

## Instruction Manual

# Model 4115-41-310 Ka-Band Block Upconverter

May 2014, Rev. A



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# INSTRUCTION MANUAL

## MODEL 4115-41-310 Ka-Band Block Upconverter, Weather Resistant\*

<u>TABLE OF CONTENTS</u>	<u>PAGE</u>
Warranty	2
<b>1.0 General</b>	<b>3</b>
1.1 Equipment Description	3
1.2 Technical Characteristics	4
<b>2.0 Installation</b>	<b>6</b>
2.1 Message Protocol	6
2.2 M&C Commands	7
2.3 M&C Queries	8
2.4 Ethernet Interface Installation	10
2.4.1 Methods of Connection	10
2.4.2 Ethernet Configuration	10
2.4.3 Web page M&C	12
2.4.4 SNMP Configuration	12
2.5 Translator Outline Drawings	15
2.6 Physical Interface	16
2.7 Installation/Operation	17

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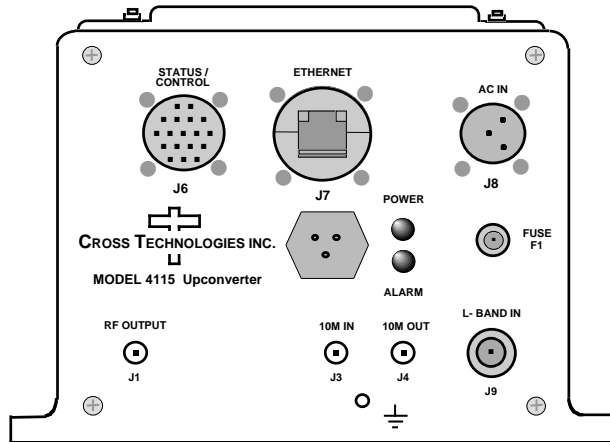
# MODEL 4115-41-310 Ka-Band Block Upconverter, Weather Resistant\*

## 1.0 General

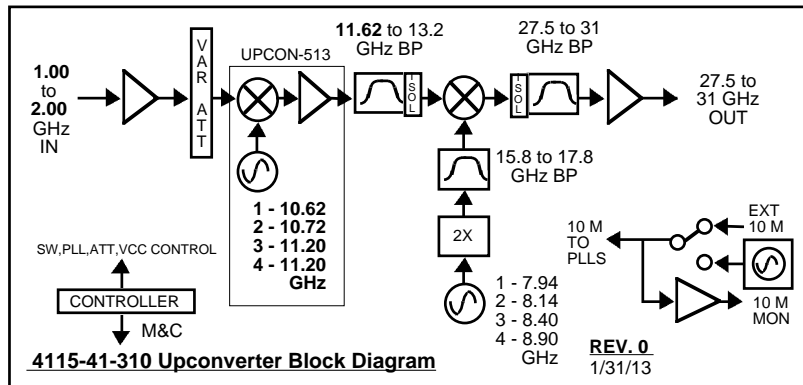
### 1.1 Equipment Description

The 4115-41-310 Ka-band Block Upconverter converts 1.00 - 2.00 GHz up to 27.5 - 31.0 GHz in four selectable fixed bands. Front panel LEDs provide indication of DC Power and PLL Alarms. The L-band to RF gain is +30 dB. Connectors are 2.92mm for RF Out, SMA for the external reference input and reference output and Type N (all female) for the L-band input. Gain, band select, and internal 10 MHz frequency are controlled by the Ethernet M&C. In AUTO, the 10 MHz reference stays in external if the external level is in the +2 to +8 dBm range. It is powered by a 100-240  $\pm$  10% VAC power supply, and mounted in a 8"W X 6"H X 16"D Weather Resistant\* enclosure.

**NOTE:** \*Weather Resistant enclosures are designed to be water resistant for installation in an outdoor enclosure/antenna hut OR mounted outdoors on an antenna assembly at their specified temperature ranges. They are designed to be located “out in the elements” (water, sleet, snow, etc.) but they are *not* designed to be “submerged under water”. If an extended temperature range is required, there is an **Extended Temperature** option (**Option W21**; -30°C to +60°C) available at an additional cost. Contact Cross for quote.



**Model 4115-41-310 Ka-Band Block Upconverter Front Panel**



**FIGURE 1.0 Model 4115-41-310 Ka-Band Upconverter Block Diagram**

## 1.2 Technical Characteristic

TABLE 1.0 4115-41-310 Upconverter Specifications**								
<b>Input Characteristics</b>								
Impedance/Return Loss	50Ω/14 dB							
Frequency (GHz)	1.00 to 2.00 GHz							
Noise Figure, Maximum	20 dB maximum gain							
Input Level Range	-40 to -15 dBm							
<b>Output Characteristics</b>								
Impedance/Return Loss	50Ω/14 dB, Mute & UnMute							
Frequency (GHz)	Band 1 - 27.5 to 28.5							
	Band 2 - 28.0 to 29.0							
	Band 3 - 29.0 to 30.0							
	Band 4 - 30.0 to 31.0							
Output Level Range	-15 to 0 dBm							
Output 1 dB Compression	+10 dBm, maximum gain							
Mute	> 60 dB @ 0 dBm Output							
<b>Channel Characteristics</b>								
Gain at $F_c$	+30 ±3 dB, (+30 to 0 dB variable in 0.5 ±0.5 dB steps)							
Spurious, Inband	F>F <sub>c</sub> ±1; <-60 dBC, 15 to -5 dBm out; Over 27.5 to 31.0 GHz band F>F <sub>c</sub> ±1; <-50 dBC, power supply related and reference sidebands; Over 27.5 to 31.0 GHz band							
Spurious, Out of band	<-60 dBm; Gain = +15, output = 2dBm; Over 10 - 27.5 GHz and 31.0 - 40 GHz bands							
Intermodulation	<-50 dBC for two carriers at 4 MHz spacing, each at -5 dBm out							
Frequency Response	±2 dB, over RF band; ± 1.5 dB, 120 MHz BW; ± 0.5 dB, 10 MHz BW							
Frequency Sense	Non-inverting							
<b>LO Characteristics</b>								
LO Frequency	Band Specific							
Frequency Accuracy	±0.05 ppm max. over temp internal ref.; Aging <22 Hz/24 hours at constant temp; ext. ref. inpu							
10 MHz Level In/Mon.	+2 to +8 dBm in; Monitor Output = input level ± 1.0 dB, 50 ohms							
Phase Noise @ Frequency Hz >	10	100	1K	10K	100K	1M	10M	100M
dBc/Hz	-32	-65	-75	-84	-95	-105	-114	-114
<b>Controls, Indicators</b>								
Gain, Band, 10M Frequency	Gain, band select, and internal 10 MHz frequency via Ethernet M&C or Status/Control Connector							
PLL Alarm	Red LED, External Contact Closure							
Power	Green LED							

Technical Characteristics continued on page 5...

**1.2 Technical Characteristics** (Continued from page 4 ...)

<b>Other</b>	
RF Out Connector	2.92 mm (Type K) female, 50Ω, weather resistant
L-Band Connector	Type N (female), 50Ω, weather resistant
10 MHz Connectors	SMA (female), 50Ω, weather resistant
Weather Resistant* Connectors	<b>Status/Control Connector</b> , MS3112E14-18S; Mating Cable Connector, MS3116F14-18P. <b>Ethernet Connector</b> , RJF21B; Mating Cable Connector, RJF6G; Cable interface, Standard RJ45. <b>AC Input Connector</b> , Clipper Series, CL1M1102, Mating Cable Connector, CL1F1101. (Unless otherwise specified, the mating connector is provided preassembled onto a standard NEMA 5-15 U.S. power cord.)
Size	8" Wide X 6" High X 16" Deep, Weather Resistant* enclosure.
Power	100-240 ±10% VAC, 47 - 63 Hz, 25 watts maximum.
**+0 to +50 degrees C; Specifications subject to change without notice.	

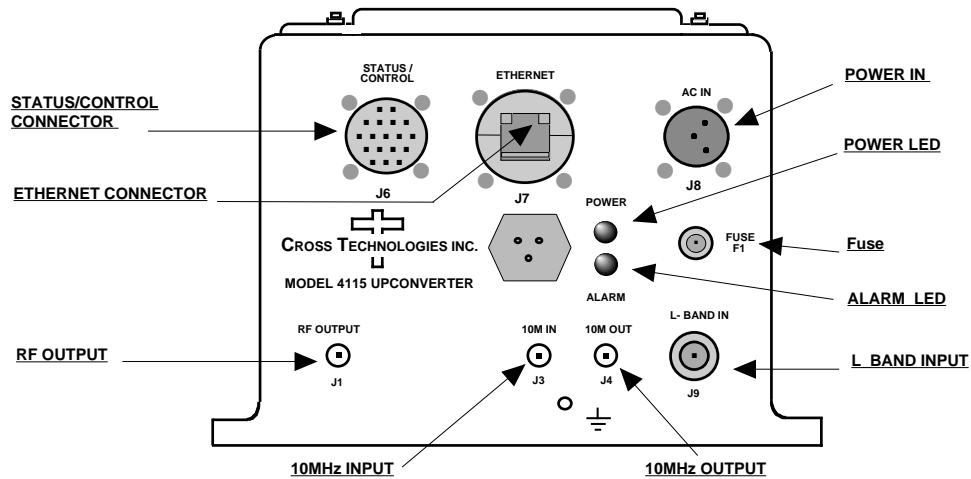
**\*Weather Resistant** enclosures are designed to be water resistant for installation in an outdoor enclosure/antenna hut OR mounted outdoors on an antenna assembly at their specified temperature ranges. They are designed to be located "out in the elements" (water, sleet, snow, etc.) but they are *not* designed to be "submerged under" water.

If an extended temperature range is required, there is an **Extended Temperature** option (**Option W21**; -30°C to +60°C) available at an additional cost. Contact Cross for quote.

## 2.0 Installation

The 4115-41-310 Ka-Band Upconverter consists of a 8”W X 6”H X 16”D Weather Resistant\* enclosure. A switching, ±12, +24, +5 VDC power supply provides power for the internal assemblies. The 4115-41-310 can be secured to a mounting plate using the 4 holes on the bottom of the front and rear panels. See figure 2.5 for mounting dimensions.

**Figure 2.0 - 4115-41-310 Front Panel**



### 2.0.1 Connection to AC Input Power

The 4115-41-310 is furnished with a pre-assembled standard NEMA 5-15P U.S. power input cable as described below.

4115-41-310 Power Input Connector, Clipper Series, CL1M1102 & Crimp Pins	
Mating Connector, Clipper Series, CL1F1101 and Crimp Pins	
and CL101021 Backshell	
Pin	Input Connector Pin Description
1	100-240 ±10% VAC, 47-63 Hz, 20 watts max.
2	Neutral
3	Ground

### 2.1 Message Protocol

The serial format for the RS232/RS422/RS485 port is 9600 baud, 8 data bits, no parity, and 1 stop bit. All messages consist of ASCII printable characters so standard terminals and terminal emulator programs may be used to control and monitor the unit. All messages begin with the open bracket character “{” (ASCII 0x7B) and end with the close bracket character “}” (ASCII 0x7D). Messages consisting of commands to set or change operating parameters and modes of the unit begin with “C” (ascii 0x43) followed by a command specific character. Messages consisting of queries to report operating parameters and modes begin with “S” (ASCII 0x53) followed by a parameter specific character.

## 2.2 M&C Commands

The following tables summarize the commands and status queries applicable to the 4115-41-310 frequency converter.

\* **PLEASE NOTE:** The two character {aa} prefix, shown in the table below, is present ONLY when RS485 is selected.

**Table 2.0 - Model 4115-41-310 M&C Commands**

Table 2.0: Model 4115-41-310 M&C Commands		
Command	Syntax	Description
Set Frequency Band	{aaCBx}	where:
		x = 1 to select band 1: in = (1000 to 2000 MHz) out = (2750 to 2850 MHz)
		x = 2 to select band 2: in = (1000 to 2000 MHz) out = (2800 to 2900 MHz)
		x = 3 to select band 3: in = (1000 to 2000 MHz) out = (2900 to 3000 MHz)
		x = 4 to select band 3: in = (1000 to 2000 MHz) out = (3000 to 3100 MHz)
Set Gain	{aaCGxxx}	where:
		xxx = 3 characters
		Range: 300 to 000 (30.0 to 0 in 0.5 dB steps)
Set Serial Interface	{aaCIx}	where:
		x = 0 to select RS232
		x = 1 to select RS422
		x = 2 to select RS485
Set Mute	{aaCMx}	where:
		x = 1 to mute the output
		x = 0 to unmute output
Set RS485 address	{aaCRxx}	where:
		xx = 2 characters
		Range: 00 to 31
Set Int. 10 MHz reference offset	{aaCOxxxxx}	where:
		xxxxx = 5 characters
		Range: +2000 to +8000
Set 10 MHz reference mode	{aaCEx}	where:
		x = 1 to select internal reference
		x = 2 to select external reference
		x = 3 to select auto reference

## 2.3 M&C Queries

**Table 2.1 Model 4115-41-310 M&C Queries**

Table 2.1: Model 4115-41-310 M&C Queries		
Command	Syntax	Description
Frequency Band	{aaSB}	Returns {aaSBx} where:
		x = 1 if band 1 is selected in = (1000 to 2000 MHz) out = (2750 to 2850 MHz)
		x = 2 if band 2 is selected in = (1000 to 2000 MHz) out = (2800 to 2900 MHz)
		x = 3 if band 3 is selected in = (1000 to 2000 MHz) out = (2900 to 3000 MHz)
		x = 4 if band 4 is selected in = (1000 to 2000 MHz) out = (3000 to 3100 MHz)
Gain	{aaSG}	Returns {aaSGxxx} where:
		xxx = 3 characters
		Range: 30 to 0 ( in 0.5 ± 0.5 dB steps)
		Example: {aaSG245} indicates the current gain setting is 24.5 dB
10 MHz reference	{aaSE}	Returns {aaSEx} where:
		x = 1 if Internal 10 MHz reference is selected
		x = 2 if External 10 MHz reference is selected
		x = 3 if Auto 10 MHz reference is selected
Serial Interface	{aaSI}	Returns {aaSIx} where:
		x = 0 if RS232 is selected
		x = 1 if RS422 is selected
		x = 2 if RS485 is selected
RS485 address	{aaSR}	Returns {aaSAxx} where:
		xx = 2 characters
		Range: 00 to 31
Mute	{aaSM}	Returns {aaSMx} where:
		x = 0 if mute is off
		x = 1 if mute is on

*Continued on page 9...*



**Table 2.1 Model 4115-41-310 M&C Queries (Continued from page 8)**

<b>Table 2.1: Model 4115-41-310 M&amp;C Queries - Continued...</b>		
<b>Command</b>	<b>Syntax</b>	<b>Description</b>
Internal 10 MHz reference offset	{aaSO}	Returns {aaSOxxxxx} where:
		xxxxx = 5 characters
		Range: +2000 to +2800
Summary Alarm	{aaSA}	Returns {aaSAx} where:
		x = 0 if no summary alarm, x = 1 if summary alarm
Internal Temperature	{aaST}	Returns {aaSTxxx} where:
		xxx = 3 characters
		Range (-99 to +99) degrees Celsius
Model and firmware revision	{aaSV}	returns {aaSVxxxxxxxxxyyy} where:
		xxxxxxxx = unit model number
		yyy = unit firmware rev.
Unit Status	{aaSS}	returns {aaSSwxyz} where:
		w = summary alarm: 0 = off, 1 = on
		x = ref. source: 1 = internal, 2 = external
		y = oven status: 0 = normal, 1 = oven warmup
		z = mute status: 0 = not muted, 1 = muted

## **2.4 ETHERNET Interface Installation and Operation**

The 4115-41-310 Upconverter is equipped with a 10/100 Base-T compatible Ethernet interface for control and monitoring of its operating parameters. An HTML script interface allows the user to monitor and control the converter using a standard web browser. SNMP (Simple Network Management Protocol) is also supported. Contact Cross Technologies for the SNMP MIB file.

### **2.4.1 Methods of Connection**

#### **Directly Connected to a PC:**

For control from a local PC, attach the 4115-41-310's Ethernet port to the Ethernet network connector on the PC using a crossover RJ-45 cable.

#### **LAN Connection**

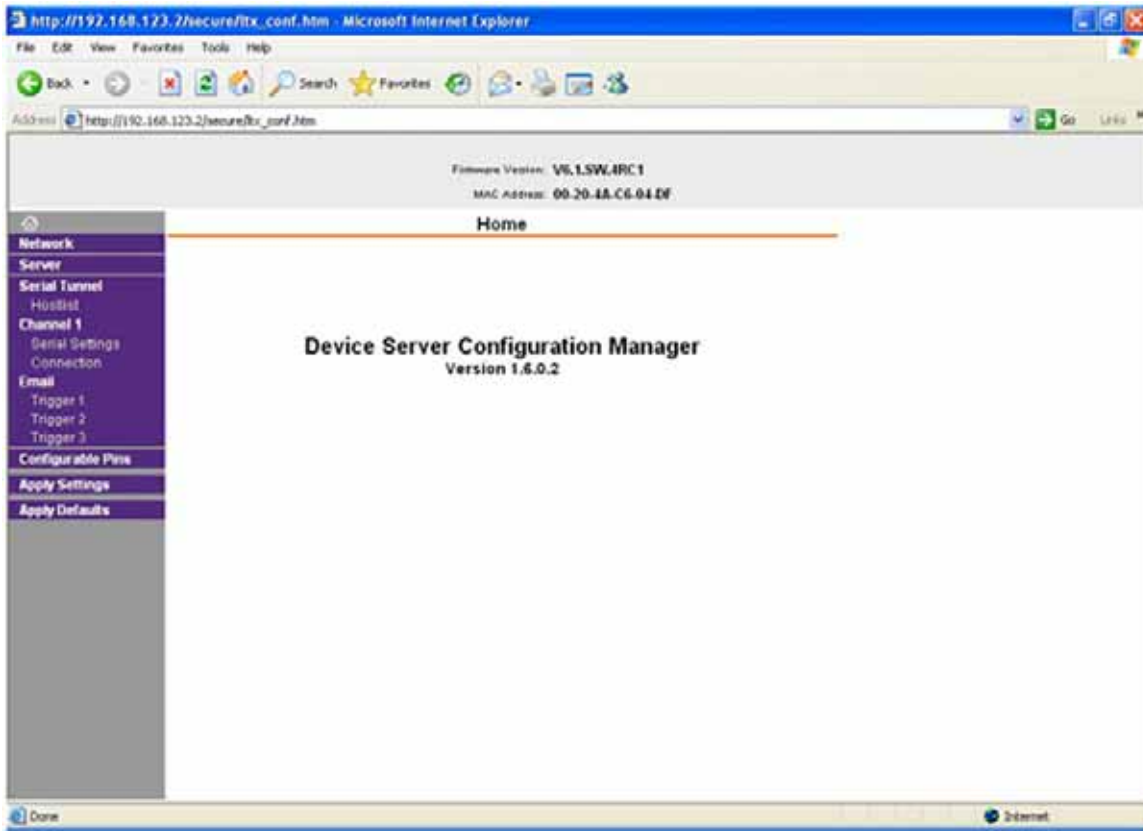
For LAN connections, attach the 4115-41-310 Ethernet port to the LAN using a normal RJ-45 cable. Use any PC on the LAN to connect to the 4115-41-310.

### **2.4.2 Ethernet Configuration**

Each 4115-41-310 must be configured with an appropriate IP address, Netmask, and Gateway assigned by your network manager. The 4115-41-310 is set at the factory with a static address that is written on a tag attached to the unit. The device server in the 4115-41-310 has a built in http based configuration manager that is used to configure network settings. To access the configuration manager open a web browser and enter the IP address of the 4115-41-310 in the browser's address field. The window shown in Figure 2-A will appear. As delivered, there is no password set. Choose your user name and password here or leave those fields blank and click OK to proceed to the configuration manager web page.



**Figure 2-A: Password Screen**



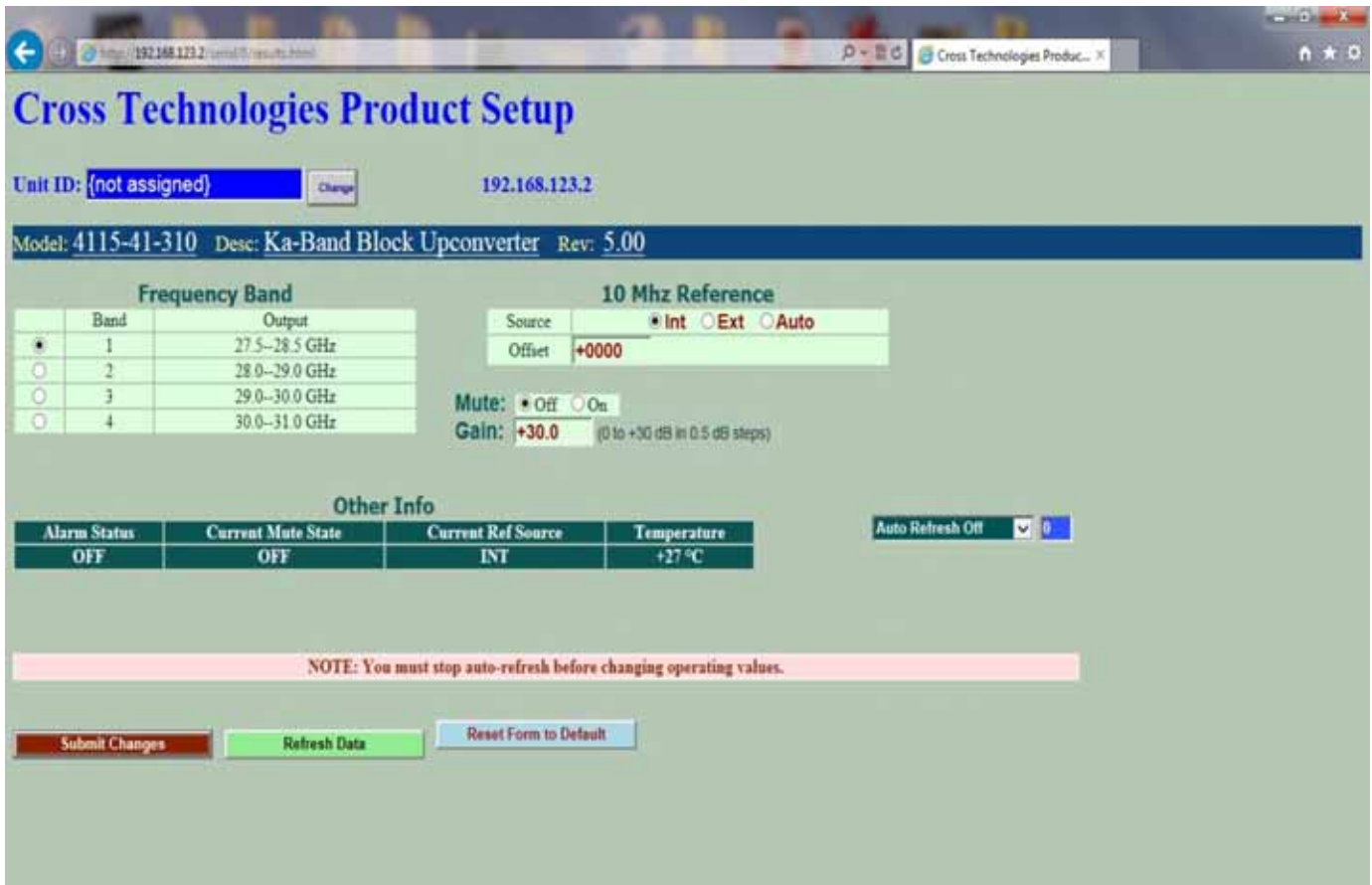
**Figure 2-B: Configuration Manager Screen**

In the left frame of the configuration manager click on Network to display the Network Settings screen. Enter the IP address, Subnet mask, and Gateway address with delimiter dots (example: 192.168.192.47). Click on apply settings to apply the new settings in the device server.

### **2.4.3 Web page M & C**

Enter the following address in a web browser to access the M&C web page:

<http://<ip address of 41xx>/serial/0/setup.htm> where <ip address> is the IP address of the unit. Figure 2-C shows the web page from a model 4115-41-310 Upconverter.

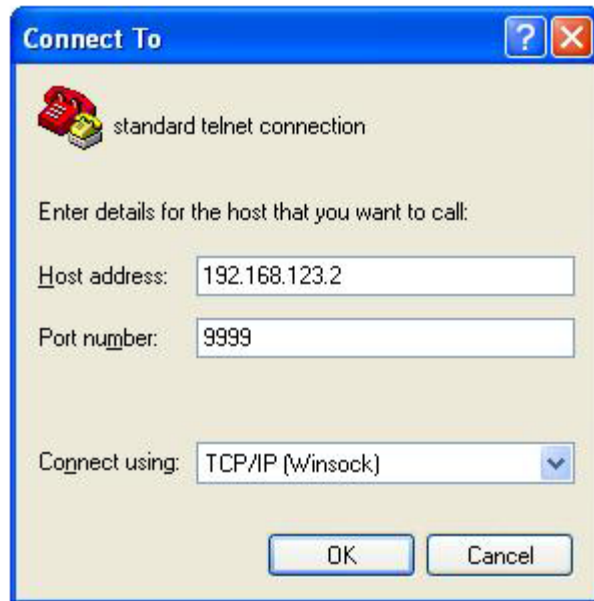


**Figure 2-C: Model 4115-41-310 Web page**

#### **2.4.4 SNMP Configuration**

Setting of SNMP parameters such as Community Write and Community Read strings requires a *Telnet* connection to port 9999. The following instructions explain how to establish such a *Telnet* connection using Windows XP's Hyper Terminal utility .

Start the Hyper Terminal application and select “New Connection” from the “File” drop down menu. The next screen is a “Connect To” dialog box. Select TCP/IP (Winsock) from the “Connect” using drop down menu. Enter the IP address of the 4115-41-310 in the “Host address:” field and 9999 in the “Port number” field. Figure 2-E shows an example of the Hyper Terminal settings required to access the SNMP configuration menu.



**Figure 2-E: Telnet Settings in Hyper Terminal**

Once the *Telnet* connection is established you will be prompted to “Press Enter for Setup Mode.” Press enter and a menu of device server configuration options will appear (see Figure 2-F). Select menu item 3, “SNMP configuration.” You will be prompted to enter SNMP community read and write strings. After setting your desired community strings you will be prompted to “Enter IP addresses for SNMP traps” You must enter at least one and up to four IP addresses of SNMP managers that will access the unit. This is required even though SNMP traps are not implemented. The unit will not process SNMP SET and GET requests from an SNMP manager unless the IP address associated with that manager is entered in the device server.

**Figure 2-F: Device Server Configuration Menu**

```
xport_telnet_setup - HyperTerminal
File Edit View Call Transfer Help
Enhanced Password is disabled

***** Channel 1 *****
Baudrate 38400, I/F Mode 4C, Flow 00
CPU performance : Standard
Web RAM size 01000

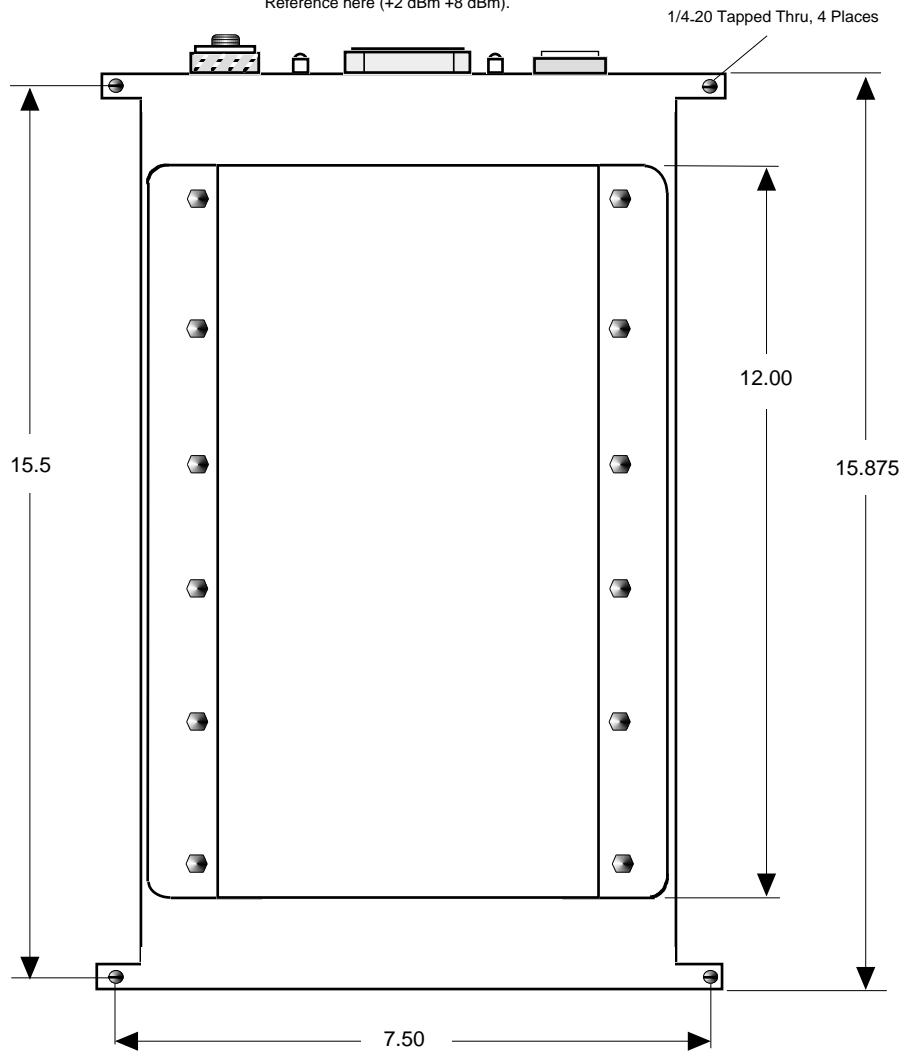
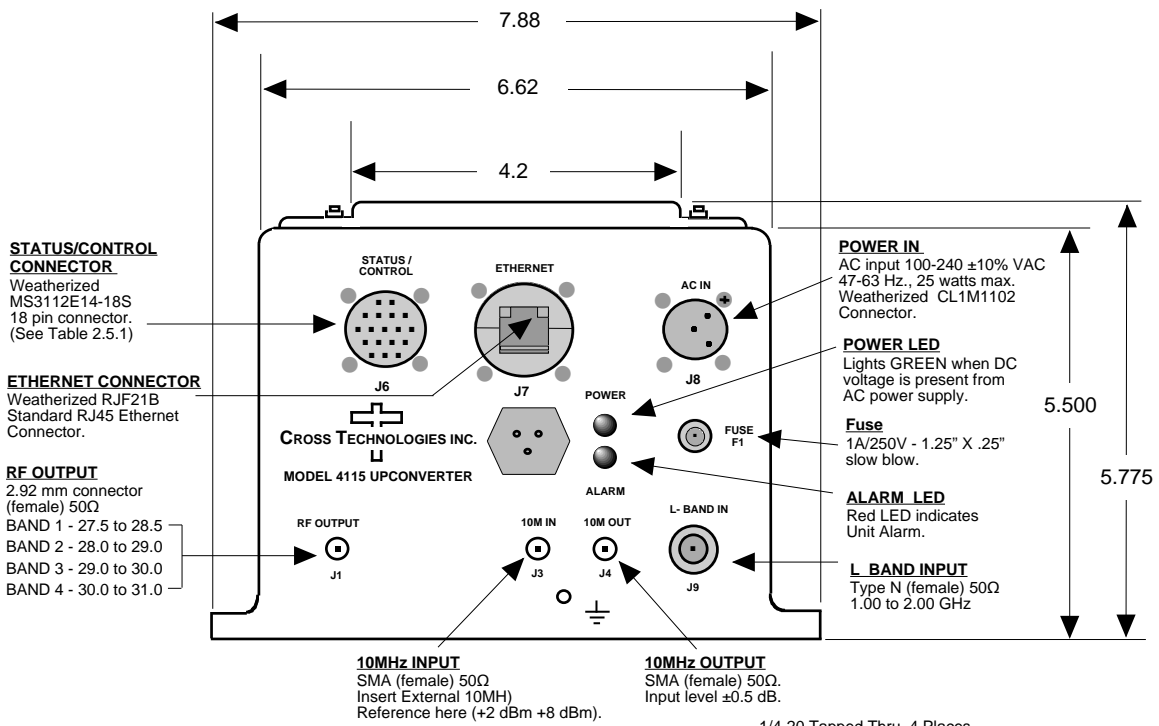
***** SNMP Configuration *****
SNMP community name for read: public
SNMP community name for write: public
Trap IP addresses:
1: 192.168.123.1
2: 0.0.0.0
3: 0.0.0.0

Change Setup:
0 Server configuration
1 Channel 1 configuration
3 SNMP configuration
6 Security
7 factory defaults
8 exit without save
9 save and exit

Your choice ?

Connected 0:00:20 ANSIW TCP/IP SCROLL CAPS NUM Capture Print
```

**Figure 2.5** Shows front panel input and output connections, top view and baseplate mounting dimensions.



## **2.6 Physical Interface**

All 4115 and 4116 units provide a RS232/RS422/RS485 interface port and a 10/100 Base-T Ethernet port. Both ports are available when the unit is installed and powered up. Commands may be sent to either port at any time and they will be processed in the order that they are received. The RS232/RS422/RS485 signals connect via an 18-pin, MS3112E14-18S connector as shown in Table 2.6. The Ethernet signals connect via a standard RJ45 connector, Part #RJF6G.

**Table 2.5.1: Monitor and Control Connector**

<b>Monitor and Control Connector Pinout</b>	
Connector part number MS3112E14-18S	
<b>Mating</b>	Cable Connector part number MS3116F14-18P
<b>Pin</b>	<b>Signal Description</b>
A	Chassis Ground
N	Summary Alarm Normally Closed
P	Summary Alarm Common
R	Summary Alarm Normally Open
E	RS422/RS485 Data Out-
F	Signal Ground
C	RS422/RS485 Data In-
D	RS422/RS485 Data Out+, RS232 Data Out
B	RS422/RS485 Data In+, RS232 Data In

### **NOTE: Planning Ethernet Access**

It is recommended that IP knowledgeable customer personnel be consulted as a resource in the installation and use of the Ethernet access features of the Cross Technologies product.



## 2.7 Installation/Operation

### **Installing and Operating the 4115-41-310 Ka-Band Upconverter**

1. Connect a -40 dBm to -15 dBm signal to L-BAND INPUT, (Figure 2.5).
2. Connect the RF OUTPUT, to the external equipment.
3. Using the pre-assembled AC power input cable (furnished), connect 100-240  $\pm$ 10% VAC, 47 - 63 Hz to AC In connector on the front panel.
4. If a custom length power cable must be made, refer to description below for connections\*.
5. Be sure DS1 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.5).
6. Set the gain for +30 to 0 dB insuring that the output level is always in the range of -15 to 0 dBm.
7. Select either INT (for internal 10 MHz ref), AUTO (for internal 10 MHz ref UNLESS an external 10 MHz, +2 to +8 dBm signal is connected to J2), or EXT (for external 10 MHz, +2 to +8 dBm reference that is inserted at J2) on front panel switch S1 (See Section 2.0 & Figure 2.6).
8. Check that a 10 MHz, signal is present at the 10 MHz REF OUTPUT at the same level as the input,  $\pm$ 0.5 dB. (J4 - Figure 2.5).
9. AC Fuse - The fuse is a 1.25" x .25"- 1.0 amp (slow blow) and is inserted in the fuse F1 position.

**NOTE:** If a fuse continues to open, the power supply is most likely defective.

### **2.0.1 Connection to AC Input Power**

The 4115-41-310 is furnished with a pre-assembled AC power input cable as described below.

<b>4115-41-310 AC Power Input Connections</b>	
	Connector, Clipper Series, CL1M1102 and crimp pins
<b>Mating</b>	Connector, Clipper Series, CL1F1101 and crimp pins
<b>Pin</b>	<b>Input Connector Pin Description</b>
1	100-240 $\pm$ 10% VAC, 47-63 Hz, 20 watts max.
2	Neutral
3	Ground

Unless otherwise specified, the mating connector is provided preassembled onto a standard NEMA 5-15P U.S. power cord.



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