

# Instruction Manual

# Model 4115-300 Ka-Band Block Upconverter Weatherized Unit

August 2011, Rev. E



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# INSTRUCTION MANUAL

## MODEL 4115-300 Ka-Band Upconverter, Weather Resistant\*

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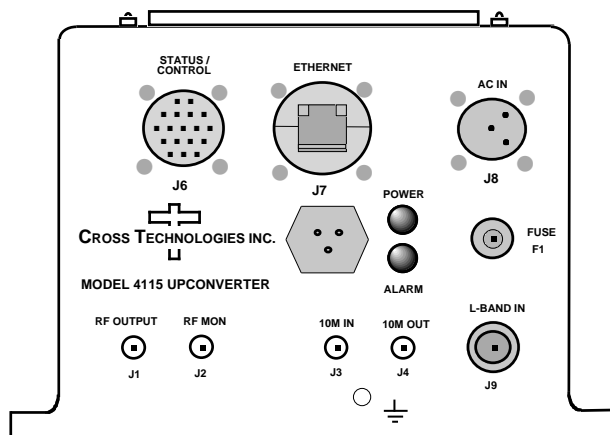
# MODEL 4115-300 Ka-Band Upconverter, Weather Resistant\*

## 1.0 General

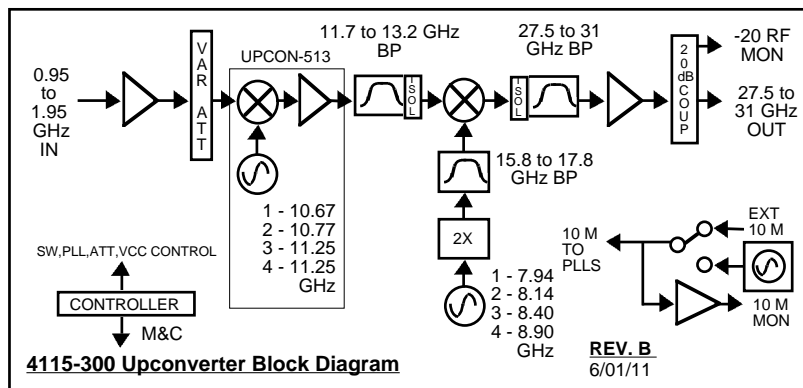
### 1.1 Equipment Description

The 4115-300 Ka-band Block Upconverter converts 0.95 - 1.95 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 and RF Monitor, SMA for the external reference input and reference output and Type N (all female) for the L-band. 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 4115-300 Ka-Band Block Upconverter Front Panel**



**FIGURE 1.0 Model 4115-300 Ka-Band Block Upconverter Block Diagram**

## 1.2 Technical Characteristics

**TABLE 1.0 4115-300 Upconverter Specifications\*\***

### Input Characteristics

|                       |                  |
|-----------------------|------------------|
| Impedance/Return Loss | 50 Ω /14 dB      |
| Frequency             | 0.95 to 1.95 GHz |
| Noise Figure, max.    | 20 dB max. gain  |
| Input Level           | -40 to -15 dBm   |

### Output Characteristics

|                        |  |
|------------------------|--|
| Impedance/Return Loss  | 50 Ω/14 dB, Mute & Unmute  |
| Frequency (GHz)        | <b>Band 1</b> - 27.5 to 28.5<br><b>Band 2</b> - 28.0 to 29.0<br><b>Band 3</b> - 29.0 to 30.0<br><b>Band 4</b> - 30.0 to 31.0 |
| Output Level Range     | -15 to 0 dBm   |
| Output 1dB Compression | +10 dBm, max. gain   |
| Mute at max. level out | >60 dB @ 0 dBm output  |

### Channel Characteristics

|                       |   |
|-----------------------|---|
| Gain                  | +30 ±3 dB, (+30 to 0 dB variable in 0.5 dB steps)   |
| Spurious, Inband      | SIG REL <-50 dBC in band, -15 to 0 dBm out;<br>SIG IND <-55 dBm; Over 27.5 to 31 GHz band |
| Spurious, Out of band | <-55 dBm; Over 27.0 to 31.5 GHz Band  |
| Intermodulation       | <-50 dBC for two carriers at 4 MHz spacing, each at -5 dBm out                            |
| Frequency Response    | ±2 dB, over RF band; ± 0.5 dB, 40 MHz BW;<br>Frequency Sense - Non-inverting              |

### LO Characteristics

|                     |  |
|---------------------|--|
| LO Frequency        | Band Specific  |
| Frequency Accuracy  | ± 0.05 ppm max. over temp internal reference; ext. ref. input  |
| 10 MHz Level In/Mon | +2 to +8 dBm In; Monitor Output = Input level ±1.0 dB, 50 ohms |

| Phase Noise @ F (Hz)> | 100 | 1K  | 10K | 100K | 1M   |
|-----------------------|-----|-----|-----|------|------|
| dBC/Hz                | -65 | -75 | -80 | -95  | -105 |

### Controls, Indicators

|                       |   |
|-----------------------|---|
| Gain, Band, 10M Freq. | 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   |

### Other

|                          |   |
|--------------------------|---|
| RF Out, RF Mon. Conn.    | 2.92mm (40 GHz) female, 50Ω   |
| L-Band Connector         | Type N (female), 50Ω  |
| 10 MHz Connector         | SMA (female), 50Ω   |
| Status/Control Connector | MS3112F-18P, Weatherized Connector  |
| Ethernet Connector       | Standard RJ45, Weatherized Connector  |
| Size                     | 8" Wide X 6" High X 16" Deep Weather Resistant* Enclosure                             |
| Power                    | 100-240 ±10% VAC, 47 - 63 Hz, 25 watts max./<br>FCI Clipper Series CL1M1102 Connector |

\*\*+10°C to +40°C; Specifications subject to change without notice.

## 2.0 Installation

The 4115-300 Ka-Band Upconverter consists of a 8"W X 6"H X 16"D Weather Resistant\* enclosure. A switching,  $\pm 12$ , +24, +5 VDC power supply provides power for the assemblies. The 4115-300 can be secured to a mounting plate using the 4 holes on the bottom of the front and rear panel. (See Figure 2.5 for mounting dimensions.)

**Figure 2 - 4115-300 Front Panel**



### 2.0.1 Connection to AC Input Power

The 4115-300 is furnished with a pre-assembled AC power input cable as described below.

| 4115-300 Mating Input Connector             |   |
|---|---|
| FCI Clipper Series, CL1M1102 and crimp pins |   |
|   |   |
| Pin   | Input Connector Pin Description                 |
| 1   | 100-240 $\pm 10\%$ 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 4115-300 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 4115-300 M&C Commands**

| Table 2.0: Model 4115-300 M&C Commands |             |  |
|--|-------------|--|
| Command                                | Syntax      | Description  |
| Set Frequency Band                     | {aaCBx}     | where:   |
|  |             | x = 1 to select band 1: in = (950 to 1950 MHz)<br>out = (27.5 to 28.5 MHz)   |
|  |             | x = 2 to select band 2: in = (950 to 1950 MHz)<br>out = (28.0 to 29.0 MHz)   |
|  |             | x = 3 to select band 3: in = (950 to 1950 MHz)<br>out = (29.0 to 30.0 MHz)   |
|  |             | x = 4 to select band 3: in = (950 to 1950 MHz)<br>out = (30000 to 31000 MHz) |
| Set Gain                               | {aaCGxxx}   | where:   |
|  |             | xxx = 3 characters   |
|  |             | Range: 000 to 300 (00.0 to 30.0 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: 0 to 31   |
| Set Int. 10 MHz reference offset       | {aaCOxxxxx} | where:   |
|  |             | xxxxx = 5 characters   |
|  |             | Range: +2000 to +8000  |

## 2.3 M&C Queries

**Table 2.1 Model 4115-300 M&C Queries**

| Table 2.1: Model 4115-300 M&C Queries |        |  |
|---------------------------------------|--------|--|
| Queries                               | Syntax | Description  |
| Frequency Band                        | {aaSB} | Returns {aaSBx} where:   |
|                                       |        | x = 1 if band 1 is selected in = (950 to 2050 MHz)<br>out = (27.5 to 28.5 MHz) |
|                                       |        | x = 2 if band 2 is selected in = (950 to 2050 MHz)<br>out = (28.0 to 29.0 MHz) |
|                                       |        | x = if band 3 is selected in = (950 to 2050 MHz)<br>out = (29.0 to 30.0 MHz)   |
|                                       |        | x = if band 4 is selected in = (950 to 1950 MHz)<br>out = (30.0 to 31.0 MHz)   |
|                                       |        |  |
| Gain                                  | {aaSG} | Returns {aaSGxxx} where:   |
|                                       |        | xxx = 3 characters   |
|                                       |        | Range: 0 to 300 ( in 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 8...*

**Table 2.1 Model 4115-300 M&C Queries (Continued from page 7)**

| Table 2.1: Model 4115-300 M&C Queries - Continued... |        |  |
|--|--------|--|
| Queries  | Syntax | Description  |
| Int. 10 MHz reference offset                         | {aaSO} | Returns {aaSOxxxxx} where:   |
|  |        | xxxxx = 5 characters   |
|  |        | Range: +2000 to +8000  |
| Unit Status  | {aaSA} | Returns {aaSAxy} where:  |
|  |        | x = 0 if no summary alarm, x = 1 if summary alarm  |
|  |        | y = 0 if unit is using internal 10 MHz ref,<br>y = 1 if unit is using external reference |
| 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   |
|  |        | yyyy = unit firmware rev.  |
|  |        |  |

## 2.4 ETHERNET Interface Installation and Operation

The 4115-300 frequency converter 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 4115-300's Ethernet port to the Ethernet network connector on the PC using a crossover RJ-45 cable.

#### LAN Connection

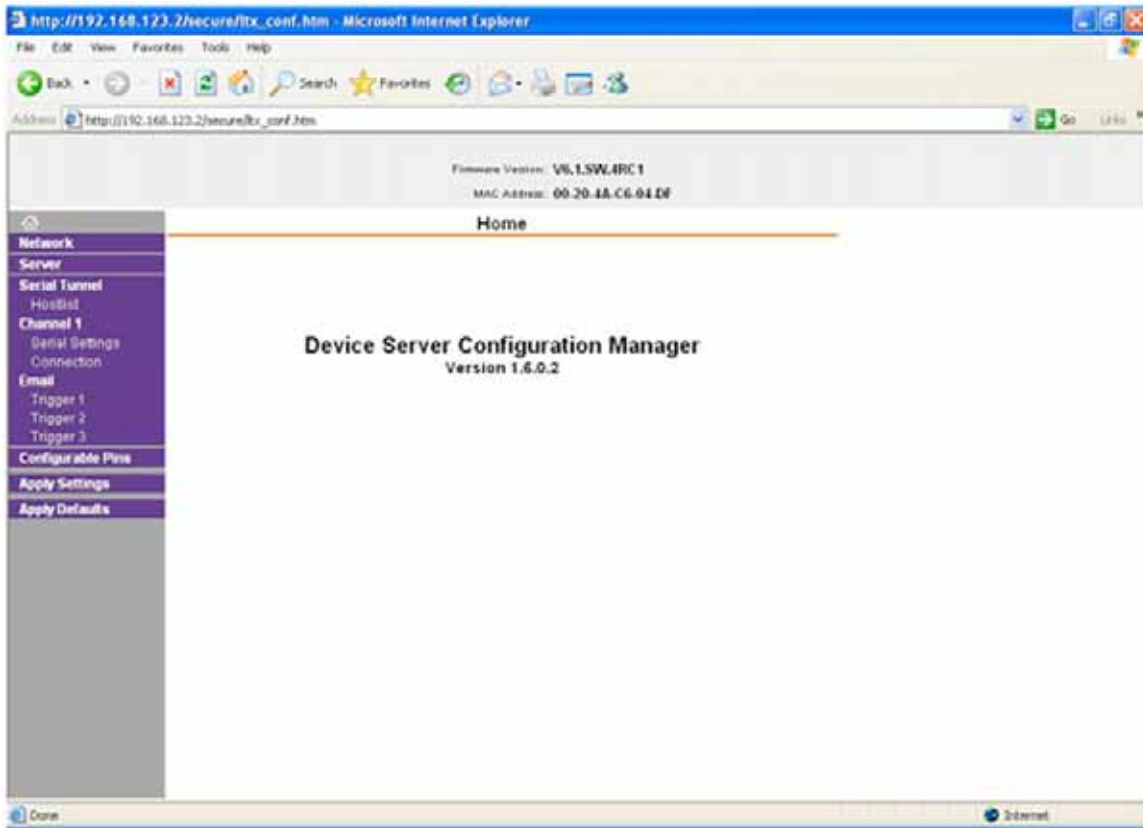
For LAN connections, attach the 4115-300 Ethernet port to the LAN using a normal RJ-45 cable. Use any PC on the LAN to connect to the 4115-300.

### 2.4.2 Ethernet Configuration

Each 4115-300 must be configured with an appropriate IP address, Netmask, and Gateway assigned by your network manager. The 4115-300 is set at the factory with a static address of 192.168.123.2. The device server in the 4115-300 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 4115-300 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**

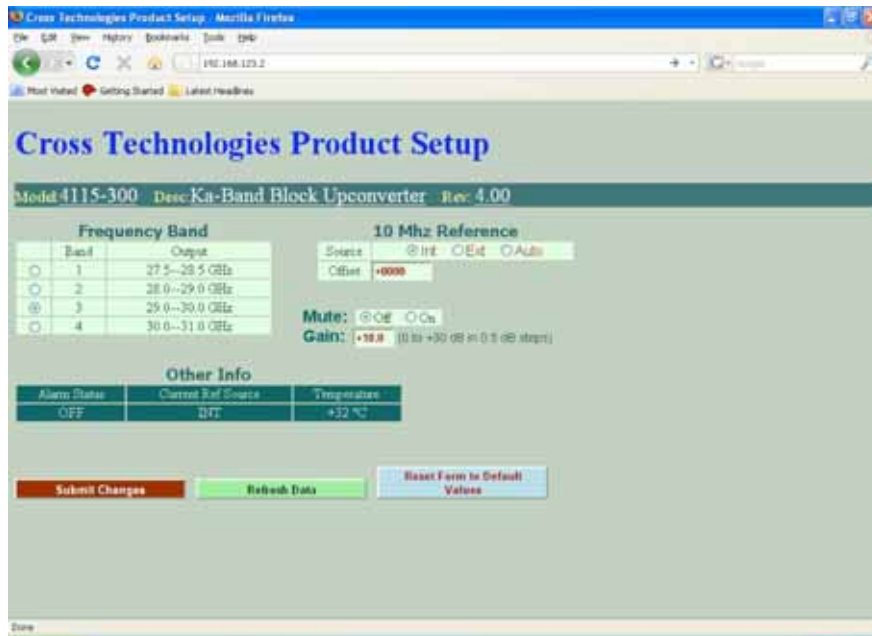


**Figure 2-B: Configuration Manager Screen**

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](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 4115-300 frequency converter.

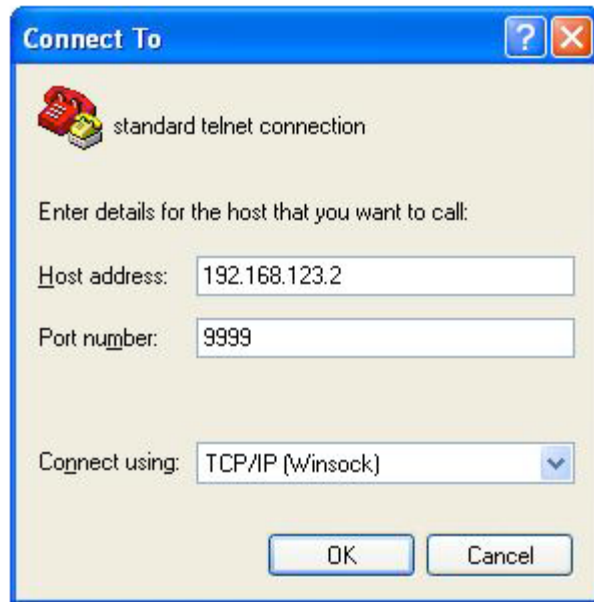


**Figure 2-C: Model 4115-300 Web page**

#### 2.4.4 SNMP Configuration

Setting of SNMP parameters such as Community Write and Community Read strings requires a *Telnet*<sup>®</sup> connection to port 9999. The following instructions explain how to establish such a *Telnet*<sup>®</sup> 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 4115-300 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

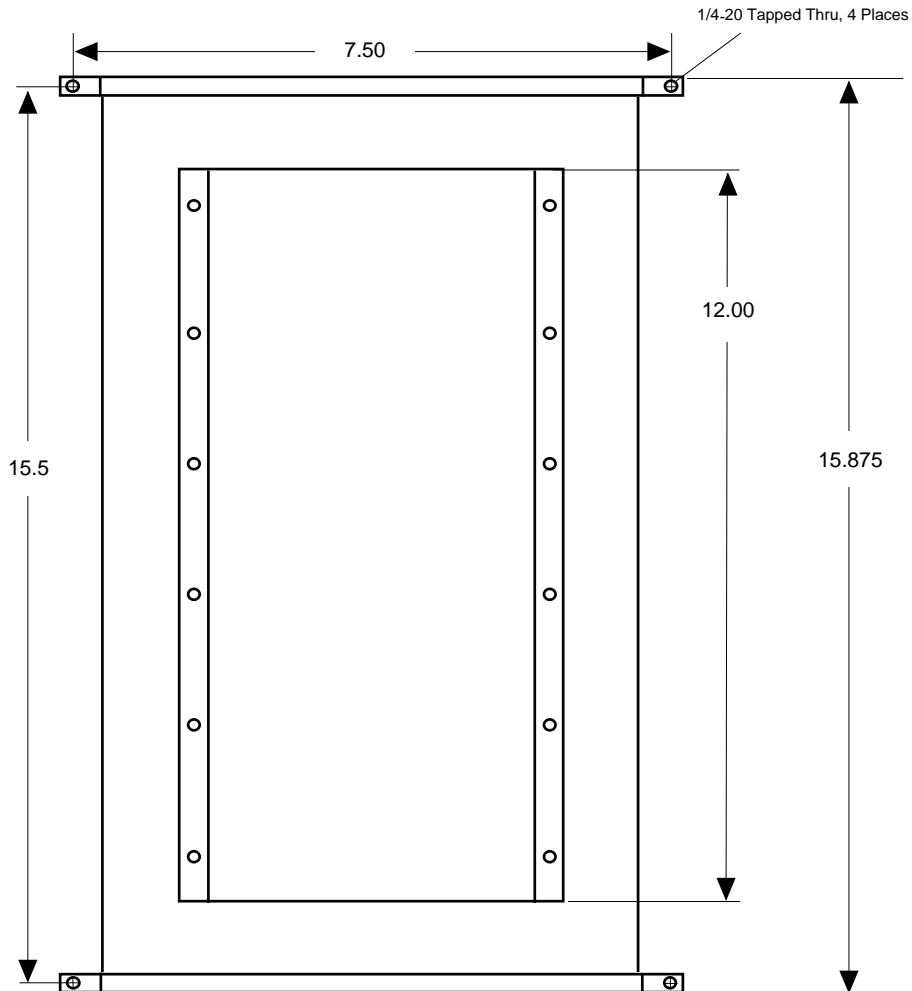
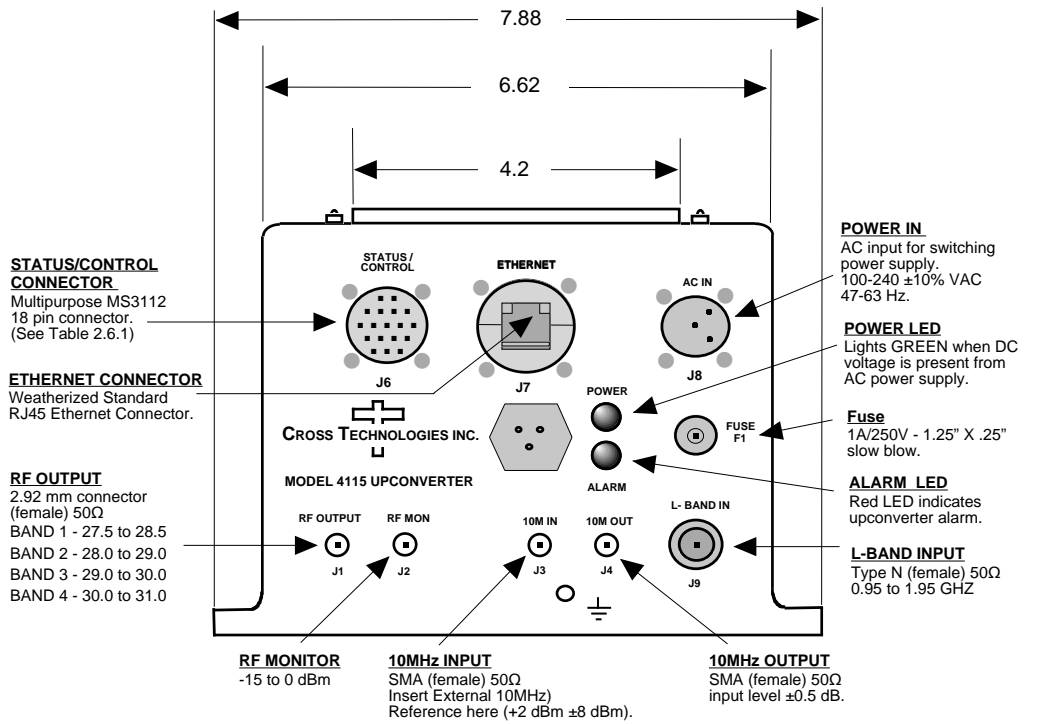
***** SNMP Configuration *****
SNMP community name for read: public
SNMP community name for write: public
Trap IP addresses:
1: 192.168.123.1
2: 0.0.0.0
3: 0.0.0.0

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 ANSIIW 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 a multipurpose MS3112 18 pin connector as shown in Figure 2.5. The Ethernet signals connect via a standard RJ45 connector.

**Table 2.6.1: Monitor and Control Connector**

| <b>Monitor and Control Connector Pinout</b> |                                       |
|---|---------------------------------------|
| Mating 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   |

## 2.7 Installation/Operation

### Installing and Operating the 4115-300 Tri-Band Downconverter

1. Connect a -40 to -15 dBm signal to L-BAND INPUT, (Figure 2.5).
2. Connect the RF OUTPUT, to the external equipment.
3. Connect 100-240  $\pm$ 10% VAC, 47 - 63 Hz to AC Inconnector on the front panel.
4. Be sure DS1 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.5).
5. Set the gain so that the output level is always within the range -15 to 0 dB.  
(see Table 2.0 and 2.6.1).
6. Select either INT (for internal 10 MHz ref), AUTO (for internal 10 MHz ref UNLESS a external 10 MHz, +2 to +8 dBm signal is connected to J2), or EXT (for external 10 MHz, +2 to +8 dBm ref that is inserted at J2) on front panel switch S1 (see Table 2.0 and 2.6.1).
7. 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).
8. AC Fuse - The fuse is a 1A/250V 1.25" x .25" (slow blow) and is inserted in the fuse F1 position.

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

#### **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.



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