Instruction Manual

Model 4116-41-212
Ka-Band Block Downconverter
Weather Resistant Unit

October 2014, Rev. C

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INSTRUCTION MANUAL

MODEL 4116-41-212 Ka-Band Block Downconverter, Weather Resistant*

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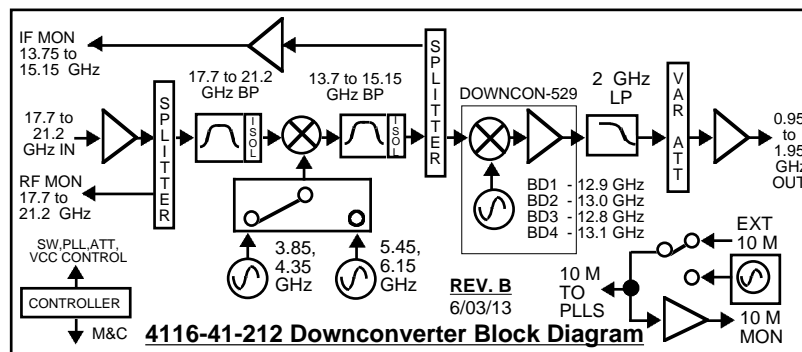# MODEL 4116-41-212 Ka-Band Block Downconverter, Weather Resistant*

1.0 General

1.1 Equipment Description

The 4116-41-212 Ka-band Block Downconverter converts 17.7 - 21.2 GHz to 0.95 - 1.95 GHz in four selectable fixed bands. Front panel LEDs provide indication of DC Power and PLL Alarms. The **RF to L-band** gain is **+20 dB.** Connectors are **2.92 mm** for RF In, **RF Monitor,** and **IF** Monitor, SMA for external reference input and output, and Type N (all female) for L-band out. 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. The unit is powered by a 100-240 ±10% VAC power supply, and is 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.
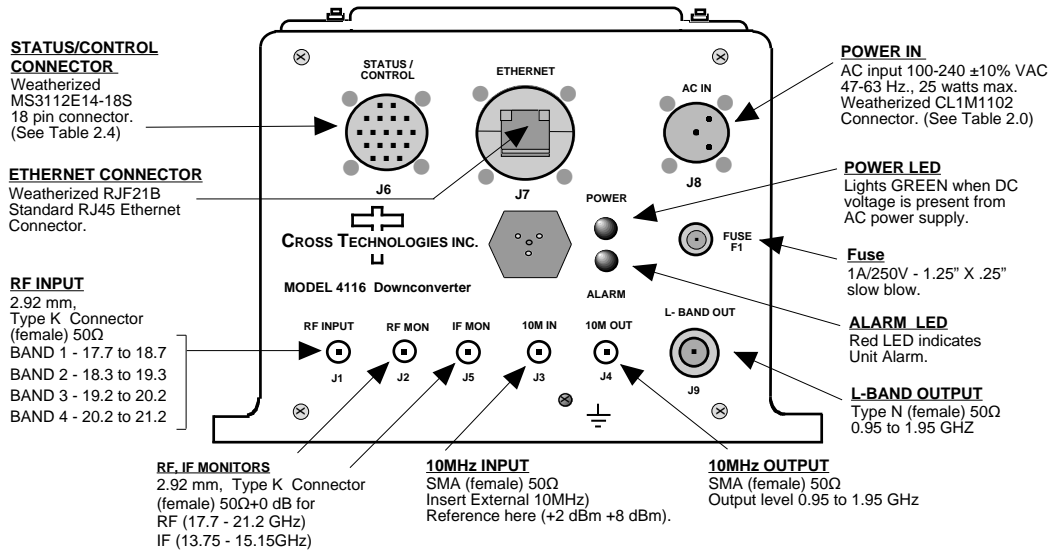
Model 4116-41-212   Ka-Band Block Downconverter Front Panel

FIGURE 1.0   Model 4116-41-212 Ka-Band Downconverter Block Diagram

1.2 Technical Characteristics

TABLE 1.0 4116-41-212 Downconverter Specifications**	
Input Characteristics	
Impedance/Return Loss	50Ω/14 dB
Frequency (GHz)	Band 1 - 17.7 to 18.7
	Band 2 - 18.3 to 19.3
	Band 3 - 19.2 to 20.2
	Band 4 - 20.2 to 21.2
Noise Figure, Maximum	20 dB at +10 dB Gain
Optimum Input Level	-45 to -10 dBm
Input 1 dB compression	0 dBm at +10 dB Gain
Output Characteristics	
Impedance/Return Loss	50Ω/14 dB
Frequency (GHz)	0.95 to 1.95 GHz
Output 1 dB Compression	+15 dBm, at maximum gain
Channel Characteristics	
Gain at F_c	+20 ±2 dB, (+20 to 0 dB variable in 0.5 ± 0.5 dB steps)
Image Rejection	< 60 dB, minimum
Spurious, Inband	SIG. REL. <-50 dBC, -15 to 0 dBm out; 2XFo < -45 dBC SIG. Independent,<-60 dBm; .95-1.95 GHz out, G_{max}
Spurious, Out of band	<-55 dBm, signal independent, 0.5-0.95 and from 1.95-2.45 GHz out
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, 10 MHz BW (also for monitors)
Frequency Sense	Non-inverting
RF, IF Monitor Gain	+0 ±2 dB (±1 dB design goal) above RF In for RF (17.7-21.2 GHz) and IF (13.75 - 15.15 GHz) monitors
RF, IF Monitor P1dB Out	+0 dB for RF (17.7 - 21.2 GHz) and IF (13.75 - 15.15 GHz) monitors
LO Characteristics	
LO Frequency	Band Specific, fixed frequency
Frequency Accuracy	± 0.05 ppm max. over temp. internal reference; external reference input
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

Controls, Indicators	
Gain, Band,10M Frequency	Gain, band select, and internal 10 MHz frequency via Ethernet M&C or Status/Control Connector.
PLL Alarm; Power	Red LED, External Contact Closure; Green LED

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

Other	
Signal Connector(s)	RF In, RF Monitor & IF Monitor - 2.92 mm (Type K) (female), 50Ω, L-Band - Type N (female) 50Ω; - 10 MHz - 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 pre assembled 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 4116-41-212 Ka-Band 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 4116-41-212 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 - 4116-41-212 Front Panel
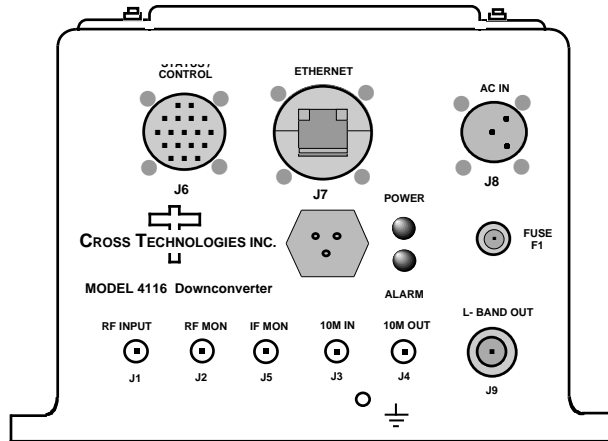
2.0.1 Connection to AC Input Power
The 4116-41-212 is furnished with a pre-assembled AC power input cable as described below.

4116-41-212 Power Input Connector, FCI Clipper Series, CL1M1102 & Crimp Pins	
Mating Connector 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 4116-41-212 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 4116-41-212 M&C Commands

Table 2.0: Model 4116-41-212 M&C Commands		
Command	**Syntax**	**Description**
Set Frequency Band	{aaCBx}	where:
		x = 1 to select band 1: in = (1770 to 1870 MHz) out = (950 to 1950 MHz)
		x = 2 to select band 2: in = (1830 to 1930 MHz) out = (950 to 1950 MHz)
		x = 3 to select band 3: in = (1920 to 2020 MHz) out = (950 to 1950 MHz)
		x = 4 to select band 4: in = (2020 to 2120 MHz) out = (950 to 1950 MHz)
Set Gain	{aaCGxxx}	where:
		xxx = 3 characters
		Range: 200 to 000 (+20 to 0 dB variable 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

2.3 M&C Queries

Table 2.1   Model 4116-41-212 M&C Commands

Table 2.1: Model 4116-41-212 M&C Queries		
Command	**Syntax**	**Description**
Frequency Band	{aaSB}	Returns {aaSBx} where:
		x = 1 if band 1 is selected in = (1770 to 1870 MHz) out = (950 to 1950 MHz)
		x = 2 if band 2 is selected in = (1830 to 1930 MHz) out = (950 to 1950 MHz)
		x = 3 if band 3 is selected in = (1920 to 2020 MHz) out = (950 to 1950 MHz)
		x = 4 if band 4 is selected in = (2020 to 2120 MHz) out = (950 to 1950 MHz)
Gain	{aaSG}	Returns {aaSGxxx} where:
		xxx = 3 characters
		Range: 200 to 0 (in 0.5 ± 0.5 dB steps)
		Example: {aaSG145} indicates the current gain setting is 14.5 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: 20 to 0

Table 2.1 Model 4116-41-212 M&C Commands (Continued from page 8)

Table 2.1: Model 4116-41-212 M&C Queries - Continued...		
Command	**Syntax**	**Description**
Internal 10 MHz reference offset	{aaSO}	Returns {aaSOxxxxx} where:
		xxxxx = 5 characters
		Range: +2000 to +8000
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	{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
		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 {aaSVxxxxxxxxyyyy} where:
		xxxxxxxx = unit model number
		yyyy = unit firmware revision

2.4 ETHERNET Interface Installation and Operation

The 4116-41-212 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 4116-41-212's Ethernet port to the Ethernet network connector on the PC using a crossover RJ45 cable.

LAN Connection
For LAN connections, attach the 4116-41-212 Ethernet port to the LAN using a normal RJ45 cable. Use any PC on the LAN to connect to the 4116-41-212.

2.4.2 Ethernet Configuration

Each 4116-41-212 must be configured with an appropriate IP address, Netmask, and Gateway assigned by your network manager. The 4116-41-212 is set at the factory with a static address that is written on a tag attached to the unit. The device server in the 4116-41-212 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 4116-41-212 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
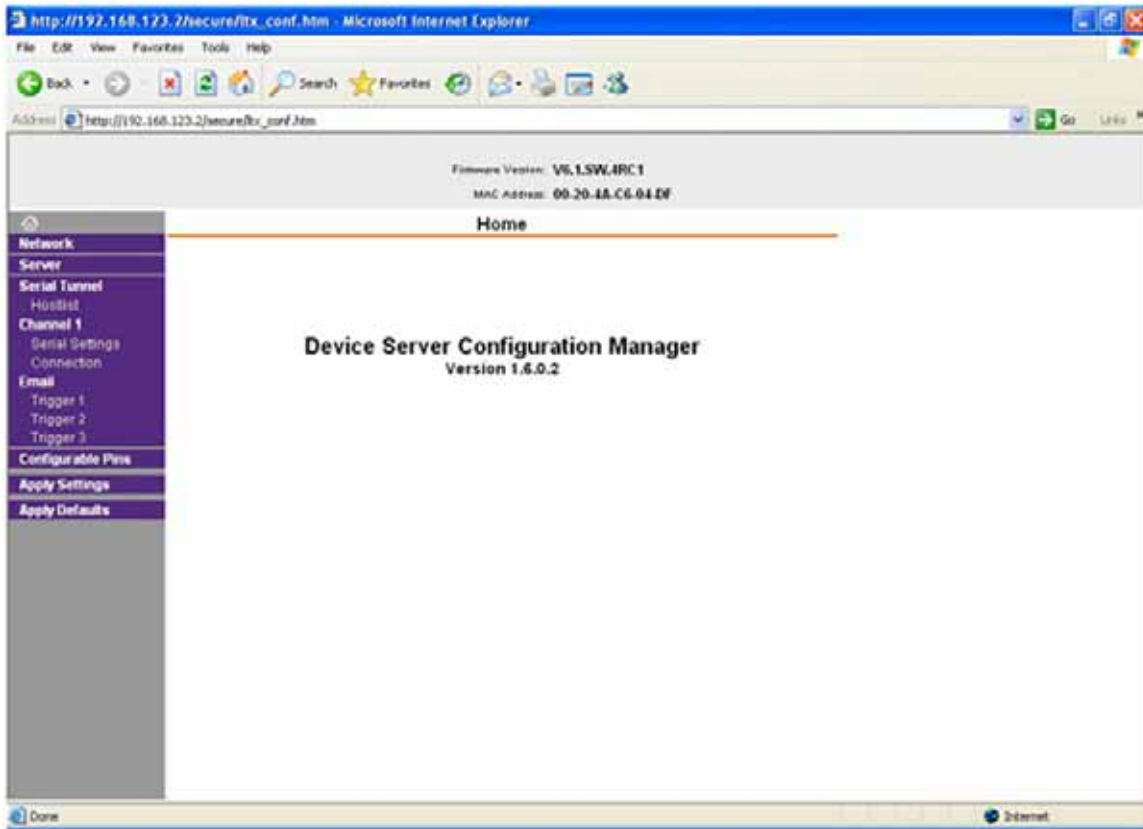
Figure 2-B: Configuration Manager Screen

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 model 4116-41-212 Downconverter.
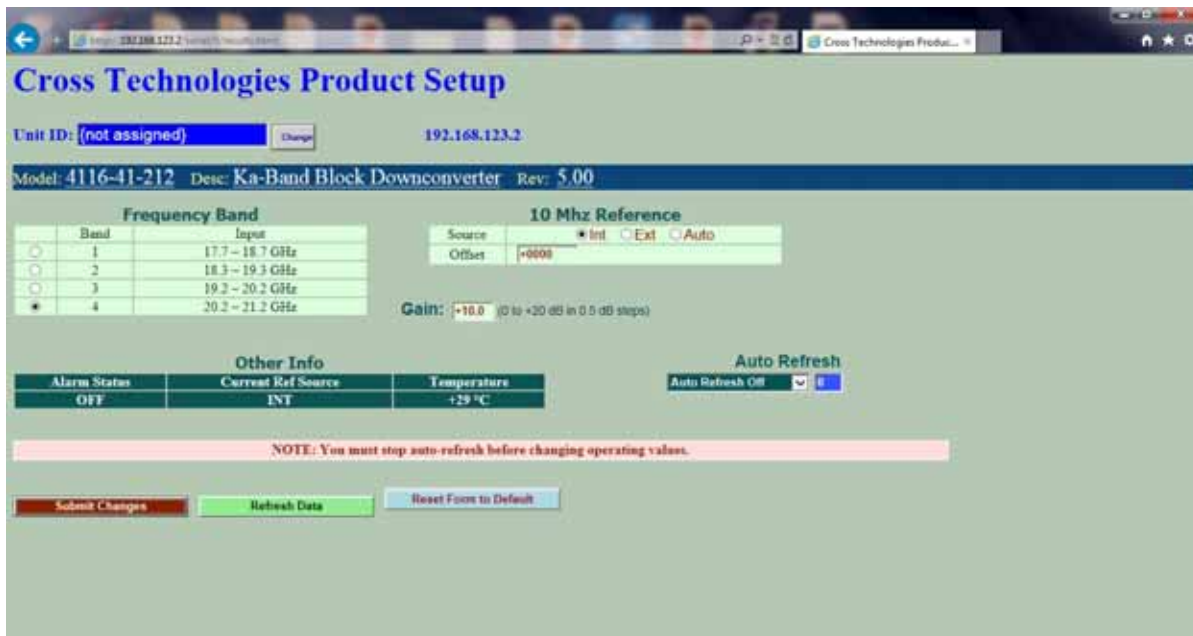
Figure 2-C: Model 4116-41-212 Web page

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.
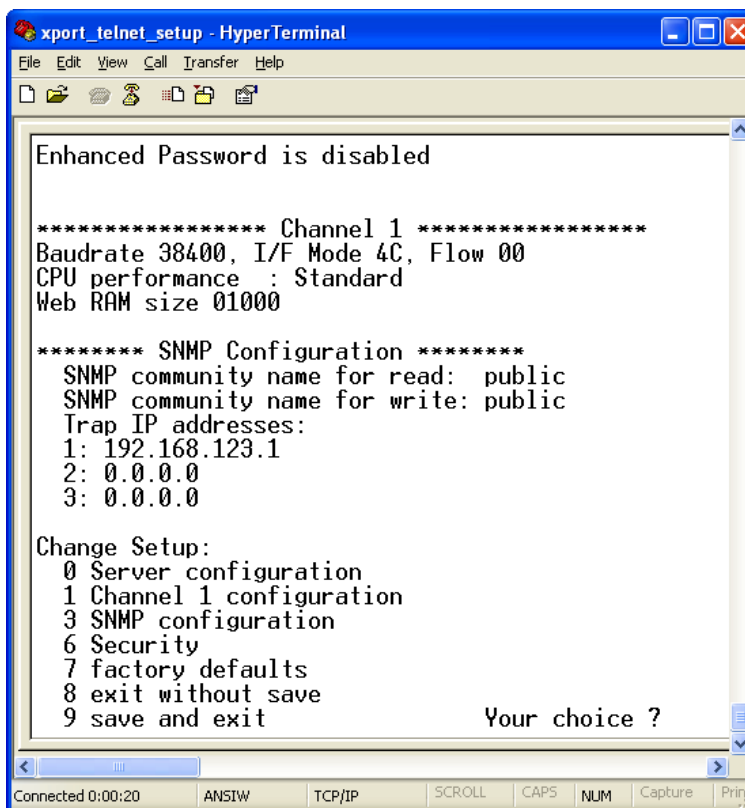
Enter the IP address of the 4116-41-212 in the "Host address:" field and 9999 in the "Port number" field.
Figure 2-E shows an example of the Hyper Terminal settings required to access the SNMP configuration menu.
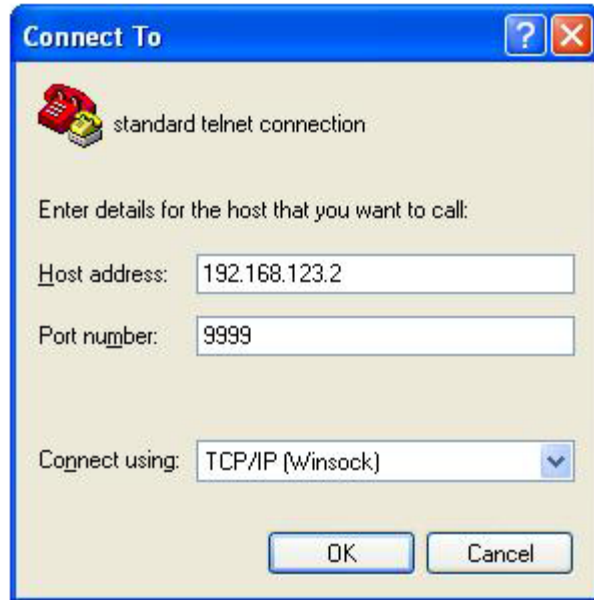
Figure 2-E: Telnet Settings in Hyper Terminal

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

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
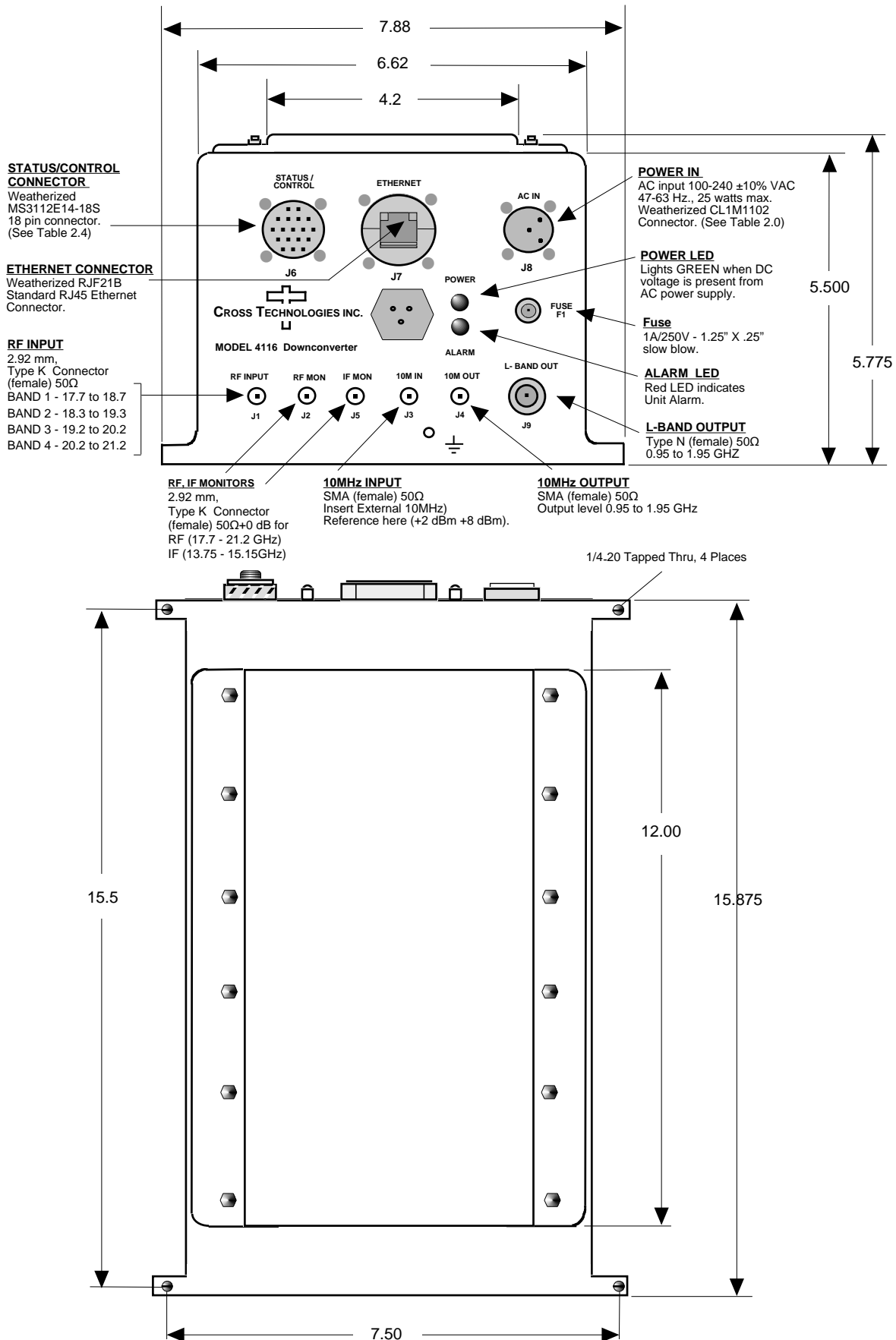 8 exit without save
  9 save and exit   Your choice ?

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

STATUS/CONTROL CONNECTOR
Weatherized MS3112E14-18S 18 pin connector. (See Table 2.4)

ETHERNET CONNECTOR
Weatherized RJF21B Standard RJ45 Ethernet Connector.

RF INPUT
2.92 mm, Type K Connector (female) 50Ω
BAND 1 - 17.7 to 18.7
BAND 2 - 18.3 to 19.3
BAND 3 - 19.2 to 20.2
BAND 4 - 20.2 to 21.2

RF, IF MONITORS
2.92 mm, Type K Connector (female) 50Ω+0 dB for RF (17.7 - 21.2 GHz)
IF (13.75 - 15.15GHz)

10MHz INPUT
SMA (female) 50Ω
Insert External 10MHz)
Reference here (+2 dBm +8 dBm).

10MHz OUTPUT
SMA (female) 50Ω
Output level 0.95 to 1.95 GHz

POWER IN
AC input 100-240 ±10% VAC 47-63 Hz., 25 watts max. Weatherized CL1M1102 Connector. (See Table 2.0)

POWER LED
Lights GREEN when DC voltage is present from AC power supply.

Fuse
1A/250V - 1.25" X .25" slow blow.

ALARM LED
Red LED indicates Unit Alarm.

L-BAND OUTPUT
Type N (female) 50Ω
0.95 to 1.95 GHZ

STATUS / CONTROL   ETHERNET   AC IN

CROSS TECHNOLOGIES INC.

MODEL 4116 Downconverter

POWER   FUSE F1   ALARM

RF INPUT RF MON IF MON 10M IN 10M OUT L- BAND OUT

J1   J2   J5   J3   J4   J9   J6   J7   J8

7.88   6.62   4.2   5.500   5.775

1/4-20 Tapped Thru, 4 Places

15.5   12.00   15.875   7.50

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 weather resistant Ethernet connector, (Part#RJF6G).

Table 2.6: 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 4116-41-212 Ka-Band Downconverter

1. Connect a -45 dBm to -10 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 +20 to 0 dB insuring that the output level is always in the range of -20 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 (Section 2.0 & Table 2.6).

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.

2.0.1   Connection to AC Input Power

The 4116-41-212 is furnished with a pre-assembled AC power input cable as described below.

4116-41-212 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

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

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