

## Instruction Manual

# Model 4116-T61 Multi-Band Block Translator Weather Resistant Enclosure

August 2009, Rev A



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# INSTRUCTION MANUAL

## MODEL 4116-T61 Multi-Band Translator, Outdoor

<u>TABLE OF CONTENTS</u>	<u>PAGE</u>
<b>Warranty</b>	<b>2</b>
<b>1.0 General</b>	<b>3</b>
1.1 Equipment Description	<b>3</b>
1.2 Technical Characteristics	<b>4</b>
<b>2.0 Installation</b>	<b>6</b>
2.1 Message Protocol	<b>6</b>
2.2 M&C Commands	<b>7</b>
2.3 M&C Queries	<b>8</b>
2.4 Ethernet Interface Installation	<b>10</b>
2.4.1 Methods of Connection	<b>10</b>
2.4.2 Ethernet Configuration	<b>10</b>
2.4.3 Webpage M&C	<b>11</b>
2.4.4 SNMP Configuration	<b>12</b>
2.5 Translator Outline Drawings	<b>15</b>
2.6 Physical Interface	<b>16</b>
2.7 Installation/Operation	<b>17</b>
<b>3.0 Environmental Use Information</b>	<b>18</b>

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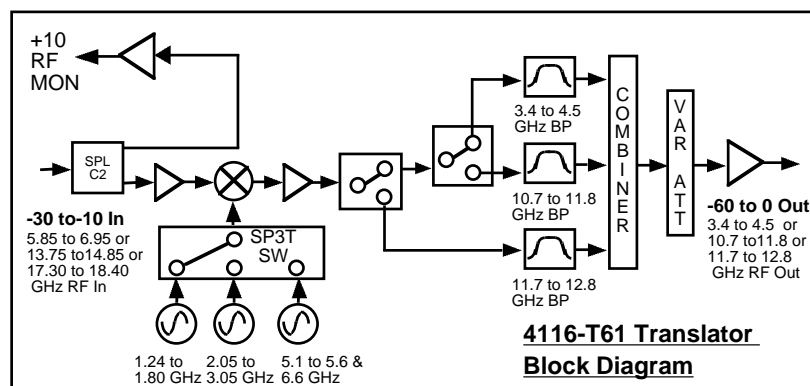
## 1.0 General

### 1.1 Equipment Description

The 4116-T61 Translator converts one of three input RF bands to one of three output RF bands. Front panel LEDs provide indication of DC Power, and PLL Alarm. The RF to RF gain is +20 dB, maximum. Connectors are Type N female for the RF out, RF in and RF in Monitor and SMA female for the external reference input and reference output. The 10 MHz reference switches to internal when the external falls below +1 dBm. Gain, band select, and internal 10 MHz frequency are controlled by the Ethernet M&C or via the Status/Control connector. The 4116 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.



**Model 4116-T61 Multi-Band Translator Front Panel**



**FIGURE 1 Model 4116-T61 Multi-Band Block Translator Block Diagram**

## 1.2 Technical Characteristics

**TABLE 1.0 4116-T61 Multi-Band Block Translator Specifications\***

### Input Characteristics

Impedance/Return Loss	50Ω /14 dB
Frequency (GHz)	See Band Chart below
Noise Figure, max.	20 dB at max gain
Input Level	-30 to -10 dBm
Input 1dB Compression	0 dBm

### Output Characteristics

Impedance/Return Loss	50Ω/14 dB (see TABLE 2.5.1 for connector options)
Frequency (GHz)	See Band Chart below
Output Level Range	-60 to 0 dBm
Output 1dB Compression	+10 dBm

### BAND CHART - Frequencies, Translations, 10kHz Phase Noise

BAND NO.	IN RANGE (GHz)	OUT RANGE (GHz)	TRANSLATE DEFAULT (GHz)	TRANSLATE RANGE (GHz)	TRANSLATE STEP (MHz)	PH NOISE @ 10 kHz
1	5.85-6.95	3.4-4.5	2.45	2.05-3.05	1	-90
2	13.75-14.85	10.7-11.8	3.05	2.05-3.05	1	-90
3	13.75-14.85	11.7-12.8	2.05	2.05-3.05	1	-90
4	13.75-14.85	11.7-12.8	1.5	1.24-1.80	1	-90
5	17.3-18.4	10.7-11.8	6.6	6.6	FIXED	-85
6	17.3-18.4	11.7-12.8	5.6	5.1-5.6	5	-85

### LO Harmonically-related In-Band Fixed Spur Frequencies

BAND NO.	OUT RANGE (GHz)	TRANSLATE RANGE (GHz)	In-Band Fixed Spurs (-30 dBC at -10 in) (-10 dBC at -30 in)
1	3.4-4.5	2.05-3.05	2.05 to 2.25, Carrier related -20dBC
2	10.7-11.8	2.05-3.05	2.14 to 2.36; 2.675 to 2.95
3	11.7-12.8	2.05-3.05	2.05 to 2.1; 2.34 to 2.565; 2.925 to 3.05
4	11.7-12.8	1.24-1.80	1.24 to 1.40 ; 1.5 to 1.6 ; 1.75 to 1.8
5	10.7-11.8	6.6	None
6	11.7-12.8	5.1-5.6	None

### Channel Characteristics

Gain	+20 to ±3 dB, (+20 to -40 dB variable in 0.5 dB steps)
Input to Output Isolation	> 60 dB, min
Spurious, Inband	<-40 dBC in band, except -30dBC at -10 dBm in where harmonics of LO falls in-band (See Chart above)
Spurious, LO	<-60 dBm LO
Intermodulation	<-50 dBC for two carriers 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 max over temp internal reference; ext. ref. input

Phase Noise @ F (Hz)>	100	1K	10K	100K	1M
dBC/Hz	-70	-80	See Band Chart	-100	-110

10 MHz Level +2dBm to +8dB in, Monitor Output = input level ±0.5dB, 50 ohms

**TABLE 1.0 4116-T61 Multi-Band Block Translator Specifications (continued)**

**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, Mon. Connector	Type N (female), 50Ω
L-Band Connector	Type N (female), 50Ω
10 MHz connectors	SMA (female), 50Ω
Status/Control Connector	MS3116F14-18P; Weatherized Ethernet Connector
Size	8" W X 6" H X 16" D Weather Resistant Enclosure
Power	100-240 ±10% VAC, 47-63 Hz, 20 watts max. FCI Clipper Series CL1M1102 Connector

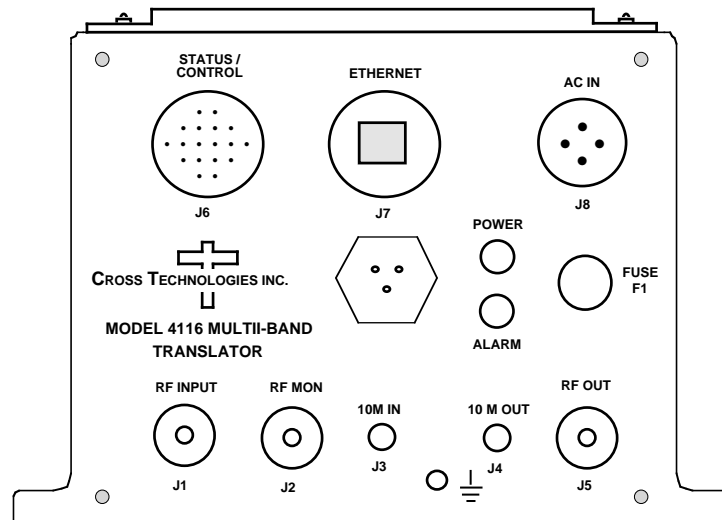
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\*+0 to +50 degrees C; Specifications subject to change without notice

## 2.0 Installation

The 4116-T61 Multi-Band Block Translator 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 4116-T61 can be secured to a mounting plate using the 4 holes on the bottom of the front and rear panel. Figure 2 shows how the 4116-T61 is assembled.

**Figure 2 - 4116-T61 Assembled**



## 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-T61 Multi-Band Block Translator.

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

**Table 2.0 Model 4116-T61 M&C Commands**

<b>Table 2.0: Model 4116-T61 M&amp;C Commands</b>		
<b>Command</b>	<b>Syntax</b>	<b>Description</b>
Set Frequency Band	{aaCBx}	x = 1 to select band 1: in = (5850 to 6950 MHz) out= (3400 to 4500 MHz)
		x = 2 to select band 2: in = (13750 to 14850 MHz) out = (10700 to 11800 MHz)
		x = 3 to select band 3: in = (13750 to 14850 MHz) out = (11700 to 12800 MHz)
		x = 4 to select band 4: in = (13750 to 14850 MHz) out = (11700 to 12800 MHz)
		x = 5 to select band 5: in = (17300 to 18400 MHz) Out = (11700 to 12800 MHz)
		x = 6 to select band 6: in = (17300 to 18400 MHz) Out = (11700 to 12800 MHz)
Set Frequency Offset	{aaCFxxxx}	where:
		xxxx = 5 characters
		if Band 1 is selected, Range: -0400 to +0600 in 1 MHz steps
		if Band 2 is selected, Range: 00000 to -1000 in 1 MHz steps
		if Band 3 is selected, Range: 00000 to +1000 in 1 MHz steps
		if Band 4 is selected, Range: -0260 to +0300 in 1 MHz steps
		if Band 6 is selected, Range: 00000 to -0500 in 5 MHz steps
Set Gain	{aaCGxxxx}	where:
		xxxx = 4 characters
		Range: -400 to +200 (-40.0 to +20.0 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 the output
Set RS485 address	{aaCRxx}	where:
		xx = 2 characters
		Range: 00 to 31
Set Int. 10 MHz reference offset	{aaCOxxxx}	where:
		xxxx = 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-T61 M&C Commands**

Table 2.1: Model 4116-T61 M&C Queries		
Command	Syntax	Description
Frequency Band	{aaSB}	Returns {aaSBx} where:
		x = 1 if selected band is 1: in = (5850 to 6950 MHz) out = (3400 to 4500 MHz)
		x = 2 if selected band is 2: in = (13750 to 14850 MHz) out = (10700 to 11800 MHz)
		x = 3 if selected band is 3: in = (13750 to 14850 MHz) out = (11700 to 12800 MHz)
		x = 4 if selected band is 4: in = (13750 to 14850 MHz) out = (11700 to 12800 MHz)
		x = 5 if selected band is 5: in = (17300 to 18400 MHz) out = (11700 to 12800 MHz)
		x =6 if selected band is 5: in = (17300 to 18400 MHz) out = (11700 to 12800 MHz)
Gain	{aaSG}	Returns {aaSGxxxx} where:
		xxxx = 4 characters
		Range: (-400 to +200 in 0.5 dB steps)
		Example: {aaSG-245} indicates that 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
Frequency Offset	{aaSF}	Returns {aaSFxxxxx} where:
		xxxxx = 5 characters
		if Band 1 is selected, Range: -0400 to +0600 in 1 MHz steps
		if Band 2 is selected, Range: 00000 to -1000 in 1 MHz steps
		if Band 3 is selected, Range: 00000 to +1000 in 1 MHz steps
		if Band 4 is selected, Range: -0260 to +0300 in 1 MHz steps
		if Band 6 is selected, Range: 00000 to -0500 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

*continued on page 8...*

**Table 2.1 Model 4116-T61 M&C Commands (continued from page 8)**

Command	Syntax	Description
RS485 address	{aaSR}	Returns {aaSAxx} where:
		xx = 2 characters
		Range: 00 to 31
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-T61 Multi-Band Block 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:

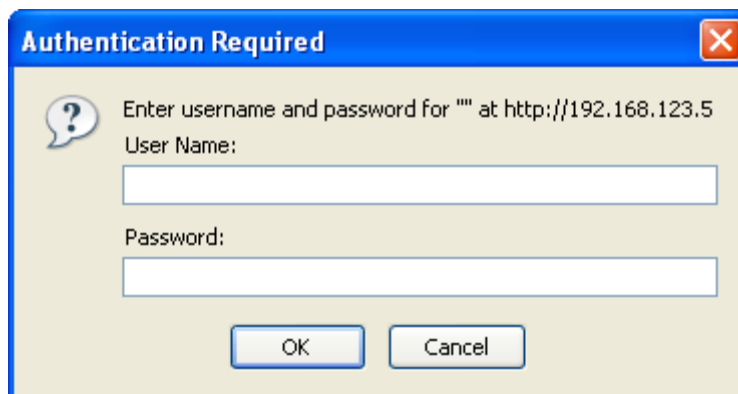
For control from a local PC, attach the 4116-T61's Ethernet port to the Ethernet network connector on the PC using a crossover RJ-45 cable.

#### LAN Connection

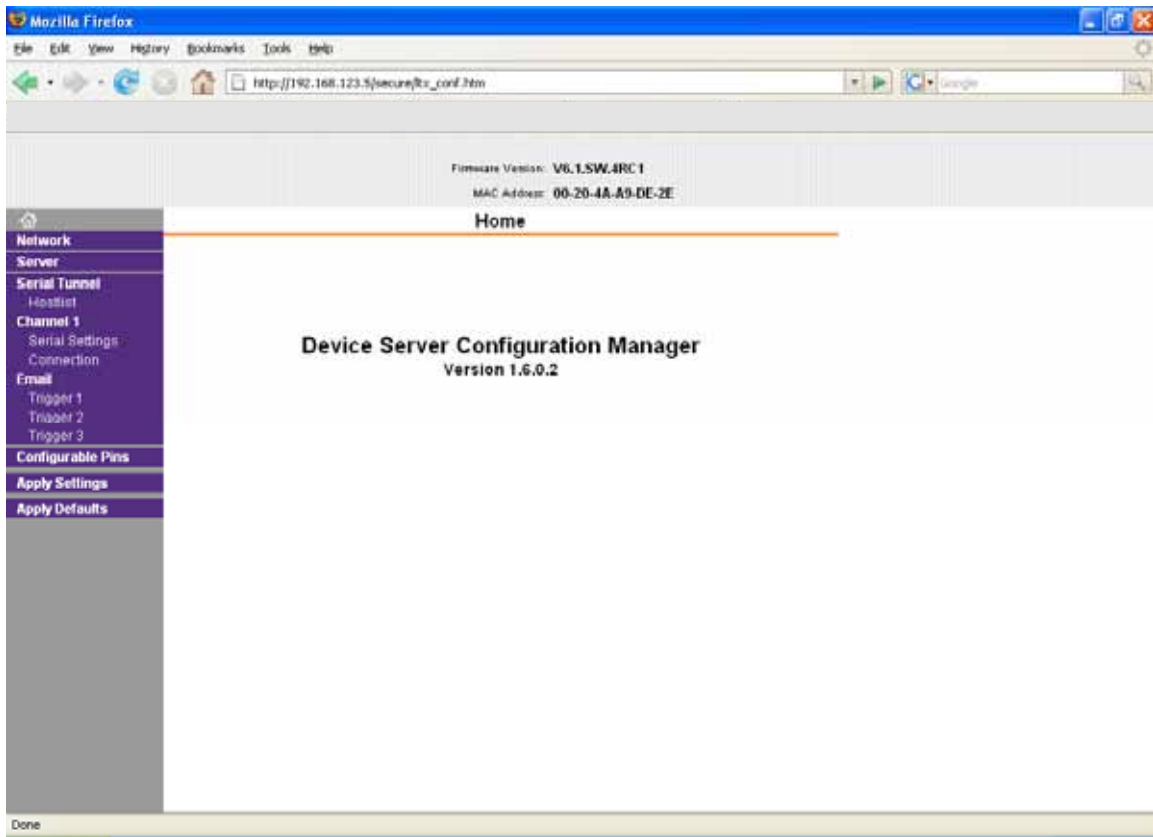
For LAN connections, attach the 4116-T61 Ethernet port to the LAN using a normal RJ-45 cable. Use any PC on the LAN to connect to the 4116-T61.

### 2.4.2 Ethernet Configuration

Each 4116-T61 must be configured with an appropriate IP address, Netmask, and Gateway assigned by your network manager. The 4116-T61 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-T61 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-T61 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**

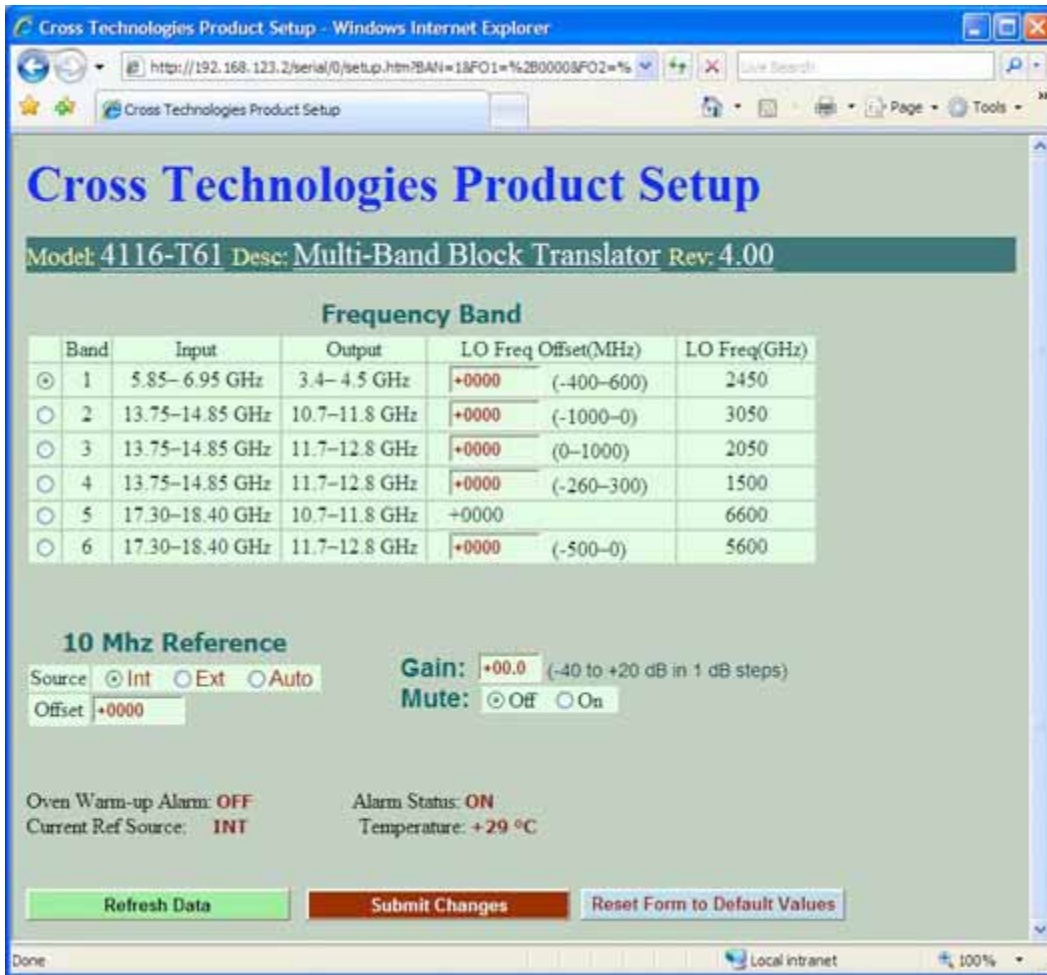
In the left frame of the configuration manager click on Network to display the Network Settings screen. Enter the IP address, Subnet mask, and Gateway address with delimiter dots (example: 192.168.192.47).

### **2.4.3 Webpage M & C**

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

<http://<ip address>/serial/0/setup.htm> where <ip address> is the IP address of the unit.

Figure 2-C (page 11) shows the product setup web page from a model 4116-T61 frequency converter.

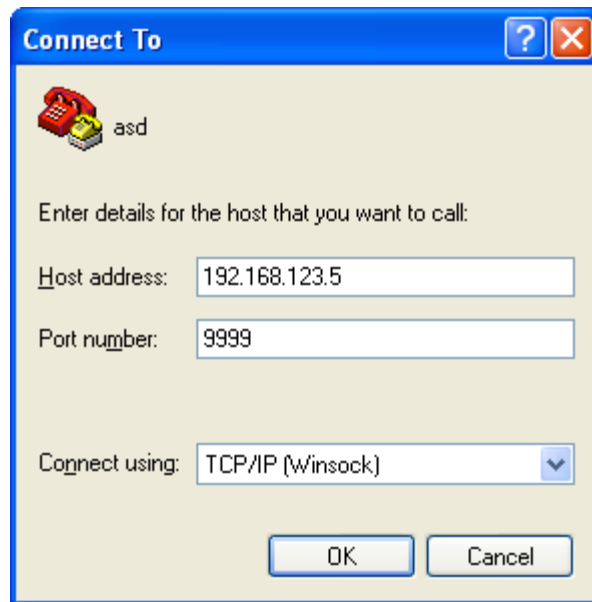


**Figure 2-C: Model 4116-T61 Product Setup Web Page**

## 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.

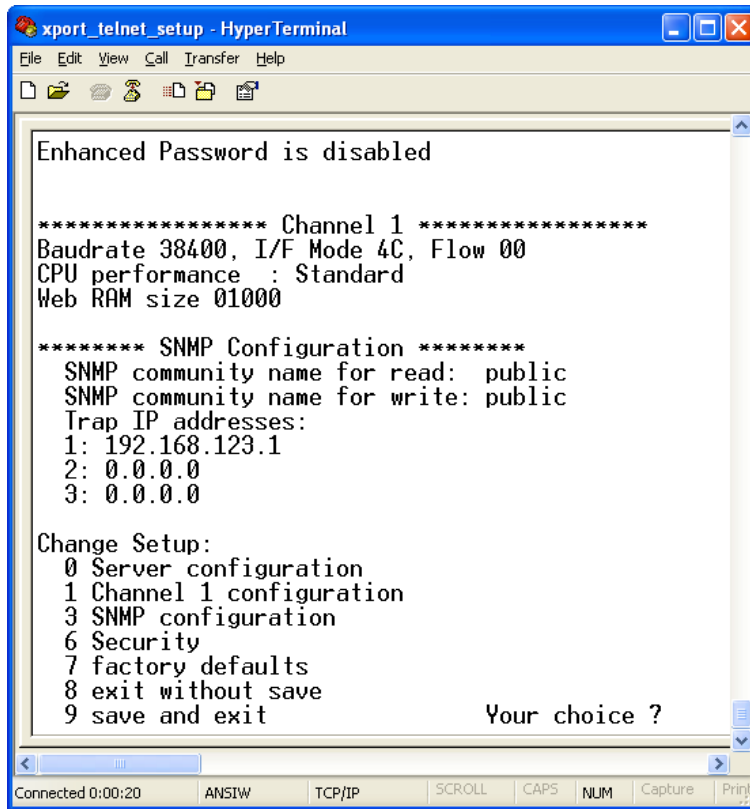
Start the Hyper Terminal application and select “New Connection” from the “File” drop down menu. The next screen is a “Connect To” dialog box. Select TCP/IP (Winsock) from the “Connect” drop down menu. Enter the IP address of the 4116-T61 in the “Host address:” field and 9999 in the “Port number” field. Figure 2-E shows an example of the Hyper Terminal settings required to access the SNMP configuration menu.



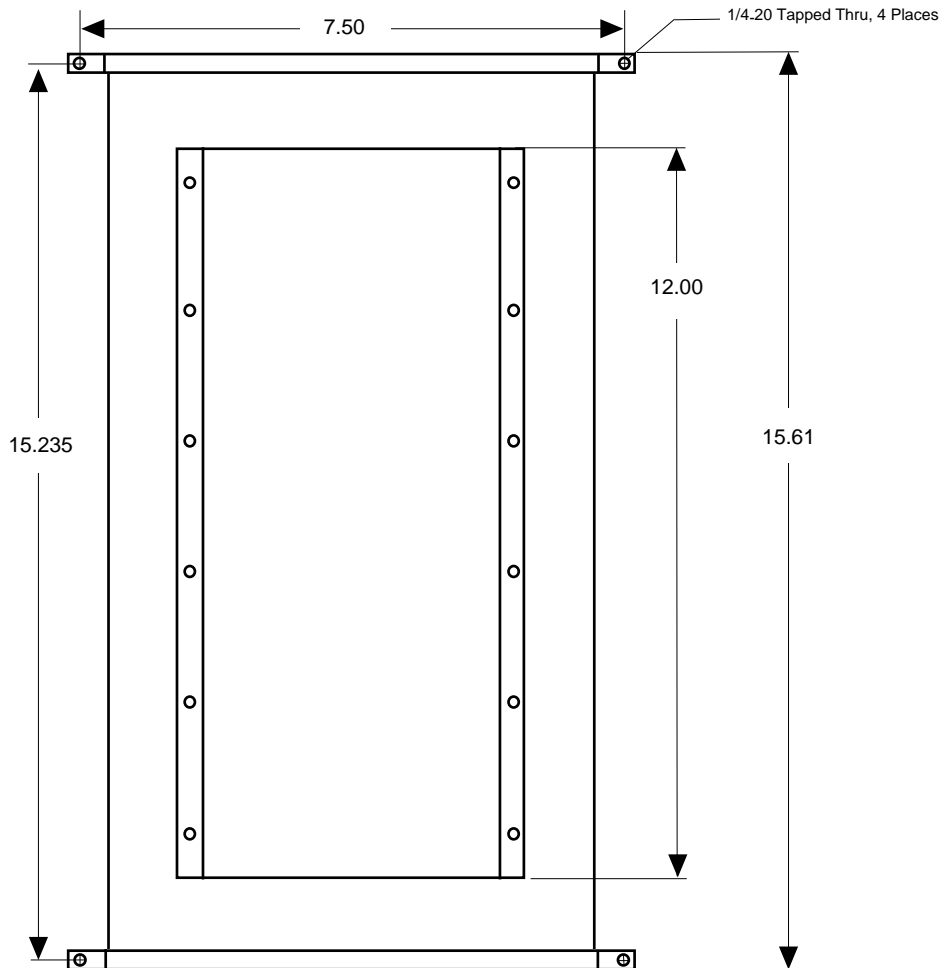
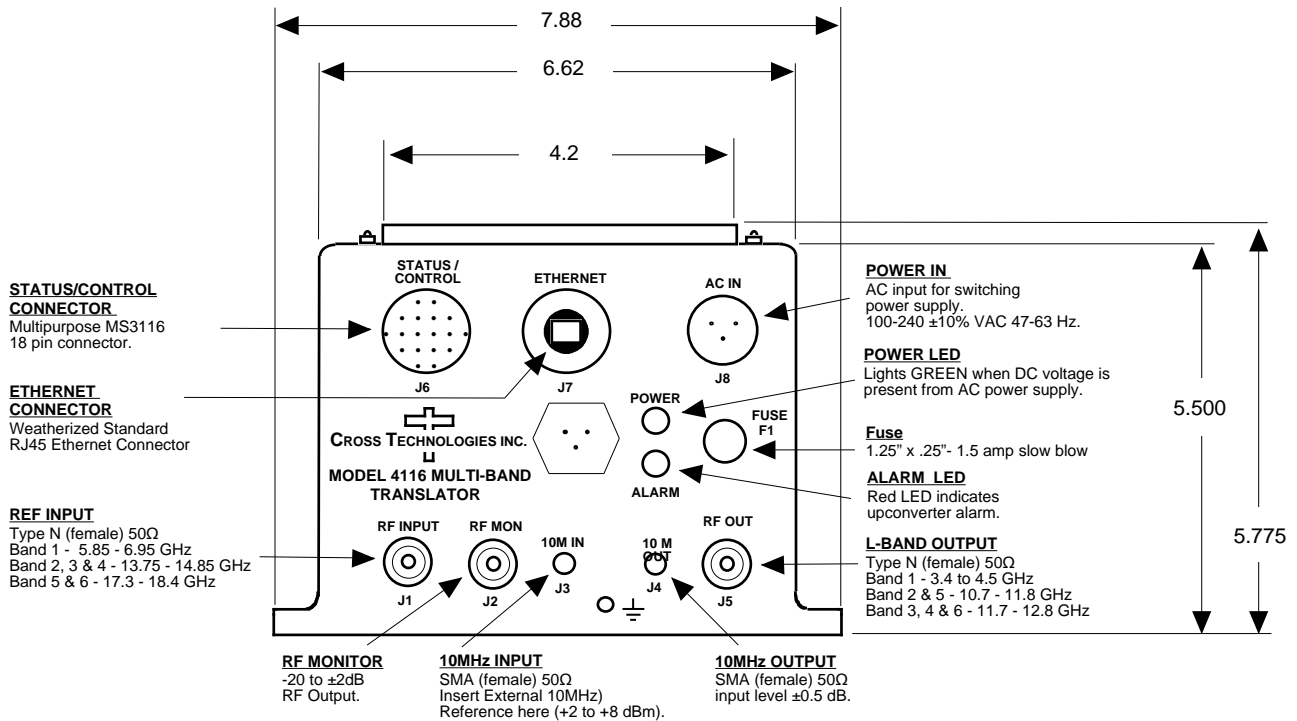
**Figure 2-E: Telenet Settings in Hyper Terminal**

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 the input and output connection on the front panel and top view of the 4116-T61



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

**Table 2.5.1: Monitor and Control Connector**

<b>Monitor and Control Connector Pinout</b>	
<b>Mating connector part number MS3116F14-18P</b>	
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

## 2.7 Installation/Operation

### Installing and Operating the 4116-T61 Multi-Band, Block Translator

1. Connect a -30 dBm to -10 dBm signal to L-BAND INPUT, (Figure 2.4).
2. Connect the RF OUTPUT, to the external equipment.
3. Connect 100-240  $\pm$ 10% VAC, 47 - 63 Hz to AC connector to the front panel.
4. Be sure DS1 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.4).
5. Set the gain for +20 to  $\pm$ 3 dB insuring that the output level is always in the range of -60 to 0 dB.
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) via Ethernet or serial command.
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 1.25" x .25" - 1.5 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.

#### **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.

### 3.0 Environmental Use Information

- A. Rack-Mounting** - To mount this equipment in a rack, please refer to the installation instructions located in the user manual furnished by the manufacturer of your equipment rack.
- B. Mechanical Loading** - Mounting of equipment in a rack should be such that a hazardous condition does not exist due to uneven weight distribution.
- C. Elevated Operating Ambient Temperature** - If installed in a closed or multiunit rack assembly, the operating ambient temperature of the rack may be greater than room ambient temperature. Therefore, consideration should be given to Tmra.
- D. Reduced Air Flow** - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Additional space between unit may be required.
- E. Circuit Overloading** - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits could have on over current protection and supply wiring. Appropriate consideration of equipment name plate rating should be used, when addressing this concern.
- F. Reliable Earthing** - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connection to the Branch (use of power strips).
- G. Top Cover** - There are no serviceable parts inside the product so, the Top Cover should not be removed. If the Top Cover is removed the ground strap and associated screw **MUST BE REINSTALLED** prior to Top Cover screw replacement. **FAILURE TO DO** this may cause **INGRESS** and/or **EGRESS** emission problems.



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2009 • Printed in USA