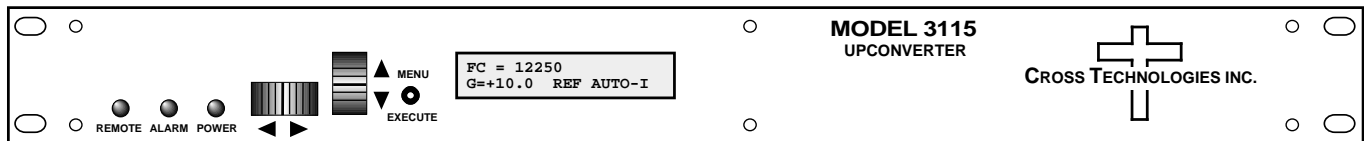


Instruction Manual

Model 3115-107-1975

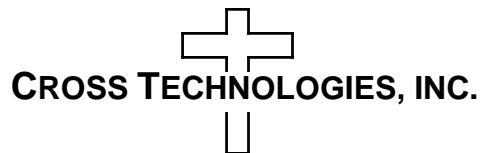
Agile Upconverter

October 2019, Rev. 0



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INSTRUCTION MANUAL

MODEL 3115-107-1975 Block Upconverter

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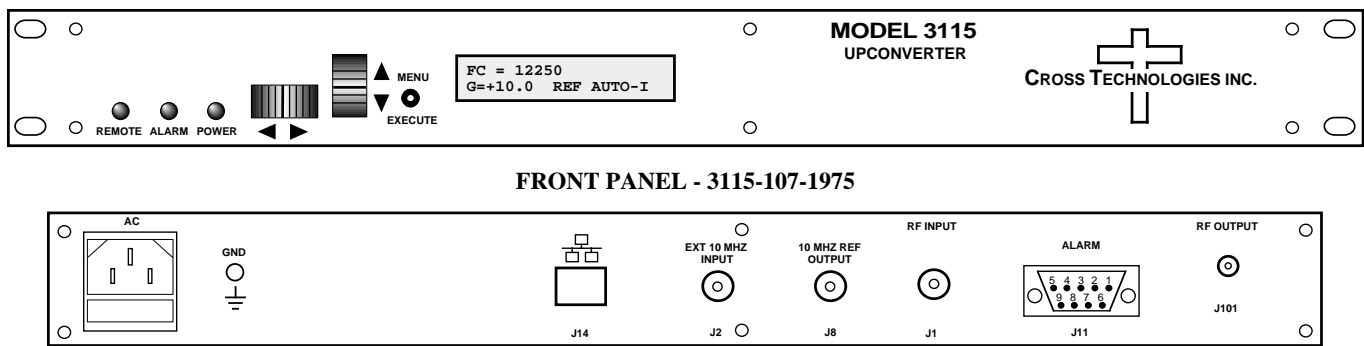
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3115-107-1975 Agile Upconverter, 1975 ±125 MHz to 10.7 - 12.7 GHz

1.0 General

1.1 Equipment Description

The 3115-107-1975 Agile Upconverter converts 1975 ± 125 MHz to 10.7 to 12.7 GHz (non-inverted) in 1 MHz steps, $F_c = 10.8\text{-}12.6\text{ GHz}$ (12.70 GHz max RF out) by switching between two bandpass output filters. The gain is 0 to +20 dB, adjustable in $0.5 \pm 0.5\text{ dB}$ steps. Front panel LEDs provide indication of Remote operation, PLL Alarm and DC Power. Gain, F_c frequency (10.8-12.6 GHz, 12.70 max output frequency) and internal/external/Auto reference frequency selection are controlled by front panel switches or remote selection (via RS-232C/485, standard; Ethernet Optional) and are viewable on the LCD Display. Connectors are SMA female for the RF and BNC female for the RF Input and external reference input and reference output. In AUTO, the 10 MHz reference stays in external if the external level is +1 to +8 dBm. It is powered by a $100\text{-}240 \pm 10\%$ VAC power supply, and in a 1 3/4" X 19" X 14" rack mount chassis.



FRONT PANEL - 3115-107-1975

REAR PANEL - 3115-107-1975 (Shown with optional RJ45 Ethernet Connector)

FIGURE 1.1 3115-107-1975 Front and Rear Panels

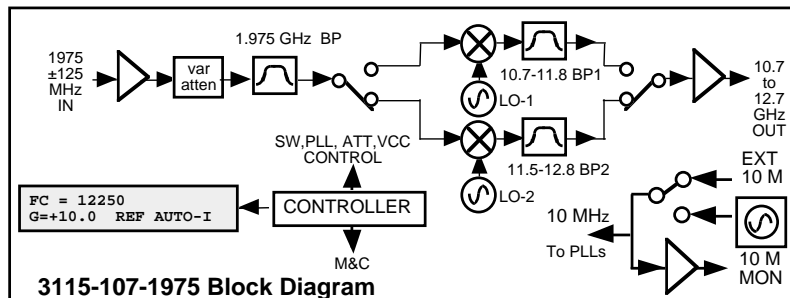


FIGURE 1.2 3115-107-1975 Block Diagram

1.2 Technical Characteristics

TABLE 1.0 3115-107-1975 Agile Upconverter Specifications*

Input Characteristics (RF Input)					
Impedance / Return Loss	50Ω / 14 dB				
Frequency	1975 ± 125 MHZ				
Input Level Range	-30 to -10 dBm				
Output Characteristics (RF Output)					
Impedance / Return Loss	50Ω / 14 dB				
Frequency	10.7 to 12.7 GHz				
	Fc = 10.8 - 12.6 GHz				
Output Level Range	-25 to -5 dBm				
Output 1 dB Compression	+5 dBm at maximum gain				
Channel Characteristics					
Gain, Maximum; adjustment	+20 ± 1 dB, max gain at Fc; +0 to +20 dB adjustment in 0.5 ± 0.5 dB steps				
Spurious Response	<-50 dBC carrier & non-carrier related, Inband; ≤ -50dBm out of band (9.7 -13.7 GHz)				
Intermodulation	<-50 dBC for two carriers each at -8 dBm out.				
Frequency Response	± 1.5 dB, 250 MHz BW, (Fc = 10.8-12.6 GHz, 12.70 max output frequency)				
Group Delay, Maximum	10 ns total (parabolic + linear + ripple)				
Frequency Sense	Non-inverting				
Synthesizer Characteristics					
Frequency Accuracy	±0.01 ppm internal reference; External reference input				
LO Frequency	9.6 - 11.4 GHz (Fc = 10.8-12.6 GHz, 12.70 GHz max out)				
Frequency Step	1 MHz min, Fc= 10.8-12.6 GHz;				
10 MHz Level In/Out	3 dBm, ± 3 dB, with Auto-detect				
Phase Noise @ F (Hz) >	100HZ	1K	10K	100K	1MHZ
Standard dBC/(Hz)	-70	-80	-85	-100	-120
Controls, Indicators					
Freq/Gain/Ext. Ref. Select	Direct Readout LCD; pushbutton switches or remote selection				
Power, Alarm, Remote, Mute	Green LED, Red LED, Yellow LED, Yellow LED				
Remote	RS232C, 9600 baud; RS485/422 or Ethernet optional				
Other					
RF/ IN/OUT Connectors	SMA (female), 50Ω / SMA (female), 50Ω				
10 MHz Connectors	BNC (female), 75Ω works with 50 or 75 ohms				
Alarm / Remote Connector	DB9 - NO or NC Contact Closure on Alarm				
Size	19 inch, Standard Chassis, 1.75" high X 14" deep				
Power / Temp Range	100-24 ±10% VAC, 47-63 Hz, 45 watts maximum				

*10 degrees C to +40 degrees C; Specifications subject to change without notice.

Technical Specifications continued on page 5...

Technical Characteristics continued from page 4...

Available Options	
E6-25X	Int 10MHz reference locked to ext 25 MHz
W31 -	0 to +50 degrees C Operation
Available Connector Options, See Table 2.2, PG 10	

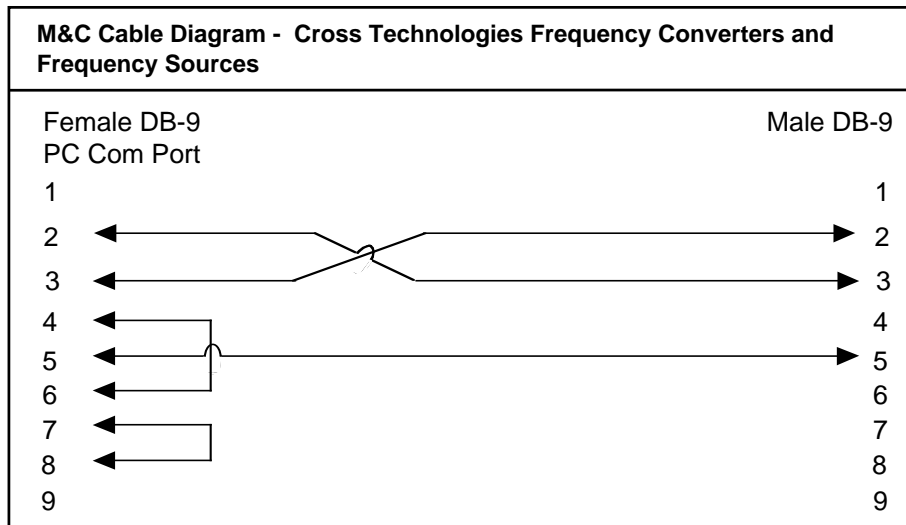
Remote M&C Ethernet Options	
- W8	Ethernet with Web Browser Interface
- W18	Ethernet with SNMP (and MIB) Interface
- W28	Ethernet: with Direct TCP/IP Interface
- W828	Ethernet: W8 + W18 + W28

Available Connector Options	
STD	N-type (RF Out), 50Ω BNC (RF In)
NN -	50Ω N-Type (RF), 50Ω N-Type (L-Band)
S7 -	50Ω SMA (RF), 75Ω BNC (L-Band)
SF -	50Ω SMA (RF), 75Ω F-type (L-Band)
SN -	50Ω SMA (RF), 50Ω N-Type (L-Band)
SS -	50Ω SMA (RF), 50Ω SMA (L-Band)
Contact Cross for other options	

1.3 Monitor and Control Interface

A) Remote Serial Interface

Protocol: RS-232C, 9600 baud rate, no parity, 8 data bits, 1 start bit, and 1 stop bit.
(RS-232C, RS-422, or RS-485 - **option Q**)



Connector: Rear panel, DB-9 male

J11 Pinouts (RS-232C/422/485)	
Pin	Function
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

B) Status Requests - Table 1.1 lists the status requests for the 3115-107-1975 and briefly describes them.

* PLEASE NOTE: The two character {aa}(00-31) prefix, in the table below, should be used ONLY when RS-485 is selected.

TABLE 1.1 3115-107-1975 Upconverter Status Request/Inquiries		
Status Request/Inquiries		
Get Frequency	{aaSF}	returns: {aaSFxxxxx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		F = command code
		xxxxx = the converter's RF center frequency in MHz.
		The unit will append the '>' character if the command is successfully processed.
Get Gain	{aaSG}	returns: {aaSGxxx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		G = command code
		xxx = Gain in 0.5 dB.
		The unit will append the '>' character if the command is successfully processed.
Get Reference Mode	{aaSE}	returns: {aaSEx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		E = command code
		x = 0 for Internal, 1 for External, and 2 for Auto.
		The unit will append the '>' character if the command is successfully processed.
Get External Reference Frequency (Option E6-25X only)	{aaSH}	returns: {aaSHxx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		H = command code
		xx = 10 for 10 MHz, 25 for 25 MHz
		The unit will append the '>' character if the command is successfully processed.

TABLE 1.1 3115-107-1975 Upconverter Status Commands (continued)

Get Mute	{aaSM}	returns: {aaSMx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		M = command code
		x = 0 for mute off, 1 for mute on.
		The unit will append the '>' character if the command is successfully processed.
Get Internal 10 MHz Reference Offset	{aaSO}	returns: {aaSOxxxx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		O = command code
		xxxx is the offset value.
		The unit will append the '>' character if the command is successfully processed.
Get alarm status	{SA}	returns {aaSAx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		A = command code
		x = 0 for alarm off, 1 for alarm on.
		The unit will append the '>' character if the command is successfully processed.
Get Last Frequency Command		
Processing Time	{aaST}	returns: {aaSTxxxx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		T = command code
		xxxx = command processing time in uS.
		example: unit returns {ST3195}
		This means the last command took 3.195 ms from the time the '}' character was received until all pll register data was loaded. This is a special command provided for testing the frequency tuning speed.
		The unit will append the '>' character if the command is successfully processed.
Get product/model info	{aaSV}	returns {aaSV3115-107-1975rev.5xx}
		where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		V = command code
		3115-107-1975 = product model and rev. 5.xx is the firmware revision.
		The unit will append the '>' character if the command is successfully processed.
Get IP address (ethernet option)	{aaSi}	returns {aaSixxx.xxx.xxx.xxx}
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		i = command code
		xxx.xxx.xxx.xxx = IP address
Get subnet mask (ethernet option)	{aaSs}	returns {Ssxxx.xxx.xxx.xxx}
		where xxx.xxx.xxx.xxx = subnet mask

C) **Commands**

Table 1.2 lists the commands for the 3115 and briefly describes them.

After a command is sent the 3115 sends a return “>” indicating the command has been received and executed.

General Command Format - The general command format is {CND...}, where:

- { = start byte
- C = 1 character, either C (command) or S (status)
- N = 1 character command or status request
- D = 1 character or more of data (depends on command)
- } = stop byte

* PLEASE NOTE: The two character {aa}(00-31) prefix, in the table below, should be used ONLY when R S-485 is selected.

TABLE 1.2 3115-107-1975 Upconverter Commands		
Command Function	Syntax	Command Description
Set Frequency	{aaCFxxxx}	where: aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit F = command code xxxx = Converter center frequency in MHz. Range: 10700 to 12700 MHz in 1 MHz steps. example: {CF12125} Will set the converter center frequency to 12125 MHz. The unit will reply with the '>' character if the command is successfully processed.
Set Gain	{aaCGxxx}	where: aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit G = command code xxx = Desired gain in 0.5 dB steps, omit the decimal point. Range: 0 to 200 (0 to 20.0 in 0.5 dB steps). example: {CG155} Will set the gain to 15.5 dB. The unit will reply with the '>' character if the command is successfully processed.
Set Reference Mode	{aaCEx}	where: aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit E = command code x = 0 for Internal, 1 for External, and 2 for Auto. example: {CE1} Will set unit's 10 MHz reference mode to External. The unit will reply with the '>' character if the command is successfully processed.

TABLE 1.2 3115-107-1975 Upconverter Commands

Command Function	Syntax	Command Description
Set External Reference Frequency	{aaCHxx}	where:
Option E6-25X only)		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		H = command code
		xx = 10 for 10 MHz, 25 for 25 MHz
		example: {CH25}
		Will set unit's Internal reference input to 25 MHz.
		The unit will reply with the '>' character if the command is sucessfully processed.
Set Mute	{aaCMx}	where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		M = command code
		x = 0 for mute off and 1 for mute on.
		example: {CM1}
		Will mute the converter's RF output.
		The unit will reply with the '>' character if the command is sucessfully processed.
Set Internal 10 MHz Reference Offset	{aaCOxxxx}	where:
		aa = unit address, range = 00 to 31, only used if interface is RS485, otherwise omit
		O = command code
		xxxx = Internal 10 MHz reference frequency offset.
		Range: -2000 to +2000
		example: {CO-1000}
		Will tune the internal reference frequency about -25%.
		The unit will reply with the '>' character if the command is sucessfully processed.
		Note: This command will only effect the reference frequency if the Reference Mode is set to internal.

2.0 Installation

2.1 Mechanical

The 3115 is powered by a 100-240 \pm 10% VAC power supply, and housed in a 1 3/4" X 11.7 X 19" rack mount chassis. The 3115-107-1975 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 3115-107-1975 is assembled.

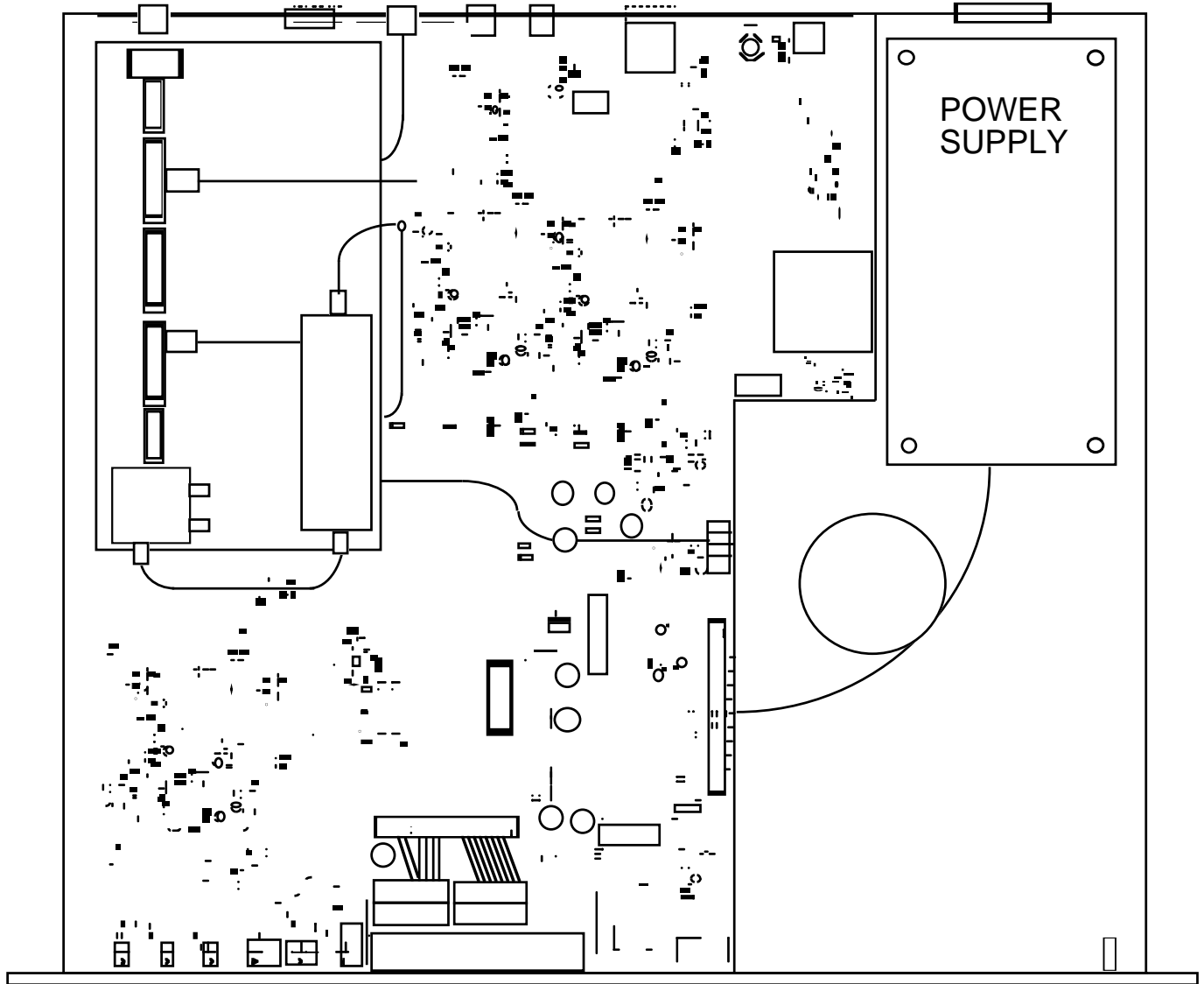


FIGURE 2.0 3115-107-1975 Mechanical Assembly

2.2 Rear Panel Input/Output Signals

Figure 2.1 shows the input and output connectors on the rear panel.

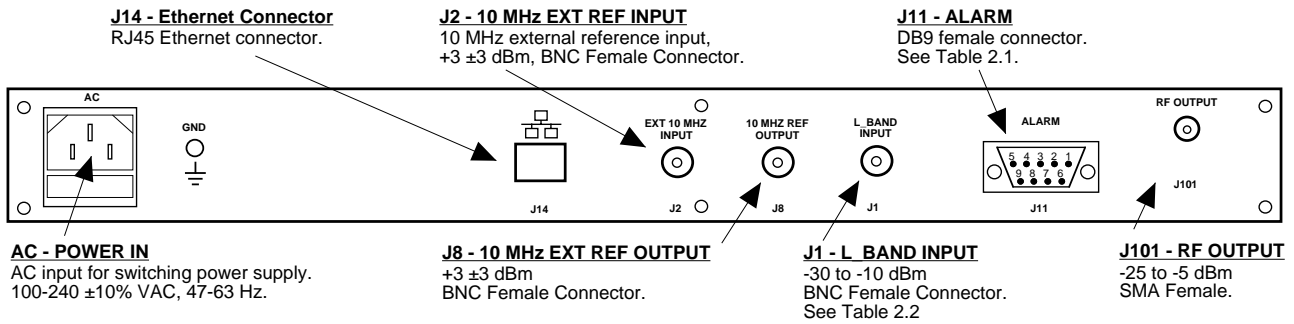


FIGURE 2.1 3115-107-1975 Rear Panel I/O's

TABLE 2.1 J11 Pinouts*	
Pin	Function
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

TABLE 2.2 Connector Options		
Option	RF	L-Band
-N	50Ω Type N	50Ω BNC
-NN	50Ω Type N	50Ω Type N
-S7	50Ω SMA	75Ω BNC
-SF	50Ω SMA	75Ω Type F
-SN	50Ω SMA	50Ω Type N
-SS	50Ω SMA	50Ω SMA

*Remote Serial Interface

Interface: DB-9 Male Protocol: RS-232C (RS-232C/422/485, **Option Q**),
9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit.

2.3 Front Panel Controls and Indicators

Figure 2.2 shows the front panel controls and indicators.

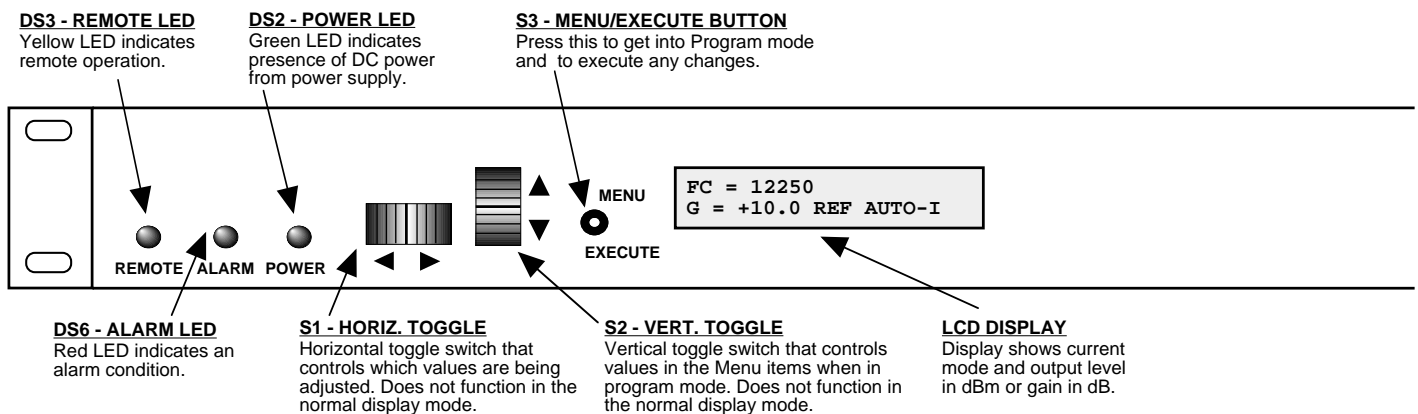


FIGURE 2.2 3115-107-1975 Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 3115-107-1975

1. Connect a -30 dBm to -10 dBm signal to L-Band IN, J1 (Figure 2.1).
2. Connect the RF OUT, J101, to the external equipment.
3. Connect 100-240 \pm 10% VAC, 47 - 63 Hz to AC connector on the back panel.
4. Set the gain +20 dB maximum, adjustable in 0.5 \pm 0.5 dB steps
Make sure the output stays within +0 to +20 dBm with the gain selected and the input level provided. (See Section 2.5 Menu Settings).
5. Be sure DS2 (green, DC Power) is on and DS6 (red, Alarm) is off (Figure 2.2).
6. 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.

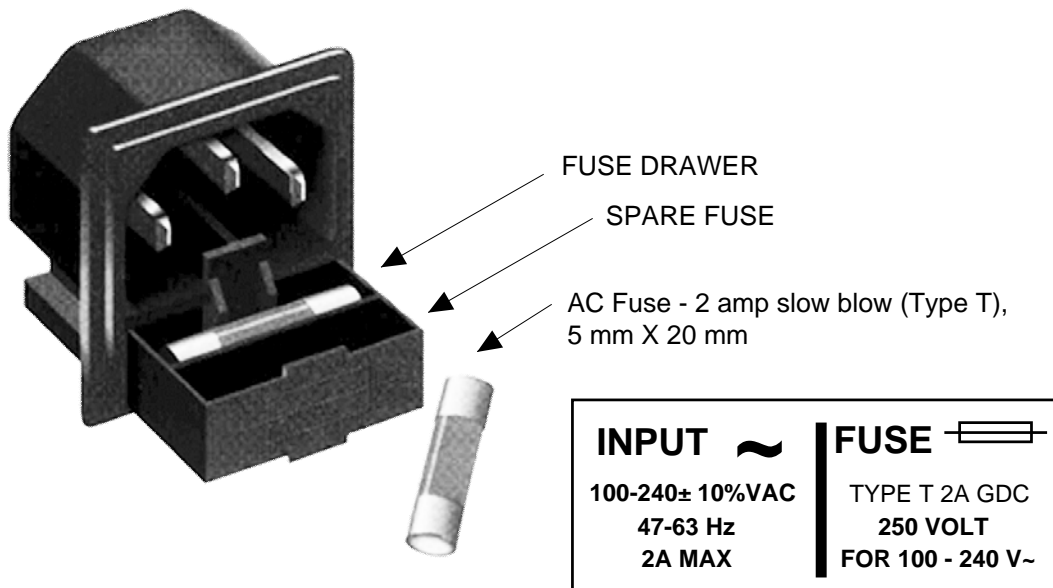


FIGURE 2.3 Fuse Location and Spare Fuse

2.5 Menu Settings

2.5.1 Functions

This section describes operation of the front panel controls. There are three operator switches, the LCD display and alarm indicator LEDs. All functions for the equipment are controlled by these components. The functions are (See Figure 2.4):

Power Up

Normal Display

Menu 1	Set Gain
Menu 2	Set Mute
Menu 3	Set Reference Mode
Menu 4	Set Reference Offset
Menu 5	Set Remote
Menu 6	Set Remote Interface
Menu 7	Set RS-485 Address

Save Menu When “R” is selected from any above menu or at the end.

Alarm indications appear on the LEDs (see Figure 2.2).

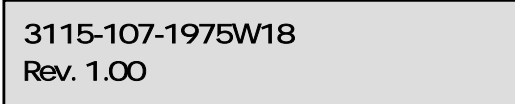
All program changes must start with the operation of the Menu/Execute switch and must also end with the operation of the Menu/Execute switch verified by the “Save Settings?” Menu. If this sequence is not followed, none of the changes will take effect. If programming is initiated and no operator action takes place for approximately 30 seconds (before the final press of the Menu/Execute switch) the display will revert to its previous status and you will need to start over.

2.5.2. Power On Settings

NOTE: THE LAST OPERATING PARAMETERS OF A UNIT ARE RETAINED EVEN WHEN POWER IS REMOVED. WHEN POWER IS RESTORED, THE UNIT WILL RETURN TO IT'S PREVIOUS SETTINGS.

When power is first applied, the LCD display goes through three steps.

1. The LCD goes black to show all segments are functioning.
2. The Model and Software version will be displayed.



3115-107-1975W18
Rev. 1.00

3. The present frequency and gain of the upconverter is shown.



FC = 12250
G=+10.0 REF AUTO-1

The unit is now operational and ready for any changes the operator may desire.

2.5.3 Control Switches

1. Menu/Execute - Any change to the programming of the unit must be initiated by pressing the Menu/Execute switch and completed by pressing the Menu/Execute switch.
2. Horizontal Switch - This switch is mounted so its movement is horizontal and moves the display cursor left or right.
3. Vertical Switch - This switch is mounted so its movement is vertical and has two functions:
 - a. During gain changes, the vertical movement will raise or lower the number in the direction of the arrows.
 - b. For other functions such Remote on/off, the vertical switch will alternately turn the function on or off regardless of the direction operated.

2.5.4 Gain Changes

When you get to this menu note that gain changes will be made as you make them but if you do not wish to save the changes you have made, scroll to **“R”** and push the menu/Execute switch and select **“NO”** in the **“SAVE SETTINGS?”** window or **do not press the Menu/Execute switch**; simply do nothing for approximately 30 seconds, and the system will return to the normal operating mode.

NOTE: THE GAIN WILL CHANGE AS YOU ADJUST THE NUMBERS. HOWEVER, THE VALUE WILL NOT BE STORED UNTIL YOU INDICATE YES IN THE SAVE SETTINGS WINDOW. DO NOT SET A GAIN THAT WOULD EXCEED 0 dBm OR HAVE LESS THAN -20 dBm OUTPUT LEVEL.

Press the Up/Down switch to change the gain in 0.5, 1, or 10 dB steps and then push the Menu/Execute switch to get to the Save Settings Menu:

GAIN = +1 <u>5</u>.5 R

When the display indicates the value desired you can push the Menu/Execute switch to the next item OR you can scroll to **“R”**, push the Menu/Execute switch to get to:

SAVE SETTINGS? <u>Y</u>N

Selecting **Y** will save the new settings. Selecting **N** will revert to the previous settings.

Figure 2.4 (page 15) gives the menu items and how to make changes.

2.5.5 Alarm Indications

An alarm condition will occur if any local oscillator phase lock loop (PLL) comes out of lock. The Remote LED will light when you select the Remote mode.

2.5.6 10 MHz Reference Mode Operation

Internal Mode: The unit uses its own built-in 10 MHz OCXO. The Internal Reference is present on the Reference Output Connector, J8. REF = INT appears on the front panel display.

External Mode: The unit uses a 10 MHz Reference that is connected to the External Reference Input, J2. REF = EXT appears on the front panel display. The External 10 MHz Reference level must be +3dBm, ± 3 dB. If the External 10 MHz signal does not meet the unit's specified parameters then the unit will not function properly. The External Reference is present on the Reference Output connector, J8.

Auto Mode: The unit defaults to the External 10 MHz Reference as long as the level meets the +3dBm, ± 3 dB specification. REF = AUTO - E appears on the front panel display where the -E indicates that the unit is using the External 10 MHz Reference. The External Reference is present on the Reference Output connector, J8.

If the external 10 MHz Reference signal level is less than -1dBm, the unit switches to Internal 10 MHz Reference. REF = AUTO -I appears on the front panel display where -I indicates that the unit is using the Internal 10 MHz Reference. The Internal 10 MHz Reference is present on the reference output connector, J8.

Option E6-25X External Reference Option

Option E6-25X provides the ability to lock the internal reference to an external 10 MHz or 25 MHz reference signal input. First, the reference mode must be set to either "external" or "auto". Next, the external reference frequency must be selected.

The external reference frequency may be selected from the front panel menu:

EXTERNAL REF	R
FREQUENCY =	25 MHZ

The external reference frequency may also be selected with the following M&C command:

{CHxx} where xx is either 10 or 25 for 10 MHz or 25 MHz respectively.

The status of the internal reference is shown in the upper right corner of the LCD display when the unit is in normal display mode. When the unit is powered up from a cold start the internal reference's oven needs to warm up before it can lock to the external reference input. When the oven is warming up the normal display will show "OV" in the upper right corner. Once the oven is warmed up the display will show "LK" if the internal reference is locked to the external reference input. The display will show "UL" if the internal reference is not locked to the external reference input.

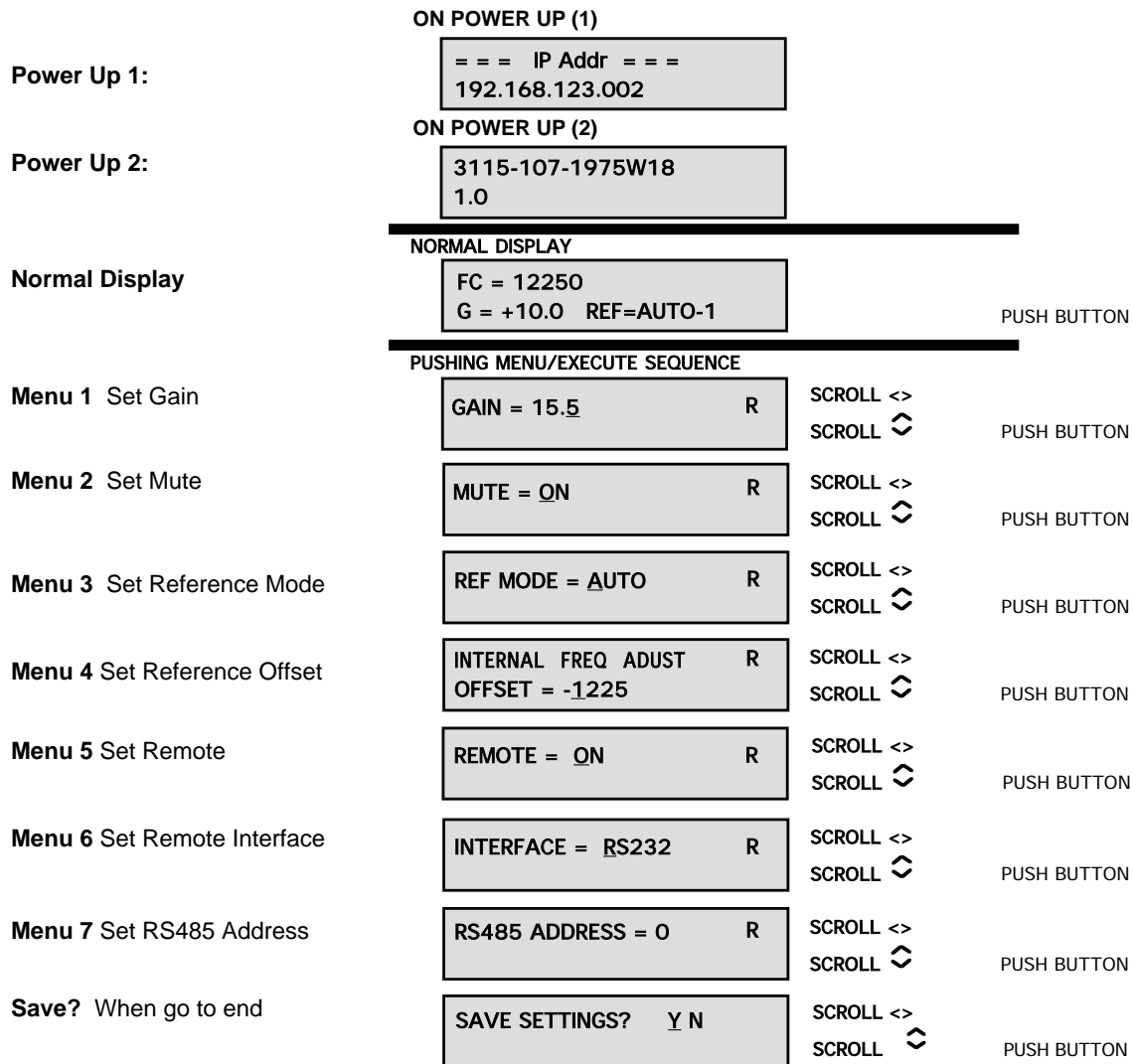
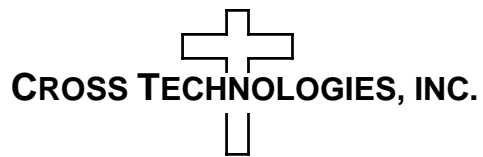


FIGURE 2.4 Menu Display and Sequences

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 (Maximum Recommended Ambient Temperature).
- 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 units 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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