



Intelligent CableUPS® Technical Manual

XM3-HP Series
Effective: July 2012

Power

Alpha Technologies 

Power

XM3HP

High Efficiency CableUPS®

Technical Manual
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NOTE:

Photographs contained in this manual are for illustrative purposes only. These photographs may not match your installation.



NOTE:

Operator is cautioned to review the drawings and illustrations contained in this manual before proceeding. If there are questions regarding the safe operation of this powering system, please contact Alpha Technologies or your nearest Alpha representative.



NOTE:

Alpha shall not be held liable for any damage or injury involving its enclosures, power supplies, generators, batteries or other hardware if used or operated in any manner or subject to any condition not consistent with its intended purpose or is installed or operated in an unapproved manner or improperly maintained.

Notice of FCC Compliance

Per FCC 47 CFR 15.21:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Per FCC 47 CFR 15.105:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Contacting Alpha Technologies: www.alpha.com

or

For general product information and customer service (7 AM to 5 PM, Pacific Time), call

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Safety Notes

Review the drawings and illustrations contained in this manual before proceeding. If there are any questions regarding the safe installation or operation of the system, contact Alpha Technologies or the nearest Alpha representative. Save this document for future reference.

To reduce the risk of injury or death and to ensure the continued safe operation of this product, the following symbols have been placed throughout this manual. Where these symbols appear, use extra care and attention.

ATTENTION:

The use of ATTENTION indicates specific regulatory/code requirements that may affect the placement of equipment and/or installation procedures.



NOTE:

A NOTE provides additional information to help complete a specific task or procedure.



CAUTION!

The use of CAUTION indicates safety information intended to PREVENT DAMAGE to material or equipment.



WARNING!

WARNING presents safety information to PREVENT INJURY OR DEATH to the technician or user.

Safety Precautions

- Only qualified personnel should service the Power Supply.
- Verify the voltage requirements of the equipment to be protected (load), the AC input voltage to the Power Supply (line) and the output voltage of the system prior to installation.
- Equip the utility service panel with a properly rated circuit breaker for use with this Power Supply.
- When connecting the load, DO NOT exceed the output rating of the Power Supply.
- Always use proper lifting techniques whenever handling units, modules or batteries.
- The Power Supply contains more than one live circuit! Even though AC voltage is not present at the input, voltage may still be present at the output.
- The battery string, which provides backup power, contains dangerous voltages. Only qualified personnel should inspect or replace batteries.
- In the event of a short-circuit, batteries present a risk of electrical shock and burns from high current. Observe proper safety precautions.
- Do not allow live battery wires to contact the enclosure chassis. Shorting battery wires can result in a fire or possible explosion.
- This Power Supply has been investigated by regulatory authorities for use in various Alpha enclosures. If you are using a non-Alpha enclosure, it is your responsibility to ensure your combination conforms to your local regulatory requirements and the Power Supply remains within its environmental specifications.

Battery Safety Notes

Any gelled or liquid emissions from a valve-regulated lead-acid (VRLA) battery contains diluted sulfuric acid, which is harmful to the skin and eyes. Emissions are electrolytic and are electrically conductive and corrosive.

To avoid injury:

- Always wear eye protection, rubber gloves, and a protective vest when working near batteries. To avoid battery contact, remove all metallic objects, (such as rings or watches), from your person.
- Batteries produce explosive gases. Keep all open flames and sparks away from batteries.
- Use tools with insulated handles, do not rest any tools on top of batteries.
- If any battery emission contacts the skin, wash immediately and thoroughly with water. Follow your company's approved chemical exposure procedures.
- Neutralize any spilled battery emission with the special solution contained in an approved spill kit or with a solution of one pound bicarbonate of soda to one gallon of water. Report a chemical spill using your company's spill reporting structure and seek medical attention if necessary.
- Prior to handling the batteries, touch a grounded metal object to dissipate any static charge that may have developed on your body.
- Use special caution when connecting or adjusting battery cabling. An improperly or unconnected battery cable can make contact with an unintended surface that can result in arcing, fire, or a possible explosion.
- A battery showing signs of cracking, leaking, or swelling should be replaced immediately by authorized personnel using a battery of identical type and rating.

Battery Maintenance Guidelines

- During maintenance visits, inspect batteries for the following:
 - » **Signs of battery cracking, leaking or swelling.** The battery should be replaced immediately by authorized personnel using a battery of the identical type and rating.
 - » **Signs of battery cable damage.** Battery cable should be replaced immediately by authorized personnel using replacement parts specified by vendor.
 - » **Loose battery connection hardware.** Refer to documentation for the correct torque and connection hardware for the application.
- Always replace batteries with those of an identical type and rating. Match conductance, voltage and date codes.
- Do not attempt to remove the vents (valves) from the AlphaCell broadband battery or add water. This is a safety hazard and voids the warranty.
- Apply NO-OX grease on all exposed connections.
- When necessary, clean up any spilled electrolyte in accordance with all federal, state, and local regulations or codes.
- Follow approved storage instructions.
- Always replace batteries with those of an identical type and rating. Never install untested batteries.
- Do not charge batteries in a sealed container. Each individual battery should have at least 1/2 inch of space between it and all surrounding surfaces to allow for convection cooling.
- All battery compartments must have adequate ventilation to prevent an accumulation of potentially dangerous gas. Never place batteries in a sealed enclosure. Extreme caution should be used when maintaining and collecting data on the battery system. Ensure all enclosure vents and filters are clean and free of debris.
- Spent or damaged batteries are environmentally unsafe. Always recycle used batteries. Refer to local codes for proper disposition of batteries.

Utility Power Connection Notes



NOTE:

Alpha enclosures are engineered to properly vent the Power Supply. The power supplies have been investigated by regulatory authorities for use in various Alpha enclosures. If you are using a non-Alpha enclosure, it is your responsibility to ensure your combination conforms to your local regulatory requirements and the Power Supply remains within its environmental specifications.

ATTENTION:

Connecting to the utility should be performed only by qualified service personnel and in compliance with local electrical codes. Connection to utility power must be approved by the local utility before installing the Power Supply.

Local regulatory authorities may require the use of an approved service entrance and/or service disconnect switch when the Power Supply is installed in an outdoor enclosure. Alpha enclosures have options for these. The installer may need to provide these if using a non-Alpha enclosure.



NOTE:

In order to accommodate the high-inrush currents normally associated with the start-up of ferroresonant transformers (400 Amp, no-trip, first-half cycle), either a "high-magnetic" or an HACR (Heating, Air Conditioning, Refrigeration) trip breaker must be used. Do not replace these breakers with a conventional service entrance breaker. Alpha recommends ONLY Square D breakers because of the increased reliability required in this powering application. High-magnetic Square D circuit breakers and a BBX option (UL Listed service entrance) are available from Alpha Technologies.

Description	Alpha Part Number	Square D Part Number
240V Installation - HACR (15A)	470-224-10	QO215
120V Installation - High-magnetic (20A)	470-017-10	QO120HM
BBX - External Service Disconnect	020-085-10	QO2 -4L70RB
BBX - External Service Disconnect	020-141-10	QO8-16L100RB

ATTENTION:

In most cases, the following configurations qualify for service entrance use when wiring a duplex receptacle to a service disconnect. Other codes may also apply. Always contact your local utility to verify the wiring conforms to applicable codes.

XM3-HP Connections

Proper 120VAC 20A service requires the installation site be:

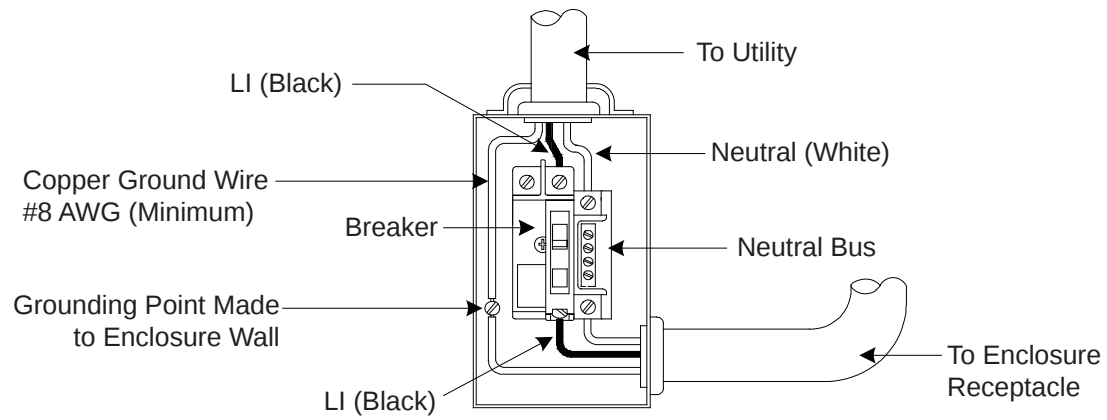
- Equipped with a 120VAC duplex receptacle which provides power to the Power Supply and peripheral equipment.
- Have a NEMA 5-20R receptacle protected by a single-pole, 20 Amp High Magnetic (HM) circuit breaker inside the service entrance.
- Checked to NEC/CEC Code or with your local regulatory authority to verify proper wire AWG (suggested wire gauge is 12AWG).
- Equipped with a grounding clamp on the enclosure to facilitate dedicated grounding.



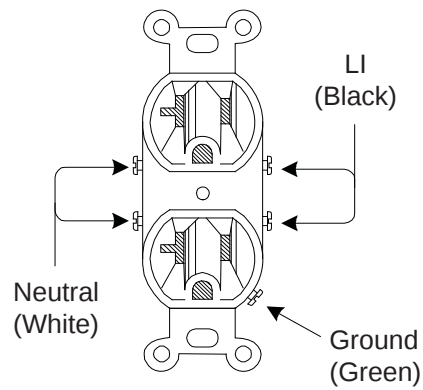
NOTE:

When it is required to bond the box to a neutral plate, use the long green bonding screw provided (Alpha P/N 523-011-10, Square D P/N 40283-371-50).

Utility Power Connection Notes, continued



Typical 120VAC Service Entrance Wiring



Typical 120 VAC 20A Receptacle Wiring, 5-20R
(P/N 531-006-10)

Utility Power Connection Notes, continued

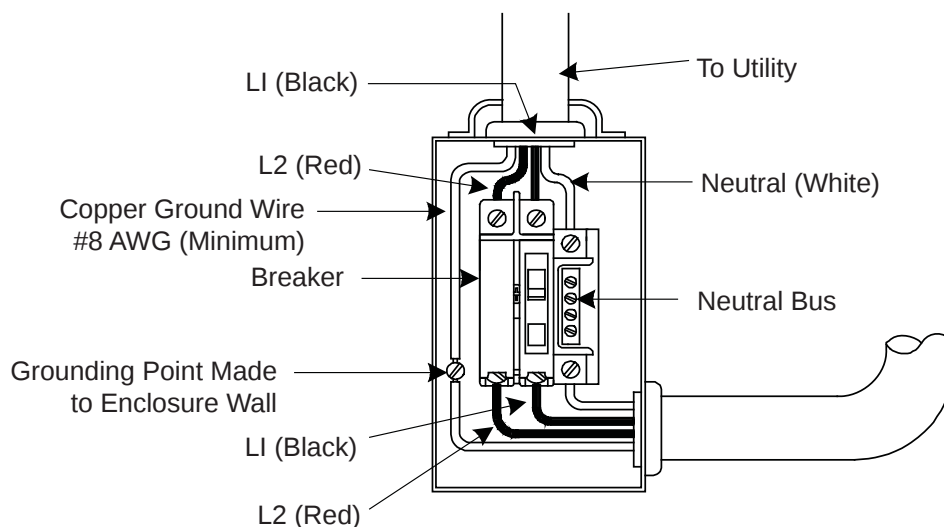
Proper 240VAC 15A service requires the installation site be:

- Equipped with a 240VAC duplex receptacle to provide power to the Power Supply and peripheral equipment.
- Have a NEMA 6-15R receptacle that is protected by a single, 2-pole, common trip 15A circuit breaker inside the service entrance.
- Checked to NEC/CEC Code or with your local regulatory authority to verify proper wire AWG (suggested wire gauge is 14AWG).
- Equipped with a grounding clamp on the enclosure to facilitate dedicated grounding.

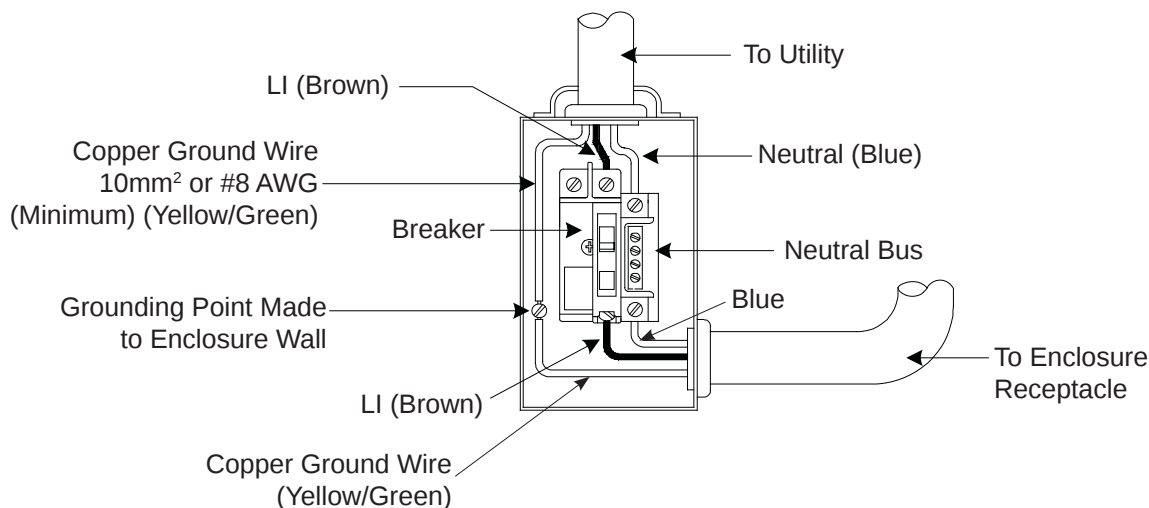


NOTE:

When it is required to bond the box to a neutral plate, use the long green bonding screw provided (Alpha P/N 523-011-10, Square D P/N 40283-371-50).



Typical 240VAC 60 Hz Service Entrance Wiring



Typical 230VAC 50Hz Service Entrance Wiring

Grounding and Earth Connection Notes

In order to provide a ready, reliable source of backup power, it is necessary to connect the Power Supply to an effective grounding and Earthing system. This not only provides for the safety of the service personnel responsible for its operation and maintenance, but also facilitates the proper operation and protection of the equipment within the network. Such a grounding system provides protection with respect to operator safety, system communication and equipment protection.

Lightning strikes, grid switching or other aberrations on the power line and/or communications cable have the potential to cause high-energy transients that can damage the powering or communications systems. The most viable method available to protect the system from damage is to divert these unwanted high-energy transients along a low-impedance path to earth. A low-impedance path to earth prevents these currents from reaching high voltage levels and posing a threat to equipment.

The key to the success of lightning protection is single-point grounding so the components of the grounding system appear as a single point of uniform impedance. Two places recommended by Alpha for single-point grounding are connections in the enclosure and connections to earth. Single-point grounding in the enclosure is achieved by bonding all electrical connections to the enclosure, including the connection to earth, as close together on the enclosure as possible. Single-point grounding for the connection to earth is achieved, for example by the proper bonding of the ground rods.

Safety Ground and Earth Connection

The safety ground and earth is a two-part system, comprised of the utility service and the Alpha system.

1. The utility service;

As a minimum requirement for the protection of Alpha equipment, the local utility service must provide a low-impedance path for fault current return. In addition, there must be a low impedance bonded path between the Power Supply ground pin and the enclosure.

2. The Alpha grounding system;

The Alpha grounding system consists of a low-impedance connection between the enclosure and an Earth Ground (located at least 6' away from the Utility Earth connection).

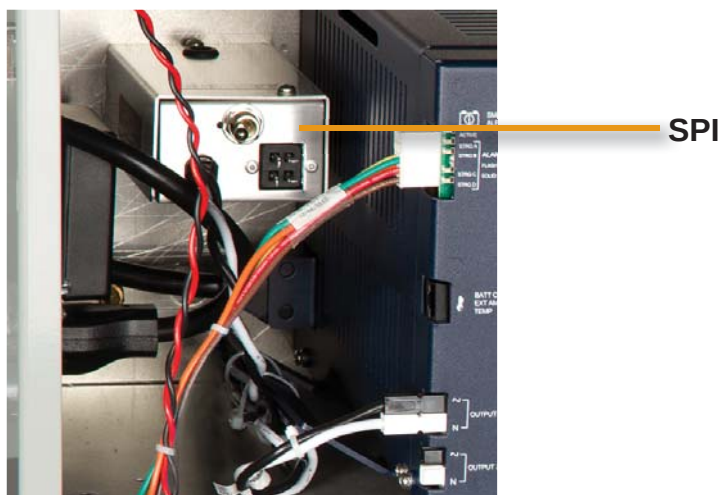
This impedance between the enclosure and Earth must be 25 Ohms or less at 60 Hertz as measured by AMPROBE Model DGC-1000 or equivalent. The measurement should be made on the wire or ground rod after it exits the enclosure.

Local soil conditions will determine the complexity of the grounding system required to meet the 25 Ohm (maximum) resistance specified above. For example, a single 8' ground rod may be sufficient to meet the requirement. In some cases, a more elaborate system may be required such as multiple ground rods connected by a #6AWG solid copper cable buried 8-12" below the surface. Where this is not possible, contact a local grounding system expert for alternate methods that will meet the 25 Ohm (maximum) specification.

All ground rod connections must be made by means of a listed grounding clamp suitable for direct burial or exothermic welding.

Power Output Return

For proper operation, the Service Power Inserter (SPI) must be securely bonded to the enclosure.



Communications Grounding

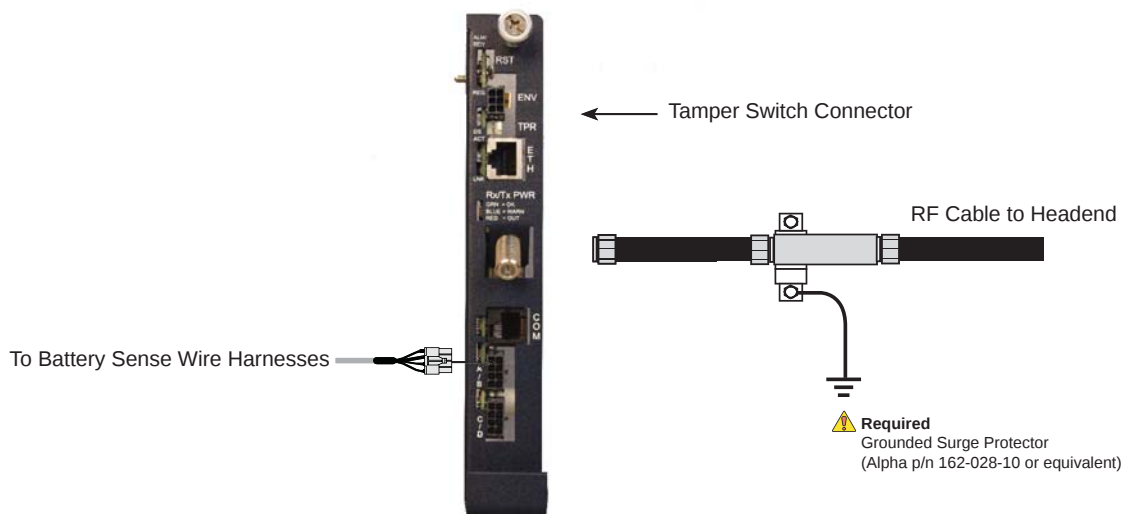
For an external status monitoring transponder, the transponder chassis is typically bonded via a separate ground wire to the enclosure. For systems using an embedded transponder, the grounding connection is typically made either through a separate chassis ground block bonded to the enclosure or by means of the internal mounting hardware which bonds the transponder through the CableUPS. Please refer to the appropriate communications product manual for installation procedures.

For communication cables, Alpha strongly recommends the use of a surge arresting device electrically bonded to the Alpha Enclosure.



WARNING!

Low impedance grounding is **mandatory for personnel safety** and critical for the proper operation of the cable system.



1.0 Introduction

1.1 Alpha XM3-HP Intelligent CableUPS



Fig. 1-1, Alpha XM3-HP Intelligent CableUPS

The Intelligent CableUPS powers signal processing equipment in cable television and broadband LAN distribution systems. The transformer module provides a critical load with current-limited regulated AC power that is free of spikes, surges, sags and noise.

During AC line operation, AC power entering the Power Supply is converted into a quasi square wave and is regulated by a ferroresonant transformer at the required output voltage. The regulated voltage is connected to the load via the output connectors and some power is directed to the battery charger to maintain a float charge on the batteries.

When the incoming AC line voltage significantly deviates from normal, the Inverter Module automatically switches to standby operation and maintains power to the load. During the switch to standby operation, energy in the module's ferroresonant transformer continues to supply power to the load. In standby mode, the Power Supply powers the load until the battery voltage reaches a low-battery cutoff point.

When utility power returns, the transformer module waits a short time (approximately 10 to 20 seconds) for the utility voltage and frequency to stabilize and then initiates a smooth, in phase transfer back to AC line power. Once the transfer is complete, the battery charger recharges the batteries in preparation for the next event.



NOTE:

The duration of battery-backed standby operation depends upon the type and number of batteries and the load on the Power Supply.

The Alpha XM3-HP CableUPS contains the following:

- Smart Display
- Hot-swappable Inverter Module
- Built-in Self Test
- Wide Input voltage range
- High efficiency transformer
- Communications menu with DOCSIS® parameters (only with optional DSM3 installed)
- Optional factory-installed AlphaDOC (PIM) allows the Intelligent CableUPS to provide programmable current limits for two output channels.
- Optional Smart AlphaGuard (SAG)
- Optional AlphaAPPS (APPS) card
- Via the Smart Display, the operator can view all of the Power Supply's operating parameters.
- Troubleshooting tips automatically display in the Alarm menu screen.
- Built-in metering circuits measure voltage and current, without the need for external test equipment.



NOTE:

During a no-load start-up, the Power Supply may reduce output voltage to 75-80% of rated output voltage until a load of greater than 1.5A is applied.

1.2 Theory of Operation

1.2.1 AC (Line) Operation

During AC Line operation, utility power is routed into the primary winding of the ferroresonant transformer through the contacts of the transfer isolation relay. Simultaneously, in the inverter, power is directed to the rectifier circuitry providing power for the control circuitry. The bidirectional inverter also serves as a battery charger during line operation. The ferroresonant transformer and an AC capacitor form the resonant tank circuit, which provides excellent noise and spike attenuation, output short-circuit current-limiting, and output voltage regulation. The ferroresonant transformer produces a quasi square wave output which resembles a rounded square wave.



NOTE:

When measuring the output voltage of ferroresonant transformers, use only a true RMS AC voltmeter. Non-RMS reading meters are calibrated to respond to pure sine waves and do not provide an accurate reading when measuring *quasi* square wave output.

1.2.2 Standby Operation

When the incoming AC line voltage drops or rises significantly or a complete power outage occurs, the control logic's line monitor activates standby operation. During the transfer from AC line to standby operation, the battery powered inverter comes online as the isolation relay switches to prevent AC power from back-feeding to the utility. The following changes also occur within the Power Supply:

- The isolation relay opens to disconnect the AC line from the primary winding of the ferroresonant transformer.
- The control logic switches the inverter FETs on and off. This switching action converts the DC battery current into AC current in the inverter windings of the ferroresonant transformer, providing regulated power to the load.
- The control logic, which includes a microprocessor and other circuits to protect the inverter FETs from overcurrent damage, monitors the condition of the batteries and the inverter during standby operation. Since a prolonged AC line outage could severely discharge the batteries, resulting in permanent damage, the control logic disables the inverter when the batteries drop to a predetermined cutoff voltage.
- The XM3-HP offers two user-selectable EOD options based on either overall string voltage or individual battery voltage. See Table 1-1 for battery specific EOD settings. Operation is defined as follows:
 - Battery String Voltage Mode which shuts off the inverter when the 36V bus voltage reaches Low Battery Cutoff Voltage as seen at the inverter.
 - Individual Battery Voltage Mode which shuts off the inverter when any battery in any string (1-4) reaches Low Battery Cutoff Voltage.
 - All units will factory default to battery string voltage mode.
 - Individual battery EOD will only be available (user-selectable) if individual battery voltages are being sensed and present at logic card via the Smart AlphaGuard, DSM3 or other approved status monitor card with individual battery voltage sensing.
 - When set to battery string voltage mode the "Low Battery Cutoff" (EOD) is not user adjustable from the default. See Table 1-1 for more information.
 - When set to individual battery voltage mode the "Low Battery Cutoff" (EOD) will automatically set to default values based on battery type (see Table 1-1). A secondary option is then offered to the user for manually programming the "Low Battery Cutoff" (EOD), regardless of battery type, within the range 1.65 to 1.80 V/C.

1.0 Introduction, continued

1.2 Theory of Operation, continued

1.2.2 Standby Operation, continued

- When set to Individual Battery Voltage Mode, if individual battery voltage is lost the unit automatically reverts back to Battery String Voltage Mode and "Low Battery Cutoff" (EOD) will revert back to default value based on battery type.

	HP Batteries	GXL Batteries	OTHER Batteries
	Fixed	Fixed	Fixed
String Low Battery Cutoff (EOD)	30.6 VDC (1.70 V/C)	31.5 VDC (1.75 V/C)	31.5 VDC (1.75 V/C)

Individual Low Battery Cutoff (EOD)	Default	Minimum	Maximum
HP Batteries	10.2 VDC (1.70 V/C)	9.9 VDC (1.65 V/C)	10.8 VDC (1.80 V/C)
GXL Batteries	10.5 VDC (1.75 V/C)		
OTHER Batteries	10.5 VDC (1.75 V/C)		

Table 1-1, Low Battery Cutoff (EOD)

- When acceptable AC line voltage returns, the Power Supply returns to AC line operation after a 10 to 20 second lag. This delay lets the AC line voltage and frequency stabilize before the control logic phase-locks the inverter's output to the utility input. The control logic then de-energizes the isolation relay, reconnects the AC line to the primary of the ferroresonant transformer and disables (turns off) the inverter. This results in a smooth, in-phase transfer back to utility power without interruption of service to the load. The battery charging circuit then activates to recharge the batteries in preparation for the next power outage.

1.2.3 Charger Modes of Operation

AlphaCell Batteries			OTHER Batteries		
	HP	GXL	Default	Minimum	Maximum
Float V/C	2.25	2.27	2.27	2.10	2.35
Accept V/C	2.35	2.40	2.40	2.20	2.45
Automatic 30-Minute Refresh On/Off	ON	ON	OFF	OFF	OFF
Manual 24-Hour Refresh On/Off	OFF (Programmable)	OFF (Programmable)	OFF (Programmable)	OFF	ON
Refresh V/C	2.45	2.45	2.45	2.40	2.50
Rest On/Off	ON	OFF	OFF (Programmable)	OFF	ON
Temperature Compensation	-4mV / °C / cell	-5mV / °C / cell	-5mV / °C / cell (Programmable)	0 mV / °C / cell	-5mV / °C / cell

Table 1-2, Charger Modes of Operation



NOTE:

If a battery type other than an AlphaCell is installed, it is the responsibility of the technician to review the proper charging specifications for the battery used.

1.2.3 Charger Modes of Operation

The Alpha XM3-HP uses a three-stage (other), four-stage (AlphaCell GXL), or five-stage (AlphaCell HP) temperature compensated battery charger as determined by the type of battery used in the system. During AC line operation, the inverter winding on the ferroresonant transformer feeds the charger circuit which provides the appropriate charge voltages to the batteries.

3-Stage Charger Modes (BULK/ACCEPT/FLOAT):

The 3-stage charger is applied when the battery type of OTHER is selected in the Smart Display menu.

BULK charge is a “Constant Current” charge. The maximum current is 10A. As the charge is returned to the batteries, their voltage increases to a specific threshold (2.40VDC per cell). The charger then switches to ACCEPT mode. The BULK charger mode generally returns the battery charge state to 80 percent of rated battery capacity.

ACCEPT charge is a “Constant Voltage” charge. This voltage, default 2.40VDC (programmable 2.20-2.45VDC) per cell, is temperature-compensated to ensure longer battery life and proper completion of the charge cycle. This cycle is complete when the charging current into the batteries becomes less than 0.5A or approximately six hours elapses from the time ACCEPT mode was entered, at which time the charger switches to the FLOAT mode of operation.

FLOAT charge is a temperature-compensated charge, default 2.27VDC (programmable 2.10-2.35VDC) per cell. During FLOAT mode, the batteries are fully charged and ready to provide backup power. The charger provides a small maintenance charge to overcome the batteries self-discharge characteristics and other minor DC loads within the Power Supply.

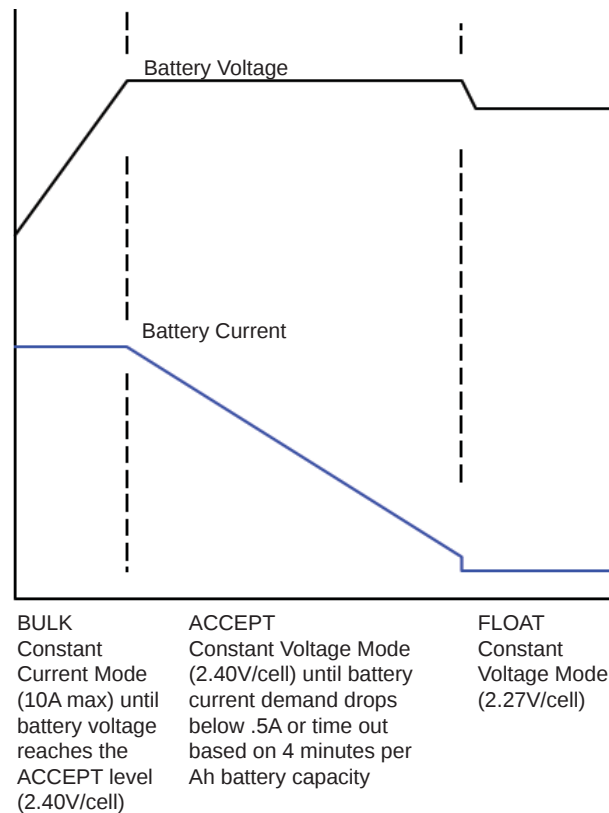


Fig. 1-2, 3-Stage Charger Modes

1.0 Introduction, continued

1.2 Theory of Operation, continued

1.2.3 Charger Modes of Operation, continued

4-Stage Battery Charger (BULK/ACCEPT/REFRESH/FLOAT):

This preset value is applied to AlphaCell GXL batteries when selected in the Smart Display Menu.

A 30-minute REFRESH charge is added, after BULK and ACCEPT states, before dropping down to FLOAT state, when the batteries are discharged more than 30% and it has been more than 30 days since the last REFRESH charge.

A manual REFRESH charge mode is recommended to be applied to all new batteries upon installation. This mode “boosts” the individual cell voltage of batteries that may have been in storage before they were placed on permanent FLOAT. Refresh can be initiated manually via menu selection or automatically when the battery date code is updated. The REFRESH charge is a one-time, 24-hour charge to raise individual cell voltage to 2.45VDC, and may bypass the BULK and ACCEPT states if the batteries are fully charged. The batteries are temperature-compensated at -0.005VDC per cell per degree C to ensure a safe battery cell voltage and to maximize battery life.

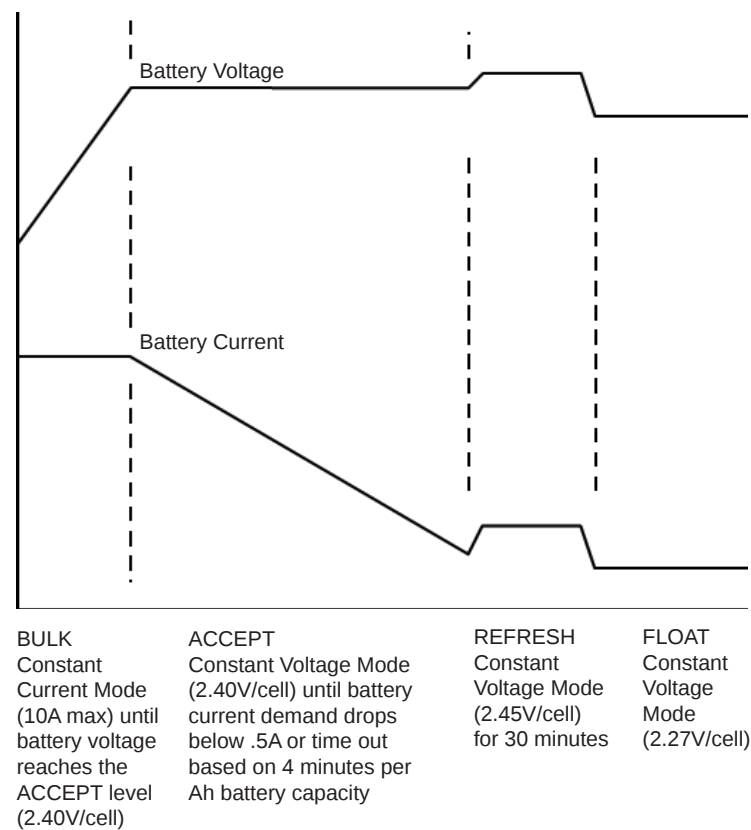


Fig. 1-3, 4-Stage Charger Modes

1.0 Introduction

1.0

1.0 Introduction, continued

1.2 Theory of Operation, continued

1.2.3 Charger Modes of Operation, continued

5-Stage Battery Charger (BULK/ACCEPT/REFRESH/FLOAT/REST):

This preset value is applied to AlphaCell HP batteries when selected in the Smart Display Menu.

REST: Charger is turned off (if ENABLED) and leaves the batteries without external voltage applied on the battery. Removing charged voltage and allowing the battery to sit in an open circuit environment maximizes the battery life by eliminating the chance of overcharging individual cells inside the 12V battery.

If the Smart AlphaGuard (SAG) is installed and the battery harness is connected, the unit will not go into REST mode until the SAG indicates that any batteries are less than or equal to 0.3V out of balance, or until 4 days per string has elapsed, whichever comes first after the 6 hour float period.

After any discharge/recharge cycle, once the charger reaches FLOAT mode, it will wait 24 hours in FLOAT mode before going to REST mode. On a daily basis, without any discharge cycle, the batteries will be in FLOAT for 25% and REST (charger off) for 75% (6 hours float, 18 hours rest).

REST mode is terminated if voltage drops to less than 2.12VPC. Upon exiting REST mode due to a voltage below 2.12VDC, a BULK/ACCEPT cycle will be initiated.

The battery charger voltage is temperature-compensated at -0.004VDC per cell per degree C to ensure a safe battery cell voltage and to maximize battery life.

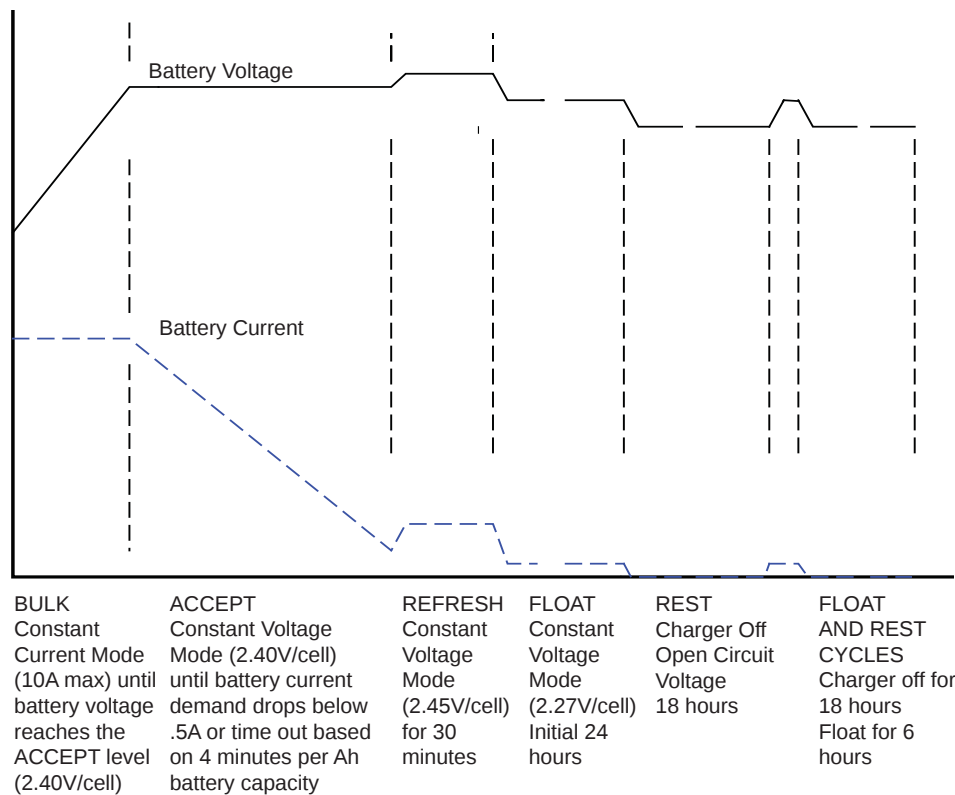


Fig. 1-4, 5-Stage Charger Modes

1.3 Alpha XM3-HP CableUPS® Layout

The Intelligent CableUPS is comprised of the following:

Transformer module, which acts as a stand-alone line conditioner. The transformer module contains a ferroresonant transformer, ferroresonant capacitor, line isolation relay, Power Distribution Board, EMC Filter board and the optional AlphaDOC (PIM) board, Smart AlphaGuard (SAG) and Alpha APPS card.



NOTE:

The option cards require an Inverter Module installed in order to be functional.

Intelligent Inverter Module, which is required for standby operations and contains circuitry needed for the three-to-five-stage temperature-compensated battery charger, DC to AC inverter, AC line detectors and Smart Display.

Optional DOCSIS Communications Module (interfaces to Inverter Module) provides remote status monitoring and communications.

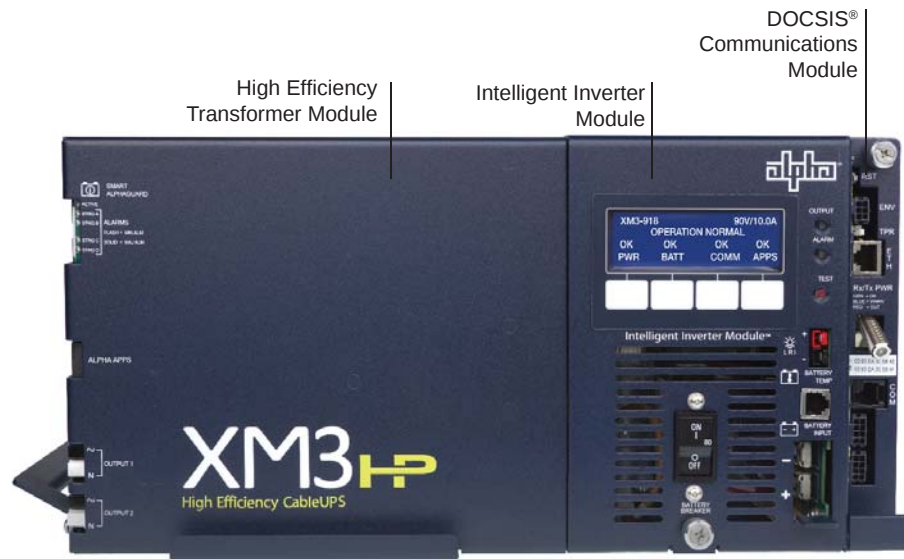


Fig. 1-5, Front Panel, XM3-HP Power Supply

1.3.1 Side Panel Connectors

- 1 AC Input Line Cord Connector
- 2 Optional Smart AlphaGuard Connector
- 3 Optional APPS Card
- 4 Output 1 Connector
- 5 Output 2 Connector



Fig. 1-6, Side Panel, XM3-HP Power Supply

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.2 Front Panel Indicators

Circuit boards for the optional Smart AlphaGuard (SAG), Alpha APPS card and the two-output AlphaDOC (PIM) are located behind the removable front panel.

- 1 Smart AlphaGuard (SAG): Available in two models, the SAG-2 and SAG-4 will enable the XM3 to gather battery voltage data for up to two or four battery strings respectively (A through D) and its Charge Management Technology applies excess charge current to batteries as needed to maintain balanced voltages throughout the string. See section 1.3.4 for connection information and LED functionality.
- 2 Alpha APPS Card
- 3 Output 1 (White = Neutral, Black = Line): The AC output connector is clearly marked and color-coded for easy identification. The Service Power Inserter (SPI) connects directly into the Output 1 connector.
- 4 Output 2 (White = Neutral, Black = Line): When no AlphaDOC is installed, this output is wired in parallel to Output 1 and is often used for auxiliary loads. If the AlphaDOC is installed, Output 2 can be isolated from Output 1.



Fig. 1-7, Detail View, Front Panel Connections and Indicators

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.3 AlphaDOC (PIM)

The optional AlphaDOC adds a second isolated output to the Power Supply. It provides programmable current limits for two output channels and protects system components by shutting down the load during overcurrent and short circuit conditions.

The AlphaDOC has a programmable overcurrent threshold (3A-25A) and overcurrent tolerance period that specifies the time (20-9900ms) an overcurrent condition is permitted before shutting down.

The programmable retry limit can be programmed to select how many times (0-40) after a programmable delay (5-301 seconds) the AlphaDOC will attempt to reconnect an output once it has been shut down. When the limit is reached, the XM3 Power Supply automatically retries once every 30 minutes until the fault clears.

Adding the AlphaDOC to the Power Supply provides these advantages:

A second isolated output: The main purpose of the AlphaDOC is to limit the impact of a fault condition in one output channel. If a fault condition occurs in a Power Supply (without the optional AlphaDOC installed) the entire customer network can be affected. The AlphaDOC option affords protection to one output should a fault condition exist on the other. This gives you flexibility to isolate Output 1 from Output 2.

A current for critical loads: With the AlphaDOC option, you can designate one output as the primary connection and the other output as the secondary connection. Commonly, critical loads are connected to Output 1 as the primary feeder. Using the overcurrent limit settings, you can ensure the primary output always provides the necessary power. For example, on a 15 Amp Power Supply, if a customer needs 10 Amps available on Output 1, the overcurrent limit for Output 2 is set at 5 Amps, so regardless of Output 2, 10 Amps will remain available for the primary Output 1.

Additional current protection: The standard Power Supply current limit protection is provided by the fold-back characteristics of the transformer (150% of rated output). The 150% current limit may exceed the ratings of active devices in the cable network and cause failures. You can lower the maximum current provided at each output by lowering the overcurrent limit of each respective output. Therefore, to minimize failures due to excess current supply, set the overcurrent limit to a value below the maximum current the active components can tolerate.

Power Supply Load		Permitted Duration of Load
918	All Other Models	
>125%	>150%	10 seconds
113% to 125%	125% to 150%	10 minutes
108% to 113%	115% to 125%	30 minutes
<108%	<115%	Several months

Table 1-3, Duration of Load

For example, on a 18A Power Supply, where both outputs are programmed to 10A maximum and both outputs are supplying 10A, neither output is “in violation” but the total system at 18A is operating at 111% of its rated output. In this example, after 30 minutes, the Power Supply will begin a “load shedding” algorithm. The first action is to disconnect Output 2. If this does not correct the system overload, the next action is to disconnect Output 1.

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.3 AlphaDOC (PIM), continued

1.3.3.1 Installing the AlphaDOC



NOTE:

Only qualified personnel should install the AlphaDOC. To install the AlphaDOC you must completely shut down the Power Supply. To maintain output to the load, consider using either the APP9015S or APP9022S Service Power Supply during installation.



WARNING!

To avoid exposing the technician to potentially lethal voltages, before you proceed you must remove all power from the Power Supply; unplug the Power Supply from the AC power source, remove all front panel connections and disconnect the battery connector.

Tools Required:

3mm slotted screwdriver

#2 Phillips-head screwdriver

To install the AlphaDOC

1. Completely shut down the Power Supply; verify all power is removed. Ensure utility power is off and battery power is safely secured (or not installed) in the enclosure assembly. All connections and cables must be removed from the Power Supply. To maintain output to the load, consider using the APP9015S or APP9022S Service Power Supply when installing the AlphaDOC.
2. To remove the transformer module's front panel, remove the three front panel screws.
3. Remove the output voltage wires from the terminal block.
4. Remove the ribbon cable.
5. Lift the front panel up and away from the chassis.
6. Remove the existing single-output wire harness and output connector bracket.
7. Replace with the AlphaDOC board and dual output wire harness assembly.
 - A. Attach the nomex to the back of the PCB using the two 3/8" circuit board supports.
 - B. Install the output connector bracket using the #6-32 KEPS nut that was removed in step 6 on the PEM stud that is farther from the connectors.
 - C. Install the PCB using two #6-32 screws, routing the wires under the PCB and nomex as shown.
8. Connect the dual output voltage wires to the output voltage terminal block (Fig. 1-9) as shown. Torque terminal block screws to 7.0 Inch-Pounds.
9. Replace the front panel.
10. Replace connections and return the unit to service.

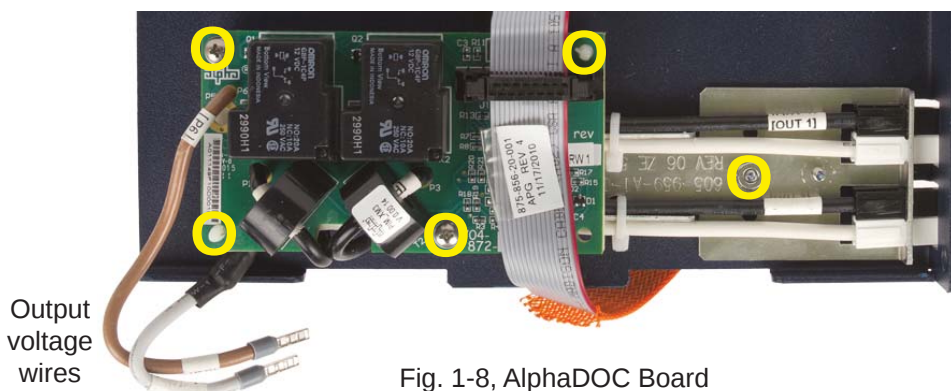


Fig. 1-8, AlphaDOC Board



Fig. 1-9, Output Voltage Terminal Block

017-882-B0-001, Rev. A (07/2012)

Output
voltage
wires

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.3 AlphaDOC (PIM), continued

1.3.3.2 Programming the AlphaDOC

Programmable parameters (with AlphaDOC installed) are:

Channel 1 Overcurrent Limit: The RMS current level that causes the Output 1 protection relay to trip after a specified delay (overcurrent tolerance period).

Channel 2 Overcurrent Limit: The RMS current level that causes the Output 2 protection relay to trip after a specified delay (overcurrent tolerance period).

Retry Delay: The time between each attempt to restart an output in the event of an overcurrent event.

Retry Limit: The number of times the Power Supply attempts to restart an output connection. Once the RETRY LIMIT is exceeded, standard models attempt to restart the output connection every 30 minutes. Set this parameter to “zero” to disable the “automatic retry” function.

Overcurrent Tolerance Period (20-9900ms): In the event of an overcurrent episode, the amount of time an output overcurrent condition is permitted on either output connection. Once this time expires, the output protection relay disables its output feeder.

Output 1 Reset/Output 2 Reset: This manually resets corresponding tripped output. These are not displayed if the corresponding output is not tripped.



NOTE:

Programming any of the above parameters will reset the “trip/retry” counters.

Read Only AlphaDOC Menu Items:

AlphaDOC Option: Automatically senses and indicates whether the AlphaDOC is installed.

AlphaDOC FW: Firmware version installed in the AlphaDOC.

DOC #####: Serial number of the AlphaDOC.



NOTE:

If the optional AlphaDOC is not installed, the values shown under the “AlphaDOC OPTION” line of the Smart Display are hidden.

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.4 Smart AlphaGuard

The Smart AlphaGuard (SAG) is an optional device that maximizes battery life.

The SAG enables the XM3-HP system to gather individual battery voltages and balance the batteries. A description of the SAG's operation and features follows.

1.3.4.1 Theory of Operation

The Smart AlphaGuard (SAG) is a battery balancer with multiple string capability and integrated intelligent functions. It minimizes differences in individual battery voltages during the charging of the batteries (all modes except REST) by transferring charge from a battery with a higher voltage to the batteries with lower voltages within a string. The SAG's balancer circuit switches between strings enabling a single XM3-HP to service up to four strings of batteries.

The SAG periodically measures all the battery voltages. These measurements are sent to the system master XM3. Voltage measurements are used to determine the level of balance of the batteries and determine if there is one or more batteries that need to be balanced. The level of balance will determine which string the SAG will focus on. The SAG selects the string with the highest delta mean ($V_{bat}-V_{mean}$) and focus its efforts there.

The SAG communicates directly with the XM3. The SAG sends battery data, unit states and alarms to the XM3 and the XM3 sends control messages to the SAG.

There are two versions available.

SAG-2: Good for one to two strings

SAG-4: Good for one to four strings

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.4 Smart AlphaGuard, continued

1.3.4.2 Connections

The connection from the embedded SAG to the battery strings are made with one of the orderable wire kits. Kits for one, two, three, or four strings are available. Kits are also available that mate to the external AlphaGuard wire kit. The SAG wire kit consists of a string 36V positive and a string negative that are common for all strings. For each string (A, B, C and D), there are two additional wires that must be connected.

Wire kits

New install with embedded SAG

- 1 string Battery harness p/n 875-848-20
- 2 string Battery harness p/n 875-848-21
- 3 string Battery harness p/n 875-848-22
- 4 string Battery harness p/n 875-848-23

Upgrade with external AlphaGuard wire kits in place

- 1 string Battery harness p/n 875-910-20
- 2 string Battery harness p/n 875-910-21
- 3 string Battery harness p/n 875-910-22
- 4 string Battery harness p/n 875-910-23

Single battery string

A single string system must use String A on the wire harness.

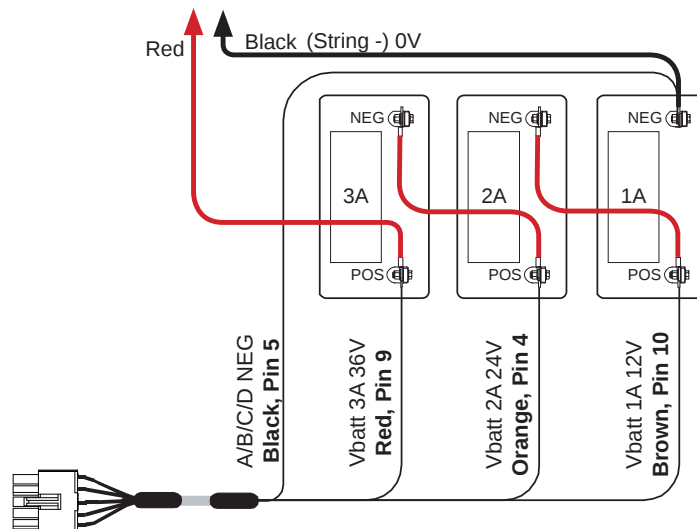


Fig. 1-10, Single Battery String Wiring Diagram

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.4 Smart AlphaGuard, continued

1.3.4.2 Connections, continued

Multiple battery strings

A system with multiple strings must use String A as the first string, B as the second, C as the third and D as the fourth.

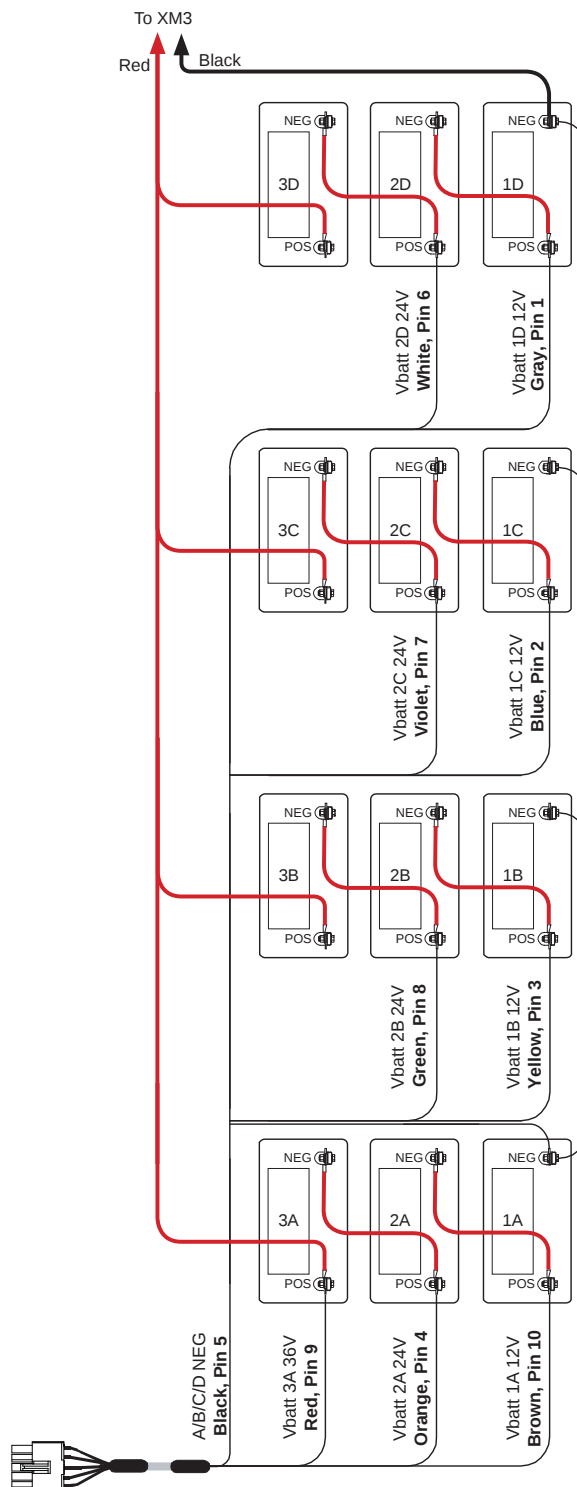


Fig. 1-11, Multiple Battery String Wiring Diagram

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.4 Smart AlphaGuard, continued

1.3.4.3 Alarms

The alarms are available through the LEDs and through the status monitoring card.

Definitions – SAG Alarms via CIB

Miswired – PS Minor

The SAG will verify a string is correctly wired before it will add it to the list of battery strings to balance. If it detects the wires are reversed or only one battery is connected, the alarm will activate.

High delta mean – PS Minor

The SAG compares all measured voltages to a calculated mean voltage. This is the ideal voltage of the battery based on the total string voltage divided by the total number of batteries in the string. If a battery in the string gets more than 500mV from the calculated mean voltage the alarm will activate immediately.

Check battery – PS Minor

The SAG keeps track of the balancing duration of all valid strings. If a string has a battery that will not balance to within 150mV of the calculated ideal battery mean with three weeks of balancing, then the alarm will be set. The suspect battery will be flagged in the status monitor information. The whole string should be checked as two suspect batteries can cause an alarm on a good battery.

Stuck relay – PS Minor

The SAG uses relays to fully isolate the battery strings from each other. To provide a safety measure the SAG checks to verify that the relays have opened before it will turn on a new string. If any of the relays do not open properly, the SAG will activate the alarm and discontinue balancing until the alarm has cleared.

1.0 Introduction

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.4 Smart AlphaGuard, continued

1.3.4.4 LEDs

The LEDs provide visual indications of the state that the SAG is in and any alarms that are present.

Major/Minor definitions

Major alarm	The SAG creates this alarm when it is no longer able to perform the balancing operation properly.
Minor alarm	The SAG creates this alarm when it is operating properly, but the battery string(s) need to be checked.

LED states

LED name	Color	State	Function
Active	Green	Off	No power to SAG
		Solid	Unit is on and communicating with Power Supply or in Rest mode
		Flash (90% on / 10% off)	Unit is on and operational
		Flash (50% on / 50% off)	Actively balancing
		Flash (10% on / 90% off)	Powersave mode
STRG A STRG B STRG C STRG D (ALARMS)	Red	Off	Normal operation
			No string wires connected
		Flash (50% on / 50% off (Minor Alarm))	High delta mean
			Check battery alarm
		Solid (Major Alarm)	String A missing
			String miswired

SAG front panel



Fig. 1-12, SAG Front Panel

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.4 Smart AlphaGuard, continued

1.3.4.5 Troubleshooting

High delta mean alarm during charging

A high delta mean alarm during charging is usually seen when one battery has either higher or lower capacity than the other two batteries. This may be seen on initial install of unbalanced batteries. Verify that the alarm clears within 7 days. Otherwise investigate the batteries.

High delta mean during discharging

A high delta mean alarm during discharging is usually seen when one battery has either higher or lower capacity than the other two batteries. The SAG cannot compensate for reduced capacity batteries in discharge mode to maintain balance. Investigate the batteries.

Miswired string alarm during discharging

A miswired string alarm occurs when a battery voltage is not within the specified valid battery range, but the other batteries are in valid ranges. During discharge a battery with a much lower capacity will have a voltage that is much lower than the others in the string. This can cause the low capacity battery voltage to fall outside the limits of a valid battery and the SAG may identify the string as miswired. Investigate the batteries.

Major alarm, maintenance required and stuck relay alarm at the same time

This is normal alarm operation. A stuck relay alarm will trigger the major alarm in the SAG and the XM3 will trigger a maintenance required alarm. If the alarm does not clear itself replace the unit.

Minor alarm, preventive maintenance required and high delta mean alarm at the same time

This is normal alarm operation. A high delta mean alarm will trigger the minor alarm in the SAG and the XM3 will trigger a preventive maintenance required alarm. Investigate the battery condition if the alarm persists.

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.5 Inverter Module Overview

The removable Inverter Module is powered by the batteries and provides uninterrupted power to the ferroresonant transformer (via the batteries) during utility failures. During normal operation, the inverter charges the batteries using a three-, four- or five-stage (Bulk, Accept, Refresh, Rest and Float) charging protocol determined by the charger setting and battery type.

- 1 Smart Display: All operational functions, system testing, setup items and alarms are available via the Smart Display panel on the front of the Power Supply.
- 2 Softkeys: Provide access to the various menus and submenus within the Alpha XM3-HP.
- 3 Output LED: Indicates output state of the Alpha XM3-HP.
- 4 Alarm LED: Indicates Alarm condition.
- 5 Self Test button: Initiates Self Test.
- 6 Local/Remote Indicator Connector: Indicates alarm condition to exterior lamp.
- 7 The Precision Temperature Sensor (PTS): Plugs directly into the Temperature Probe (RJ-11C type) Connector.
- 8 Battery Circuit Breaker: Controls battery DC power to the inverter.
- 9 Battery Cable Input Connector: The battery cable connector plugs directly into the Inverter Module's battery input connector. The connector is polarized and fits in one direction only.

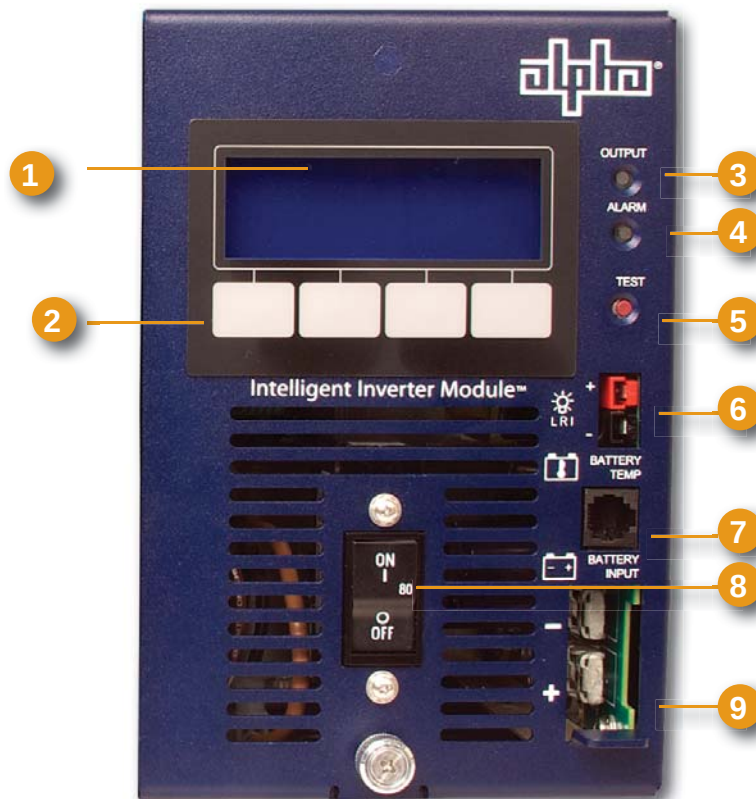


Fig. 1-13, Inverter Module Connections

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.6 Optional DOCSIS Status Monitoring Modules

The Power Supply supports several Alpha communication modules which may be ordered factory-installed or as a user-installed field upgrade. The AlphaNet DSM3 and IDH4 Series Embedded DOCSIS Transponders allow monitoring of Alpha power supplies through existing cable network infrastructure. Advanced networking services provide quick reporting and access to critical powering information.

The communications modules utilize Simple Network Management Protocol (SNMP) and standard Management Information Bases (MIBs) to provide network status monitoring and diagnostics. A Web interface enables authorized personnel direct access to advanced diagnostics using a common Web browser. This manual addresses all models and is based on the DSM3x, which has the complete feature set. Table 1-4 compares the differences between the transponder models.

1.0 Introduction, continued

1.3 Alpha XM3-HP CableUPS Layout, continued

1.3.6 Optional DOCSIS Status Monitoring Modules, continued



Fig. 1-14, AlphaNet Series Communications Modules

Status Monitoring Features

	AlphaNet DSM Series			AlphaNet IDH4 Series		
	DPM	DSM3	DSM3x	IDH4L	IDH4	IDH4x
DOCSIS 2.0, ANSI/SCTE HMS Compatible	x	x	x	x	x	x
SNMP, Web and Ethernet Craft Access	x	x	x	x	x	x
Single Image Firmware	x	x	x	x	x	x
Supports XM3-HP	x	x	x	x	x	x
Single Processor Design 1-IP, 2-IP	x	x	x	x	x	x
Harness Installation and RF Level Indicators	x	x	x	x	x	x
Max. Number of Battery Strings Monitored	Requires SAG option	2	4	Requires SAG option	2	4
External Equipment Monitoring and Control			x			x
Multiple PS and Generator (AlphaBus)			x			x
Constellation Diagrams				x	x	x

Table 1-4, Comparative features, AlphaNet Series Communications Modules

2.0 Installation

2.1 Installation Procedure

The Alpha XM3-HP CableUPS can be shelf-mounted within a variety of Alpha enclosures. The installer must read and follow all safety instructions starting on page 8 and the preliminary inspection below prior to installation of the Power Supply.



CAUTION!

Read the Safety Precautions, Utility Power Connection Notes and Grounding Connection Notes (pages 10-14) before installing the Power Supply.

Pre-installation Inspection

1. Remove the Power Supply from the shipping container. Confirm the Power Supply, including the Precision Temperature Sensor and all other ordered options, are included.
2. During shipping, components might shift. Carefully inspect the Power Supply and other contents for possible shipping-related failures, such as loosened or damaged connectors. If any items are damaged or missing, contact Alpha Technologies or the shipping company immediately. Most shipping companies have a short claim period.
3. Do not attempt to install a Power Supply without first passing a complete pre-installation inspection.



NOTE:

Use the original shipping container if the Power Supply needs to be returned for service. If the original container is not available, make sure the unit is well packed with at least three inches of shock-absorbing material to prevent shipping damage.



CAUTION!

Do not use popcorn-type material. Alpha Technologies is not responsible for damage caused by improper packaging of returned units.

2.2 XM3-HP Start-Up Procedure

2.2.1 Parts and Connections

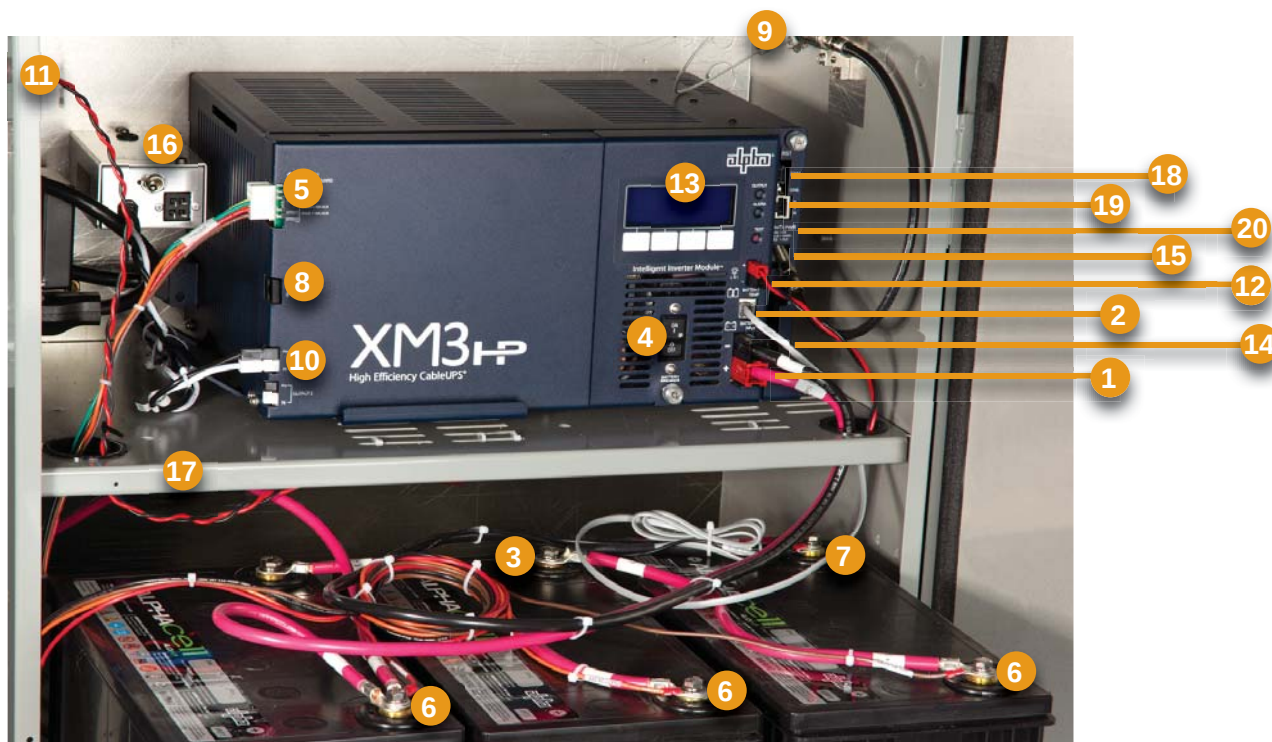


Fig. 2-1, Installation of XM3-HP

- | | |
|---|---|
| 1 Battery Connector to Inverter | 11 Local Remote Indicator (LRI) |
| 2 Precision Temperature Sensor (PTS) | 12 LRI Interface to Inverter |
| 3 Negative Terminal to Center Battery and PTS | 13 Smart Display |
| 4 Battery Breaker | 14 Transponder Battery Sense Harness connection point |
| 5 Smart AlphaGuard Harness | 15 RF Connector to Transponder |
| 6 Positive Battery Terminals to Smart AlphaGuard (3, Red) | 16 Service Power Inserter (SPI) |
| 7 Negative Battery Terminal (1, Black) | 17 Alarm Intrusion Tamper Switch |
| 8 APPS Card | 18 Transponder Tamper Switch Connector |
| 9 Grounded Surge Protector | 19 Ethernet (Web Page Interface) |
| 10 AlphaDOC Dual Output Connectors | 20 Tri-color LED Tx/Rx dB Levels |



WARNING!

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

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.2 Battery Installation Options and Wiring Diagram

Load batteries into cabinet with the positive terminals (red) facing forward. Battery strings are lettered A through D; batteries are numbered 1 through 3, from right to left.

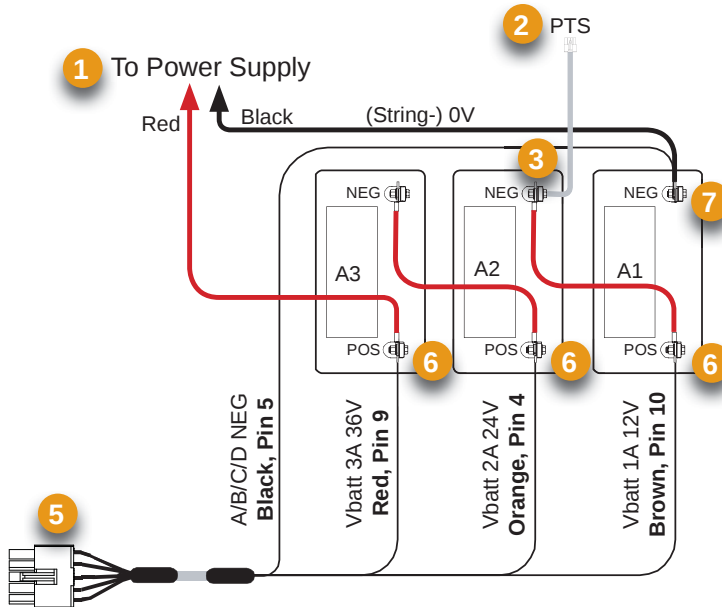


Fig. 2-2, Battery Wiring Diagram



Fig. 2-3, Precision Temperature Sensor (PTS), p/n 746-254-20

Smart AlphaGuard (Embedded) — use Battery Harness, p/n:
875-848-20 for one string
875-848-21 for two strings
875-848-22 for three strings
875-848-23 for four strings.

AlphaGuard (external) — use Battery Harness, p/n 875-090-32.

Upgrade existing external AlphaGuard to Smart AlphaGuard — use Retrofit cable, p/n
875-910-20 for one string
875-910-21 for two strings
875-910-22 for three strings
875-910-23 for four strings.

DSM3 (1 battery string) — use Battery Sense Harness, p/n 874-842-21 (Not required if Smart AlphaGuard is installed with its sense harness).

DSM3 (2 battery strings) — use Battery Sense Harness, p/n 874-842-28 (Not required if Smart AlphaGuard is installed).

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.2 Battery Installation Options and Wiring Diagram, continued

2.2.2.1 Threaded Insert Terminals



CAUTION!

Threaded insert terminals require the use of 3/4" (19mm) bolts. The use of 1" (25.4mm) bolts will seriously damage the battery. The only exception is the terminal with the large spacer for the in-line fuse link. Apply NO-OX grease on all exposed connections.

Torque all nuts and bolts to 110 in-lbs.

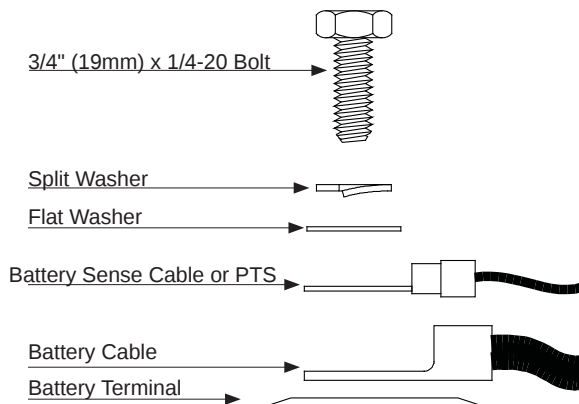


Fig. 2-4, Battery Terminal Bolt Stack-up

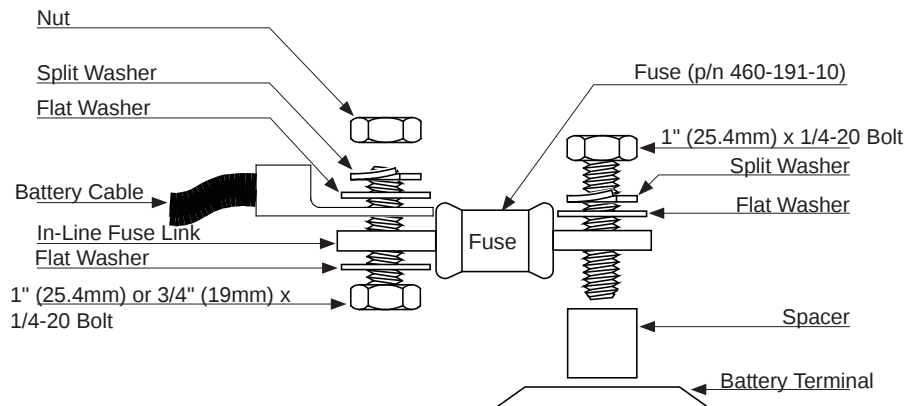


Fig. 2-5, Fuse Bolt Stack-up

2.2.3 63/89VAC Output Voltage Reconfiguration Procedure

Tools Required:

Small flat-blade screwdriver

1. Remove the Inverter Module.
2. Loosen the output voltage wire and move it to the desired output voltage position on the terminal strip.
3. Replace Inverter Module and tighten the screws (torque to 7.0 in-lbs).



Fig. 2-6, Voltage Wire Positions

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

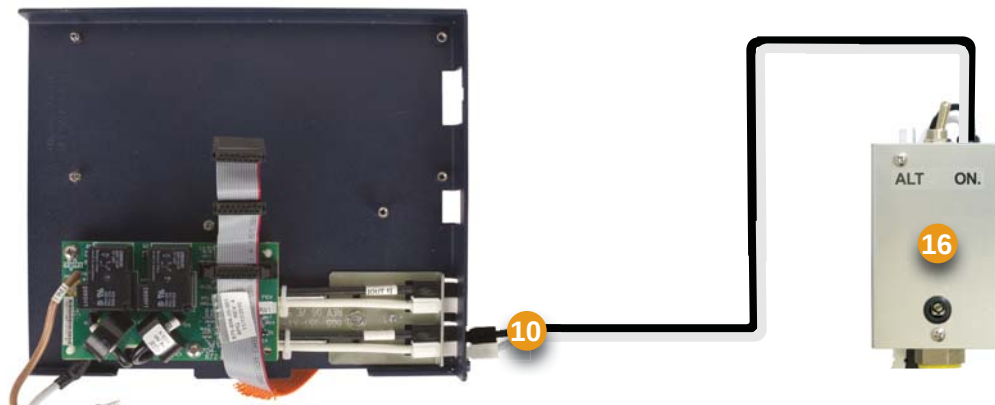
2.2.4 Optional AlphaDOC, Smart AlphaGuard, and Alpha APPS Installation



WARNING!

Remove all sources of power to unit before performing these procedures.

Front panel of XM3-HP with Dual-output AlphaDOC installed.

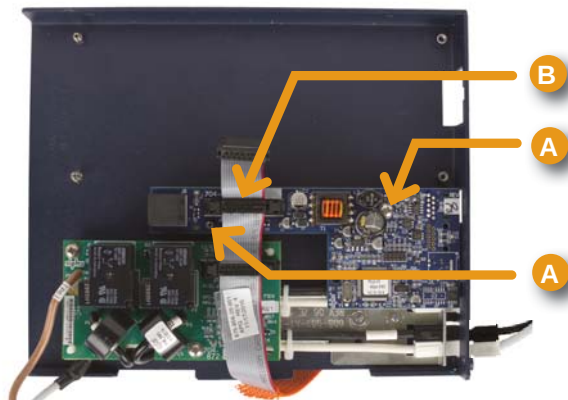


Install AlphaAPPS card in position shown.

1. Secure with one 6-32 screw and standoff (A)
2. Connect Ribbon cable as shown (B)

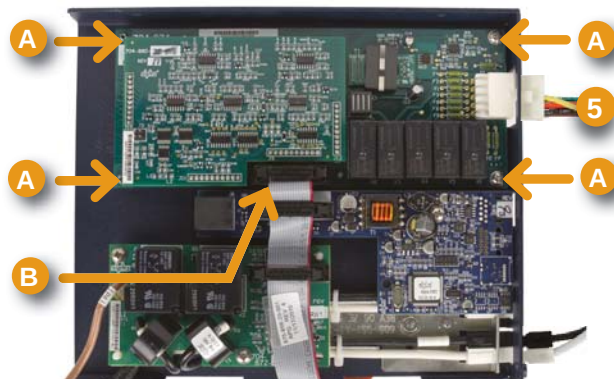
Tools required:

#2 Phillips screwdriver



Install Smart AlphaGuard in position shown.

1. Secure with two 6-32 screws and two standoffs (A)
2. Connect Ribbon cable as shown (B)



2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.5 Communications DOCSIS Status Monitoring

2.2.5.1 DOCSIS Status Monitor Front Panel Connections

1. Connect Battery Sense Wire Harness to the A/B, C/D connection points (as applicable). For XM3 units with the Smart AlphaGuard option, connect the Battery Harness (5) to the AlphaGuard connection located on the left side of the XM3 Power Supply.
2. Connect Tamper Switch Wire Harness to the TPR Connector (18).
3. Connect the RF drop (15) and make front panel connections as shown below for the DSM3. The DOCSIS specification for downstream power level is +/-15 dBmV. However, for optimal performance, set the level as close to 0 dBmV as possible.

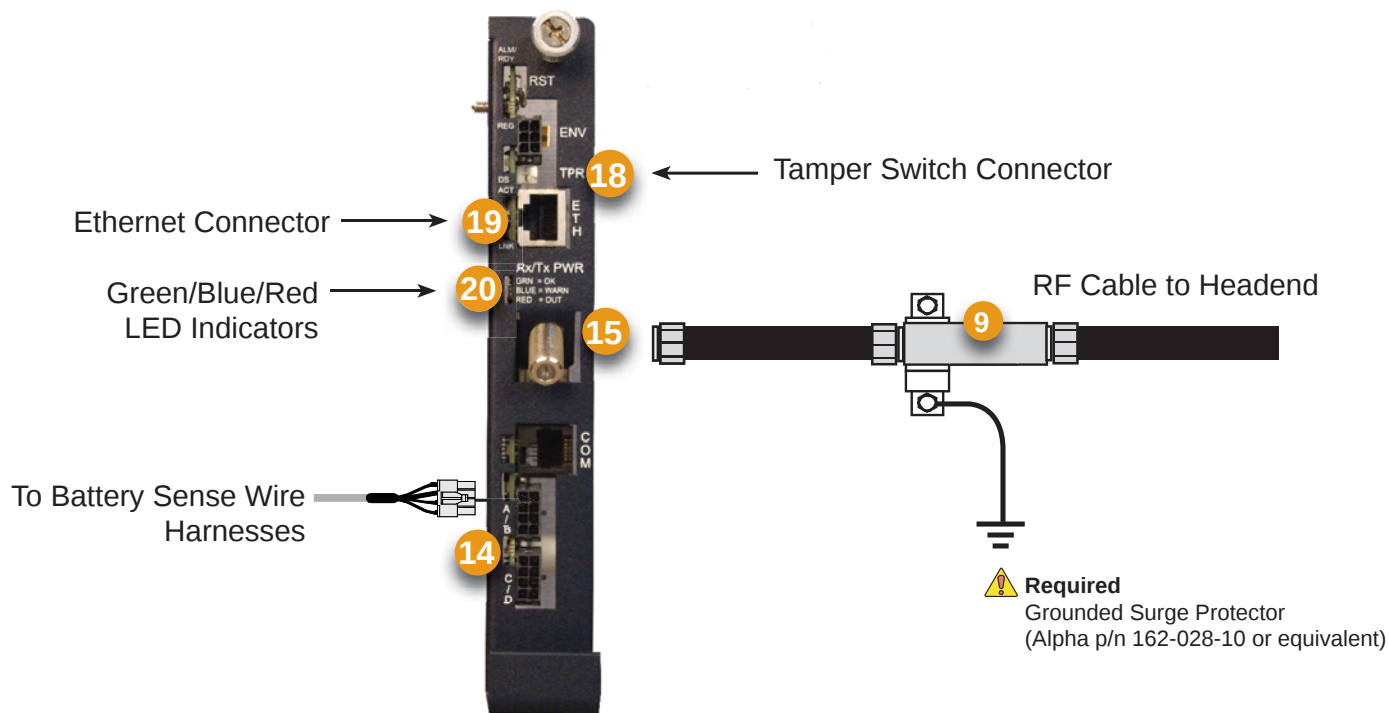


Fig. 2-7, DOCSIS Status Monitor Front Panel Connections

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.5 Communications DOCSIS Status Monitoring, continued

2.2.5.2 LED Status Verification

Verify the DSM3 LEDs behavior is as follows:

Step	Communications State	LEDs and Indications (20)				
		ALM/RDY	Downstream (DS)	Registration (REG)	Rx/Tx Power	Communications (COM)
1	Transponder Initializing/Searching for Downstream DOCSIS channel	Flashing (Green)	Flashing	OFF	OFF	Flashing
2	DOCSIS Channel locked - Completing upstream and network registration	Flashing (Green)	ON	Flashing	ON (GREEN)	Flashing
3	Online - Registration Complete	Flashing (Green)	ON	ON	ON (GREEN)	Flashing
4	DSM3 Series fully functional	Flashing (Green)	ON	ON	ON (GREEN)	Bursts when Communicating

Refer to Step 4 in the above table for normal LED behavior when the DSM3 is fully functional.

- Blue Rx/Tx Power LED indicates Rx/Tx Power at a warning level. Make the necessary RF level adjustments.
- Red Rx/Tx Power LED indicates Rx/Tx Power at an alert level. Make the necessary RF level adjustments.

LED Color	Rx Range (dBmV)	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

Table 2-1, DSM3 LEDs Behavior

2.2 XM3-HP Start-Up Procedure, continued

2.2.6 Power Module Configuration and Installation Procedure

**NOTE:**

Before applying power, verify Power Supply rating is matched to AC input utility. Verify a low-resistance ground is installed in accordance with your local electrical regulatory authority.

**CAUTION!**

Batteries are an important part of the Power Supply. Properly install and test all batteries, battery connections and battery cables before you connect them to the Power Supply.

1. Route the Local/Remote Indicator cable down through the opening in the left side of the shelf and back up through the opening in the right side of the shelf and connect.

Note: For existing LRI installations, use LRI adapter kit, p/n 875-952-20.

2. After wiring battery cable kit, battery sense cables and PTS as shown in Section 1, verify DC breaker is OFF, then connect battery cable to Inverter Module.
3. Connect the Smart AlphaGuard wire harness to Smart AlphaGuard port.
4. Connect Remote Temperature Sensor to Inverter Module.
5. Connect transponder, RF Input cable, and the tamper switch (if installed). Refer to section 2.2.6.1 for communication module connections.
6. For new installations, skip to step 10.
7. For upgrading existing sites, install service Power Supply (see Attached documents) and remove existing Power Supply.
8. Thoroughly inspect output connectors for abnormal heating or damaged housing; replace if necessary.
9. Verify SPI (16) switch is in "ALT" position.
10. Connect the SPI (network load) to the Output 1 connector.
11. Connect auxiliary load (i.e., fan) to the Output 2 connector.
12. Turn on AC breaker (located on enclosure) and verify correct (per unit's nameplate voltage) utility voltage at outlet; if correct, plug in line cord to the utility outlet.
13. Turn battery breaker ON.
14. Toggle SPI switch to ON.
15. Verify no alarms are present after power up initiation (it may take up to 60 seconds for alarms to clear; APPs alarms may take longer). Alarms may be verified on the LCD display or Alarm LED.

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.6 Power Module Configuration and Installation Procedure, continued

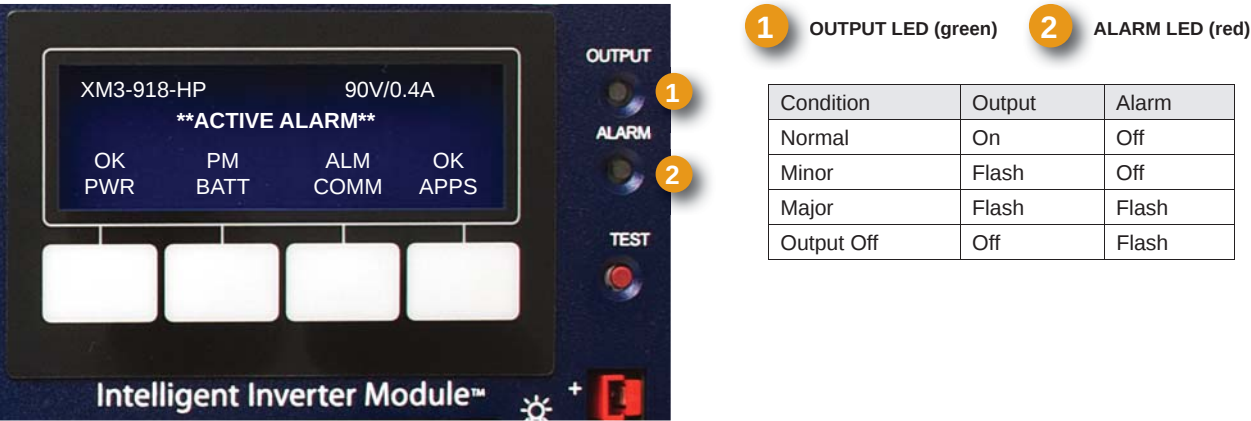


Fig. 2-8, Active Alarm Table

- 16. If alarms do not clear after 60 seconds, press the menu key with ALM indicated above it to see the ACTIVE ALARM list for the selected key.
- 17. Press UP or DOWN to select the alarm of interest.
- 18. Press ENTR to select the alarm and display diagnostic information. Press ESC to return to the alarm list.
- 19. Enter Battery Type (or parameters) and number of battery strings. Battery type entries can be made on the LCD.
- 20. Enter the battery DATE code and the MHOs (conductance) readings. Battery date and MHOs entries can be made on the LCD (see Figs. 2-9 and 2-10).

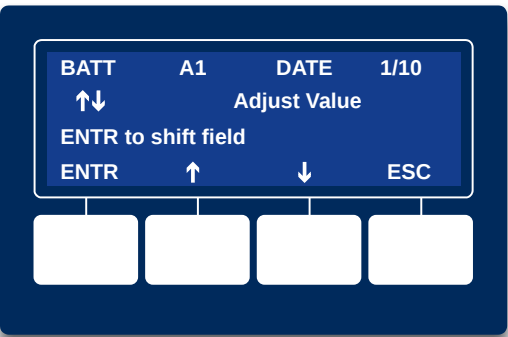


Fig. 2-9, Enter Battery Date Code

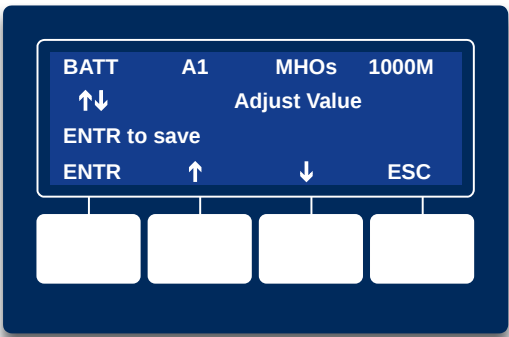


Fig. 2-10, Enter Battery MHOs Reading

2.2 XM3-HP Start-Up Procedure, continued

2.2.6 Power Module Configuration and Installation Procedure, continued

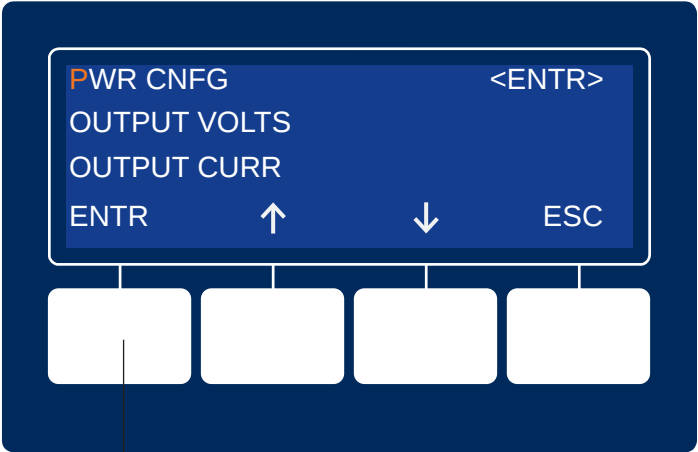
- 21. Once the unit is running on line voltage, perform a Self Test by pressing and holding the test button for 1-2 seconds with a pen (or similar object). Wait for Self Test completion before proceeding (see Section 3.1.1 Self Test Operation).

NOTE:
If the unit is operating from batteries, the Self Test will not initiate. Check input breaker and input line cord.

- 22. Perform standby test by shutting off utility breaker and verifying it goes into standby and supports the load.
- 23. Re-apply AC power and verify unit goes to Line Mode.

NOTE:
Two output connectors will be present on the side of the front panel whether or not the optional AlphaDOC is installed. If an AlphaDOC is not installed, the output voltage (Output 1) will be present on both connectors as the connectors are wired in parallel by means of a split ("Y") wiring harness. If an optional AlphaDOC is installed, the split wiring harness is replaced with individual wiring for Output 1 and Output 2 (**Secondary loads to be connected to Output 2**).

NOTE:
The default language is set to English. Unless the XM3 is ordered preset to another language, the language can be changed through the Power Config (PWR CNFG) menu. Pressing the PWR (Power) softkey while in the OPERATION NORMAL screen opens the Power Info Menu display (the first letter of the top line will blink indicating it is the active line; shown in orange). Pressing ENTR from this screen opens the PWR CNFG Menu. Scroll down to the SELECT LANGUAGE menu to set to the desired language.



Power Info Menu	Default	Range
PWR CNFG <ENTR>		

Power Config Menu	Default	Range
SELECT LANGUAGE	English	Spanish French Portuguese German

2.2 XM3-HP Start-Up Procedure, continued

2.2.7 Local Verification of DOCSIS Transponder

To confirm successful hardware installation before leaving the installation site, verify network connectivity and correct hardware interconnection.

The DS and REG LEDs on the front of the DSM3 Series should be ON solid green. This indicates successful registration with the headend. In addition, the RF LED should also be ON solid green indicating proper RF power levels and the ALM/RDY LED should be blinking green for normal operation.

With the DSM3 Series used in conjunction with the XM3-HP Power Supply, network connectivity can be verified via the COMM menu on the XM3 Smart Display. The following provides a list of parameters available on the XM3 Smart Display populated with sample values.

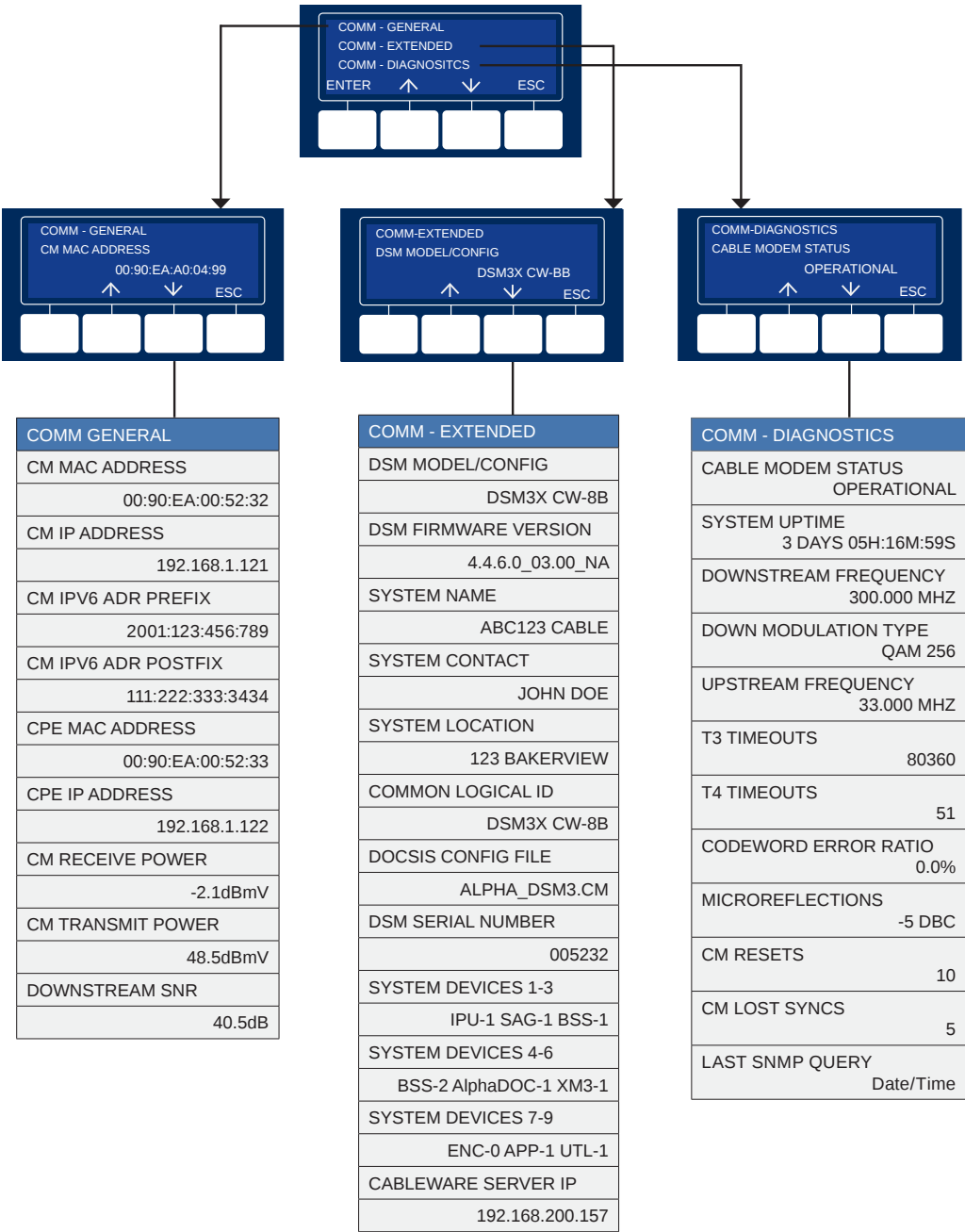


Fig. 2-11, XM3 Smart Display Screens

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.8 Web Interface

Overview

The DSM3 Series Power Supply transponder provides an embedded Web server interface to allow operations personnel the ability to connect locally or remotely via TCP/IP over Ethernet with a laptop/computer to verify the status of common data points and to configure various operating parameters.

2.2.8.1 Local Web Server Access

The DSM3 Series transponder's Ethernet port (comparable to the "Craft" port on some transponder models) will typically be used as a local connection point allowing the user to connect directly to the DSM3 Series Web server interface to verify/configure common communication parameters and view Power Supply status and battery values. The Ethernet port on the DSM3 Series is a fully functional standard Ethernet port, capable of providing all the functionality of any standard Ethernet connection.

To access the DSM3 Series transponder Web server locally utilizing a Web browser, follow the procedure outlined below:

1. Connect a standard Ethernet cable (CAT5) between the DSM3 Series transponder Ethernet port (ETH) and a laptop or computer's 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 (Fig. 2-12). **Note: For the DSM3 Series, this may take up to 45 seconds when the transponder is initially powered up with no RF connection.**
5. Click on the "Language" menu to select a desired language for the text information on the Web page. The language choices are English (default), Spanish, Portuguese, French & German.

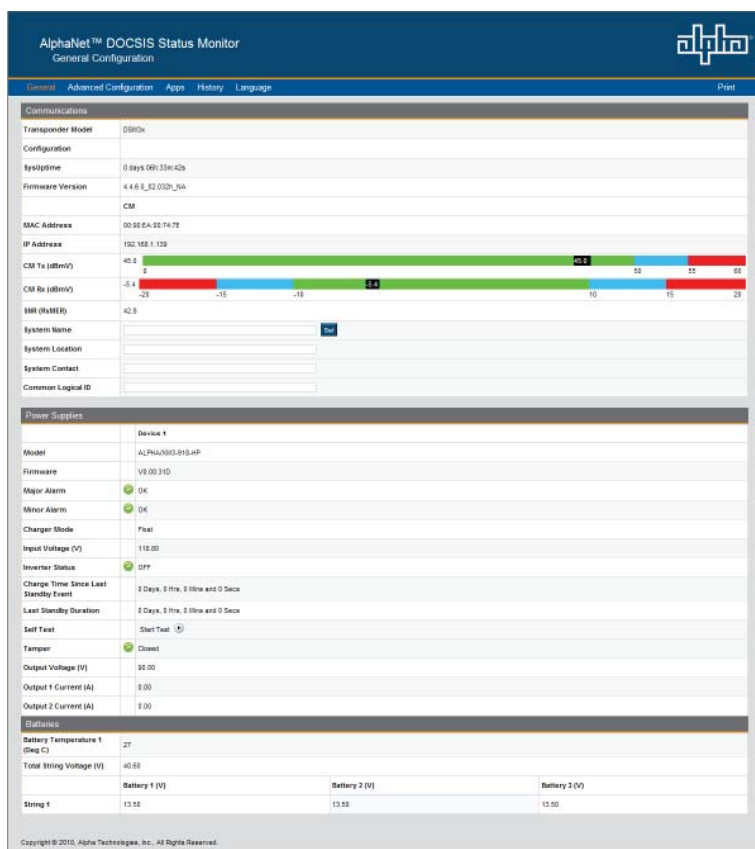


Fig. 2-12, DSM3 Series Web Page
(data values shown for illustration purposes only)

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.8 Web Interface, continued

2.2.8.1 Local Web Server Access, continued



NOTE:

If you are unable to view the home page of the DSM3 Series using IP Address 192.168.100.1, the network configuration on the computer that is being used to connect to the DSM3 Series transponder may require a temporary static IP address to be configured.

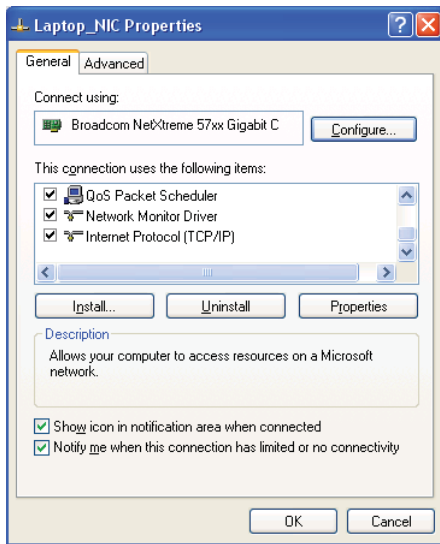


Fig. 2-13, Local Area Connection Properties Screen

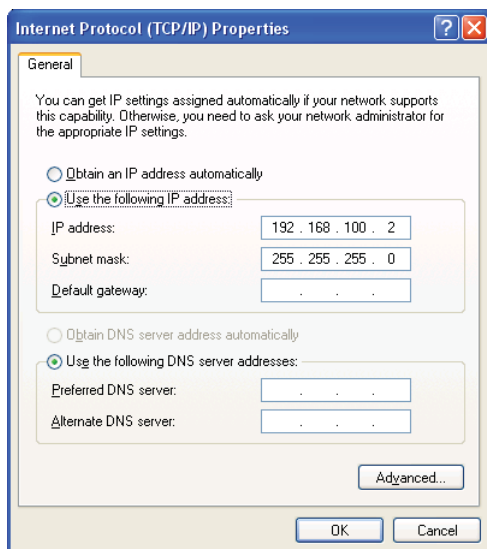


Fig. 2-14, Internet Protocol (TCP/IP) Properties Screen

Use the following procedure to configure a static IP address on a laptop or computer:

1. Click on the "start" button (lower left button on most Windows® computers).
2. When the window pops up, click on "Control Panel" (usually about half the way down the second column).
3. Click on "Network Connections."
4. Right-Click on "Local Area Connection" to open menu box.
5. Click on the bottom option "Properties."
6. You will see a dialog box much like Fig. 2-13; scroll down to the entry "Internet Protocol (TCP/IP)" and then click on the "Properties" button.
7. The Internet Protocol (TCP/IP) Properties dialog box will open (Fig. 2-14). Enter the values as shown. Record the existing IP address and Subnet mask in order to later return the computer to its original state.
8. Click on the "OK" button and try to connect to the DSM3 Series transponder once again using 192.168.100.1 in your Web browser.
9. Once completed with the DSM3 Series local Ethernet port connection, repeat the above steps 1 to 6 to restore the computer's network configuration back to the original settings.

2.2 XM3-HP Start-Up Procedure, continued

2.2.9 Remote Web Server Access

To remotely access the DSM3 Series transponder Web server utilizing a Web browser, follow the procedure outlined below:



NOTE:
For Web server (HTTP) access, port 80 must not be blocked.

- 1. Connect the laptop or computer's network interface port to the company's Ethernet network.
- 2. Open a Web browser.
- 3. Enter the DSM3 Series' designated IP address (e.g., 192.168.1.124) into the Web browser's address field.
- 4. The DSM3 Series transponder's Web server home page will appear (Fig. 2-15).
- 5. Click on the "Language" menu to select a desired language for the text information on the Web page. The language choices are English (default), Spanish, Portuguese, French & German.

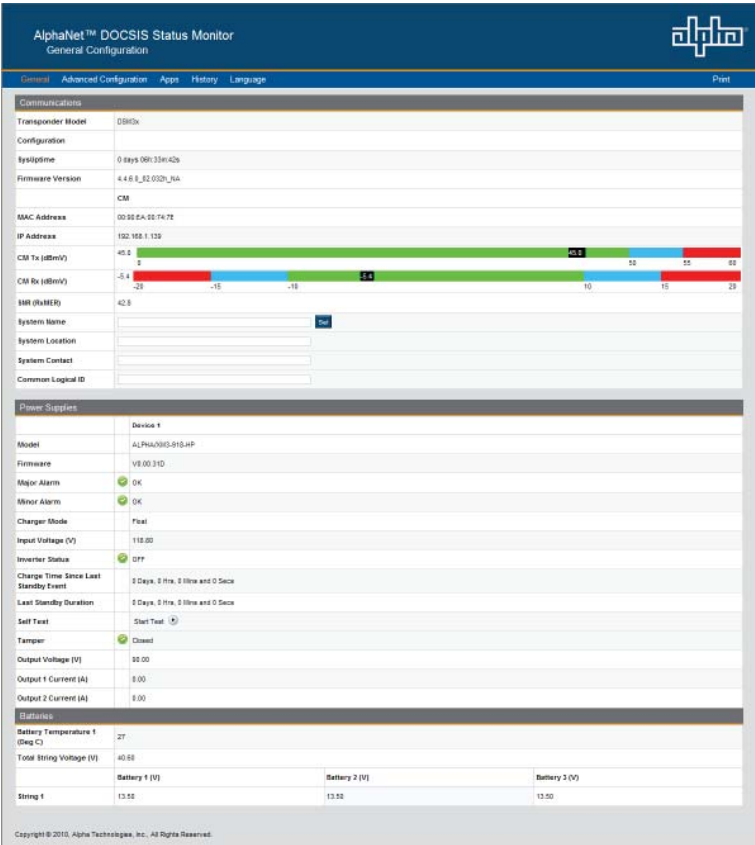


Fig. 2-15, Web Server Home Page
(data values shown for illustration purposes only)

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.10 Navigating the Web Page

Once the Web page has been successfully accessed, the operator is able to select a link on the header bar and the page specific to the topic will open enabling real-time data to be observed. The header bar has links for the following menu items:

AlphaNet™ DOCSIS Status Monitor

General Configuration

General Advanced Configuration APPS History Language Print

Communications

Transponder Model Configuration

SysUpTime

Firmware Version

CM MAC Address

IP Address

CM Tx (dBmV)

CM Rx (dBmV) SNR (RxMER)

System Name

System Location

System Contact

Common Logical ID

Power Supplies

Model

Firmware

Major Alarm

Minor Alarm

Charger Mode

Input Voltage (V)

Inverter Status

Time Since Last Standby

Last Standby Duration

Self Test

Start Test

Tamper

Output Voltage (V)

Output Current 1 (A)

Batteries

Battery Temperature 1 (°C)

Total String Voltage (V)

String 1

Generator

Firmware

Generator Status

Major Alarm

Minor Alarm

Self Test

Start Test

COMMUNICATION CONFIGURATION

NETWORK PROVISIONING

CM Transponder Model

MAC DHCP/Static Status

SysUpTime

IP Subnet Mask Gateway

TOD Server

TFTP Server

DHCP Server

Lease Duration

Lease Expires

Configuration File

Config Download Timer (Hours)

DOCSIS

Downstream / Upstream Frequency (MHz)

Modulation Lock Status Power (dBmV)

Channel ID Symbol Rate (Msym/sec)

SNR (RxMER) CER T3 Timeouts T4 Timeouts

SNMP

docsDevNmAccessTable

Alpha Proprietary MIB

SNMP Trap 1

SNMP Trap 2

SNMP Trap 3

SNMP Trap 4

SNMP Trap

String Trap on Normal Trap

Send Count SNMP TimeOut (Minutes)

MISCELLANEOUS

Data Bus Size

DocsDev Event Log

RESET LOG

docsDevEvFirstTime

docsDevEvLastTime

docsDevEvCounts

docsDevEvLevel

docsDevEvId

docsDevEvText

Power Supply CONFIGURATION

Power Supply Model

Firmware Version

AC Line Mode

Major Alarm

Minor Alarm

SELF TEST

Self Test

Start Test

Test Countdown (Days)

Test Duration (Days)

Test Interval (Days)

INPUT Input Voltage (V)

Input Freq (Hz)

Input Current (A)

Tap Switch

BATTERY CHARGING

Battery String Voltage (V)

Charger Mode

Charger Current (A)

Charger Current Limit (A)

Charger Enable

Charger Accept Voltage (V/C)

Charger Float Voltage (V/C)

Batt Capacity (AH)

Charger Temperature Compensation (mV)

Low Voltage Cutoff (V)

Power Supply CONFIGURATION (conf'd)

INVERTER

Inverter Enable

Standby Events

Total Inverter Run Time (Days)

Total Time Inverter In Standby (Hours)

OUTPUT

Output 1 Current (A)

Output Voltage (V)

Output Power Apparent (VA)

Output Power Real (Watts)

Percent Load (%)

PIM Option Installed

Output 1 Reset

Output Over-Current Tolerance (mSec)

Output 1 Over-Current Trip Level (A)

N+1 In Use

N+1 Valid Retry Delay (Seconds)

Retry Limit

ADVANCED GENERATOR

STATUS

Firmware Version

Generator Status

Time Since Last Engine Run

Last Engine Run Duration

Engine Enable/Disable

Engine Run Time (dHR)

ENGINE STATUS / ALARMS

Reset Latched Alarms

AC Line Status

AC Line Voltage (Vac)

DC Bus Status

DC Bus Voltage (Vdc)

Over Voltage

Self Test Alarm

Self Test

Start Test

Test Countdown (HR)

Low Ignition Battery

Ignition Battery Voltage (Vdc)

SETTINGS

Start Delay (SEC)

Cool-Down Period (SEC)

Low DC Bus Level (Vdc)

Hi DC Bus Level (Vdc)

Over-voltage Duration (SEC)

Automatic Test Interval (HR)

Service Required Service Interval (HR)

Service Due (HR)

Low Oil Pressure

High Engine Temperature

Over Speed

Over Crank

Low Fuel Level

CONTROL ALARMS

Control Fail

RAS Switch

ENCLOSURE ALARMS

Gas Hazard (LEL)

Water Intrusion

Pad Shear

Tamper

I/O CONTROLLER

Environmental Controller Status

Actstate

Mode

Temperature

Hysteresis

Timer Countdown

Enclosure Fan Not Installed / Installed

Tamper Switch Status

Tamper Switch Polarity

Property Tree

Parameter OID

PS Device 1

psOutputVoltage.1

psInputVoltage.1

psTotalStringVoltage.1

psPowerOut.1

psFrequencyOut.1

psStringChargeCurrent.1.1

psStringChargeCurrent.1.2

psStringFloat.1.1

psStringFloat.1.2

psOutputCurrent.1.1

psTemperature.1.1

psBatteryVoltage.1.1.1

psBatteryVoltage.1.1.2

psBatteryVoltage.1.1.3

psBatteryVoltage.1.2.1

psBatteryVoltage.1.2.2

psBatteryVoltage.1.2.3

Discrete Table

Parameter OID

PS Device 1

psInverterStatus.1.1

psInverterStatus.1.2

psInverterStatus.1.3

psInverterStatus.1.4

psInverterStatus.1.5

psMajorAlarm.1.1

psMajorAlarm.1.2

psMinorAlarm.1.1

psMinorAlarm.1.2

psTamper.1.1

psTamper.1.2

GENERATOR

genGeneratorStatus.8.1

genGeneratorGasHazard.8.1

genWaterIntrusion.8.1

genPadShear.8.1

genEnclosureDoor.8.1

genCharger.8.1

genFuel.8.1

genOil.8.1

genMinorAlarm.8.1

genMajorAlarm.8.1

TRANSPONDER

commonCraft Status.0.1

commonCraft Status.0.2

tibControlMode.1.1

tibControlMode.1.2

tibControlMode.1.3

Fig. 2-16, DSM3 Series Site Map

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.10 Navigating the Web Page, continued

2.2.10.1 Web Interface Security Levels

Within the DSM3 Series transponder are two levels of function-specific security. General operations are set at Level 1 and configuration-related functions are set at Level 2. Default User Name and Passwords are shown in the figure below.

DSM3 Series Web Page Security		
OID	Function	Value
1.3.6.1.4.1.4413.2.2.2.1.1.3.3.0	Level 1 User Name	Alpha
1.3.6.1.4.1.4413.2.2.2.1.1.3.4.0	Level 1 Security Password	AlphaGet
1.3.6.1.4.1.4413.2.2.2.1.1.3.1.0	Level 2 User Name	Alpha
1.3.6.1.4.1.4413.2.2.2.1.1.3.2.0	Level 2 Security Password	AlphaSet

Web Page	Function	Security Level
Apps Overview	Configure/Save	2
Battery Management	Configure/Save	2
General	System Name, System Contact, System Location, Common Logical ID	1
	Power Supply Self Test	1
	Generator Self Test	1
Advanced Communications	Reset Transponder	1
	Provisioning Mode - Single IP or Dual IP	2
	Configure Static IP Address	2
	Configure Proprietary Trap Addresses	2
Advanced Power Supply	Power Supply Self Test	1
	Configure/Save	2
	Reset Output 1/2	2
Advanced Generator	Generator Self Test	1
	Reset Latched Alarms	1
Modem Log [Event Log]	Reset Log	1
Advanced I/O	Tamper Switch Polarity	1
	Enclosure Heater/Cooler Installed	1
HMS Alarms	Export Alarm Cloning File	2

Fig. 2-17, DSM3 Series Transponder Security Levels

2.0 Installation, continued

2.2 XM3-HP Start-Up Procedure, continued

2.2.11 Verifying Communication Parameters

Also displayed on the “General” tab of the Web page are the common communication settings and values of the DSM3 Series cable modem. Additional communication parameters may be viewed by navigating to the "Communications" menu on the "Advanced Configuration" tab.

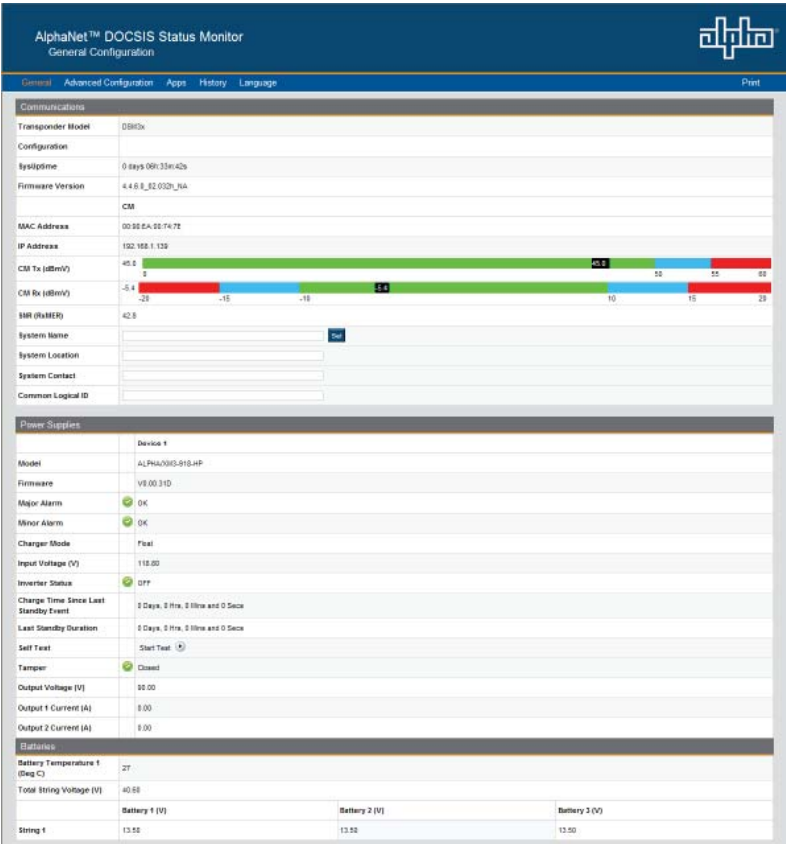


Fig. 2-18, Communication Parameters
(data values shown for illustration purposes only)

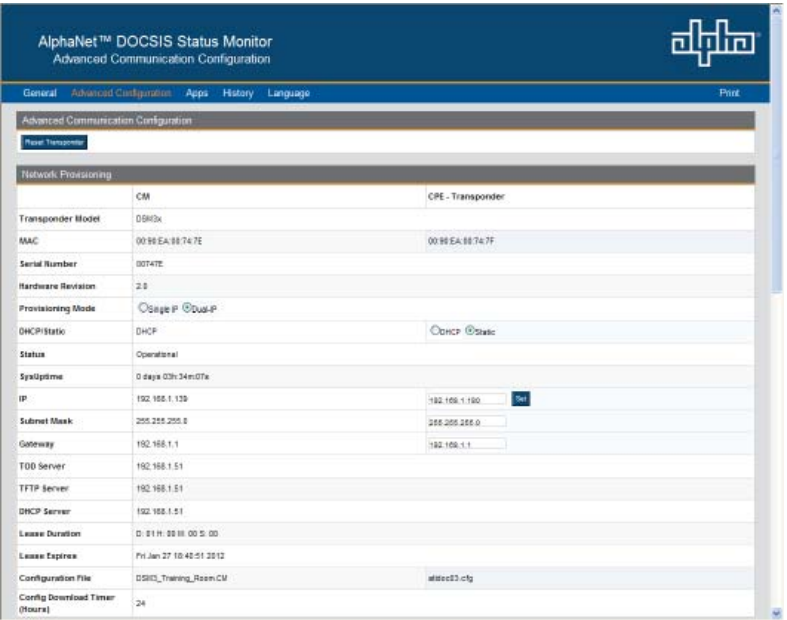


Fig. 2-19, Advanced Communication Parameters
(data values shown for illustration purposes only)

2.2 XM3-HP Start-Up Procedure, continued

2.2.12 Verifying Power Supply and Battery Parameters

The “General” tab of the Web page also displays the common Power Supply and battery parameter values. Important parameters such as current alarm status, inverter status and tamper status can be quickly verified on this page. Additional Power Supply parameters can be viewed and edited on the Power Supply page located in the Advanced Configuration menu.



Fig. 2-20, Power Supply and Battery Parameters
(data values shown for illustration purposes only)

2.2.13 Remote Self Tests via the Web Page

Remote Self Tests on power supplies may be started and stopped via the DSM3 Series Web page. This requires a Level 1 login. Refer to section 2.2.10.1, *Web Interface Security Levels for User Name and Password*.
To launch a remote Self Test, click on the “Start Test” button.
To stop a remote Self Test before the predefined test duration, click on the “Stop Test” button.

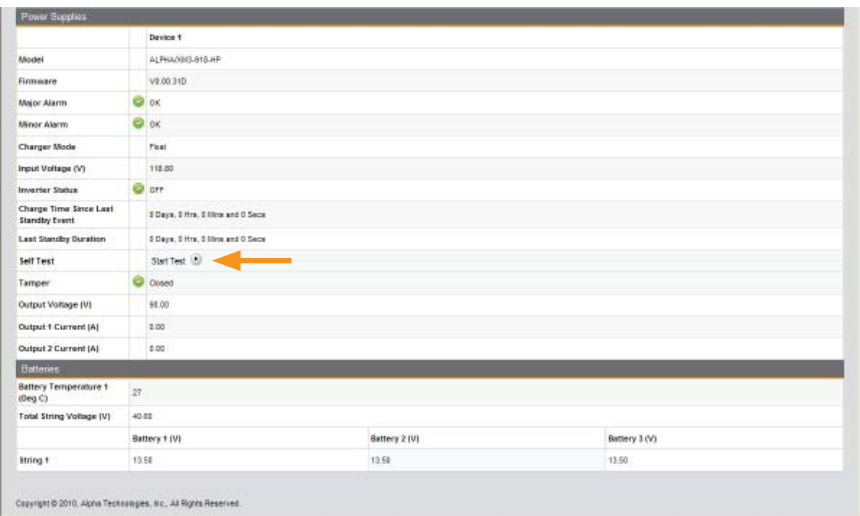


Fig. 2-21, Location of "Start" Button for Self Test
(data values shown for illustration purposes only)

3.0 Operation

3.1 Start-Up and Test

3.1.1 Self Test Operation

1. The Power Supply should be operating correctly with no alarms present. Use the Smart Display to verify Normal and Communication Information. Verify test duration in the Power Config menu screen.
2. Press the Self Test button on the Inverter Module to start Self Test. The test will run for a preset time (5-180 minutes, set in the Setup Menu). Self Test can also be entered by setting Self Test to ON in the Power Config 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.
3. While in Self Test mode, use the Smart Display or a true RMS voltmeter to verify output. Output voltages should appear within the ranges listed in Table 3-1. To cancel a Self Test in progress, press the Self Test button a second time or change Self Test to OFF in the Power Config Menu.



NOTE:

Possible measurement points for output voltage are an unused output connector or the SPI coax seizure screw.

Voltage Setting	Voltage Regulation (% Range)	
	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

Table 3-1, AC Output

3.2 Using the Smart Display

All operational functions, system testing, setup menus and alarms are available via the illuminated display panel on the front of the CableUPS. Display functions are accessible by following the indicated prompts above the four softkeys. Descriptions of the key functions are as follows:

Item	Softkey	Function (from OPERATION NORMAL Screen)
1	PWR (Power)	Pressing this key once opens the Power Info Menu. From this menu, the operator can view the current Power Supply configuration or access the PWR CONFIG menu to adjust parameters.
2	BATT (Battery)	Pressing this key once opens the Battery Info Menu. From this menu, the operator can view the current battery information or type and adjust battery parameters as necessary.
3	COMM (Communications)	Pressing this key once opens the COMM Info Menu. From this menu, the operator can access additional menus (General/Extended/Diagnostics) to view and/or modify COMM parameters.
4	APPS (Applications)	Pressing this key once opens the Apps Info Menu. From this menu, the operator can view or modify parameters for the installed APP card.

Display Backlighting: The display is normally unlit. Press any key once to activate backlighting and illuminate the display.

Moving up and down the menu: Press the up or down arrow key to access menu items in the active screen (see Fig. 3-2). Each press of the arrow key steps up or down through the sub-menu items. Press ENT to access the next menu option. Press ESC to return to the previous screen.

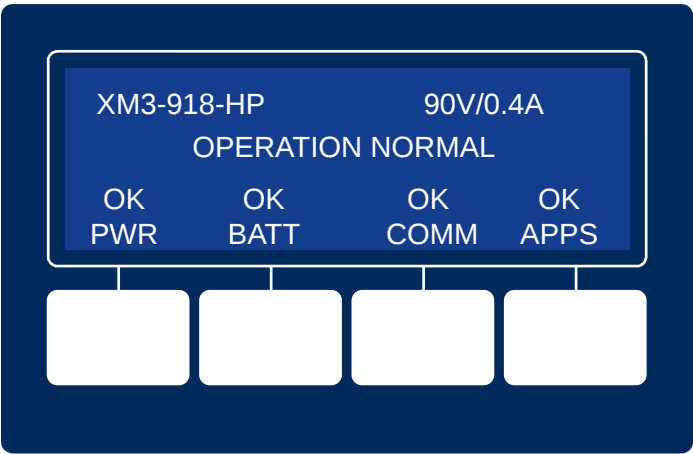


Fig. 3-1, Operation Normal Display Screen

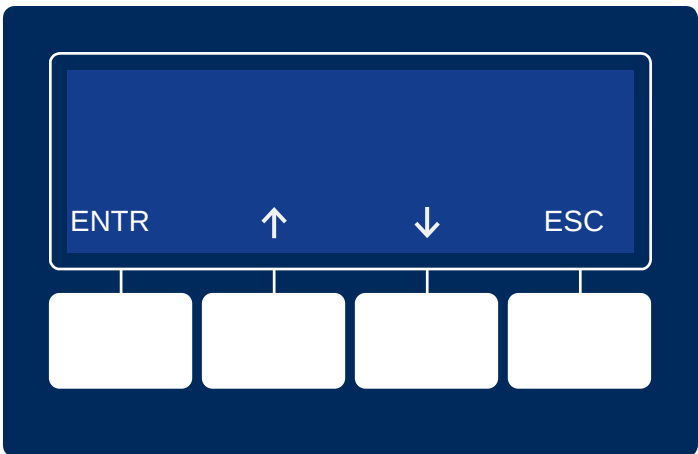
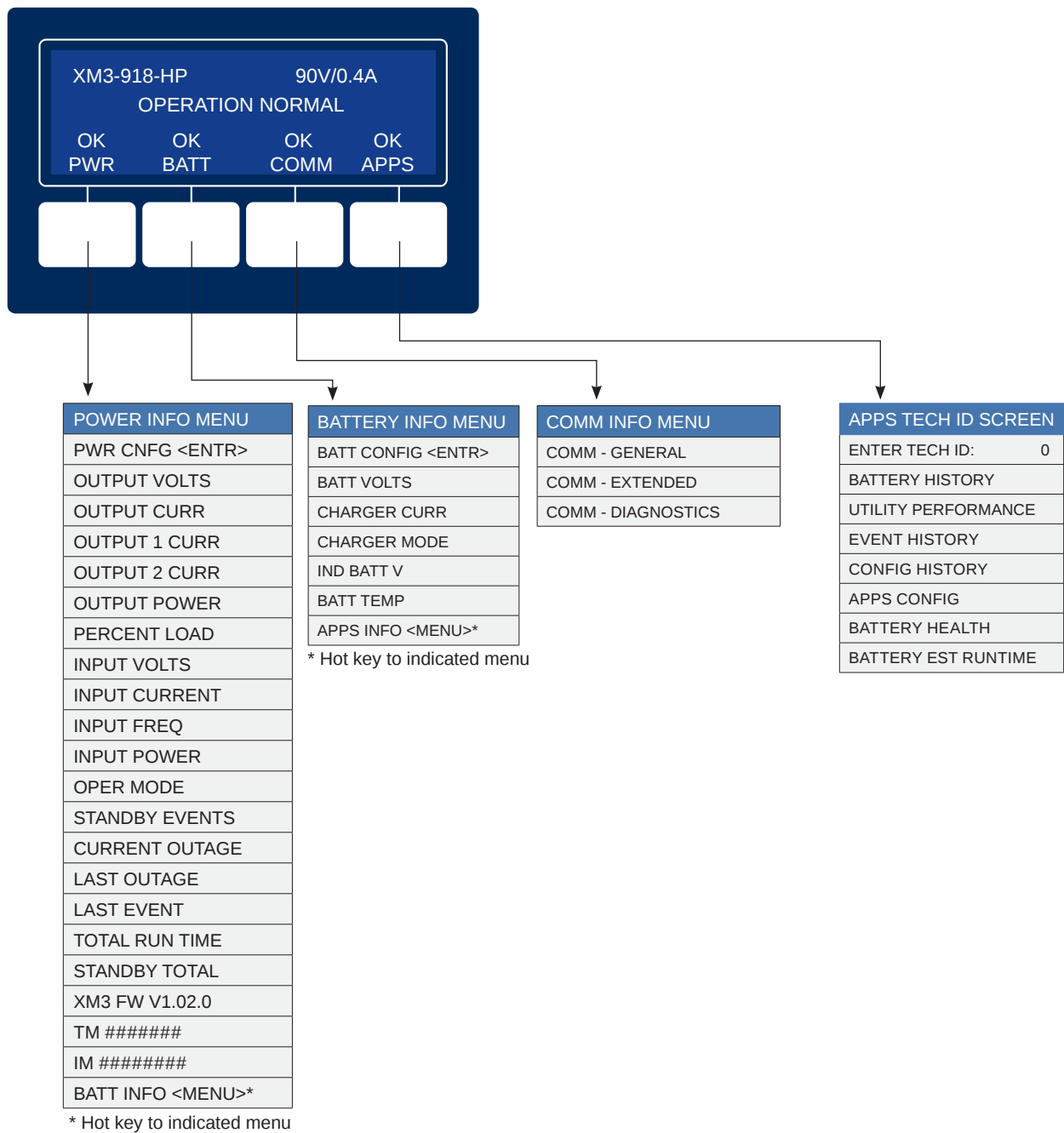


Fig. 3-2, Navigating Through Menu Screens

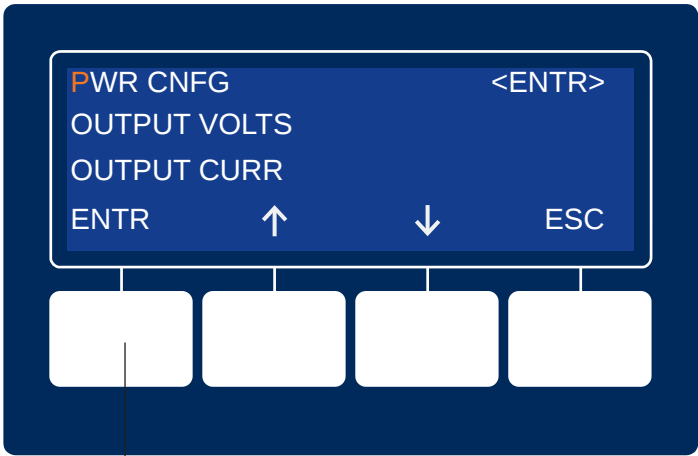
3.3 Smart Display Softkeys

While in the OPERATION NORMAL display, the following menu prompts are displayed when the respective softkey is pressed.



3.3.1 Power Information and Configuration

Pressing the PWR (Power) softkey while in the OPERATION NORMAL screen opens the Power Info Menu display (the first letter of the top line will blink indicating it is the active line; shown in orange). Pressing ENTR from this screen opens the PWR CNFG Menu. Cycling through each menu item and following the prompts on the lower line will enable the user to configure the parameters shown in the menu.



Power Info Menu	Default	Range
PWR CNFG <ENTR>		
OUTPUT VOLTS	63 or 89 VAC	0 -101 VAC
OUTPUT CURRENT	10.5A	0 - 40 A
OUTPUT 1 CURRENT	6.8A	
OUTPUT 2 CURRENT	8.0A	
OUTPUT POWER	2000W	
PERCENT LOAD	80%	0-255%
INPUT VOLTS	120V	0-325 VAC
INPUT CURRENT	(4.5A)	0 - 25 A
INPUT FREQ	60HZ	42HZ - 67.5HZ
INPUT POWER	2000W	
OPER MODE		LINE/STANDBY
STANDBY EVENTS		0-65535 EVENTS
CURRENT OUTAGE		0-65535 MIN
LAST OUTAGE		0-65535 MIN
LAST EVENT	(DD:HH:MM)	
TOTAL RUN TIME		0-65535 DAYS
STANDBY TOTAL		0-65535 MIN
XM3 FIRMWARE	Vx,xx,x	
TM #####		
IM #####		
BATT INFO	<ENTR>	

Power Config Menu	Default	Range
SELF TEST	OFF	ON / OFF
TEST INTERVAL	30 DAYS	0 - 365 DAYS
TEST DURATION	10 MIN	5-180 MINUTES
TEST COUNTDOWN	30 DAYS	0-365 DAYS
TEST INHIBIT		1=Test Inhibit 0=OFF
DISCHARGE LVL	TIMED	TIMED, 10-50%
FREQ RANGE	3.0HZ	1-6HZ
ALPHADOC OPTION	AUTO	YES / NO
ALPHADOC FW	VX.XX.X	
DOC #####		
OUTPUT 1 RESET		NO**
OUTPUT 2 RESET		NO**
CURR LIMIT 1	110% RATING	3-25A*
CURR LIMIT 2	110% RATING	3-25A*
RETRY DELAY	60S	5-301S*
RETRY LIMIT	20	0-40*
OVER CURR TOL	3000MS	20-9000mS
OUTPUT VOLT REG		FINE/COARSE
PS PRIORITY		NORMAL
INPUT LIMIT		
SET DEFAULTS	NO	NO/YES
DEVICE ADDRESS	1	0-7
SELECT LANGUAGE	English	Spanish French Portuguese German

Hidden if no
AlphaDOC is
installed

*Ability to select available if Optional AlphaDOC installed
** Output 1 & 2 Reset will be hidden if the corresponding output is not tripped.

3.0

Operation, continued

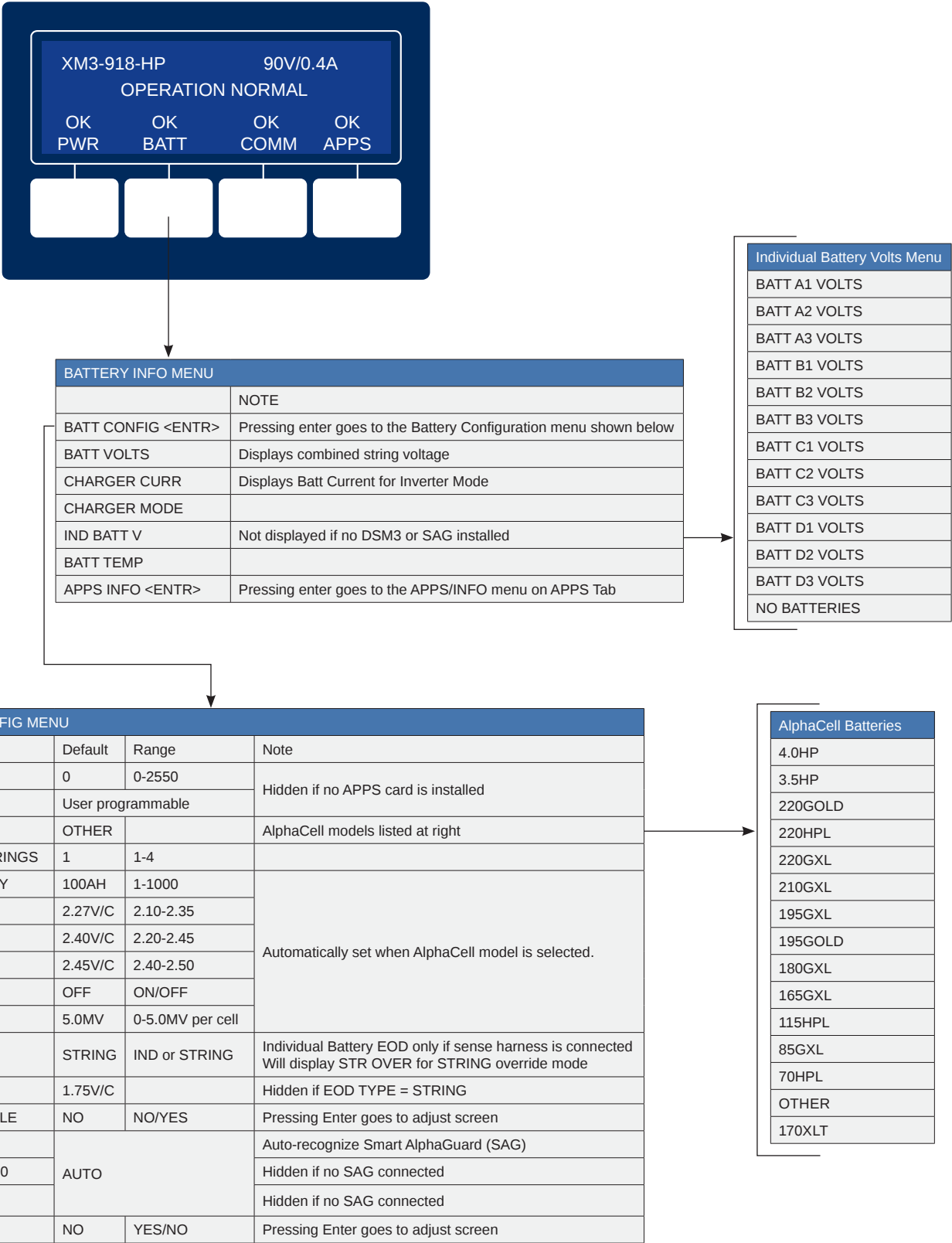
3.3

Smart Display Softkeys, continued

3.3.2

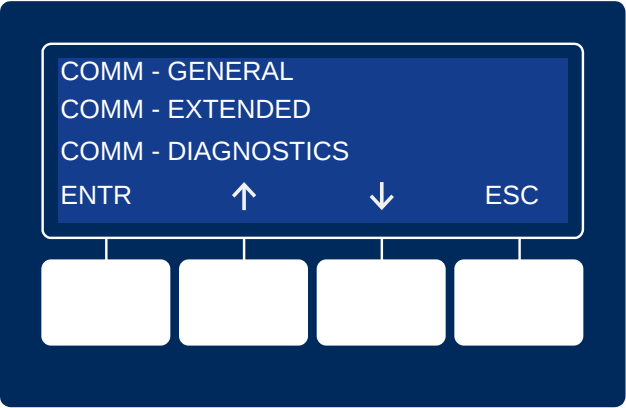
Battery Information and Configuration

The top line of the display is affected by pressing a softkey. In this case, pressing Enter <ENTR> will open the BATTERY INFO/BATTERYCONFIG Menu enabling the operator to set values for the following parameters.



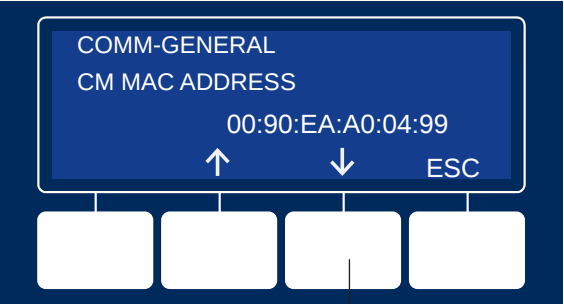
3.3.3 COMM Softkey

Pressing the COMM softkey while in the OPERATION NORMAL screen opens the following display (the first letter of the top line will blink indicating it is the active line).



COMM-GENERAL

The top line of the display is affected by pressing a softkey. In this case, pressing Enter <ENTR> will open the COMM-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.



Press "Down" arrow softkey to view next item(s) in menu.

COMM GENERAL	
CM MAC ADDRESS	00:90:EA:00:52:32
CM IP ADDRESS	192.168.1.121
CM IPV6 ADR PREFIX	2001:123:456:789
CM IPV6 ADR POSTFIX	111:222:333:3434
CPE MAC ADDRESS	00:90:EA:00:52:33
CPE IP ADDRESS	192.168.1.122
CM RECEIVE POWER	-2.1dBmV
CM TRANSMIT POWER	48.5dBmV
DOWNSTREAM SNR	40.5dB

3.0

Operation, continued

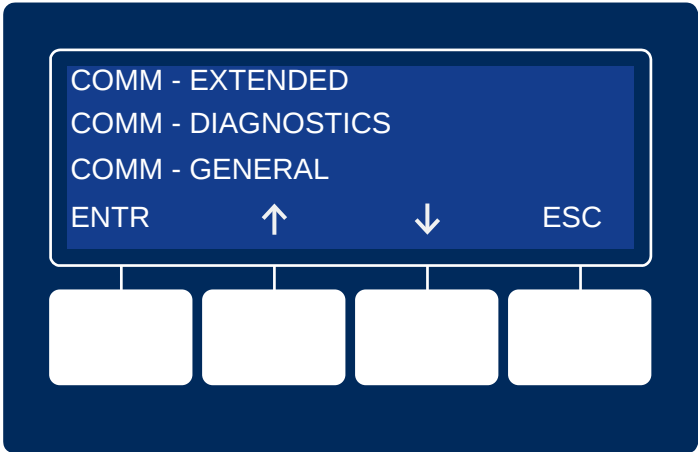
3.3

Smart Display Softkeys, continued

3.3.3

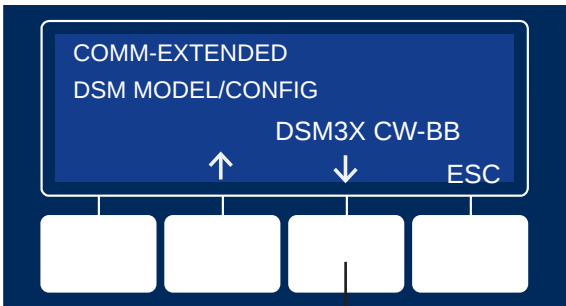
COMM Softkey, continued

Pressing the down arrow softkey to move COMM-EXTENDED (the first letter of the top line will blink indicating it is the active line) to the top line and press ENTR to open the COMM-EXTENDED menu.



COMM-EXTENDED

Pressing Enter <ENTR> opens the COMM-EXTENDED 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.



Press "Down" arrow softkey to view next item(s) in menu.

COMM - EXTENDED
DSM MODEL/CONFIG
DSM3X CW-8B
DSM FIRMWARE VERSION
4.4.6.0_03.00_NA
SYSTEM NAME
ABC123 CABLE
SYSTEM CONTACT
JOHN DOE
SYSTEM LOCATION
123 BAKERVIEW
COMMON LOGICAL ID
DSM3X CW-8B
DOCSIS CONFIG FILE
ALPHA_DSM3.CM
DSM SERIAL NUMBER
005232
SYSTEM DEVICES 1-3
IPU-1 SAG-1 BSS-1
SYSTEM DEVICES 4-6
BSS-2 AlphaDOC-1 XM3-1
SYSTEM DEVICES 7-9
ENC-0 APP-1 UTL-1
CABLEWARE SERVER IP
192.168.200.157

3.0
Operation

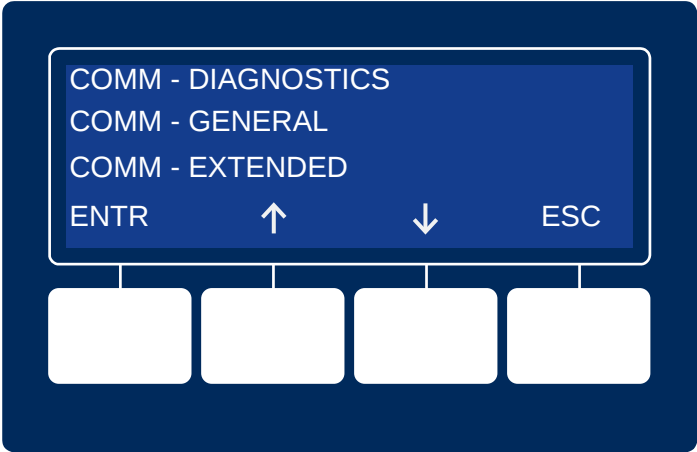
3.0
3.3

Operation, continued

Smart Display Softkeys, continued

3.3.3 COMM Softkey, continued

Pressing the down arrow softkey to move COMM-DIAGNOSTICS (the first letter of the top line will blink indicating it is the active line) to the top line and press ENTR to open the COMM-DIAGNOSTICS menu.

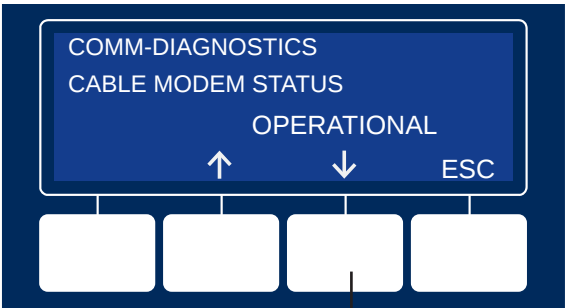


3.0
Operation

3.0
3.3

COMM-DIAGNOSTICS

Pressing Enter <ENTR> opens the COMM-DIAGNOSTICS 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.

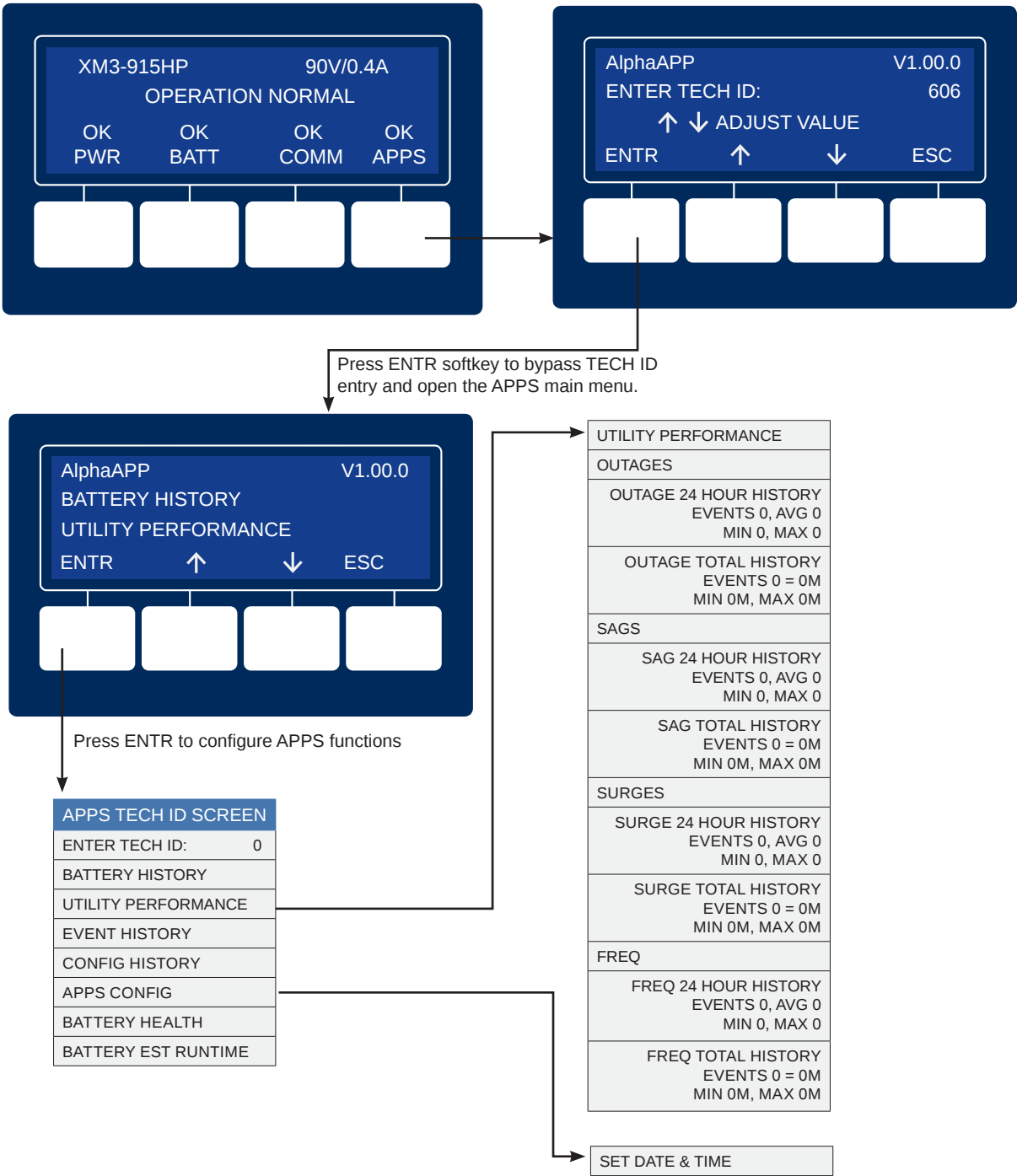


Press "Down" arrow softkey to view next item(s) in menu.

COMM - DIAGNOSTICS	
CABLE MODEM STATUS	OPERATIONAL
SYSTEM UPTIME	3 DAYS 05H:16M:59S
DOWNSTREAM FREQUENCY	300.000 MHZ
DOWN MODULATION TYPE	QAM 256
UPSTREAM FREQUENCY	33.000 MHZ
T3 TIMEOUTS	80360
T4 TIMEOUTS	51
CODEWORD ERROR RATIO	0.0%
MICROREFLECTIONS	-5 DBC
CM RESETS	10
CM LOST SYNCs	5
LAST SNMP QUERY	Date/Time

3.3.4 Alpha Applications Information and Configuration

Pressing the OK APPS softkey while in OPERATION NORMAL screen opens the APPS TECH ID screen. The technician may bypass this screen by pressing ENTR with a number 0 on the display, or the technician may enter a number using the up and down arrow keys and then pressing ENTR. If a technician ID is entered, a confirmation screen will appear. Press ENTR again to commit the value and the APPS menu list will appear. Press ENTR again to commit the value and the APPS menu list will appear.



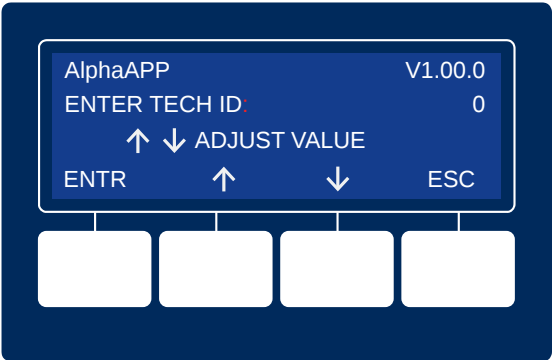
3.4 AlphaAPPs Overview

The AlphaAPPs (applications) card is an optional coprocessor card for the XM3 Power Supply. It operates as an independent computing system gathering telemetry from the Power Supply, batteries and the environment. The embedded Alpha APP Operating System and Flash File System provides the customer with an expandable platform for future software applications. As new applications are developed, they can be downloaded over the Power Supply cable modem interface.

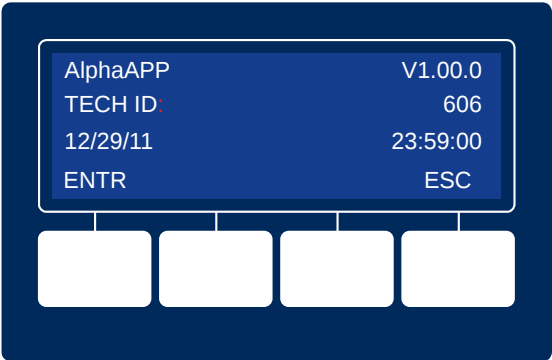
3.4.1 Display Structure

Technician ID Screen:

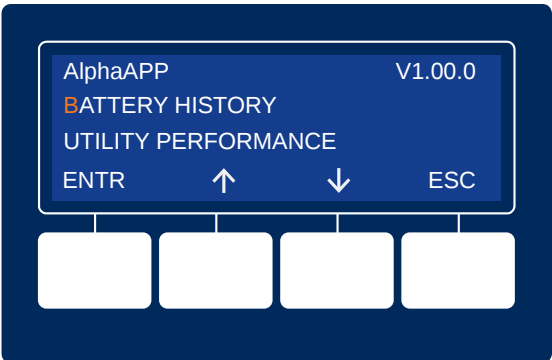
To access the APPS screens press the APPS softkey on the main XM3 menu. The first APP screen displayed will be the Technician ID screen (orange denotes a flashing character in this document).



If the technician wishes to have their visit logged, they may enter their ID number (up to 999) by pressing the up and down arrow softkeys and then press the ENTR softkey. The technician ID may be bypassed by pressing the ENTR softkey with an ID of zero.



Press ENTR once again to confirm the entry. The APP main menu screen will appear.



3.4.1 Display Structure, continued

The main menu screen can scroll up or down using the arrow softkeys. The flashing character (shown in orange) denotes which sub-menu will be selected when ENTR is pressed.



When the “OK” is flashing, press ENTR one more time to save the value. Press ESC if no changes to the date or time are desired.

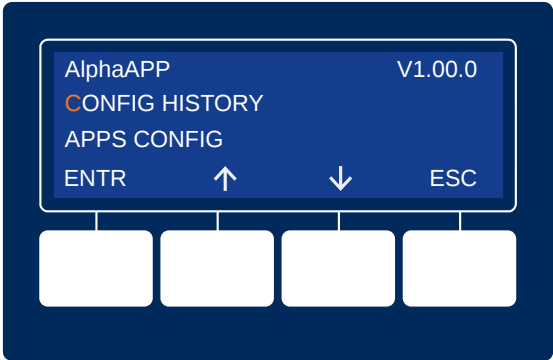
3.4.2 Applications

There are currently six applications:

- 1. Configuration Logging
- 2. Alarm Event Logging
- 3. Battery Information Logging
- 4. Utility Performance
- 5. Battery Health
- 6. Battery Run Time

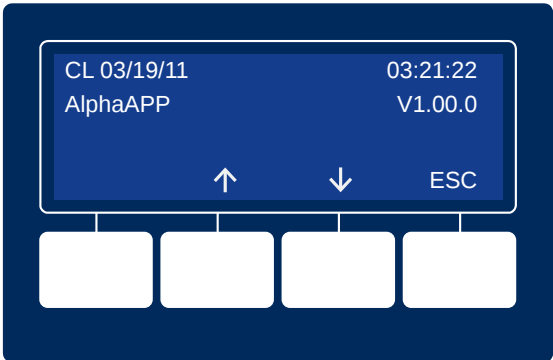
Configuration Log Screen:

To enter the Configuration History screen, scroll up or down until the CONFIG HISTORY is at the top of the scroll area.



Press ENTR to access the CONFIG HISTORY screen. The “CL” indicates that this a Configuration Log record, and the time stamp shows when the record was created. Lines two and three on the display contain the record contents. In this example, the APP firmware version record is shown.

The screen will begin with the last record created. Press the down arrow to go back in time, or press the up arrow to go forward.



3.0

Operation, continued

3.4

AlphaAPPs Overview, continued

3.4.2

Applications, continued

Event Logging App:

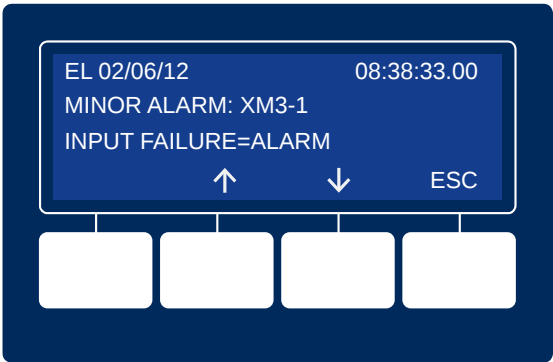
The APP card has a 768 record event log. This log does roll-over when the maximum size has been reached. When the roll-over occurs, the oldest 64 records are erased to make room for new records. Once a roll-over has occurred, the number of records available will be between 704 and 768.

Table of Events Logged:

APP Card Code Downloaded	Input Failure Alarm (shown below)
APP Card Hardware Status	Inverter Alarm
APP Card Real Time Clock Set	Line Isolation Alarm
APP Card Reset Cause	Low Battery Shutdown Alarm
APP Card Technician Code Entered	Major Application Alarm
Battery Log Cleared	Minor Application Alarm
Battery Temperature Probe Status Alarm	Output 1 Enable
Charger Fail Alarm	Output 1 Tripped Alarm
CM IP Address	Output 2 Enable
CM MAC Address	Output Failed Alarm
Configuration Log Cleared	Output Overload Alarm
CPE IP Address	Power Supply Input Current Limit Alarm
CPE MAC Address	Self Test Alarm
Event Log Cleared	Self Test Fail Alarm
High Battery Alarm	

This is an example event log screen shot. The “EL” denotes the event log, and the record was time stamped on February 6, 2012 at 8:38:33 in the morning.

The up and down arrow keys step through the log records forward and backward in time.



3.0 Operation, continued

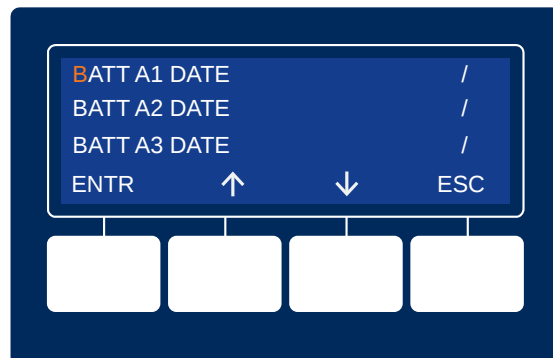
3.4 AlphaAPPs Overview, continued

3.4.2 Applications, continued

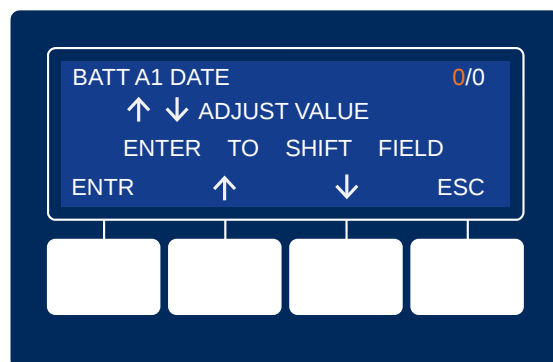
Battery Logging App:

This application allows the operator to manually enter the battery manufacture dates and their conductance (Mhos) values.

1. To enter the battery manufacture dates, press the BATT softkey on the XM3 main menu.
2. Next select the BATT CONFIG sub-menu.
3. Scroll the screen using the arrow keys until BATT DATES appears at the top of the screen.
4. Press the ENTR softkey. The APP card will now take over control of the display and show a list of installed batteries.



5. If the dates have never been entered, they will appear blank as shown. Use the arrow softkeys to select the appropriate battery.
6. To enter the manufacture date, press the ENTR softkey. The following screen will appear.
7. Use the up and down arrow softkeys to set the month.
8. Press the ENTR softkey to select the year adjustment.
9. Press the ENTR softkey when finished.



Note: The APP card will not allow a manufactured date set to a time after the current APP card date.

As a time saving feature, if battery dates have never been entered into the APP card, it will copy the entry for battery A1 to all batteries if A1 is done first.

When a battery date has been saved, the APP card will create a battery log record recording the date and time of the entry and the battery manufactured date for this battery.

3.0

Operation, continued

3.4

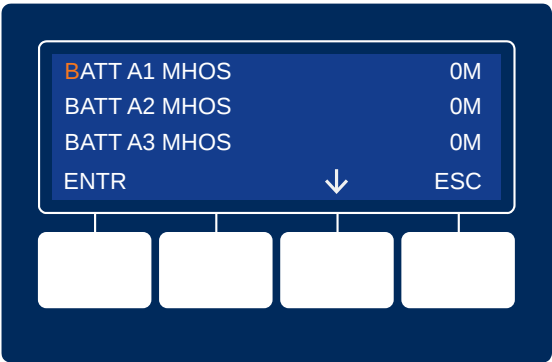
AlphaAPPs Overview, continued

3.4.2

Applications, continued

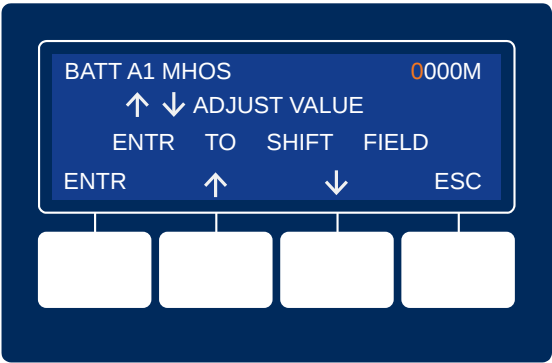
Entering Battery Mhos:

To enter the battery MHOS reading, press the BATT softkey on the XM3 main menu. Next select the BATT CONFIG sub-menu. Scroll the screen using the arrow keys until BATT MHOS appears at the top of the screen. Press the ENTR softkey. The APP card will now take over control of the display and show a list of installed batteries.



Use the softkeys to select the appropriate battery.

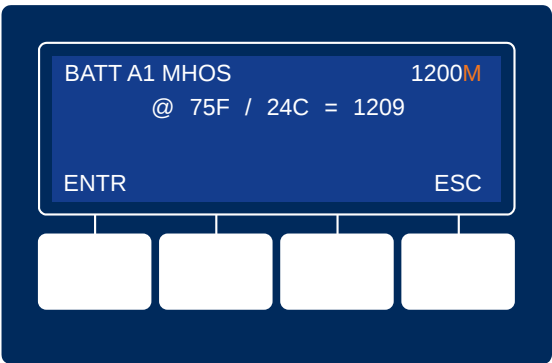
To enter the mhos value, press the ENTR softkey. The following screen will appear.



Use the arrow keys to select the flashing digit value. Press the ENTR softkey to move to the next digit, and so on. When all digits have been entered, the units will flash. The display will show the entered mhos value and the temperature compensated value. The PTS probe temperature is used for temperature compensation.

Press the ENTR softkey one more time to save the value.

Only the temperature compensated value will be logged or displayed from this point forward.



3.0

Operation, continued

3.4

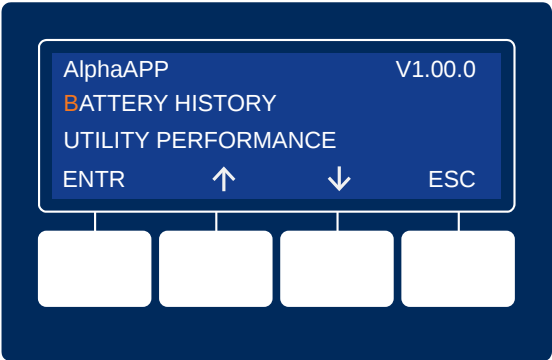
AlphaAPPS Overview, continued

3.4.2

Applications, continued

Battery Log Screen:

To enter the Battery History screen, select the APPS menu from the main XM3 screen. Bypass the Technician ID screen if needed and scroll up or down until BATTERY HISTORY is at the top of the scroll area.

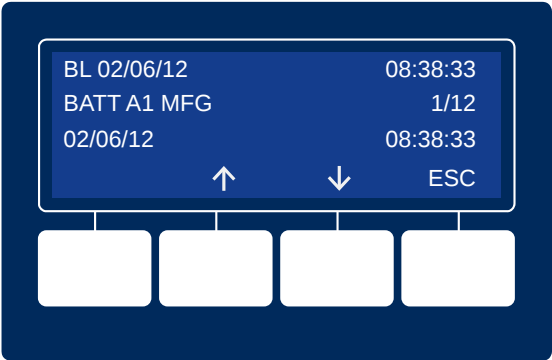


Press ENTR to access the BATTERY HISTORY screen:

The top three lines of the display scroll up and down using the arrow softkeys.

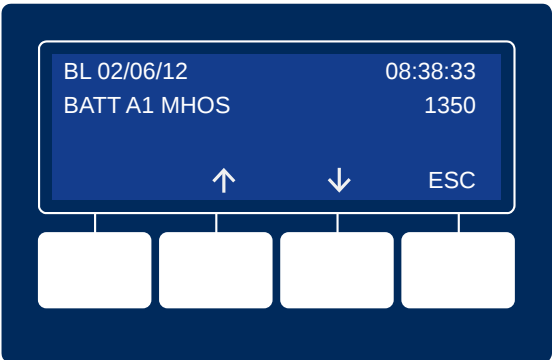
The “BL” in line one indicates the Battery Log. Also in line one is the date and time the record was created.

Line two has the battery name and the manufactured date stored.



There are also battery mhos records stored in the battery log.

The format of the record matches the battery dates record.



3.0

Operation, continued

3.4

AlphaAPPs Overview, continued

3.4.2

Applications, continued

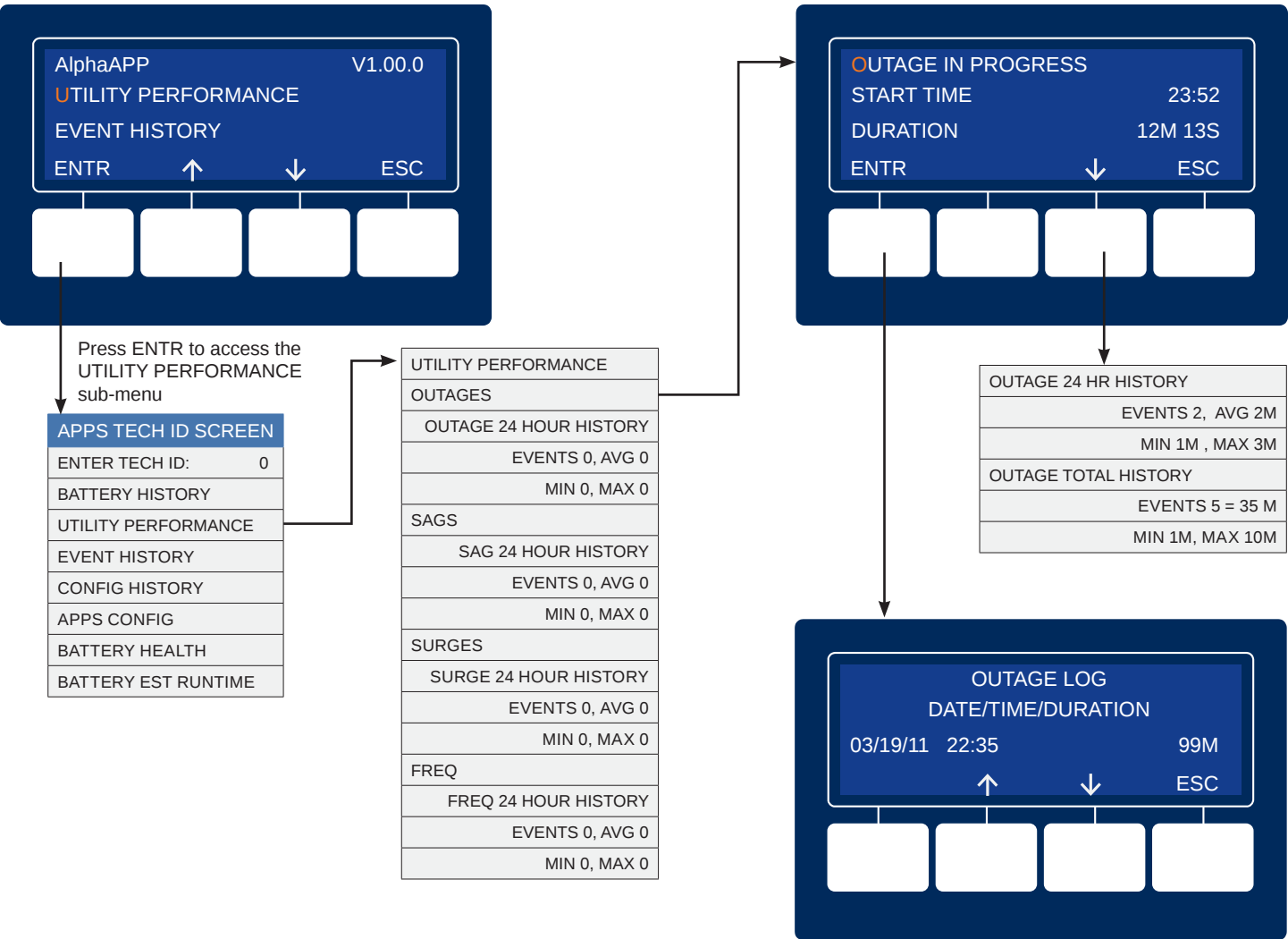
Utility Performance App:

This application monitors the AC line input to the XM3 Power Supply. It detects, displays and logs four types of AC fault conditions:

1. Outage – If the AC input is below a factory set threshold, an outage condition is recorded.
2. Sag – If the AC input exists but is below a factory set threshold, a line sag condition is recorded.
3. Surge – If the AC input exceeds a factory set threshold, a line overvoltage or surge condition is recorded.
4. Frequency – If the AC line frequency exceeds the normally defined operating range, a frequency event is recorded.

Each condition is measured with one second resolution and will not be permanently logged until the event has ended.

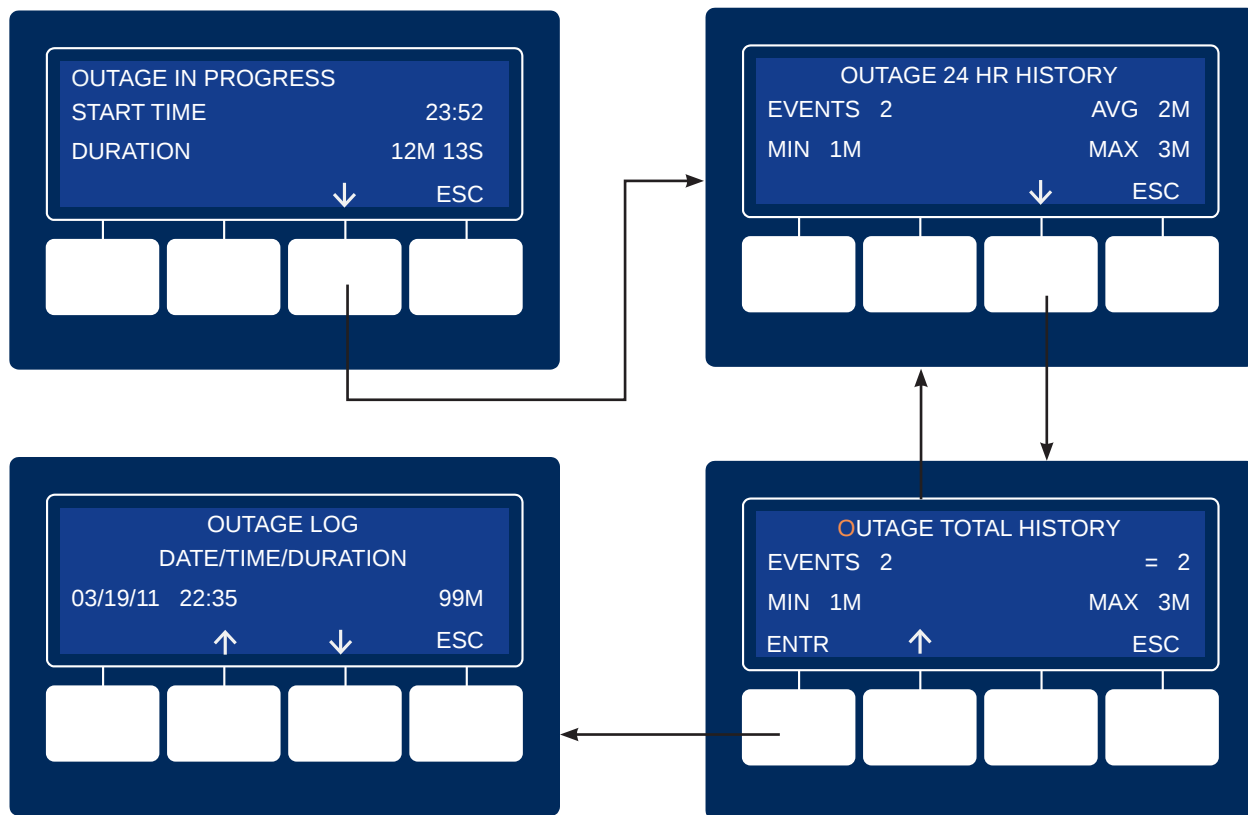
To enter the Utility Performance sub-menu, scroll up or down until UTILITY PERFORMANCE is at the top of the scroll area.



3.0 Operation, continued

3.4 AlphaAPPs Overview, continued

3.4.2 Applications, continued



The top line of the Utility Performance sub-menu does not scroll. It indicates “OK” if there are no utility events active or “EVT” if there are.

Pressing the down arrow scrolls the sub-menu to show SAGS, SURGES and FREQUENCY sub-menu selections. Each of these sub-menus has the same structure as the OUTAGES sub-menu, so only OUTAGES will be shown here.

Press ENTR to select OUTAGES sub-menu. This screen will appear if an Outage is in progress, otherwise the screen below it will appear.

If any previous outages have been logged, the ENTR key will appear and the first character in OUTAGE will flash. Pressing the ENTR displays the Outage Log.

Pressing the up and down arrows displays the various log entries. The last complete Outage logged will be displayed first. Press the down arrow to go back in time.

3.0

Operation, continued

3.4

AlphaAPPs Overview, continued

3.4.2

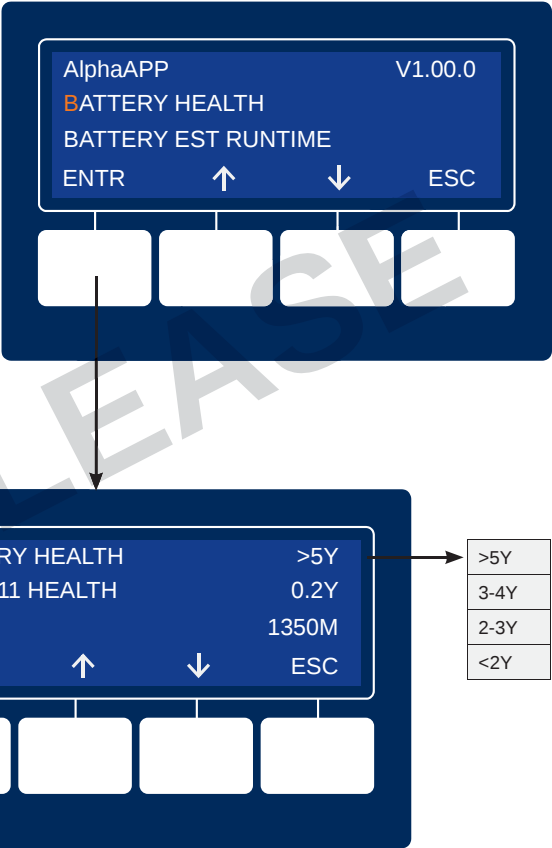
Applications, continued

Battery Health App:

The battery health application uses several factors in determining the remaining life of the batteries. Battery Manufacture date, install date, battery type, and other environmental conditions are key inputs to this algorithm.

To enter the Battery Health sub-menu, scroll up or down until BATTERY HEALTH is at the top of the scroll area.

Press ENTR to access the BATTERY HEALTH sub-menu.



The top line of the BATTERY HEALTH sub-menu does not scroll. It indicates the remaining expected life of the battery set.

The second and third lines scroll together using the up and down arrow keys.

Line two contains the battery number (String A, B, C) and number (1, 2, 3). Battery A1 is the 12V battery on string A. Line two also contains the battery manufactured date and the calendar age of the battery.

Line three contains the date and the temperature compensated MHOS value. The temperature compensated value is computed using the PTS.

3.0 Operation, continued

3.4 AlphaAPPs Overview, continued

3.4.2 Applications, continued

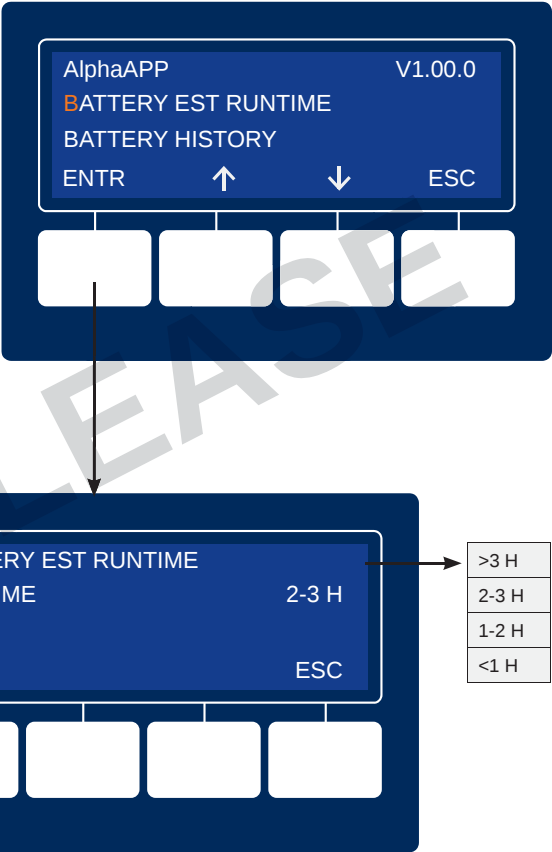
Battery Run Time App:

The battery run time app dynamically computes the amount of standby time remaining in the batteries. It uses the existing capacity of the batteries, the AC load, the power factor and other environmental parameters.

The computed value is sent to the headend automatically. When a Power Supply is first installed, the display will indicate calculating to the headend until the first Self Test is run.

To enter the Battery Runtime sub-menu, scroll up or down until BATTERY EST RUNTIME is at the top of the scroll area.

Press ENTR to access the BATTERY RUNTIME sub-menu.



3.5 Active Alarms

Two LEDs on the Inverter Module indicate the condition and status of the Intelligent CableUPS.

- 1
- The Green Output LED, when lit, indicates the Power Supply is functioning normally and supplying output AC to the load. A flashing output LED indicates that an alarm has been detected. If the Output LED is off, the output is off.
- 2
- The Red Alarm LED flashes to indicate a major alarm has been detected. This state clears when the alarm is no longer present. Under typical operating situations, the red Alarm LED is off. This indicates normal Power Supply operation.

In the event of a failure, the Active Alarm displays which alarms are active and how to correct the alarm condition.

- Press the menu key with ALM indicated above it to see the ACTIVE ALARM list for the selected key.
- Press UP or DOWN to select the alarm of interest.
- Press ENTR to select the alarm and display diagnostic information. Press ESC to return to the alarm list.



1

 OUTPUT LED (green)

2

 ALARM LED (red)

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

Fig. 3-3, Active Alarm Table
(Alarm Conditions exist in the Battery and Communications subsystems)

A Help sub-menu provides possible remedies relating to the active alarm. To access the Active Alarm Help sub-menu, scroll to the alarm of interest and press ENTR. Press either UP or DOWN to scroll through the list of remedies.

Alarms are classified in two categories:

MAJOR Alarms are indications of a serious failure within the Power Supply, such as a loss of output voltage or a failed battery charger. Any situation that causes output failure is considered a Major Alarm. Major alarms require immediate action to correct the failure. To correct Major Alarms, follow the Smart Display on-screen instructions.

MINOR Alarms indicate a less serious failure, such as defective PTS or loss of utility power. Corrective action can be delayed for a short time. To correct, follow the Smart Display on-screen instructions.

The alarm matrices on the following pages indicate the MAJOR/MINOR active alarms, the probable cause, troubleshooting items to check to correct the alarm condition, and whether or not Standby is disabled for that alarm type.

3.5 Active Alarms, continued

3.5.1 Menu Structure/Navigation (from Active Alarms Screen)

Sample alarm screens are shown for PWR, BATT, and COMM menus. Pressing the ENTR soft-key in any of these screens will open the diagnostics screen for the alarm condition shown on the 3rd line of the screen.

The alarm condition will advance to the top of the screen and the second line will scroll through a listing of probable causes. Pressing ENTR will open a diagnostic screen of the suggested fixes.

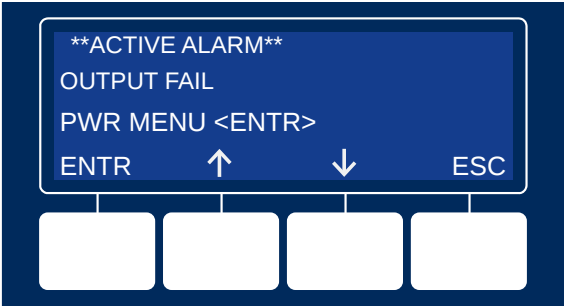


Fig. 3-4, Sample Active Alarm Display, Power Menu

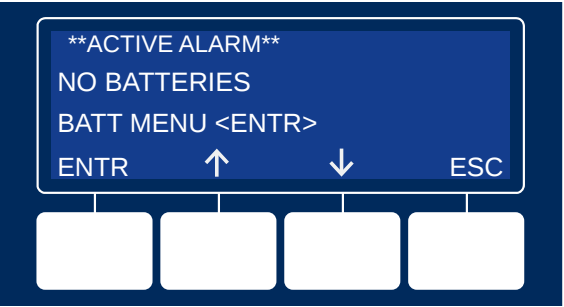


Fig. 3-5, Sample Active Alarm Display, Battery Menu

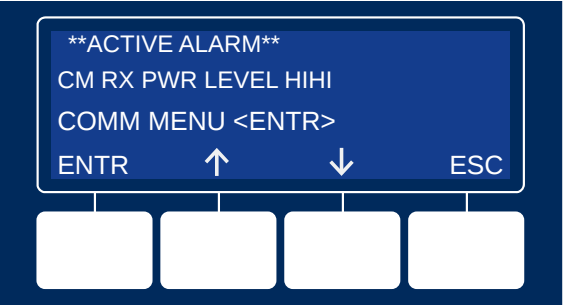


Fig. 3-6, Sample Active Alarm Display, COMM Menu

3.0 Operation, continued

3.5 Active Alarms, continued

3.5.2 Power Alarms

The Alpha XM3-HP CableUPS detects alarms and displays the type of active alarm in the Smart Display screen and the severity of alarm (e.g., Major/Minor) by means of the Inverter Module LEDs (see Fig. 3-4).

Active Alarm	Alarm type	Alarm Category	Probable Cause of Alarm	Corrective action	Standby Disabled
SELF TEST FAIL	Major	PWR	Output voltage failed or batteries less than 1.85V/C during Self Test.	1. Check Batteries 2. Check Inverter	NO
LINE ISOLATION	Major	PWR	Line isolation has failed and Inverter operations are suspended.	1. Replace Power Supply as soon as possible	YES
OUTPUT FAILURE	Major	PWR	The AC output has failed due to a bad Inverter or transformer.	1. Apply load >1.5A 2. Output Overloaded 3. Check Inverter	NO
OUTPUT OVERLOAD	Major	PWR	The output is overloaded or shorted.	1. Output Short Circuit 2. Check Output Current	NO
OUTPUT 1 TRIPPED	Major	PWR	Output 1 AlphaDOC hardware protection mode is engaged and overloaded.	1. Over Current 2. Check Settings	NO
OUTPUT 2 TRIPPED	Major	PWR	Output 2 AlphaDOC hardware protection mode is engaged and overloaded.	1. Over Current 2. Check Settings	NO
CHARGER FAILURE	Major	PWR	Charger has failed to shut down; possible battery over temperature condition exists.	1. Re-seat Inverter 2. Perform Self Test	NO
INVERTER TEMP	Major	PWR	Inverter heat sink has exceeded set temperature. (Stand-by operations suspended until temperature drops to a safe level.	1. Check Inverter 2. Check PDB 3. Check Enclosure Ventilation	NO
CONFIG ERROR	Major	PWR	The Power Supply is improperly configured and operation is suspended until error is corrected.	1. Wrong Input Voltage or Frequency	NO
INVERTER ALARM/ INVERTER FAILED	Major	PWR	No output detected with good batteries for 30 seconds OR inverter is disconnected from PDB.	1. Re-seat Inverter 2. Replace Inverter	YES
INPUT FAILURE	Minor	PWR	Utility AC input has failed.	1. Utility Failure 2. Check Input Breaker 3. Input Connections	NO
INPUT OVER CURR / INPUT CURRENT LIMIT	Minor	PWR	AC Input current exceeds threshold setting.	1. Reduce Output Load 2. Check Input Current Limit Setting	NO
SURGE MOV FAIL	Minor	PWR	The MOV board surge protection has failed and needs to be replaced.	1. Replace MOV board	NO
ALPHADOC OPTION	Minor	PWR	I2C has failed between XM3 and DOC.	1. Check ribbon cable 2. Replace DOC	NO
INVERTER ENABLE	Minor	PWR	System controller has disabled the Inverter	1. Check inverter	YES
CHARGER ENABLE	Minor	PWR	System controller has disabled the charger	1. Check charger	NO
APP OPTION	Minor	PWR	I2C has failed between XM3 and APP.	1. Check ribbon cable 2. Replace APP	NO
INV EEPROM ERROR	Minor	PWR	There has been an error reading the EEPROM on the inverter board.	1. Replace inverter	NO
HW COMPATIBILITY	Minor	PWR	There is a hardware incompatibility between the Main micro board and the inverter board.	1. Check Micro Board 2. Check Inverter Brd	NO
PDB EEPROM ERROR	Minor	PWR	There has been an error reading the EEPROM on the PDB.	1. Replace pwr supply"	NO

3.0 Operation, continued

3.5 Active Alarms, continued

3.5.3 Battery Alarms

The Alpha XM3-HP CableUPS detects a wide array of battery alarms, and displays the type of active alarm in the Smart Display screen and the severity of alarm (e.g., Major/Minor) by means of the Inverter Module LEDs.

Active Alarm	Alarm type	Alarm Category	Probable Cause of Alarm	Corrective action	Standby Disabled
NO BATTERIES	Major	BATT	Detected the absence of batteries (alarm inactive when battery capacity or number of battery strings is set to 0).	1. Check Batt Breaker 2. Check Connections 3. Check Battery Fuse	YES
LOW BATT VOLTS	Major	BATT	Battery voltages below 1.833V/cell	1. Check AC Input 2. Restore AC Input 3. Connect Generator	NO
HIGH BATT VOLTS	Major	BATT	Battery voltages above 4.5V over target charger voltage	1. Check Batteries 2. Replace Inverter	NO
BATTERY EOD	Major	BATT	Batteries dropped below the low voltage shutdown level	1. Low Battery Disconnect	YES
BATTERY FAIL	Major	BATT	Charge current > 5.0A for 7 days while in float mode	1. Check Batteries 2. Replace Batteries	NO
BATT TEMP PROBE	Minor	BATT	Precision Temperature Sensor (PTS) failed or is not installed.	1. Check Connection 2. Replace Sensor	NO
REFRESH/BATT REFRESH ALARM	Minor	BATT	Battery Temperature Exceeded 60°C	1. Check Charger Settings 2. Check Batteries 3. Check Battery Temperature	NO
SAG OPTION	Minor	BATT	I2C has failed between XM3 and SAG.	1. CHECK RIBBON CABLE 2. REPLACE SAG"	NO
SAG DELTA MEAN	Minor	BATT	Battery voltage is either too high or low from mean	1. CHECK BATTERIES 2. REPLACE BATTERIES"	NO
SAG RELAY STUCK	Minor	BATT	Relay has stuck or 36V or 0V wire is no longer connected	1. CHK SAG WIRES BAT 2. CHK SAG WIRES UNIT 3. REPLACE SAG"	NO
STR X MISWIRED	Minor	BATT	Battery wires are not connected properly	1. CHK SAG WIRES BAT 2. CHK SAG WIRES UNIT 3. REPLACE SAG WIRES"	NO
SAG NOT CALIBRAT	Minor	BATT	Calibration data is not or is no longer available	1. REPLACE SAG"	NO
X BAL STAGE	Minor	BATT	Stage 0 and 1 are normal. Stage 2 shows that the batteries are not of similar capacity. Stage 3-5 trigger check battery alarm to show that there is a major capacity imbalance	1. CHECK BATTERIES 2. REPLACE BATTERIES"	NO
SAG NO HARNESS	Minor	BATT	Battery wires are not connected properly	1. CHK SAG WIRES BAT 2. CHK SAG WIRES UNIT 3. REPLACE SAG WIRES"	NO

Table 3-3, Battery Alarms: Classifications, Causes and Corrections

If desired, the No Battery alarm can be disabled by changing the Number of Battery Strings or Battery Capacity to "0" in the setup menu.

ATTENTION:

Setting the number of strings or capacity to zero will disable the inverter, and the unit will no longer have back up capability. At the time batteries are installed, verify the battery capacity is set to match the number of battery strings installed to enable battery charger and allow the XM3 to go into Self Test and Standby.

3.0 Operation, continued

3.5 Active Alarms, continued

3.5.4 COMM Alarms

The Alpha XM3-HP CableUPS detects a wide array of communication alarms and displays the type of active alarm in the Smart Display screen and the severity of alarm (e.g., Major/Minor) by means of the Inverter Module LEDs.

Active Alarm	Alarm type	Alarm Category	Probable Cause of Alarm	Corrective action	Standby Disabled
DNSTRM POWER FAULT	Minor	COMM	RF receive level above HMS "hi" threshold or below HMS "lo" threshold	1. Check attenuation 2. Adjust RF padding	NO

Table 3-4, COMM Alarms: Classifications, Causes and Corrections

3.6 Smart Display Glossary

Battery Capacity: The capacity of the battery strings attached to a particular Intelligent CableUPS. When batteries are not attached, the setting must be programmed to "0." This disables standby operations, including test mode and disables the No Batteries Alarm. If batteries are attached, then this setting should be programmed to the rating of each battery.

Battery Model: The AlphaCell battery type can be specified in the Smart Display (if not AlphaCell, leave as default battery type, Other). If AlphaCell is selected, parameters for **Accept, Float, Temp, Comp and Battery Capacity** are automatically selected. If Other, these parameters will need to be manually set to the manufacturer's recommended rating.



NOTE:

If the Power Supply is used in a non-standby application, the Battery Capacity variable must be programmed to "0" to disable the battery maintenance cycle portion of a Self Test.

Charger Accept Voltage: Battery Accept charge voltage control in volts per cell. This voltage, 2.40VDC (adjustable for OTHER battery types) per cell, is temperature compensated to ensure longer battery life. It properly completes the charge cycle and is factory set for AlphaCell batteries. If another manufacturer's batteries are used, consult the battery manufacturer for Accept voltage levels.

Charger Float Voltage: Battery Float charge voltage control in volts per cell. The average is approximately 2.27VDC (adjustable for OTHER battery types) per cell. It is factory set for AlphaCell batteries. If another manufacturer's batteries are used, consult the battery manufacturer for Float voltage levels.

Charger Temperature Compensation: Battery charger temperature compensation control. Programming this parameter to "0.0" disables temperature compensation. It is factory set for AlphaCell batteries (5mV/cell). If another manufacturer's batteries are used, consult the battery manufacturer for Charger Temperature compensation ranges.

Device Address: The Power Supply must have a unique address to communicate with a system controller. The system controller uses the address as an identifier to query the Power Supply for information. Each Power Supply on the same communications bus must be identified with a value between 1 and 7.



NOTE:

The device address does not reset to 1 when factory defaults are reset.

End of Battery Discharge (EOD): The point at which the batteries are fully discharged (default 1.75V/C — GXL Series or "Other" batteries or 1.70V/C — HP Series batteries; 18 cells for 36V inverter) and the Power Supply shuts off, preventing permanent damage to the batteries.

Frequency Range Limit (setting may be increased when powering with AC Generator): AC input voltage frequency range limit. This limit establishes the acceptable input frequency range outside of which standby operation is initiated.

3.6 Smart Display Glossary, continued

Output 1 Overcurrent Trip level — Primary leg: Value of RMS current that causes an overcurrent trip on the Output 1 protection relay after a specified delay. This limit is linked to counter data item Overcurrent Tolerance Period. This parameter is only visible when the Protective Interface Module (AlphaDOC) is attached.

Output 2 Overcurrent Trip level — Secondary leg: Value of RMS current that causes an overcurrent trip on the Output 2 protection relay after a specified delay. This limit is linked to counter data item Overcurrent Tolerances Period. This parameter is only visible when the optional AlphaDOC is attached.

Output Voltage Regulation Mode: The XM3 will be able to function in 2 modes of output voltage regulation: Fine and Coarse. When operating in Fine mode, the unit will maintain the tightest output voltage regulation possible. When set to fine mode the unit will automatically adjust to and from Coarse mode temporarily if a) The unit switches to inverter because of high/low line more than 2 times in a 60 day period or b) the unit switches tap relays more than 60 times in a 60 day period. The unit will then automatically adjust back to Fine mode if there are less than 2 inverter transfers for high/low line and less than 15 output tap switches in a 60 day period. When operating in Coarse regulation - Wider output voltage regulation window - Switches taps as few times as possible. Will never automatically adjust once it is selected. Both of these modes are user selectable in the PWR CNFG Menu.

Set Defaults: When programmed to YES, the programmable data levels (with the exception of Last Standby Time, Total Standby Time, Standby Events, Device Address, Total Run Time, Battery Type and Language) are reset to the original factory settings.

Self Test: When programmed to YES, the Power Supply automatically starts a Self Test.

Standby Events: A standby events counter. This does not include Self Test events. Use the Setup Menu to reset Standby Events to zero.

Standby Total: The total amount of time the Power Supply has operated in standby mode. This does not include Self Test time and represents the sum total number of minutes of AC line failure since the last time the counter was reset. Use the Setup Menu to reset Standby Time to zero.

**NOTE:**

Resetting factory defaults does not clear Standby Events or Standby Total.

Test Countdown: The number of days remaining before the next scheduled automatic Self Test initiates. This variable is programmable and you can select the day the autotest sequence will begin. This counter has no effect if test interval is set to 0.

Test Duration: Automatic Self Test duration timer. This sets the number of minutes of a battery maintenance cycle test. This timer applies to automatically or manually initiated tests.

Test Inhibit: Becomes active when programmed by the operator (or when the unit runs in inverter mode for more than 5 minutes). The Power Supply delays the start of a scheduled Self Test for seven days if the test countdown is less than seven days (See Section 3.7, Automatic Performance Test for complete details).

Test Interval: Automatic Self Test control timer. The number of days between battery maintenance cycle tests. Set this value to zero to disable automatic Self Test.

Total Run Time: The amount of time (in days) the Power Supply has functioned in any mode of operation. This is not a resettable value.

3.7 Automatic Performance Test

Automatic Self Test: An automatic Self Test is periodically performed to verify the state of the batteries and the inverter circuitry. The automatic test feature has several programmable parameters that determine the frequency and duration of automatic tests. A running test may be halted manually by pressing the TEST button a second time.

The automatic test feature is on by default. To turn auto-test off, change Test Interval to 0 days in the Setup Menu. Auto-test may be enabled at any time by changing the test interval to any numerical value (excluding "0"). The default test interval is 30 days.

The test sequence process:

- Begins with a check to verify the batteries are attached and the battery circuit breaker is closed. If the batteries are discharged or not connected, the Power Supply does not attempt to operate in inverter mode, preventing a drop of the load.
- Next, the Power Supply switches to standby mode for a pre-programmed period. Successful completion of a test sequence indicates the unit is operating normally in standby mode, the battery voltage did not drop below a preset threshold and the output was stable throughout the test. Failure of test is indicated by a Self Test Fail alarm, which can be cleared by subsequently running a successful test for at least one minute.

Test Control: In addition to automatic testing, the operator can manually initiate a Self Test. A running test may be halted at any time by pressing the Self Test switch on the front panel (below the OUTPUT and ALARM LEDS on the Inverter Module) or from the PWR CONFIG menu. A Self Test may also be initiated via the status monitoring card.

To prevent an automatic test scheduled to occur in the next week, issue a Test Inhibit command. This command is useful if periodic maintenance of the Power Supply is scheduled close to the next scheduled automatic test.

This control feature may also be used when inclement weather is expected that might cause a utility failure. The Test Inhibit command only affects an automatic test scheduled to run in the next seven days. Multiple issues of the Test Inhibit command result in the deferral of the next automatic test until at least seven days after the last request. This command has no effect if an automatic test is not scheduled to take place in the next week. Starting a test manually overrides the Test Inhibit command.

3.8 Providing Power via Portable Generator or Inverter

In the event of an extended utility failure, an external AC or DC Power Supply can provide backup power to the system. This backup power enables the Power Supply to continue charging the batteries ensuring interrupted service to the network. Follow the documentation and connection procedures listed below.

3.8.1 DC Powering

The AlphaGen Portable Generator provides a convenient method of providing backup DC power. Upon the loss of commercial AC power, the existing battery strings immediately supply voltage to the Inverter Module. After some point of battery discharge, a portable generator can be deployed to the site to supply power to the DC bus. For complete connection and operation information of the AlphaGen Portable Generator, refer its operator's manual (Alpha P/N 041-028-B0).

3.8.2 AC Powering

Should it become necessary to power the CATV system with a portable AC generator, truck-mounted AC generator or truck-mounted inverter, follow the procedures below for the protection of service personnel and powering system equipment.

Connection Procedure:

1. Read the Smart Display to determine if there is output power to the system. If there is still power to the system, check the battery voltage on the Smart Display:
 - If the battery voltage is greater than 34.5VDC (36VDC-battery system), then approximately one hour remains to complete the changeover to generator power before the cable system loses power to its customers.
 - If the battery voltage is less than the previous numbers, move rapidly as there is not much time until the system fails. However, exercise caution as there are dangerous voltages in the system that can shock you or damage the cable amplifiers.
2. Verify the AC Input breaker from the utility powering system is in the OFF position. This ensures that if power returns suddenly, you will not experience a surge in power. This also ensures when the generator is connected it will not put AC voltage back onto the power lines.
3. Properly ground the generator by connecting a #6 AWG wire from the grounding lug on the output panel of the generator to either a driven ground rod or the strand ground on the pole to which the Power Supply is mounted. If working with a ground-mounted Power Supply, locate the grounding point inside the enclosure and clamp on to that point.



CAUTION!

Grounding the generator is *mandatory* for safety and for proper operation of the Power Supply.

3.0 Operation, continued

3.8 Providing Power via Portable Generator or Inverter, continued

3.8.2 AC Powering, continued

4. After the generator is properly grounded, unplug the Power Supply from the convenience outlet inside the enclosure and plug the Power Supply input cable into the generator output. Use an outdoor rated approved extension cord. Recommend min 12 AWG for 120V, 14AWG for 240V installations.
5. Start and operate the generator according to the generator operation manual.
6. If the generator kilowatt rating is twice the kilowatts used by the Power Supply indicated on the Smart Display, leave the battery breaker on and the generator will charge the batteries. If the generator fails, the Power Supply will continue to provide battery backup. If the generator output is not approximately twice the kilowatt rating indicated on the Smart Display, switch the battery breaker off to reduce the load on the generator if battery backup of the system is unavailable.
7. In either case, after the power from the generator is applied to the Power Supply, use the Smart Display to increase the Frequency Input Tolerance to $\pm 6\text{Hz}$ from the normal $\pm 3\text{Hz}$, inhibiting the Power Supply from switching to battery backup if the generator occasionally does not operate on the proper frequency. It is not uncommon for smaller (4 kilowatt or less) sized generators to get "off frequency" due to the step loading of the Power Supply.



WARNING!

Ground the vehicle before operating a truck inverter or truck-mounted generator. Failure to do so places service personnel at risk for electric shock.

3.8.3 Using a Truck-mounted Inverter or Generator

To use a truck-mounted inverter or generator, follow the steps listed in Section 3.8.2 with the additional step of grounding the truck. Run the ground wire from an unpainted point on the truck chassis to either a driven ground rod or strand ground to complete the grounding circuit. The rubber tires on the truck insulate it from being grounded in all but the most exceptional circumstances.

3.9 Resumption of Utility Power



WARNING!

Use caution when disconnecting and reconnecting a generator to utility power. Dangerous voltages are present.



CAUTION!

Exercise care to ensure that both powering systems are **not** connected at the same time or damage to the Power Supply and the generator may result.

1. Before turning on the AC voltage input breaker, use a voltmeter to verify the input voltage is within specifications.
2. When the proper voltage is present, verify the battery voltage indicated on the Smart Display is greater than 31.5VDC (in a 36VDC battery system). Disconnect the Power Supply from the generator output and plug the Power Supply input cord into the convenience outlet within the enclosure. The Power Supply operates on battery backup for this short period of time, but exercise caution during this changeover as the grounding circuit to the Power Supply is broken.

If the batteries are at or below the low voltage cutoff, then the Power Supply will NOT transfer to battery back up and there will be a momentary power outage to the cable system while you make this changeover.

Turn on the AC input power.

Shut down the generator and remove the grounding system.

A routine maintenance program, performed every three to six months, ensures the Intelligent CableUPS will provide years of trouble-free operation.

Good battery care is the first step in any Power Supply maintenance program. In addition to voltage checks, visually inspect the batteries for signs of cracking, leaking or swelling.

To aid in quick identification and tracking of voltages in the maintenance log, number the batteries inside the enclosure using labels or masking tape. Batteries are temperature sensitive and susceptible to overcharging and undercharging. Since batteries behave differently in the winter than in the summer, Alpha's battery chargers automatically compensate for changes in temperature by adjusting float and accept charge voltages.



CAUTION!

- The Power Supply must be serviced by qualified personnel.
- Use heavy gloves when handling a unit that has recently been taken out of service. The ferroresonant transformer generates heat that may cause burns if handled with bare hands.
- Alpha Technologies is not responsible for battery damage due to improper charger voltage settings. Consult the battery manufacturer for correct charger voltage requirements.
- When removing batteries, ALWAYS switch the battery breaker off before unplugging the battery connector.
- Always wear safety glasses when working with batteries.

4.0 Maintenance

4.1 Safety Precautions

- Only qualified personnel should service the Power Supply.
- Verify the voltage requirements of the equipment to be protected (load), the AC input voltage to the Power Supply (line) and the output voltage of the system prior to installation.
- Equip the utility service panel with a properly rated circuit breaker for use with this Power Supply.
- When connecting the load, DO NOT exceed the output rating of the Power Supply.
- Always use proper lifting techniques whenever handling units, modules or batteries.
- The Power Supply contains more than one live circuit! Even though AC voltage is not present at the input, voltage may still be present at the output.
- The battery string, which provides backup power, contains dangerous voltages. Only qualified personnel should inspect or replace batteries.
- In the event of a short-circuit, batteries present a risk of electrical shock and burns from high current. Observe proper safety precautions.
- Do not allow live battery wires to contact the enclosure chassis. Shorting battery wires can result in a fire or possible explosion.
- This Power Supply has been investigated by regulatory authorities for use in various Alpha enclosures. If you are using a non-Alpha enclosure, it is your responsibility to ensure your combination conforms to your local regulatory requirements and the Power Supply remains within its environmental specifications.

4.2 Required Tools and Equipment

Prior to beginning maintenance, ensure that all required tools and equipment, including safety equipment, is available and functional.

The following is a list of the minimum equipment required to maintain and troubleshoot the XM3 Power Supply system and batteries:

- Digital voltmeter
- Socket wrenches, insulated
- Box end wrenches, insulated
- Torque wrench calibrated in inch/lbs
- Rubber gloves
- Full face shield
- Safety glasses
- Plastic apron
- Portable eyewash
- Spill kit, including sodium bicarbonate solution
- Fire extinguisher
- Service Power Supply
 - True RMS Volt Meter with DC Amp Clamp
 - Midtronics Conductance Meter
- Optional equipment, depending on the type of maintenance being performed, includes:
 - 100 amp momentary load test set
 - System load bank (DC if to be performed at the battery and AC if to be performed by loading a Power Supply output— contact your Alpha Sales Representative for purchasing information).
 - No-Ox Corrosion Inhibitor
 - Paper towels and/or rags

4.3 Power Supply System Maintenance

4.3.1 Preparing for Maintenance

The Power Supply system should be remotely monitored and physically inspected periodically. If the system has an automatic monitoring system to gather the electrical and environmental data, the remote checks should consist of evaluating the recorded data and visiting any site that does not meet the specifications listed in the detailed procedures below.

Notify anyone affected by the intended maintenance or troubleshooting activity. This should include but not be limited to anyone responsible for the status monitoring equipment at the headend or NOC.

4.3.2 Periodic Maintenance Tasks

4.3.2.1 Remote Status Monitoring of Power Supply Monthly Self Test

The following maintenance procedure requires a fully functional status monitoring system capable of remotely measuring and recording the following data from a Self Test:

Self Test Result
Percent Load
Output Voltage

Procedure:

1. If Self Test fails a site visit is required
2. If the Power Supply percentage load is above 100% a site visit is required
3. If Output voltage is below 84.5V for 89V units or 59V for 63V units a site visit is required.

4.3.2.2 On-Site Power Supply Preventive Maintenance



CAUTION!

Ensure personal preventive equipment (including rubber gloves, plastic apron, safety glasses, and face shield) is worn prior to proceeding.

Procedure:

1. **Exterior site inspection**
 - a. Inspect Power Supply pedestal security and condition.
 - b. Inspect cabinet for integrity (securely mounted, service meter and conduit integrity, etc).
 - c. Check all locks and hinges for proper operation and lubricate if necessary.
 - d. Inspect integrity of ground wire and ground rod. Ensure wire is of acceptable gauge and proper connections are tight at both ends, meeting NEC or Local Authority specs.
2. **Interior Cabinet inspection**
 - a. Remove any dust, debris, or rodent signs from enclosure, louvers or vents. If enclosure has filters, clean with compressed air or leaf blower.
 - b. Check all interior locks, hinges and battery slide trays for proper operation and lubricate if necessary.
 - c. Verify that SPI (ALT Box) is tight along with coaxial connection, ensuring that Power Supply and sheath of coax is grounded.
 - d. Verify that Power Supply has a Surge Arrestor that is in working condition. Replace the unit as needed.
3. **Power Supply component inspection**
 - a. Before physical inspection of the Power Supply, verify normal operation on the XM3 Smart Display. Clear all Active Alarms before proceeding.
 - b. Check physical condition of Power Supply; remove any dust or debris built up in or around openings.
 - c. Inspect all cabling and connections of the Power Supply system (see Fig. 4-1). Verify that all cabling is intact and all connectors are properly seated; resolve as needed.

4.0 Maintenance, continued

4.3 Power Supply System Maintenance, continued

4.3.2 Periodic Maintenance Tasks, continued

4.3.2.2 On-Site Power Supply Preventive Maintenance, continued

- | | |
|---|--|
| 1 Battery Connector to Inverter | 8 AlphaDOC Dual Output Connectors |
| 2 Precision Temperature Sensor (PTS) | 9 Local Remote Indicator (LRI) |
| 3 Negative Terminal to Center Battery and PTS | 10 LRI Connection to Power Supply |
| 4 Smart AlphaGuard Harness | 11 DSM3 Battery Sense Harness connection point |
| 5 Positive Battery Terminals to Smart AlphaGuard (3, Red) | 12 RF Connector/DSM3 |
| 6 Negative Battery Terminal (1, Black) | 13 Tamper Switch |
| 7 APPs Card | 14 DSM3 Tamper Switch Connector |



Fig. 4-1, XM3-HP System Components

4.0 Maintenance, continued

4.3 Power Supply System Maintenance, continued

4.3.2 Periodic Maintenance Tasks, continued

4.3.2.2 On-Site Power Supply Preventive Maintenance, continued

4. Inspect Inverter Module



CAUTION!

ALWAYS switch the battery breaker off before removing or installing the Inverter Module assembly.



NOTE:

Whenever the battery breaker is turned off or the batteries are not connected, the CableUPS automatically reports a No Battery alarm. This is a built in safety feature. The unit does not attempt inverter operations, either standby or test, during a No Battery alarm.



NOTE:

You can remove the Inverter Module assembly while the Power Supply is running on line power. The Power Supply will continue to operate as a non-standby regulated Power Supply

- a. Carefully remove the Inverter Module assembly.
 1. Shut off battery circuit breaker and disconnect the 36V battery cable from the Inverter Module.
 2. Disconnect the LRI and temp probe cables from the Inverter Module and the TMPR and XPDR cables from the communication module.
 3. Loosen the thumbscrews.
 4. Grasp tab at base of Communications Module sheet metal and pull Inverter Module from the Power Supply.
- b. Verify Output voltage remains with volt meter.
- c. Inspect the Inverter Module for signs of dust or corrosion.
- d. Reinstall the Inverter Module (reverse removal procedure) and test the Power Supply for proper operation.
 1. Turn off the utility input breaker to remove input power. The Power Supply goes into standby operation.
 2. Verify on the Smart Display that there is no interruption to the output.
 3. After five minutes reapply utility power. The Power Supply then transfers back to Operation Normal, clears any alarms and starts the battery charger (BULK, if needed.) This test adds standby events and time to the event counter.

5. Record the following data from the XM3 Smart Display and record in the XM3 system maintenance log:

Operational Data:

Output 1 Voltage

Output 2 Voltage (if AlphaDOC installed)

Output 1 Current

Output 2 Current (if AlphaDOC installed)

Input Voltage

Standby Events

Total Standby Time

Input Watts

Output Watts

PTS Reading

Outside Ambient

4.4 Battery Maintenance



WARNING!

Lead-acid batteries contain dangerous voltages, currents, and corrosive material. Battery installation, maintenance, service, and replacement must only be performed by authorized personnel.

4.4.1 Battery Notes

- Always refer to the battery manufacturer's recommendation for selecting correct FLOAT, ACCEPT and REFRESH charge voltages and REST Mode setting. Failure to do so can damage the batteries.
- Batteries are temperature sensitive. During extremely cold conditions, a battery's charge acceptance is reduced and requires a higher charge voltage; during extremely hot conditions, a battery's charge acceptance is increased and requires a lower charge voltage. To compensate for changes in temperature, the battery charger used in the Power Supply is temperature compensating.
- If the batteries appear to be overcharged or undercharged, first check for defective batteries and then verify the correct charger voltage settings.
- During preventive maintenance, check battery terminals and connecting wires. Clean battery terminal connectors and ensure torque is tightened (torque specifications are listed on the top of the battery). Spray the terminals with an approved battery terminal coating such as NO-OX.
- If installed, disconnect the Smart AlphaGuard prior to measuring battery voltage.
- Refer to the battery manufacturer's recommendation for correct charger voltages and the Power Supply operation manual for corresponding charger settings.
- Number the batteries (3,2,1 left to right as shown in the Installation Procedure) inside the enclosure for easy identification (refer to the appropriate enclosure installation guide).
- Establish and maintain a battery maintenance log.
- If batteries are being stored prior to installation, recharge per manufacturer's specifications to ensure optimum performance and maximum battery service life.
- XM3 has a refresh "boost charge" feature specifically designed to deal with a battery coming out of storage. See section 1.2.3 for instructions on initiating REFRESH Mode.

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.2 Battery Maintenance Guidelines

For optimal performance, inspect batteries periodically for:

- **Signs of battery cracking, leaking or swelling.** The battery should be replaced immediately by authorized personnel using a battery of the identical type and rating (*match conductance, voltages, and date codes as specified in this document*).
- **Signs of battery cable damage.** Battery cable should be replaced immediately by authorized personnel using replacement parts specified by vendor.
- **Loose battery connection hardware.** Refer to documentation for the correct torque and connection hardware for the application.
- Do not attempt to remove the vents (valves) from the AlphaCell GXL or AlphaCell HP battery or add water. This is a safety hazard and voids the warranty.
- Apply NO-OX grease on all exposed connections.
- When necessary, clean up any spilled electrolyte in accordance with all federal, state, and local regulations or codes.
- Follow approved storage instructions.
- Always replace batteries with those of an identical type and rating. Do not charge batteries in a sealed container. Each individual battery should have at least 1/2 inch of space between it and all surrounding surfaces to allow for convection cooling.
- All battery compartments must have adequate ventilation to prevent an accumulation of potentially dangerous gas. ***Never place batteries in a sealed enclosure.*** Exercise caution when maintaining and collecting data on the battery system.

4.4.3 Disposal, Recycling and Storage Instructions

- Spent or damaged batteries are considered environmentally unsafe as they contain lead and dilute sulfuric acid. They should not be "thrown away" with common refuse.
- Always recycle used batteries in accordance with federal, state, provincial, and local regulations. The Alpha Group provides recycling services. Call 800 863 3930 or contact your local Alpha representative.
- All lead acid batteries experience self-discharge while in open circuit storage. This causes circuit voltage and capacity to decrease (see Fig.4-2), especially over long periods of time at higher temperatures. Storage of the batteries in the shaded area of Fig. 4-2 is not recommended.

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.3 Disposal, Recycling and Storage Instructions, continued

During storage please note:

- The self-discharge rate is related to ambient temperature. The lower the temperature, the less the discharge. Batteries should be stored in a clean, ventilated, and dry location with an ambient temperature of 32°F to 68°F (0°C to 20°C).
- It is important to track open circuit voltage which is related to the density of the electrolyte. If the open circuit voltage is lower than 12.6V or the batteries have been stored beyond the limits shown in Fig. 4-2, the batteries should be charged to avoid damage caused by self-discharge.
- All batteries should be fully charged before storage. Record the storage date and next supplemental charge date in a maintenance record and on the battery.
- Upon battery deployment, verify all batteries within each string measure in the range of +/- 0.3VDC of the string average.



NOTE:

The product warranty is void if the batteries are not stored and recharged in accordance with these guidelines.

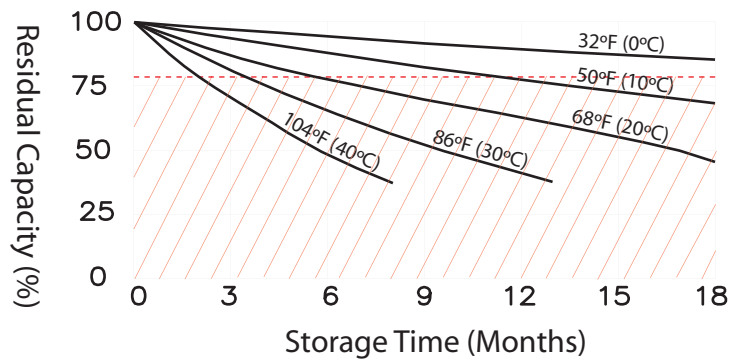


Fig. 4-2, Capacity vs. Storage Time for AlphaCell GXL

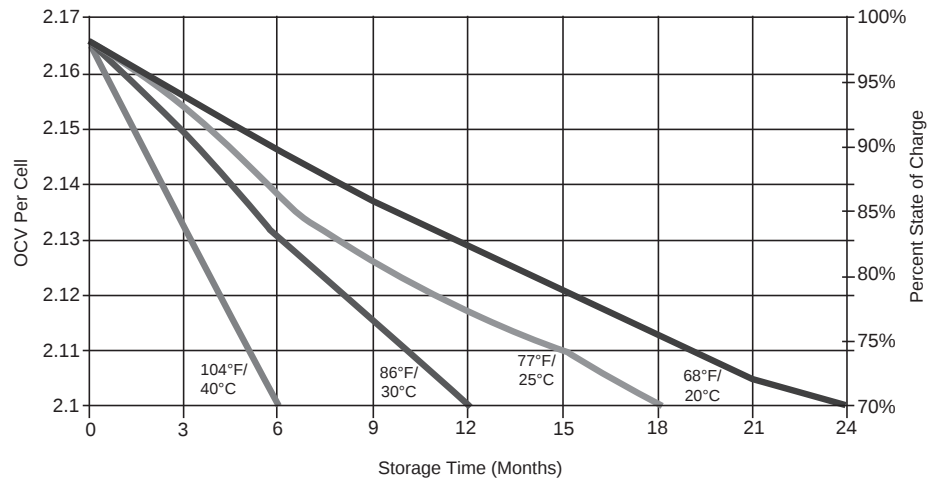


Fig. 4-3, Capacity vs. Storage Time for AlphaCell HP

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.4 Capacity

The actual capacity is related to the utilization ratio of the active positive and negative materials within the battery. The utilization ratio is influenced by the depth of discharge, the structure of the battery, and the manufacturing technology. During normal usage, the factors that influence the actual capacity are discharge rate, depth of discharge, end voltage, and temperature.

- The higher the discharge rate, the lower the available capacity.
- As batteries get colder, the available capacity is reduced (See Fig. 4-3). This is related to the kinetics of the electrochemical reactions and the resistivity of the electrolyte.



NOTE:

Although the battery can be operated at temperatures below -4°F (-20°C), the capacity and ability to discharge will be dramatically decreased. Similarly, temperatures approaching 122°F (50°C) will increase electrolyte loss and corrosion of the plates, resulting in a shorter battery life.

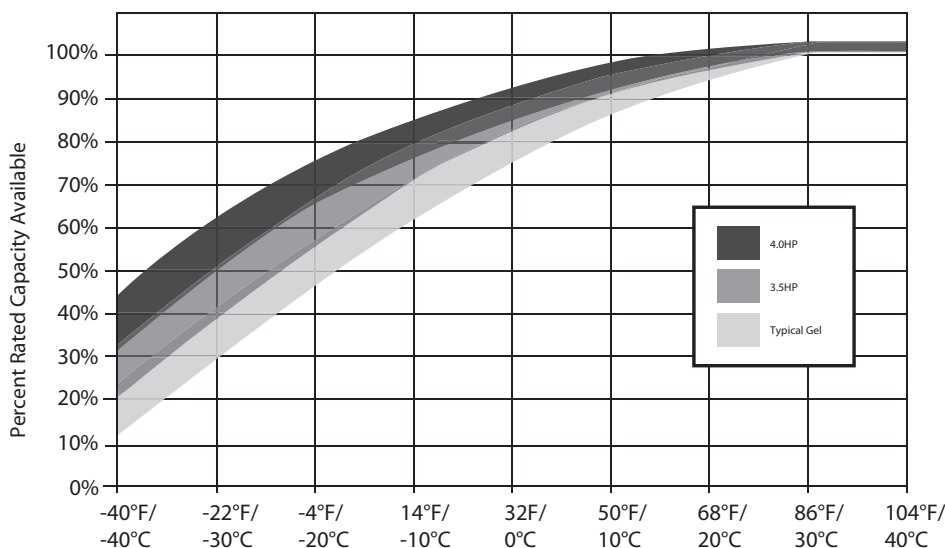


Fig. 4-4, Available Capacity vs. Ambient Temperature

4.4.5 Preparing for Maintenance

The battery system should be remotely monitored and physically inspected periodically. If the battery system has an automatic monitoring system to gather the electrical and environmental data, the remote checks should consist of evaluating the recorded data and visiting any site that does not meet the specifications listed in the detailed procedures below.

You do not have to measure the electrolyte specific gravity or add water to the cells.

All batteries in the string should be numbered to facilitate recording and analysis of data unique to each unit.

Notify anyone affected by the intended maintenance or troubleshooting activity. This should include but not be limited to anyone responsible for the status monitoring equipment at the head-end or NOC.

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.6 Periodic Maintenance Tasks

4.4.6.1 Remote Status Monitoring

The following maintenance procedure requires a fully functional status monitoring system capable of remotely measuring and recording the following data:

- Battery Temperature
- Individual Battery Voltage
- Total Battery String Voltage

Please note: If status monitoring is not available these checks need to be made during the onsite visit and any batteries not meeting the minimum requirement must be addressed at such time.

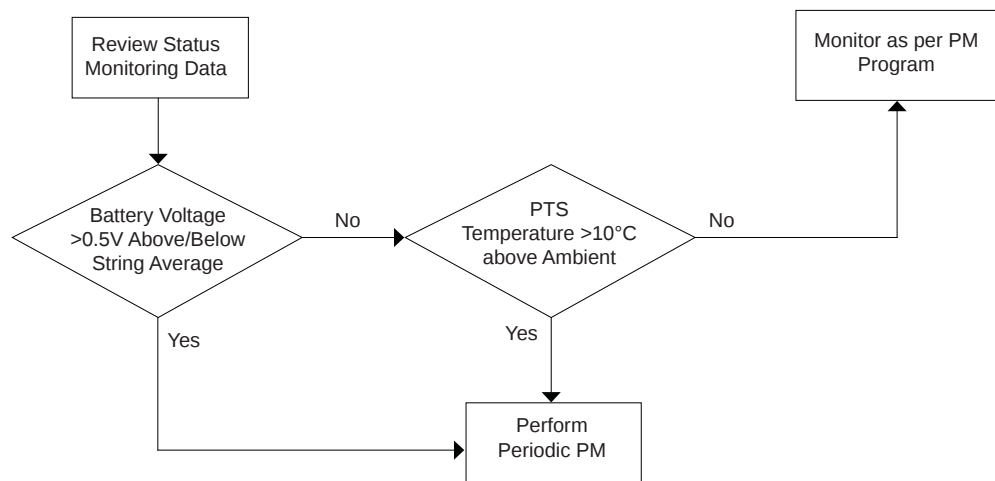


Fig. 4-5, Flow Chart for Remote Status Monitoring

Procedure

1. If any individual battery voltage varies more than 0.5V above or below the average for the string then a site visit is required.

Example V1 = 13V, V2 = 13V, V3=14V

Average voltage = 13.3V

If V3 greater than average by 0.5V, then a site visit is required

2. If the PTS temperature is greater than 10 degrees C above the current regional ambient temperature then a site visit is required.
3. Prioritize site visits based on highest PTS temperatures and battery voltages.
4. Visit the site periodically and remedy the problem by replacing the bad battery or batteries and reset maintenance schedule.

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.6 Periodic Maintenance Tasks, continued

4.4.6.2 On-Site Battery Preventive Maintenance

Required Equipment

- True RMS Volt Meter with DC Amp Clamp
- Midtronics Conductance Battery Tester

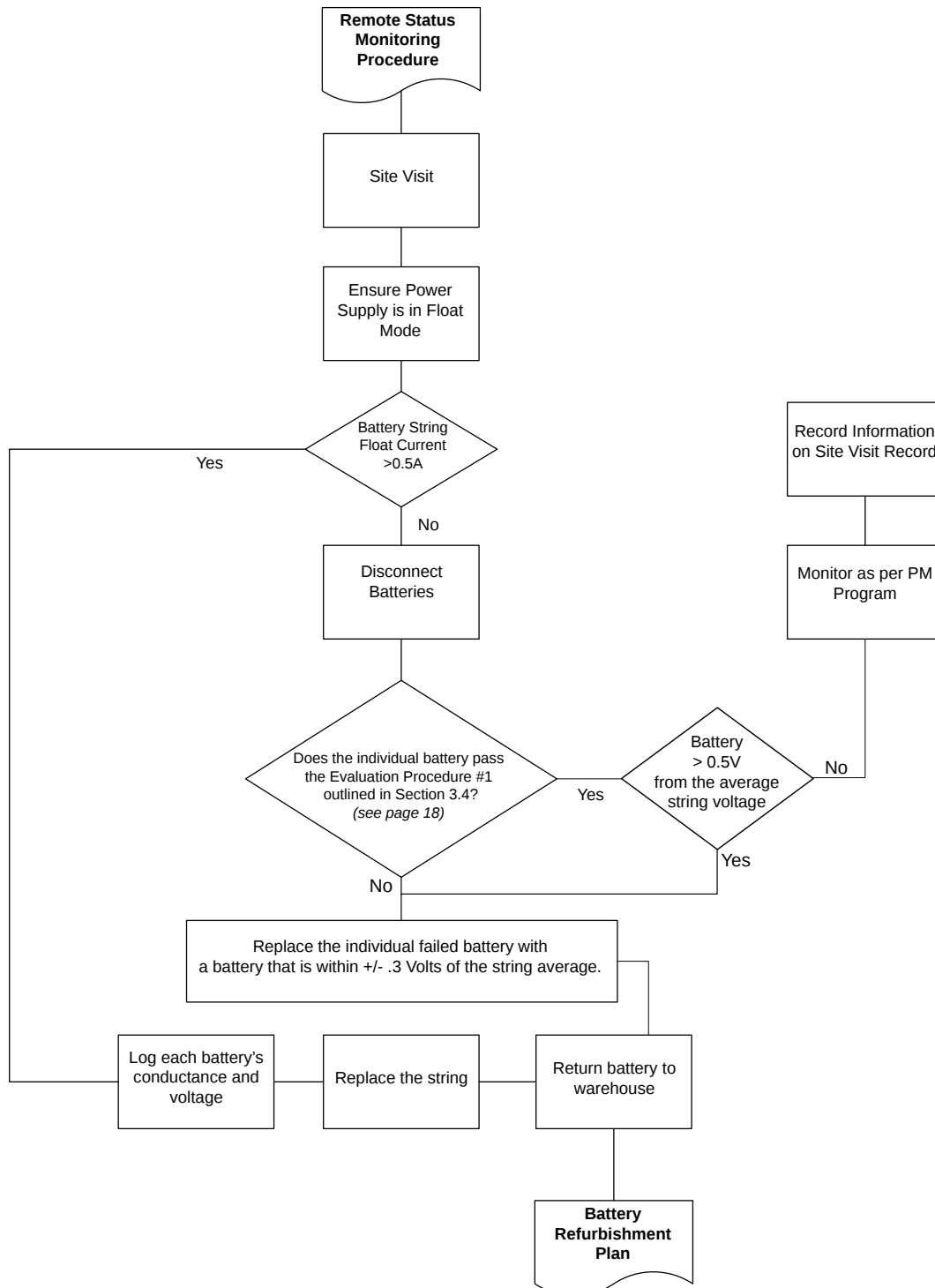


Fig. 4-6, Flow Chart for Preventive Maintenance

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.6 Periodic Maintenance Tasks, continued

4.4.6.2 On-Site Battery Preventive Maintenance, continued

Procedure

1. Verify the Power Supply is in FLOAT mode.
2. Use the DC Amp clamp to measure and record each individual battery string's float current.
3. If the individual string float current is greater than 0.5 amps, replace the battery string. Measure and record the individual battery conductance and voltage on the Site Visit Record.
4. If the string float current is less than 0.5 amps,
 - a. Disconnect the batteries from the system.
 - b. Measure the battery conductance. If any reading is below the suspect level, refer to Table 4-1, for mhos values for battery models.
 - c. Measure the battery voltage. If any reading is less than 12.6V then replace all those batteries in the string.
 - d. If any individual battery voltage varies more than 0.5V above or below the average for the string then replace the string.
 - i. Example: V1 = 13V, V2 = 13V, V3=14V
 - ii. Average voltage = 13.3V
 - iii. If V3 is greater than average by 0.5V, then the batteries should be replaced. Batteries removed from the site should then be tested per Section 4.5.7, "Battery Refurbishment Plan".
 - e. Log the site location, battery location, model, manufacturer date codes, voltage and conductance readings for all batteries.
5. Record data on Battery Maintenance log.
6. Verify the spacing between the batteries from front to back is at least 1/2" or 13mm, and adjacent batteries do not touch one another.
7. Ensure the enclosure is clean and free of debris.
8. Measure and record the top center battery's temperature. This is typically the warmest battery in the string.
9. Visually inspect the batteries for:
 - a. Cleanliness
 - b. Terminal damage or evidence of heating or overheating
 - c. Container or cover damage
10. Check terminal posts for signs of corrosion. If corrosion is present, neutralize with a solution of 1 lb (454g) sodium bicarbonate (baking soda) to 1 gallon (3.8l) of water. Rinse and dry.
11. Verify terminal posts are coated with NO-OX grease or a spray-on protectant. Reapply as needed.
12. Retorque all the interunit connecting hardware to the values noted in the tables on the next page.

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.6 Periodic Maintenance Tasks, continued

4.4.6.2 On-Site Battery Preventive Maintenance, continued

Parameter	Model Number			
	220 GOLD-HP	220GXL	195 GOLD-HP	195GXL
Terminal Type	Threaded Insert	Threaded Insert	Threaded Insert	Threaded Insert
Bolt Size	1/4"-20 UNC Bolt	1/4"-20 UNC Bolt	1/4"-20 UNC Bolt	10-32 UNC Bolt
Annual Retorque Inch-Pounds / N•m	110In-lb / 2.4N•m	110In-lb / 2.4N•m	110In-lb / 2.4N•m	25In-lb / .8N•m
Open Circuit Voltage	12.84	12.84	12.84	12.84
Average Float Voltage Range (volts/unit)	13.5 to 13.8	13.5 to 13.8	13.5 to 13.8	13.5 to 13.8
20-Hour Ampere Rate to 1.75 V/C	5.45	5.45	5.00	5.00
Typical Impedance @ 60Hz ohms	0.0050	0.0050	0.0050	0.0050
Typical Conductance 7Hz mohms	960 to 1400	960 to 1400	880 to 1320	880 to 1320
Typical 10 Sec. Voltage @ 100 amp	11.4	11.4	11.3	11.3

Parameter	Model Number			
	195GXL FT	165GXL	135AGM-P	85GXL-HP
Terminal Type	16mm Insert	Threaded Insert	Threaded Insert	Threaded Insert
Bolt Size	M6 thread	1/4"-20 UNC Bolt	1/4"-20 UNC Bolt	10-32 UNC Bolt
Annual Retorque Inch-Pounds / N•m	110In-lb / 12.4N•m	110In-lb / 12.4N•m	110In-lb / 12.4N•m	25In-lb / 2.8N•m
Open Circuit Voltage	12.84	12.84	12.84	12.84
Average Float Voltage Range (volts/unit)	13.5 to 13.8	13.5 to 13.8	13.5 to 13.8	13.5 to 13.8
20-Hour Ampere Rate to 1.75 V/C	5.50	4.30	3.75	2.50
Typical Impedance @ 60Hz ohms	0.0050	0.0055	0.0055	0.0040
Typical Conductance 7Hz mohms	800 to 1200	800 to 1200	900 to 1350	480 to 720
Typical 10 Sec. Voltage @ 100 amp	10.8	11.2	11.2	11.6

Parameter	Model Number	
	3.5 HP	4.0 HP
Terminal Type	Threaded Insert	Threaded Insert
Bolt Size	1/4"-20 UNC Bolt	1/4"-20 UNC Bolt
Annual Retorque Inch-Pounds / N•m	110In-lb / 2.4N•m	110In-lb / 2.4N•m
Open Circuit Voltage	12.80	12.80
Average Float Voltage Range (volts/unit)	12.6 to 14.1	12.6 to 14.1
Typical Impedance @ 60Hz ohms	2.7	2.2
Typical Conductance 7Hz mohms	1400 to 1850	1700 to 2500

Table 4-1, On-Site Battery Preventive Maintenance

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.7 Battery Refurbishment Plan

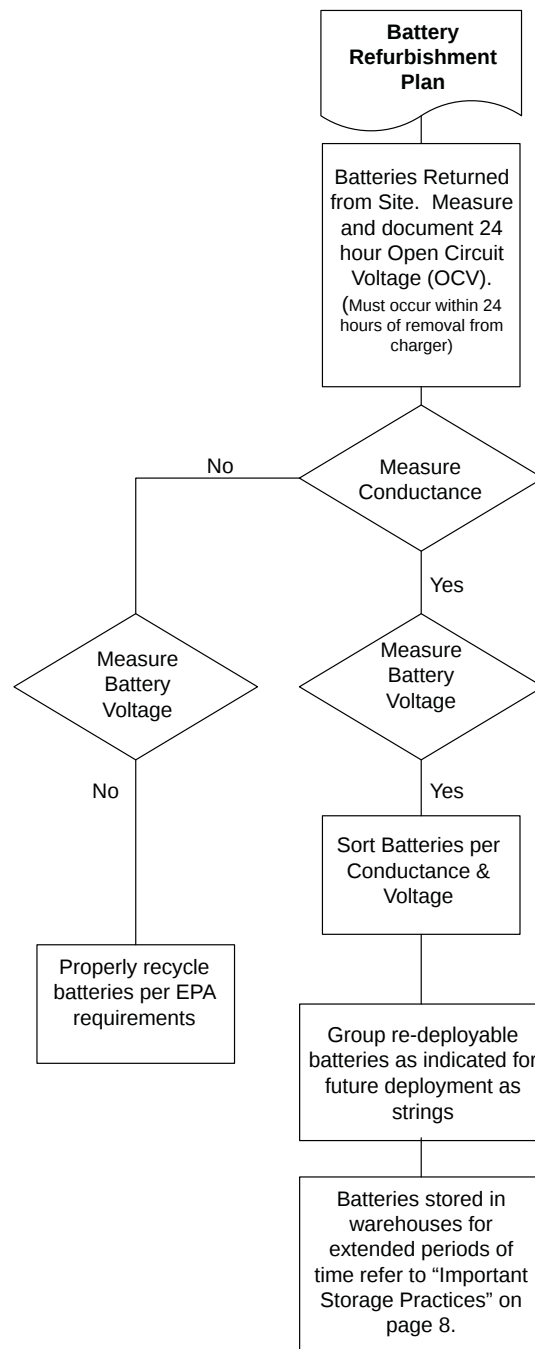


Fig. 4-7, Flow Chart for Battery Refurbishment Plan

1. DO NOT mix batteries of different models within in a string. Example: 165GXL with 195GXL.
2. DO NOT mix batteries from different manufacturers. Example: Alpha and MK.
3. No battery age limit if it passes the other tests.

4.0 Maintenance, continued

4.4 Battery Maintenance, continued

4.4.8 Battery Evaluation Procedures for AlphaCell Batteries

To help identify batteries approaching end of life in an operating power system, the following test should be performed at each maintenance interval. For accuracy, tests must be performed on fully charged batteries.

Conductance/Impedance Test – Measure the conductance of each battery. Any battery that possesses a conductance that is 50% less than the initial reading taken at the point of install can be considered suspect of being below 70% capacity and should be evaluated further. The battery temperature must be approximately the same each time this reading is taken (see Table 1 below). Use temperature compensation feature when using Midtronics meter.

And

Float Voltage Test – Measure the float voltage of each battery in the string that is on float charge. Any battery in the string measured at 13.2 volts or less is a suspect battery and should be further evaluated with the steps below. Any battery below 12.6 volts should be replaced. The 13.2 & 12.6 voltage values are based on a 77°F (25°C) temperature. Adjust the voltage for higher or lower temperatures by 0.0168 Volts per battery per degree Fahrenheit. The higher the temperature above 77°F (25°C) the lower the voltage will have to be adjusted and vice-versa for temperature below 77°F (25°C). (i.e.: at a temp of 89°F (32°C) would have a corresponding float voltage of 13.0 volts).

Battery Replacement Criteria – Batteries with a Siemens numbers of 400 or less should be replaced. Batteries with a Siemens number between 400 and 700 and failing the 10 minute Self Test should be replaced. If the Self Test passes, the batteries will not be replaced. Batteries with a Siemens number greater than 700 and passing the 10 minute Self Test should not be replaced. A battery that drops below 10.8 volts during the 10 minute Self Test is suspect.

Midtronics Conductance Models 3200/micro CELLTRON	170XLT	85 GXL- HP	135 GXL	160 AGM	165 GXL	195 GXL	195 GXL- FT	220 GXL	195 GOLD-HP	220 GOLD-HP
Approximate Conductance Values (mhos) Healthy Battery @ 77°F (25°C)	1040-1560	480-720	900-1350	1040-1560	800-1200	880-1320	800-1200	960-1400	880-1320	960-1400
Suspect Battery @ 77°F (25°C) in mhos	<520	<240	<450	<520	<400	<440	<400	<480	<440	<480

Table 4-2, AlphaCell GXL Conductance Values, Healthy vs. Suspect Batteries

Midtronics Conductance Models 3200/micro CELLTRON	3.5 HP	4.0 HP
Approximate Conductance Values (mhos) Healthy Battery @ 77°F (25°C)	1400-1850	1700-2500
Suspect Battery @ 77°F (25°C) in mhos	<680	<840

Table 4-3, AlphaCell HP Conductance Values, Healthy vs. Suspect Batteries

4.0 Maintenance, continued

4.5 XM3-HP System Preventive Maintenance Log

ALPHA TECHNOLOGIES XM3-HP Power System Preventive Maintenance Checklist

Lat: _____ Long: _____

Hub:	Street:	Date: / /
Site Number:	City:	County:

Equipment Identification & As-Found Alarms:

Power Supply Make-Model:	PS1Serial #:	SM1Transponder:
Battery Make-Type:		
Record as-found alarms:	PS Input Wattage:	PS Output Wattage:
	Electric Meter #:	Reading:
	Battery Capacity:	

Battery String Maintenance:

Battery #	Date Code	ID Number	Voltage- No Load (VDC) Total String :	Voltage-Under Load (VDC) Total String:	BS Conductance – (mhos)	
					°F	Corrected 77°F
A1:			.	.		
A2:			.	.		
A3:			.	.		
A4:			.	.		
B1:			.	.		
B2:			.	.		
B3:			.	.		
B4:			.	.		
Ignition Battery:			.	N/A		
Battery String Replaced? Yes / No		Clean & no-ox battery terminals and lugs? Yes / No		Battery Torque (inch-pounds): 65 / 110 in-lbs		

Power Supply Maintenance:

Power Supply #	Power Supply Events		AC Input Voltage (VAC)	Output Voltage (VAC)	Output Current (Amps)	
	Number	Time			A	B
PS:						
Clean and inspect each power supply? Yes / No		Run Power Supply Auto-Test? Pass / Fail		Clear Power Supply Event Log? Yes / No		

Enclosure Interior and Exterior Maintenance Checklist:

Items to Check	Results	Items to Check	Results	Items to Check	Results
Clean dust/dirt from enclosure inside	Yes / No	Check LAP's	OK / Replaced / None Installed	Touchup paint enclosure exterior	Yes / OK
Change or clean enclosure air filters	Yes / No	Check Lamps & LED's	OK / Replaced Note Below	Note condition of retaining walls	Pass / Fail; Note Below
Tighten all enclosure hardware	Yes / No	Cut weeds back 36" from enclosure	Yes / No / NA	Any pad undermining?	None / Yes; Note Below
Inspect wire harnesses and connectors	Pass / Fail	Cleanup garbage within immediate vicinity	Yes / No / NA	Any enclosure damage or vandalism	None / Yes; Note Below
Inspect battery temperature probes	Pass / Fail	Is powernode site ID legible?	Yes / No / NA	Power Supply 120 v or 240 v	120 / 240
Inspect for rodent and insect damage	Yes; Note Below / OK	Clean enclosure exterior & remove graffiti	Yes / No	Generator Cord Present?	Yes / No / Installed

Comments & Replacement Parts Used: _____

PM Service Technician: _____

5.0 Shut Down

The Alpha XM3-HP CableUPS contains more than one live circuit. During an emergency, utility power can be disconnected at the service entrance or main electrical panel to protect emergency personnel. However, power is still present at the output. To prevent the possibility of injury to service or emergency personnel, always follow this procedure to safely shutdown the Power Supply.

Emergency Shutdown Procedure:

- 1 Switch Battery Breaker OFF.
- 2 Unplug the AC Input Line Cord from the service entrance.
- 3 Unplug both the Output 1 and Output 2 connections.



Fig. 5-1, Emergency Shutdown

Specifications (Alpha XM3-HP CableUPS North American Models)

North American Models:	908HP	910HP	915HP	918HP
Fine Mode Parameters				
Nominal AC Input Voltage	120VAC	120VAC	120VAC, 240VAC	120VAC
Nominal Input Frequency	60Hz	60Hz	60Hz	60Hz
Input Frequency Tolerance (%)	±3	±3	±3	±3
Input Voltage Operating Range Tolerance (%)	-25 / +15	-25 / +15	-25 / +15	-25 / +15
Input Voltage Range (VAC)	90-138	90-138	90-138, 173-276	90-138
Output Voltage (VAC)	63 / 89	63 / 89	63 / 89	63 / 89
Output Voltage Regulation (%)	-2.5 / +1	-2.5 / +1	-2.5 / +1	-2.5 / +1
Maximum Rated Output Current	8 Amps	10 Amps	15 Amps	18 Amps
Maximum Output Power (VA)	720	900	1350	1620
Line Mode Efficiency	Up to 94%			
Standby Efficiency	Up to 91%			
Output Waveform	Quasi-square wave			
Short Circuit Protection	<150% of maximum current rating			
Transfer Characteristics	Uninterrupted output			
Battery Voltage (VDC)	36	36	36	36
Battery Charger				
Temperature Compensation	Programmable (0 to 5mV/Cell/°C)			
Bulk Charger Current	10A			
5 Stages	Refresh, Bulk, Accept, Float, Rest			
Mechanical				
Inverter Module	Front plug in, Hot swappable Inverter Module			
Dimensions H x W x D (in/mm)	7.8 x 15 (16.7 w/handle) x 10 (10.7 w/handle) / 198.1 x 381 (424.18 w/handle) x 254 (271.8 w/handle)			
Weight (lb/kg)	48.5 / 22.0	49 / 22.3	60 / 27.2	60.5 / 27.5
Input Power Connector (IEC 320/C20)	NEMA 5-15P Plug	NEMA 5-15P Plug	NEMA 5-20P/ NEMA 6-15P Plug	NEMA 5-20P Plug
Battery Connector	Anderson style 75A			
Remote Temp Sensor	Ring lug fastens to negative terminal on center battery			
Display	4 line by 20 character blue LCD with soft-key menu controls			
Environment				
Operating Temperature	-40 to 60°C / -40 to 140°F (derate by 2°C / 3.6°F per 1000 feet above 3000 feet)			
Humidity	0 to 95% non-condensing (relative)			
Agency Compliance				
Safety	CSA/UL 60950-1 (2nd), UL 1778 (4th) CSA No 107.3, C/US			
EMC	FCC Part 15 Class A			

Specifications, continued (Alpha XM3-HP CableUPS International Models)

International Models:	915M-HP	915P-HP	910E-HP	915E-HP	615CE-HP	622CE-HP	908HP	910HP	915HP	918HP
Parameters										
Nominal AC Input Voltage (VAC)	127	200-240	200-240	200-240	230	230	120	120	120	120
Nominal Input Frequency	60Hz	60Hz	50Hz	50Hz	50Hz	50Hz	60Hz	60Hz	60Hz	60Hz
Input Frequency Tol (%)	±3	±3	±3	±3	±3	±3	±3	±3	±3	±3
Input Voltage Operating Range Tolerance (%)	-34 / +15	-30 / +20	-30 / +20	-30 / +20	-30 / +20	-30 / +20	-30 / +15	-30 / +15	-30 / +15	-30 / +15
Output Voltage (VAC)	63 / 89	63 / 89	63 / 89	63 / 89	63	63	63 / 89	63 / 89	63 / 89	63 / 89
Output Voltage Regulation	-5 / +1	-5 / +1	-5 / +1	-5 / +1	-6 / +1.5	-6 / +1.5	-5 / +1	-5 / +1	-5 / +1	-5 / +1
Maximum Rated Output Current	15 Amps	15 Amps	15 / 10 Amps	22 / 15 Amps	15 Amps	22 Amps	8 Amps	10 Amps	15 Amps	18 Amps
Output Power (VA)	1350	1350	900	1350	900	1408	720	900	1350	1620
Line Mode Efficiency	Up to 94%									
Standby Efficiency	Up to 91%									
Bulk Charger Current (@ 80% Load & Nom line)	10 Amps	10 Amps	10 Amps	10 Amps	10 Amps	10 Amps	10 Amps	10 Amps	10 Amps	10 Amps
Battery Voltage (VDC)	36	36	36	36	36	36*	36	36	36	36

* XM2-622CE will continue as a 48V model until further notice.

Mechanical										
Inverter Module	Front plug in, Hot swappable Inverter Module									
Dimensions H x W x D (in/ mm)	7.8 x 15 (16.7 w/handle) x 10 (10.7 w/handle) / 198.1 x 381 (424.18 w/handle) x 254 (271.8 w/handle)									
Weight (lb/kg)	60 / 27.2	60 / 27.2	53 / 24.1	67 / 30.5	53 / 24.1	67 / 30.5	48.5 / 22.0	49 / 22.3	60 / 27.2	60.5 / 27.5
Input Power Connector	IEC 320/C20									
Battery Connector	Anderson style 75A									
Remote Temp Sensor	Ring lug fastens to negative terminal on center battery									
Display	4 Line by 20 Character Blue LCD with soft-key menu controls									
LRI Connector	Anderson PP30's									
Mounting	Shelf mounts inside suitably rated electrical enclosure									
Environment										
Operating Temperature	-40 to 60°C / -40 to 140°F (derate by 2°C / 3.6°F per 1000 feet above 3000 feet)									
Storage Temperature	-40 to 70°C / -40 to 158°F									
Humidity	0 to 95% non-condensing (relative)									
Conformal Coating	All Printed Circuit Board assemblies to prevent moisture related failure									

Models:	915M-HP	915P-HP	910E-HP	915E-HP	615CE-HP	622CE-HP	908HP	910HP	915HP	918HP
Name Plate Rating (VAC)	127	200-240	200-240	200-240	230	230	110-127	110-127	110-127	120
Input Window +/- (% of Nominal Input)	-34 / +15	-30 / +20	-30 / +20	-30 / +20	-30 / +20	-30 / +20	-30 / +15	-30 / +15	-30 / +15	-30 / +15
Input Range (VAC)	84-146	161-276	161-276	161-276	161-276	161-276	84-138	84-138	84-138	84-138
Output Regulation +/- (%)	-5 / +1	-5 / +1	-5 / +1	-5 / +1	-6 / +1.5	-6 / +1.5	-5 / +1	-5 / +1	-5 / +1	-5 / +1
Load Range	1-15A	1-15A	1-10A	1-15A	1-15A	1-22A	1-8A	1-10A	1-15A	1-18A
Output Voltage Min / Max (VAC)	84.6 / 90	84.6 / 90	84.6 / 90	84.6 / 90	59.2 / 64	59.2 / 64	84.6 / 90	84.6 / 90	84.6 / 90	84.6 / 90
Safety Compliance										
UL/CSA 60950-1, UL 1778, CSA 107.3 (NRTL/C)	Y	Y					Y	Y	Y	Y
IEC 60950-1 (CB)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
IEC 62040-1					Y	Y				
Safety Mark	NRTL/C	NRTL/C			CE	CE	NRTL/C	NRTL/C	NRTL/C	NRTL/C
EMC Compliance										
FCC Part 15 Class A	Y	Y					Y	Y	Y	Y
IEC/EN 50083-2 (CATV)					Y	Y				
IEC/EN 65040-2 (UPS)			Y	Y	Y	Y				
CISPR22			Y	Y	Y	Y				

Safety and EMC Compliance

The Alpha XM3-HP CableUPS is certified over a wide range of North American and International safety and EMC specifications as indicated below.

Model	Input VAC	Agency Req.	EMI/EMC
XM3-908/910/915HP	110-127V 60Hz	UL/CSA 60950-1, UL 1778, CSA 107.3 BSMI (for 908/910/915)	FCC CFR47 Part 15 Class A ICES-003, BSMI
XM3-918HP	120V 60Hz	UL/CSA 60950-1, UL 1778, CSA 107.3	FCC CFR47 Part 15 Class A ICES-003
XM3-915M-HP	127V 60Hz	CB Report, IEC/EN 60950-1: ED 2	CISPR Class A
XM3-915P-HP	200-240V 60Hz	CB Report, KTL IEC/EN 60950-1: ED 2,	CISPR Class A, KTL
XM3-910E-HP	200-240V 50Hz	CB Report, IEC/EN 60950-1: ED 2	CISPR Class A
XM3-915E-HP	200-240V 50Hz	CB Report, IEC/EN 60950-1: ED 2	CISPR Class A
XM3-615CE-HP	230V 50Hz	EN 62040-1-2, IEC/EN 60950-1: ED 2, EN 60728-11 CB Report, CE	EN62040-2 (UPS Equipment) EN50083-2 (CATV Equipment EMC) Category C3 Class B Conducted Limits
XM3-622CE-HP	230V 50Hz	EN 62040-1-2, IEC/EN 60950-1: ED 2, EN 60728-11 CB Report, CE	EN62040-2 (UPS Equipment)
			EN50083-2 (CATV Equipment EMC) Category C3 Class B Conducted Limits

Table A-1, Product Certifications Regarding Safety, EMC Compliance

Simplified Block Diagram

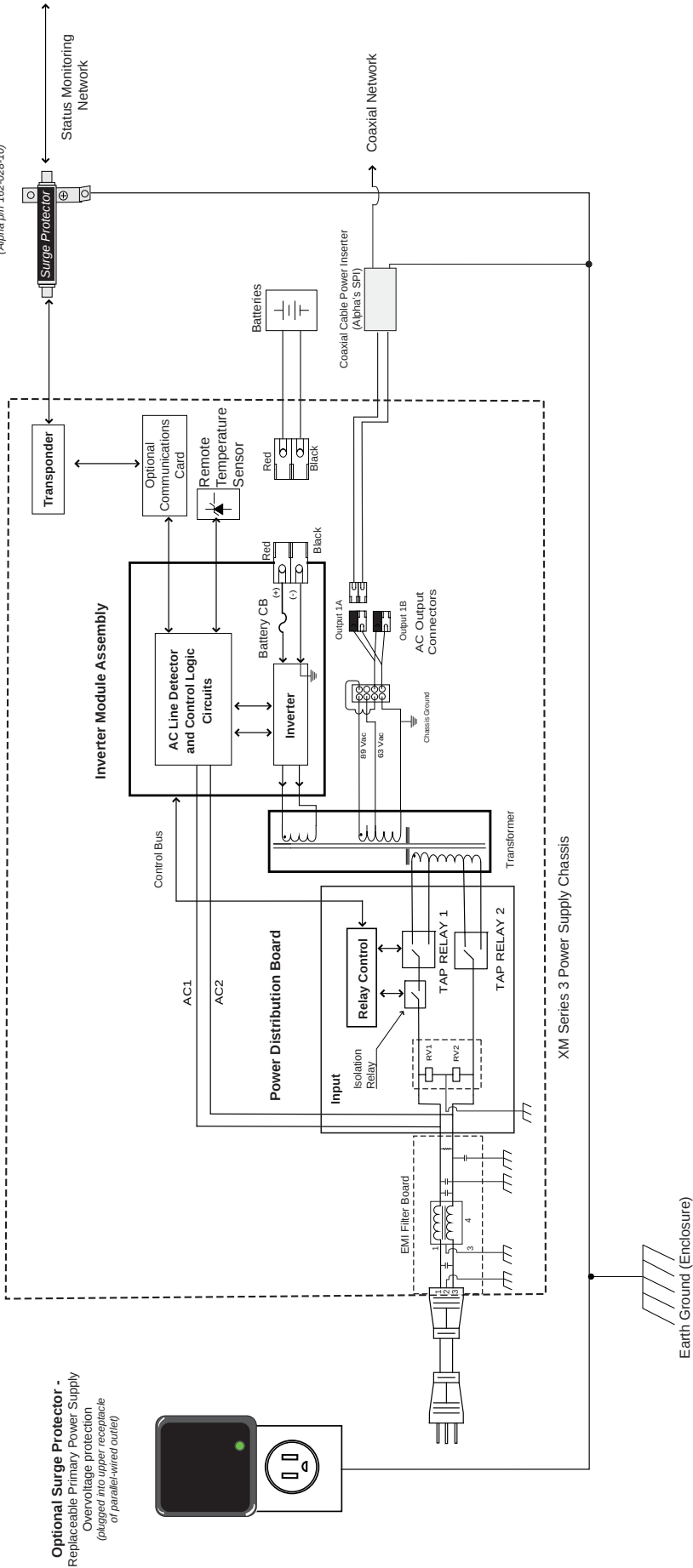


Fig. A-1, Block Diagram

Battery Spacer Clips

Convection airflow battery cooling relies on proper spacing of batteries installed in the enclosure. Consistent spacing is achieved by the use of Alpha's Battery Spacer clips. These easy-to-install clips snap over the tops of AlphaCell batteries allowing for optimal airflow. For domestic applications, use one battery clip per 36V battery string for optimal spacing. For international applications use two clips per 36V battery string.

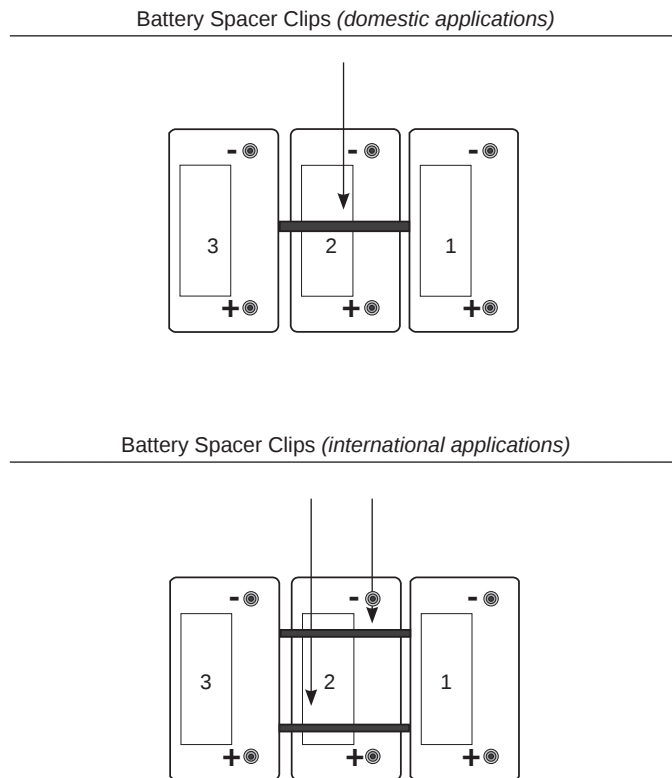


Fig. A-2, Placement of Battery Spacer Clips
(for domestic and international 36V battery strings)
(Note: actual placement determined by battery arrangement)

System Options

These options can be factory installed or upgraded in the field by the user:

Local and Remote Indicator (LRI)

The red LRI lamp is located on the outside of pole-mount enclosures. Using this simple form of status monitoring operators can check the operational status of the Power Supply without having to climb the pole and open the enclosure. During normal AC line operation, the LRI remains off. The LRI comes on only when the Power Supply is running in standby mode. Whenever a fault is detected during Self Test, the LRI flashes to indicate that service is required.

AC Indicator (ACI)

The green ACI lamp is located next to the LRI on the outside of pole-mount enclosures and also acts as a simple form of status monitoring so cable technicians can check the output status of the Power Supply without having to climb the pole and open the enclosure. As long as there is voltage present at the output, the ACI remains on. To provide much longer life than the original light bulb design, use the ACI-LL (long life LED). Models for 60V and 90V are available. Do not use ACIs for ground mount enclosures.

Coaxial Surge Arrestor

Alpha recommends using coaxial surge suppression for enclosure protection. The Coax Surge Protector (Alpha P/N 162-028-10) includes 75 ohm surge suppressor and mounting hardware.

APP90S/APP9022S (Service Power Supply)

The APP90S/APP9022S is a portable, non-standby Power Supply that provides conditioned AC power to the load when the main power module is out of service. An internal tap lets the APP90S/APP9022S be set for 90/75/60VAC applications. Use a 15A or 25A SPI (Service Power Inserter) to transfer power from the APP9015S/APP9022S to the load.

Return and Repair Information

In the event you need to return the Power Supply to Alpha Technologies for service, a Return Material Authorization (RMA) form must accompany the unit. The form can be found at Alpha's Web site (www.alpha.com/rma). Follow the instructions contained in the form to obtain an RMA. Once an RMA number has been issued, pack the unit per instructions and return to the service center assigned by Alpha Technologies. Or, if preferred, contact Alpha Technologies at (800) 322-5742 for assistance.



NOTE:

Any information pertaining to the nature of the Power Supply failure or problem, along with a copy of the Power Supply's maintenance log, should be included with the returned Power Supply.

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