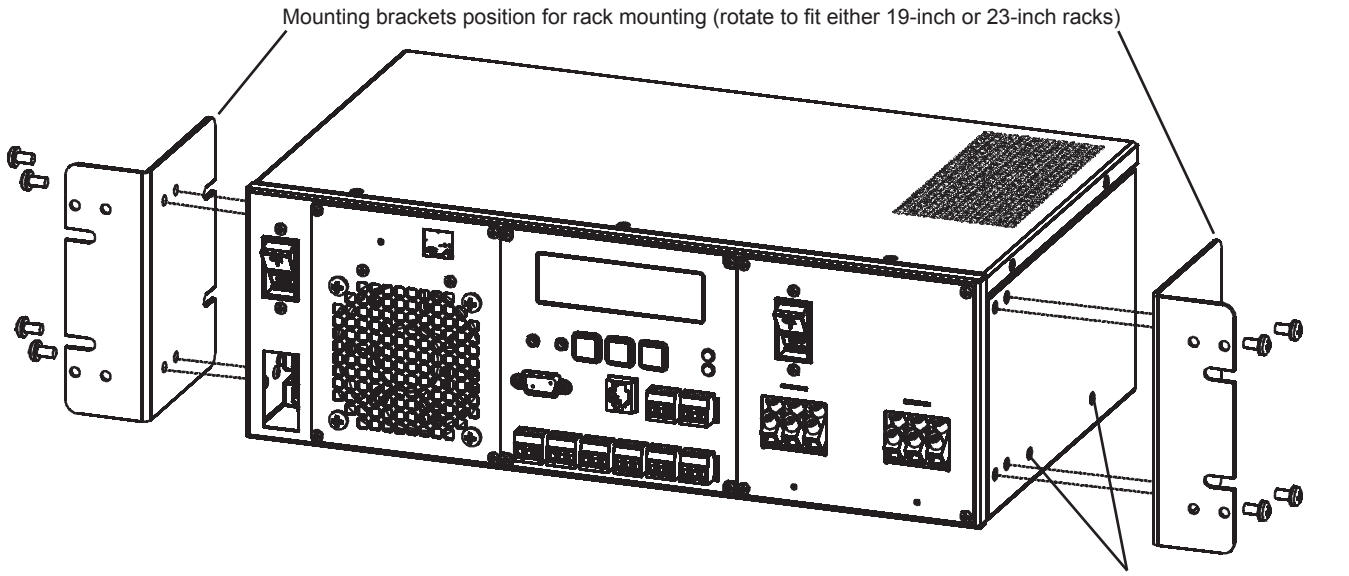
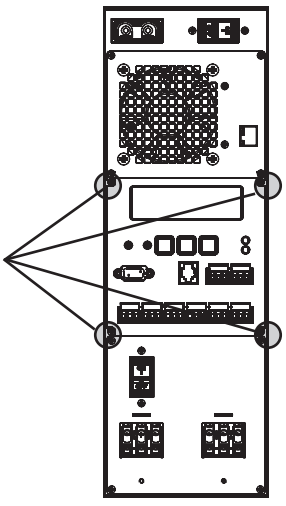


Figure 2.2.1
UPS Mounting

For the FXM 1100/1500/2000 units ***only***, the control panel and the power connection panel can be rotated to suit your needs. To rotate either one, unscrew the screws in each corner, remove the panel, rotate it and reinstall the screws.



Do not damage or pull out the wires or the ribbon cables when rotating the panels.

2.3 Wiring the External Batteries

DANGER: Before starting, make sure you have read the instructions on battery safety in Section 1.1 of this manual.

Tools and Materials Required

- DC Voltmeter.
- Labels or masking tape and marker.
- Torque wrench.
- High strength, flame-proof tape (such as duct tape).
- Battery terminal corrosion inhibitor (such as NOCO Company's NCP-2 or Sanchem Inc.'s No-Ox ID Grease "A").

Battery Checklist

☐ Use new batteries when installing a new unit. Verify they are all the same battery type with identical date codes.

☐ Before attaching the batteries to the UPS, make sure the polarity is correct.

☐ If you are making your own battery wiring harness, use at least 10 AWG (for FXM 1100) or 8 AWG (FXM 1500/2000).

☐ If batteries have been in storage for more than 3 months, recharge them for at least 24 hours then test them with a load before installation.

☐ Each AlphaCell™ battery has a date code, found on the warning label, which must be recorded in the maintenance log. If non-Alpha batteries are used, see the manufacturer's documentation for date code type and placement.

Continued on the next page

2.3 Wiring the External Batteries (Continued)

Procedure

1. Number the batteries from 1 to 4 with labels or tape as shown in Figure 2.3.1.
2. Coat the battery terminals with battery corrosion inhibitor.
3. Wire the batteries as shown in Figure 2.3.1. If used, install the in-line fuse between batteries #2 and #3.

Torque the battery terminals according to the manufacturer's specifications as given on the name plate or data sheet.

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4. Verify battery connector polarity and DC voltage with a voltmeter. If correct, attach it to the UPS's external battery connector. If not, perform troubleshooting before connecting it to the UPS.
5. Route the sensor end of the battery temperature cable to the batteries. Tape it to the side of battery #2 or #3 as shown in Figure 2.3.1.
6. If a second battery string is used, repeat steps 1 to 4.

Battery Wiring Finished

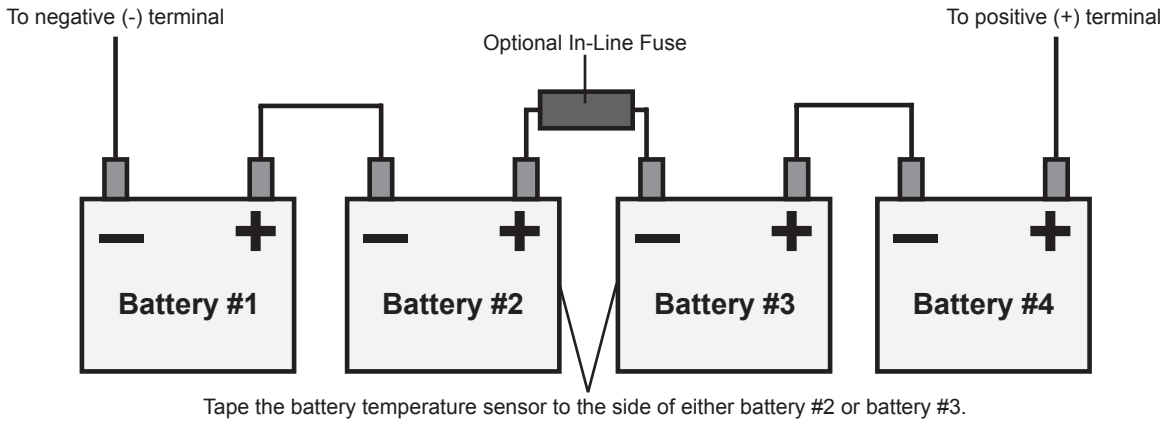


Figure 2.3.1
External Battery Wiring

2.4 Wiring the UPS

DANGER: Before starting, make sure line power is turned off and that the UPS's battery and input circuit breakers are turned off.

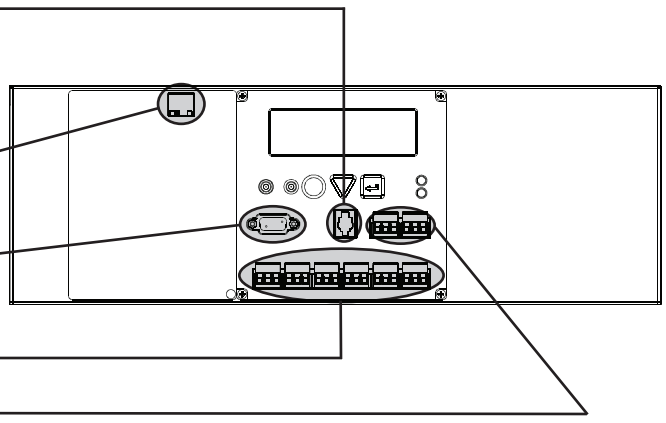
If stranded wires are used for the input and output terminal blocks, ferules MUST be used.

Tools and Materials Required

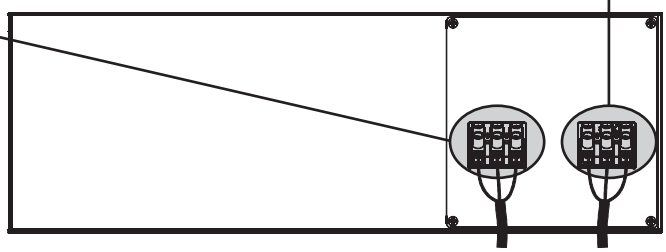
- Slot head screwdriver to fit the terminal blocks.
- Maximum 12 AWG copper wire rated to at least 90°C for the input and output power terminal blocks (or as specified by the local electrical code).

Procedure

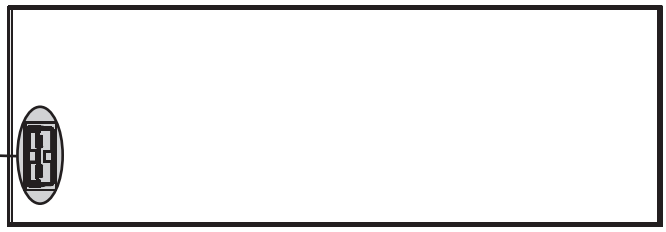
1. Connect the battery temperature sensor to the UPS. Attach the sensor end of the cable to the side of the centre battery as shown in Figure 2.3.1.
2. If used, connect:
   - The Ethernet port.
   - The RS-232 port.
   - The dry contacts.
   - The user inputs.
3. Connect the load line to the UPS's output terminal block.
4. Connect the line power line to the UPS's input terminal block.



DANGER: Before proceeding, verify the line wire is attached to the line terminal block, the ground wire is attached to the ground terminal block and the neutral wire is attached to the neutral terminal block to prevent accidental shocks or electrocutions.



5. Connect the external battery.



Wiring Finished

3
Operation

This Section Tells You How To Operate the Novus FXM

- How to use the LCD Control Panel and its Buttons to Operate the UPS (Section 3.1)
- How to Turn the UPS On or Off (Section 3.2)
- How to Replace the Battery (Section 3.3)
- How to Operate the UPS or Program it to Meet Your Operating Conditions (Section 3.4)
- How to Make Input, Output and Other UPS Measurements (Section 3.5)
- How to do Troubleshooting (Section 3.6)
- How to See the Last Event that Happened to the UPS (Section 3.7)

3.1 Operating the Control Panel

The LCD control panel provides “at a glance” monitoring. This panel, when used along with the **CANCEL**, **SCROLL** and **SELECT** buttons below it, lets you program, make measurements and troubleshoot the UPS. The layout is shown below in Figure 3.1.1.

The UPS is monitored and controlled with a series of menus and submenus. The menu tree and how to use the buttons to move through it is shown in Figure 3.1.3. For a tutorial on how to use this panel, see Section 3.3, “Battery Replacement.”

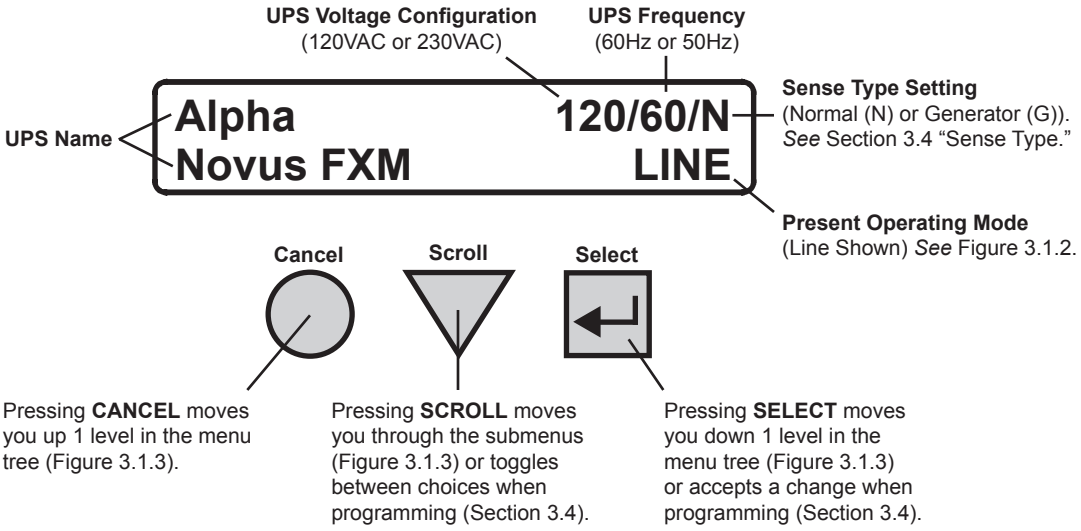


Figure 3.1.1
LCD Control Panel (Logo Screen Shown)

The UPS’s operating mode automatically changes as a result of changes in the line or the UPS’s status (Figure 3.1.2). The LCD panel automatically updates to show this.

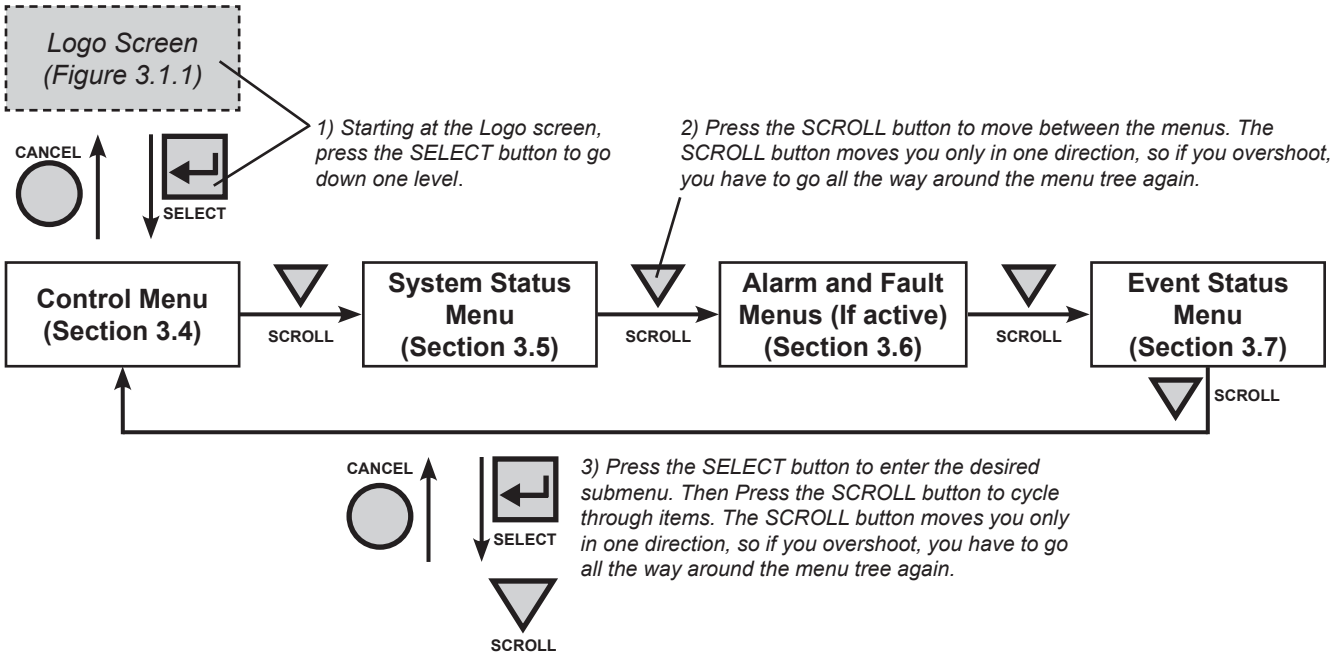
UPS Operating Modes

LCD Shows	Description
SHUTDOWN	The UPS’s inverter is turned off. Line power is disconnected from the load.
LINE	The UPS is turned on. Line power is provided to the load.
BOOST 1 OR BOOST 2	The UPS’s transformer is raising line voltage without using the batteries. AVR is enabled (*See* Section 3.4).
BUCK 1 OR BUCK 2	The UPS’s transformer is lowering line voltage. AVR is enabled (*See* Section 3.4).
INVERTER	The UPS is providing backup battery power to the load.
RETRAN	The UPS is transferring from the state it is now in into Line mode.
TRAN	The UPS is transferring from the state it is now in into Inverter mode.
STANDBY	The UPS’s electronics are turned on but there is no output. If there is qualified line power at the input, the UPS switches into Line, Boost or Buck mode.

Figure 3.1.2
UPS Operating Modes

3.1 Operating the Control Panel (Continued)

Pressing the **CANCEL**, **SCROLL** and **SELECT** buttons allow you to navigate through the menus and submenus to monitor, control and troubleshoot the UPS as shown in Figure 3.1.3 below. For a tutorial on how to use these menus, see Section 3.3, “Battery Replacement.”



The **CONTROL** submenu (Section 3.4) lets you control, program and adjust the UPS to meet your operating needs. You can control the:

- INVERTER
- INVERTER BYPASS
- BATTERY TEST
- AUTO TEST
- SENSE TYPE
- FUNC MODE
- VOLTAGE
- FREQUENCY
- QUAL TIME
- BATT COMP
- DATE SEL
- INV RECORD

The **SYSTEM STATUS** submenu (Section 3.5) lets you measure various inputs, outputs and other values. The available measurements are:

- V IN
- V OUT
- IOUT AC
- INTL TEMP
- BATT TEMP
- FREQ IN
- OUTPUT PWR
- BATT VOLT
- DATE
- TIME
- INV COUNT
- INV TIMER
- SHED CNTR 1, 2 or 3
- VERSION

The **FAULT** and **ALARM** submenus (Section 3.6) are invisible and disabled until the UPS has a malfunction.

When the front panel’s alarm LED is on or flashing, press **SELECT**.

One of the malfunctions listed in Section 3.6 will appear on the LCD. Press the **SCROLL** button to see if more than 1 malfunction is present.

Fix the malfunction. Press the **SELECT** button to clear the malfunction from the screen.

If the malfunction is fixed, the malfunction is cleared from the LCD. If it isn’t fixed, it will reappear on the screen.

The **EVENT STATUS** submenu (Section 3.7) shows you the last UPS event. This is different from the 100 event log (Section 4.5).

Press the **SELECT** button to access the event screen.

Then press the **SCROLL** button to see what the specific event was. It will show one of the faults or alarms listed in Section 3.6.

Press the **SCROLL** button again to see if more than 1 fault or alarm happened at the same time.

To set the counter to zero, press the **SELECT** button for 5 seconds.

Figure 3.1.3
LCD Menu Tree

If the UPS constantly switches between Inverter and Line modes due to a noisy line, the UPS's input parameters should be broadened from normal to generator (See Section 3.4, "Programming the UPS," "Sense Type").

In generator mode, the range of acceptable input frequency and voltage is expanded to accept the fluctuations created by a generator.

3.2.1 Turn On

This procedure assumes the line is qualified and the batteries are fully charged. If the UPS does not act as described, do troubleshooting as described in Section 3.6, "Troubleshooting."

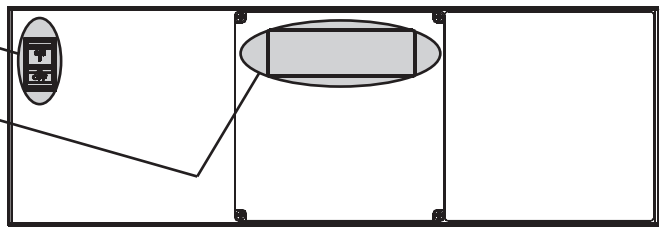
If this is the first turn on after the UPS's installation or maintenance, do steps 3 and 4, or do a battery test (*See* Section 3.4 "Programming the UPS," "Battery Test") to confirm the wiring is correct, that the batteries are charged and that the UPS functions correctly.

Before starting, turn off the UPS's battery and input circuit breakers.

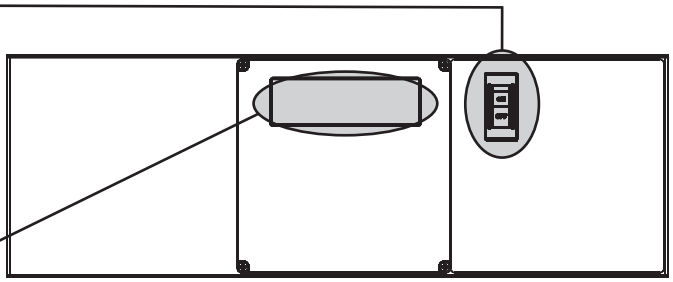
Procedure

1. Turn on the battery circuit breaker.

   The LCD displays **STANDBY**.



2. Turn on the input circuit breaker.



   The FXM series has autofrequency sensing. When it is first turned on, it senses the line frequency and adjusts its output frequency to match.

   The LCD displays **RETRAN**, then shows **LINE**, or **BUCK** or **BOOST**. The status LED turns on.

   If there is no line power, the UPS will go to Line mode when the line is qualified. If you need to provide backup battery power to the load, do a manual start by using the inverter command (*See* Section 3.4 "Programming the UPS," "Inverter").

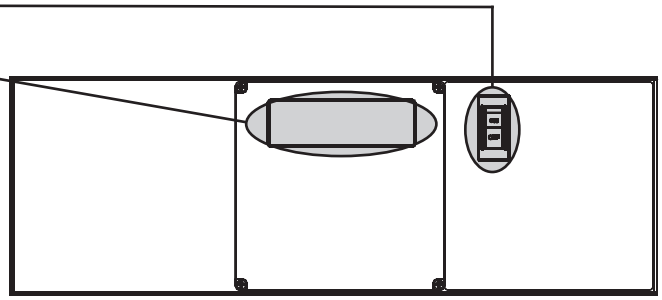
Continued On the Next Page

3. Turn off the input circuit breaker.

   The LCD shows **INVERTER**, the status LED starts flashing to show the UPS is running on backup battery power.

4. Turn on the input circuit breaker.

   The LCD displays **RETRAN**, then shows **LINE**, or **BUCK** or **BOOST**. The status LED turns on.



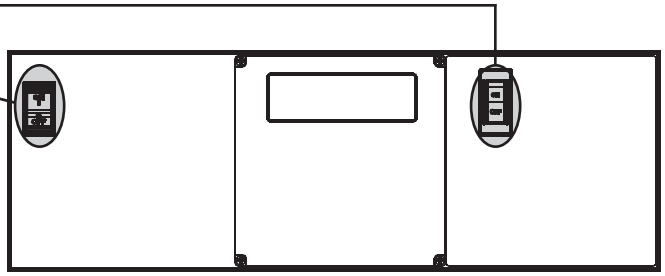
Turn On Finished

3.2.2 Turn Off

Procedure

1. Turn off the input circuit breaker.
2. Turn off the battery circuit breaker.

   The status LED is off and the LCD panel is blank.



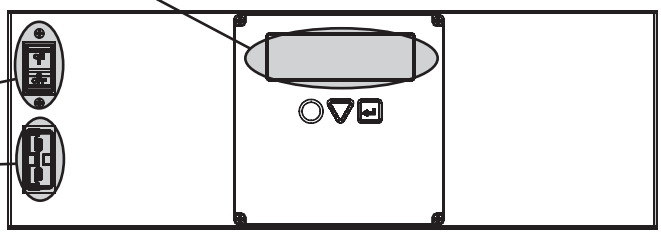
Turn Off Finished

3.3 Battery Replacement

While the batteries are being replaced, the UPS cannot provide backup battery power. This procedure should NOT be done when critical loads are running that depend on this unit for backup power.

Procedure

1. If the UPS is in Line, Buck or Boost mode (Figure 3.1.2) go to the control submenu to switch it into **Inverter Bypass** (Section 3.4). If it isn't in those modes, wait until the line is qualified.
2. Turn off the battery circuit breaker.
3. Unplug the battery string.
4. Disconnect the battery cables from the batteries.
5. Connect the battery cables to the new batteries (*Also See* Section 2.3, "Wiring the External Batteries").
6. Plug the battery connector into the UPS.
7. Turn on the battery circuit breaker.
8. Switch the UPS out of **Inverter Bypass**.



Battery Replacement Finished

Control Panel Tutorial

From the **LOGO SCREEN** (Figure 3.1.1):

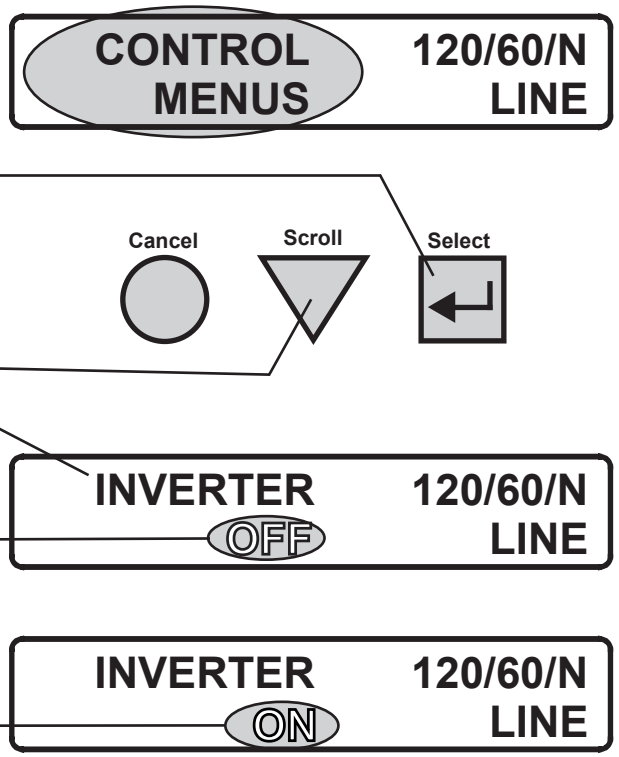
1. Press the **SELECT** button once.
   The LCD shows **CONTROL**.
2. Press the **SELECT** button once.
   The LCD shows **INVERTER**.
3. Press the **SCROLL** button until the LCD shows **INV BYPASS**.
4. Press the **SELECT** button once.
   OFF is flashing.
5. Press the **SCROLL** button once.
   ON is flashing.
6. Press the **SELECT** button once.
   ON is on solid. The UPS has been switched into **INV BYPASS** and you can replace the batteries.

3.4 Operating the UPS

The Control Submenu (Figure 3.4.1) lets you operate the UPS or program it to suit your operating conditions. You can also use the Novus FXM Monitor software to make these adjustments (*See* Section 4.6, “FXM Monitor Graphical User Interface”).

Procedure

1. From the Logo Screen (Figure 3.1.1) go to the Control menu (Figure 3.1.3).
2. Press the **SELECT** button to enter the submenu (Figure 3.4.1).
3. Press the **SCROLL** button to move between items in the submenu.
4. When you have reached the item you want to change, press the **SELECT** button. The item you have chosen is blinking.
5. To toggle between choices, press the **SCROLL** button. Stop when the LCD displays the choice you want.
6. To make the change, press the **SELECT** button. The blinking stops.



Programming Finished

Control Submenu

LCD Shows	Meaning	Description
INVERTER	**Inverter**	When turned on, this forces the UPS to provide backup battery power to the load. This function is usually turned on at UPS start-up if line power is not available.
INV BYPASS	**Inverter Bypass**	When turned on, this locks the UPS into line mode and makes the output voltage equal to the input. This function is used to: Replace the batteries (*See* Section 3.3). OR Just before you turn a break-before-make manual bypass switch so the UPS can be shut off for maintenance or replacement without interrupting power to the load.

Figure 3.4.1
Control Submenu

Continued On the Next Page

3.4 Operating the UPS (Continued)

Control Submenu

LCD Shows	Meaning	Description
BATT TEST	**Battery Test**	This is the UPS's self test. When it is turned on, this forces the UPS to verify its proper operation by providing backup battery power to the load and then switching back to line mode. The default setting for the run time is 2 minutes, but this can be changed with the RS-232 menus (*See* Section 4.3, "#30, Battery Test Options").
AUTO TEST	**Automatic Battery Test**	If enabled via the GUI (*See* Section 4.6), this starts the pre-set periodic battery test, no matter when it is scheduled to take place.
SHUTDOWN	**Shutdown**	When turned on, the UPS's inverter is shut off. The line is disconnected so no line power is provided to the load.
SENSE TYPE	**Sense Type**	This toggles between: **NORMAL**: The UPS can operate successfully with most line conditions. OR **GENERATOR**: The input voltage parameters are expanded so the UPS can work with the voltage and frequency fluctuations caused by a generator or noisy line.
FUNC MODE	**Functional Mode**	This toggles between: **Automatic Voltage Regulation (AVR)**: The buck and boost modes are turned on OR **QUALITY**: The buck and boost modes are turned off, the input voltage is the UPS's output voltage. The range of acceptable parameters are narrowed to 100 ± 2VAC to 130 ± 2VAC. If you are connecting an Alpha Technologies Automatic Transfer Switch to traffic intersection equipment, then the UPS *MUST* be switched to quality since most traffic equipment cannot handle the high voltage output of the UPS when it is AVR mode.
VOLTAGE	**Voltage**	The lets you set the UPS's output voltage to 120VAC, 230VAC or 220VAC. This should only be done by a qualified technician acting under the instructions of Alpha Technologies's customer service department. Failure to contact Alpha Technologies before doing this procedure could result in voiding of the warranty.
FREQUENCY	**Frequency**	This lets you set the UPS's frequency to either 50Hz or 60Hz. This should only be done by a qualified technician acting under the instructions of Alpha Technologies's customer service department. Failure to contact Alpha Technologies before doing this procedure could result in voiding of the warranty.
QUAL TIME	**Line Qualify Time**	This lets you set how long it takes for the UPS to return to Line Mode after the line has become requalified. It can be set to 3, 10, 20, 30, 40 or 50 seconds. The factory default setting is 3 seconds.
BATT COMP	**Battery Temperature Compensation**	This lets you set the battery temperature compensation to match the batteries you are using. It can be set to -2.5, -4, -5 or -6mV/°C/Cell. The factory default setting is-5mV/°C/Cell.
DATE SEL	**Date Format Selection**	This lets you toggle the UPS's date format between YY-MM-DD or MM-DD-YY or DD-MM-YY. The factory default setting is MM-DD-YY.
INV RECORD	**Inverter Record Clear**	This clears the inverter counter and timer from the LCD's system status menu (Section 3.7). This does not clear the 100-event RS-232 log (Section 4.5).

Figure 3.4.1
Control Submenu (Continued)

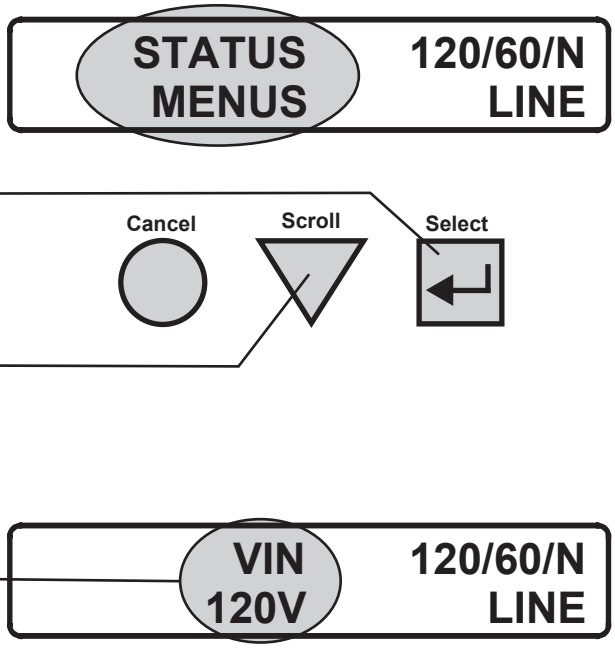
3.5 Making Measurements

The System Status Submenu (Figure 3.5.1) lets you make measurements of various UPS inputs, outputs and other values. You can also use the Novus FXM Monitor software to make these measurements (*See* Section 4.6, “FXM Monitor Graphical User Interface”).

Procedure

1. From the Logo Screen (Figure 3.1.1) go to the System Status menu (Figure 3.1.3).
2. Press the **SELECT** button to enter the submenu (Figure 3.5.1).
3. Press the **SCROLL** button to move between items in the submenu. When you have reached the item you want to measure, stop pressing the button.

   The measurement is automatically displayed on the LCD. It is automatically updated ever 0.5 seconds (VIN shown).



Measurement Finished

System Status Submenu

LCD Shows	Meaning	Description
VIN	**Input Voltage**	The line input voltage into the UPS.
VOUT	**Output Voltage**	The UPS’s output voltage (true RMS).
IOUT AC	**Output Current (AC)**	The UPS’s AC output current (true RMS).
INTL TEMP	**Internal Temperature**	The temperature inside the UPS (°C).
BATT TEMP	**Battery Temperature**	The battery’s temperature (°C).
FREQ IN	**Input Frequency**	The frequency of line power into the UPS (Hz).
OUTPUT PWR	**Output Power**	The UPS’s output power in VA (true RMS).
BATT VOLT	**Battery Voltage**	The battery’s output voltage (VDC).

Figure 3.5.1
System Status Submenu

Continued On the Next Page

3.5 Making Measurements (Continued)

System Status Submenu

LCD Shows	Meaning	Description
DATE	**Date**	The date and time (24 hour clock).
TIME	**Time**	
INV COUNT	**Inverter Count**	The number of times the UPS was in inverter mode.
SHED CNTR 1	**Amount of time until the dry contact is activated.**	The factory default dry contact for this setting is contact C4. SHED CNTR2 and SHED CNTR3 can be field programmed (*See* Section 4.4.2, “Setting the Timer Contact”). This display shows the amount of time in seconds until the contact is activated. The factory default setting is 2 hours, but this can be changed as shown in Section 4.4.2.
SHED CNTR 2		
SHED CNTR 3		
VERSION	**Software Version**	The software version used in this UPS.

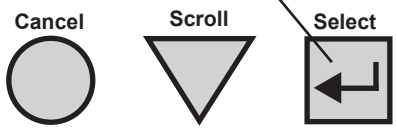
Figure 3.5.1
System Status Submenu (Continued)

3.6 Troubleshooting

When the front panel alarm LED is on or flashing, the UPS is malfunctioning. The Alarm and Fault Submenus describe the malfunction. You can also use the Novus FXM Monitor software for troubleshooting (*See* Section 4.6, “FXM Monitor Graphical User Interface”).

Procedure

1. Press the **SELECT** Button



2. One of the items listed in Figure 3.6.1 is shown on the LCD (Alarm: Overload is shown).

3. Press the **SCROLL** button to see if more than one malfunction is present.
4. To clear the malfunction from the screen, press the **SELECT** button for 5 seconds.

Troubleshooting Finished

Alarm Submenu

LCD Shows	Description
OVERLOAD	The UPS is overloaded. Remove excess loads.
BATTERY OVER VOLTAGE	The batteries cannot be charged.
BATTERY LOW	When the UPS is in Inverter mode, the batteries are almost discharged and cannot power the load much longer. The UPS is about to go into Standby mode.
BATT TEMP HI	The battery temperature is above or below specifications.
BATT TEMP LOW	
BATT LOW WARNING	The batteries are almost discharged. Also see Section 4.3, “Controlling the UPS,” “#35: Low Battery Warning Voltage.”
FAN FAIL	The UPS’s internal fan has failed. Contact Alpha Technologies.
TEMP PROBE UNPLUG	The temperature probe is unplugged. Plug it back into the UPS.
USER INPUT ALARM	When the user input is shorted (Section 1.3.1, “User Input S2), this alarm appears.
IN FREQ OUT OF RANGE	The line frequency is outside of the UPS’s qualified range.
BAD BATTERY	The batteries failed the self test.

Figure 3.6.1
Alarm and Fault Submenus

Continued On the Next Page

3.6 Troubleshooting (Continued)

Fault Submenu

LCD Shows	Description
OVERLOAD FAULT	The load draws more power than the UPS can provide. This can cause an automatic UPS shutdown. Remove excess loads.
SHORT CIRCUIT	The load has a short.
INTL TEMP FAULT	The UPS's internal temperature is too high and could cause an automatic shutdown. Verify the UPS's fan is not blocked and that it is working. *Also see* Fan Fail Alarm.
OUTPUT OVER VOLTAGE	The output voltage is above or below the UPS's specifications.
OUTPUT VOLTAGE LOW	
BATTERY FAIL	The batteries have failed the self test. Inspect them to make sure they are properly connected and that they are in good condition. Make sure they are fully charged.
BACKFEED	A relay inside the UPS has failed. It cannot be fixed in the field. Contact Alpha Technologies.

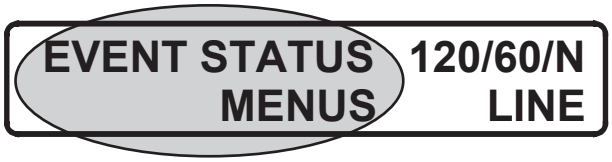
Figure 3.6.1
Alarm and Fault Submenus (Continued)

3.7 Last Event Log

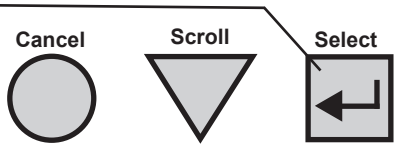
The Event Submenu displays the last event the UPS went through. To use the 100-event log, see Section 4.5, “Accessing the Event Log.” You can also use the Novus FXM Monitor software to see either log (*See* Section 4.6, “FXM Monitor Graphical User Interface”).

Procedure

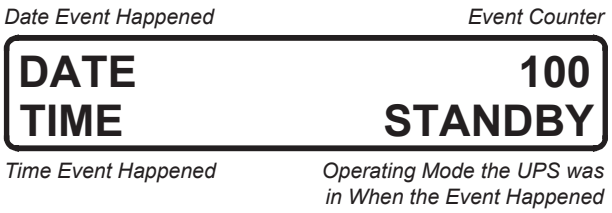
1. From the Logo Screen (Figure 3.1.1) go to the Event menu (Figure 3.1.3).



2. Press the **SELECT** button to enter the submenu.



3. The LCD displays this information on the event.



4. Press the **SCROLL** button to see what the event was. One of the faults or alarms shown in Figure 3.6.1 is displayed.

   Press the **SCROLL** button again to see if more than one fault or alarm happened at the same time. Keep pressing until you see the information screen shown in step 3.

5. To clear the event counter, press the **SELECT** button for 5 seconds.

Finished

4
Communication

This Section Tells You How To Operate the Novus FXM With RS-232 Computer Commands

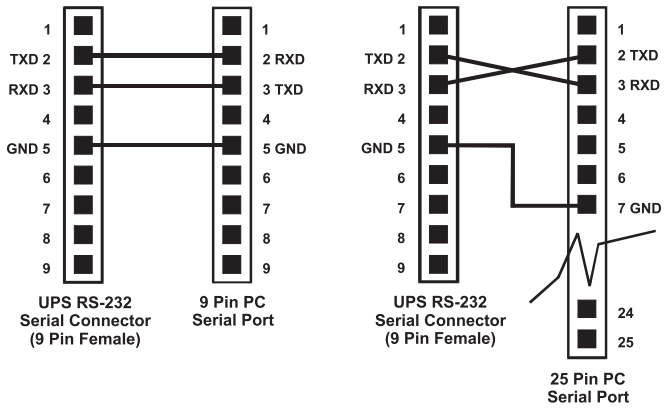
- How to Wire the RS-232 Port (Section 4.1)
- How to Use the Main Menu (Section 4.2)
- How to Adjust and Control the FXM (Section 4.3)
- How to Program the Dry Contacts or Set the Clock and Calendar (Section 4.4)
- How to Access the 100-Event Log (Section 4.5)
- How to Install and Use the Novus FXM Monitor Graphical User Interface (Section 4.6)

4.1 Wiring the RS-232 Port

The UPS's front panel has a DB-9 female connector. When connected to a PC with Window's HyperTerminal or other terminal emulation software, the UPS can be remotely monitored and controlled with it's command-line system (*See* Sections 4.2 to 4.5). The Novus FXM Graphical User Interface (GUI) provides a Windows or Web type of control (*See* Section 4.6).

Procedure

1. Connect a 9-pin, fully shielded, straight-through cable between the computer's port and the UPS's port.



2. Configure the communications parameters to the values shown in the terminal set up table.

RS-232 Wiring Finished

Terminal Set Up Table

Emulation Type	VT 100 or Compatible	**Backspace**	N/A
Duplex Mode	Half Duplex	**Break Length**	N/A
Xon/Xoff Flow Control	None	**Emulation Type**	N/A
RTS/CTS Flow Control	Off	**Communication Parameters**	
Line Wrap	On	**Handshaking**	Software Handshaking
Screen Scroll	On	**Baud Rate**	2400 bps
CR Translation	CR	**Data Format**	8 Data, No Parity, 1 Stop Bit

4.2 Using the Main Menu

The UPS's main menu screen runs on a command line system. This program does not recognize the backspace or delete keys even if appears that way on the monitor. If you make a mistake and press ENTER, the UPS echos the command back exactly as you typed it. Press ENTER and retype the command again.

If you choose not to use the command line system, you can use the Novus FXM Graphical User Interface (See Section 4.6) to run and monitor the UPS.

4.2.1 Main Menu Screen

The main menu screen (Figure 4.2.1) shows the UPS's current input and output values, displays if any faults or alarms are present and gives access to the submenus. It is reached from anywhere in the menu tree (Figure 4.2.2) by typing **0** and pressing **ENTER**. The UPS is controlled by submenu 3.

To access a particular submenu, type in the **submenu number** and press **ENTER**. To update the main menu screen, press **ENTER**.

The complete menu tree is given in Figure 4.2.2. Tables describing the Line Status, Output Status, Faults and Alarms displays are given in Figures 4.2.3, 4.2.4 and 4.2.5.

- ***The readings on the main menu screen do not automatically update to reflect changes in the UPS's status. Press ENTER to update the screen.***
- ***For many functions you need to enter a password. The factory set password is 1111.***

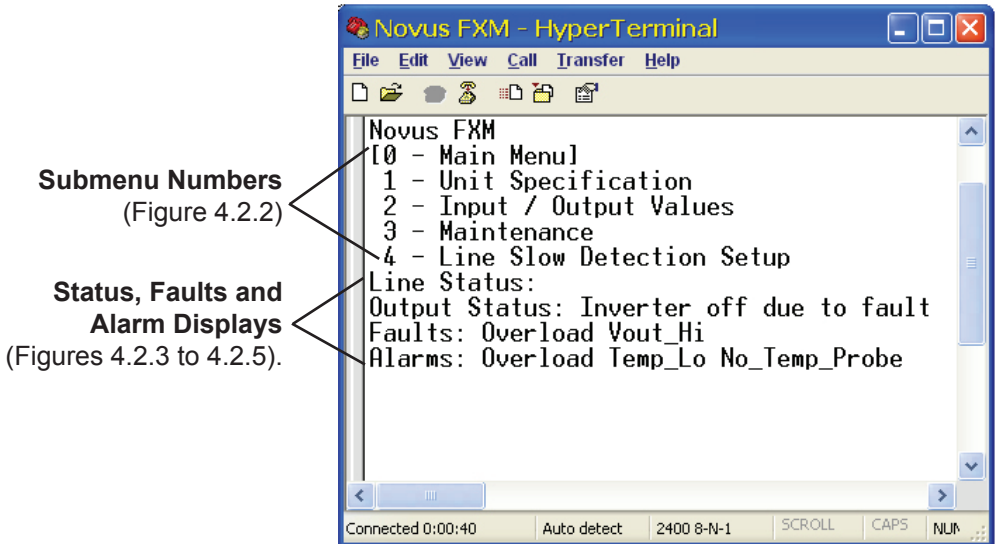


Figure 4.2.1
Main Menu Screen

4.2.2 RS-232 Menu Tree

Submenus 1, 2 and 4 provide read-only screens for monitoring the UPS. To control the UPS, use submenu #3, the Maintenance submenu.

0-Main Menu
(Figure 4.2.1)

Submenus ***Submenus***

1-Unit Specifications

Unit Model

Input
- Voltage
- Frequency

Output
- Voltage
- VA

Battery Voltage
- Voltage

Software Version

2-Input/Output Values

Input
- Voltage
- Frequency

Output
- Voltage
- Current
- VA

Battery
- Voltage
- Temperature

*These 2 read-only screens show the UPS's factory specifications or the present input and output measurements. The Input/Output Values submenu does not automatically update. For an updated value, type **2** and press **ENTER**.*

3-Maintenance
(Section 4.3)

30-Battery Test Options
- *300-Set Battery Test Period*
- *301-Battery Test On/Off*

31-Inverter On/Off
- *310-Set Inverter Off Delay*
- *311-Inverter On/Off*

32-Change Password

34-Line Qualify Time
- *1) Set to 3 seconds (Default)*
- *2) Set to 10 seconds)*
- *3) Set to 20 seconds*
- *4) Set to 30 seconds*
- *5) Set to 40 seconds*
- *6) Set to 50 seconds*

35-Low Battery Warning Voltage

36-Load Shed Timer On/Off
- *1) Timer 1 on*
- *2) Timer 1 off*
- *3) Timer 2 on*
- *4) Timer 2 off*
- *5) Timer 1 on*
- *6) Timer 1 off*

4-Line Slow Detection Setup

This read-only screen shows the UPS's input voltage parameters. These values are factory set and cannot be changed in the field.

Press **ENTER** to go up 1 level in the menu tree.

To reach any submenu, type in its number and press **ENTER**.

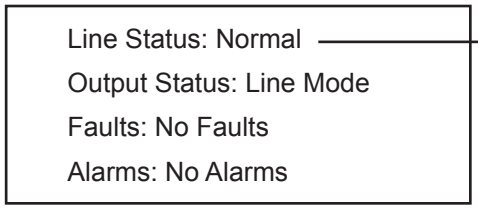
To reach the main menu, type **0** and press **ENTER**.

Figure 4.2.2
RS-232 Menu Tree

4.2 Using the Main Menu (Continued)

4.2.3 Line Status

Line status tells you the line's condition. For an updated value, press **ENTER**.

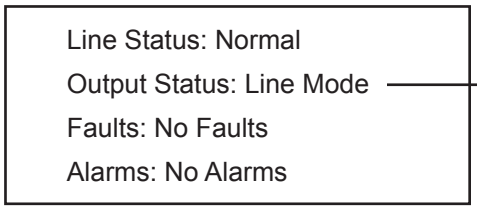


Line Status

Normal	The line is within specifications. The UPS is operating in Line mode.
Boost	Line voltage is out of tolerance. The UPS is operating in Boost mode.
Boost 2	Line voltage is out of tolerance. The UPS is operating in Boost 2 mode.
Buck	Line voltage is out of tolerance. The UPS is operating in Buck mode.
Buck 2	Line voltage is out of tolerance. The UPS is operating in Buck 2 mode.
Blackout	The line is absent.
Freq Low	Line frequency is too low.
Freq High	Line frequency is too high.

4.2.4 Output Status

Output status tells you how the UPS is producing power (*Also see* Figure 3.1.2). For an updated value, press **ENTER**.



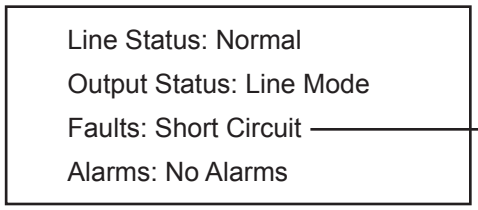
Output Status

Line Mode
Battery Mode
Battery mode, low bat warning
Battery mode, testing battery
Boost mode
Boost 2 mode
Buck mode
Buck 2 mode
Bypass
Inverter off due to fault
Inverter off due to low battery
Inverter off at start up
Shutdown due to user request

4.2 Using the Main Menu (Continued)

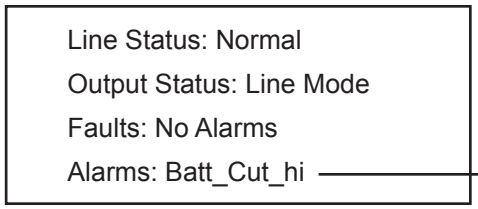
4.2.5 Fault and Alarm Displays

These display any malfunctions the UPS has (*Also see* Section 3.6).



Faults

Short Circuit	The load has a short.
Vout_Hi	The output voltage is above specifications.
Batt_Hi	The batteries cannot be charged.
Batt_Lo	The batteries are almost discharged.
Vout_Lo	The output voltage is below specifications.
Overload	The UPS is overloaded. Remove excess loads.
Backfeed	A relay inside the UPS has failed and it cannot be replaced in the field. Contact Alpha Technologies.
Bad_Battery	The battery has failed the self test
Fan_Fail	The UPS's internal fan has failed.



Alarms

Batt_Cut_hi	The battery charger is off due to a high battery charge.
Batt_Cut_lo	Low battery disconnect, the UPS is in Standby mode.
Overload	The UPS is overloaded. Turn off excess loads.
Temp_Hi	The ambient battery temperature is too high.
Temp_Lo	The ambient battery temperature is too low.
User_Input	The user input contact (Section 1.3.1, User Input S2) is shorted.
Line_Freq	The line frequency is outside of the UPS's input specifications.
No_Temp_ Probe	The battery temperature sensor has become disconnected or has failed.
Bad_Battery	The battery has failed the self test.
Batt_Low	The battery voltage is low.

4.3 Operating the UPS

The Maintenance submenu (Figure 4.3.1) lets you control the UPS and change selected items to meet your operational needs.

Procedure

At the main menu (Figure 4.2.1) type **3** and press **ENTER**.

Maintenance Submenu

30 Battery Test Options	This starts the self test and sets for how long it will run. The default setting for the test duration is 2 minutes, but this can be adjusted in 1 minute intervals with this submenu.
31 Inverter On/Off	This switches the inverter on or off to allow you to prevent a deep damaging battery discharge or to provide backup battery power to the load. You can set a delay before the inverter is turned on to allow you time to thurn critical loads off. The Set Inverter ON/OFF delay is only available when the UPS is in Battery or Standby modes. The delay can be adjusted in 1 second steps with a default of setting of 0 seconds to a maximum of 600 seconds (5 minutes). The delay is only available in Standby or Battery modes. Once the UPS returns to Line mode, the delay resets itself to 0 seconds.
32 Change Password	This changes the UPS's password. The factory set password is 1111. It can only be changed when the when the UPS is in Line mode. The password must be only 4 numbers (no letters or spaces) long.
34 Line Qualify Time	This lets you set the delay when the UPS goes from Battery mode to Line mode after the line becomes requalified. The purpose of this delay is to make sure the line is stable before the UPS switches back to it. The default setting is 3 seconds, but you can set this to 3, 10, 20, 30, 40 or 50 seconds.
35 Low Battery Warning Voltage	The lets you set the UPS's low battery warning voltage, adjusting the setting to match the batteries you are using and the actual operating conditions. The default value is 40%. To change it type in the % battery voltage level where you want the warning to be triggered at.
36 Load Shed Timer On/Off	This lets you turn the timer contacts on or off.

Figure 4.3.1
Maintenance Submenu

4.4 Programming the Dry Contacts and the Clock

The UPS's front panel contacts (Section 1.3.1) can be programmed to meet your specifications with RS–232 communications. You can also use computer commands to adjust the UPS's date and time.

4.4.1 Programming the Dry Contacts

The functions of dry contacts C1 to C5 (and if factory configured, dry contact C6) can be changed with RS-232 communications.

For example, to change contact C1:

1. To see how it is currently programmed, type **c1** (all lower case) and press **ENTER**.

2. The UPS responds with ***c1=1*** where the * shows the unit responded to your command.

   1 shows it is programmed to be the On Battery indicator as shown in the Dry Contact Configuration table below.

Dry Contact Configuration

1= On Battery	4= Alarm	7= Timer 2
2= Low Battery	5= Fault	8= Timer 3
3= Timer 1	6= Disabled	9= 48VDC (Only available for contact C6)

3. To change the contact, type **c1=X** where X is 1 to 9 and press **ENTER**.

   The UPS responds with ***c1=(1 to 9)***. The programming is done for that contact. Repeat as necessary for the other contacts.

   Each contact can only be programmed for one function at a time; it cannot show multiple conditions.

4. To reset the contacts to the factory default, type **default** and press **ENTER**. The UPS responds with ***default***, showing it is reset. This command also resets the timer setting to the 2 hours factory default (Section 4.4.2, "Setting the Timer Contact").

Finished

Continued on the next page

4.4.2 Setting the Timer Contact

The front panel's timer contact (Section 1.3.1; C4 and Section 4.4.1) can be programmed to suit your conditions.

1. To learn what the contact is set to, type **timer** (all lower case) and press **ENTER**. If more than one contact is set as the timer, type timer (1, 2 or 3) depending on your set up.

   The UPS responds with ***timerX=XXXXX*** where XXXXX is the setting in 0.5 second steps, timerX is timer 1, 2 or 3 and the * shows the UPS responded to your command. For example a reading of 120 shows the timer is set to 60 seconds.

2. To set the timer, type **timer=X**, and press **ENTER** (where X can be from 1 to a maximum of 14,400 steps (2 hours)).

   The UPS responds with ***timer=(value you have set)***.

3. Typing **default** and pressing **ENTER** sets it to the 2 hour (14,400, 0.5 second steps) factory default setting in addition to resetting contacts C1 to C5 to the factory default settings (Section 4.4.1, "Programming the Dry Contacts.")

Finished

4.4.3 Setting the Date and Time

1. To learn what time and date the UPS is set to, type **clock** (all lower case) and press **ENTER**.

   The UPS responds with ***clock=mm/dd/yy hh:mm:ss*** where the * shows the UPS responded to your command. It uses a 24-hour clock.

   NOTE: Changing the mm/dd/yy format on the LCD control panel (Figure 3.4.1) does not change the RS-232 mm/dd/yy format.

2. To program the date and time type **clock=mmddyy(1 space)hhmmss** (no slashes, colons or spaces between the numbers). Press **ENTER**.

   The UPS responds with ***clock=mm/dd/yy hh:mm:ss**. If the date or time change is invalid, it shows the time and date it was set to before you tried making the change.

The date and time must be entered as one complete line; you cannot change only the time or the date alone, both must be set at the same time. If you make a mistake, press ENTER and try again.

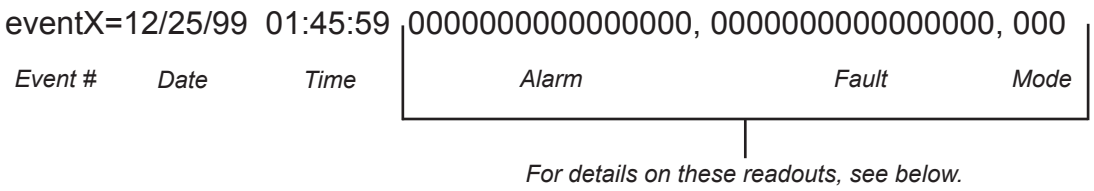
Finished

4.5 Accessing the 100-Event Log

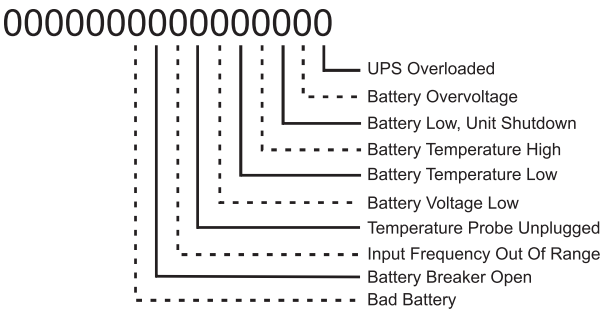
Up to 100 events are stored in the UPS's log. If more than 100 events occur, the oldest is over written.

Procedure

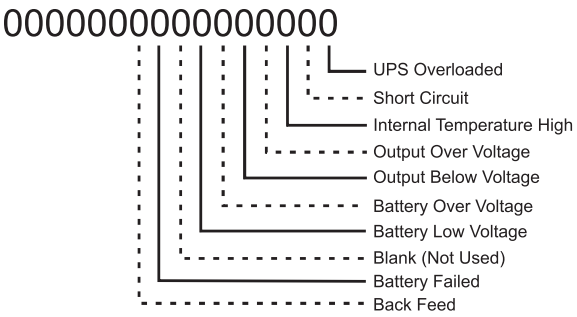
1. To see the log, type **event** (all lower case) and press **ENTER**. The events are listed starting with the most recent and appear as:



Alarm: When the following bits show a 1, it is displaying the following alarms.



Fault: When the following bits show a 1, it is displaying the following faults.



Code	Mode	Code	Mode
000	Standby	005	Buck 2
001	Line	006	Inverter
002	Boost 2	009	Shutdown
003	Boost 1	010	Bypass
004	Buck 1		

2. If less than 100 events occurred, the last entry appears as:

   eventX=00/00/00 00:00:00 0000000000000000, 0000000000000000, 000

Continued on the next page

4.5 Accessing the 100-Event Log (Continued)

3. To clear the log, type **eventclr** and press **ENTER**.

   It takes the UPS 30 seconds to clear the log. Do not enter any other commands during this time.

4. To see a specific event, type **eventX** where X is from 1 to 100 and press **ENTER**. To see a range of events (for example, events 20 to 30), type **eventX-X** where X are events from 1 to 100 and press **ENTER**.

Finished

4.6 Novus FXM Graphical User Interface

4.6.1 Introduction

The Novus FXM RS–232 Graphical User Interface (GUI) works like a Web or Windows© based GUI. The screen and it's features are shown below in Figure 4.6.1. With it you can monitor, control and set various parameters like the date and time, when the weekly self test is run, change the relay configurations, etc. Descriptions of all the items are given in Section 4.6.3, "Operation."

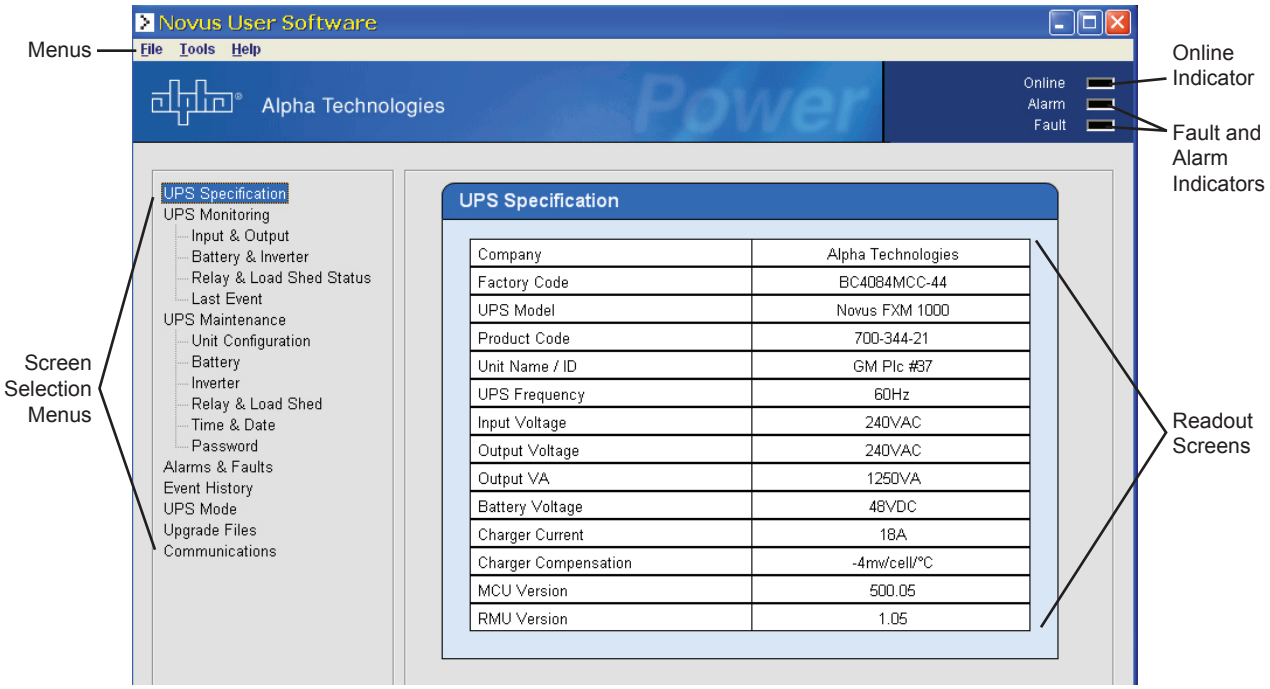


Figure 4.6.1
Novus User Software (UPS Specification Screen Shown)

4.6.2 Installation and Set Up

Tools and Materials Required

- Novus FXM Monitor software (available from www.alpha.com).
- Computer.
- Standard DB–9 serial straight-through computer cable.
- At least Windows 98 with Microsoft's .NET framework installed.

Continued on the next page

Procedure

1. Install the FXM Monitor software onto your computer. Restart the computer.

   If you install the FXM Monitor on a version of Windows without the .NET framework installed, you will get an error message saying the framework is not installed. Install the framework onto your computer.

2. Connect the computer cable from any available communications port on your computer to the RS–232 port on the UPS's front panel (*See* Section 4.1, "Wiring the RS-232 Port").

3. Set the communications parameters on your computer to:

   - **COM Port:** The COM port on your computer you have selected to use.
   - **Baud Rate:** 9600.

4. To start communications between the computer and the FXM:

   Click on the screen's **on-line indicator**.

   OR

   In the **File** menu, click on **Connect to FXM**.

Installation Finished

4.6.3 Operation

The menu tree for the FXM monitoring software is shown on the next page.

These screens (Figure 4.6.1) act like a Web or Windows-type screens. Point and click to change the various functions or fields.

The on line indicator shows if you are connected to the UPS. To turn communications on or off, click on it or, on the screen's **File** menu, click on **Connect to** [or **Disconnect from**] **FXM**.

If the Fault or Alarm Indicator is on, the UPS has a malfunction (*See* Section 3.6, "Troubleshooting").

Continued on the next page

4.6 Novus FXM Graphical User Interface (Continued)

UPS SPECIFICATIONS

This read-only screen shows the UPS's factory specifications.

UPS MONITORING

These read-only screens show the UPS's present input and output values and other settings.

Input & Output: *This shows you the present line input and UPS output values, power factor and the UPS's present operating mode.*

Battery & Inverter: *This shows you the battery string's status as well as how many times and for how long the inverter has been active.*

Relay & Load Shed: *This shows you how the front panel dry contacts are configured (Also See Section 1.3.1, "Dry Contacts"). If any relays are used for load shedding, it shows the time they are set to.*

Last Event: *This shows you the last event the UPS went through (Also See Section 3.7, "Last Event Log"). It shows what fault or alarm triggered the event.*

UPS MAINTENANCE

These screens let you adjust the UPS to meet your operating needs (*Also See* Sections 3.4, "Programming the UPS" and 4.3, "Controlling the UPS").

Unit Configuration: *This lets you set the UPS's name, input, output and other parameters.*

Battery: *This lets you set the battery string voltage, charging parameters, when the low battery warning happens, starts the battery test and sets when the periodic battery test occurs (if used).*

Inverter: *This lets you turn the inverter on or off to provide backup battery power to the load.*

Relay & Load Shed : *This lets you set the front panel's dry contact configuration.*

Time & Date: *This lets you set the UPS's date and time.*

Password: *This lets you set the UPS's password. The factory set password is 1111.*

ALARMS & FAULTS

This read-only screen shows you what malfunctions the UPS has. When the fault or alarm indicators in the top right corner of the screen are lit go to this screen to learn what it is (*See Section 3.6, "Troubleshooting" for descriptions of these items*).

EVENT HISTORY

This screen shows you the last 100 events the UPS went through. Choosing a number in the **Event Index** list box and then clicking on the **Show Event** button will show you the event, when it happened and what fault or alarm caused it (*Also See Sections 3.7, "Last Event Log" or 4.5, "Accessing the 100-Event Log"*).

Clicking on the **Clear History** button clears the log. This action cannot be undone.

Continued on the next page

4.6 Novus FXM Graphical User Interface (Continued)

UPGRADE FILES

This screen lets you update UPS's internal software (*See Section 5.1, "Updating the Software*"). You must have already downloaded the firmware from www.alpha.com and put it where you can access it before using this screen.

COMMUNICATIONS

This screen changes the UPS's communication parameters to suit your needs.

5
Maintenance

This Section Tells You How To Maintain the Novus FXM

- How to Replace the Software (Section 5.1)

5.1 Updating the Software

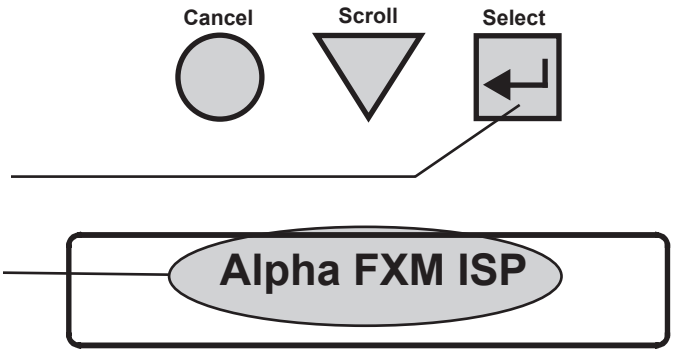
The UPS's firmware can be reinstalled or updated to the latest version with this procedure.

Tools and Materials Required

- RS-232 connection to UPS (*See* Section 4.1).
- uBug12 software installed on your computer (http:support/technologicalarts.ca/docs/uBug12/How%20/to%use%%20uBug12.pdf).
- Alpha Technologies firmware installed where you can access it with your computer (available at www.alpha.com).

Procedure

1. Turn the UPS off (*See* Section 3.2.2). Connect RS-232 if it isn't connected.



2. Press the **SELECT** button. Turn the UPS on while pressing the button down.

   The LCD panel shows "Alpha FXM ISP."

3. Start uBug12.

4. Type (all lower case) **con**(1 space)**1**(or the number of the computer's comm port you are using) and press **ENTER**. The screen shows "connected" when the connection is made.

5. Type (all lower case) **fbulk** and press **ENTER**.

   The erase pop-up appears. It disappears when the UPS's memory is erased.

6. Type (all lower case) **fload;b** and press **ENTER**.

   A pop-up appears asking you to locate the new firmware. Look for a "Sx record" (*.Sx). Select this new firmware. The fload pop-up appears. When the software is finished loading into the UPS, the pop-up shows "Loaded OK in (xx) seconds."

7. Type (all lower case) **exit** and press **ENTER**.

   The uBug12 screen disappears. Turn the UPS off.

8. Turn the UPS on.

   If the reprogramming was successful, the LCD's logo screen appears (Figure 3.1.1). If it wasn't, it shows "Alpha FXM ISP" as shown in step 2. Try installing the firmware again.

Firmware Replacement Finished

Mechanical Specifications

FXM 1100/1500/2000 Dimensions, in (mm) H x W x D	5.2 x 15.5 x 8.75 (133 x 394 x 222)
FXM 1100/1500/2000 Weight, lb (kg)	35 (15.9)
FXM 500 Dimensions, in (mm) H x W x D	3.5 x 17 x 9 (89 x 432 x 229)
FXM 500 Weight, lb (kg)	25 (11.3)
Mounting	Shelf, rack or wall; horizontal or vertical mount.
Humidity (operating)	Up to 95% (non-condensing)
Temperature Range, °C	
Operating	-40 to 55
Storage	-40 to 75
(Notes 1, 2)	
Altitude	
Operating (Note 3)	Up to 12,000 ft. (3658 m)
Storage	Up to 15,000 ft. (4572 m)
AC Input and Output Connectors	Terminal block (maximum 10 AWG)
Dry Contact Connectors	Terminal block (maximum 16 AWG)
RS-232 Connector	DE-9, female
Ethernet Connector	Optional, factory installed RJ-45
Dry Contacts	6 sets of single-pole, double-throw relays located on the front panel. They are rated at 250VAC, 1A. The factory default settings are: **C1:** On Battery **C2, C3:** Low Battery **C4:** Timer **C5:** Alarm **C6:** 48VDC for an external fan. It can be factory configured as a dry contact.
User Inputs	Three optically-isolated inputs are located on the front panel. When they are shorted, their functions are: **S1:** Starts the Self test **S2:** Activates an alarm **S3:** Unit shutdown
User Input (Note 4)	2 x 20 backlit alpha-numeric LCD screen. Three control buttons located below.

Electrical Specifications

Input

Voltage (nominal, VAC)	120 or 230 (optional 220)
Frequency, Hz ±5%	60/50 (autofrequency)
Current, A (@ nominal Vin and 6A battery charger)	**–500W:** 7.5/3.8 @120/230VAC **–1100W:** 12.6/6.5 @120/230VAC **–1500W:** 16/8.4 @120/230VAC **–2000W:** 20.5/10.7 @120/230VAC

Output

Voltage (nominal, VAC)	120 or 230 (optional 220)
Frequency, Hz ±5%	60/50 (autofrequency)
Current, A	**–500W:** 4.2/2.2 @120/230VAC **–1100W:** 9.4/4.8 @120/230VAC **–1500W:** 12.5/6.5 @120/230VAC **–2000W:** 16.7/8.7 @120/230VAC
AC Input and Output Connectors	Terminal block (maximum 10 AWG)
Power, W/VA	500/1100/1500/2000
Waveform	Sinewave
Load Crest Factor	3:1 (load dependant)
Output Voltage Distortion	< 3% THD (resistive load)
Efficiency (typical)	
Normal Mode	>98%
Backup Mode	>84%
Transfer Time (mS)	
AVR to Backup	5 (Typical)
Backup to AVR	3 (Typical)
Line Qualification Time	3 seconds (factory default), user adjustable to 3, 10, 20, 30, 40, or 50 seconds.
Battery String Voltage	48VDC 24VDC (FXM 500 only)
Battery Charger Current	6A (factory default), user adjustable to 3, 6 or 10 A.
Battery Charger Temperature Compensation	-5mV/°C/Cell (factory default), user adjustable to -2.2, -4, -5 or -6mV/°C/Cell.

Boost/Buck/Line Transfer Thresholds

Subject to change without notice

Parameter	120VAC Units	230VAC Units
High Line Transfer	175 VAC	325 VAC
High Line Retransfer	162 VAC	303 VAC
Buck 2 Transfer	152 VAC	282 VAC
Buck 2 Retransfer	146 VAC	272 VAC
Buck 1 Transfer	134 VAC	250 VAC
Buck 1 Retransfer	128 VAC	236 VAC
Boost 1 Retransfer	116 VAC	210 VAC
Boost 1 Transfer	112 VAC	207 VAC
Boost 2 Retransfer	102 VAC	180 VAC
Boost 2 Transfer	98 VAC	176 VAC
Low Line Retransfer	97 VAC	162 VAC
Low Line Transfer	88 VAC	151 VAC

Regulatory

Electrical Safety	UL 1778, CSA22.2#107.3, EN50091-1-2, EN60950
Emission	FCC subpart J, level A for conducted and radiated EMI; CSPR22, EN55022 level A for conducted and radiated EMI.
Marks	$_{C}CSA_{US}$, CE (CE for 230VAC versions only).
Packaging	Designed to meet requirements for ISTA program

NOTES:

Note 1: Capable of operating up to 74°C. Above 55°C, derate output power by 1.3% per °C.

Note 2: Capable of operating at fully rated load below 0°C down to -40°C after the UPS has been stabilized at 0°C for at least 1 hour.

Note 3: Derate 2°C per 1000 ft (305 m) above 4500 ft (1372 m).

Note 4: The LCD may not function below 20°C. It resumes normal operation when the temperature rises above -20°C. The UPS continues to operate normally.

Note 5: This UPS is intended for use in a restricted access area.

NOTICE

The Novus FXM generates, uses and radiates radio frequencies if not installed and tested in accordance with the instructions in this manual. It has been tested and found to comply with the limits established for a Class A computing device pursuant to part 15 of FCC rules and CSPR 22 when it is operated alone. It also complies with the radio interference regulations of DOC which are designed to provide reasonable protection against such interference to radio to TV reception, which is determined by switching it on and off, relocate the equipment or use an electrical circuit other than the one used by the Novus FXM.

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LIMITED 24-MONTH WARRANTY

AC PRODUCTS

Alpha Technologies warrants its equipment to be free of manufacturing defects in material and workmanship for a period of 24 months from the date of manufacture. The liability of Alpha Technologies under this warranty is solely limited to repairing, replacing, or issuing credit for such equipment (at the discretion of Alpha Technologies), provided that:

1. Alpha Technologies' Customer Service Department is promptly notified, by facsimile or telephone, that a failure or defect has occurred.
2. Alpha Technologies' Customer Service Department issues a Return Materials Authorization (RMA) number, and designates the service location. The RMA must be clearly marked on the outside of the shipping container.
3. Purchaser is responsible for all in-bound shipping and handling charges (COD and freight collect will not be accepted without prior approval from Alpha Technologies); Alpha Technologies will pay out-bound surface shipping charges for return of repaired equipment.
4. A satisfactory examination of the returned UPS by Alpha Technologies' Service personnel shall disclose that defects have not been caused by misuse, neglect, improper installation, repair, alteration, or accident, or failure to follow instructions furnished by Alpha Technologies. If Alpha Technologies' Service personnel determine that the UPS has been damaged due to one of these causes, or if the UPS is free of defects, a handling or repair fee may be assessed prior to returning the UPS.

WITH RESPECT TO BATTERIES, PERIPHERAL DEVICES, ATTACHMENTS OR APPARATUS NOT MANUFACTURED BY ALPHA TECHNOLOGIES, ALPHA WILL ASSIGN TO THE PURCHASER ITS RIGHTS UNDER THE ORIGINAL MANUFACTURER'S WARRANTY OF SUCH BATTERIES, PERIPHERAL DEVICES, ATTACHMENTS OR APPARATUS, BUT OFFERS NO ADDITIONAL WARRANTIES IN CONNECTION THEREWITH.

THIS LIMITED 24-MONTH WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO CASE SHALL ALPHA TECHNOLOGIES BE LIABLE FOR ANY INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES WHATSOEVER, INCLUDING WITHOUT LIMITATION ANY CLAIM FOR LOST PROFITS OR REVENUES, EVEN IF ALPHA TECHNOLOGIES HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH, FOR BREACH OF THIS OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.

Any action for breach of this limited 24-month warranty must be brought within a period of 24 months from date of manufacture.

This limited 24-month warranty does not extend to any UPS that has been repaired or altered by any party other than Alpha Technologies or its Authorized Service Center.

Alpha Technologies reserves the right to discontinue particular models and to make modifications in design and/or function at any time, without notice and without incurring obligations to modify previously purchased UPSs.

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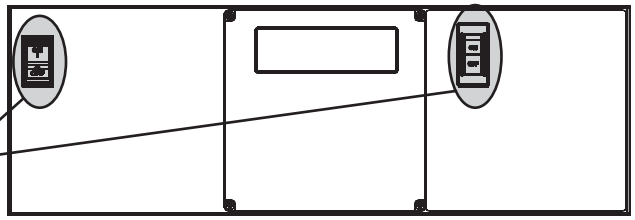
Emergency Shutdown Procedure

The Novus FXM has more than one live circuit. In an emergency, line power may be disconnected at the input, but there can still be AC power present at the output.

Turn off the Input Circuit Breaker and the Battery Circuit Breaker.



For emergency technical support 7 days a week/24 hours a day, call:

USA: 1 800 863 3364

Canada: 1 800 667 8743

Complete the following for your records

Serial # _____

Options _____

Purchase Date _____

This Novus FXM was purchased from

Dealer _____

City _____

State/Province _____

Zip/Postal Code _____

Country _____

Telephone # _____

Fax # _____

E Mail Address _____

Alpha Technologies

Power

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