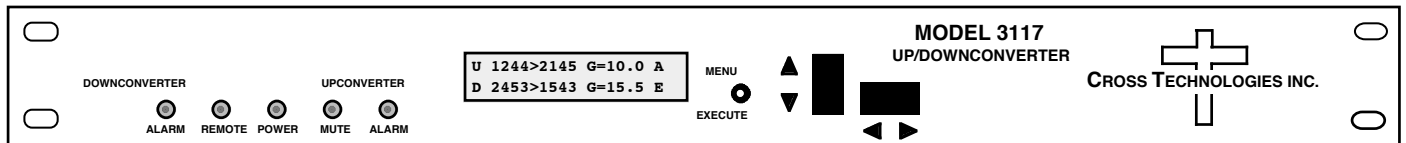


Instruction Manual

Model 3117-2525-1216# Up/Downconverter

January 2024, Rev. 0



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6170 Shiloh Road
Alpharetta, Georgia 30005

(770) 886-8005
FAX (770) 886-7964
Toll Free 888-900-5588

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com

INSTRUCTION MANUAL

MODEL 3117-2525-1216# Up/Downconverter

<u>TABLE OF CONTENTS</u>	<u>PAGE</u>
Warranty	2
1.0 General	3
1.1 Equipment Description	3
1.2 Technical Characteristics	4
1.3 Monitor & Control Interface	5
2.0 Installation	8
2.1 Mechanical	9
2.2 Rear I/O's	10
2.3 Front Panel Controls, Indicators	11
2.4 Operation	12
2.5 Menu Settings	15
3.0 Environmental Use Information	21

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6170 Shiloh Road
Alpharetta, Georgia 30005

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com

MODEL 3117-2525-1216# Up/Downconverter

1.0 General

1.1 Equipment Description

The 3117-2525-1216# Up/Downconverter converts 1.2 - 1.6 GHz \pm 40 MHz to 2.0 - 2.5 GHz \pm 40 MHz (Up) and 2.0 - 2.5 GHz \pm 40 MHz to 1.2 - 1.6 GHz \pm 40 MHz (Down). Multi-function switches select the gain (upconverter 0 to +20 dB; downconverter 0 to +20 dB), and other parameters. Front panel LEDs provide indication of DC power (green), PLL alarm (red), remote operation (yellow), and upconverter mute (yellow). Remote operation allows selection of frequency, gain and external 10 MHz reference. Connectors are BNC female for the IF, RF (SMA and N optional) and external reference input and output. A high stability (\pm 0.01 ppm) option (H) is also available. It is powered by a 100-240 \pm 10% VAC power supply and housed in a 1.75" X 19" X 16" 1RU chassis.

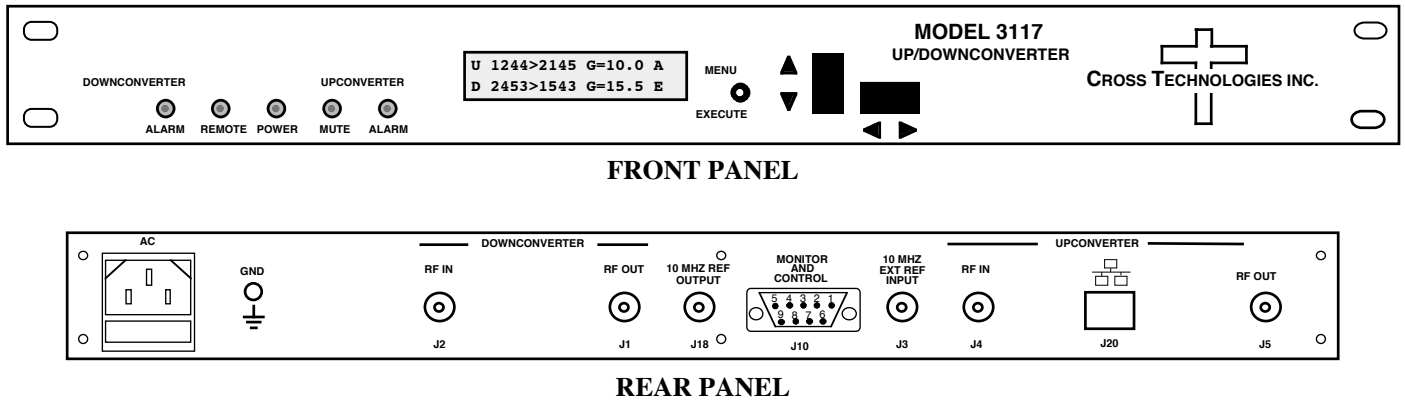


Figure 1.1 Model 3117-2525-1216# Front & Rear Panels

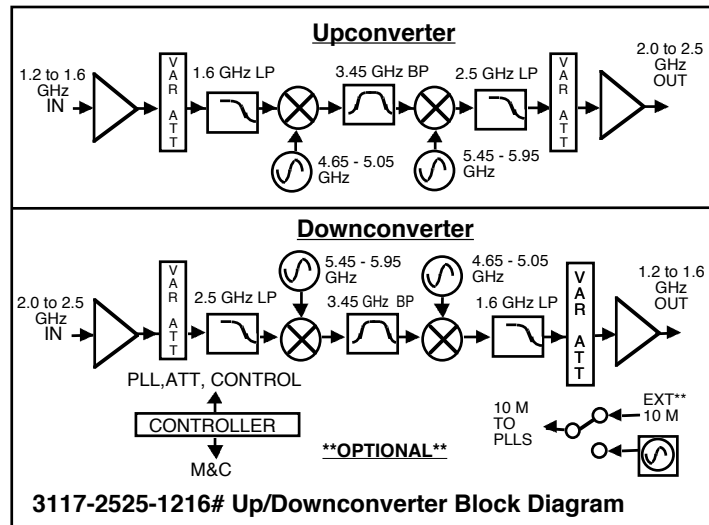


Figure 1.2 Model 3117-2525-1216# Up/Downconverter Block Diagram

1.2 Technical Characteristics

EQUIPMENT SPECIFICATIONS*		
Input Characteristics	UP, S	DOWN, L
Impedance/Return Loss	50Ω/14 dB	50Ω/14 dB
Frequency	1.2 - 1.6 GHz	2.0-2.5GHz
Noise Figure, Max.	20 dB @ max gain	15 dB @ max gain
Input Level range	-40 to -10 dBm	-40 to -10 dBm
Output Characteristics		
Impedance/Return Loss	50 Ω /14 dB	50 Ω /14 dB
Frequency (GHz)	2.0-2.5 GHz	1.2 - 1.6 GHz
Output Level Range	-20 to 0 dBm	-20 to 0 dBm
1 dB comp, max gain	+5 dBm	+5 dBm
Mute @ 0 dBm out	>60 dB	N/A
Channel Characteristics		
Gain, max. at Fc	+20 ±3 dB	+20 ±3 dB
Gain, range, 1±1 dB steps	+20 to 0 dB	+20 to 0 dB
Image Rejection	N/A	> 50 dB, min
Spurious, Inband, sig. rel.	<-40 dBc, OdBm	<-40 dBc, OdBm
Spurious, Inband, sig. ind.	<-40 dBc, Gmax	<-40 dBc, Gmax
Spurious, Out of band	<-40 dBc,Gmax	<-40 dBc,Gmax
Intermod - 2 carriers 4MHz	<-40 dBc,Gmax	<-40 dBc,Gmax
Frequency Resp. band	±1.5 dB	±1.5 dB
Frequency Resp. 80 MHz	±1.0 dB	±1.0 dB
Frequency Sense	Non-inverting	Non-inverting

Available Options

R = Redundant AC Power Supply

Remote M&C Ethernet Options

W8 - Ethernet w/web browser Interface
 W18 - Ethernet w/SNMP (and MIB) Interface
 W28 - Ethernet w/direct TCP/IP Interface
 W828 - Ethernet W8 +W18 +W28

Connector Options

N = 50Ω N-type (RF), 75Ω BNC (L-Band)
 NN = 50Ω N-type (RF), 50Ω N-type (L-Band)
 S = 50Ω SMA (RF), 50Ω BNC (L-Band)
 S7 = 50Ω SMA (RF), 75Ω BNC (L-Band)
 SS = 50Ω SMA (RF), 50Ω SMA (L-Band)

Contact Cross for other options

LO Characteristics

Frequency Accuracy ± 1.0 ppm internal reference (± 0.01 ppm, option H)
 Frequency Step 1 MHz steps

Phase Noise @ F (Hz) >	100	1K	10K	100K	1M
dBc/Hz - Standard	-70	-75	-85	-95	-110

10 MHz In/Out Level 3 dBm, ± 3 dB, w/ Auto-detect

Controls, Indicators

Gain; Ext Ref Selection Direct readout LCD; pushbutton switches or remote
 Power; Alarm; Remote Green LED; Red LED; Yellow LED;
 Remote RS232C/RS485/422, 9600 baud

Other

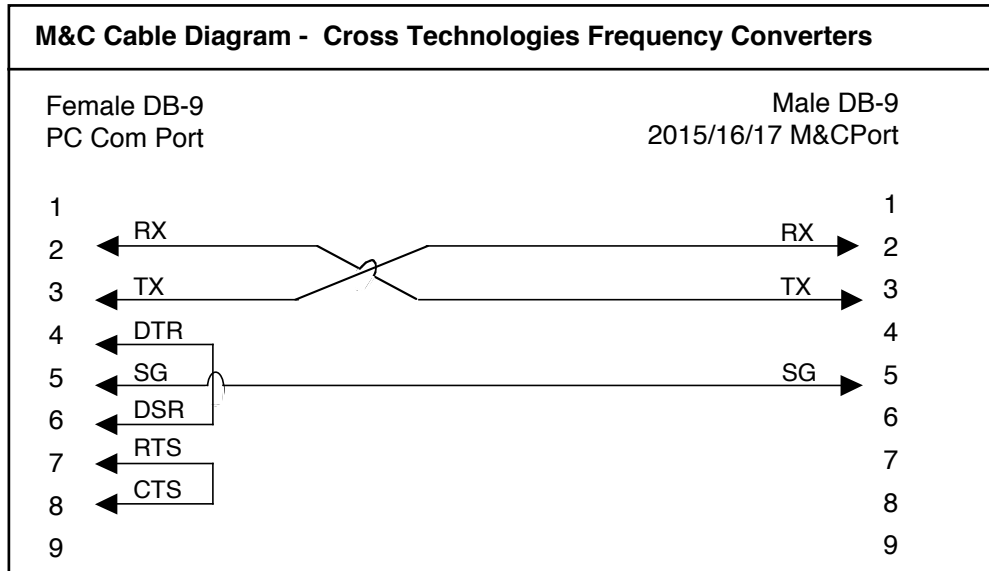
RF In/Out, L-BAND Con. BNC (female), BNC (female), 50Ω
 10 MHz connectors BNC (female), 75Ω connector; works with 50Ω or 75Ω
 Alarm Connector DB9 - NO or NC contact closure on Alarm
 Size 19 inch standard chassis 1.75" high X **16"** deep
 Power 100-240 ± 10% VAC, 47 - 63 Hz, **50** watts maximum

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

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)



Connector: Rear panel, DB-9 male

J10 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 3117-2525-1216# and briefly describes them.

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

Table 1.1 3117-2525-1216# Status Requests		
Command	Syntax*	Description
Upconverter Input Frequency	{aaS1}	Returns {aaS1bbbb} where: • bbbb = Upconverter input frequency in MHz
Upconverter Output Frequency	{aaS2}	Returns {aaS2bbbb} where: • bbbb = Upconverter output frequency in MHz
Downconverter Input Frequency	{aaS3}	Returns {aaS3bbbb} where: • bbbb = Upconverter input frequency in MHz
Downconverter Output Frequency	{aaS4}	Returns {aaS4bbbb} where: • bbbb = Upconverter output frequency in MHz
Upconverter Gain	{aaSG}	Returns {aaSGbbbb} where: • bbbbb= Upconverter gain in 0.5 dB
Downconverter Gain	{aaSH}	Returns {aaSHbbbb} where: • bbbbb= Downconverter gain in 0.5 dB
10 MHz reference mode/status	{aaSE}	Returns {aaSEbc} where: • b = 0 if internal reference mode is selected • b = 1 if external reference mode is selected • b = 2 if auto reference mode is selected • c = 0 if internal 10 MHz is active • c = 1 if external 10 MHz is active
IP Address (W8, W18, W28 only)	{aaSi}	Returns {aaSixxx.xxx.xxx.xxx} where: • x...x is the IP address
Subnet mask(W8,W18,W28 only)	{aaSs}	Returns {aaSsxxx.xxx.xxx.xxx} where: • x...x is the subnet mask
Unit ID	{aaSU}	Returns {aaSUx...x} where: • x...x is the unit ID character string (max. 16 characters)
Product Info	{aaSV}	Returns {aaSV3117-xxxx ver y.yy} where: 3117-xxxx is the model with options; yyy is the firmware Rev.

C) Commands

Table 1.2 lists the commands for the 3117-2525-1216# and briefly describes them. After a command is sent the 3117-2525-1216# sends a return “>” indicating the command has been received and executed.

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

- { = start byte
- aa = address (RS-485 only)
- 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 included **ONLY** when RS-485 is selected

Table 1.2 3117-2525-1216# Commands		
Command	Syntax*	Description
Set Upconverter Input Frequency	{aaC1xxxx}	where:
		• xxxx = 4 characters
		• Range: 1200 to 1600 (MHz in 1 MHz steps)
		<i>Example: {C11250} sets the upconverter's input frequency to 1250 MHz.</i>
Set Upconverter Output Frequency	{aaC2xxxx}	where:
		• xxxx = 4 characters
		• Range: 2000 to 2500 (MHz in 1 MHz steps)
		<i>Example: {C22350} sets the upconverter's output frequency to 2350 MHz.</i>
Set Downconverter Input Frequency	{aaC3xxxx}	where:
		• xxxx = 4 characters
		• Range: 2000 to 2500 (MHz in 1 MHz steps)
		<i>Example: {C32350} sets the downconverter's input frequency to 2350 MHz.</i>
Set Downconverter Output Frequency	{aaC4xxxx}	where:
		• xxxx = 4 characters
		• Range: 1200 to 1600 (MHz in 1 MHz steps)
		<i>Example: {C41250} sets the downconverter's output frequency to 1250 MHz.</i>
Set Upconverter Gain	{aaCGxxx}	where:
		• xxx = 3 characters
		• Range: 0 to 200 (0 dB to 20.0 dB in 0.5 dB steps, omit decimal point.) <i>Example: {CG155} sets the upconverter gain to 15.5 dB.</i>
Set Downconverter Gain	{aaCHxxx}	where:
		• xxx = 3 characters
		• Range: 0 to 200 (0 dB to 20.0 dB in 0.5 dB steps, omit decimal point.) <i>Example: {CH155} sets the downconverter gain to 15.5 dB.</i>

C) Commands (continued)

Table 1.2 continued.

Table 1.2 3117-2525-1216# Commands		
Command	Syntax*	Description
Set Upconverter Mute	{aaCMx}	where: <ul style="list-style-type: none">• x = 1 to mute the upconverter's output• x = 0 to unmute the upconverter's output
Set Ext Reference Mode	{aaCEx}	where: <ul style="list-style-type: none">• x = 0 for internal reference• x = 1 for external reference• x = 2 for auto reference
Enable Remote	#	Just # sign
Disable Remote	{aaCRO}*	{CR and zero}

2.0 Installation

2.1 Mechanical

The 3117-2525-1216# consists of one RF/Controller PCB housed in a 1 RU (1 3/4 inch high) by 16 inch deep chassis.

A switching, ± 12 , $+5$, $+24$ VDC power supply provides power for the assemblies. The 3117-2525-1216# can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 3117-2525-1216# is assembled.

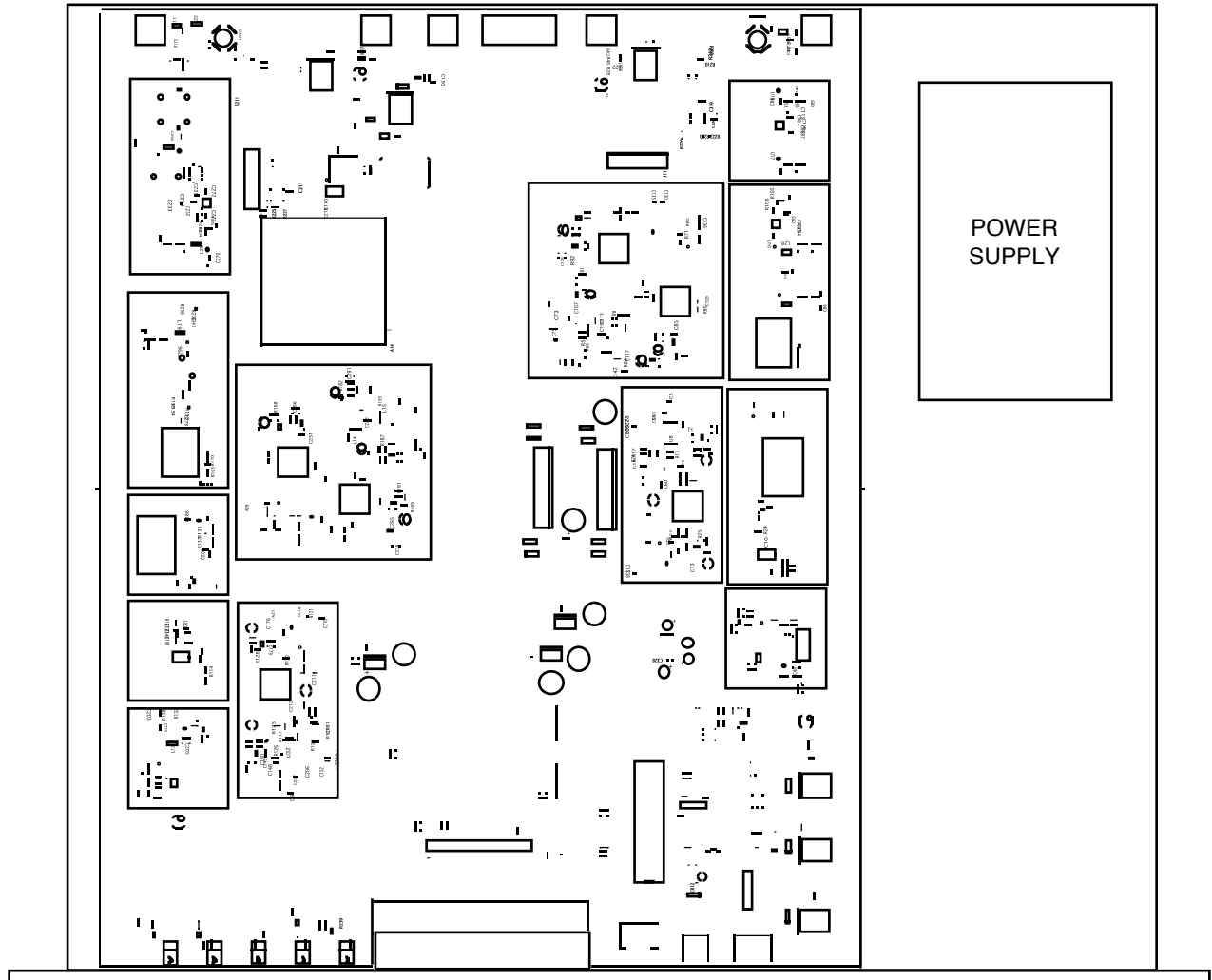


Figure 2.0 Model 3117-2525-1216# Mechanical Assembly

2.2 Rear Panel Input/Output Signals and Control -

Figure 2.2 shows the input and output connectors on the rear panel.

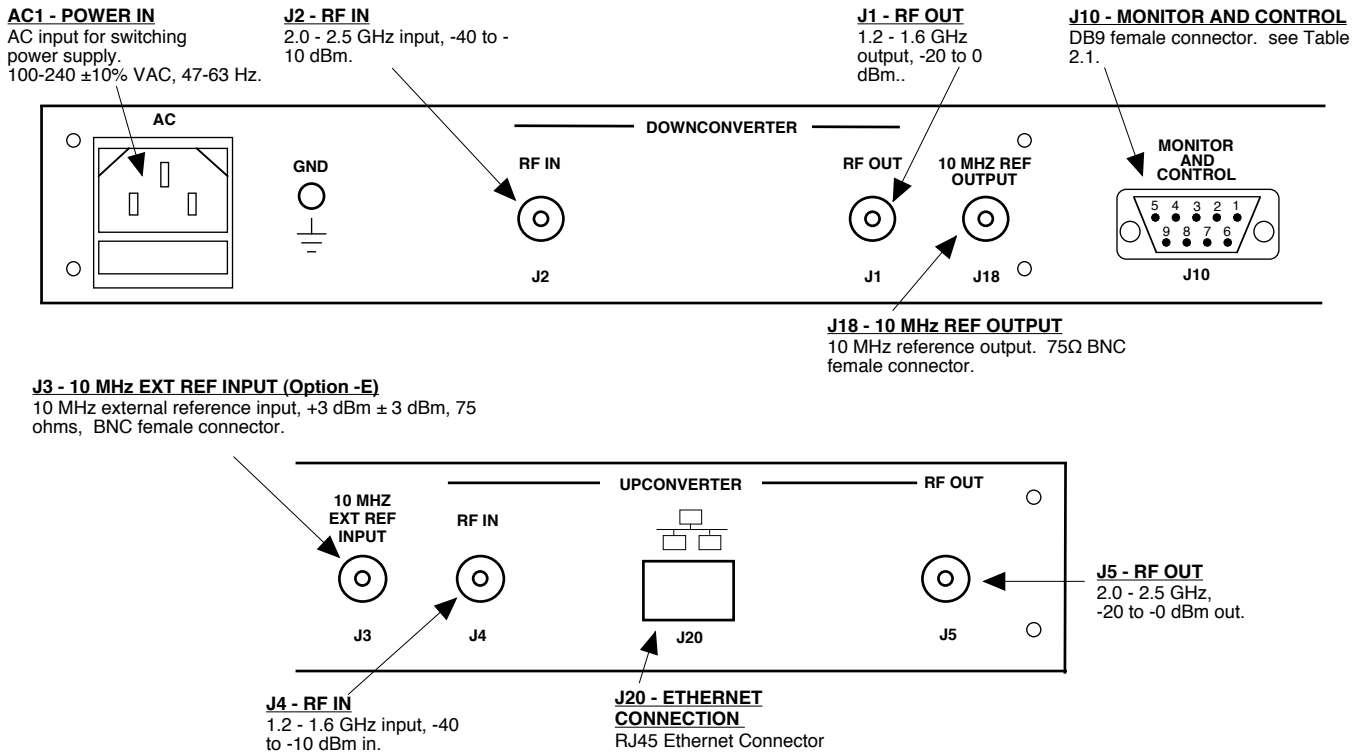


Figure 2.1 Model 3117-2525-1216# Rear Panel I/O's

TABLE 2.1 J10 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

*Remote Serial Interface

Interface: DB-9 Male

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

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

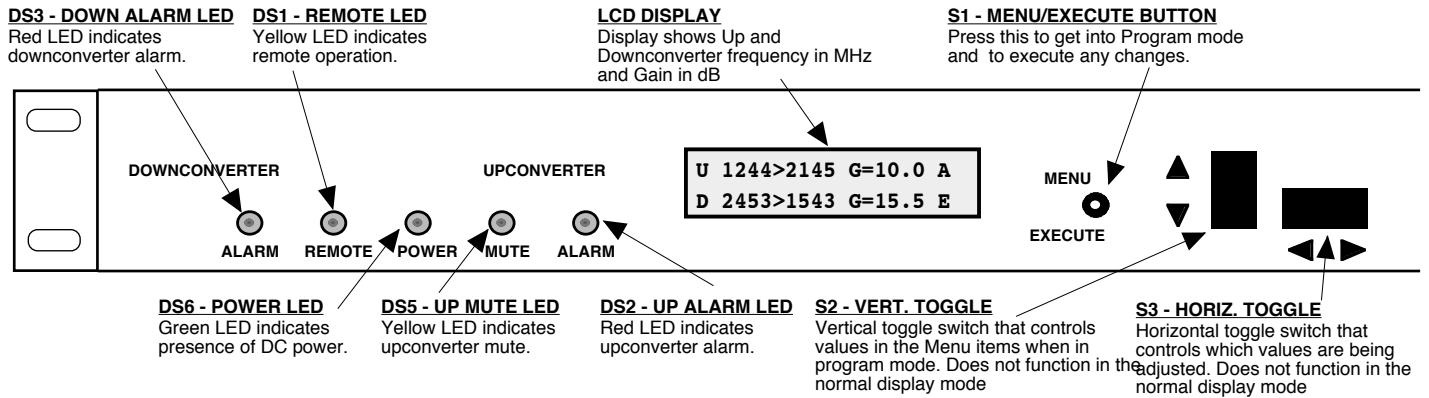


Figure 2.2 Model 3117-2525-1216# Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 3117-2525-1216#, Upconverter Section

- 1.) Connect a 1200 to 1600 MHz -40 dBm to -10 dBm signal to IF In, J4 (Figure 2.1).
- 2.) Connect the RF OUT (2000 to 2500 MHz) J5 to the external equipment.
- 3.) Connect 100-240 \pm 10% VAC, 47 - 63 Hz to AC on the back panel.
- 4.) Set the gain so that the output level is within -20 to 0 dBm (See Section 2.5 Menu Settings).
- 5.) Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.2).

2.4.2 Installing and Operating the 3117-2525-1216#, Downconverter Section

- 1.) Connect a 2000 to 2500 MHz, -40 dBm to -10 dBm signal to Downconverter RF In, J2.
- 2.) Connect the RF OUT (1200 to 1600 MHz) J1 to the external equipment.
- 3.) Connect 100-240 \pm 10% VAC, 47 - 63 Hz to AC on the back panel.
- 4.) Set the gain so that the output level is within -20 to 0 dBm (See Section 2.5 Menu Settings).
- 5.) Be sure DS6 (green, DC Power) is on and DS3 (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.

2.4.3 External 10 MHz Reference Operation

Internal Reference Mode

When the internal reference mode is selected, the unit's internal 10 MHz reference will become the 'primary' source and the unit's synthesizers will lock to this internal 10 MHz reference. The front panel LCD display will show "I" in the upper right corner. The unit will ignore any external 10 MHz signal present on the external reference input (J3). The unit will also buffer the internal 10 MHz signal and provide it on the Reference Out connector (J18) at +3 dBm, +/- 3 dB.

External Reference Mode

When the external reference mode is selected, the external 10 MHz reference (received on J3) will become the 'primary' source and the unit's synthesizers will lock to this external 10 MHz reference. The front panel LCD display will show "E" in the upper right corner. The unit *must* have a 10 MHz signal connected to the external reference input (J3) on the rear panel. The external 10 MHz signal must be +3 dBm, +/- 3 dB. The unit will also buffer the external 10 MHz signal and provide it on the Reference Out connector (J18) at +3 dBm, +/- 3 dB.

Auto Reference Mode

When the auto reference mode is selected the unit will detect and select the external 10 MHz signal if it is present and at least +3 dBm. The front panel LCD display will show "A" in the upper right corner. If the external 10 MHz signal falls below 1 dBm (+/- 1 dB) the unit will automatically switch to the internal 10 MHz reference. The front panel LCD display will show "E" in the lower right corner when the unit detects a reference signal on the external reference input. The front panel LCD display will show "I" in the lower right corner if the external reference is below the minimum required level. The reference out connector (J18) provides a buffered rendition of the selected 10 MHz signal at +3 dBm, +/- 3 dB.

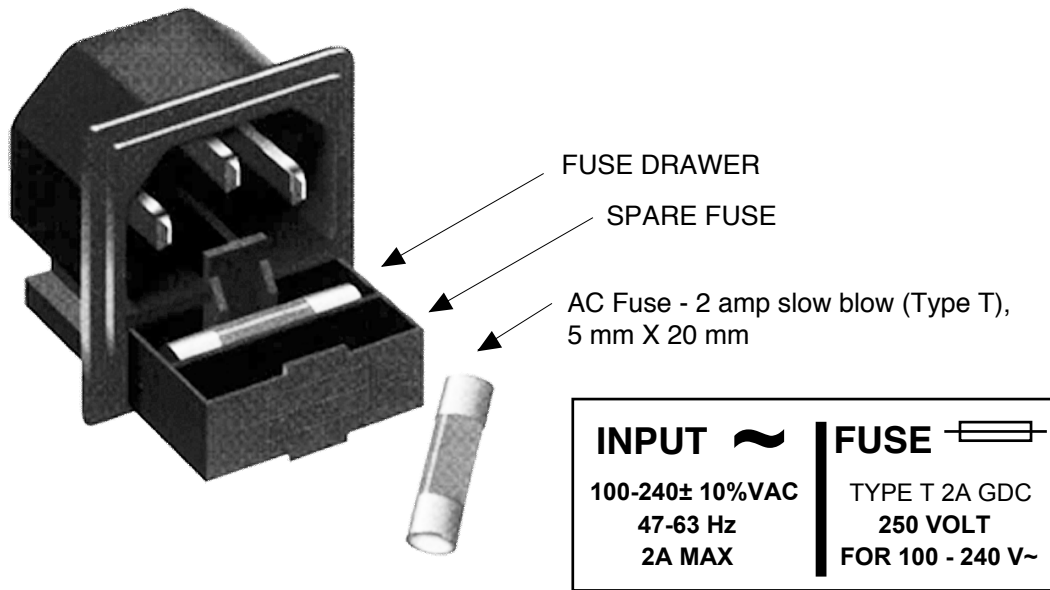


Figure 2.3 Fuse Location and Spare Fuse

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 2.2):

Power Up

Normal Display

Menu 1	Upconverter In and Out Frequency
Menu 2	Downconverter In and Out Frequency
Menu 3	Up Gain (0 to 20.0)
Menu 4	Down Gain (0 to 20.0)
Menu 5	Up Mute
Menu 6	Reference Mode
Menu 7	Remote
Menu 8	Interface
Menu 9	RS485 Address (0 to 31)
Menu 10	Reset Ethernet Settings

Save Menu When go to 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 STATUS OF A UNIT IS 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 number with options software version will be displayed.

3117-2525-1216#EW8 5.20

3. The present frequency, gain, and reference status of the up and downconverter is shown.

U 1244>2145 G=10.0 A D 2453>1543 G=15.5 E
--

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 cursor left or right.
3. Vertical Switch - This switch is mounted so its movement is vertical and has two functions:
 - a. During frequency, gain, input level changes, the vertical movement will raise or lower the number in the direction of the arrows.
 - b. For other functions such Mute on/off, the vertical switch will alternately turn the function on or off regardless of the direction operated.

2.5.4 Frequency Changes

At any time during the modification process, if you have made a mistake and do not wish to save the changes you have made, **do not press the Menu/Execute switch**; simply do nothing for approximately 30 seconds, and the system will return to the normal operating mode or scroll to “**R**” and push the menu/Execute switch and select “**NO**” in the “**SAVE SETTINGS?**” window.

To change the upconverter input and output frequencies:

Operate the Menu/Execute switch until you get to the menu item you want to change (see Figure 2.4 for the sequence of menu options). The following display is for changing the upconverter frequency:

```
UP  F IN= 1350      R
UP  F OUT= 2250
```

Pressing the Up/Down switch down will toggle the display to:

```
UP  F IN= 1450      R
UP  F OUT= 2250
```

By using the horizontal rocker switch the cursor can be moved left or right. Keep moving right and the cursor will move down to the bottom line. Keep moving left and the cursor will move up to the top line.

```
UP  F IN= 1450      R
UP  F OUT= 2250
```

NOTE: CHANGES DO NOT TAKE PLACE ON FREQUENCY UNTIL YOU GO TO THE SAVE MENU AND INDICATE YOU WANT TO SAVE THE CHANGES.

When the display indicates the value desired you can push the Menu/Execute switch to the next item:

```
DN  F IN= 2350      R
DN  F OUT= 1550
```

OR you can scroll to “**R**”, push the Menu/Execute switch to get to:

```
SAVE SETTINGS?      Y N
```

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

Pushing the Menu/Execute switch then takes you to the main display :

```
U  F=1450      G=+10.0
D  F=1250      G=+20.0
```

Figure 2.4 shows all the menu items and how to make changes.

2.5.5 Gain Changes

NOTE: CHANGES TAKE PLACE ON GAIN IMMEDIATELY BUT DO NOT GET SAVED UNTIL YOU GO TO THE SAVE MENU AND INDICATE YOU WANT TO SAVE THE CHANGES.

When you get to this menu note that the 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.

2.5.5.1 Upconverter Gain

To set the upconverter gain, first push the Menu/Execute switch to get to the gain setting:

Pressing the Up/Down switch to change the gain in 0.5 dB steps:

UP G = +10.0	R
--------------	---

By using the horizontal rocker switch the cursor can be moved left or right .
Press the Up/Down switch until you have the desired gain.

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 A 0 dBm OUTPUT LEVEL.

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.

Pushing the Menu/Execute switch then takes you to the :ert to the previous settings.

Pushing the Menu/Execute switch then takes you to the :

U 1244>2145 G=10.0 A
D 2453>1543 G=15.5 E

Figure 2.4 shows all the menu items and how to make changes.

2.5.5.2 Downconverter Gain

To set the downconverter gain, first push the Menu/Execute switch to get to the gain setting:

Operate the Menu/Execute switch until you get to the menu item you want to change. See Figure 2.4 for the sequence of menu options.

The following display is for changing the downconverter gain. Set the gain to provide an appropriate output level.

DN G = +15.5	R
--------------	---

Press the Up/Down switch to change the level in 0.5 dB steps. By using the horizontal rocker switch the cursor can be moved left or right. Pressing the Up/Down switch down will toggle the display digit selected until you have the desired gain.

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.

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.

Pushing the Menu/Execute switch then takes you to the :

U 1244>2145 G=10.0 A
D 2453>1543 G=15.5 E

Figure 2.4 shows all 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.

	ON POWER UP			
Power Up	3117-2525-1216#EW8 5.20			
NORMAL DISPLAY				
Normal Display	U 1244>2145 G=10.0 A D 2453>1543 G=15.5 E			PUSH BUTTON
PUSHING MENU/EXECUTE SEQUENCE				
Menu 1 Up Frequency In/Out	UP F IN = 1244 R UP F OUT = 2145		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 2 Down Frequency In/Out	DN F IN = 2144 R DN F OUT = 1245		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 3 Up Gain (0 to +20.0)	UP G = 10.5 R		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 4 Down Gain (0 to +20.0)	DN G = 12.0 R		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 5 Up Mute	UP MUTE OFF R		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 6 Reference Mode	REF = AUTO R		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 7 Remote	REMOTE OFF R		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 8 Interface	INTERFACE RS232 R		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 9 RS485 Address(0 to 31)	ADDRESS = 00 R		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 10 Reset Ethernet Settings	Reset Ethernet Settings NO R		SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Save Settings? At the end or when "R" is selected from any of the above menus	SAVE SETTINGS? Y N			

Figure 2.4 Menu Display and Sequence

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 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.



6170 Shiloh Road
Alpharetta, Georgia 30005

(770) 886-8005
FAX (770) 886-7964
Toll Free 888-900-5588

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com

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