

Instruction Manual

Model 4116-T61 Multi-Band Block Translator Weather Resistant Unit

May 2015, Rev. I



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INSTRUCTION MANUAL

MODEL 4116-T61 Multi-Band Translator, Weather Resistant

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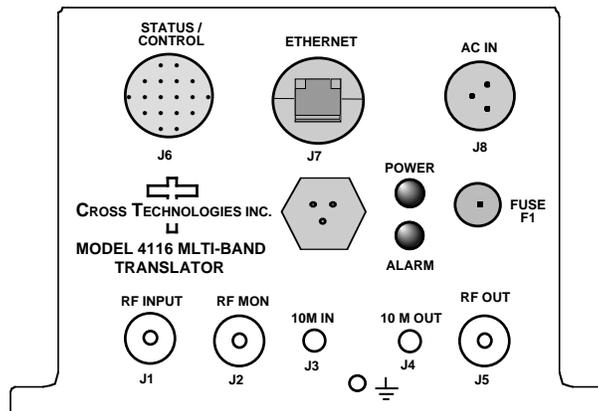
MODEL 4116-T61 Translator, Weather Resistant*

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. When using an external 10 MHz reference, if the external level falls below +1dBm, the 10 MHz reference switch selects the internal sequence source. 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.

(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-T61 Multi-Band Translator, Front Panel

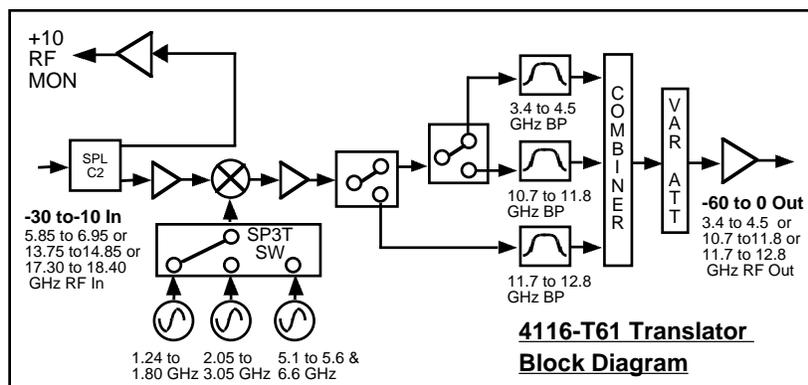


FIGURE 1 Model 4116-T61 Multi-Band Block Translator Block Diagram

1.2 Technical Characteristics

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

Input Characteristics

| | |
|-----------------------|---------------------------|
| Impedance/Return Loss | 50Ω /12 dB, 14 dB typical |
| Frequency (GHz) | See Band Chart below |
| Noise Figure, max. | 20 dB at max. gain |
| Input Level | -30 to -10 dBm |

Output Characteristics

| | |
|----------------------------|---------------------------|
| Impedance/Return Loss | 50Ω /10 dB, 14 dB typical |
| Frequency (GHz) | See Band Chart below |
| Output Level Range | -60 to 0 dBm |
| Output 1dB Comp. max. gain | +8 dBm, +10 typical |

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 | 85 |
| 2 | 13.75-14.85 | 10.7-11.8 | 3.05 | 2.05-3.05 | 1 | 85 |
| 3 | 13.75-14.85 | 11.7-12.8 | 2.05 | 2.05-3.05 | 1 | 85 |
| 4 | 13.75-14.85 | 11.7-12.8 | 1.5 | 1.24-1.80 | 1 | 85 |
| 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* |

* 5 MHz steps; >75 dBC for 1 MHz steps

LO Harmonically-related In-Band Fixed Spur Frequencies

| BAND NO. | OUT RANGE (GHz) | TRANSLATE RANGE (GHz) | In-Band Fixed Spurs (-25 dBC at -10 in) (-5 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 ±3 dB max., (+20 to -40 dB variable in 1 dB steps) |
| Input to Output Isolation | > 45 dBC, min; >60 dBC typical |
| Spurious, Inband | > 30 dBC in band, except 25 dBC (>30 dBC typical) at -10 dBm in where harmonics of LO falls in-band (See Chart above) |
| Spurious, Sig. Rel., Band 1 | >20 dBC |
| Spurious, LO (at input) | <-60 dBm LO |
| 2 Tone @-20 dBm in,-5 out, each | >45 dBC (>50 dBC typical) |
| 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 |
| 10 MHz Level | +2 to +8 dBm in; Monitor Output= Input Level ±1.0 dB, 50Ω |

| Phase Noise @ F (Hz)> | 100 | 1K | 10K | 100K | 1M |
|-----------------------|-----|----|-----|------|-----|
| Specification dBC/Hz | 70 | 80 | 85 | 95 | 110 |
| Typical dBC/Hz | 75 | 85 | 90 | 100 | 125 |

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

| 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 |
| 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 Connector , 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. | |

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, ± 12 , +24, +5 VDC power supply provides power for the internal assemblies. The 4116-T61 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-T61 utilizes a pre-assembled AC power input cable as described below.

| 4116-T61 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 $\pm 10\%$ 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 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

| Command | Syntax | Description |
|----------------------------------|------------|---|
| 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 9...

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

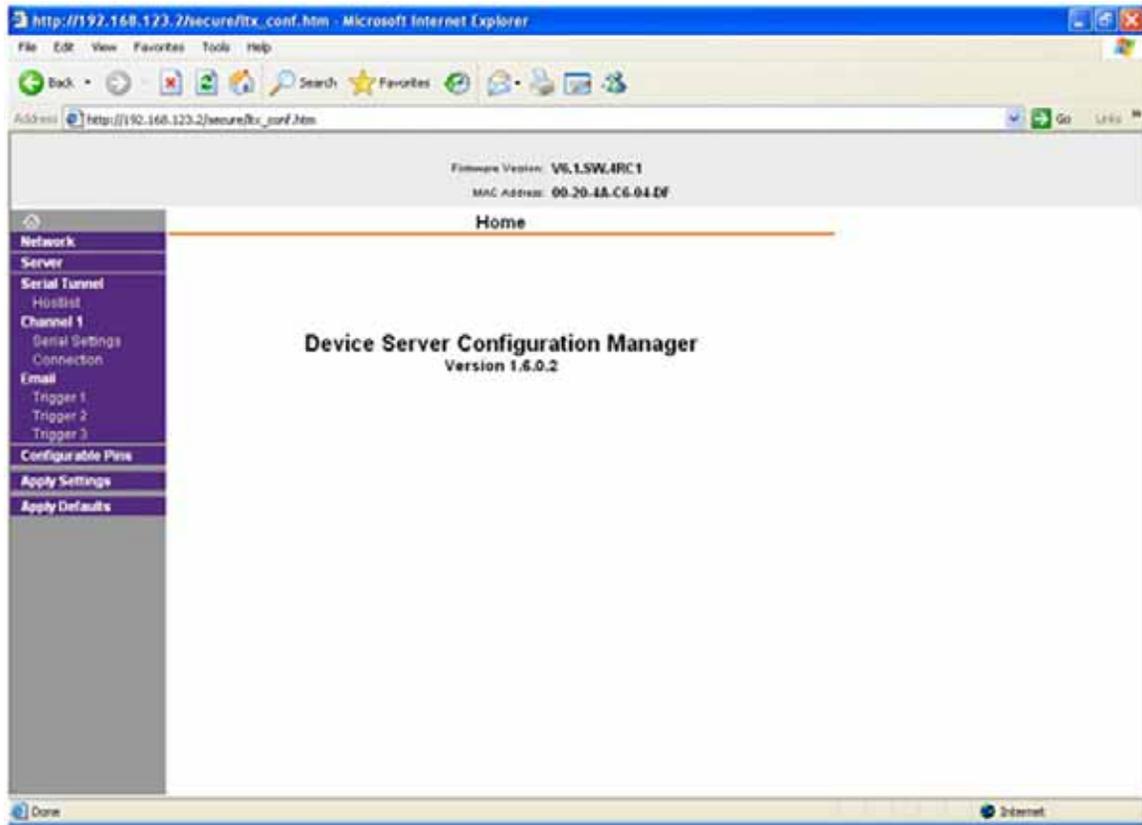


Figure 2-B: Configuration Manager Screen

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 of 41xx>/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.

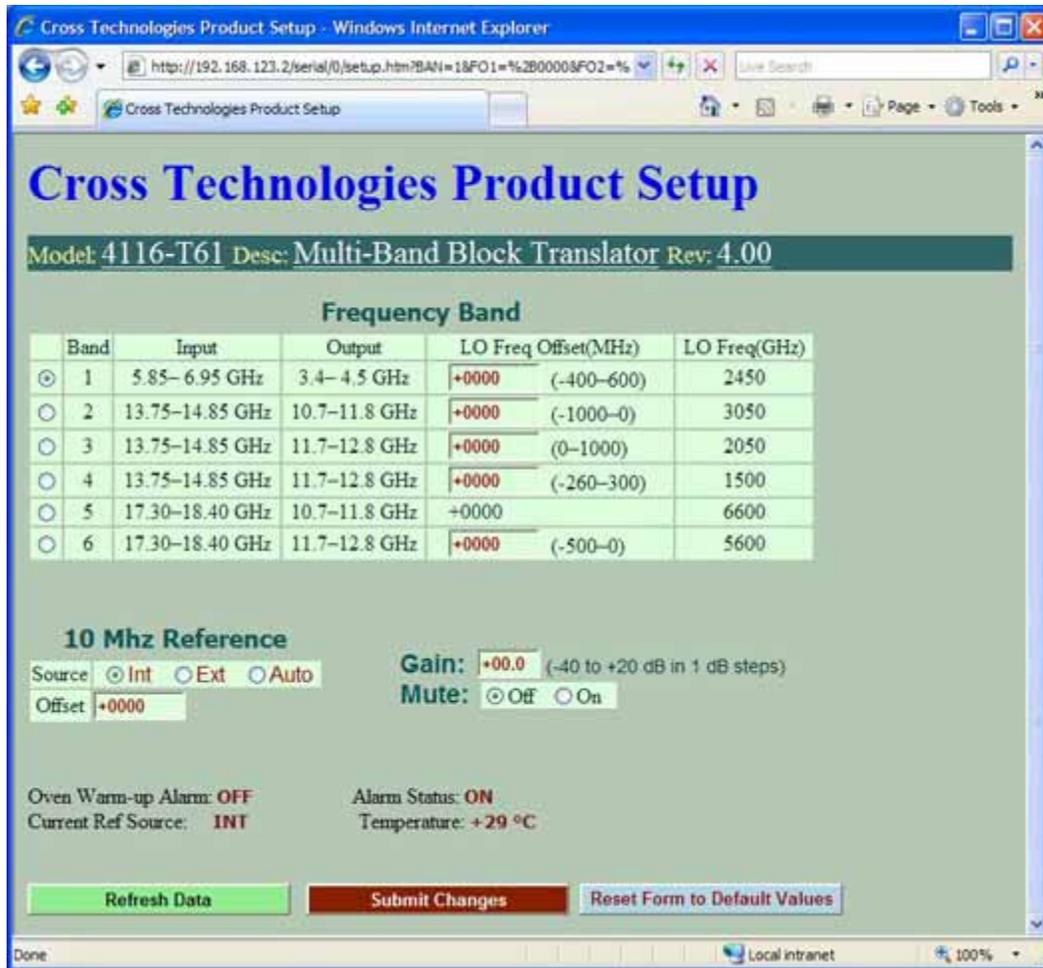


Figure 2-C: Model 4116-T61 Product Setup Web Page

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.

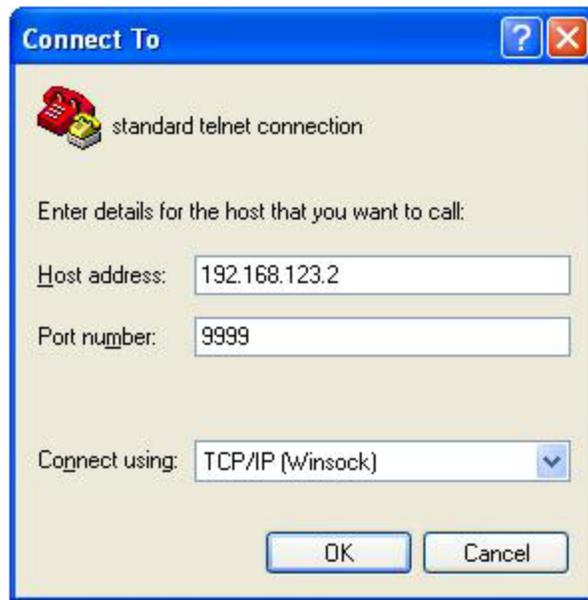


Figure 2-E: Telnet® Settings in Hyper Terminal

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

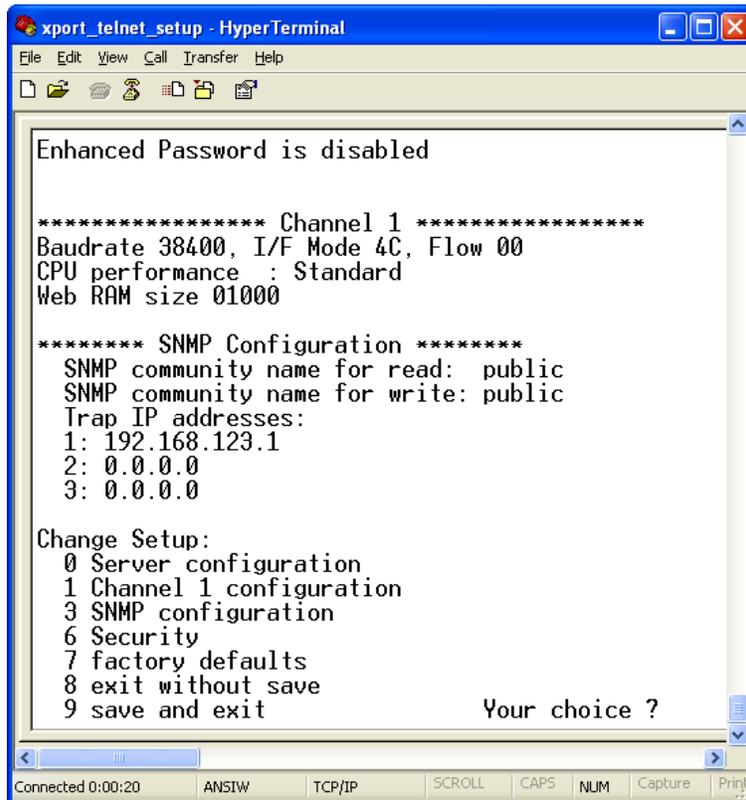
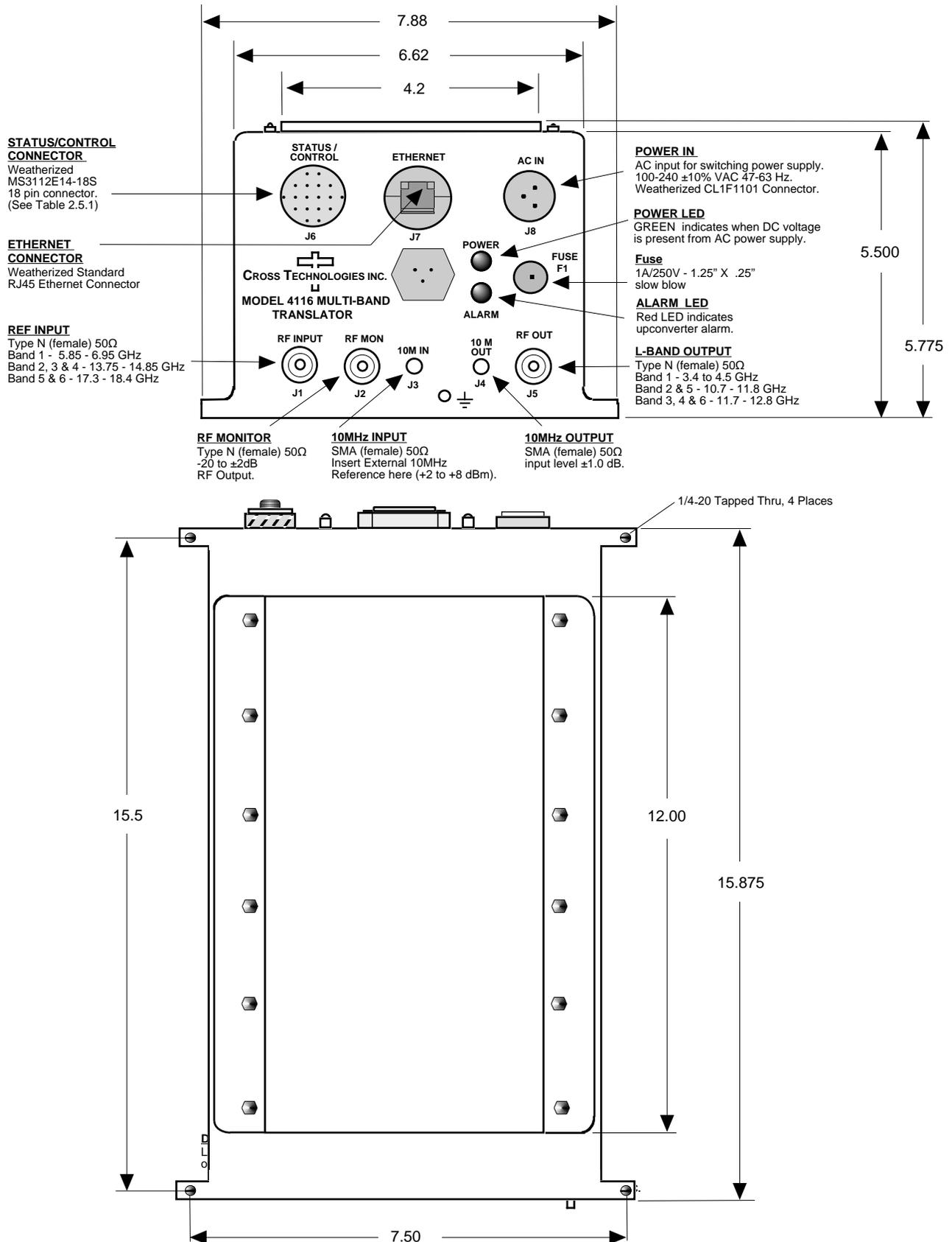


Figure 2.5 Shows the input and output connections on the front panel and the top view of the 4116-T61:



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 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-T61 Multi-Band, Block Translator

1. Connect a -30 dBm to -10 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 \pm 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 -60 to 0 dB (See Table 2.0 and 2.5.1).
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 ref. that is inserted at J2) via Ethernet or serial command (See Table 2.0 and 2.5.1).
8. Check that a 10 MHz, signal is present at the 10 MHz REF OUTPUT at the same level as the input, \pm 1.0 dB (J4 - Figure 2.5).
9. AC Fuse - The fuse is a 1.25" x 0.25" - 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.

| 4116-T61 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 \pm 10% VAC, 47-63 Hz, 20 watts max. |
| 2 | Neutral |
| 3 | Ground |
| | |



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