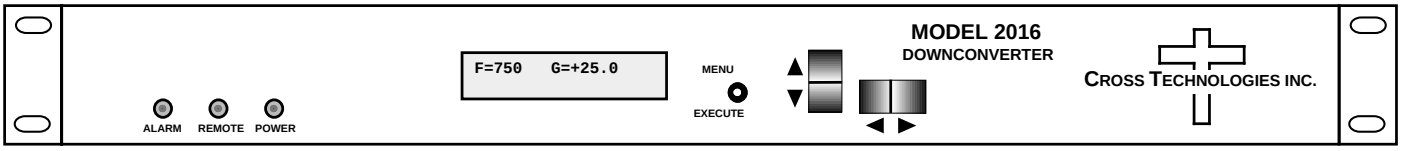
Instruction Manual

Model 2016-95
Downconverter

March 2017, Rev. A



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 2016-95 Downconverter

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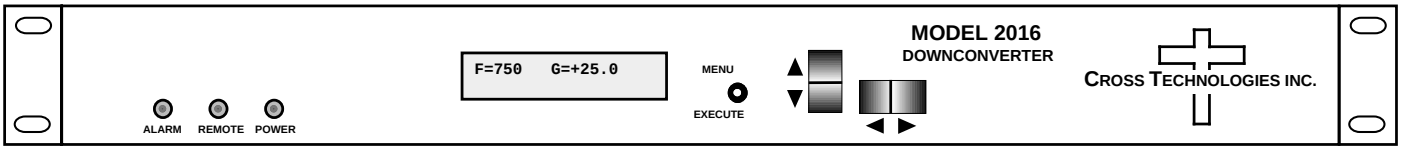
MODEL 2016-95 Downconverter

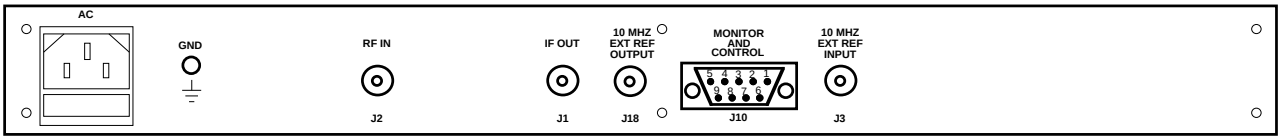
1.0 General

1.1 Equipment Description

The 2016-95 Downconverter converts 250 to 950 MHz to 70 ± 18 MHz in 1 MHz steps with low group delay and flat frequency response. Synthesized local oscillators (LO) provide frequency selection. Multi-function push button switches select the input frequency, gain, and other parameters. Front panel LEDs provide indication of DC power, PLL alarm or Remote operation. Gain is adjustable manually (MGC) over a 0 to 50 dB range. The frequency and gain are remotely selectable. Parameter selection and frequency and gain settings appear on the LCD display. Connectors are Type F female for the RF, and BNC female for the IF and optional external 10 MHz reference input and output (option E). Other connector options are available. The 2016-95 is powered by a 100-240 ±10%VAC power supply, and is contained in a 1 3/4" X 19" X 16" rack mount chassis.

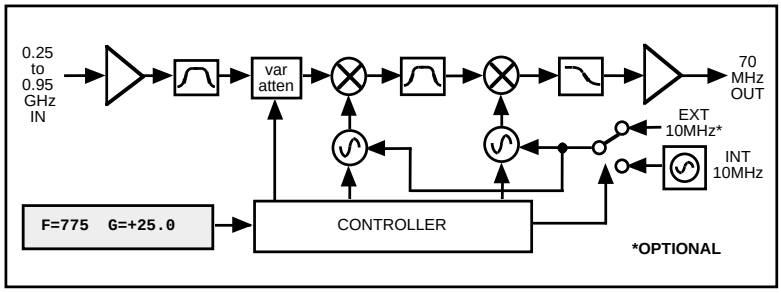


FRONT



REAR

FIGURE 1.1 Model 2016-95 Front and Rear Panels



Block Diagram

FIGURE 1.2 Model 2016-95 Downconverter Block Diagram

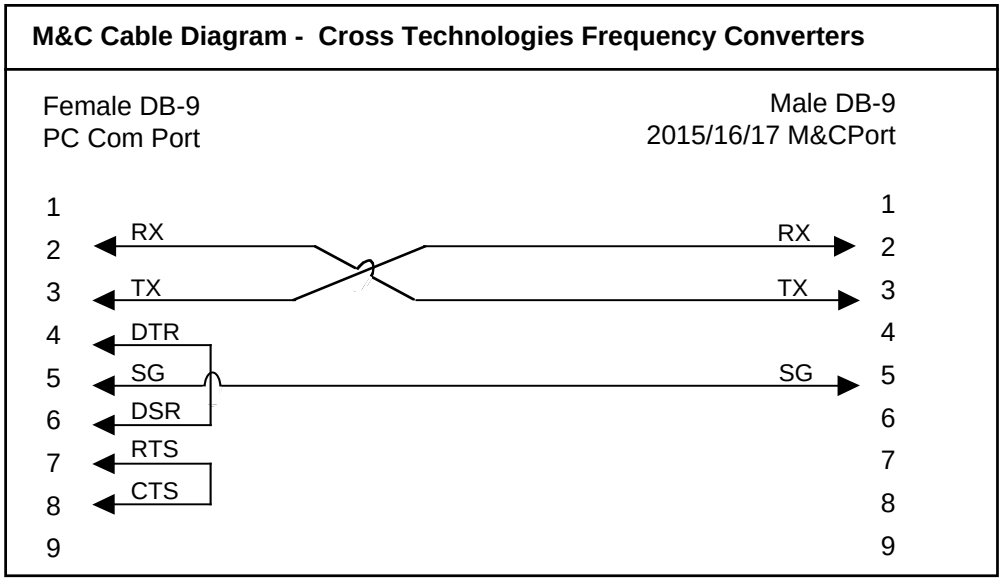
1.2 Technical Characteristics

TABLE 1.0 2016-95 Downconverter Specifications**	
Input Characteristics	
Input Impedance/Return Loss	75Ω/12 dB
Frequency	250 to 950 MHz
Noise Figure, Max.	15 dB max. gain
Input Level Range	-70 to -20 dBm
Input 1dB compression	-15 dBm
Output Characteristics	
Impedance/Return Loss	75Ω / 18 dB
Frequency	70 ±18 MHz
Output Level Range	-20 to -10 dBm
Output 1 dB Compression	-5 dBm
Channel Characteristics	
Gain Range (adjustable)	0.0 to +50.0 dBm, 1 dB steps
Image Rejection	> 50 dB, min.
Frequency Response	±1.5 dB, 250 - 950 MHz; ±0.5 dB, 36 MHz BW; ±1.0 dB, 40 MHz BW
Spurious Response	< -50 dBc in band
Group Delay, max.	0.02 ns/MHz^2 parabolic; 0.06 ns/MHz linear; 1 ns ripple
Frequency Sense	Inverting or Non-inverting (user selectable)
Synthesizer Characteristics	
Frequency Accuracy	±1.0 ppm internal reference (±.01ppm, Option -H)
Frequency Step	1.0 MHz minimum
10 MHz Level (In or Out)	3 dBm, ± 3 dB, (Option -E)
Controls, Indicators	
Frequency/Gain Selection	Direct readout LCD; manual or remote selection
Power, Alarm, Remote	Green LED; Red LED, Yellow LED
Remote	RS232C, 9600 Baud; (RS485, Option -Q)
Other	
RF, IF Connectors	Type F, 75Ω(female), BNC, 75Ω (female)
IF, 10 MHz Connectors	BNC (female), 50Ω / 75Ω (Option -E)
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
Available Options	
E -	External 10 MHz reference input & output
H -	High Stability (± 0.01 ppm) internal reference
Q -	RS-422/485 Remote Interface
T -	Temperature Sensor
W8 -	Ethernet M&C Remote Interface
X -	125 kHz step size
Connector Options	See TABLE 2.2
**+10˚C to +40˚C; Specifications subject to change without notice	**Cross Technologies, Inc., 2017**

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 1.2 lists the status requests for the 2016-95 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 1.2 2016-95 Status Requests		
Command	**Syntax***	**Description**
Command Status	{aaS1}	Returns {S1bbbbcccIA} where:
		• bbbb = Rx frequency
		• cc = Rx gain
		• I = 1 - spectrum invert enabled
		• A = summary alarm; 1=alarmed, 0=normal
10MHz Ref Status	{aaS2}	Returns {S2E} where:
(option -E only)		• E = 1 - external 10 MHz switched in

C) Commands - Table 1.1 lists the commands for the 2016-95 and briefly describes them. After a command is sent the 2016-95 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 1.1 2016-95 Commands

Command	Syntax*	Description
Set Receiver Frequency	{aaC2xxxx}	where:
		• xxxx = 4 characters
		• Range: 0250 to 0950 MHz, in 1 MHz steps
Set Receiver Gain	{aaC4xx}	where:
		• xx = 2 characters
		• Range: 00 to 50 (0 dB to +50 dB, in 1 dB steps)
Enable Spectrum Invert	{aaC7x}	where x =:
		• 0 to disable spectrum invert
		• 1 to enable spectrum invert
Enable External 10MHz IN	{aaCEx}	where x =:
(option -E only)		• 0 to disable External 10MHz ref signal
		• 1 to enable External 10MHz ref signal
Enable Remote	#	Just # sign
Disable Remote	{aaCR0}	{CR and zero}

2.0 Installation

2.1 Mechanical - The 2016-95 consists of one RF/Controller PCB housed in a 1 RU (1 3/4 inch high) by 16 inch deep chassis. A switching, ±12, +24, +5 VDC power supply provides power for the assemblies. The 2016-95 can be secured to a rack using the 4 holes on the front panel. Figure 2.1 shows how the 2016-95 is assembled.

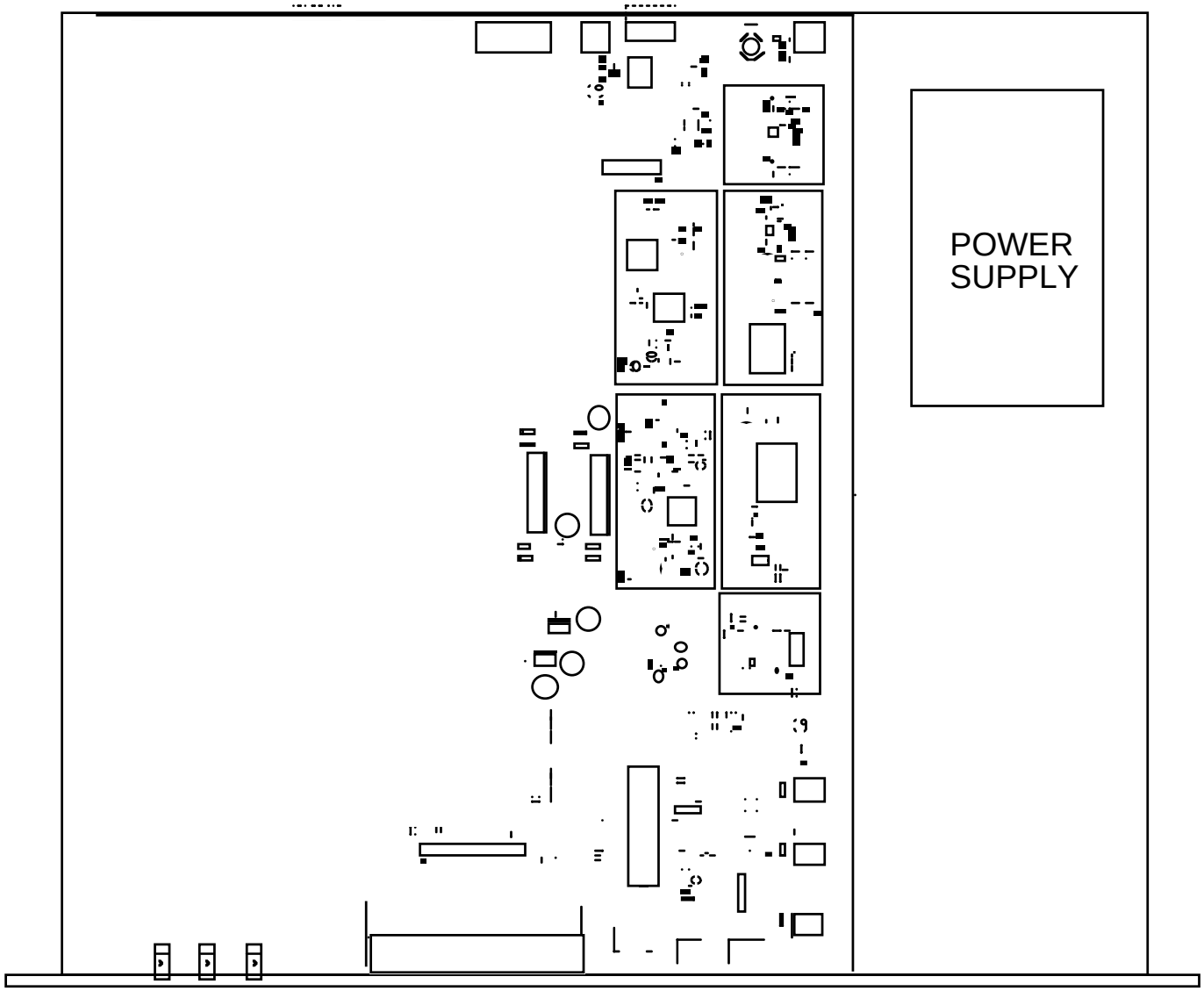


FIGURE 2.1 2016-95 Mechanical Assembly

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

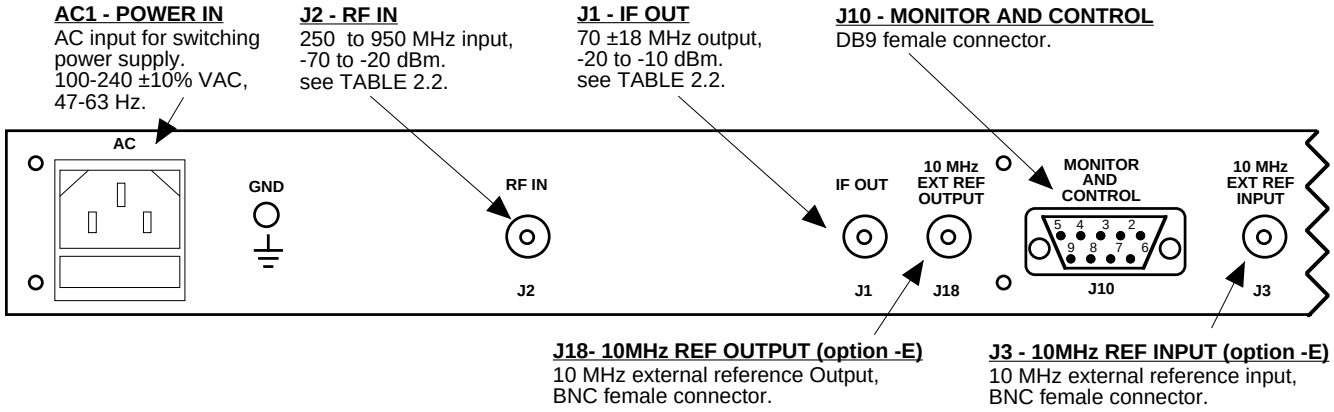


FIGURE 2.2 2016-95 Rear Panel I/Os

TABLE 2.1 J10 Pinouts (RS-232C*)	
Pin	**Function**
1	Not Used
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Not Used
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Closed
8	Not Used
9	Alarm Relay: Normally Open

***Remote Serial Interface**

Interface: DB-9 Male

Protocol: RS-232C, 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	F-Type, 75Ω
-B	BNC, 75Ω	BNC, 75Ω
-C	BNC, 75Ω	BNC, 50Ω
-D	BNC, 50Ω	BNC, 50Ω
-K	BNC, 50Ω	BNC, 75Ω
-M	BNC, 50Ω	Type N, 50Ω
-N	BNC, 75Ω	Type N, 50Ω

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

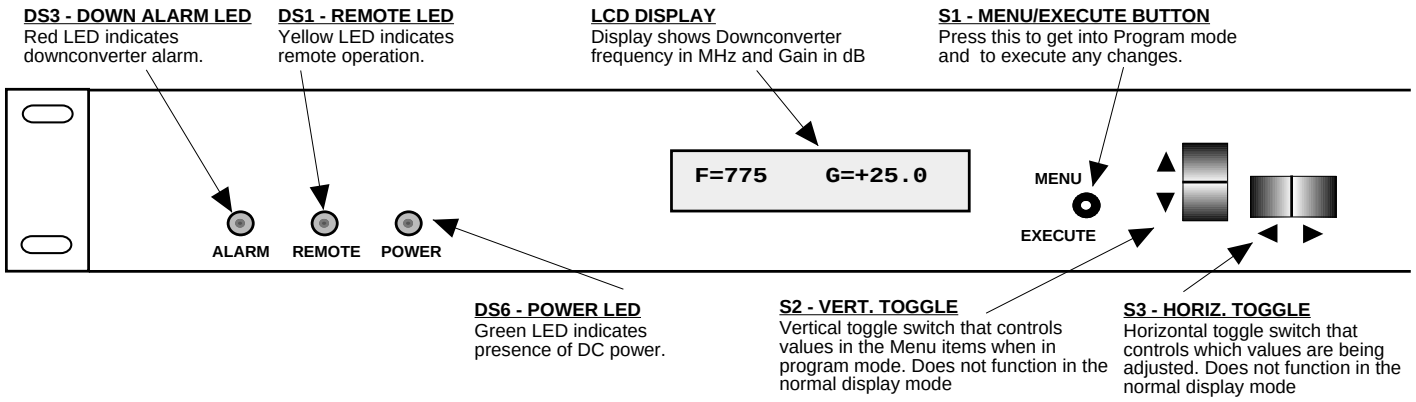


FIGURE 2.3 2016-95 Front Panel Controls and Indicators

2.4 Operation

2.4.1 Installing and Operating the 2016-95 Downconverter

1. Connect a -70 dBm to -20 dBm signal to RF IN, J2 (Figure 2.2)
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 input frequency (See Section 2.5 Menu Settings).
5. Set the gain for 0.0 to +50.0 dB (See Section 2.5 Menu Settings).
6. Be sure DS6 (green, DC Power) is on and DS3 (red, Alarm) is off (Figure 2.3).
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 2.4. There is a spare fuse in the near slot. If a fuse continues to open, the power supply is most likely defective.

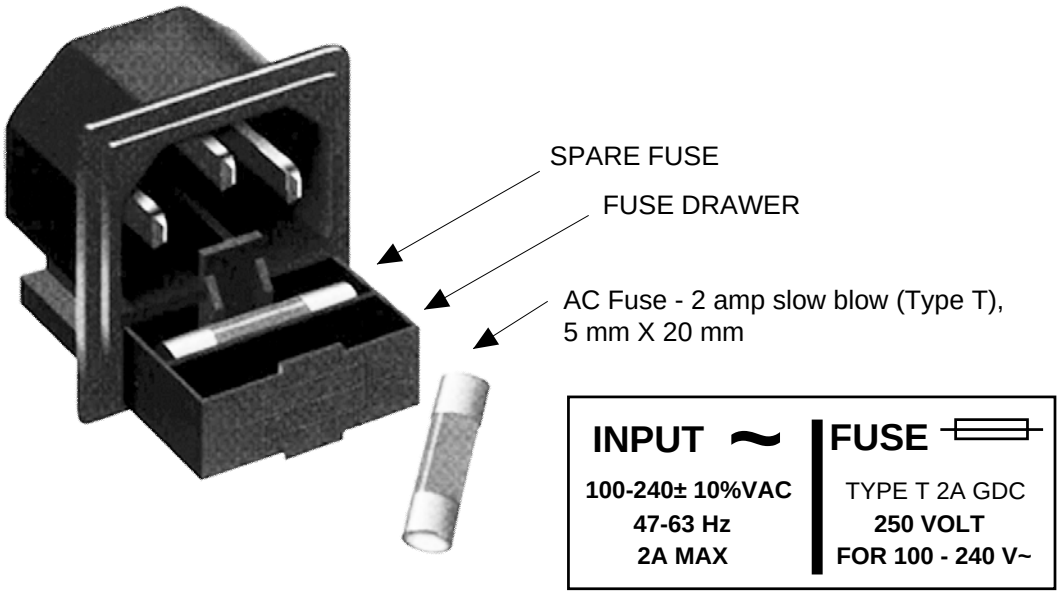


FIGURE 2.4 Fuse Location and Spare Fuse

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 2.5):

Power Up
Normal Display

Menu 1 Frequency in MHz

Menu 2 Gain (0 to +50, 1dB steps)

Menu 3 Set Unit to Remote Operation

Menu 4 Select Non-inverting or Inverting Spectrum

Menu 5 Select External 10 MHz Ref (option -E)

Menu 6 Set Remote mode (option -Q)

Menu 7 Set RS-485 address (option -Q)

Save Menu When go to end

Alarm indications appear on the LEDs (See figure 2.3).

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

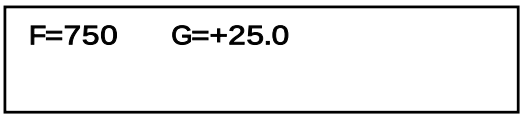
NOTE: THE LAST STATUS OF A UNIT IS RETAINED EVEN WHEN POWER IS REMOVED. WHEN POWER IS RESTORED, THE UNIT WILL RETURN TO IT'S PREVIOUS SETTINGS.

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 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 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 2.5 for the sequence of menu options. The following display is for changing the downconverter frequency:

```
F = 775                    R
```

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

```
F = 875                    R
```

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

```
F = 875                    R
```

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

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

```
G = +25.0                  R
```

OR you can scroll to "R", push the Menu/Execute switch to get to:

```
SAVE SETTINGS?     YN
```

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

```
F=750     G=+25.0
```

Figure 2.5 gives 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.

To change the DOWNCONVERTER GAIN:

Push the Menu/Execute switch to get to the gain setting (See Figure 2.5 for the sequence of menu options):

```
G = +25.0                    R
```

Pressing the Up/Down switch will change the gain in 1 or 10 dB steps depending on the cursor location:

```
G = +35.0                    R
```

By using the horizontal rocker switch the cursor can be moved left or right. Pressing the Up/Down switch will toggle the display digit selected until you have the desired gain.

```
G = +35.0                    R
```

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.

```
SAVE SETTINGS?      YN
```

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

```
F=750     G=+25.0
```

Figure 2.5 gives 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. The Mute LED will light if you select Mute and the Remote LED will light when you select the Remote mode.

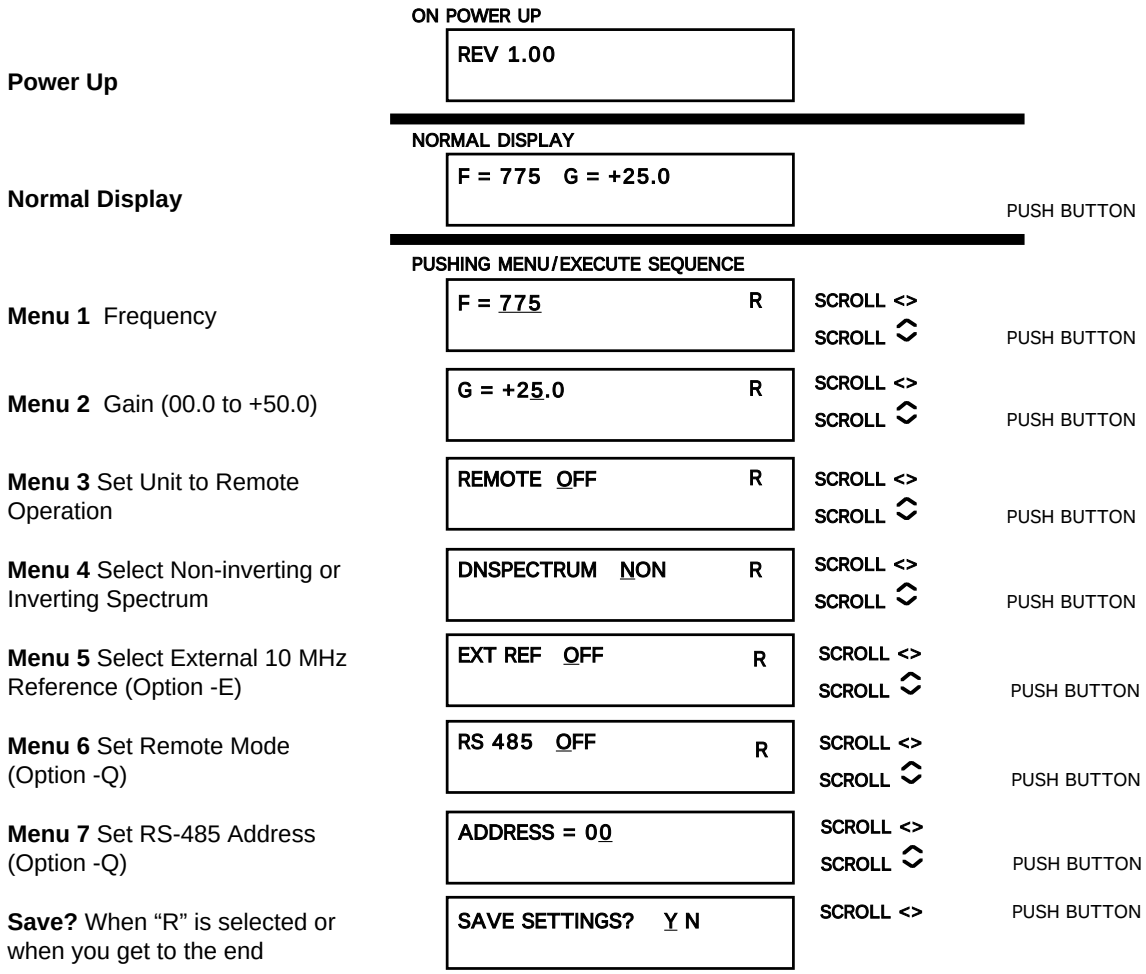


FIGURE 2.5 Menu Display and Sequence

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.

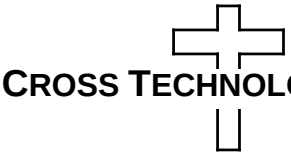
C. **Elevated operating ambient temperature** - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack may be greater than room ambient temperature. Therefore, consideration should be given to Tmra.

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 units 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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