Instruction Manual

Model 4116-T300

Ka-Band Block Translator

Weather Resistant Unit

November 2015, Rev. F

When ordering parts from Cross Technologies, Inc., be sure to include the equipment model number, equipment serial number, and a description of the part.

CROSS TECHNOLOGIES, INC.

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INSTRUCTION MANUAL

MODEL 4116-T300 Ka-Band Translator (Weather Resistant* Enclosure)

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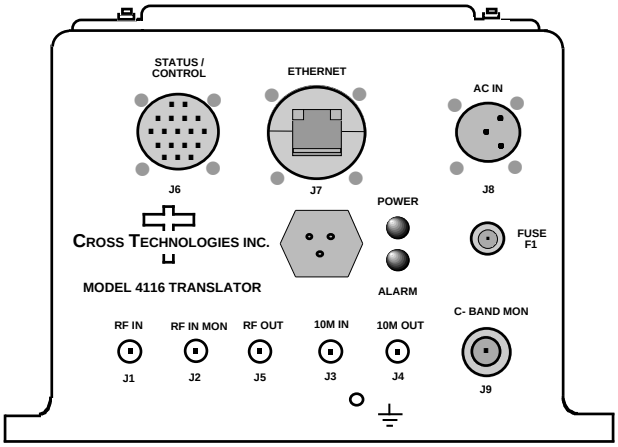
MODEL 4116-T300 Ka-Band Translator (Weather Resistant* Enclosure)

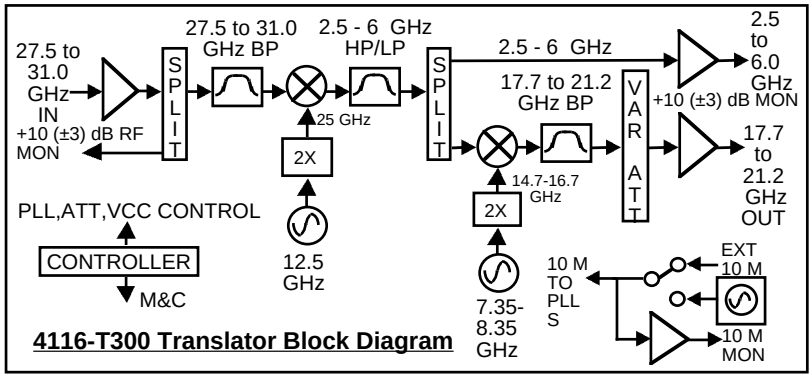
1.0 General

1.1 Equipment Description

The 4116-T300 Ka-band Translator converts 27.5 - 31.0 GHz to 17.7 - 21.2 GHz in four selectable fixed bands and to 2.5 - 6.0 GHz for monitoring purposes. LEDs provide indication of DC Power, and PLL Alarms. The maximum gain is +20 dB. Connectors are 2.92mm for the RF In and RF Monitor, Super SMA for the RF Out, Type N for the C-band monitor, and SMA (all female) for the external reference input and output. Gain, band select, and internal 10 MHz frequency are controlled by the M&C (Ethernet and/or Status/Control) Connectors. In AUTO, the 10 MHz reference stays in external if the external level is in the +2 to +8 dBm range. The 4116-T300 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.





1.2 Technical Characteristics

TABLE 1.0 4116-T300 Ka-Band Translator Specifications**

TABLE 1.0 4116-T310 Ka-Band Translator Specifications**	
Input Characteristics	
Impedance/Return Loss	50Ω/14 dB
Frequency (GHz)	See Frequency (GHz) Band Chart Below
Noise Figure, Maximum	20 dB maximum gain
Maximum Input Level	-40 to -15 dBm
Output Characteristics	
Impedance/Return Loss	50Ω/14 dB, Mute & UnMute
Frequency (GHz)	See Frequency (GHz) Band Chart Below
Output Level Range	-15 to 0 dBm
Output 1 dB Compression	+8 dBm maximum gain
Mute	> 60 dB @ 0 dBm output

Frequency (GHz) Band Chart

Bands	Input (GHz)	Output (GHz)	Translation (GHz)
Band 1	27.5 - 28.5	17.7 - 18.7	9.800 (8.8 - 10.3)
Band 2	28.0 - 29.0	18.3 - 19.3	9.700 (8.7 - 10.3)
Band 3	29.0 - 30.0	19.2 - 20.2	9.800 (8.8 - 10.3)
Band 4	30.0 - 31.0	20.2 - 21.2	9.800 (8.8 - 10.3)
Band 5	27.5 - 28.5	18.3 - 19.3	9.200 (8.3 - 10.2)
Band 6	27.5 - 28.5	19.2 - 20.2	8.300 (8.3 - 9.3)
Band 7	28.0 - 29.0	17.7 - 18.7	10.300 (9.3 - 10.3)
Band 8	28.0 - 29.0	19.2 - 20.2	8.800 (8.3 - 9.8)
Band 9	29.0 - 30.0	18.7 - 19.7	10.300
Band 10	29.0 - 30.0	19.0 - 20.0	10.000 (9.7 - 10.3)
Band 11	30.0 - 31.0	20.0 - 21.0	10.000 (9.8 - 10.3)

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.

(Technical Characteristics continued on page 5...)

TABLE 1.0 4116-T310 Ka-Band Translator Specifications**

(continued from page 4....

Channel Characteristics	
Gain at F_C	+20 ±3 dB, (+20 to -10 dB variable in 1±1 dB steps)
Input to output isolation	> 60 dB, minimum (at maximum gain and 0 dBm out)
Spurious, Inband	SIGNAL REL. <-45 dBC, -15 to 0 dBm out; SIGNAL Independent,<-50 dBm; fc ± 0.5 GHz
Spurious, Out of band	<-45 dBm, signal independent, fc ± 1 GHz
Spurious, LO	<-50 dBm measured at the input; <-25 dBm, measured at the output
Intermodulation	<-45 dBC for two carriers at 4 MHz spacing, each at -7 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, 8.3 to 10.3 GHz translation range, 5 MHz steps
Frequency Accuracy	± 0.05 ppm max. over temp internal reference; ext. reference input
10 MHz Level In/Mon.	+2 to +8 dBm in; Monitor Output = input level ± 1 dB, 50 ohms

Phase Noise @ Frequency Hz	100	1K	10K	100K	1M
dBC/Hz	-65	-75	-77	-93	-105

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

Other	
RF In, RF Mon. Connectors	2.92mm (40 GHz) female, 50Ω
RF Out Connector	Super SMA (27 GHz) 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.)
C-Band Connector	Type N (female), 50Ω
10 MHz Connectors	SMA (female), 50Ω
Size	8” Wide X 6” High X 16” Deep, Weather Resistant* Enclosure
Power	100-240 ±10% VAC, 47-63 Hz, 30 Watts Maximum, FCI Clipper Series CL1M1102, Weather Resistant* Connector.
**+0 to +50 degrees C; Specifications subject to change without notice.	

2.0 Installation

The 4116-T300 Ka-Band Translator consists of a 8" Wide X 6" High X 16" Deep Weather Resistant* enclosure. A switching, ±12, +24, +5 VDC power supply provides power for the internal assemblies. The 4116-T300 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 - 4116-T300 Ka-Band Translator Front Panel

2.0.1 Connection to AC Input Power

The 4116-T300 is furnished with a pre-assembled AC power input cable as described below.

4116-T310 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-T300.
*** PLEASE NOTE:** The two character {aa} prefix, shown in the following table, is present ONLY when RS485 is selected.

Table 2.0 Model 4116-T300 M&C Commands

Table 2.0: Model 4116-T300 M&C Commands		
Command	**Syntax**	**Description**
Set Frequency Band	{aaCBx}	x = 1 to select band 1: in = (27.5 to 28.5 GHz) out = (17.7 to 18.7 GHz)
		x = 2 to select band 2: in = (28.0 to 29.0 GHz) out = (18.3 to 19.3 GHz)
		x = 3 to select band 3: in = (29.0 to 30.0 GHz) out = (19.2 to 20.2 GHz)
		x = 4 to select band 4: in = (30.0 to 31.0 GHz) out = (20.2 to 21.2 MHz)
		x = 5 to select band 5: in = (27.5 to 28.5 GHz) Out = (18.3 to 19.3 GHz)
		x = 6 to select band 6: in = (27.5 to 28.5 GHz) Out = (19.2 to 20.2 GHz)
		x = 7 to select band 7: in = (28.0 to 29.0 GHz) Out = (17.7 to 18.7 GHz)
		x = 8 to select band 8: in = (28.0 to 29.0 GHz) Out = (19.2 to 20.2 GHz)
		x = 9 to select band 9: in = (29.0 to 30.0 GHz) Out = (17.7 to 18.7 GHz)
		x = 10 to select band 10: in = (29.0 to 30.0 GHz) Out = (18.3 to 19.3 GHz)
		x = 11 to select band 11: in = (30.0 to 31.0 GHz) Out = (19.2 to 20.2 GHz)
Set Frequency Offset	{aaCxx yyyy}	where:
		xx = Band (Range 1 to 11)
		yyyyy = Translation Frequency Offset
		if Band 1 is selected, Range: -500 to +1000 in 5 MHz steps
		if Band 2 is selected, Range: -600 to +1000 in 5 MHz steps
		if Band 3 is selected, Range: -500 to +1000 in 5 MHz steps
		if Band 4 is selected, Range: -500 to +1000 in 5 MHz steps
		if Band 5 is selected, Range: -1000 to +900 in 5 MHz steps
		if Band 6 is selected, Range: -1000 to 0 in 5 MHz steps
		if Band 7 is selected, Range: 0 to +1000 in 5 MHz steps
		if Band 8 is selected, Range: -1000 to +500 in 5 MHz steps
		if Band 9 is selected, Range: 0 to 0 (not tunable)
		if Band 10 is selected, Range: -300 to 300 in 5 MHz steps
		if Band 11 is selected, Range: -300 to +200 in 5 MHz steps

continued on page 8...

M&C Commands (continued)

Table 2.0: Model 4116-T300 M&C Commands		
Command	**Syntax**	**Description**
Set Gain	{aaCGxxxx}	where:
		xxxx = 4 characters
		Range: -100 to +200 (-10.0 to +20.0 in 1 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 the 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 -2000
Set 10 MHz reference mode	{aaCEx}	where:
		x = 1 to select Internal 10 MHz reference
		x = 2 to select External 10 MHz reference
		x = 3 to select Auto 10 MHz reference

2.3 M&C Queries

Table 2.1: Model 4116-T300 M&C Queries		
Queries	**Syntax**	**Description**
Frequency Band	{aaSB}	Returns {aaSBx} where:
		x = 1 if band 1 is selected: in = (27.5 to 28.5 GHz)
		x = 2 if band 2 is selected: in = (28.0 to 29.0 GHz)
		x = 3 if band 3 is selected: in = (29.0 to 30.0 GHz)
		x = 4 if band 4 is selected: in = (30.0 to 31.0 GHz)
		x = 5 if band 5 is selected: in = (27.5 to 28.5 GHz)
		x = 6 if band 6 is selected: in = (27.5 to 28.5 GHz)
		x = 7 if band 7 is selected: in = (28.0 to 29.0 GHz)
		x = 8 if band 8 is selected: in = (28.0 to 29.0 GHz)
		x = 9 if band 9 is selected: in = (29.0 to 30.0 GHz)
		x = 10 if band 10 is selected: in = (28.0 to 29.0 GHz)
		x = 11 if band 11 is selected: in = (30.0 to 31.0 GHz)
Gain	{aaSG}	Returns {aaSGxxxx} where:
		xxxx = 4 characters
		Range: (+20 to 0 in 1 dB steps)
		Example: {aaSG+090} indicates that the current gain setting is +9.0 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

continued on page 10...

M&C Queries (continued)

Queries	Syntax	Description
Frequency Offset	{aaSxx}	Returns {aaSxxyyyy} where:
		xx = Band (Range 1 to 11)
		yyyyy = Translation Frequency Offset
		if Band 1 is selected, Range: -500 to +1000 in 5 MHz steps
		if Band 2 is selected, Range: -600 to +1000 in 5 MHz steps
		if Band 3 is selected, Range: -500 to +1000 in 5 MHz steps
		if Band 4 is selected, Range: -500 to +1000 in 5 MHz steps
		if Band 5 is selected, Range: -1000 to +900 in 5 MHz steps
		if Band 6 is selected, Range: -1000 to 0 in 5 MHz steps
		if Band 7 is selected, Range: 0 to +1000 in 5 MHz steps
		if Band 8 is selected, Range: -1000 to +500 in 5 MHz steps
		if Band 9 is selected, Range: 0 to 0 (not tunable)
		if Band 10 is selected, Range: -300 to 300 in 5 MHz steps
		if Band 11 is selected, Range: -300 to +200 in 5 MHz steps
Serial Interface	{aaSI}	Returns {aaSIx} where:
		x = 0 if RS232 is selected
		x = 1 if RS422 is selected
		x = 2 if RS485 is selected
		if Band 5 is selected, Range: 00000 to -0500 in 5 MHz steps
RS485 address	{aaSR}	Returns {aaSRxx} where:
		xx = 2 characters
		Range: 00 to 31

continued on page 11...

M&C Queries (continued)

Queries	Syntax	Description
Mute Status	{aaSM}	Returns {aaSMx} where:
		x = 0 if mute is off
		x = 1 if mute is on
Int. 10 MHz reference offset	{aaSO}	Returns {aaSOxxxxx} where:
		xxxxx = 5 characters
		Range: +2000 to -2000
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 rev.

2.4 ETHERNET Interface Installation and Operation

The 4116-T300 Ka-Band Translator 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-T300'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-T300's Ethernet port to the LAN using a normal RJ-45 cable.
Use any PC on the LAN to connect to the 4116-T300.

2.4.2 Ethernet Configuration

Each 4116-T300 must be configured with an appropriate IP address, Netmask, and Gateway assigned by your network manager. The 4116-T300 is set at the factory to the static address 192.168.123.2. The device server in the 4116-T300 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-T300 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 webpage.

Figure 2-A: Password Screen

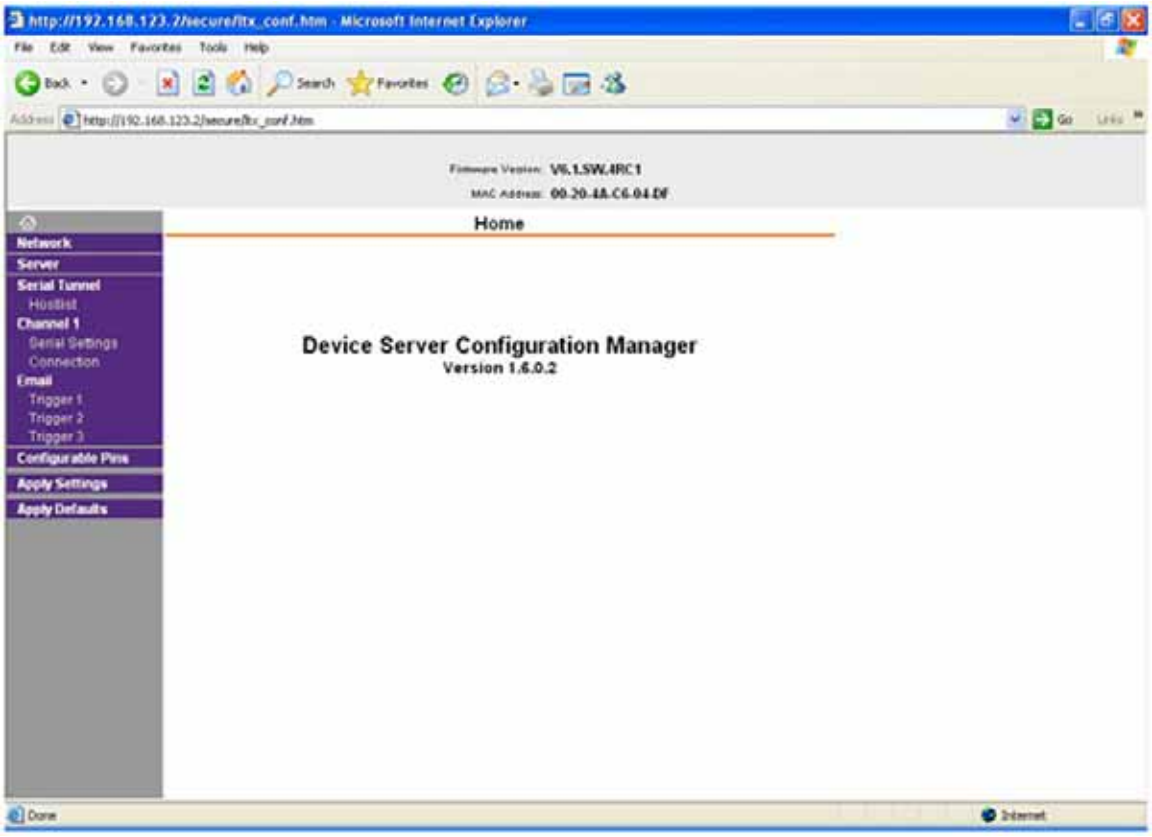


Figure 2-B: Configuration Manager Screen

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).

2.4.3 Webpage M & C

Enter the following address in a web browser to access the M&C webpage:
http://<ip address of 41xx>/serial/0/setup.htm where <ip address> is the IP address of the unit.

Figure 2-C (page 14) shows the product setup web page from a model 4116-T300 frequency converter.

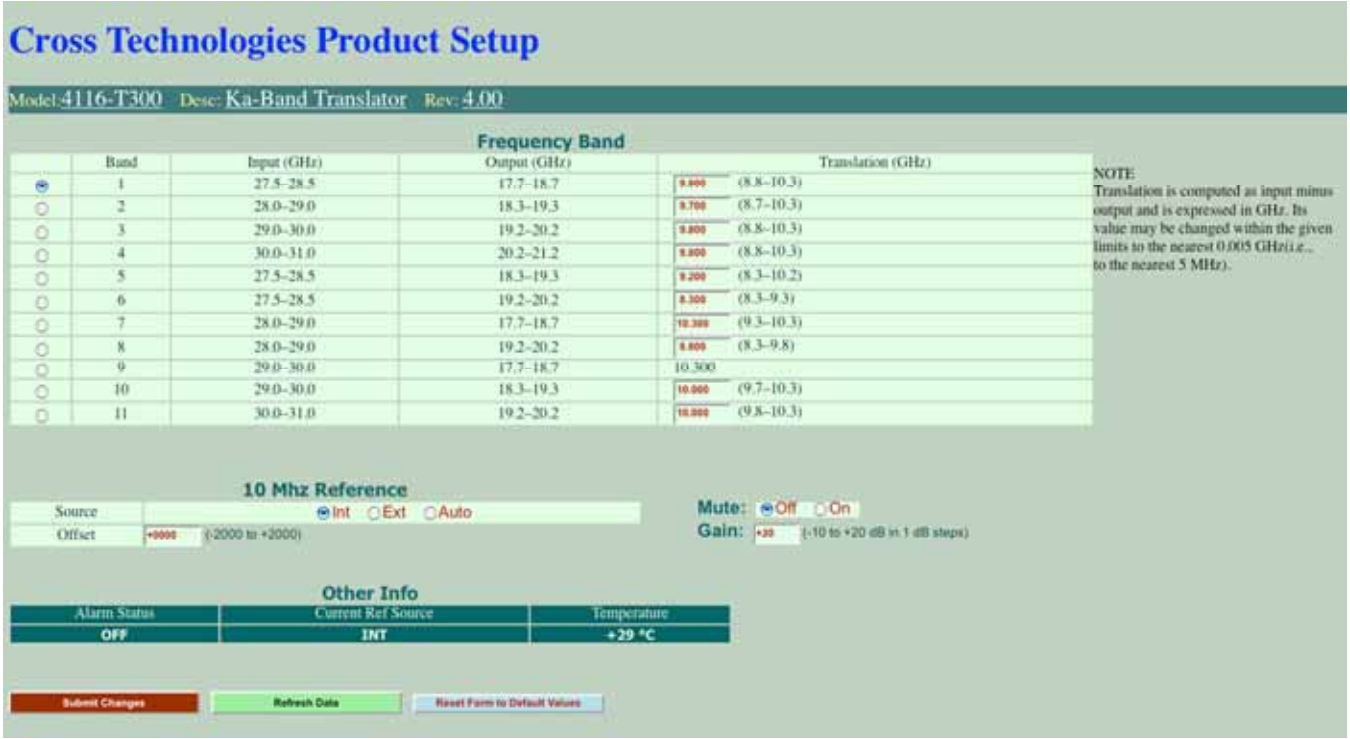


Figure 2-C: Model 4116-T300 Product Setup Web Page

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” drop down menu.
Enter the IP address of the 4116-T300 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.

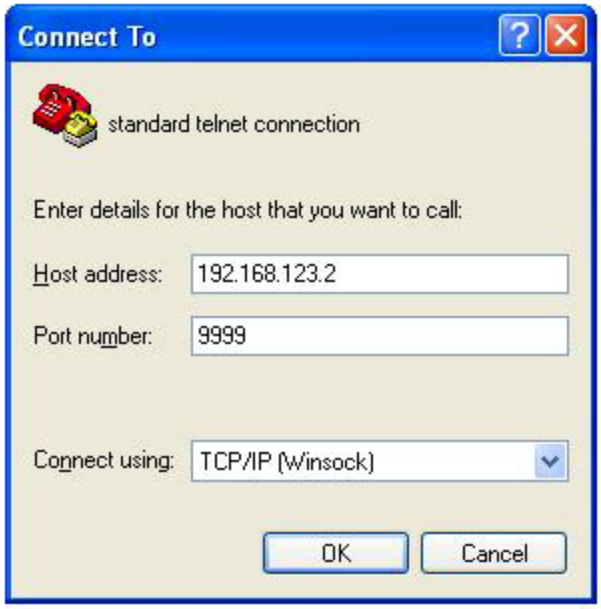


Figure 2-E: Telnet® Settings in Hyper Terminal

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

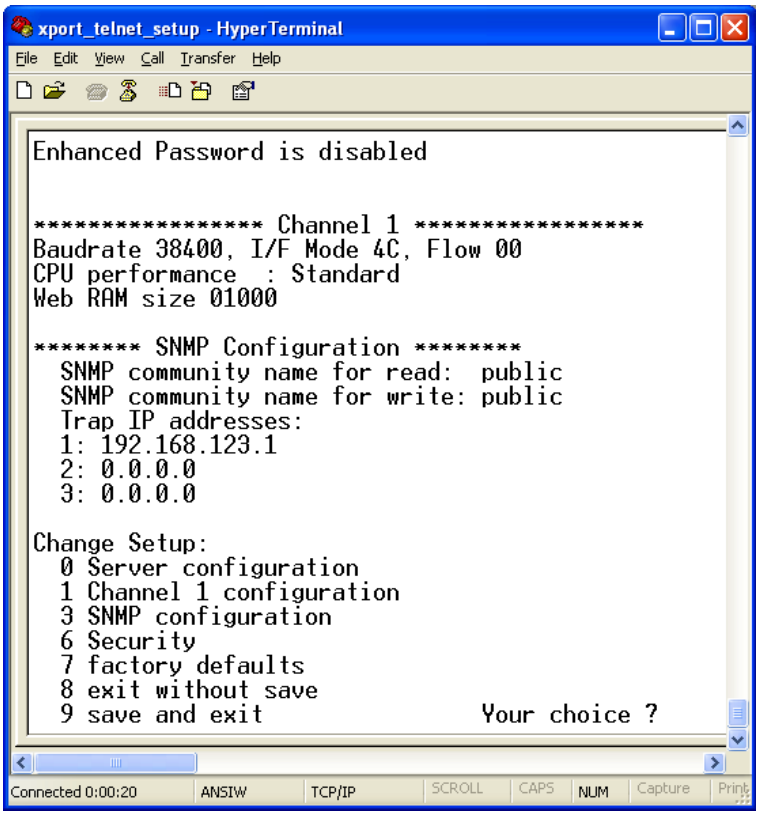
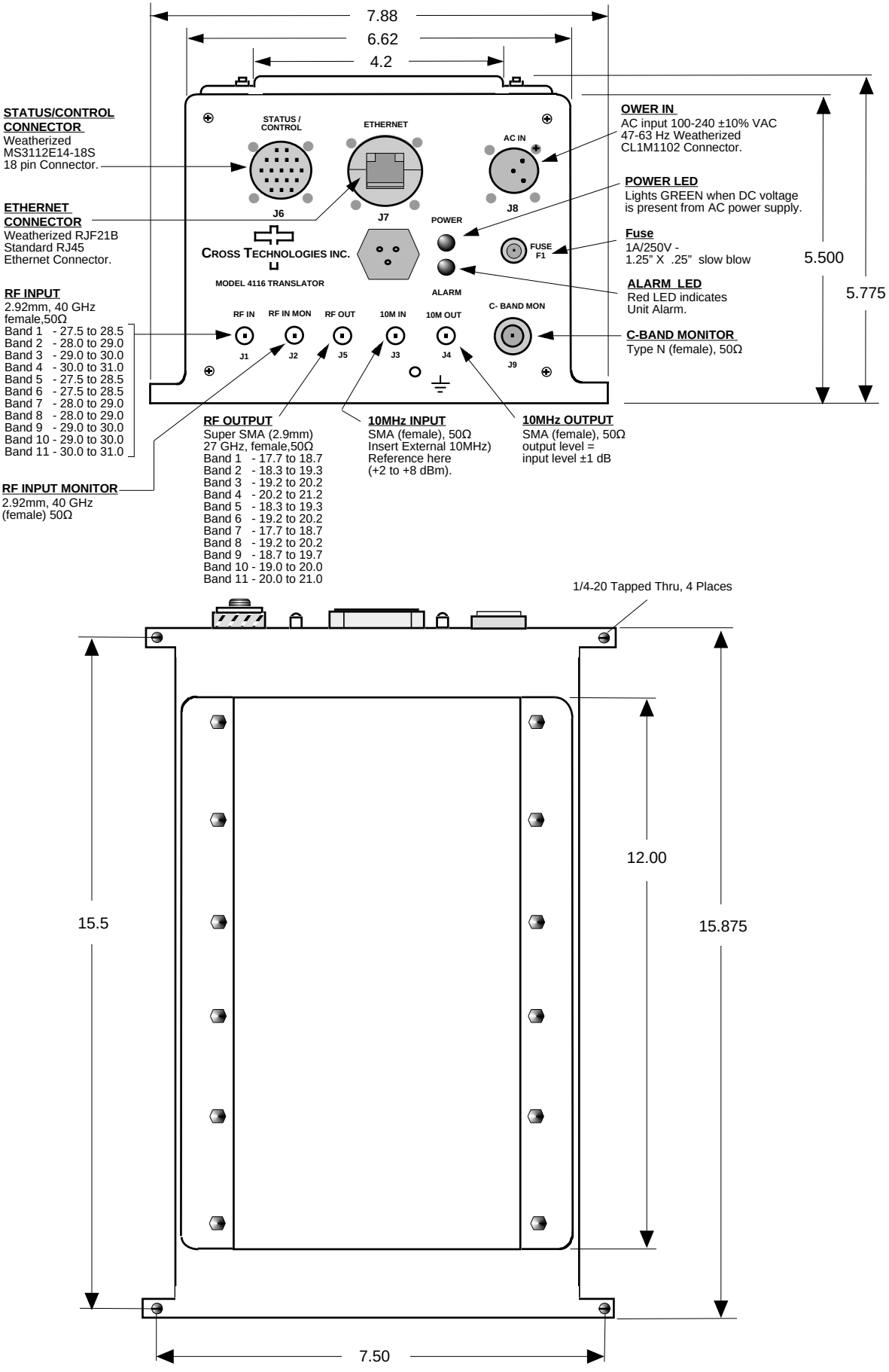


Figure 2.5 Shows front panel input and output connections, top view and baseplate mounting dimensions.



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, 18 connector as shown in Table 2.6. The Ethernet signals connect via a standard RJ45 connector, Part # RJF6G.

Table 2.6: Monitor and Control Connector

Table 2.6.1 - Monitor and Control Connector Pinouts	
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-T300 Multi-Band, Block Translator

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 ±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 so that the output level is always within the range of -15 to 0 dB. (See Table 2.0 and 2.6.1).
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) via Ethernet or serial command. (see Section 2.0 and Table 2.6.1).
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 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.

2.7.1 Connection to AC Input Power

The 4116-T300 is furnished with a pre-assembled AC power input cable as described below.

* 4116-T300 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 preassembled onto a standard NEMA 5-15P U.S. power cord.

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