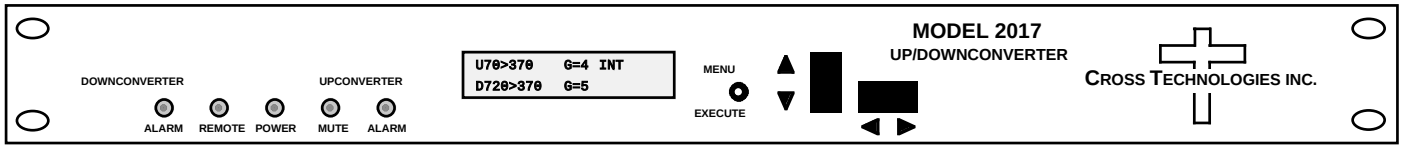
Instruction Manual

Model 2017-370
Up/Downconverter

July 2010 Rev. 0



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INSTRUCTION MANUAL

MODEL 2017-370 Up/Downconverter

TABLE OF CONTENTS **PAGE**

Warranty **2**
1.0 General **3**
1.1 Equipment Description **3**
1.2 Technical Characteristics **4**
1.3 Monitor & Control Interface **5**
1.4 Environmental Use Information **8**
2.0 Installation **9**
2.1 Mechanical **9**
2.2 Rear I/O's **10**
2.3 Front Panel Controls, Indicators **12**
2.4 Operation **13**
2.5 Menu Settings **14**

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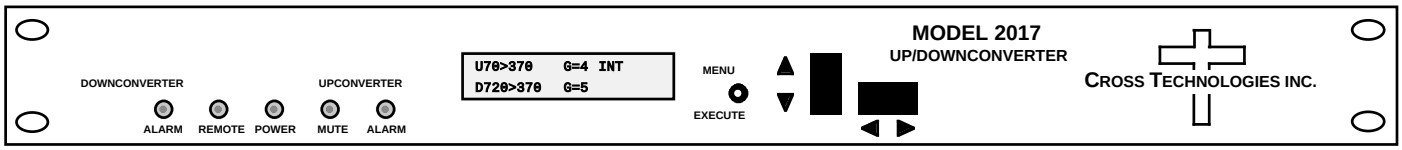
MODEL 2017-370 Up/Downconverter

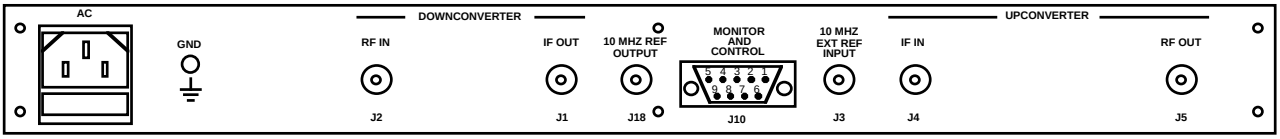
1.0 General

1.1 Equipment Description

The 2017-370 Up/Downconverter converts 70 ±10 MHz to 370 MHz (Up) and 720 ±130 MHz to 370 MHz (Down). Synthesized local oscillators (LO) provide frequency translation. Multi-function push button switches select the gain, external 10 MHz input. Front panel LEDs provide indication of DC power (green), PLL alarm for up and downconverters (red), remote operation (yellow), and Upconverter mute (yellow). Gain can be manually controlled for 5 ± 5 dB range in 1 dB steps for the upconverter and downconverter as adjusted by the front panel multi-function push-button switches. Remote operation allows selection of gain and external 10 MHz. Gain and external 10 MHz input settings appear on the LCD display. Connectors are TNC female for IF and RF and BNC female for the external reference input and output. It is powered by a 100-240 ±10% VAC power supply and housed in a 1.75" X 19" X 16" 1RU chassis.



FRONT PANEL



REAR PANEL

Figure 1.1 Model 2017-370 Front and Rear Panels

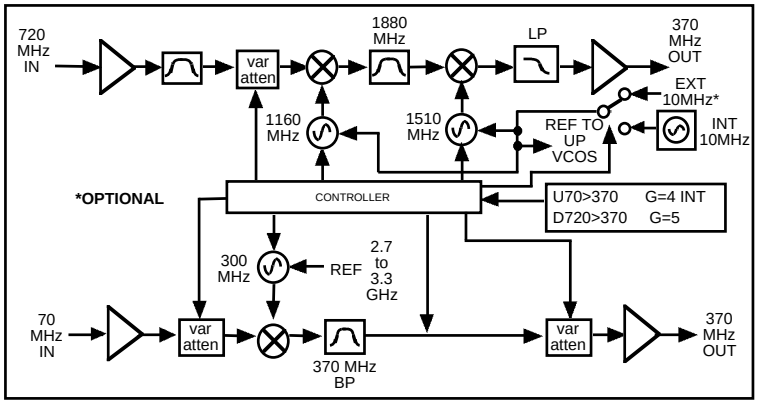


Figure 1.2 Model 2017-370 Up/Downconverter Block Diagram

1.2 Technical Characteristics

TABLE 1.0 2017-370 Up/Downconverter Specifications*

----------UPCONVERTER----------

Input Characteristics (IF)

Impedance/Return Loss	50Ω /18 dB
Frequency	70 ± 12.5 MHz
Noise Figure, max.	15 dB
Level	-19 ± 3 dBm

Output Characteristics (RF)

Impedance/Return Loss	50 Ω/18 dB
Frequency	370 ± 12.5 MHz
Output level	-15 ± 3 dBm
Output 1 dB compression	+0 dBm

Channel Characteristics

Gain range (adjustable)	+5 dB ± 5 dB, 1dB steps
Frequency Sense	Non-inverting

Phase Noise @ F (Hz) >	10	100	1k	10k	100k	1M	10M
Cust. Spec dBC/Hz	65	95	98	98	102	125	130
Cross Spec dBC/Hz	65	90	98	98	102	125	130

----------DOWNCONVERTER----------

Input Characteristics (RF)

Impedance/Return Loss	50Ω /18 dB
Frequency	720 ± 130 MHz
Noise Figure (max)	15 dB
Input Level	-19 ± 3 dBm

Output Characteristics (IF)

Impedance/Return Loss	50 Ω/18 dB
Frequency	370 ± 130 MHz
Output level/max linear	-15 ± 3 dBm
Output 1 dB compression	+0 dBm

Channel Characteristics

Gain range (adjustable)	+5 dB ± 5 dB, 1 dB steps
Image Rejection	> 20 dB, min
Freq Sense (selectable)	Non-inverting

Phase Noise @ F (Hz) >	10	100	1k	10k	100k	1M	10M
Cust. Spec dBC/Hz	65	95	98	98	102	125	130
Cross Spec dBC/Hz	65	87	98	98	102	125	130

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

Channel Characteristics, any 25 MHz Bandwidth

Frequency Response	±0.3 dB ±5MHz; ±0.5 dB, ±12.5 MHz BW
Spurious Response	<-30 dBC
Group Delay, ns, max	2.6 ± 9.5 MHz, 3.6 ±11 MHz;7.7 ±15 MHz

Synthesizer Characteristics

Frequency Accuracy	± 0.01 ppm internal reference
Frequency Step	None; Fixed frequency
10 MHz Level (In or Out)	3 dBm ± 3 dB

Controls, Indicators

10M Freq/Gain Selection	Direct readout LCD; pushbutton switches or remote selection
Power; Alarm; Remote	Green LED; Red LED; Yellow LED
Remote	RS232C, 9600 baud

Other

RF Connector	TNC (female)
IF Connector	TNC (female)
10 MHz Connectors	BNC (female), 50Ω/75Ω
Alarm/Remote Connector	DB9 - NO or NC closure on Alarm
Size	19 inch, 1RU, 1.75” high X 16.0” deep
Power	100-240 ±10% VAC, 47-63 Hz, 25 W

Options

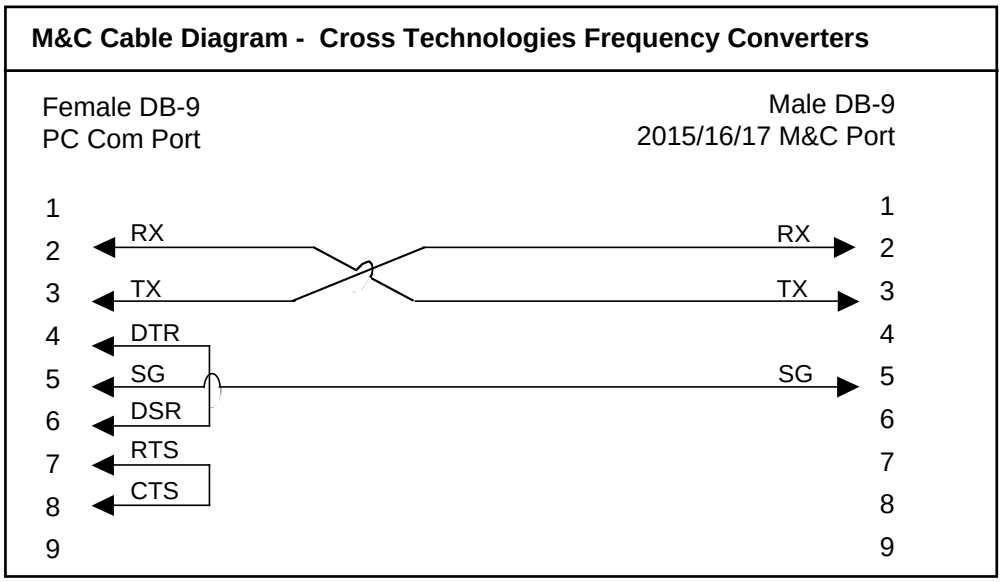
-Q	RS485 Remote Interface
-W8	Ethernet M&C Rremote Interface

*+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 2017-370 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 2017-370 Status Requests		
Command	**Syntax***	**Description**
Command Status	{aaS1}	Returns {aaS1bbccDEFG} where:
		• bb = Tx Gain (0 to 10)
		• cc = Rx Gain (0 to 10)
		• D = 0 - Receiver synth alarm
		• E = 0 - Transmitter synth alarm
		• F = 0 - Summary alarm
		• G = 0 - Transmit signal disabled (muted)
External 10MHz (option -E)	{aaS2}	Returns {aaS2b} where:
		• b = 1 - External 10MHz selected

C) Commands

Table 1.2 lists the commands for the 2017-370 and briefly describes them. After a command is sent the 2017-370 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 2017-370 Commands		
Command	**Syntax***	**Description**
Set Transmit Gain	{aaC3xx}	where:
		• xx = 2 characters
		• Range: 00 to 10 (00 dB to 10 dB, in 1 dB steps)
Set Receiver Gain	{aaC4xx}	where:
		• xx = 2 characters
		• Range: 00 to 10 (00 dB to 10 dB, in 1 dB steps)
Enable Tx	{aaCAx}	where x =:
		• 0 to disable Tx signal (mute)
		• 1 to enable Tx signal (unmute)
External 10MHz (option -E)	{aaCEx}	where x =:
		• 0 to disable External 10MHz ref signal
		• 1 to enable External 10MHz ref signal
Enable Remote	#	Just # sign
Disable Remote	{aaCR0}*	{CR and zero}

1.4 Environmental Use Information

A. **Rack-Mounting** - To mount this equipment in a rack, please refer to the installation instructions located in the user manual furnished by the manufacturer of your equipment rack.

B. **Mechanical Loading** - Mounting of equipment in a rack should be such that a hazardous condition does not exist due to uneven weight distribution.

C. **Elevated Operating Ambient Temperature** - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack may be greater than room ambient temperature. Therefore, consideration should be given to Tmra.

D. **Reduced Air Flow** - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Additional space between unit may be required.

E. **Circuit Overloading** - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits could have on over current protection and supply wiring. Appropriate consideration of equipment name plate rating should be used when addressing this concern.

F. **Reliable Earthing** - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connection to the Branch (use of power strips).

G. **Top Cover** - There are no serviceable parts inside the product so, the Top Cover should not be removed. If the Top Cover is removed the ground strap and associated screw MUST BE REINSTALLED prior to Top Cover screw replacement. FAILURE TO DO this may cause INGRESS and/or EGRESS emission problems.

2.0 Installation

2.1 Mechanical

The 2017-370 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 2017-370 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2017-370 is assembled.

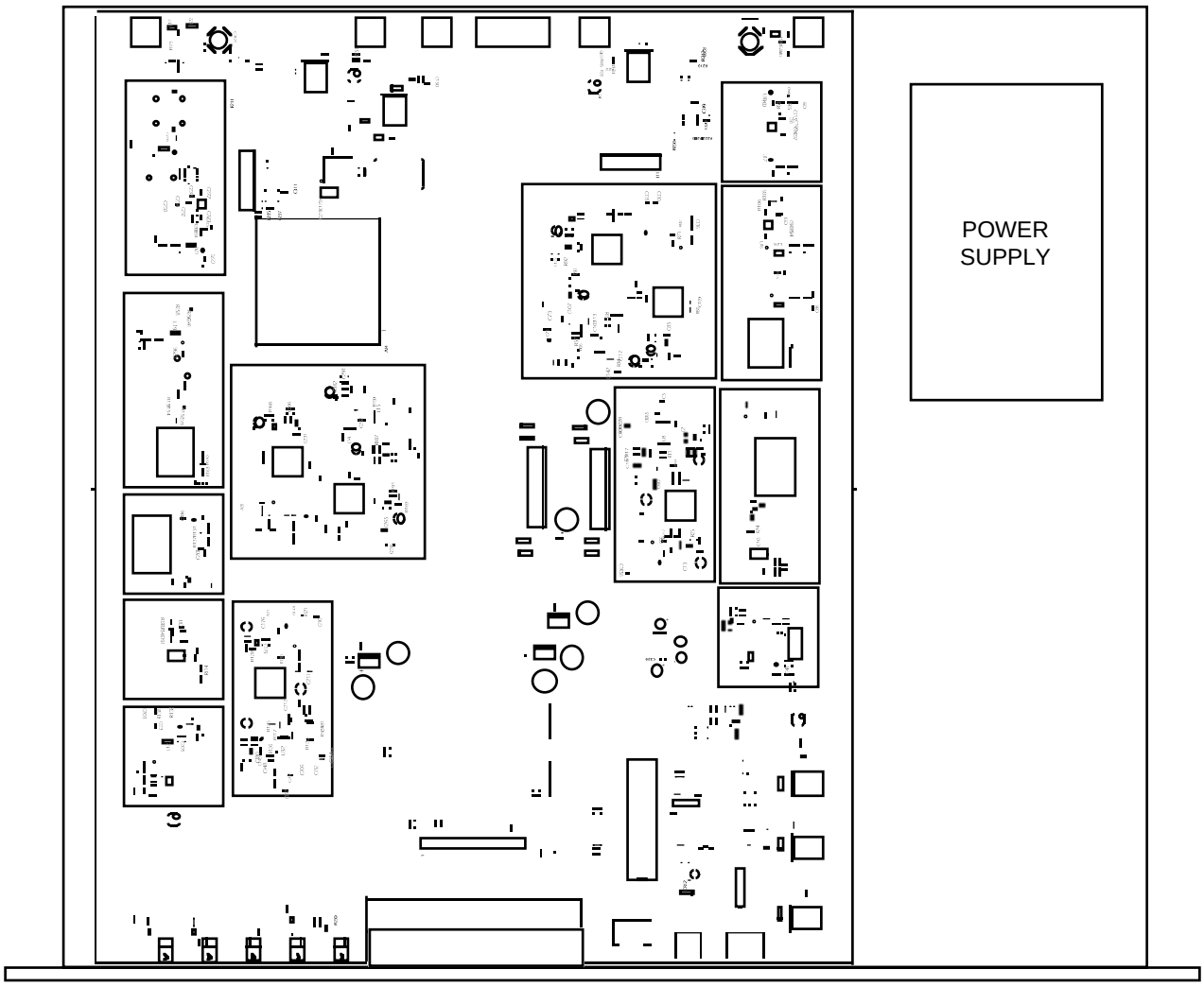


Figure 2.0 Model 2017-370 Mechanical Assembly

2.2 Rear Panel Input/Output Signals and Control -

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

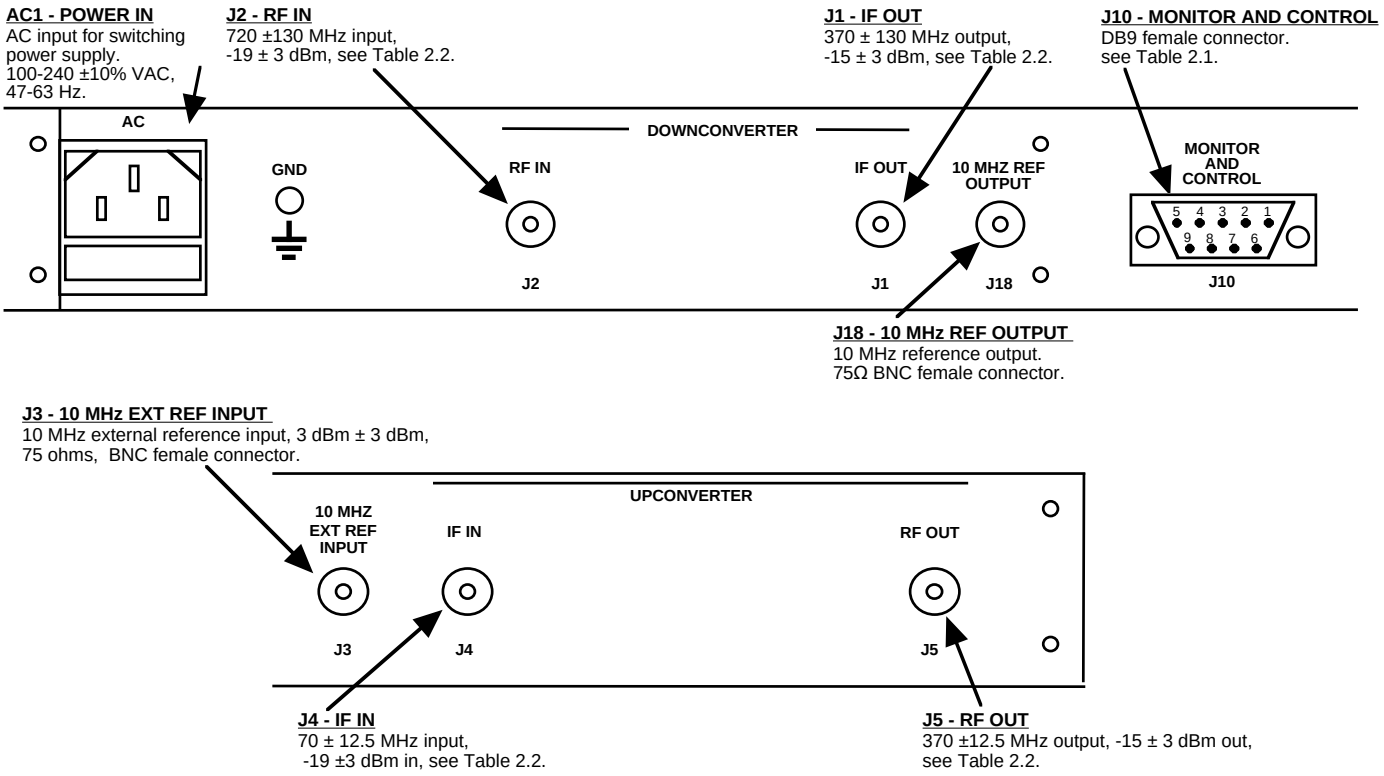


Figure 2.1 Model 2017-370 Rear Panel I/O's

Tables 2.1 & 2.2 shows the input and output connectors on the rear panel.

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, 75Ω	Type F, 75Ω
-B	BNC, 75Ω	BNC, 75Ω
-C	BNC, 75Ω	BNC, 50Ω
-D	BNC, 50Ω	BNC, 50Ω
-J	BNC, 50Ω	Type F, 75Ω
-N	BNC, 75Ω	Type N, 50Ω
-M	BNC, 50Ω	Type N, 50Ω
-S	BNC, 50Ω	SMA, 50Ω

2.3 Front Panel Controls and Indicators -

The following are the front panel controls and indicators.

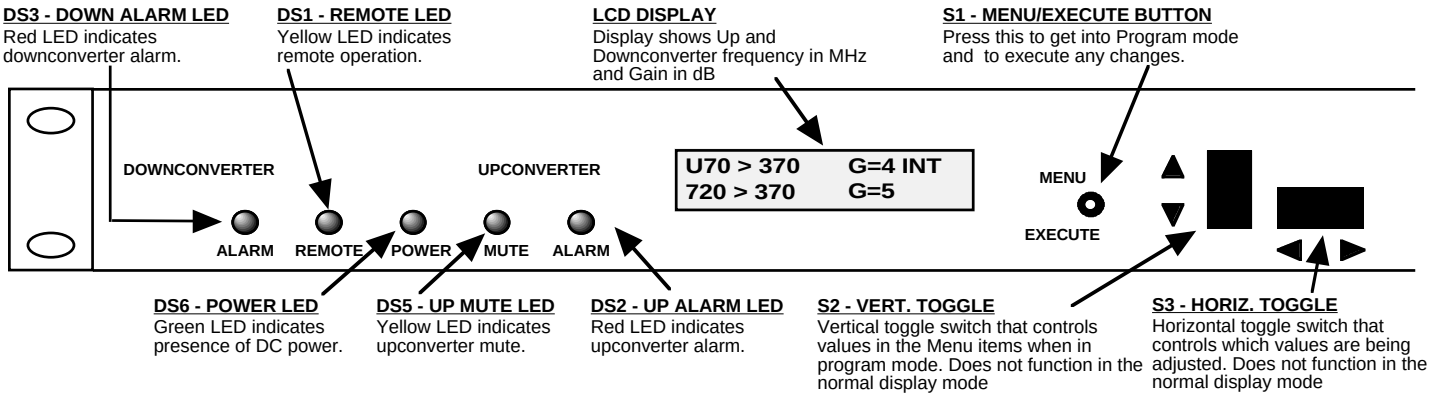


Figure 2.2 Model 2017-370 Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 2017-370, Upconverter Section

1.) Connect a -19 ± 3 dBm signal to IF In, J4 (Figure 2.1).
2.) Connect the RF OUT, J5, to the external equipment.
3.) Connect 100-240 ±10% VAC, 47 - 63 Hz to AC on the back panel.
4.) Set the desired output frequency (See Section 2.5 Menu Settings).
5.) Set the gain (See Section 2.5 Menu Settings).
6.) Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.2).

2.4.2 Installing and Operating the 2017-370, Downconverter Section

1.) Connect a -19 ± 3 dBm signal to RF In, J2 (Figure 2.1).
2.) Connect the IF OUT, J1, to the external equipment.
3.) Connect 100-240 ±10% VAC, 47 - 63 Hz to AC on the back panel.
4.) Set the desired input frequency (See Section 2.5 Menu Settings).
5.) Set the gain to get an output level in the +5 ± 5 range (See Section 2.5 Menu Settings).
6.) Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.2).
7.) **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.

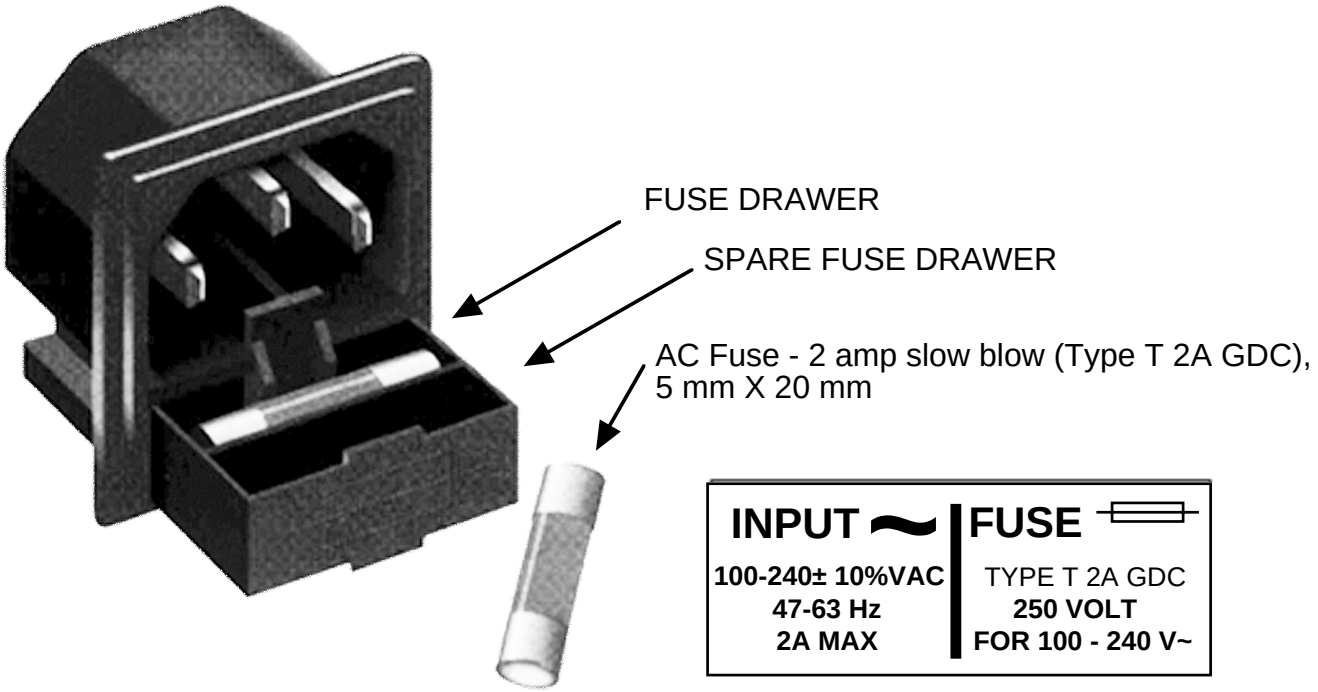


Figure 2.3 Fuse Location and Spare Fuse

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 2.2):

Power Up
Normal Display

Menu 1	Up Gain (+5 ± 5 dBm)
Menu 2	Down Gain (set +5 ± 5 dBm out range)
Menu 3	Up Mute
Menu 4	Set Unit to Remote Operation
Menu 5	Select External 10 MHz Ref (option -E)
Menu 6	Set RS-485 mode (option -Q)
Menu 7	Set RS-485 address (option -Q)
Menu 8	View PCB Temperature (option -T)
Menu 9	View LNB and/or SSPB Current (options -L and/or -V)

Save Menu At the end or when "R" is selected from any of the above menus

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 12 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 software version will be displayed.

```
REV 1.00
```

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

```
U70>370        G=4  INT
D720>370       G=5
```

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.

```
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 :

```
U70>370        G=4  INT
D720>370       G=5
```

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

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 12 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:

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 = +10.0                R
```

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 BE CHANGED 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?           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 :

```
U70>370          G=4  INT
D720>370         G=5
```

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

2.5.4.2 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. This is an important setting to optimize spurious and should be made as accurately as possible to provide an output in the -20 to 0 dBm level range:

```
DN  G = +10.0                R
```

Pressing 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 BE CHANGED 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?          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:

```
U70>370          G=4  INT
D720>370         G=5
```

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

2.5.4.3 Alarm Indications

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

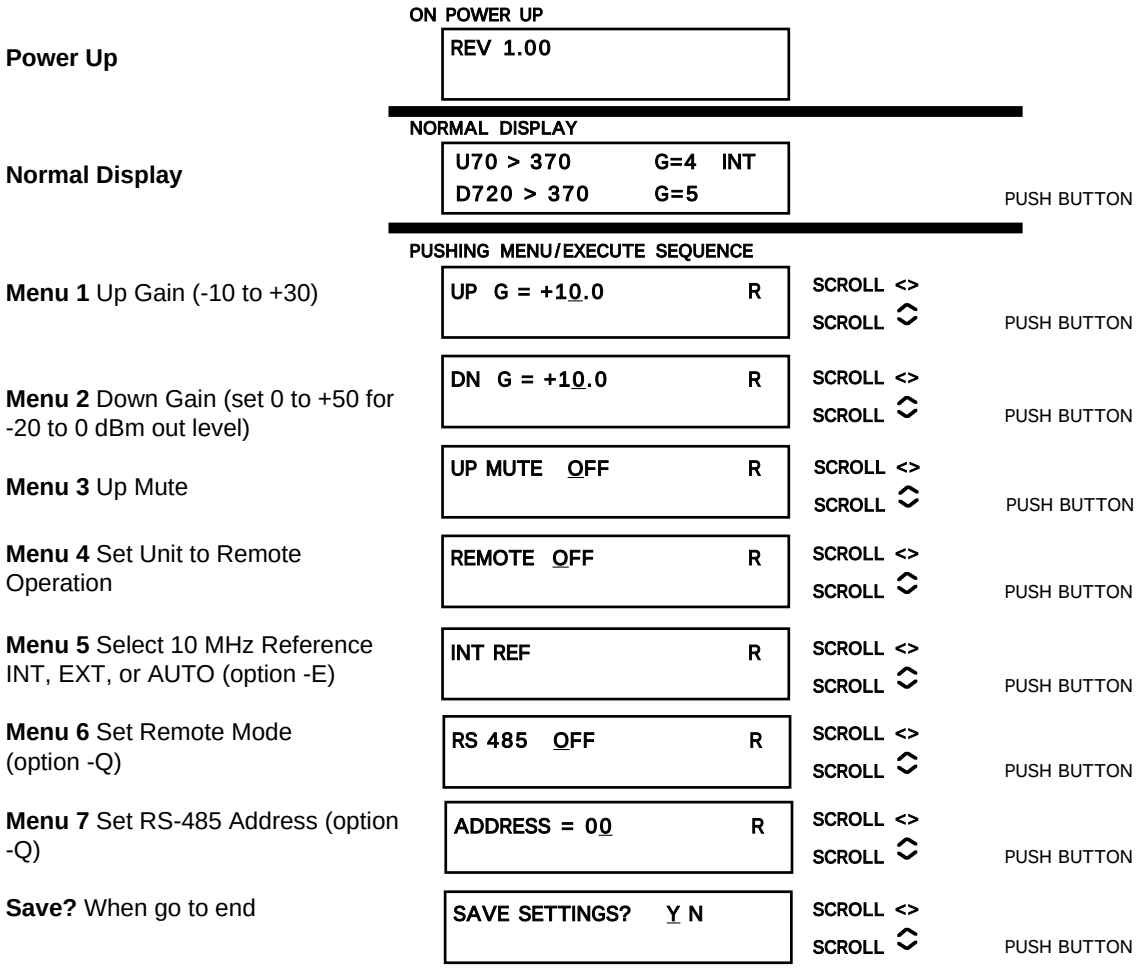
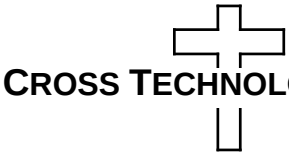


Figure 2.4 Menu Display and Sequence



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