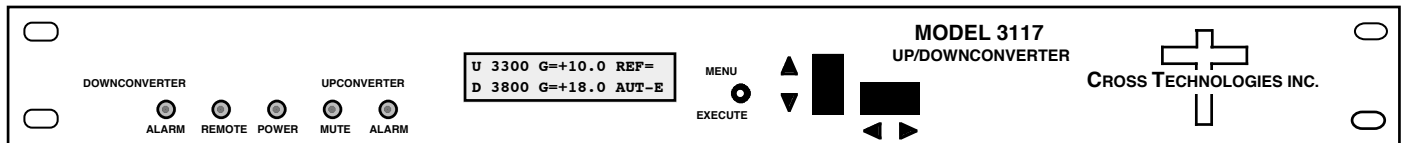


Instruction Manual

Model 3117-3338#-720

Up/Downconverter

March 2022, Rev. 0



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INSTRUCTION MANUAL

MODEL 3117-3338#-720 Up/Downconverter

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MODEL 3117-3338#-720 Up/Downconverter

1.0 General

1.1 Equipment Description

The 3117-3338#-720 Up/Downconverter converts 0.72 to 3.3 and 3.8 to 0.72 GHz (± 0.3 GHz) with non-inverting spectrums. Front panel LEDs provide indication of Remote, DC Power, upconverter mute, and PLL Alarm. The maximum gain is +20 dB for the upconverter and +20 dB for the downconverter (adjustable in 0.5 ± 0.5 dB steps). Gain 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 Type N female for the RF DOWN IN and RF UP OUT and BNC female for the RF UP IN, RF DOWN OUT and external reference input and reference output. In AUTO, the 10 MHz reference stays in external if the external level is +3 dBm, ± 3 dB. The 3117 is powered by a 100-240 $\pm 10\%$ VAC power supply, and in a 1 3/4" X 19" X 14" rack mount chassis.

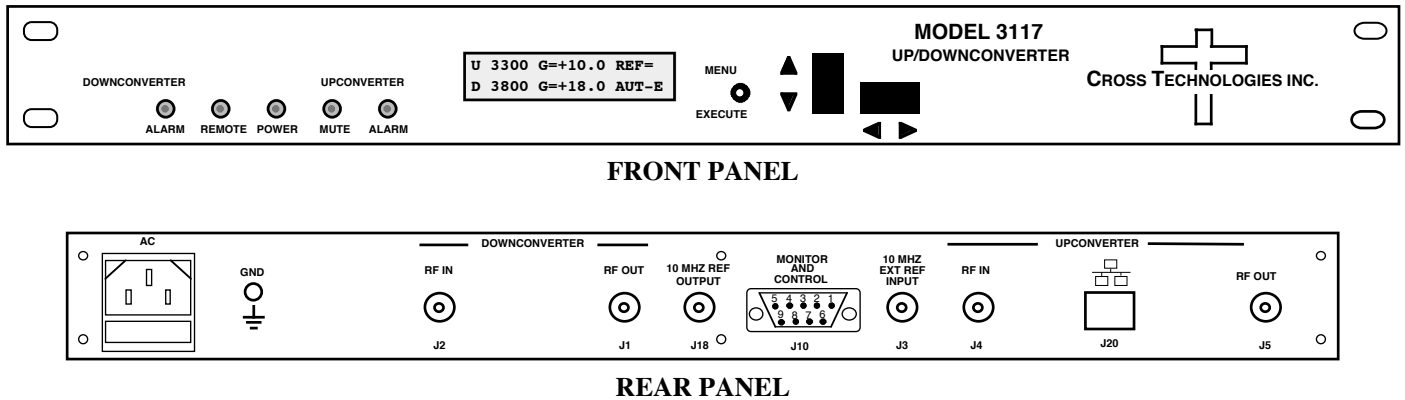


Figure 1.1 Model 3117-3338#-720 Front & Rear Panels

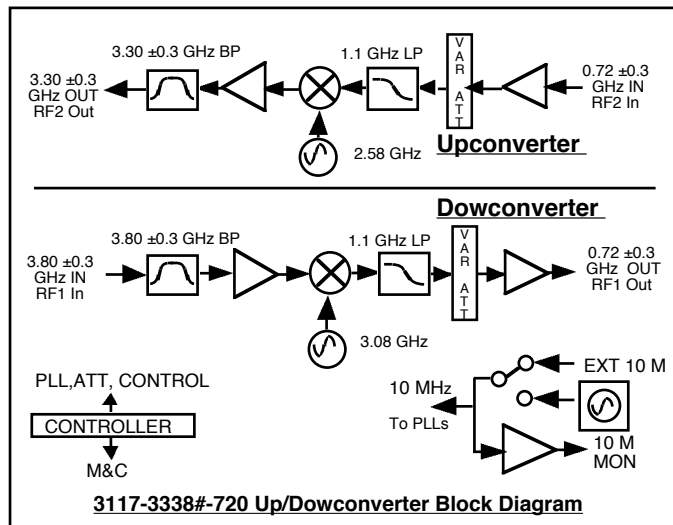


Figure 1.2 Model 3117-3338#-720 Up/Downconverter Block Diagram

1.2 Technical Characteristics

EQUIPMENT SPECIFICATIONS*		
Input Characteristics	UP	DOWN
Impedance/Return Loss	50Ω/14 dB	50Ω/14 dB
Frequency	0.72 ±0.3 GHz	3.80 ±0.3 GHz
Noise Figure, Max.	15 dB @ max gain	15 dB @ max gain
Input Level range	-40 to -20 dBm	-40 to -20 dBm
Output Characteristics		
Impedance/Return Loss	50 Ω /14 dB	50 Ω /14 dB
Frequency (GHz)	3.30 ±0.3 GHz	0.72 ±0.3 GHz
Output Level Range	-20 to 0 dBm	-20 to 0 dBm
1 dB comp, max gain	+10 dBm	+10 dBm
Channel Characteristics		
Gain, max. at Fc	+20 ±1 dB	+20 ±1 dB
Gain, range, 0.5±0.5 dB steps	0 to +20	0 to +20
Image Rejection	>50 dBc	>50 dBc
Spurious, Inband, sig. rel., lvl	<-45 dBc, 0dBm	<-45 dBc, 0dBm
Spurious, Inband, sig. ind.	<-50 dBc, Gmax	<-50 dBc, Gmax
Spurious, Out of band, Fc±0.6G	<-50 dBm, Gmax	<-50 dBm, Gmax
2 tone Fc± 2MHz del, -10 ea	<-50 dBc, Gmax	<-50 dBc, Gmax
Frequency Resp. Fc ±0.3 GHz	±1.5 dB	±1.5 dB
Frequency Resp. 40 MHz	± 0.5 dB	± 0.5 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 Step None; 2.58 GHz Up, 3.08 GHz Down fixed frequency LO
 Frequency Accuracy ± 0.01 ppm max over temp internal reference; ext. ref. input

Phase Noise @ F (Hz) >	100	1K	10K	100K	1M
dBc/Hz - Standard	-75	-80	-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. N-type (female), 50Ω / 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

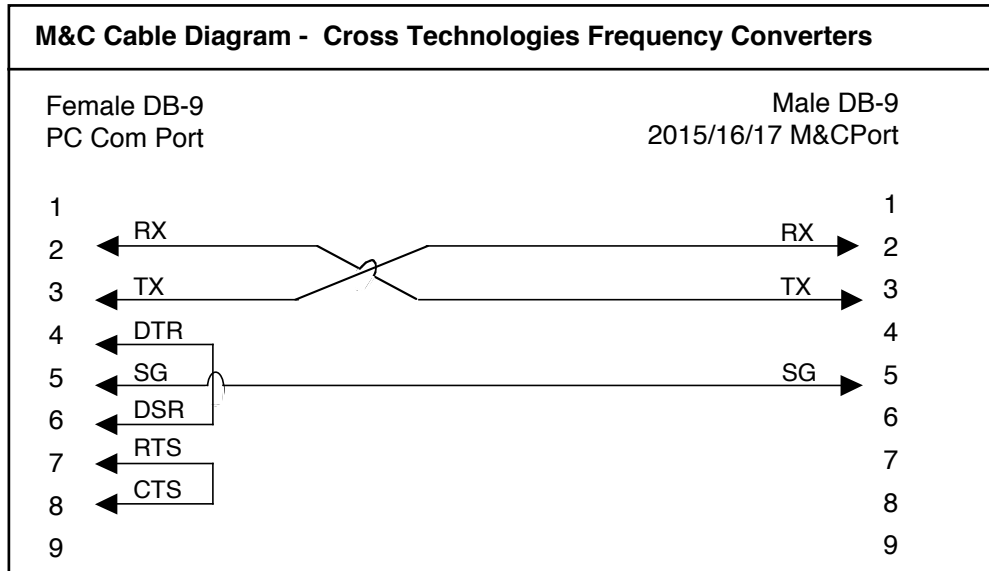
Connectors/Impedance See Table 2.2

*+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 3117-3338#-720 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 3117-3338#-720 Status Requests		
Command	Syntax*	Description
Status	{aaS1}	Returns {aaS1bbbcccddefg} where: <ul style="list-style-type: none"> • bbb = Upconverter gain (000 to 200, 0 to 20.0 dB) • ccc = Downconverter gain (000 to 200, 0 to 20.0 dB) • d = Downconverter alarm (0 = alarm off; 1 = alarm on) • e = Upconverter alarm (0 = alarm off; 1 = alarm on) • f = Summary alarm (0 = alarm off; 1 = alarm on) • g = Upconverter mute status (1 = muted)
10 MHz reference mode/status	{aaS2}	Returns {aaS2bc} where: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • x...x is the IP address
Subnet mask(W8,W18,W28 only)	{aaSs}	Returns {aaSsxxx.xxx.xxx.xxx} where: <ul style="list-style-type: none"> • x...x is the subnet mask
Unit ID	{aaSU}	Returns {aaSUx...x} where: <ul style="list-style-type: none"> • x...x is the unit ID character string (max. 16 characters)
Product Info	{aaSV}	Returns {aaSV2017-xxxx ver y.yy} where: 2017-xxxx is the model with options; yyy is the firmware Rev.

C) Commands

Table 1.2 lists the commands for the 3117-3338#-720 and briefly describes them. After a command is sent the 3117-3338#-720 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 3117-3338#-720 Commands		
Command	Syntax*	Description
Set Upconverter Gain	{aaC3xxx}	where: <ul style="list-style-type: none"> • xxx = 3 characters • Range: 0 to 200 (0 dB to 20.0 dB in 0.5 dB steps, omit decimal point.) Example: {C3155} sets the upconverter gain to 15.5 dB.
Set Downconverter Gain	{aaC4xxx}	where: <ul style="list-style-type: none"> • xxx = 3 characters • Range: 0 to 200 (0 dB to 20.0 dB in 0.5 dB steps, omit decimal point.) Example: {C4155} sets the downconverter gain to 15.5 dB.
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 3117-3338#-720 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 3117-3338#-720 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 3117-3338#-720 is assembled.

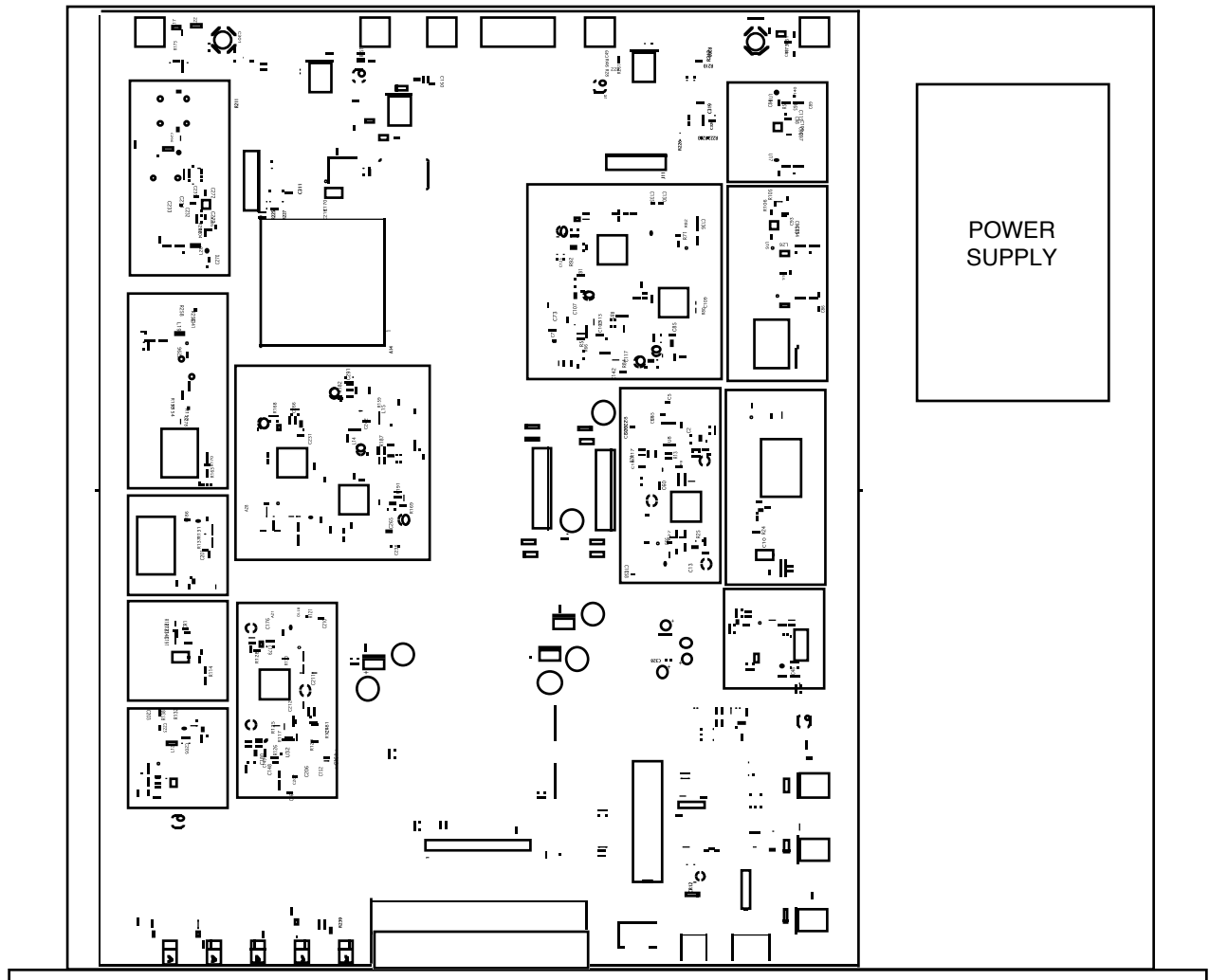


Figure 2.0 Model 3117-3338#-720 Mechanical Assembly

2.2 Rear Panel Input/Output Signals and Control -

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

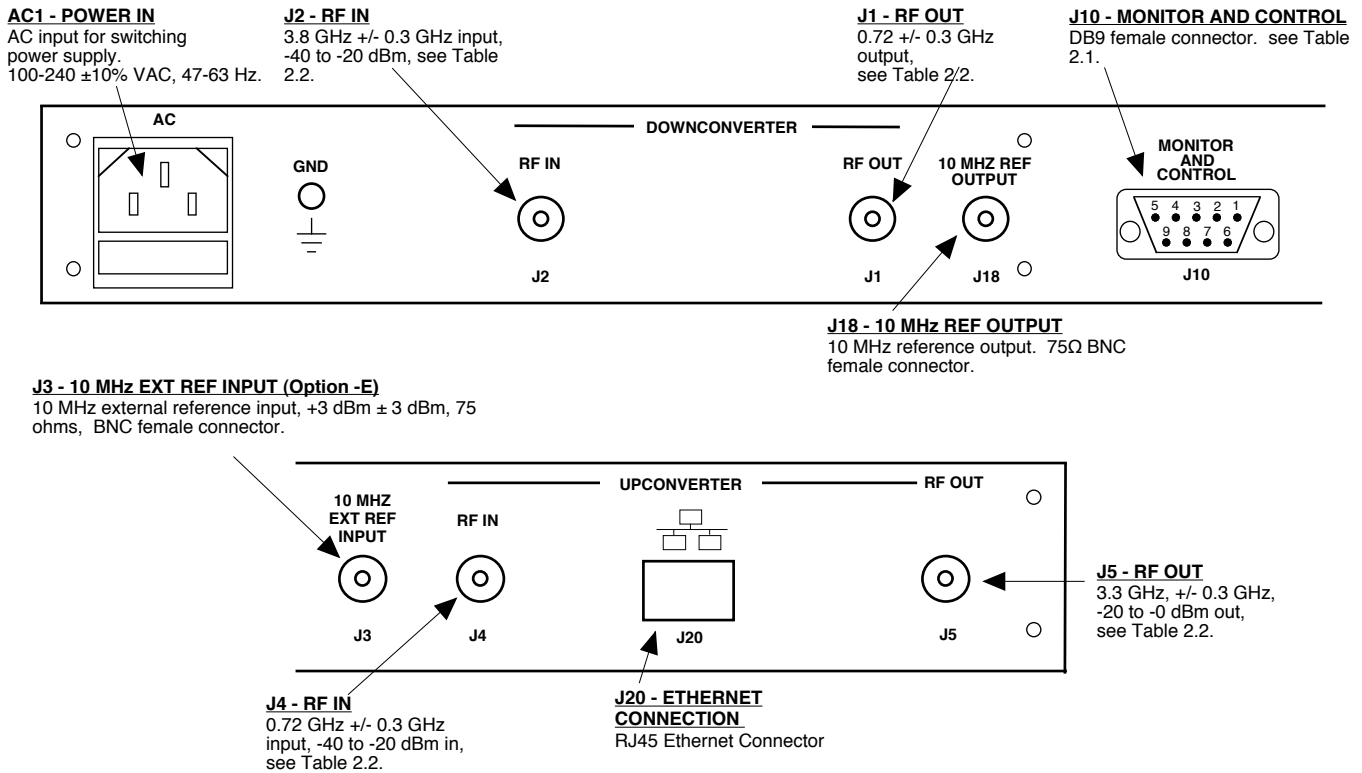


Figure 2.1 Model 3117-3338#-720 Rear Panel I/O's

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.

TABLE 2.2 IF/RF Connector Options		
Option	IF	RF
STD	BNC, 75Ω	Type F, 75Ω
-B	BNC, 75Ω	BNC, 75Ω
-C	BNC, 75Ω	BNC, 50Ω
-D	BNC, 50Ω	BNC, 50Ω
-N	BNC, 75Ω	Type N, 50Ω
-M	BNC, 50Ω	Type N, 50Ω

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

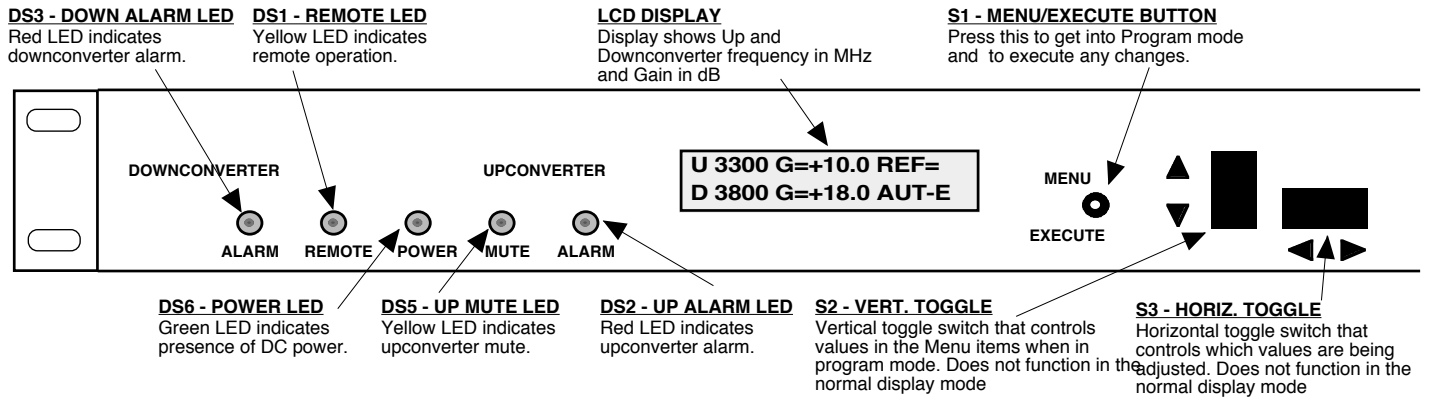


Figure 2.2 Model 3117-3338#-720 Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 3117-3338#-720, Upconverter Section

- 1.) Connect a -40 dBm to -20 dBm signal to RF In, J4 (Figure 2.1).
- 2.) Connect the RF OUT, 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 (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 3117-3338#-720, Downconverter Section

- 1.) Connect a -40 dBm to -20 dBm signal to RF In, J2 (Figure 2.1).
- 2.) Connect the RF OUT, 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 to get the desired output level.
- 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 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 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. If the external 10 MHz signal falls below 1 dBm (+/- 1 dB) the unit will automatically switch to the internal 10 MHz reference. The reference out connector (J18) provides a buffered rendition of the selected 10 MHz signal at +3 dBm, +/- 3 dB.

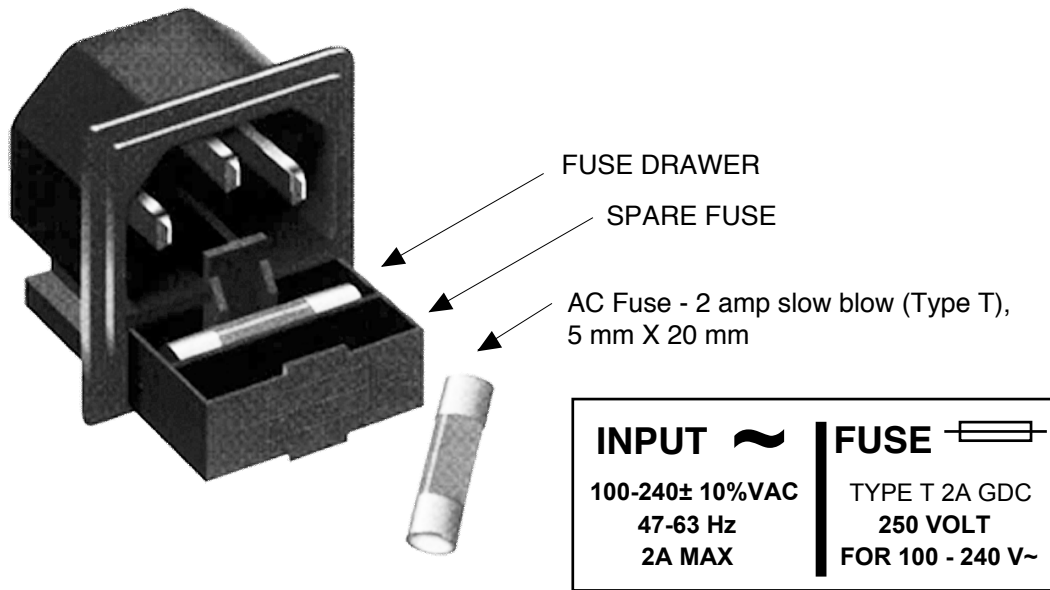


Figure 2.3 Fuse Location and Spare Fuse

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	Up Gain (0 to 20.0)
Menu 2	Down Gain (0 to 20.0)
Menu 3	Up Mute
Menu 4	Reference Mode
Menu 5	Remote
Menu 6	Interface
Menu 7	RS485 Address (0 to 31)
Menu 8	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.

3117-3338#-720E1W8X 4.00

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

U 3300 G==+10.0 REF= D 3800 G==+18.0 AUT-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 Gain 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.

2.5.4.1 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 = +14.5	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 3300 G=+10.0 REF=
D 3800 G=+18.0 AUT-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 = +12.5	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 3300 G=+10.0 REF=
D 3800 G=+18.0 AUT-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	3117-3338#-720E1W8X 4.00		
NORMAL DISPLAY			
Normal Display	U 3300 G = +10.0 REF= D 3800 G = +18.0 AUT-E		PUSH BUTTON
PUSHING MENU/EXECUTE SEQUENCE			
Menu 1 Up Gain (0 to +20.0)	UP G = 10.5 R	SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 2 Down Gain (0 to +20.0)	DN G = 12.0 R	SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 3 Up Mute	UP MUTE OFF R	SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 4 Reference Mode	REF = AUTO R	SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 5 Remote	REMOTE OFF R	SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 6 Interface	INTERFACE RS232 R	SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 7 RS485 Address(0 to 31)	ADDRESS = 00 R	SCROLL ⇐ SCROLL ⇐	PUSH BUTTON
Menu 8 Reset Ethernet Settings	Reset Ethernet R Settings NO	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.



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