Data, drawings, and other material contained herein are proprietary to Cross Technologies, Inc., but may be reproduced or duplicated without the prior permission of Cross Technologies, Inc. for purposes of operating the equipment.

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

<table>
<thead>
<tr>
<th>Warranty</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.0 General</strong></td>
<td></td>
</tr>
<tr>
<td>1.1 Equipment Description</td>
<td>3</td>
</tr>
<tr>
<td>1.2 Technical Characteristics</td>
<td>4</td>
</tr>
<tr>
<td><strong>2.0 Installation</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 Mechanical</td>
<td>5</td>
</tr>
<tr>
<td>2.2 Rear Inputs and Outputs</td>
<td>6</td>
</tr>
<tr>
<td>2.3 Front Panel Indicators</td>
<td>6</td>
</tr>
<tr>
<td>2.4 Operation</td>
<td>7</td>
</tr>
<tr>
<td><strong>3.0 Environmental Use Information</strong></td>
<td>8</td>
</tr>
</tbody>
</table>

**WARRANTY** - The following warranty applies to all Cross Technologies, Inc. products.

All Cross Technologies, Inc. products are warranted against defective materials and workmanship for a period of one year after shipment to customer. Cross Technologies, Inc.’s obligation under this warranty is limited to repairing or, at Cross Technologies, Inc.’s option, replacing parts, subassemblies, or entire assemblies. Cross Technologies, Inc. shall not be liable for any special, indirect, or consequential damages. This warranty does not cover parts or equipment which have been subject to misuse, negligence, or accident by the customer during use. All shipping costs for warranty repairs will be prepaid by the customer. There are not other warranties, express or implied, except as stated herein.
MODEL 2115-109 Block Upconverter

1.0 General

1.1 Equipment Description

The 2115-109 Block Upconverter converts 0.95 - 1.7 GHz to 10.95 - 11.7 GHz with a local oscillator at 10.0 GHz. Front panel LEDs provide indication of DC Power, External 10 MHz, and PLL Alarm. The L-band to RF gain is +20 dB. Connectors are SMA female for the RF and BNC female for the L-Band and external reference input and reference output. A three-way switch controls which 10 MHz reference is being used. In the INT position, the internal reference is used, in the EXT position, the external reference is used, and in the AUTO position, the internal reference is used unless a +3 dBm ± 3 dB, 10MHz reference signal is connected to the external reference input. The 2115 is powered by a 100-240 ±10% VAC power supply, and mounted in a 1 3/4” X 19” X 14” rack mount chassis.

FIGURE 1.1 Front and Rear Panels

FIGURE 1.2 Model 2115-109 Upconverter Block Diagram
1.2 Technical Characteristics

**TABLE 1.0  2115-109 Upconverter Specifications***

**Input Characteristics**
- Impedance/Return Loss: 50 Ω/14 dB (see TABLE 2.2 for connector options)
- Frequency: 0.95 to 1.7 GHz
- Noise Figure, max.: 20 dB, max gain
- Input Level: -40 to -25 dBm
- Input 1dB Compression: -15 dBm

**Output Characteristics**
- Impedance/Return Loss: 50 Ω/14 dB (see TABLE 2.2 for connector options)
- Frequency: 10.95 to 11.7 GHz
- Output Level Range: -20 to -5 dBm
- Output 1dB Compression: +5 dBm

**Channel Characteristics**
- Gain: +20 ±1 dB, (+20 to +5 dB variable with Variable Attenuator - Option VA)
- Image Rejection: > 60 dB
- Spurious, Inband: Signal related < -60 dB, -5 dBm out; Signal independent < -60 dBm
- Spurious, Out of Band: < -50 dBm
- Intermodulation: < -50 dB for two carriers each at -10 dBm out
- Frequency Response: ±1 dB, 10.95 to 11.7 GHz; ±0.5 dB, 40 MHz BW
- Frequency Sense: Non-inverting

**LO Characteristics**
- LO Frequency: 10.0 GHz
- Frequency Accuracy: ±0.01 ppm max over temp internal reference; external ref. input
- 10 MHz Level: +3 dBm ± 3 dB, External In or 10MHz Out

<table>
<thead>
<tr>
<th>Phase Noise @ Freq</th>
<th>100 Hz</th>
<th>1kHz</th>
<th>10kHz</th>
<th>100kHz</th>
<th>1MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>dBC/Hz</td>
<td>-70</td>
<td>-80</td>
<td>-85</td>
<td>-100</td>
<td>-110</td>
</tr>
</tbody>
</table>

**Controls, Indicators**
- Attenuator Option - VA: Provides +20 to +5 dB variable gain via front panel potentiometer
- Ext 10 MHz: Yellow LED, Indicates Ext 10 MHz reference is selected (rear panel sw)
- PLL Alarm: Red LED, External contact closure
- Power: Green LED

**Other**
- RF Connector: SMA 50Ω female (see TABLE 2.2 for other options)
- L-Band Connector: BNC 50Ω, female (see TABLE 2.2 for other options)
- 10 MHz Connectors: BNC (female) 75Ω connector; Works with 50Ω or 75Ω
- Alarm Connector: DB9, female - NO or NC contact closure on Alarm
- Size: 19 inch, 1RU Standard Chassis 1.75”high X 14.0” deep
- Power: 100-240 ±10% VAC, 47-63 Hz, 25 watts max

**Options**
- Connector options: See TABLE 2.2

---

*+10°C to +40°C; Specifications subject to change without notice.*
2.0 Installation

2.1 Mechanical
The 2115-109 consists of a PCB and an RF assembly housed in a 1 RU (1 3/4 inch high) by 12 inch deep chassis. A switching, ±12, +24, +5 VDC power supply provides power for the assemblies. The 2115-109 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2115-109 is assembled.

![Diagram of 2115-109 Mechanical Assembly](image)

**FIGURE 2.0  2115-109 Mechanical Assembly**
2.2 Rear Panel Input/Output Signals - Figure 2.1 shows the input and output connectors on the rear panel.

**J2 - EXT 10MHz INPUT**  
BNC (female) 75 Ω. Insert external 10MHz reference here (3 dBm ± 3 dB).

**J1 - L-BAND INPUT**  
BNC (female) 50 Ω. 0.95 to 1.45 GHz, -10 dBm max input signal. See Table 2.2 for other connector options.

**J11 - ALARM**  
DB9 (female) connector. See Table 2.1.

**J8 - 10MHz REF OUTPUT**  
BNC (female) 75 Ω. Outputs currently selected 10MHz ref signal (3 dBm ± 3 dB).

**J101 - RF OUTPUT**  
SMA (female) 50 Ω. 12.2 to 12.7 GHz -10 dBm max output signal. See Table 2.2 for other connector options.

**TABLE 2.1 J11 Pinouts (DB9)**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not Used</td>
</tr>
<tr>
<td>2</td>
<td>Not Used</td>
</tr>
<tr>
<td>3</td>
<td>Not Used</td>
</tr>
<tr>
<td>4</td>
<td>Not Used</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>Alarm Relay: Common</td>
</tr>
<tr>
<td>7</td>
<td>Alarm Relay: Normally Open</td>
</tr>
<tr>
<td>8</td>
<td>Not Used</td>
</tr>
<tr>
<td>9</td>
<td>Alarm Relay: Normally Closed</td>
</tr>
</tbody>
</table>

**TABLE 2.2 Connector Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>RF</th>
<th>L-Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD</td>
<td>SMA, 50Ω</td>
<td>BNC, 50Ω</td>
</tr>
<tr>
<td>M</td>
<td>Type N, 50Ω</td>
<td>BNC, 50Ω</td>
</tr>
<tr>
<td>N</td>
<td>Type N, 50Ω</td>
<td>BNC, 75Ω</td>
</tr>
<tr>
<td>NF</td>
<td>Type N, 50Ω</td>
<td>Type F, 75Ω</td>
</tr>
<tr>
<td>NN</td>
<td>Type N, 50Ω</td>
<td>Type N, 50Ω</td>
</tr>
<tr>
<td>S7</td>
<td>SMA, 50Ω</td>
<td>BNC, 75Ω</td>
</tr>
<tr>
<td>SF</td>
<td>SMA, 50Ω</td>
<td>Type F, 75Ω</td>
</tr>
<tr>
<td>SN</td>
<td>SMA, 50Ω</td>
<td>Type N, 50Ω</td>
</tr>
<tr>
<td>SS</td>
<td>SMA, 50Ω</td>
<td>SMA, 50Ω</td>
</tr>
</tbody>
</table>

2.3 Front Panel Indicators - The following are the front panel indicators.

**DS2 - ALARM LED**  
Lights RED when PLL comes out of lock.

**DS3 - EXT 10 MHz LED**  
Lights YELLOW when external 10MHz reference is active.

**DS1 - POWER LED**  
Lights GREEN when DC voltage is present from AC power supply.

**VA OPTION**  
Potentiometer provides continuously variable gain of +5 dB (max ccw) to +20 dB (max cw)

**MODEL 2115 UPCONVERTER**

**FIGURE 2.2 2115-109 Front Panel Controls and Indicators**
2.4 Installation / Operation

2.4.1 Installing and Operating the 2115-109 Upconverter

1. Connect a -40 dBm to -25 dBm signal to L-BAND INPUT, J1 (Figure 2.1).
2. Connect the RF OUTPUT, J101, to the external equipment.
3. Connect 100-240 ±10% VAC, 47 - 63 Hz to AC connector on the back panel.
4. Be sure DS1 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.2).
5. For Option -VA, adjust front panel potentiometer to get desired gain.
6. Select either INT (for internal 10MHz ref), AUTO (for internal 10MHz ref UNLESS a external 10MHz, +3 dBm signal is connected to J2), or EXT (for external 10MHz, +3 dBm ref that is inserted at J2) on rear panel switch S1 (Figure 2.1).
7. If EXT is selected or AUTO is selected and there is a 10MHz, +3 dBm signal at J2, check that DS3 (yellow, Ext 10MHZ) is on (Figure 2.2).
8. Check that a 10MHz, +3 dBm ±3 dB signal is present at the 10MHZ REF OUTPUT (J8) (Figure 2.1).
9. **AC Fuse** - The fuse is a 5 mm X 20 mm, 2 amp slow blow (Type T) and is inserted in the far slot in the drawer below the AC input as shown in Figure 2.3. There is a spare fuse in the near slot. If a fuse continues to open, the power supply is most likely defective.

![Fuse Location and Spare Fuse](image)
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 multi-unit 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.