USM2.5 Status Monitor

Operator's and Technical Manual

USM2.5 Status Monitor

Effective: April, 2006

Alpha Technologies

USM2.5 Staus Monitoring Module

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Effective: April, 2006

Statement of Intended Usage

Alpha denies responsibility for any damage or injury involving its enclosures, power supplies, generators, batteries, or other hardware when used for an unintended purpose, installed or operated in an unapproved manner, or improperly maintained.

Information on CE Compliance

Alpha Technologies Communications Module, model USM 2.5, has been qualified as an EMC Class B product, when configured in an Alpha Uninterruptible Power Supply (UPS) product. When an (optional) Acterna Embedded Transponder Assembly is configured in an Alpha UPS with model USM 2.5 Communications Module, the resultant UPS product configuration complies only to Class A requirements, in accordance with the EMC Directive and applicable Technical Standards.

Contacting Alpha Technologies:

For general **product information and customer service**

1-800-863-3930

(7:00 AM to 5:00 PM Pacific Time)

For complete **technical support**

1-800-863-3364

(7:00 AM to 5:00 PM Pacific Time, or 24/7 emergency support)

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Safety Notes

This symbol identifies conditions and actions that pose a hazard to the user.

This symbol cautions the user of conditions and actions that may damage the power supply or associated equipment.

This symbol identifies a condition that may be corrosive to equipment and parts, or damaging to skin.

This symbol identifies a condition in which it is required to recycle discarded materials.

This symbol identifies a situation in which static-sensitive components are present.

Warnings

WARNING: This power supply and its associated hardware (enclosure, batteries, cabling) may contain equipment, batteries or parts which have accessible hazardous voltage or currents.

To avoid injury:

- The USM2.5 must be serviced by authorized personnel only.
- The enclosure which contains the USM2.5 and associated equipment must remain locked at all times, except when authorized service personnel are present.
- Remove watch and/or jewelry prior to servicing equipment, parts, connectors, or wiring.
- Read and follow all installation, equipment grounding, usage, and service instructions included in this manual.
- Use proper lifting techniques whenever handling equipment, or parts.

Cautions

NOTE: Equipment or parts may be damaged or cause damage if used or installed improperly.

To avoid damage:

- Prior to installation, verify that the AC input voltage to the enclosure and its equipment match with respect to voltage and frequency.
- Prior to installation, verify that the output voltage from the enclosure or its equipment match the voltage requirements of the connected equipment (load).
- Prior to installation, verify that the enclosure's utility service panel is equipped with a properly rated circuit breaker for use with the equipment inside. Refer to manufacturer's recommendations.
- Review and upgrade utility service panel circuit breaker requirements whenever the equipment within the enclosure is changed.
- Prior to installation, contact local utilities, local building maintenance departments, and cable/piping locator services to ensure that installation does not interfere with existing utility or building cables/piping.
- Do not exceed the output rating of equipment. Verify load requirements prior and during connection process.
- Prior to handling the batteries, touch a grounded metal object to dissipate any static charge that may have developed in your body.

1.1 USM2.5 Introduction

This Operator's and Technical Manual will cover the installation, signal definition, operation, and basic troubleshooting for the USM2.5 when used with the Alpha XM Series 2 Power Supply.

The USM2.5 card is a logic controller PCB which may be used to upgrade any XM Series 2 Power Supply for the purpose of remote status monitoring. As part of the Communications Module upgrade, the USM2.5 connects directly to the XM2's Inverter Module via an 18 pin jumper. No recalibration of the power supply is required at the time of installation.

System Concept

The USM2.5 remote status monitoring system is comprised of the following basic building blocks:

- An Alpha XM Series 2 Uninterruptible Power Supply.
- An approved transponder.
- The USM2.5 status monitoring card.

Operating through a transponder and status monitoring system, the operator may issue commands to the USM2.5 to control the operating mode of the power supply; evaluate potential fault conditions reported by the software; or run routine checks on the power supply.

For example, the operator may issue a command that initiates a "Self-Test" mode to check the inverter circuitry, status of the batteries, or obtain values for battery voltages. This kind of information allows for a more accurate assessment of the operating condition, and ability to supply uninterrupted performance of each power supply. More importantly, proper USM2.5 operations allow for preventive maintenance on an "as required" basis. This has obvious advantages over a scheduled maintenance program, since service personnel can be dispatched when required with the appropriate parts and tools.

1.2 Identification of USM2.5

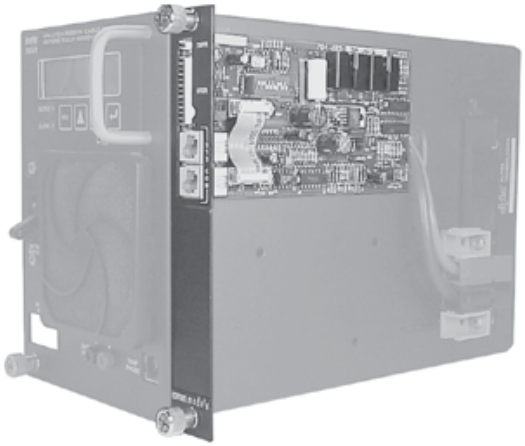

Figure 1-1,
Old Version of USM2.5

Figure 1-2,
New Version of USM2.5

2. Installation

2.1 Inverter Module Removal and Installation

The XM Series 2 Power Supply comes with a field-replaceable Inverter Module, containing the inverter, battery charger and control logic circuitry. The Inverter Module is designed to accept USM2.5 plug-in logic upgrades to facilitate remote status monitoring. The Inverter Module can be removed while the power supply is running on line power. With the Inverter Module removed, the power supply will continue to operate in a non-standby mode.

Remove the Inverter Module prior to adding the optional USM2.5 circuit board. Follow the first procedure below precisely.

CAUTION: ALWAYS switch the battery breaker **OFF** prior to removing the Inverter Module.

XM Series 2 Inverter Module Removal Procedure:

1. Switch OFF the battery breaker. Disconnect the battery input, and the temp probe cables.
2. Disconnect all remaining cables as needed from the Inverter Module.
3. Loosen the thumbscrews on the Inverter Module.
4. To remove the Inverter Module: grasp ONLY the handle of the Inverter Module, pull firmly to release the module from the connector. Slide the module assembly straight out.
5. Disconnect the Ribbon cable attaching the inverter module to the power distribution board before sliding the inverter module all of the way out. (Refer to Figure 2-1.)

XM Series 2 Inverter Module Installation Procedure:

1. Attach the ribbon cable to the inverter module.
2. To reseat the Inverter Module: align the metal shield in the upper and lower card-guides. Using ONLY the Inverter Module's handle (*absolutely apply no pressure of any kind to the front panel*) firmly drive the module back into the connectors. The connectors are designed to be made with reasonable force. The thumbscrews are not intended to aid in making these connections, but to secure the Inverter Module to the chassis.
3. If the Inverter Module is correctly seated the front panel Smart Display will start-up, and the "Inverter Disconnected Alarm" will NOT be active.
4. Retighten thumbscrews. It is recommended that screws be tightened by hand ONLY. Avoid using tools to tighten thumbscrews.
5. Reconnect all the cables (TMPR, XPDR, and SYS COM) as needed to the Communications Module.
6. Verify that the battery breaker is OFF, reconnect the battery input and the temp probe cables, verify battery polarity, and then finally switch ON the battery breaker.

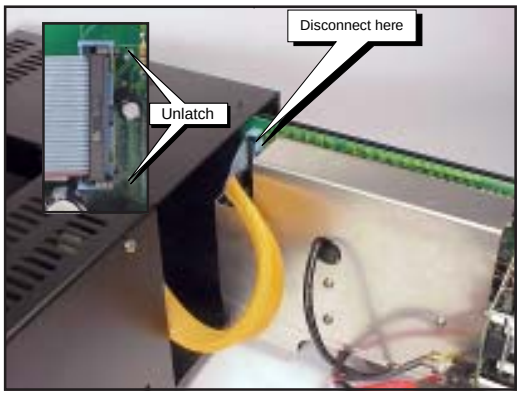

Figure 2-1, Inverter Module ribbon cable

2.2 USM2.5 Installation

The optional USM2.5 status monitoring upgrade plugs into the XM Series 2 Inverter Module. The USM2.5 can be configured for various status monitoring interfaces by setting the DIP switch. Status monitoring interfaces are listed according to their manufacturer, along with the associated parts in Section 3.1. The USM2.5 also accommodates a tamper switch assembly to indicate unauthorized enclosure entries.

CAUTION: The USM2.5 PCB contains static sensitive components that could be easily damaged if not handled properly.

When installing the USM2.5 use the following procedure:

USM2.5 Installation Procedure:

1. Refer to Section 2.1 for Inverter Module removal.

2. Install the USM2.5 assembly on the Inverter Module:

Tools Required: #2 Phillips head screwdriver.

a) The 2 x 9 pin Strip Connector (Fig. 2-3), must be installed onto the Inverter Module. A properly installed strip connector will be fully seated and firmly in place.

b) A new USM2.5 will come with a snap-on support. Position the USM2.5 over the strip connector and the rear hole for the support and carefully push into place. Verify the position of the strip connector, and that the support is fully seated into the Inverter Module mounting shield.

c) When replacing a USM2.5 the support may already be installed. If so, align the USM2.5 over the supports and gently rock onto the strip connector. verify the position of the strip connector, and that the support is fully seated into the Inverter Module mounting shield.

d) Secure the top of the USM2.5 card to the Inverter Module with the captive screw fastener. The lower portion is covered by an optional blanking plate (Fig. 2-2) or an Internal Transponder. Use 2 #6 screws to secure the blanking plate, or the two captive screw fasteners with the Internal Transponder.

3. Setup the USM2.5 for proper operation (see Section 3, Configuration):

a) Before reinstalling the Inverter Module, set the DIP switch, SW1 to the proper configuration settings for the status monitoring interface, as per Table 3-1 (page 12). Always verify USM2.5 configuration especially after upgrading or modifying the XM Series 2 Power Supply.

4. Carefully reinstall the Inverter Module. Refer to section 2.1.

2.2 USM2.5 Installation, *continued*

Figure 2-2; Optional Blanking Plate
Part Number 745-419-20

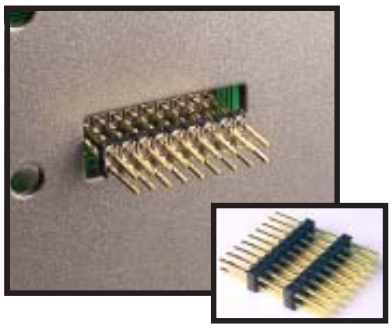

Figure 2-3; 2X9 Pin Strip Connector
Part Number 540-581-10

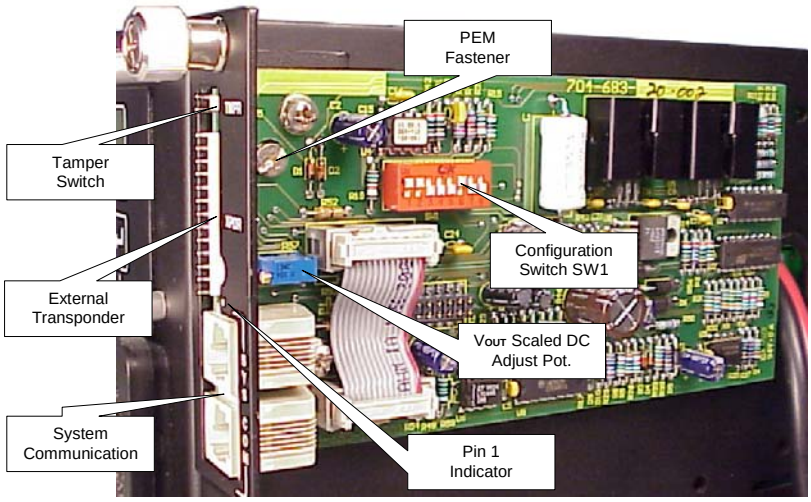

Figure 2-4; Old Version USM2.5 Front Panel & PCB

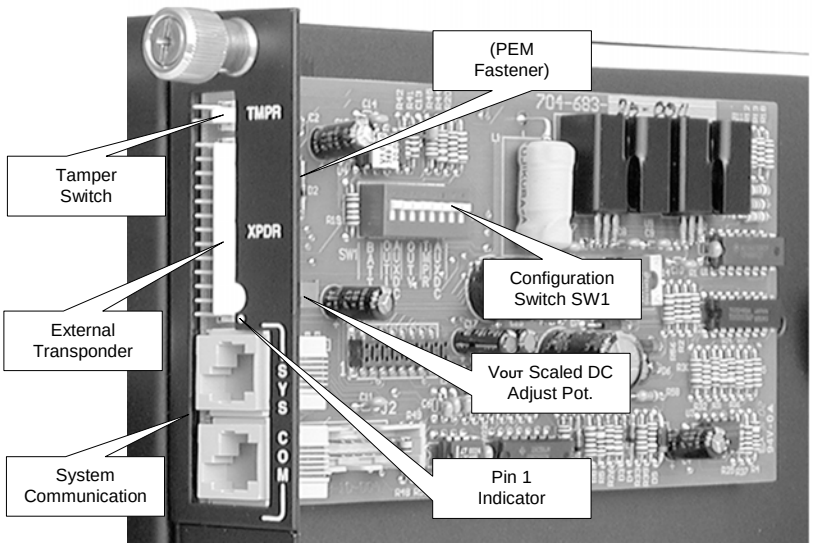

Figure 2-5; New Version USM2.5 Front Panel & PCB

3.1 USM2.5 Configuration (V Models)

The following information affects the use of the USM2.5 module on all V5 and VP versions of the XM2 Power supply. It should be referenced in place of the information contained in the relevant sections of this manual.

AC Output Current Monitoring On V5 And VP Models

- The AC current from output 1 of the Power supply is present on Pin 13 of the USM2.5 transponder connector J3.
- The AC current from output 2 of the Power supply is present on Pin 8 of the USM2.5 transponder connector J3.

This information overrides the following sections of this manual:

- 4.1 USM2.5 Signal Definition – Figure 4-1 USM2.5 Signal Connections (page 16)
- 4.3 USM2.5 Signal Definition – Name: Output Current #1 (page 18)
- 4.3 USM2.5 Signal Definition – Name: Output Current #2 (page 20)
- 5.1 USM2.5 Operations – USM2 Start Up and Test Procedure 3 (page 21)

Note: The output current pins are swapped on the V5 and VP models in relation to the basic XM2 models. AC Outputs 3 and 4 are not monitored by the USM2.5 module or V5 and VP Power Supplies.

AC Output Current Scaling on V5 and VP Models

When monitoring the AC Current of Output 1 and Output 2 on the USM2.5 module position 3 of the Function Switch (SW1) should be set to the ON position in order to gain the correct output current scaling of 0.4VDC/AAC. This is the case for all V5 and VP models independent of the issue of USM2.5 module used or the rating of the power supply.

This information overrides the following sections of this manual:

- 3.2 USM2.5 Configuration – Table 3-1 USM2.5 DIP Switch Set-up (page 12)
- 3.2 USM2.5 Configuration – SW1 (3): Output Current Scaling (page 13)

3.2 USM2.5 Configuration

Refer to the following chart to determine your USM2.5 model

USM2-5 Model:	XM2 Model:
USM2.5	XM2-615; XM2-915
USM2.5 22	XM2-1350 @ 60 VAC Output
USM2.5 48	XM2-1350-48
USM2.5 4822	XM2-922

Transponder Manufacturer	Alpha Part Number	Battery Voltage	Output Current	Switch SW1							
				1	2	3	4	5	6	7	8
Acterna Formerly SEG / Cheetah	USM2-5 (default)	<48	<22A	**ON**	**ON**	OFF	OFF	OFF	**ON**	OFF	OFF
	USM2-5 22	<48	22A	**ON**	**ON**	**ON**	OFF	OFF	**ON**	OFF	OFF
	USM2-5 48	48	<22A	OFF	OFF	OFF	OFF	OFF	**ON**	OFF	OFF
	USM2-5 4822	48	22A	OFF	OFF	**ON**	OFF	OFF	**ON**	OFF	OFF
AM Communications	USM2-5 AM	<48	<22A	**ON**	**ON**	OFF	OFF	OFF	**ON**	OFF	**ON**
	USM2-5 AM22	<48	22A	**ON**	**ON**	**ON**	OFF	OFF	**ON**	OFF	**ON**
	USM2-5 AM48	48	<22A	OFF	**ON**	OFF	OFF	OFF	**ON**	OFF	**ON**
	USM2-5 AM4822	48	22A	OFF	**ON**	**ON**	OFF	OFF	**ON**	OFF	**ON**
Tollgrade	USM2-5 TG	N/A	<22A	OFF	OFF	OFF	OFF	**ON**	OFF	**ON**	OFF
	USM2-5 TG22	N/A	22A	OFF	OFF	**ON**	OFF	**ON**	OFF	**ON**	OFF
Internal Acterna Proprietary Transponder	USM2-5 INT-ACTP	<48	<22A	**ON**	**ON**	OFF	**ON**	OFF	**ON**	OFF	OFF
	USM2-5 INT-ACTP22	<48	22A	**ON**	**ON**	**ON**	**ON**	OFF	**ON**	OFF	OFF
	USM2-5 INT-ACTP48	48	<22A	OFF	OFF	OFF	**ON**	OFF	**ON**	OFF	OFF
	USM2-5 INT-ACTP4822	48	22A	OFF	OFF	**ON**	**ON**	OFF	**ON**	OFF	OFF

Table 3-1; USM2.5 DIP Switch Setup

NOTE: Switch 1-3 should always be ON for units equipped with the ONU option.

Transponder Manufacturer	Alpha Part Number	Battery Voltage	Output Current	Batt Scale volts/volt	Xpndr Voltage	Out V Scale volts/volt	Tamper	Out I Scale volts/amp
Acterna Formerly SEG / Cheetah	USM2-5 (default)	<48	<22A	.5VDC	(+)5VDC	.5VAC	Non inverting	.4VDC
	USM2-5 22	<48	22A					
	USM2-5 48	48	<22A	.1VDC				
	USM2-5 4822	48	22A					
AM Communications	USM2-5 AM	<48	<22A	.5VDC	(+)15VDC			
	USM2-5 AM22	<48	22A					
	USM2-5 AM48	48	<22A	.3 VDC				
	USM2-5 AM4822	48	22A					
Tollgrade	USM2-5 TG	N/A	<22A	.1VDC	(+)5VDC	.15VDC	Inverting	
	USM2-5 TG22	N/A	22A					
Internal Acterna Proprietary Transponder	USM2-5 INT-ACTP	<48	<22A	.5VDC	(+)24VDC	.5VAC	Non inverting	
	USM2-5 INT-ACTP22	<48	22A					
	USM2-5 INT-ACTP48	48	<22A	.1VDC				
	USM2-5 INT-ACTP4822	48	22A					

Table 3-2; USM2.5 Transponder Output Voltages

3.2 USM2.5 Configuration, *continued*

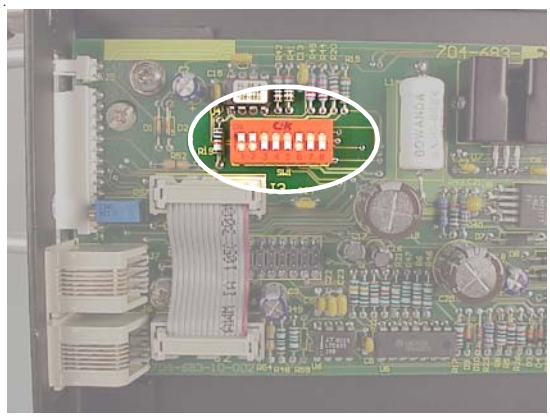

Figure 3-1; USM2.5 Switch Location
(Old Version)

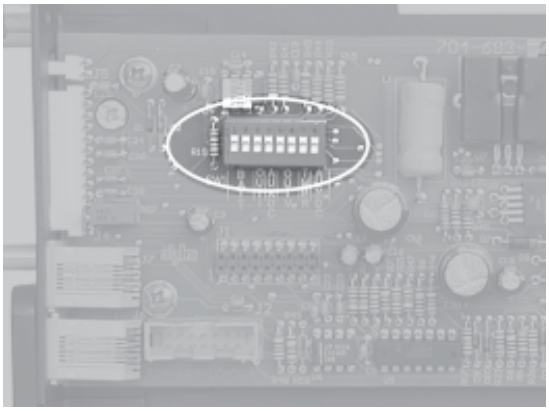

Figure 3-2; USM2.5 Switch Location
(New Version)

Always verify USM2.5 configuration especially after upgrading or modifying the XM Series 2 Power Supply.

Function Switch SW1 Reference

The following information describes each switch position (1–8) for the DIP switch SW1. SW1 is an eight switch component used primarily to select analog scaling and digital signal polarity for the USM2.5 card.

SW1 (1 and 2): Inverter Battery Voltage Scaling Select

SW1, positions 1 and 2 are used together to select the appropriate scaling for the XM Series 2 battery voltage measurement, measured at J4 pin 5.

SW1 (1)	SW1 (2)	Battery Scaling
OFF	OFF	0.1VDC/VDC
OFF	ON	0.3VDC/VDC
ON	OFF	0.3VDC/VDC Same as previous setting.
ON	ON	0.5VDC/VDC

SW1 (3): Output Current Scaling

SW1, position 3 is used to select the appropriate scaling for the XM Series 2 AC OUTPUT CURRENT#1, measured at J4 pin 8 and AC OUTPUT CURRENT #2 pin 13.

SW1 (3)	Output Current #1, #2
OFF	0.4VDC/AAC for Power Supply Output Current rating less than 20A.
ON	0.4VDC/AAC for Power Supply Output Current rating equal to or greater than 20A.

NOTE: Switch 1-3 should always be ON for units equipped with the ONU option.

3.2 USM2.5 Configuration, *continued*

SW1 (4) and (8): Auxiliary DC Voltage Select

SW1, position 4 and 8 are used to select the voltage of the AUX DC delivered to the transponder, measured at J4 pin 2.

SW1 (4)	SW1 (8)	Aux DC Voltage
OFF	OFF	+ 5 VDC
ON	OFF	+ 24 VDC
OFF	ON	+ 15 VDC
ON ON	N/A	Incorrect Switch Setting

SW1 (5) and (6): Output Voltage AC or DC Scaling Select

SW1, position 5 and 6 is used to select the AC or DC representation of the XM Series 2 AC OUTPUT VOLTAGE measurement, measured at J4 pin 4.

SW1 (5)	SW1 (6)	Output Volts (DC)
OFF	OFF	N/A No output at J4 pin 4
OFF	ON	0.5 VAC Per Volt AC Output
ON	OFF	0.15 VDC Per Volt AC Output
ON	ON	N/A Incorrect Switch Setting

NOTE: DC setting accuracy can be calibrated by adjusting the front panel potentiometer (see Fig 2-4).

SW1 (7): Tamper Status Polarity Select

SW1, position 7 is used to select between inverted or non-inverted signal polarity for the system's transponder measured at J4 pin 7.

SW1 (7)	Tamper Status
OFF	Not inverted (switch opens; Tamper Status goes HIGH)
ON	Inverted (switch opens; Tamper Status goes LOW)

4.1 USM2.5 Signal Definition

IMPORTANT NOTE: For the USM2.5 to function correctly, OUTPUT (N) must be grounded to the chassis of the XM Series 2. In a typical installation, this is automatically done through the SPI, but during bench testing this connection will have to be manually made by placing a jumper between the power supply Output Neutral and chassis ground.

HIGH is typically defined as AUX DC Voltage ± 10% (+5VDC, +15VDC, or +24VDC as set by configuration). Voltage exceeding AUX DC is abnormal, but will not likely damage the USM2.
(90%AUX DC < HIGH < AUX DC)

LOW is typically defined as 0VDC, however any nonnegative voltage between 0VDC and +1VDC will be accepted by the USM2.5 as LOW.
(0VDC < LOW < 1VDC)

Sample 1	XMS2	USM2.5 External Acterna	USM2.5 AM	USM2.5 TG	USM2.5 Internal Acterna
Auxiliary DC Out	N/A	+5VDC	+15VDC	+5VDC	+24VDC
AC Output Voltage	63VAC	31.5VAC	31.5VAC	9.45VDC	31.5VAC
Battery Voltage (36 VDC Nominal)	41.4VDC	20.7VDC	20.7VDC	4.14VDC	20.7VDC
Output Current	7A	2.8VDC	2.8VDC	2.8VDC	2.8VDC
AC Input Voltage	240VAC	N/A	N/A	N/A	Approx. 2.7VAC*
Sample 2	**XMS2**	**USM2.5 External Acterna**	**USM2.5 External AM**	**USM2.5 External TG**	**USM2.5 Internal Acterna**
Auxiliary DC Out	N/A	+5VDC	+15VDC	+5VDC	+24VDC
AC Output Voltage	87VAC	43.5VAC	43.5VAC	13.05VDC	43.5VAC
Battery Voltage (36 VDC Nominal)	39.6VDC	19.8VDC	19.8VDC	3.96VDC	20.7VDC
Output Current	14A	5.6VDC	5.6VDC	5.6VDC	2.8VDC
AC Input Voltage	120VAC	N/A	N/A	N/A	Approx. 2.5VAC*

* Input voltages will measure approximately 2.7 VAC for 240 VAC input and 2.5 VAC for 120 VAC input.

Table 4-1; USM2.5 Output Scaling Samples

4.1 USM2.5 Signal Definition, *continued*

This Section provides specific details of all signals (input and output) provided on the XPDR and TMPR Connectors when set up as a USM2.5 (default setting).

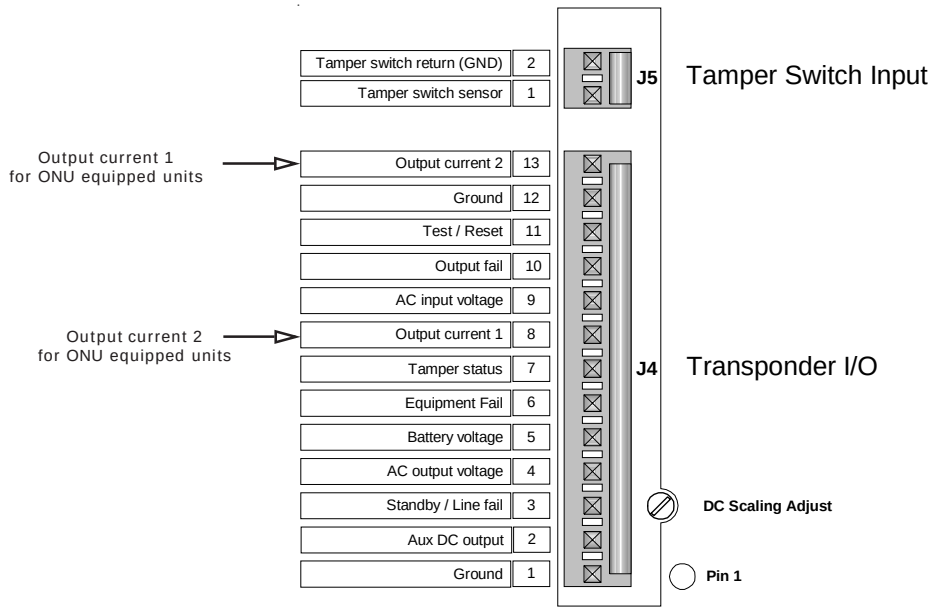

Figure 4-1; USM2.5 Signal Connections

Name:	**Common**
Pin:	J4-1
Signal Type:	Ground reference / return
Referenced to:	N/A
Description:	Ground / return reference for ALL signals (analog, input & output) on the USM2.5. Same as pins J4-12 and J5-2.

Name:	**Auxiliary DC Out**
Pin:	J4-2
Signal Type:	Power
Referenced to:	Common (J4-1, J4-12)
Description:	This pin provides power for transponder pull up resistors as needed. Auxiliary DC Out is not intended to provide complete logic & transceiver power to the transponder, except in the case of internal transponders
Parameters:	Current drawn from this pin should NOT exceed 100mA under any circumstance. Auxiliary DC Out is overcurrent protected by the foldback of the switching power supply
How to test:	Verify voltage on pin #2 is +5VDC, +15VDC, or +24VDC; (all within 10% tolerance) as set by configuration.

Name:	**Standby / Line Fail**
Pin:	J4-3
Signal Type:	USM2.5 Discrete output
Referenced to:	Common (J4-1, J4-12)
Description:	This USM2.5 output indicates the state of the XM2 inverter.
Active Means:	The XM2's inverter is ON, and/or the AC line input has failed.
Active State:	LOW
Inactive Means:	The XM2's inverter is NOT ON.
Inactive State:	HIGH
How to test:	With the XM2's inverter ON, verify LOW on J4-3.

4.1 USM2.5 Signal Definition, *continued*

Name:	**AC Output Voltage**
Pin:	J4-4
Signal Type:	USM2.5 Analog Output
Referenced to:	Common (J4-1, J4-12)
Description:	This pin provides a scaled, analog representation of the XM2's output voltage.
Parameters:	This analog output should be 0.5VAC or 0.15VDC per VAC of the XM2's output. The calculated voltage should be within 5% of the measured output voltage.
How to test:	Verify voltage on pin #4 is 0.5VAC, or 0.15VDC per VAC of the XM2's output, as set by configuration. Front panel potentiometer can be used to adjust the DC scaled voltage.

Name:	**Battery Voltage**
Pin:	J4-5
Signal Type:	USM2.5 Analog Output
Referenced to:	Common (J4-1, J4-12)
Description:	This pin provides a scaled, analog representation of the XM2's battery string voltage.
Parameters:	This analog output should read 0.1VDC, 0.3VDC, or 0.5VDC per VDC of the XM2's battery voltage, as set by configuration SW1(pins 1 and 2).
How to test:	Verify voltage on J3-5 is 0.1 VDC, 0.3VDC, or 0.5VDC per VDC of the XM2's battery voltage, as set by configuration.

Name:	**Equipment Fail Alarm**
Pin:	J4-6
Signal Type:	USM2.5 Discrete Output
Referenced to:	Common (J4-1, J4-12, J5-2)
Description:	This USM2.5 output indicates the general health of the XM2.
Active Means:	An active Equipment Fail Alarm pin indicates a 'latched' failure of an automated, local or remote inverter test or some other major alarm within the XM2. No matter the cause, an Equipment Fail Alarm indicates the XM2 will NOT perform as required and should be serviced. Once this condition has been detected by the USM2.5, the Equipment Fail Alarm will stay active until reset by the successful completion of a Self Test (either locally or remotely).
Active State:	LOW
Inactive Means:	Utility AC line input is present and no inverter failures have been detected.
Inactive State:	HIGH
How to Test:	Verify that Equipment Fail Alarm is not currently latched HIGH. With utility AC line and batteries present, initiate a remote inverter test (see description of Pin 11 Test/Reset). Next, simulate a battery failure by Switching XM2's battery circuit breaker OFF, the Equipment Fail Alarm should go LOW. Close the battery circuit breaker; the Equipment Fail Alarm will stay LOW. To clear the Equipment Fail Alarm, initiate an inverter test, wait one minute, stop the inverter test.

4.1 USM2.5 Signal Definition, *continued*

Name:	**Tamper Switch Status**
Pin:	J4-7
Signal Type:	USM2.5 Discrete Output
Referenced to:	Common (J4-1, J4-12)
Description:	USM2.5 output indicates the current state of the XM2's enclosure tamper switch. This is a non-latching type alarm.
Active Means:	The enclosure door is opened or the tamper switch is disconnected.
Active State:	HIGH
Inactive Means:	The enclosure tamper switch is properly connected and the door is closed.
Inactive State:	LOW
How to Test:	Disconnect any tamper switch from the USM2.5 TMPR connector. Short USM2.5 TMPR connector; the USM2.5 tamper status (pin #7) should go LOW. Remove the short on USM2.5 TMPR connector (open circuit) and the Tamper Status output should go HIGH.

NOTE: The tamper output polarity can be switched using SW1-7

Name:	**Output Current #1**
Pin:	J4-8 (J4-13 for ONU equipped units)
Signal Type:	USM2.5 Analog Output #1
Referenced to:	Common (J4-1, J4-12)
Description:	This USM2.5 analog output is a DC approximation of the total XM2 AC output #1 current.
Parameters:	0.4VDC per AC ampere XM2 output.
How to Test:	Verify voltage on J4-8 is 0.4VDC per AC ampere XM2 output #1. (± 5% tolerance)

NOTE: The output current scale is dependant upon SW1-3

Name:	**AC Input Voltage** (formerly not used on USM2 cards)
Pin:	J4-9
Signal Type:	USM2.5 Analog Input
Referenced to:	Common (J4-1, J4-12)
Parameters:	This analog output should be 0.0211 VRMS per VAC output for 120 VAC systems or 0.0113 VRMS per VAC output for 240 VAC systems. (Approx. 2.5 VAC.)
How to Test:	Verify that the voltage on J4 pin 9 is .0211 VRMS or .0113 VRMS per VAC of the XM2's input voltage (true RMS voltmeter must be used to read this signal). (Approx. 2.7 VAC.)

4.1 USM2.5 Signal Definition, *continued*

Name:	**Output Fail Alarm**
Pin:	J4-10
Signal Type:	USM2.5 Discrete Output
Referenced to:	Common (J4-1, J4-12)
Description:	This USM2.5 signal indicates the state of the AC output. A non-latching signal, the Output Alarm will match the state of the power supply output in real-time.
Active Means:	The XM2's AC output has failed.
Active State:	LOW
Inactive Means:	The XM2's AC output is OK.
Inactive State:	HIGH

NOTE: Removing the output fuse will result in a loss of power to the cable system (load). Do not attempt this test without first transferring the load to a Service Power Supply

How to Test:	Remove the XM2's AC output fuse; verify J4-10 is LOW. Return the XM2's fuse; verify J4-10 is HIGH.

Name:	**Test/Reset**
Pin:	J4-11
Signal Type:	USM2.5 Discrete Input
Referenced to:	Common (J4-1, J4-12)
Description:	This USM2.5 input controls remote test of the XM2's inverter and allows reset of a latched USM2.5 Equipment Fail Alarm. This control signal originates from the transponder.
Active Means:	An active Test / Reset pin indicates that the XM2 has been commanded to initiate and hold a remote inverter test.
Active State:	LOW, a transition from HIGH to LOW will indicate to the USM2.5 that the Test/Reset pin has been activated. The pin will be considered active by the USM2.5 for the duration that the pin is held LOW.
Inactive Means:	The XM2 is not commanded to perform or hold a remote inverter test. Any previously held test will be ended when the input is transitioned from active to inactive.
Inactive State:	HIGH
How to test:	To perform a test at the XM2, disconnect the transponder from the USM2.5. With line and battery applied to the XM2, carefully short and hold the Test/Reset J4-11 to ground (J4-1), the XM2 will immediately start inverter test mode. Wait at least 1 minute then release J4-11 from ground and the inverter test mode will end, and any latched Equipment Fail Alarm should clear.

Resetting a latched Equipment Fail Alarm:

If a USM2.5 Equipment Fail Alarm is latched when the Test/Reset pin is made active and a successful inverter test is completed, the Equipment Fail Alarm will be cleared (i.e. J4-6 change to inactive).

4.1 USM2.5 Signal Definition, *continued*

Name:	**Common**
Pin:	J4-12
Signal Type:	Ground reference / return
Referenced to:	N/A
Description:	Ground / return reference for ALL signals (analog, input & output) on the USM2.5. Same as J4 pin 1 and J5 pin 2.

Name:	**Output Current #2**
Pin:	J4-13 (J4-8 for ONU equipped units)
Signal Type:	USM2.5 Analog Output #2
Referenced to:	Common (J4-1, J4-12)
Description:	This USM2.5 analog output is a DC approximation of the total XM2 AC output #2 current.
Parameters:	0.4VDC per AC ampere XM2 output.
How to Test:	Verify voltage on J4-13 is 0.4VDC per AC ampere XM2 output #2 (±5% tolerance).

NOTE: The output current scale is dependant upon SW1-3

Name:	**Tamper Switch In**
Pin:	J5-1
Signal Type:	USM2.5 Discrete Input (dry contact switch)
Referenced to:	J5-2
Description:	Dry contact tamper switch input. Left open circuit, this USM2.5 input will be pulled up to +5VDC.
Active Means:	The enclosure's door is open or the tamper switch is not connected.
Active State:	OPEN
Inactive Means:	The enclosure's door is closed.
Inactive State:	SHORT
How to test:	See 'How to Test' for J4-7 (page 17).

Name:	Tamper Switch Return
Pin:	J5-2
Signal Type:	Ground Reference/return
Referenced to:	N/A
Description:	Return / ground for Tamper switch.

NOTE: ALL values are provided for troubleshooting and reference purposes ONLY.

5.1 USM2.5 Operations

USM2.5 Start up and Test Procedure

The XM Series 2 power supply should be fully tested before attempting any USM2.5 operations. Refer to the XM Series 2 technical manual for details. Once the power supply has been verified as "GOOD" the USM2.5 can then be tested as follows:

1. Verify the USM2.5 installation by checking:
   - Configuration settings of switch SW1.
   - USM2.5 is properly installed onto Communication Module, and that the Communication Module is correctly installed into the XM Series 2 power supply.
   - Tamper switch is properly installed and connected.
   - Data cable from the USM2.5 to the transponder is correctly installed.

2. Unplug transponder's data cable from the USM2.5.

3. Using a true RMS multimeter, verify the USM2.5's analog data (set by configuration) on the J4 connector by checking (ground on J4-1):
   - Auxiliary DC output on J4-2
   - AC Output Voltage Level on J4-4
   - Battery Level output on J4-5
   - Output Current#1 level on J4-8 (J4-13 for ONU equipped units)
   - Output Current#2 level on J4-13 (J4-8 for ONU equipped units)
   - AC input voltage level on J4 pin 9

4. Using a true RMS multimeter, verify the USM2.5's Digital data (set by configuration) on the J3 connector by checking (ground on J4-1):
   - Standby Status Alarm J4-3, active any time inverter in ON.
   - Equipment Fail Alarm J4-6, active if test failure or low battery condition.
   - Tamper Alarm J4-7, active when the enclosure's door is open.

NOTE: Removing the output fuse will result will result in a loss of power to the cable system (load). **Do not** attempt this test without first transferring the load to a Service Power Supply.

   - Output Alarm J4-10, active when the XM Series 2's AC output has failed.

5. Verify remote USM2.5 control on the J2 connector by shorting Pin11 to ground (J4-1):
   - Test/Reset J4-11, shorted XM Series 2 inverter Test ON, open inverter Test OFF.

NOTE: Successful completion of test steps 1-5 above is a very good indication that the USM2.5 is operating correctly, if the unit fails any of the tests, repeat the test to verify failure, and replace USM2.5 as needed.

6. Plug transponder's data cable back into the USM2.5. Repeat test steps 3-5; local results should remain the same. If results do NOT remain the same, this is an indication of a possible transponder failure.

7. Review analog data at status monitoring center. The reported data should be similar to values seen at the power supply.

8. Initiate an inverter test command from the status monitoring center. The power supply should go into test as commanded. Monitor command signals from the transponder on the USM2.5 connector J2 using a multimeter by checking:
   - Test/Reset J4-11, active XM Series 2 inverter ON, inactive inverter OFF.

NOTE: Test steps 6-8 are used to verify the transponder and the status monitoring system, if any of the tests fail; retest, verify failure, troubleshoot status monitoring system (less USM2.5) as needed.

6. Troubleshooting

6.1 Troubleshooting the Communications Link

Occasionally the communications link between the XM Series 2 power supply and the headend site may appear to break down. Updates to and from the power supply may not take place, or data received may be faulty. When this happens, isolate and correct the failed elements in a precise fashion to avoid extended troubleshooting times or the possibility spreading a potential failure from site to site.

Symptom:	No Remote Control (Inverter Test)
Diagnosis:	To start, verify that USM2.5 J4-11 (Test/Reset) are HIGH; change state via remote command pins should go LOW.
Repair Solution:	If the remote commands are present, goes from HIGH to LOW, replace the USM2.5; if not, troubleshoot the transponder and RF section.

Symptom:	Incorrect Scaling voltage reported.
Diagnosis:	Verify that the USM2.5 is configured correctly; then verify the XM2 Output in question; verify USM2.5 scaling.
Repair Solution:	If the scaling voltage reported is NOT correct, replace the USM2.5. If scaling voltages are correct, troubleshoot the transponder and RF section.

Symptom:	Status monitoring reports “Comm Error”.
Diagnosis:	Verify that the USM2.5 is correctly connected to the transponder, and that the transponder is correctly powered (per transponder documentation).
Repair Solution:	Correct connections as needed.

Symptom:	No Auxiliary DC output
Diagnosis:	Verify Auxiliary DC output by checking voltage on J4-2 with the USM2.5 disconnected from the status monitor; if voltage is correct, reconnect status monitor and check again.
Repair Solution:	With the USM2.5 disconnected from the transponder the Auxiliary DC voltage is NOT correct, replace the USM2.5. If AUX DC voltages is correct with transponder, troubleshoot the transponder and RF section.

7.1 Parts

The following parts can be purchased by calling your local Alpha representative:

Part Name:	**Alpha Part Number:**
Ribbon Cable	874-992-20
2 x 9 Header	540-581-10
Hardware Kit *Includes:* 2 x 9 Header Plastic Standoffs Screws	745-153-22
Sheet Metal Kit *Includes:* Faceplate with silkscreen Mounting Hardware	745-153-21

8. Reference

8.1 USM2.5 Signals, Quick Reference

PIN	Signal Name	Type	Signal Description
2	Tamper Switch Return	(Ground)	Return for Tamper Switch input to USM2-5 (same as J4 pins 1 and 12)
1	Tamper Switch	Discrete (In)	Tamper Switch input to USM
13	Output Current 2 (Output Current 1 for ONU equipped units)	Analog	Scaled analog representation of UPS output current #2. Scaling: 0.4 VDC per Amp output
12	Ground	Ground	Ground reference for all signal and power (same as J5 pin 2 and J4 pin 1).
11	Test / Reset	Discrete (in)	Command to UPS to initiate and hold a UPS battery and inverter test. Pulling the signal to ground for > 100ms will initiate the inverter test. Releasing the signal will allow the test to end. If the UPS has a latched alarm, successful completion of the test will clear the alarm.
10	Output Fail Alarm	Discrete (Out)	Indicates the state of the UPS output. Signal pulled up to AUX DC.
9	AC Input Voltage	Analog	Scaled representation of the UPS input voltage. Scaling set by UPS, input voltage can be .0211 (120 in) or .0113 (240 in) Volts per input volt.
8	Output Current 1 (Output Current 2 for ONU equipped units	Analog	Scaled analog representation of UPS output current #1. Scaling: 0.4 VDC per AMP output
7	Tamper Status	Discrete (Out)	Indicates state of the enclosure tamper switch. Signal pulled up to AUX DC. Polarity of signal determined by configuration.
6	Equipment Fail Alarm	Discrete (Out)	Indicates power supply equipment failure. Signal pulled up to AUX DC.
5	Battery Voltage	Analog	Scaled analog representation of UPS battery pack voltage. Scaling set by configuration. Can be .5 VDC or .15 VDC per battery volt.
4	AC Output Voltage	Analog	Scaled representation of the UPS output voltage. Scaling set by configuration. Can be .5 VDC or .15 VDC per output volt.
3	Standby / Line Fail Alarm	Discrete (Out)	Indicates the state of the UPS inverter. Signal pulled up to AUX DC.
2	Auxiliary DC Out	Power	Auxiliary output power for transponder. Voltage set by configuration; +5, +15, or +24 VDC
1	Ground	Ground	Ground reference for all signal and power (same as J5 pin 2 and J4 pin 12).

IMPORTANT NOTE: In order for the USM2.5 to function correctly, OUTPUT (N) must be grounded to the XM Series 2's chassis! During normal operation this is automatically done though the SPI, but during bench testing this ground will have to be manually maintained, by placing a jumper between the Output Neutral and chassis ground.

8.2 Testing and Troubleshooting, Quick Reference

USM2.5 Start up and Test Procedure

The XM Series 2 power supply should be fully tested before attempting any USM2.5 operations. Refer to the XM Series 2 technical manual for details. Once the power supply has been verified as "GOOD" the USM2.5 can then be tested as follows:

1. Verify the USM2.5 installation by checking:
   - Configuration settings of switch SW1.
   - USM2.5 is properly installed onto Communication Module, and that the Communication Module is correctly installed into the XM Series 2 power supply.
   - Tamper switch is properly installed and connected.
   - Data cable from the USM2.5 to the transponder is correctly installed.

2. Unplug transponder's data cable from the USM2.5.

3. Using a true RMS multimeter, verify the USM2.5's analog data (set by configuration) on the J4 connector by checking (ground on J4-1):
   - Auxiliary DC output on J4-2
   - AC Output Voltage Level on J4-4
   - Battery Level output on J4-5
   - Output Current#1 level on J4-8
   - Output Current#2 level on J4-13
   - AC input voltage level on J4 pin 9

4. Using a true RMS multimeter, verify the USM2.5's Digital data (set by configuration) on the J3 connector by checking (ground on J4-1):
   - Standby Status Alarm J4-3, active any time inverter in ON.
   - Equipment Fail Alarm J4-6, active if test failure or low battery condition.
   - Tamper Alarm J4-7, active when the enclosure's door is open.

NOTE: Removing the output fuse will result will result in a loss of power to the cable system (load). **Do not** attempt this test without first transferring the load to a Service Power Supply.

   - Output Alarm J4-10, active when the XM Series 2's AC output has failed.

5. Verify remote USM2.5 control on the J2 connector by shorting Pin11 to ground (J4-1):
   - Test/Reset J4-11, shorted XM Series 2 inverter Test ON, open inverter Test OFF.

NOTE: Successful completion of test steps 1-5 above is a very good indication that the USM2.5 is operating correctly, if the unit fails any of the tests, repeat the test to verify failure, and replace USM2.5 as needed.

6. Plug transponder's data cable back into the USM2.5. Repeat test steps 3-5; local results should remain the same. If results do NOT remain the same, this is an indication of a possible transponder failure.

7. Review analog data at status monitoring center. The reported data should be similar to values seen at the power supply.

8. Initiate an inverter test command from the status monitoring center. The power supply should go into test as commanded. Monitor command signals from the transponder on the USM2.5 connector J2 using a multimeter by checking:
   - Test/Reset J4-11, active XM Series 2 inverter ON, inactive inverter OFF.

NOTE: Test steps 6-8 are used to verify the transponder and the status monitoring system, if any of the tests fail; retest, verify failure, troubleshoot status monitoring system (less USM2.5) as needed.

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