Instruction Manual

Model 4116-31

Tri-Band Block Downconverter

Weatherized Unit

May 2015, Rev. F

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INSTRUCTION MANUAL

MODEL 4116-31 Tri-Band Block Downconverter, Weather Resistant*

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MODEL 4116-31 Tri-Band Block Downconverter, Weather Resistant*

1.0 General

1.1 Equipment Description

The 4116-31 Block Downconverter converts one of three RF bands to 0.95 - 2.05 GHz. Front panel LEDs provide indication of DC Power, and PLL Alarm. The RF to L-band gain is +30 dB. Connectors are Type N female for the L-band, RF and RF Monitor and SMA female for the external reference input and reference output. Gain, band select, and internal 10 MHz frequency are controlled by the Ethernet M&C or via the Status/Control connector. In AUTO, the 10 MHz reference stays in external if the external level is in the +2 to +8 dBm range. The 4116 is powered by a 100-240 ± 10% VAC power supply, and mounted in a 8" Wide X 6" High X 16" Deep 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.

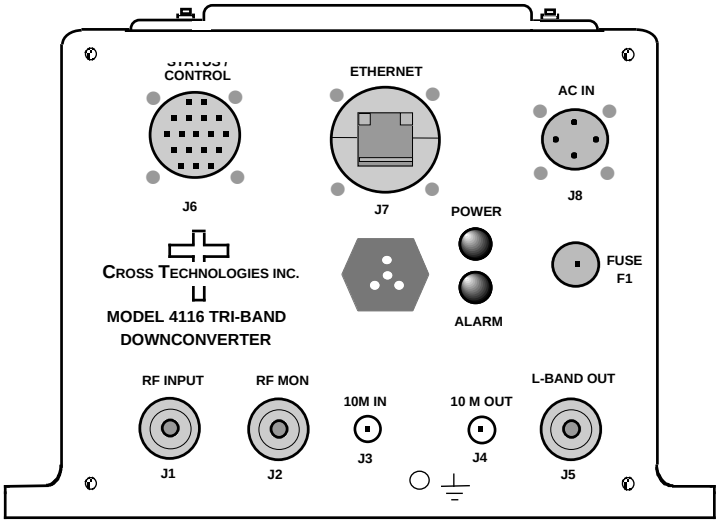


FIGURE 1.1 Model 4116-31 Tri-Band Block Downconverter Front Panel

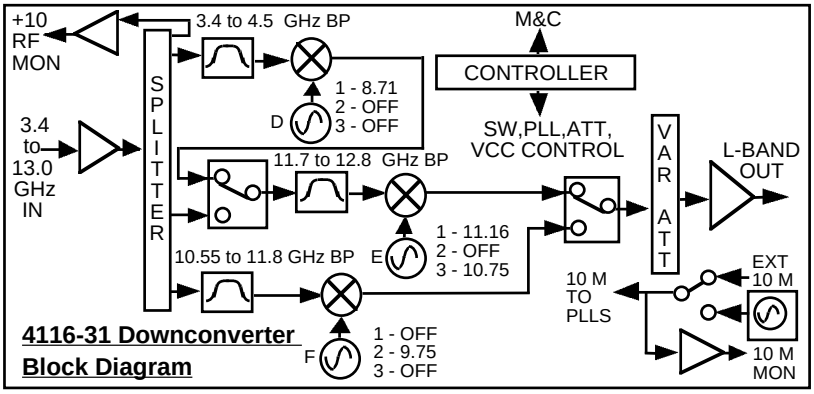


FIGURE 1. Model 4116-31 Tri-Band Block Downconverter Block Diagram

1.2 Technical Characteristics

TABLE 1.0 4116-31 Downconverter Specifications*

Input Characteristics	
Impedance / Return Loss	50Ω / 14 dB
Frequency (GHz)	Band 1 - 3.4 to 4.2
	Band 2 - 10.7 to 11.8
	Band 3 - 11.7 to 12.8
Noise Figure, Maximum	15 dB maximum gain
Input Level Range	-50 to -30 dBm
Output Characteristics	
Impedance / Return Loss	50Ω / 14 dB
Frequency (GHz)	Band 1 - 0.95 to 1.75
	Band 2 - 0.95 to 2.05
	Band 3 - 0.95 to 2.05
Output Level Range	-20 to 0 dBm
Output 1 dB Compression	+10 dBm, at maximum gain
Channel Characteristics	
Gain @ Fc	+ 30 ± 3 dB, (+30 to 0 dB variable in 0.5 dB Steps)
Image Rejection	> 60 dB, minimum
Spurious, Inband	SIGNAL RELATED <-50 dBC in band, -15 to 0 dBm out; SIGNAL INDEPENDENT,<-60 dBm
Spurious, Out of Band	<-50 dBm spurious, signal independent; 0.5 to 3 GHz out
Harmonics, In Band	< -40 dBC at 0 dBm, 0.95 to Fmax out (1.75 or 2.05 GHz depending on band)
Intermodulation	< -50 dBC for two carriers each a 4 MHz spacing, each at -5 dBm out
Frequency Response	±2 dB, over RF band; ± 0.5 dB, 40 MHz BW
Frequency Sense	Non-inverting
LO Characteristics	
LO Frequency	Band Specific
Frequency Accuracy	± 0.05 ppm maximum over temp internal reference; external reference input
10 MHz Level In/Mon	Input = +2 dBm to +8 dBm in, Monitor Output = input level ± 1.0 dB, 50 ohms
Controls, Indicators	
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

Continued on page 5...

1.2 Technical Characteristics (continued)

Other	
RF Out, Mon. Connector	Type N (female), 50Ω
L-Band Connector	Type N (female), 50Ω
10 MHz Connectors	SMA (female), 50Ω
Weather Resistant* Connectors	**Status/Control Connector,** MS3112E14-18S; Mating Cable Connector, MS3116F14-18P. **Ethernet Conector**, RJF21B; Mating Cable Connector, RJF6G; Cable interface, Standard RJ45. **AC Input Connector**, 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 4116-31 Tri-Band Block Downconverter 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 4116-31 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.

2.0.1 Connection to AC Input Power

The 4116-31 utilizes a pre-assembled AC power input cable as described below.

4115-31 Power Input Connector, FCI Clipper Series, CL1M1102 & Crimp Pins	
Mating Connector FCI Clipper Series, CL1F1101, 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 4116-31 Tri-Band Block Downconverter.

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

Table 2.0 Model 4116-31 M&C Commands

Table 2.0: Model 4116-31 M&C Commands		
Command	**Syntax**	**Description**
Set Frequency Band	{aaCBx}	where:
		x = 1 to select band 1: in = (3400 to 4200 MHz) out = (950 to 1750 MHz)
		x = 2 to select band 2: in = (10700 to 11800 MHz) out = (950 to 2050 MHz)
		x = 3 to select band 3: in = (11700 to 12800 MHz) out = (950 to 2050 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 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 -2000
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 4116-31 M&C Commands

Table 2.1: Model 4116-31 M&C Queries		
Command	**Syntax**	**Description**
Frequency Band	{aaSB}	Returns {aaSBx} where:
		x = 1 if band 1 is selected: in = (3400 to 4200 MHz) out = (950 to 1750 MHz)
		x = 2 if band 2 is selected: in = (10700 to 11800 MHz) out = (950 to 2050 MHz)
		x = 3 if band 3 is selected: in = (11700 to 12800 MHz) out = (950 to 2050 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

Continued on page 8...

Table 2.1 Model 4116-31 M&C Commands (continued from page 7)

Table 2.1: Model 4116-31 M&C Queries - Continued...		
Command	**Syntax**	**Description**
Int. 10 MHz reference offset	{aaSO}	Returns {aaSOxxxxx} where:
		xxxxx = 5 characters
		Range: +2000 to -2000
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 {aaSVxxxxxxxxyyyy} where:
		xxxxxxxx = unit model number
		yyyy = unit firmware rev.
Unit Status	{aaSS}	returns {aaSSwxy} where:
		w = summary alarm: 0 = off, 1 = on
		x = ref. source: 1 = internal, 2 = extenal
		y = oven status: 0 = normal, 1 = oven warmup

2.4 ETHERNET Interface Installation and Operation

The 4116-31 Tri-Band Block Downconverter 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 4116-31's Ethernet port to the Ethernet network connector on the PC using a crossover RJ-45 cable.

LAN Connection

For LAN connections, attach the 4116-31 Ethernet port to the LAN using a normal RJ-45 cable.
Use any PC on the LAN to connect to the 4116-31.

2.4.2 Ethernet Configuration

Each 4116-31 must be configured with an appropriate IP address, Netmask, and Gateway assigned by your network manager. The 4116-31 is set at the factory with a static address that is written on a tag attached to the unit. The device server in the 4116-31 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 4116-31 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

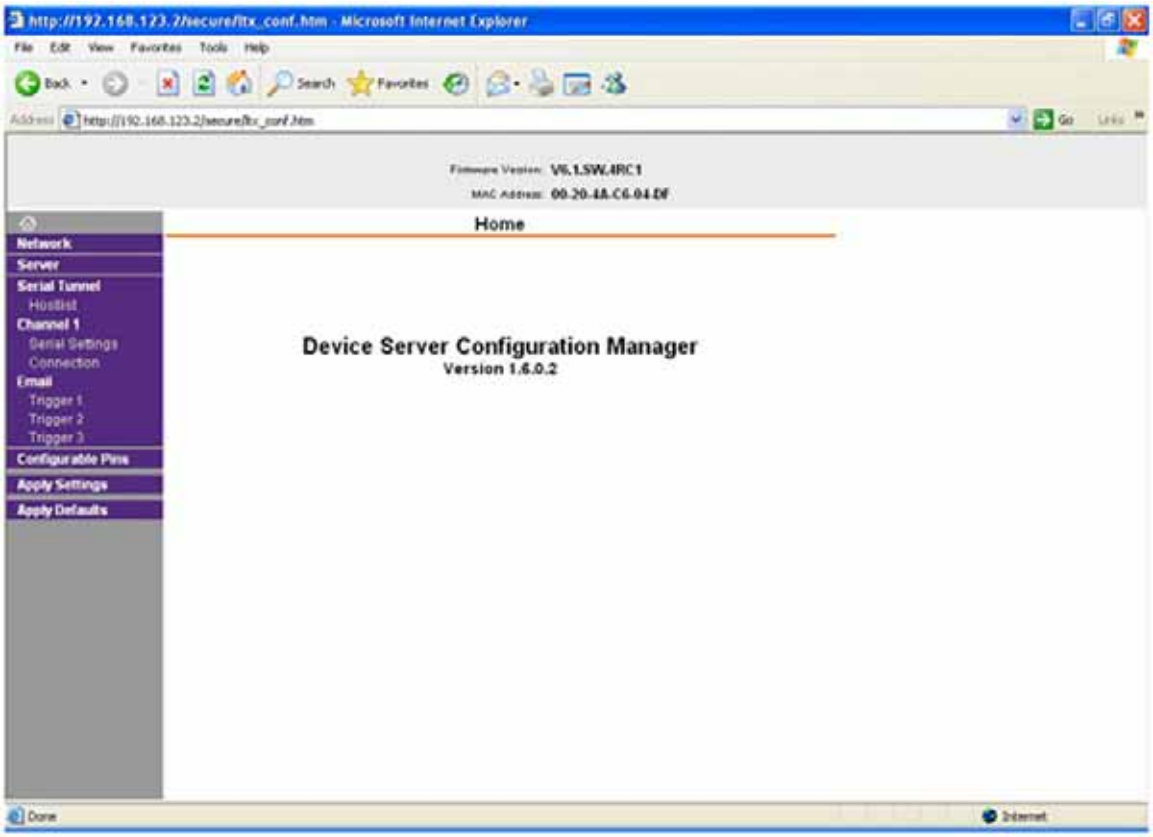


Figure 2-B: Configuration Manager Screen

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 to apply settings in the left frame to apply the new settings in the network device.

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 4116-31 frequency converter.

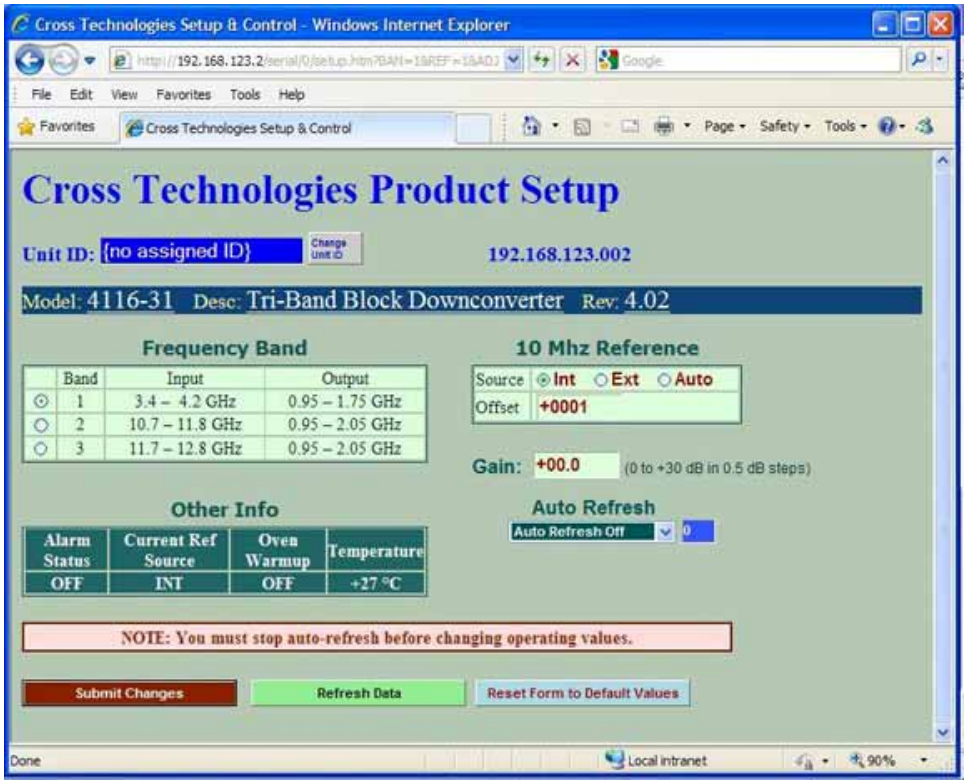


Figure 2-C: Model 4116-31 Web page

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 4116-31 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.

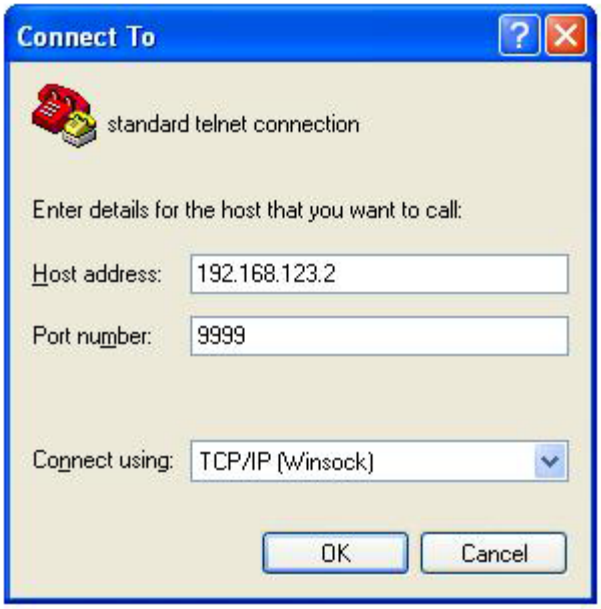


Figure 2-E: Telenet® Settings in Hyper Terminal

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

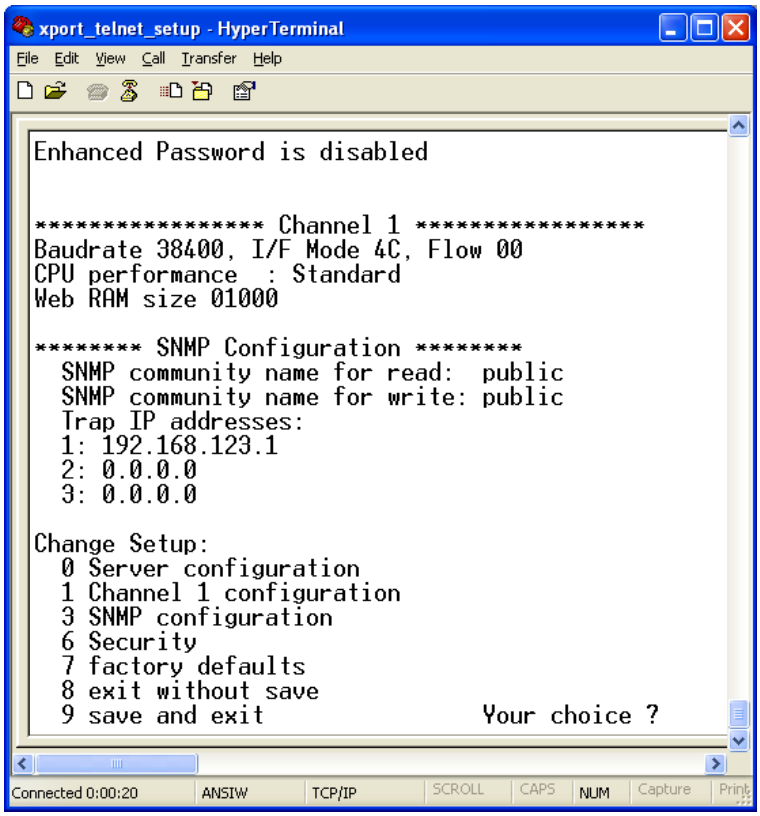
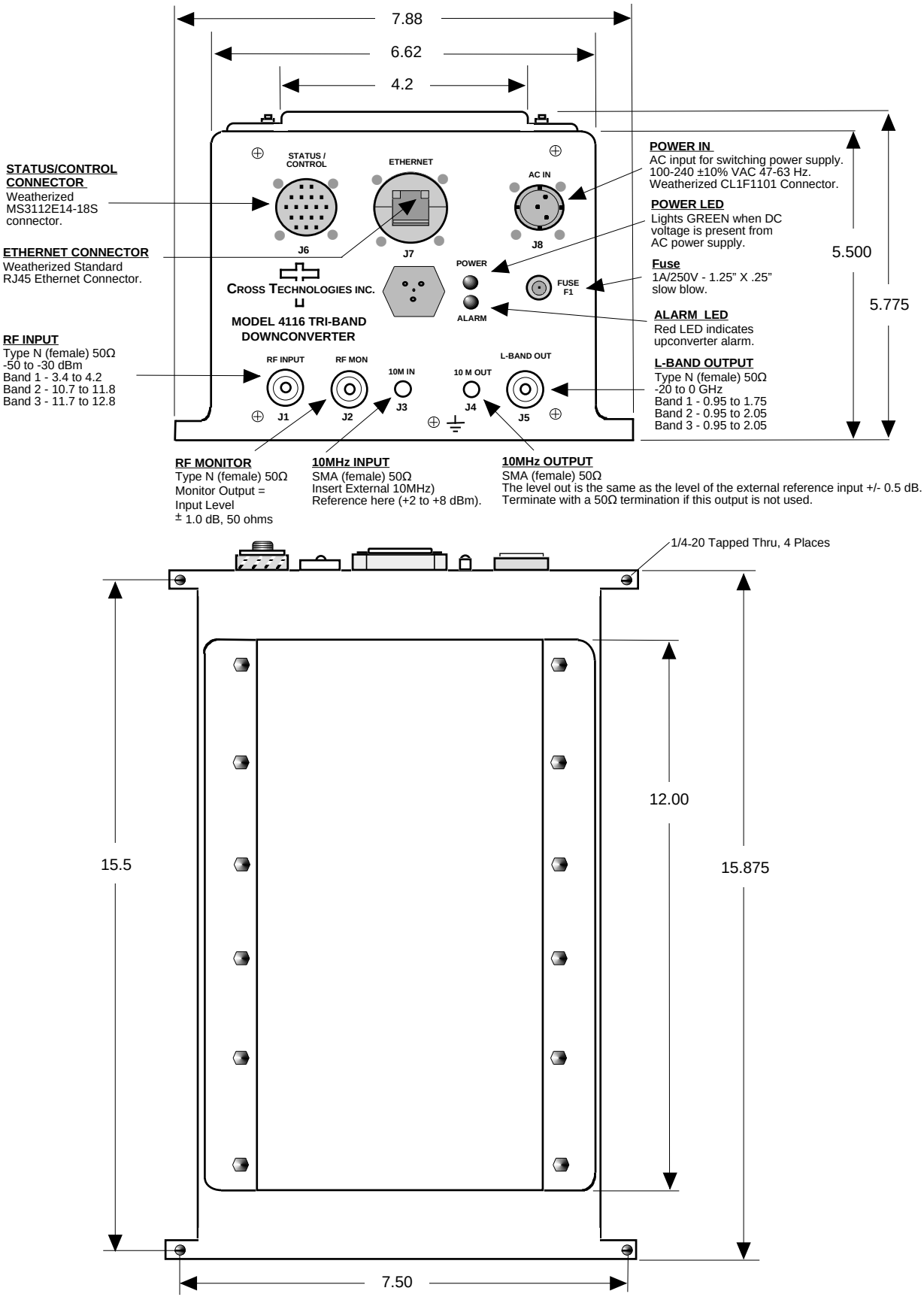


Figure 2.5 Shows front panel input and output connections, top view and baseplate mounting dimensions.



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 MS3116, 18 pin connector as shown in Figure 2.5. The Ethernet signals connect via a standard RJ45 connector.

Table 2.5.1: Monitor and Control Connector

Monitor and Control Connector Pinout	
Connector part number MS3112E14-18S	
Mating Cable Connector part number MS3116F14-18P	
Pin	**Signal Description**
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 4116-31 Tri-Band Downconverter

1. Connect a -50 dBm to -30 dBm signal to the RF INPUT, (Figure 2.5).
2. Connect the L-Band OUTPUT, to the external equipment.
3. Using the pre-assembled AC power input cable (furnished), connect 100-240 ±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 -20 to 0 dB.
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 ref that is inserted at J2) on front panel switch S1 (Figure 2.5).
8. Check that a 10 MHz signal is present at the 10 MHz REF OUTPUT at the same level as the input, ±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.

   CAUTION: When checking or replacing the fuse, do not over tighten the fuse holder cap. This can displace the cap's O-ring and the weatherproof seal will be lost.

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

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