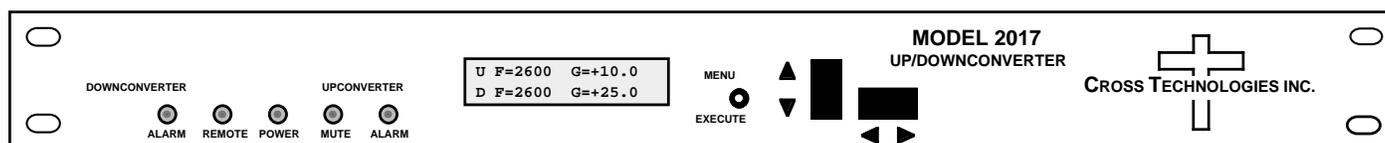


# Instruction Manual

# Model 2017-2727# Up/Downconverter

February 2018, Rev. O



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. Printed in USA.

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



6170 Shiloh Road  
Alpharetta, Georgia 30005

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

WEB [www.crosstechnologies.com](http://www.crosstechnologies.com)  
E-MAIL [info@crosstechnologies.com](mailto:info@crosstechnologies.com)

# INSTRUCTION MANUAL

## MODEL 2017-2727# Up/Downconverter

<b><u>TABLE OF CONTENTS</u></b>	<b><u>PAGE</u></b>
<b>Warranty</b>	<b>2</b>
<b>1.0 General</b>	<b>3</b>
1.1 Equipment Description	<b>3</b>
1.2 Technical Characteristics	<b>4</b>
1.3 Monitor & Control Interface	<b>6</b>
<b>2.0 Installation</b>	<b>9</b>
2.1 Mechanical	<b>9</b>
2.2 Rear I/O's	<b>10</b>
2.3 Front Panel Controls, Indicators	<b>11</b>
2.4 Operation	<b>12</b>
2.5 Menu Settings	<b>15</b>
<b>3.0 Environmental Use Information</b>	<b>20</b>

**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.



6170 Shiloh Road  
Alpharetta, Georgia 30005

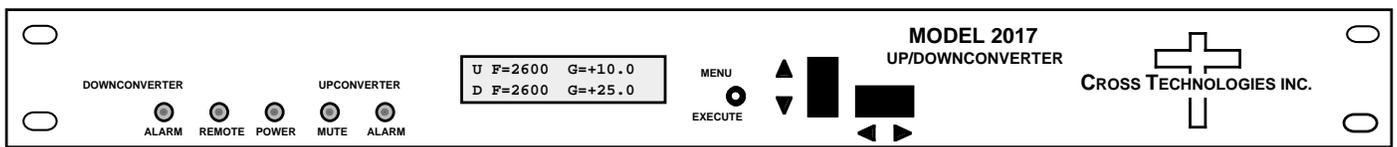
WEB [www.crosstechnologies.com](http://www.crosstechnologies.com)  
E-MAIL [info@crosstechnologies.com](mailto:info@crosstechnologies.com)

# MODEL 2017-2727# Up/Downconverter

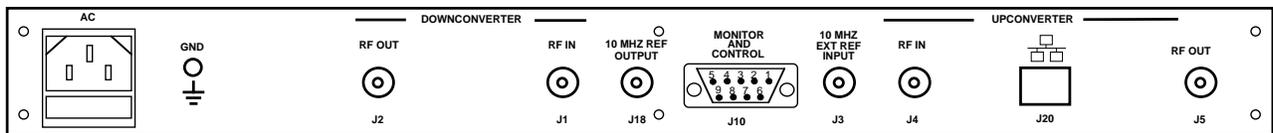
## 1.0 General

### 1.1 Equipment Description

The 2017-2727# S, L-band Up/Downconverter converts 0.95-1.15 GHz to 2.5-2.7 GHz (Up) and 2.5-2.7 GHz to 1.25-1.45 GHz (Down) using high side LOs (inverted spectrum). Multi-function switches select the gain (upconverter 0 to +30 dB; downconverter +20 to +50 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 gain and external 10 MHz reference (option E). Gain settings appear on the LCD display. Connectors are BNC female for the optional external reference input and output (option E), and BNC female for IF and RF. 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 in a 1.75" X 19" X 16" 1RU chassis.



FRONT PANEL



REAR PANEL

Figure 1.1 Model 2017-2727# Front and Rear Panels

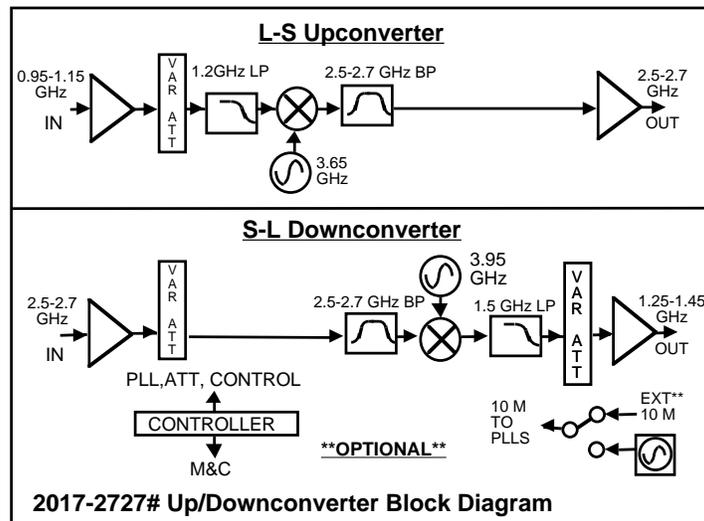


Figure 1.2 Model 2017-2727# Up/Downconverter Block Diagram

## 1.2 Technical Characteristics

**TABLE 1.0 2017-2727# Up/Downconverter Specifications\***

### -----UPCONVERTER-----

#### Input Characteristics (IF)

Impedance/Return Loss	50 Ω /14 dB
Frequency	0.95 - 1.15 GHz
Noise Figure, Max.	20 dB @ max. gain
Input Level	-30 to -10 dBm

#### Output Characteristics (RF)

Impedance/Return Loss	50 Ω/14 dB
Frequency (GHz)	2.5 - 2.7 GHz
Output level Range	-20 to 0 dBm
1dB comp, max. gain	+10 dBm
Mute @ 0 dBm Out	>50 dB

#### Channel Characteristics

Gain Max. at Fc	+30 dB to ±2 dB
Gain range, 0.5±0.5 step	+30 dB to 0 dB
Image Rejection	N/A
Spurious inband, sig. rel.	<-50 dBC 0 dBm
Spurious inband, sig. ind.	<-50 dBC Gmax
Spurious Out of Band	<-50 dBC Gmax
Intermod - 2 Carriers	<-50 dBC Gmax
Frequency Resp. Band	±2 dB
Frequency Resp. 40 MHz	±0.5s dB
Frequenc Sense	Inverting

### -----DOWNCONVERTER-----

#### Input Characteristics (RF)

Impedance/Return Loss	50 Ω /14 dB
Frequency	2.5 - 2.7 GHz
Noise Figure, Max.	15 dB @ max gain
Input Level	-55 to -35 dBm

#### Output Characteristics (RF)

Impedance/Return Loss	50 Ω/14 dB
Frequency (GHz)	1.25 - 1.45 GHz
Output level Range	-25 to -5 dBm
1dB comp, max. gain	+5 dBm
Mute @ 0 dBm Out	N/A

#### Channel Characteristics

Gain Max. at Fc	+50 dB to ±2 dB
Gain range, 0.5±0.5 step	+50 dB to +20 dB
Image Rejection	N/A
Spurious inband, sig. rel.	<-50 dBC -5dBm
Spurious inband, sig. ind.	<-50 dBC Gmax
Spurious Out of Band	<-50 dBC Gmax
Intermod - 2 Carriers	<-50 dBC Gmax
Frequency Resp. Band	±2 dB
Frequency Resp. 40 MHz	±0.5 dB
Frequenc Sense	Inverting

### -----UP AND DOWNCONVERTER-----

#### Synthesizer Characteristics

Frequency Accuracy	± 1.0 ppm internal reference (±0.01 ppm, <b>option H</b> )
--------------------	--

Phase Noise @ Freq	100 Hz	1kHz	10kHz	100kHz	1 MHz
dBC/Hz	-60	-70	-80	-95	-110

10 MHz Level (In or Out) +3 dBm ± 3 dB, 75 ohms (**option -E**)

#### Controls, Indicators

Gain Selection	Direct readout LCD; pushbutton switches or remote selection
Power	Green LED
Down/Up Alarm	Red LED
Up Mute	Yellow LED
Remote	Yellow LED; RS232C, 9600 baud ( <b>RS485, option -Q, Ethernet, optional</b> )

## 2017-2727# Up/Downconverter Specifications\*

*Continued from page 4...*

### **Other**

RF Connectors	BNC (female) (see Table 2.2 for connector options)
IF Connectors	BNC (female) (see Table 2.2 for connector options)
10 MHz Connectors	BNC (female) ( <b>option -E</b> )
Alarm/Remote Connector	DB9 (female) - NO or NC contact closure on Alarm
Size	19 inch, 1RU standard chassis 1.75"H X 16.0"D
Power	100-240 $\pm$ 10% VAC, 47-63 Hz, 45 watts max.

### **Available Options**

-E	External 10 MHz reference In & Out
-H	High Stability ( $\pm$ 0.01ppm) internal reference
W31	External Temperature 0C to +50C

### **Remote M&C Interface**

-W8	Ethernet M&C Remote Interface
-W18	Ethernet M&C Remote Interface with SNMP
-W28	Ethernet with TCP/IP, Telnet®

### **Connectors/Impedance**

Standard	-50 $\Omega$ BNC (RF), 50 $\Omega$ BNC (IF)
-M	-50 $\Omega$ N-Type (RF), 50 $\Omega$ BNC (IF)
-S	-50 $\Omega$ SMA (RF), 50 $\Omega$ BNC (IF)
-SS	-50 $\Omega$ SMA (RF), 50 $\Omega$ SMA (IF)

### **Contact Cross for other options**

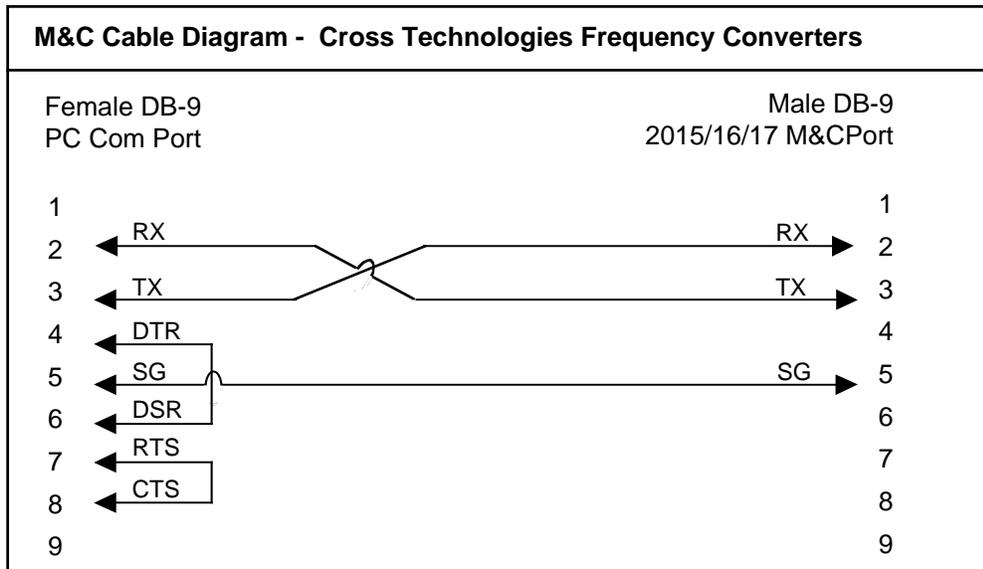
---

\*+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 - option -Q**)



**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 2017-2727# and briefly describes them.

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

Table 1.1 2017-2727# Status Requests		
Command	Syntax*	Description
Status	{aaS1}	Returns {aaS1bbbbccccdddeMNOP} where:
		<ul style="list-style-type: none"> <li>• bbbb = Tx frequency 4 characters</li> <li>• cccc = Rx frequency 4 characters</li> <li>• ddd = Tx gain (0 to 300), 0 to 30.0 dB (0.5 dB steps)</li> <li>• ee = Rx gain (20 to 500), 20.0 to 50.0 dB (0.5 dB steps)</li> <li>• M = Receiver synth alarm (0 = alarm off; 1 = alarm on)</li> <li>• N = Transmitter synth alarm (0 = alarm off; 1 = alarm on)</li> <li>• O = Summary alarm (0 = alarm off; 1 = alarm on)</li> <li>• P = Transmit signal control (0 = disabled/muted; 1 = enabled/not muted)</li> </ul>
External 10 MHz (option -E)	{aaS2}	Returns {aaS2b} where:
		<ul style="list-style-type: none"> <li>• b = 10 MHz Selected (0 = Internal; 1 = External)</li> </ul>
External 10 MHz (option -E1)	{aaS2}	Returns {aaS2bc} where:
		<ul style="list-style-type: none"> <li>• b = 1 if internal reference mode is selected</li> <li>• b = 2 if external reference mode is selected</li> <li>• b = 3 if auto reference mode is selected</li> <li>• c = 0 if internal 10 MHz is active</li> <li>• c = 1 if external 10 MHz is active</li> </ul>
IP Address (W8, W18, W28 only)	{aaSi}	Returns {aaSixxx.xxx.xxx.xxx} where:
		<ul style="list-style-type: none"> <li>• x...x is the IP address</li> </ul>
Subnet mask(W8,W18,W28 only)	{aaSs}	Returns {aaSsxxx.xxx.xxx.xxx} where:
		<ul style="list-style-type: none"> <li>• x...x is the subnet mask</li> </ul>
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 2017-2727# and briefly describes them. After a command is sent the 2017-2727# 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 **option -Q**)
- 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

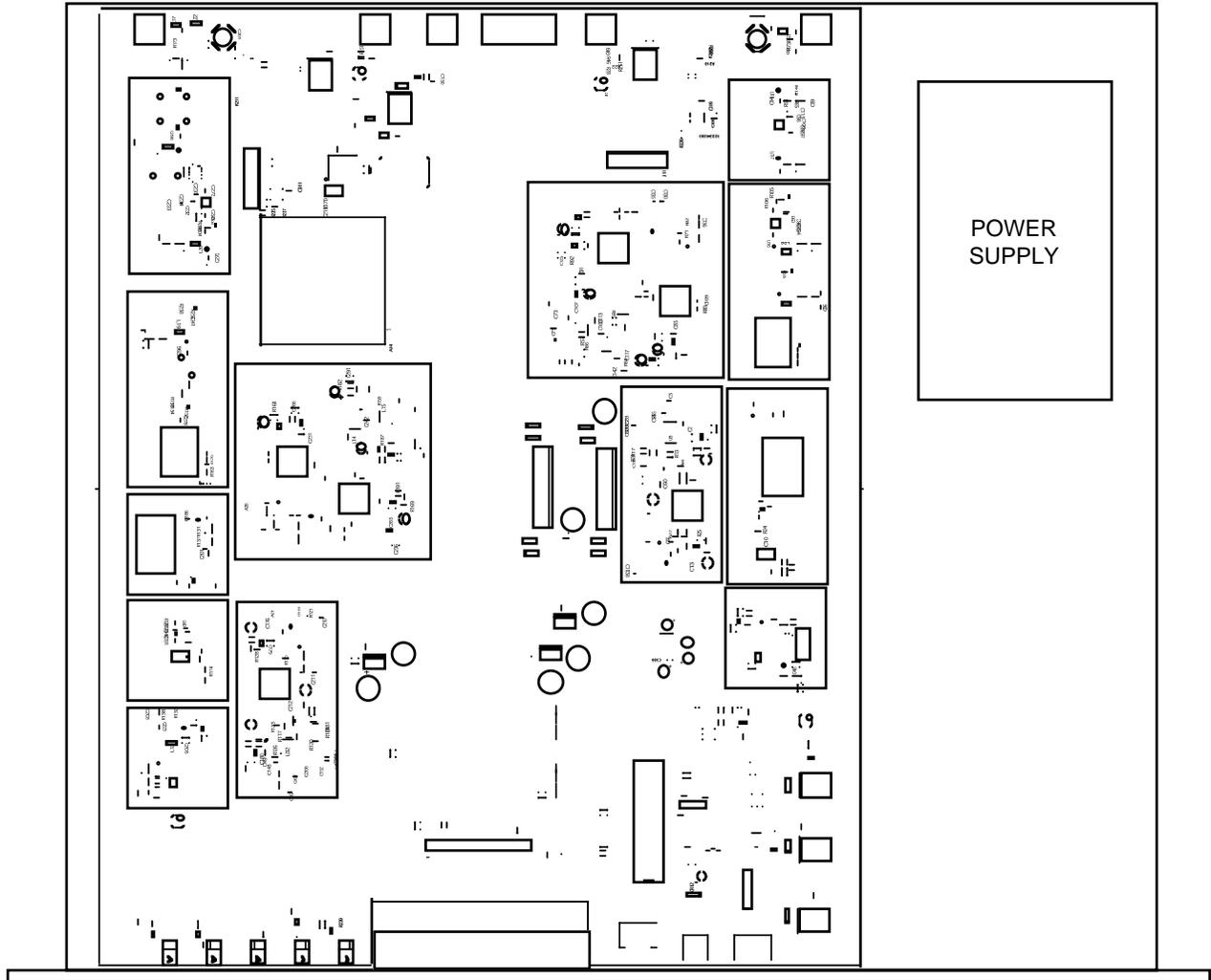
\* PLEASE NOTE: The two character {aa}(00-31) prefix, in the table below, should be used ONLY when RS-485, (OPTION-Q), is selected.

Table 1.2 2017-2727# Commands		
Command	Syntax*	Description
Set Transmit Gain	{aaC3xxxx}	where: <ul style="list-style-type: none"> <li>• xxxx = 2 or 3 characters</li> <li>• Range: 0 to 300 (0 dB to 30.0 dB, in 0.5 dB steps)</li> <li>• example: {C3245} sets the gain to 24.5 dB</li> </ul>
Set Receiver Gain	{aaC4xxx}	where: <ul style="list-style-type: none"> <li>• xx = 2 characters</li> <li>• Range: 200 to 500 (20.0 dB to 50.0 dB, in 0.5 dB steps)</li> <li>• example: {C4465} sets the gain to 46.5 dB</li> </ul>
Enable Tx	{aaCAx}	where: <ul style="list-style-type: none"> <li>• x = 0 to disable Tx signal (Mute)</li> <li>• x = 1 to enable Tx signal (Un-mute)</li> </ul>
External 10MHz (option -E)	{aaCEx}	where: <ul style="list-style-type: none"> <li>• x = 0 to set the unit to Internal reference</li> <li>• x = 1 to set the unit to External reference</li> </ul>
Enable Remote	#	Just # sign
Disable Remote	{aaCRO}*}	{CR and zero}

## 2.0 Installation

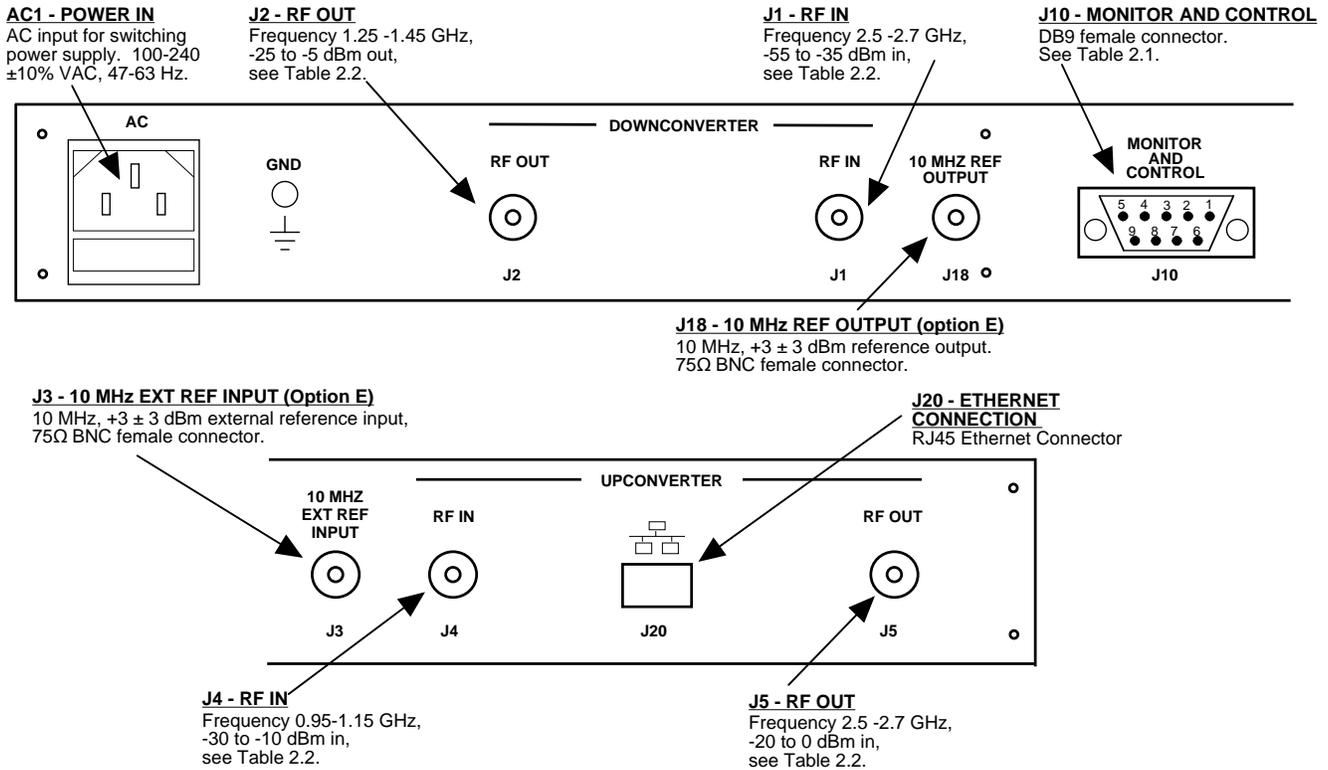
### 2.1 Mechanical

The 2017-2727# consists of one RF/Controller PCB housed in a 1 RU (1 3/4 inch high) by 16 inch deep chassis. A switching,  $\pm 12$ , +5, +24 VDC power supply provides power for the assemblies. The 2017-2727# can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2017-2727# is assembled.



**Figure 2.0 Model 2017-2727# Mechanical Assembly**

## 2.2 Rear Panel Input/Output Signals and Control - Figure 2.1 shows the input and output connectors on the rear panel.



**Figure 2.1 Model 2017-2727# 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

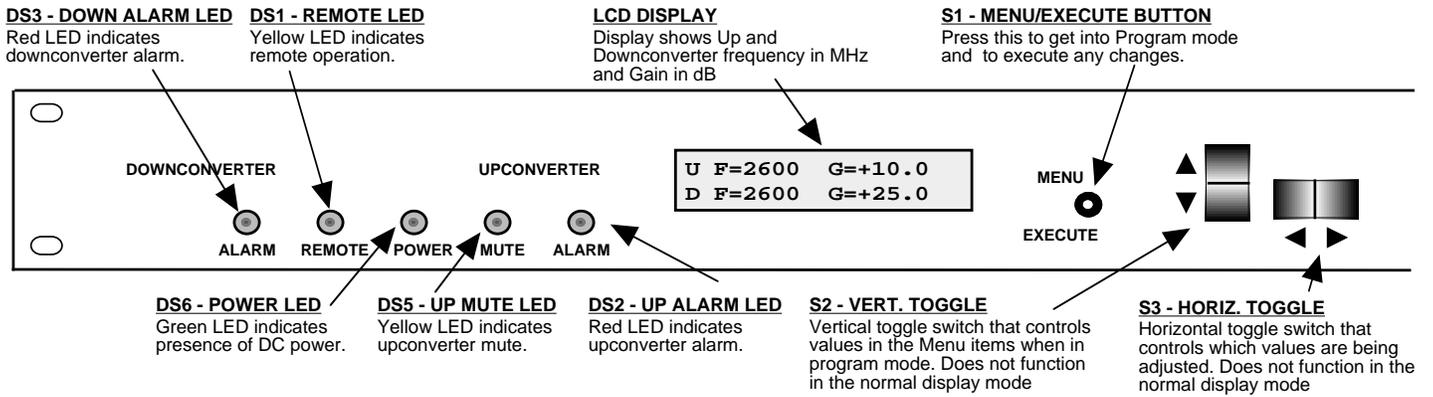
### \*Remote Serial Interface

Interface: DB-9 Male

Protocol: RS-232C (RS-232C/422/485 **option -Q**), 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, 75 $\Omega$	Type F, 75 $\Omega$
-B	BNC, 75 $\Omega$	BNC, 75 $\Omega$
-C	BNC, 75 $\Omega$	BNC, 50 $\Omega$
-D	BNC, 50 $\Omega$	BNC, 50 $\Omega$
-N	BNC, 75 $\Omega$	Type N, 50 $\Omega$
-M	BNC, 50 $\Omega$	Type N, 50 $\Omega$

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



**Figure 2.2 Model 2017-2727# Front Panel Controls and Indicators**

## 2.4 Installation / Operation

### 2.4.1 Installing and Operating the 2017-2727#, Upconverter Section

- 1.) Connect a 0.95 to 1.15 GHz 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)

### 2.4.2 Installing and Operating the 2017-2727#, Downconverter Section

- 1.) Connect a 2.5 to 2.7 GHz signal to RF In, J1 (Figure 2.1).
- 2.) Connect the RF OUT, J2, 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.) **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

The External Reference Option is required if the unit is to synch to a 10 MHz reference from an *external* source. The unit will still have an internal 10 MHz reference as a ‘back-up’ should the external reference be removed or fail. Described below are the two (2), 10 MHz External Reference Options, Option E & E1.

#### Option E

##### **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.

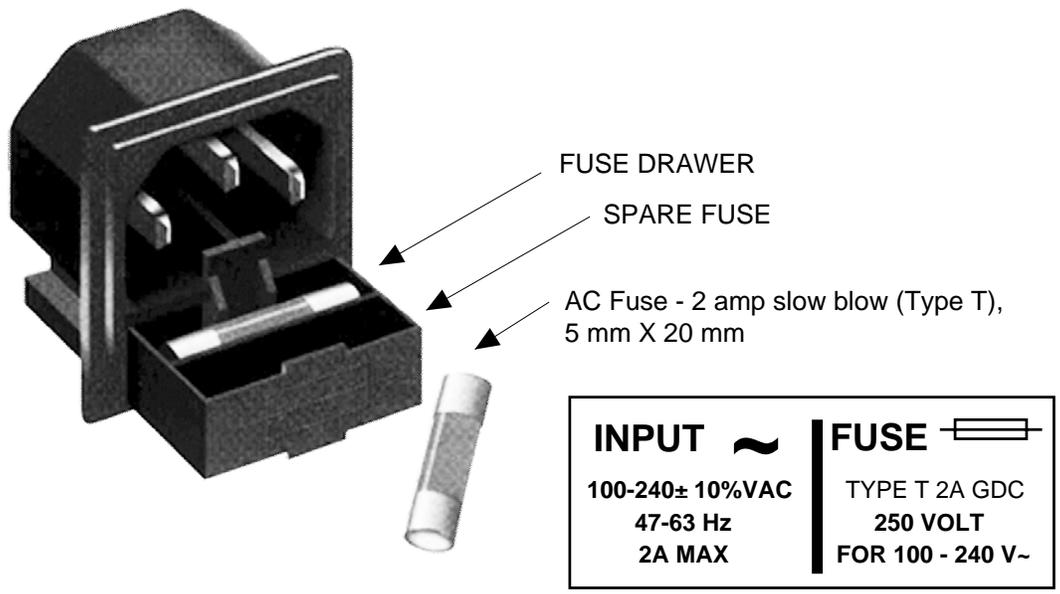
NOTE: There is no “auto-detect” capability in Option E. [See Option E1 below if this capability is required.] If the External Reference Mode is selected and the external reference fails or is removed, the unit will ALARM, but it will NOT automatically switch to the internal reference. The user will be required to manually select Internal Reference Mode (via the front panel LCD or Remote M&C) for the *internal* 10 MHz reference to become the ‘primary’ source for the unit.

Once the external 10 MHz reference is restored (on J3), the user must again manually (via the front panel LCD or Remote M&C) reselect External Reference Mode for the *external* 10 MHz reference to become the ‘primary’ source.

#### Option E1

Units with option E1 operate as described above but also have an Auto mode. When in auto mode 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.

Units with option E1 do not have the ability to insert a buffered rendition of the selected 10 MHz signal on the center pin of the (RF) connector.



**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 (+30 to 0)
- Menu 2** Down Gain (set +30 to +50 dBm)
- Menu 3** Up Mute
- Menu 4** Select External 10 MHz Reference (option -E) (option -E1)
- Menu 5** Set Unit to Remote Operation

**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.

2017-2727# 1.00
--------------------

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

U F=2600	G=+10.0
D F=2600	G=+25.0

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.

## 2.5.5 Upconverter Gain

To set the upconverter 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.

Pressing the Up/Down switch to change the level in 1 dB steps and then push the Menu/Execute switch to get to the Gain setting:

UP G = + <u>20</u>	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 :

U F=2600	G=+10.0
D F=2600	G=+25.0

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

## 2.5.6 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 = + <u>30</u>	R
--------------------	---

Press the Up/Down switch to change the level in 1 or 10 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
----------------	------------

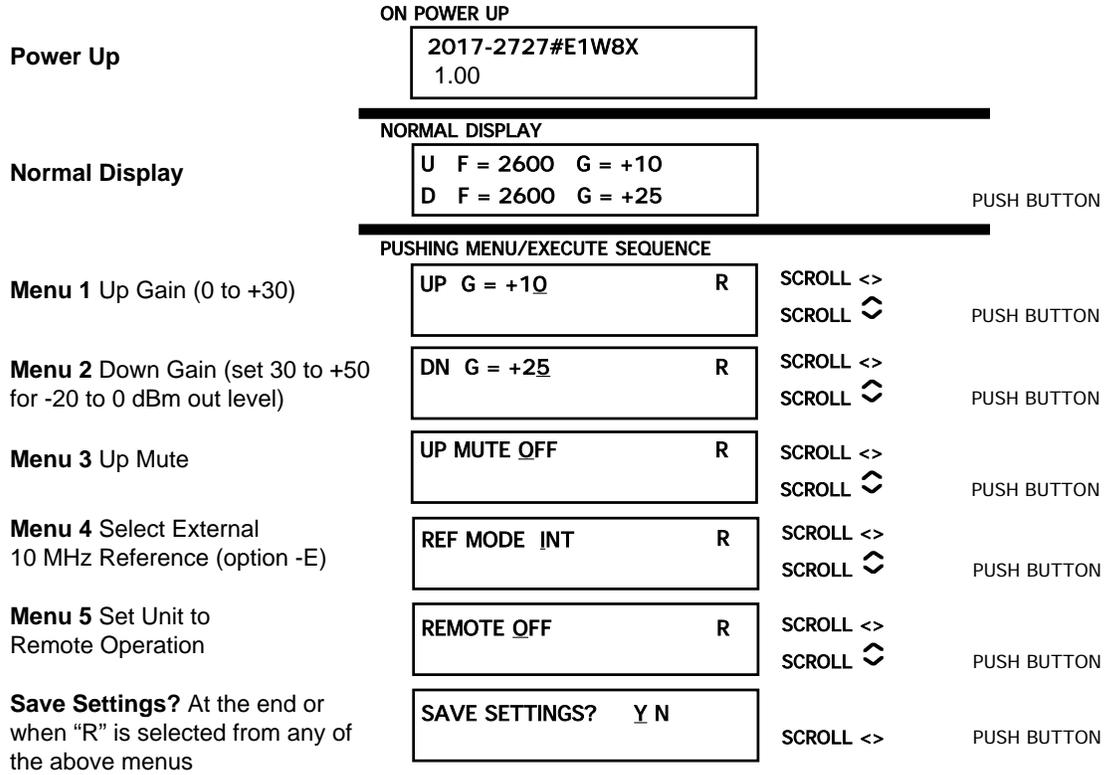
Selecting **Y** will save the new settings. Selecting **N** will revert to the previous settings. Pushing the Menu/Execute switch then takes you to the :

U F=2600	G=+10.0
D F=2600	G=+25.0

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

## 2.5.7 Alarm Indications

An alarm condition will occur if any local oscillator phase lock loop (PLL) comes out of lock.



**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](http://www.crosstechnologies.com)  
E-MAIL [info@crosstechnologies.com](mailto:info@crosstechnologies.com)

Printed in USA