

### Introduction

This guide describes the XM3.1-HP power supply (3 and 5 Amp models) and provides procedures with regard to the installation of the power supply, battery connection, the Smart Display, initial startup and test, battery configuration and verification of successful installation. For detailed information, refer to the XM3.1-HP Broadband UPS™ Technical Manual for 3 & 5 Amp Models (Alpha p/n 017-947-B0-001) available at www.alpha.com.

This guide is intended for experienced, qualified and licensed installation personnel familiar with the mechanical and electrical requirements of power supply enclosure systems. Review the XM3.1-HP Broadband UPS™ 3 & 5 Amp Technical Manual and other support documentation on the website to become familiar with the features and functions of the equipment in this system before proceeding. Failure to install and/or use this equipment as instructed in the system documents can result in a hazard to personnel or damage to the equipment. Once installation is complete, only qualified personnel should service the system.

### ATTENTION:

This power supply has been approved by regulatory authorities which require its use with Alpha® enclosures. Refer to Section 8.

### 1.0 Overview

The XM3.1-HP provides Outputs 1 & 2 for powering broadband devices and one auxiliary output for powering ancillary devices in the enclosure. The output voltage for Output 1 and 2 are dependent on the model of the power supply and the location of the Vout Selection Tap. The output voltage of Auxiliary Output 1 is dependent on the model. See page 5 for model numbers and their corresponding output voltages. The XM3.1-HP is composed of the following embedded modules:

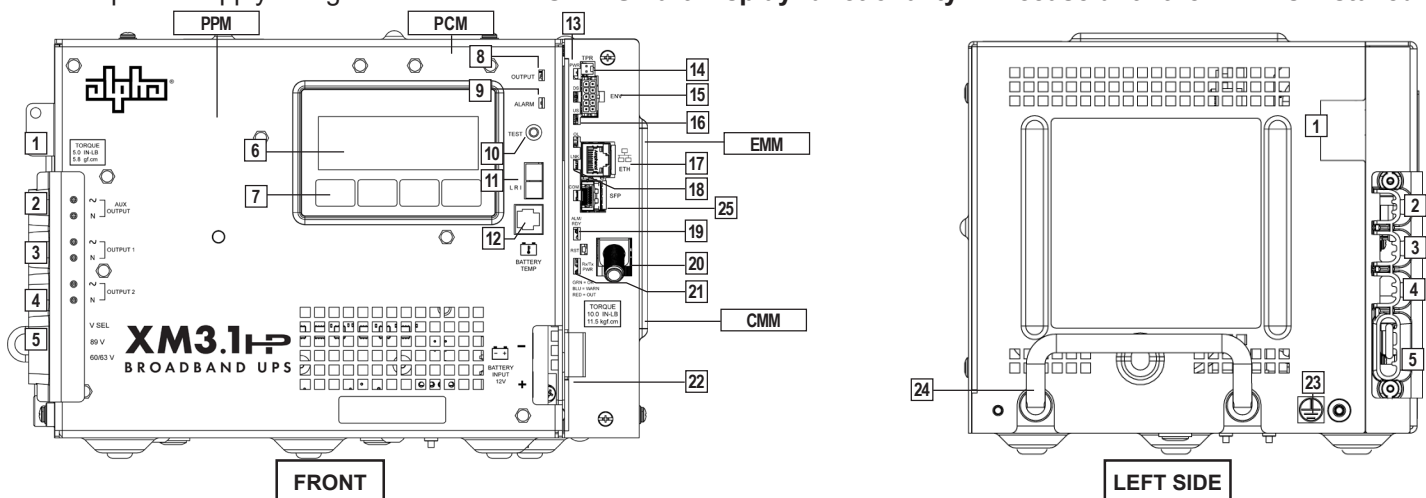
**Transformer Module** — provides a critical load with current-limited regulated AC power that is free of spikes, surges, sags and noise.

**Power Processing Module (PPM)** — contains circuits for the Inverter, Sensing, Relays and Input/Output power.

**Power Control Module (PCM)** — controls the core power supply functions such as Line Mode (AC Input), Inverter, Battery Charger, Data Storage and AC Output.

**Element Monitoring Module (EMM)** — is the interface between the Power Control Module and the Cable Modem Module (CMM). The EMM provides the necessary data storage and performs advanced functions such as logging power supply events, utility events, and battery health analysis. Additionally, the EMM provides the interface for the local web page and logic for the ancillary equipment such as tamper switches. **NOTE: Should the EMM be removed, the Smart Display will be disabled.**

**Cable Modem Module (CMM)** — interfaces with the EMM to provide the necessary communication over the DOCSIS® and Ethernet networks. The CMM enables the local Ethernet port for local web server access. The CMM may be removed from the power supply along with the EMM. **NOTE: Smart Display functionality will cease until the EMM is installed.**



- |  |   |                               |             |
|--|---|-------------------------------|-------------|
| 1 Line Cord IEC Input                      | 9 Alarm LED                                     | 17 Ethernet (ETH) Connector   | 25 SFP Port |
| 2 Aux Output, 110Vac/220Vac, RMS           | 10 Self-Test Button                             | 18 LNK: CPE Link Status       |             |
| 3 Output 1 [Voltage set by VOUT Selection] | 11 Local/Remote Indicator (LRI) Connector       | 19 Alarm / Ready              |             |
| 4 Output 2 [Voltage set by VOUT Selection] | 12 Precision Temperature Sensor (PTS) Connector | 20 RF Connector for CMM       |             |
| 5 VOUT Selection Tap Terminal Block        | 13 Cable Modem Power (PWR) Indicator            | 21 Rx/Tx Power Indicator      |             |
| 6 Smart Display                            | 14 Tamper (TPR) Switch Connector                | 22 Battery Input 12V          |             |
| 7 Soft Keys                                | 15 Environmental Control Connector              | 23 External Ground Connection |             |
| 8 Output LED                               | 16 Upstream/Downstream Indicator for CMM        | 24 Folding Handle             |             |

Fig. 1-1, Main Features of the XM3.1-HP Series Power Supply

## 2.0 Battery Installation and Wiring

### Tools Required:

- True RMS Digital multimeter
- Box end wrenches, insulated
- NO-OX® Corrosion Inhibitor
- Socket wrenches, insulated
- Torque wrench calibrated in in-lbs



### WARNING! ELECTRICAL HAZARD

Verify battery voltage, cable color, connection and polarity are correct before proceeding.



### NOTICE:

The battery terminal hardware is subject to change based on battery make and model.

1. Load batteries into cabinet with the positive terminals (+) facing forward. Coat the hardware and battery terminals with electrical contact lubricant and assemble the battery cables, PTS and hardware as shown in the illustrations below. Torque hardware to 110 in-lbs (12.43 Nm).
2. The 12V batteries can be wired in parallel, up to four batteries total, to extend standby runtime. Other factors such as cabinet size and company policies may depict the number of batteries utilized at a specific site. For sites with multiple batteries, the individual battery voltages are not available in monitoring systems due to the parallel wiring connectivity.
3. With a MIDTRONICS® Conductance meter (Celltron® Essential, Celltron® Advanced or equivalent) measure the conductance value (MHOS) of each battery and record for use in Section 5.2 *Battery Configuration*. Also, record the battery date code on the battery label for entry on the DATE SET screen.

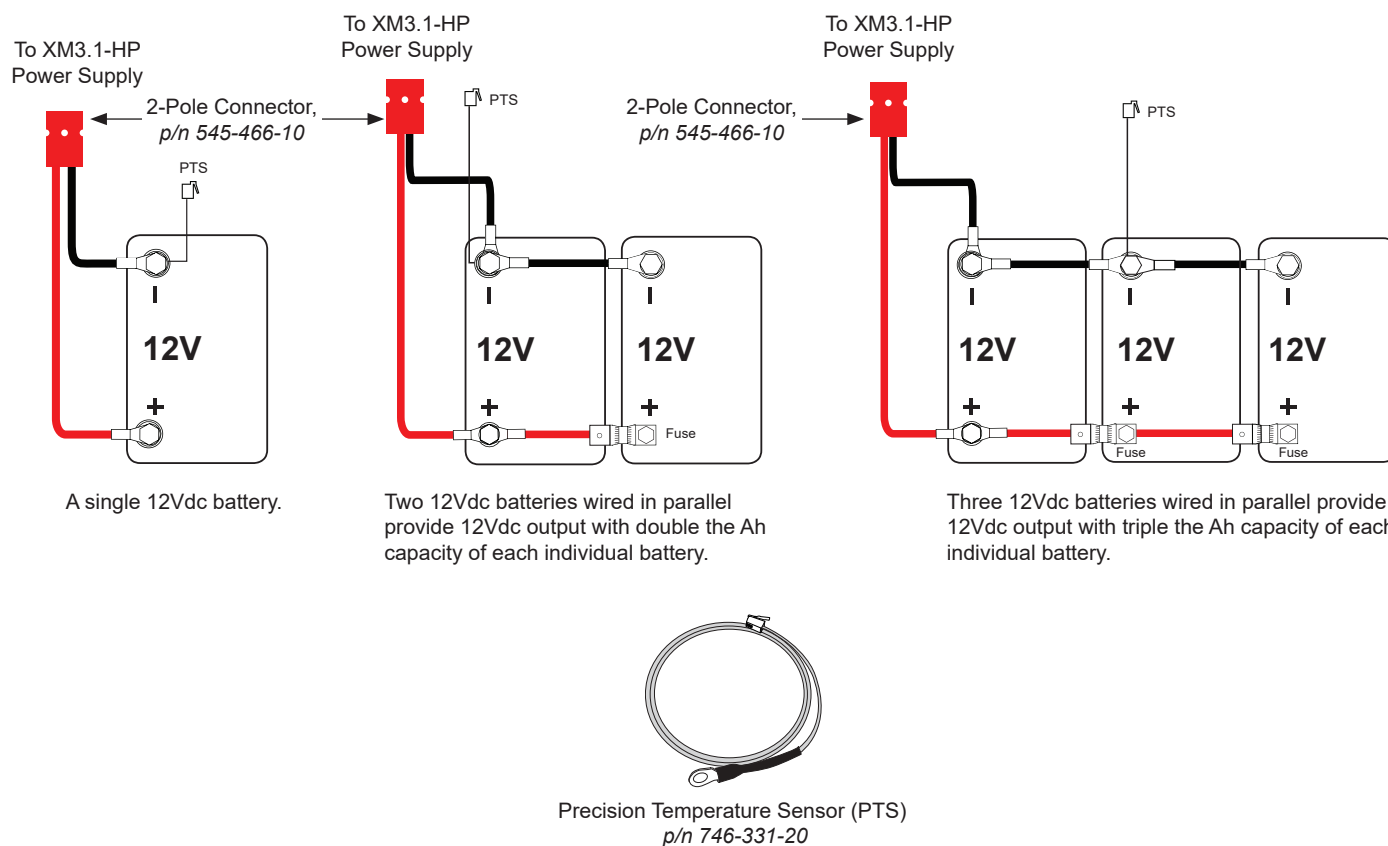


Fig. 2-1, Battery Wiring Diagrams and Precision Temperature Sensor

## CAUTION!

Use M6 × 20 mm bolts for threaded insert terminals on the AlphaCell® 100XTV. If using a spacer for the in-line fuse link, use M6 × 30 mm bolts. For AlphaCell® 4.0HP batteries, use 1/4" 20 UNC bolts for insert terminals. If using a spacer for the in-line fuse link, use 1/4-20 × 1-1/4" bolts.

### Threaded Insert Terminals

Threaded insert terminals require the use of 1/4-20 × 3/4" (M6 × 20 mm) bolts. The use of 1" (25.4 mm) bolts will seriously damage the battery. The only exception is the terminal with the large spacer for the in-line fuse link. Apply conductive electrical grease (NO-OX® Corrosion Inhibitor) on all exposed connections. Torque all nuts and bolts to 110 in-lbs (12.43 Nm).

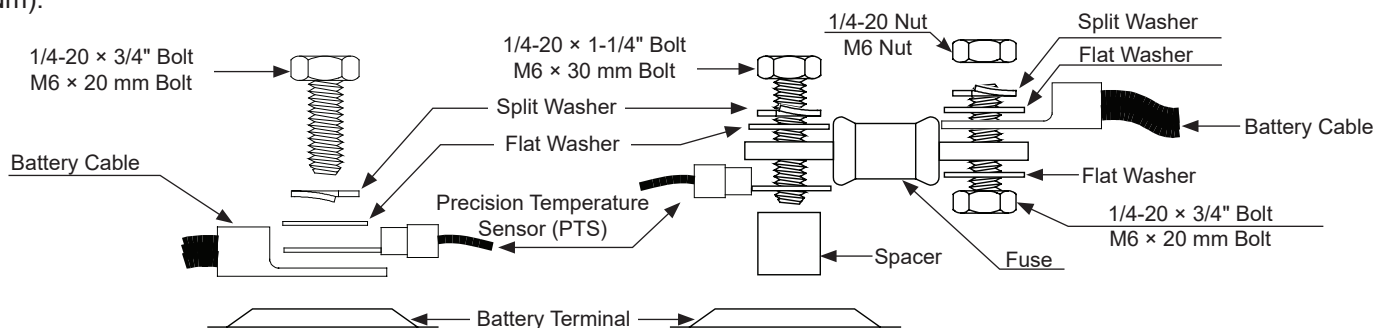


Fig. 2-2, Hardware Stack-up, Non-Fused Connection

Fig. 2-3, Hardware Stack-up, Fused Connection

## 3.0 Power Supply Connections (Refer to Fig. 1-1)

1. Connect PTS cable (Alpha p/n 746-331-20) to the PTS connector [12].
2. Connect the Tamper Switch and RF cable to the transponder [14 and 20].
3. Verify the SPI's **ON / ALT** Toggle Switch is in the **ALT** position.
4. Use a 0.6 × 3.5mm slotted screwdriver to connect the SPI's line and neutral input cables to the Output 1 Connector [3]. If a second SPI / ALT Box is present connect input cable to Output 2 Connector [4].



## WARNING! ELECTRICAL HAZARD

Do not connect the SPI to the Aux Output connector. This connector is for special applications for powering ancillary equipment in the enclosure.

5. Plug the optional Local/Remote Indicator (LRI) cable into the LRI connector [11]. For existing LRI installations, use LRI adapter kit, p/n 875-952-20.
6. Turn AC breaker **ON** and verify it is the correct utility voltage at the outlet (per unit's nameplate voltage). If correct, plug the line cord into the utility outlet.
7. Verify correct battery voltage and polarity on battery cable connector with a digital voltmeter; if correct, plug the battery cable connector into the Battery Input 12V port [22].

The unit will begin a self-test at this time and system status information will be available via the Smart Display.

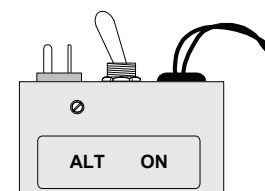


Fig. 3-1, SPI toggle switch (shown in ALT position)

## 4.0 Using the Smart Display

All operational functions, system testing, menus and alarms are available via the illuminated Smart Display. Display functions are accessible by following the indicated prompts above the four softkeys. Descriptions of the display functions are detailed below.

- 1 1st line: Input Voltage/Current and Output Voltage/Current
- 2 Describes Power Supply Mode of Operation
- 3 Describes Status of Functions
- 4 Functionality top level menu PWR, BATT, COMM and APPS
- 5 Softkeys (Menu-driven system configuration)

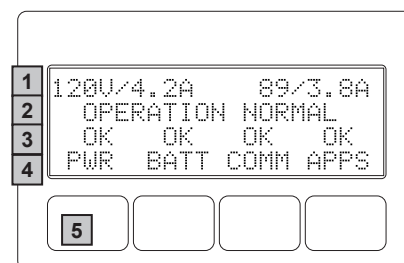


Fig. 4-1, Smart Display With Sample Screen

## 5.0 Startup, Battery Configuration and Self-Test

### 5.1 Initial startup

1. The Smart Display will cycle through its functions (approximately 60 seconds) verifying proper operation. Upon successful completion, the Smart Display will indicate “**OPERATION NORMAL**”. From this screen, proceed to Section 5.2, *Battery Configuration*.
2. If alarms are present and do not clear after 60 seconds, press the softkey associated with the alarm to see the ACTIVE ALARM list.
3. Press **UP** ↑ or **DOWN** ↓ to select the active alarm.
4. Press **ENTR** to select the alarm and display diagnostic information. Press **ESC** to return to the alarm list. Refer to the XM3.1-HP Power Supply Technical Manual for 3 and 5 Amp models for a complete listing of alarm conditions and recommended diagnostic solutions.
5. Once the alarm has been cleared, the batteries can be configured in the system as outlined in the next section.

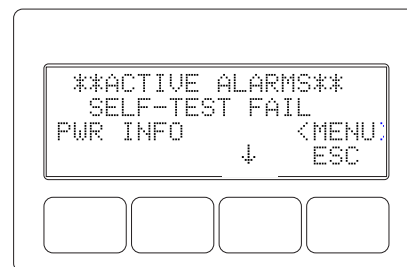


Fig. 5-1, Smart Display indicating a Self-Test Fail Alarm

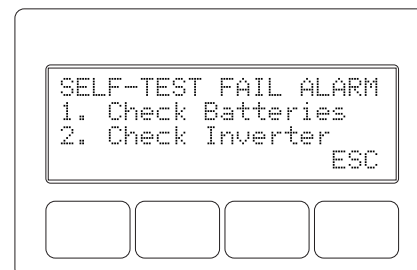


Fig. 5-2, Self-Test Fail Alarm Menu, with suggestions for corrective actions

### 5.2 Battery Configuration

1. From the Operation Normal screen, press the **BATT** softkey to open the BATTERY INFO menu.
2. Press **ENTR** to open BATT CONFIG Menu. The BATT MHOS screen opens.  
**NOTE: Battery MHOs and Date code can only be set after DOCSIS transponder has registered with CMTS. Please wait 3 minutes after power up to enter Battery MHOs measurements.**
3. Press **ENTR** to access the first battery in the string, for example, (A1). The first digit will be cycling on and off. Press the **UP arrow** softkey to set the value of each digit as recorded at the time the batteries were installed. Once the correct value is set, press **ENTR** to advance to the next digit. Use the **UP arrow** softkey as before to set the value. Repeat for each following digit. When complete, press **ENTR** to return to the BATTERY MHOS screen. Press the **DOWN arrow** softkey to select the next battery in the string and repeat the MHOS setting process.
4. Once the MHOS values for each battery have been set, press **ESC** to return to the BATTERY CONFIG MENU.
5. Press the **DOWN arrow** softkey to select the next line item for adjustment: BATT DATES.
6. Press **ENTR** to select battery and advance to DATE SET screen. Press **ENTR** to select Batt A1 date. Select **ENTR** and key in the dates recorded from the battery labels at the time of installation. Press **ESC** to return to the DATE SET screen and the down arrow to select the next battery. Repeat the above steps for each remaining battery.
7. Press **DOWN arrow** softkey and select BATT MODEL and from the submenu, select the battery type installed.
8. Press **ENTR** to return to the Battery Config menu and select NUM BATT STRINGS and enter the correct value.
9. Press **ENTR** to accept new data.
10. Press **ESC** to return to the OPERATION NORMAL screen.
11. Switch SPI/ALT **ON**. Verify the XM3.1-HP is supplying power to the load.

### 5.3 Self-Test Operation

The power supply should be operating correctly with no alarms present. Use the Smart Display to verify Normal and Communication Information. Verify Test Duration setting in the PWR CNFG menu screen.

1. Press and hold the **TEST** button for 1 to 2 seconds to start self-test. The test will run for a preset time (5-180 minutes, set in the PWR CNFG Menu, default is 10 minutes). Self-test can also be entered by setting self-test to ON in the PWR CNFG Menu. Additionally, the self-test can be configured to perform a deep-discharge of 10%, 20%, 30%, 40% and 50% of battery capacity. When the deep discharge is complete, it will revert back to the Timed Test.

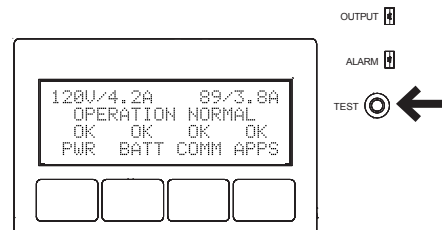


Fig. 5-3, Test Button

Condition	Output LED	Alarm LED
Normal Operation	On	Off
Minor Alarm	Flash	Off
Major Alarm	Flash	Flash
Output Off	Off	Flash

Table 5-1, Alarm Indicators

#### ✓ **NOTICE:**

A Self-Test Fail alarm will be activated and appear on the Smart Display and Transponder web page if the power supply detects one or more defective batteries, or a problem with the Inverter Module. Replace batteries or power supply as required. This is a latched alarm and power cycling the Inverter Module will not clear the alarm. This alarm can only be cleared by successfully running in self-test for a minimum of one minute.

2. While in self-test mode, use the Smart Display or a true RMS voltmeter to verify output. Output voltages should appear within the ranges shown in Table 5-2.

Voltage Regulation (% Range)		
Voltage Setting	Fine (-2.5%/+1%)	Coarse (-5%/+1%)
89Vac	86.77Vac / 89.89Vac	84.6Vac / 89.89Vac
63Vac	61.43Vac / 63.63Vac	59.85Vac / 63.63Vac
60Vac	58.5Vac / 60.6Vac	57Vac / 60.6Vac

Table 5-2, Voltage Regulation

#### ✓ **NOTICE:**

The XM3.1-HP provides Outputs 1 & 2 for powering broadband devices and one auxiliary output for powering ancillary devices in the enclosure. The output voltage for Output 1 and 2 are dependent on the model of the power supply and the location of the Vout Selection Tap. The output voltage of the Auxiliary Output is dependent on the model. See Table 5-3 for model numbers and their corresponding output voltages.

3. To halt/cancel a self-test in progress, press and hold the **TEST** button for one to two seconds or change self-test to OFF in the Power Config Menu.
4. After successful completion of the self-test, perform a Standby Test by shutting off the utility breaker and verifying the Power Supply goes into STANDBY MODE and supports the load.
5. After the Standby test, reapply AC voltage and verify the unit transfers back to LINE MODE.

XM3.1-HP Models and Voltage Outputs		
Model	Output 1 & 2 Voltage Vac (Selectable)	Aux Output Vac
XM3.1-903-HP	60 / 89	110
XM3.1-905-HP	60 / 89	110
XM3.1-605CE-HP	63	220
XM3.1-905E-HP	63 / 89	220
XM3.1-905P-HP	60 / 89	220

Table 5-3, XM3.1-HP Models and Voltage Outputs

## 6.0 Cable Modem Module Transponder LEDs

### 6.1 Verify Transponder Operation

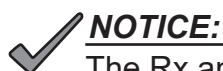
Verify the CMM LEDs behavior is as follows:

CMM Rx and Tx LED Indications					
Step	Communications State	Downstream (DS)	Upstream (US)	Online (OL)	Rx/Tx Power
1	Transponder Initializing/Searching for Downstream DOCSIS channel(s)	Flashing	OFF	OFF	OFF
2	Downstream channel(s) locked, searching for upstream channel(s)	ON	Flashing	OFF	ON (Green)
3	Upstream channel(s) locked, registering with CMTS	ON	ON	Flashing	ON (Green)
4	CMM fully functional, registration complete	ON	ON	ON	ON (Green)

Table 6-1, Transponder LEDs

When the CMM is fully functional (step 4 in the table above), the Rx/Tx Power LEDs indicate the RF power levels as follows:

### 6.2 Rx/Tx Power LED



#### NOTICE:

The Rx and Tx LED color boundaries can be changed by modifying the alarm properties associated with the readings.

LED Color	Default Rx Range (dBmV)	Default Tx Range (dBmV)
Green	- 10 to +10	0 to +50
*Blue	+15 to +10 and -10 to -15	+50 to +55
*Red	>+15 and <-15	>+55

\* Blue RF LED indicates Rx/Tx Power at a warning level. Make the necessary RF level adjustments.

\* Red RF LED indicates Rx/Tx Power at an alert level. Make the necessary RF level adjustments.

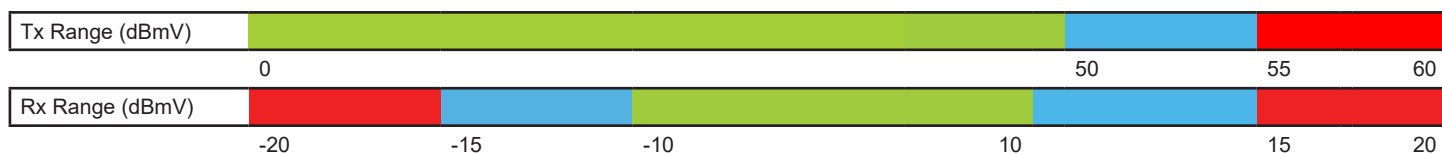


Table 6-2, Rx/Tx LEDs

### 6.3 XM3.1-HP Smart Display — COMM Menu

Verify Alpha® DOCSIS® Transponder communication parameters such as IP Address, RF Power Levels and Signal/Noise Ratio on the COMM menu of the XM3.1-HP Smart Display. The XM3.1-HP utilizes a DOCSIS 3.1 hardened cable modem that may require special provisioning by your CMTS administrator to come online. Press **ENTR** to open the RF - GENERAL Menu enabling the operator to view values for the following parameters. Pressing the **UP** or **DOWN arrow** softkeys will show two lines of information for each submenu item.

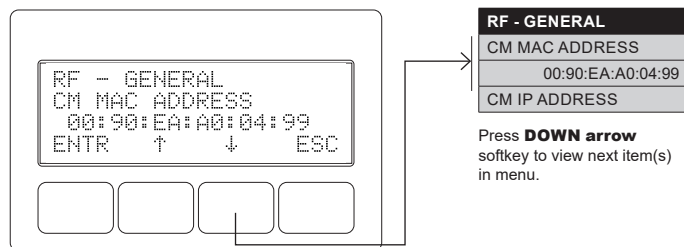



Fig. 6-1, Navigating to CM MAC address


## 7.0 Final Verification

### 7.1 Local Web Server Access

By means of the installed CMM, the enabled Ethernet port of the Alpha® DOCSIS® Transponder can be used as a local connection point, allowing the user to connect to the transponder web page. To access the web page, follow the steps below:

 **NOTICE:**  
 A Static IP address (192.168.100.2) may need to be set on your network interface card to connect to the transponder.

1. Using a standard (CAT5 or better) Ethernet cable, connect the transponder to the laptop or computer network interface port.
2. Launch a web browser.
3. Enter the transponder's default IP address (192.168.100.1) into the web browser's address field.
4. The transponder's web server home page will appear.

 **NOTICE:**  
 For the Alpha DOCSIS Transponder, this may take up to 45 seconds when the transponder is initially powered up with no RF connection.

### 7.2 Remote Web Server Access

To remotely access the Alpha DOCSIS Transponder web server utilizing a web browser:

1. Open a web browser on a computer connected to the same network as the XM3.1-HP.
2. Enter the Alpha DOCSIS Transponder's designated IP address (e.g., 192.168.1.124) into the web browser address field.
3. The Alpha DOCSIS Transponder's web server home page will appear.

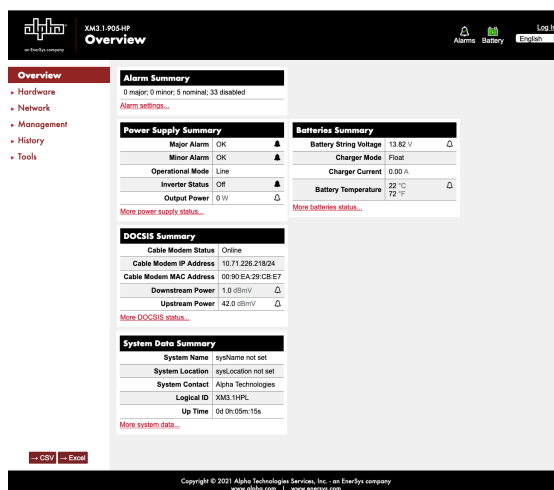


Fig. 7-1, XM3.1-HP Overview Web Page  
 (Data values shown are for illustrative purposes only.)

## 8.0 Mounting Options

Alpha® offers a variety of mounting options for the XM3.1-HP 3 and 5 Amp models. For further installation details please consult the XM3.1-HP Technical Manual for 3 & 5 Amp Models (Alpha p/n 017-947-B0-001) and/or specific rack/enclosure manuals:

Mounting Options	Supplementary Reference Material
Wall-Mount Rack (1 Battery)	017-947-B0-001 or 746-221-C0-001
Wall-Mount Rack (2 Battery)	
Wall-Mount Shelf (Large)	
Node Power Supply Enclosure	031-295-B0-001
LPE Enclosure	031-302-B0-001

Table 8-1, Mounting Options