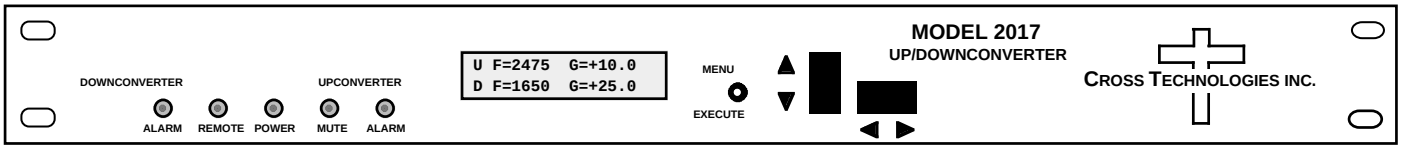
Instruction Manual

Model 2017-1625-140#
Up/Downconverter

August 2015, Rev. C



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

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INSTRUCTION MANUAL

MODEL 2017-1625-140# Up/Downconverter

TABLE OF CONTENTS **PAGE**

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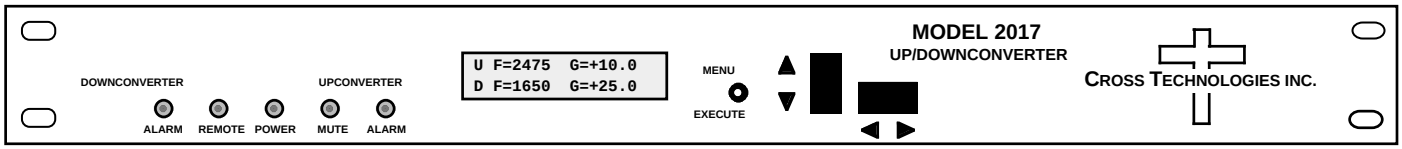
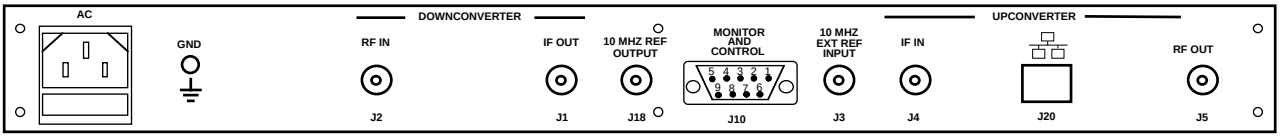
1.0 General

1.1 Equipment Description

The 2017-1625-140# S, L-band Up/Downconverter converts 140 ± 10 MHz to 2.0-2.6 GHz (Up) and 0.80-1.65 GHz to 140 ± 10 MHz (Down). Multi-function switches select the frequency, gain (upconverter -10 to +30 dB; downconverter 0 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 frequency, 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 SMA female for IF and RF. A high stability (±0.01 ppm) option (H) is also available. 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 2017-1625-140# Front and Rear Panels

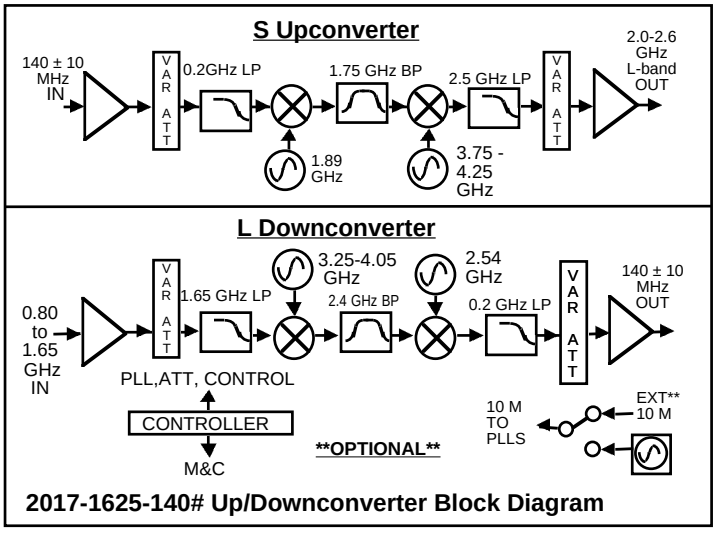


Figure 1.2 Model 2017-1625-140# Up/Downconverter Block Diagram

1.2 Technical Characteristics

TABLE 1.0 2017-1625-140# Up/Downconverter Specifications*

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

Input Characteristics (S)

Impedance/Return Loss	75 Ω /14 dB
Frequency	140 ± 10 MHZ
Noise Figure	20 dB @ max. gain
Input Level	-40 to -10 dBm

Output Characteristics (S)

Impedance/Return Loss	50 Ω/14 dB
Frequency (GHz)	2.0 to 2.6 GHz
Output Level Range	-20 to 0 dBm
1 dB comp. max. gain	+5 dBm
Mute @ 0 dBm out	>60 dB

Channel Characteristics

Gain, max. at Fc	+30 ±3 dB
Gain range, 1 ±1 dB steps	+30 dB to -10 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	± 0.5 dB
Frequency Sense	Non-inverting

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

Input Characteristics (L)

Impedance/Return Loss	50 Ω /14 dB
Frequency	0.80 to 1.65 MHz
Noise Figure (max)	15 dB @ max gain
Input Level	-70 to -20 dBm

Output Characteristics (L)

Impedance/Return Loss	50 Ω/14 dB
Frequency	140 ± 10 MHz
Output level/max linear	-30 dBm/-10 dBm
Output 1 dB compression	-5 dBm
Mute @ 0 dBm Out	N/A

Channel Characteristics

Gain, max. at Fc	+50 ±3 dB
Gain range, 1 ±1 dB steps	+50 dB to 0 dB
Image Rejection	> 50 dB, min.
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	± 0.5 dB
Frequency Sense	Non-inverting

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

Synthesizer Characteristics

Frequency Accuracy	± 1.0 ppm internal reference (±0.01 ppm, **option -H**)
Frequency Step	1 MHz, others optional
10 MHz In/Out Level	3 dBm ± 3 dB, 75 ohms (Option E)

Phase Noise @ Freq	100 Hz	1kHz	10kHz	100kHz	1MHz
dBC/Hz	-75	-70	-80	-95	-110

Controls, Indicators

Gain Selection	Direct readout LCD; pushbutton switches or remote selection
Power	Green LED
Alarm; Remote	Red LED, Yellow LED
Remote	RS232C, 9600 baud; (RS485, option Q, Ethernet, optional)

Other

RF/IF Connector	SMA (female) (see Table 2.2 for connector options)
10 MHz Connectors	BNC (female), 50Ω/75Ω
Alarm/Remote Connector	DB9 (female) - NO or NC contact closure on Alarm
Size	19 inch, 1RU standard chassis 1.75”high X 16.0”deep
Power	100-240 ±10% VAC, 47-63 Hz, 45 watts maximum

Continued on next page...

TABLE 1.0 2017-1625-140# Up/Downconverter Specifications... Continued from page 4

Available Options:

E	External 10 MHz Reference input & output
H	High Stability (±0.01ppm) Internal Reference
W78	RF/RF Monitor Ports (Front)
W31	External Temp 0C to +50C
X or X1	125 kHz or 100 kHz step size

Remote & M&C Interfaces:

Q	RS485 Remote Interface
W8	Ethernet with Web Browser
W18	Ethernet with Web Browser & SNMP
W28	Ethernet with TCP/IP, *Telnet*®

Connectors/Impeedance Interfaces:

-D	50Ω, BNC (RF), 50Ω BNC (IF)
-N	50Ω, N-Type (RF), 75Ω BNC (IF)
-M	50Ω, N-Type (RF), 50Ω BNC (IF)
-S	50Ω, SMA (RF), 50Ω BNC (IF)

Contact Cross for other available 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 2017-1625-140# and briefly describes them.

Table 1.1 2017-1625-140# Status Requests		
Command	**Syntax***	**Description**
Command Status	{aaS1}	Returns {aaS1bbbbccccdddeeffLMNOP} where:
		• bbbb = Tx frequency (bbbbbbb - 7 characters, option X)
		• cccc = Rx frequency (ccccccc - 7 characters, option X)
		• ddd = Tx gain (-10 to 30)
		• ee = Rx gain (00 to 50)
		• ff = Tx input level (10 to 40 => -10 to -40 dBm)
		• L = 0 - non-inverted Receiver; L = 1 - inverted
		• M = 0 - Receiver synth alarm
		• N = 0 - Transmitter synth alarm
		• O = 0 - Summary alarm
		• P = 0 - Transmit signal disabled (muted)
External 10MHz (option -E)	{aaS2}	Returns {aaS2b} where:
		• b = 1 - External 10MHz selected

*** PLEASE NOTE: The Address (aa) should only be used when RS-485 is selected (option -Q ONLY)**

C) Commands

Table 1.2 lists the commands for the 2017-1625-140# and briefly describes them. After a command is sent the 2017-1625-140# 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-digit command or status number, 1 through 9
D = 1 character or more of data (depends on command)
} = stop byte

Table 1.2 2017-1625-140# Commands

Command	Syntax*	Description
Set Transmitter Frequency	{aaC1xxxx}	where:
		• xxxx = 4 characters (7 characters, option X)
		• Range: 2000 to 2600 MHz
Set Transmitter Input Level	{aaClxx}	where:
		• xx = 2 characters
		• Range: 10 to 40 (-10 to -40 dBm)
Set Receiver Frequency	{aaC2xxxx}	where:
		• xxxx = 4 characters (7 characters, option -X)
		• Range: 0800 to 1650 MHz
Set Transmit Gain	{aaC3xxxx}	where:
		• xxxx = 2 or 3 characters
		• Range: -10 to 30 (-10 dB to 30 dB, in 1 dB steps)
Set Receiver Gain	{aaC4xxx}	where:
		• xx = 2 characters
		• Range: 00 to 50 (00 dB to 50 dB, in 1 dB steps)
Enable Tx	{aaCAx}	where x =:
		• 0 to disable Tx signal
		• 1 to enable Tx signal
External 10MHz (option -E)	{aaCEx}	where x =:
		• 0 to disable External 10MHz ref signal
		• 1 to enable External 10MHz ref signal
Downconverter Spectrum	{aaC7x}	where x =:
		• 0 for non-inverted
		• 1 for inverted
Enable Remote	#	Just # sign
Disable Remote	{aaCR0}*	{CR and zero}

*** PLEASE NOTE: The Address (aa) should only be used when RS-485 is selected (option -Q ONLY)**

2.0 Installation

2.1 Mechanical

The 2017-1625-140# 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 2017-1625-140# can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2017-1625-140# is assembled.

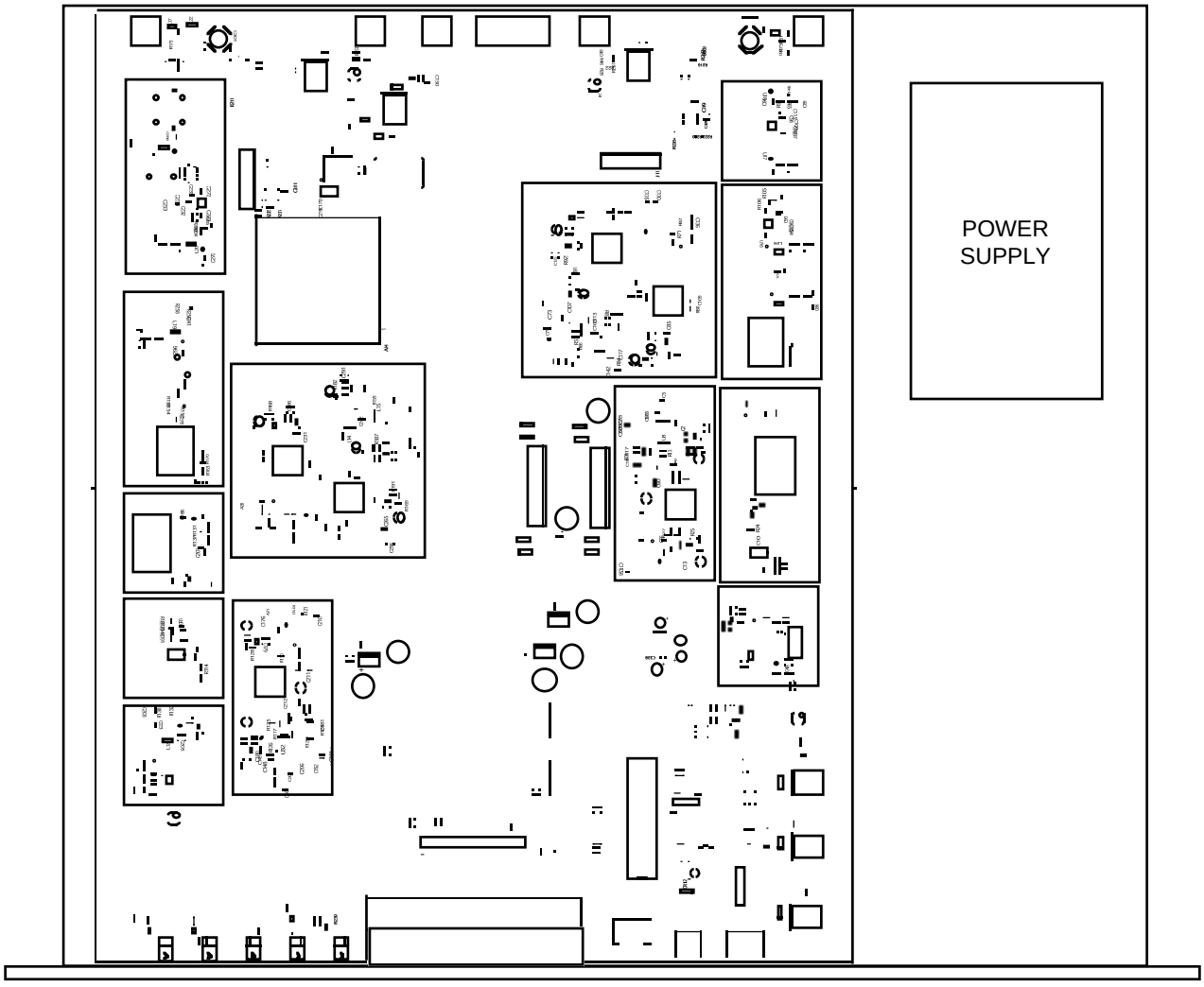


Figure 2.0 Model 2017-1625-140# Mechanical Assembly

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

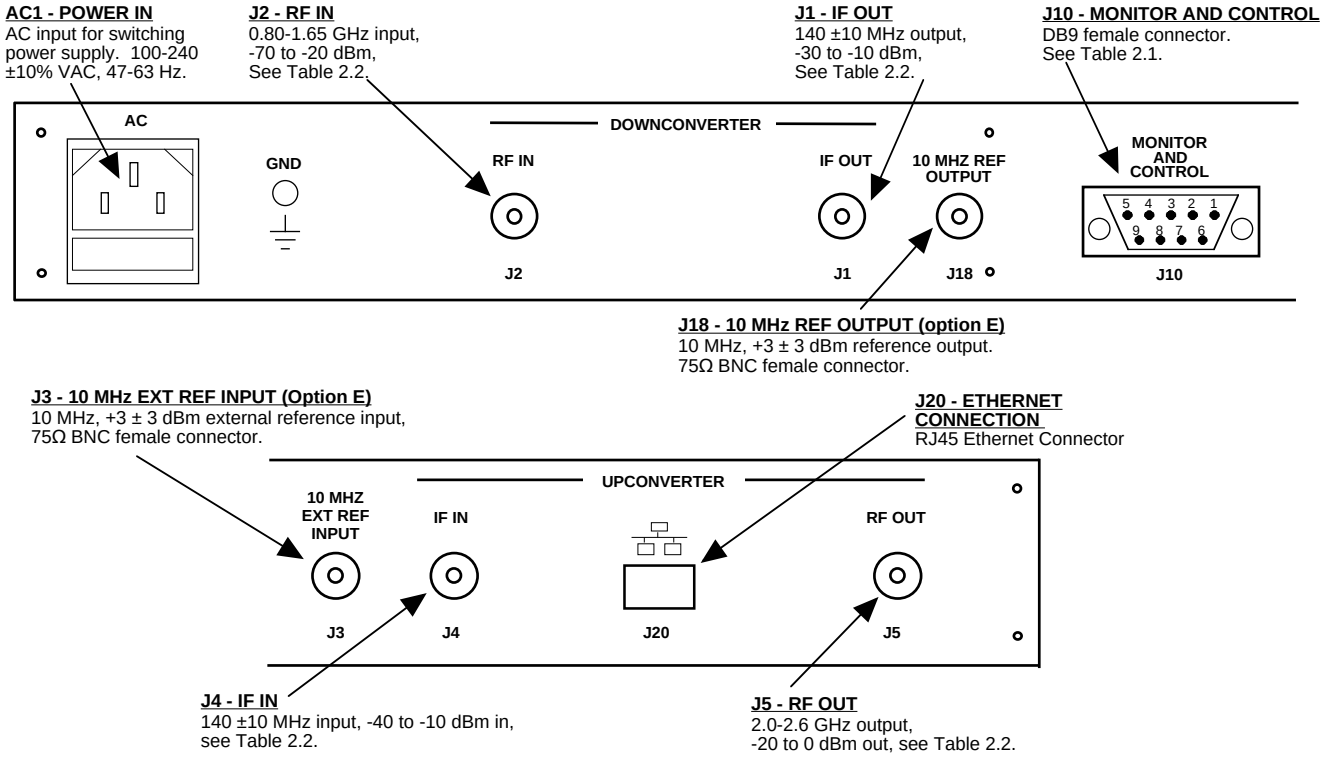


Figure 2.1 Model 2017-1625-140# Rear Panel I/O's

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, 75Ω	Type F, 75Ω
-D	BNC, 50Ω	BNC, 50Ω
-N	BNC, 50Ω	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.

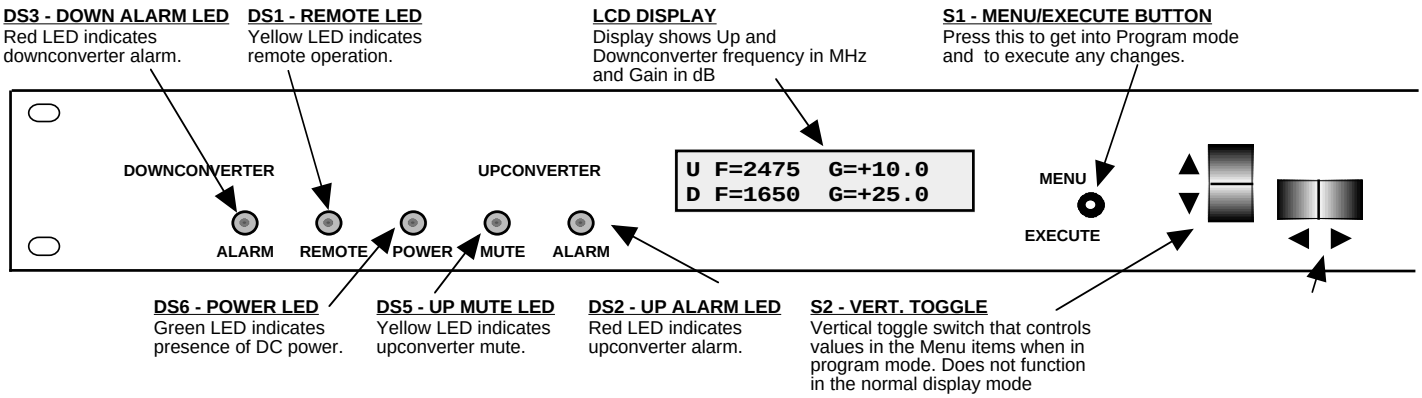


Figure 2.2 Model 2017-1625-140# Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 2017-1625-140#, Upconverter Section

1.) Connect a -40 dBm to -10 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 to get an output level in the -40 to -10 dBm range (See Section 2.5 Menu Settings).
6.) Set the gain to get an output level in the -20 to -0 dBm range (See Section 2.5 Menu Settings).
7.) Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.2).

2.4.2 Installing and Operating the 2017-1625-140#, Downconverter Section

1.) Connect a -70 dBm to -20 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 -30 to -10 dBm 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.

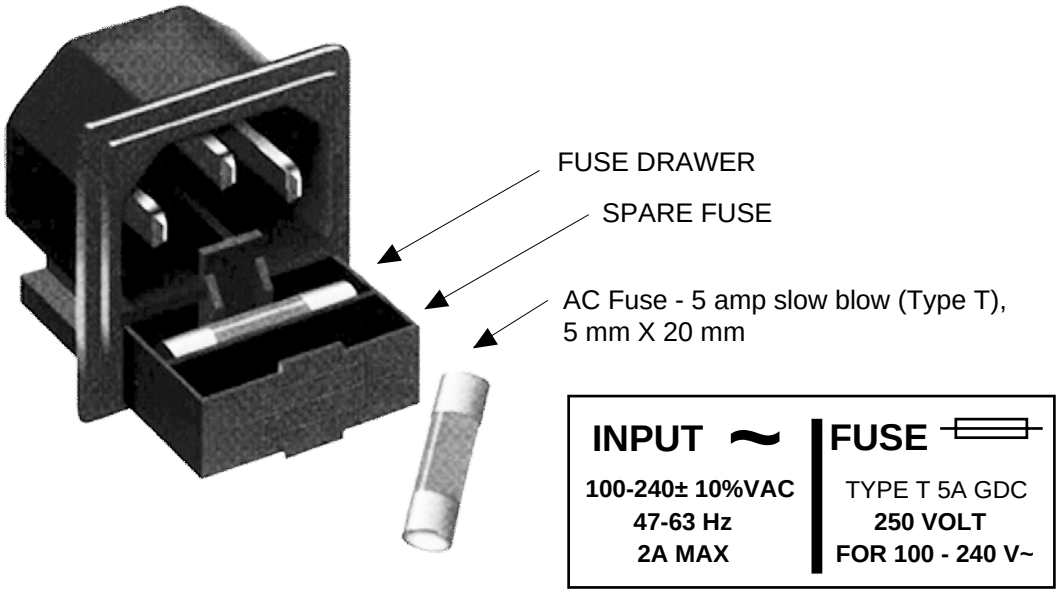


Figure 2.3 Fuse Location and Spare Fuse

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 2.4):

Power Up
Normal Display

Menu 1 Up Frequency in MHz
Menu 2 Up Input Lvl (Set from -40 to -10)
Menu 3 Up Gain (+30 to -10)
Menu 4 Down Frequency in MHz
Menu 5 Down Gain (set +50 to 0 for -20 to -10 dBm out range)
Menu 6 Up Mute
Menu 7 Set Unit to Remote Operation
Menu 8 Set Downconverter Spectrum Sense
Menu 9 Select External 10 MHz Ref (option -E)
Menu 10 Set RS-485 mode (option -Q)
Menu 11 Set RS-485 address (option -Q)
Menu 12 View PCB Temperature (option -T)

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.

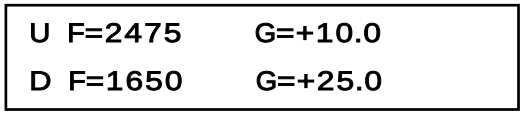
2.5.2 Power-On Settings

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.

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



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 12 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 FREQUENCY:

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 = 2225.000          R
```

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

```
UP  F = 2125.000          R
```

By using the horizontal rocker switch the cursor can be moved left or right.

```
UP  F = 2125.000          R
```

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:

```
UP INLVL = -20            R
```

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

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 :

```
U F=2475      G=+10.0
D F=1650      G=+25.0
```

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

2.5.5 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.

2.5.5.1 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.

The following display is for changing the upconverter input level. This is an important setting to optimize spurious and should be made as accurately as possible:

```
UP INLVL = -20          R
```

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             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 :

```
U F=2475      G=+10.0
D F=1650      G=+25.0
```

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. 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 = +15                    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 the :

```
U F=2475      G=+10.0
D F=1650      G=+25.0
```

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

2.5.5 Alarm Indications

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

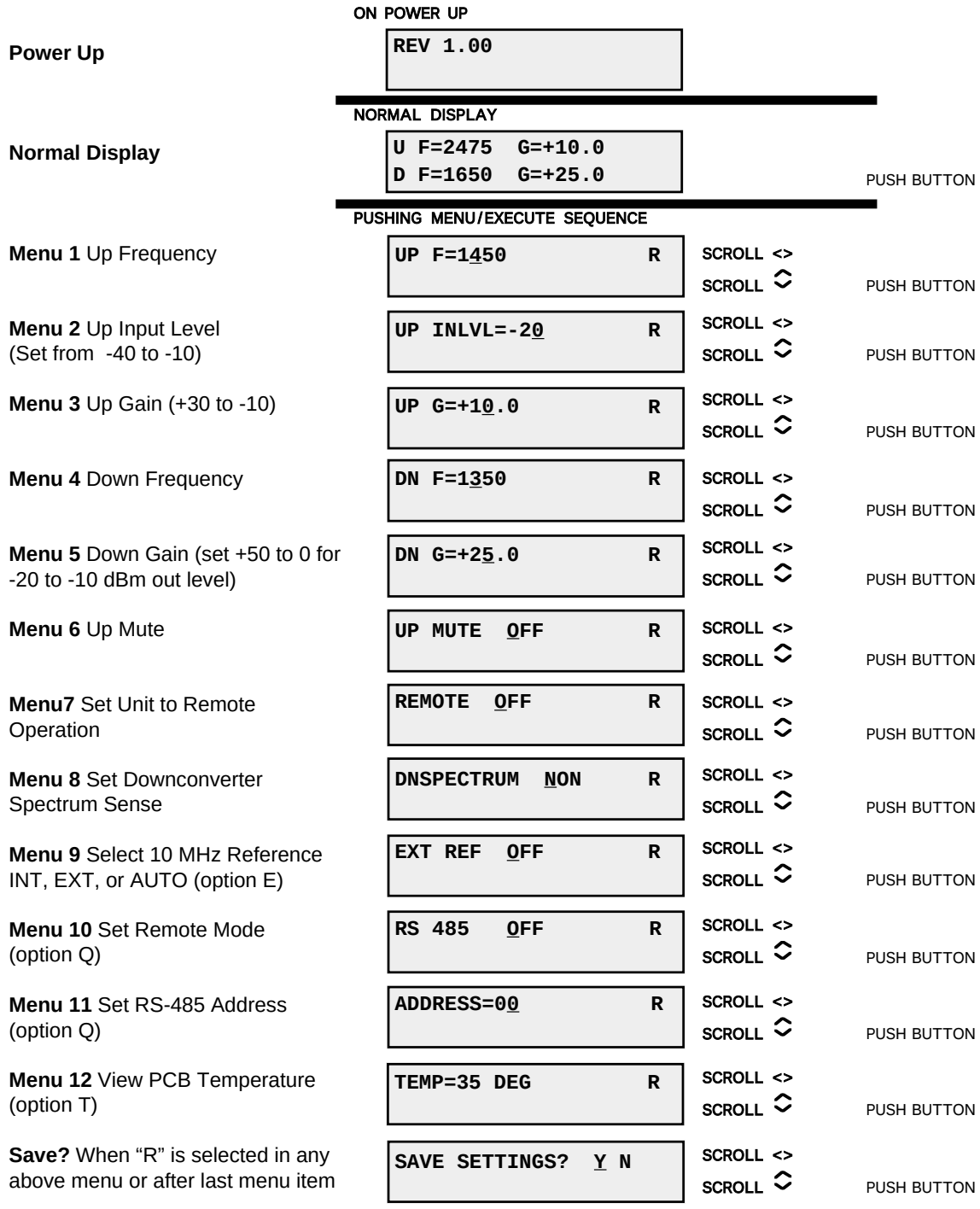
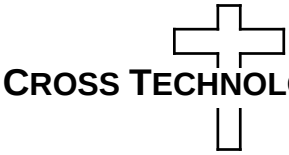


Figure 2.4 Menu Display and Sequence



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