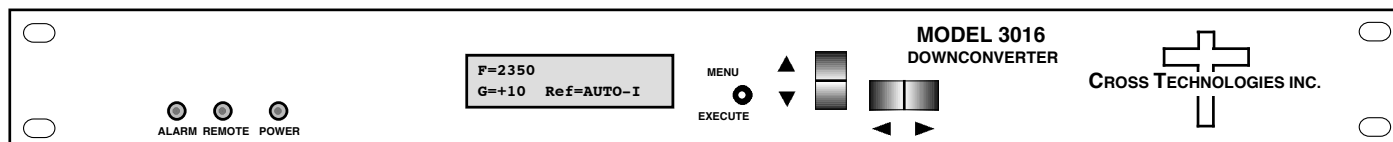


Instruction Manual

Model 3016-0004 Downconverter

July 2026, Rev. 0



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INSTRUCTION MANUAL

MODEL 3016-0004 Downconverter

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MODEL 3016-0004 Downconverter

1.0 General

1.1 Equipment Description

The 3016-0004 Downconverter converts 0.15 to 4.0 GHz to 70 $\pm$ 20 MHz in 1 MHz steps (125kHz, 100kHz, 1kHz, optional) with +0 dB gain. The 0.15 to 4 GHz is first converted to 6.0 GHz with an agile, high side LO upconverter to obtain the wide tuning range and then to 70 MHz. Synthesized local oscillators (LO) provide frequency selection. Multi-function switches select the RF frequency and other parameters. Front panel LEDs provide indication of DC power (green), PLL alarm (red), and remote operation (yellow). Remote operation allows selection of frequency. Parameter selection and frequency settings appear on the LCD display. Connectors are BNC (female) for IF and external 10MHz reference input and output, and SMA (female) for the RF input. The unit is powered by a 100-240 $\pm$ 10% VAC power supply, and housed in a 1 3/4" X 19" X 18" rack mount chassis.

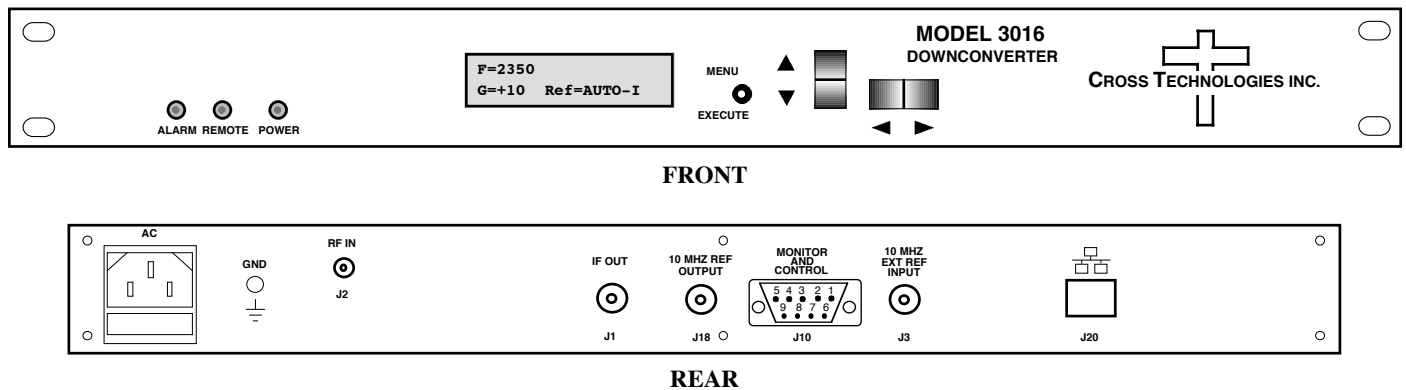


FIGURE 1.1 Model 3016-0004 Front and Rear Panels

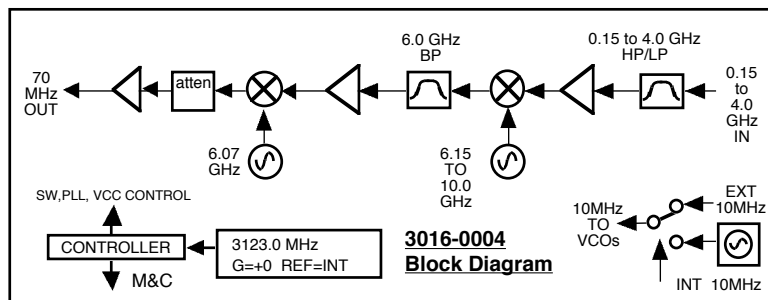


FIGURE 1.2 Model 3016-0004 Downconverter Block Diagram

1.2 Technical Characteristics

TABLE 1.1 3016-0004 Downconverter Specifications*

Input Characteristics	
Impedance / Return Loss	50Ω / 14dB minimum
Frequency	0.15 to 4.0 GHz
Input Level Range	-35 to -25 dBm
Output Characteristics (IF)	
Impedance / Return Loss	75Ω / 14 dB min
Frequency	70 ± 20 MHz
Output Level Range	-35 to -25 dBm
Output 1 dB Compression	-15 dBm

Channel Characteristics	
Gain	0 ± 2 dB, at 2 GHz in to 70 MHz out
Frequency Response	±3.0 dB, 0.15-4.0 GHz; +/- 1.5 dB over any 1 GHz band
Spurious Response	< -50 dBc, in band, 0.15 to 4.0 GHz input; 70 ±20 MHz, -25dBm output
Intermod	< -50 dBc for two carriers, 2 GHz +/- 2 MHz each at -20 dBm out
Group Delay, max.	4 ns total, 70 MHz +/- 20 MHz output
Frequency Sense	Non-inverting
Synthesizer Characteristics	
Frequency Accuracy	± 0.01 ppm maximum over temp internal reference; external reference input
Frequency Step	1 MHz minimum; other steps optional
External 10 MHz Level	+3 dBm ± 3 dB

Phase Noise @ Frequency	100 MHz	1kHz	10kHz	100kHz	1MHz
dBc/Hz	-65	-70	-80	-90	-100

Controls, Indicators	
Frequency / Gain Selection	Direct readout LCD; manual or remote selection
Power, Alarm, Remote, Mute	Green LED, Red LED, Yellow LED, Yellow LED
Remote	RS232C, 9600 baud (RS422/485/option -Q, Ethernet/option -W8, -W18, -W28 or -W828

Other	
RF, IF Connectors	SMA (Female). BNC. 75Ω (female). (Others Optional)
10 MHz Connectors	BNC (female) 75Ω works for 50 or 75 ohms
Alarm/Remote Connector	DB9 (female) - NO or NC contact closure on Alarm
Size	19 inch. 1RU Standard Chassis 1.75" high X 18.0" deep
Power	100-240 ±10% VAC. 47-63 Hz. 30 watts max.

Continued on next page...

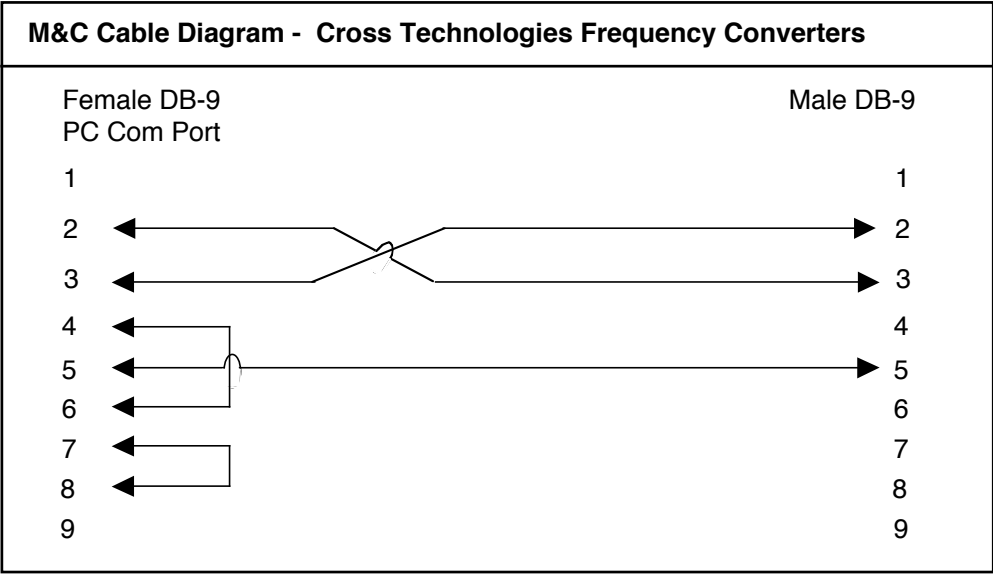
Continued from page 4.

Available Options	
- Q	RS485/422
- W8	Ethernet with Web Browser (WB)
- W18	Ethernet with Web Browser & SNMP
- W28	Ethernet with TCP/IP, Telenet
- W828	W8 +W18 +W28
Connector / Impedance	
- S	50Ω SMA (RF), 50Ω BNC (IF)
- SS	50Ω SMA (RF), 50Ω 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-485, RS-422 or RS-232C (selectable), 9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit.



B) Commands - Table 1.2 lists the commands for the 3016-0004 and briefly describes them.

After a command is sent the 3016-0004 sends a return ">" indicating the command has been received and executed.

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

[illegible]

C) Status Requests - Table 1.2 lists the status requests for the 3016-0004 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.

[illegible]

C) Status Requests - Continued...

* 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 3016-0004 Status Requests/Inquiries		
Command	Syntax	Description
Get product/model info	{aaSV}	returns {aaSV3016-0004rev.5xx}
		where:
		aa = unit address, range = 00 to 31, only used if interface
		is RS485, otherwise omit
		V = command code
		3016-0004 = product model and rev. 5.xx
		is the firmware revision.
		The unit will append the '>' character if the command
		is successfully processed.
Get IP address	{aaSi}	returns {aaSixxx.xxx.xxx.xxx}
(ethernet option)		where:
		aa = unit address, range = 00 to 31, only used if interface
		is RS485, otherwise omit
		i = command code
		xxx.xxx.xxx.xxx = IP address
Get subnet mask	{aaSs}	returns {Ssxxx.xxx.xxx.xxx}
(ethernet option)		where xxx.xxx.xxx.xxx = subnet mask

1.4 Environmental Use Information

- A. 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 T_{mra} .
- B. 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.
- C. Mechanical loading** - Mounting of equipment in a rack should be such that a hazardous condition does not exist due to uneven weight distribution.
- D. 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.
- E. 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).
- F. 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 3016-0004 consists of one RF/Controller PCB which is 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 assembly.

The 3016-0004 can be secured to a rack using the 4 holes on the front panel. Figure 2.1 shows how the 3016-0004 is assembled.

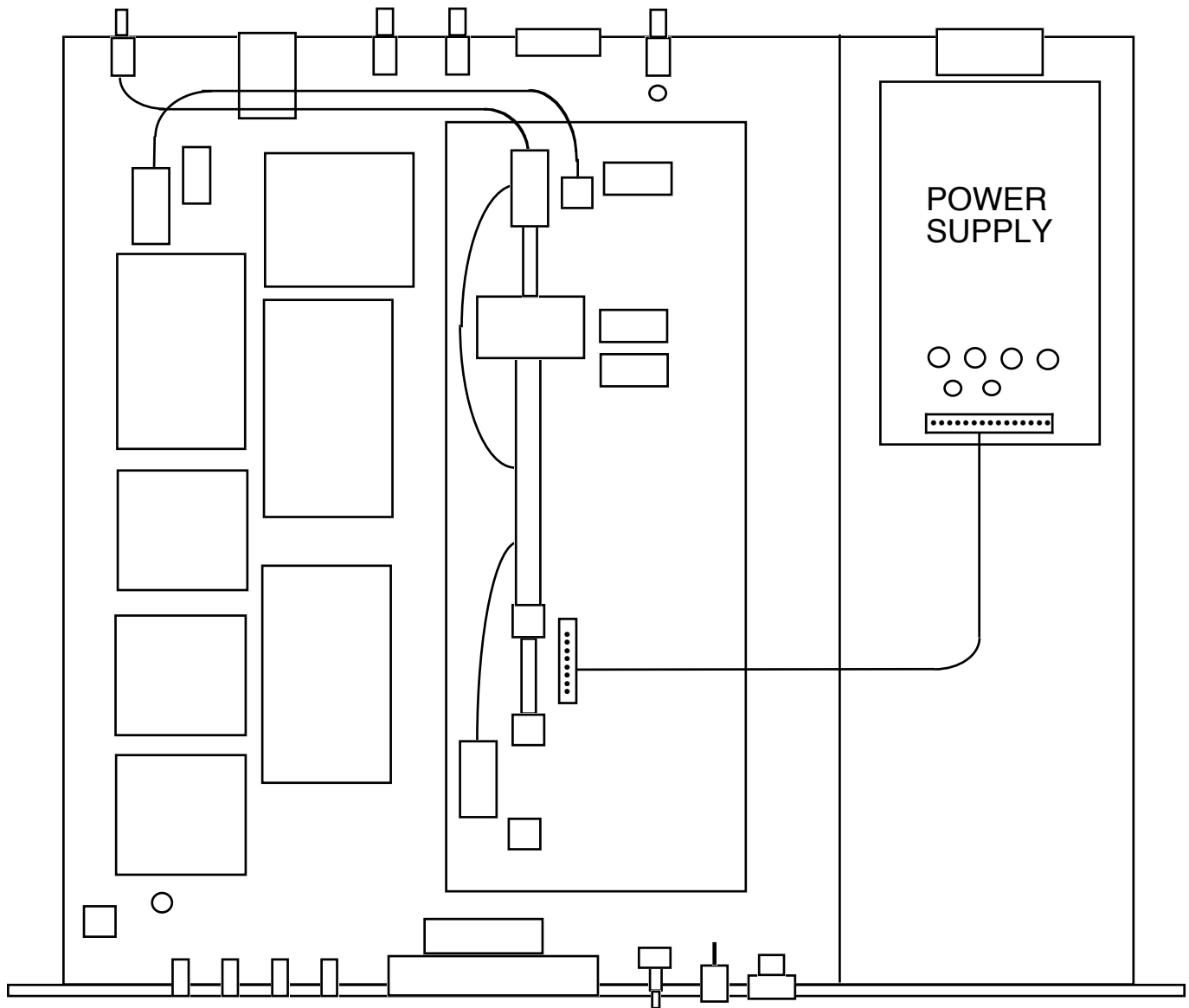


FIGURE 2.1 3016-0004 Mechanical Assembly

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

FIGURE 2.2 3016-0004 Rear Panel Inputs and Outputs

Table 2.1 J10 Pinouts (RS-485/RS-422/RS-232C)*	
Pin	Description
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	Ground
6	Alarm Relay - Common
7	Alarm Relay - Normally Open
8	Not Used
9	Alarm Relay - Normally Closed

*Interface: DB-9 Female; Protocol: RS-485, RS-422, or RS-232C (selectable), 9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit

Table 2.2 Connectors/Impedance	
S	SMA (RF), 50Ω BNC (IF)
SS	SMA (RF), SMA (IF)
	Super SMA for > 18GHz

2.3 Front & Rear Panel Controls and Indicators - Figure 2.3 shows the front and rear panel controls and indicators.

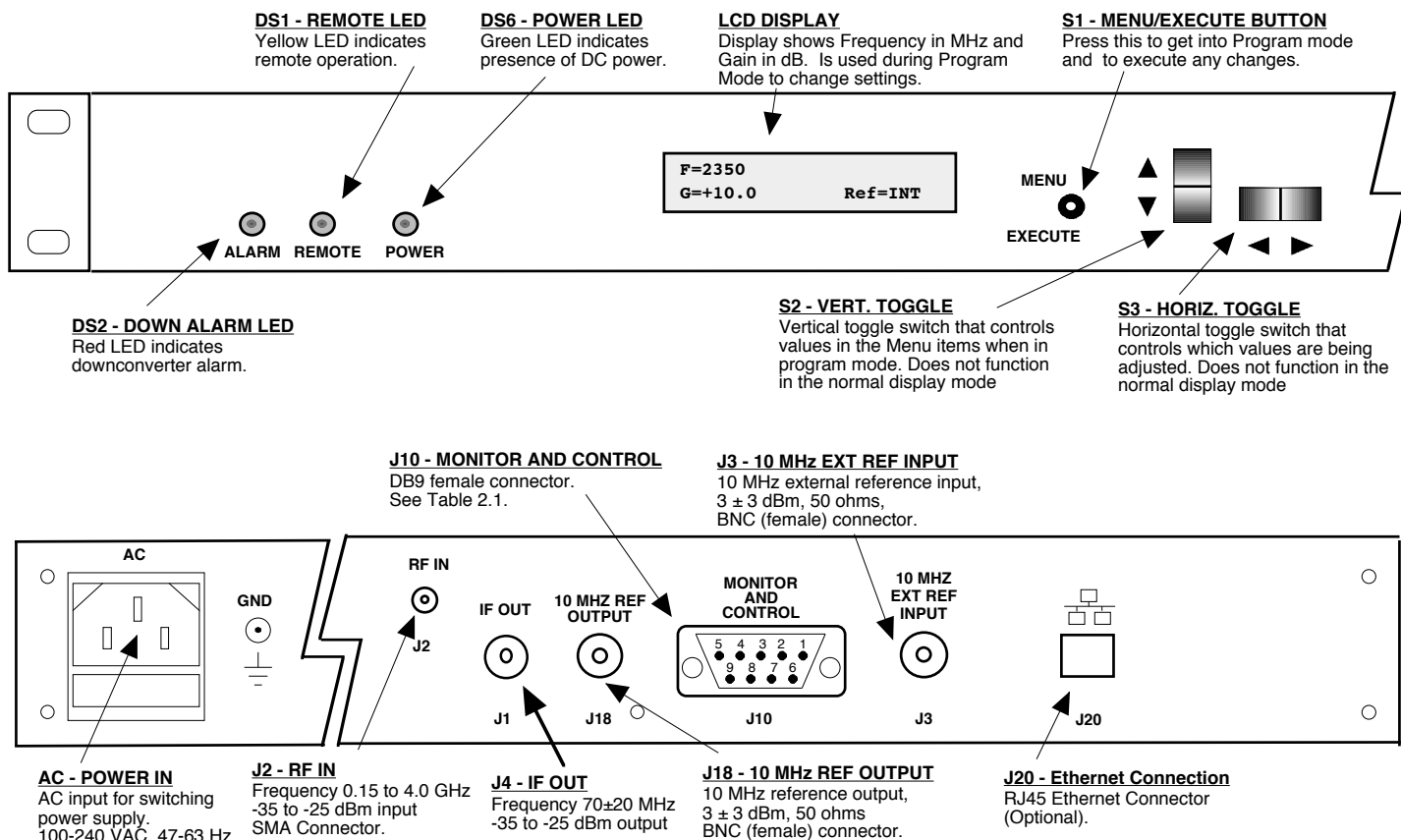


Figure 2.3 Front & Rear Panel Controls & Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 3016-0004 Downconverter

1. Connect a -35 dBm to -25 dBm signal, to RF IN, J2 (Figure 2.3, page 9)
2. Connect RF OUT, J5, to the external equipment.
3. Connect 100- 240 $\pm$ 10% VAC, 47 - 63 Hz to AC input on the back panel.
4. Set the desired input frequency (See Section 2.5 Menu Settings, page 13).
5. Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.3, page 9).
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 2.4, page 10. There is a spare fuse in the near slot.
If a fuse continues to open, the power supply is most likely defective.

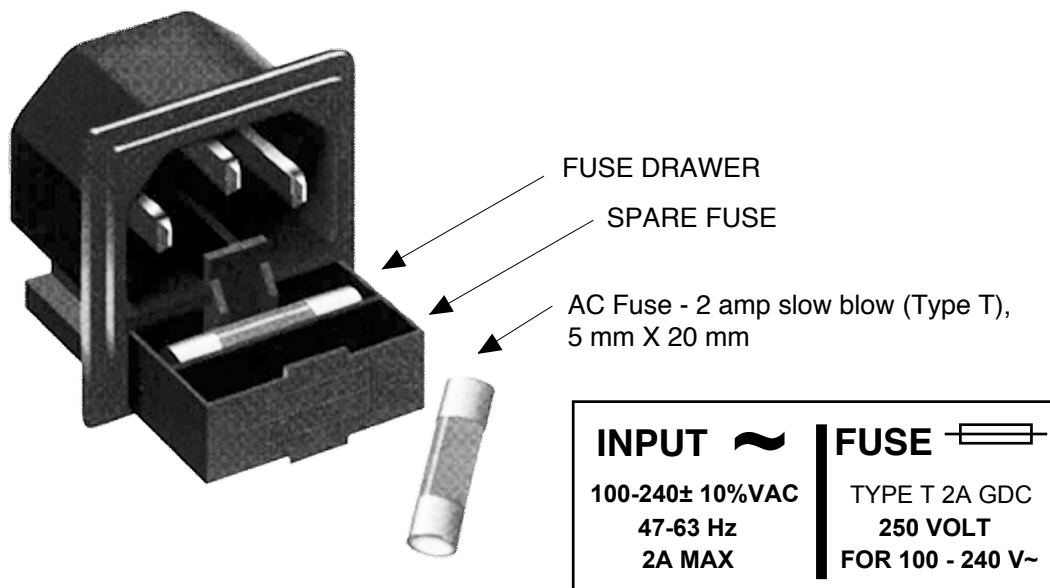


FIGURE 2.4 Fuse Location and Spare Fuse

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, page 15):

Power Up

Normal Display

- | | |
|---------------|--|
| Menu 1 | Frequency in MHz |
| Menu 2 | Set Unit to Remote Operation |
| Menu 3 | Select External 10 MHz Reference |
| Menu 4 | Select RS232, RS422, or RS485 Remote Operation (option Q) |
| Menu 5 | Select RS485 Remote Address for Unit (option Q) |

Save Menu When “R” is selected in any of the above menus or when operator reaches the end

Alarm indications appear on the LEDs (see figure 2.2, page 9).

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 its 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.

A rectangular LCD display showing the text "REV 1.00" in a bold, sans-serif font.

3. The present frequency, gain, and selected RF output of the Downconverter is shown.

A rectangular LCD display showing three lines of text: "F = 2250", "G = +10", and "REF = INT" in a bold, sans-serif font.

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 as 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 30 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:

1. 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 = 22<u>5</u>0	R
------------------------	----------

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

F = 23<u>5</u>0	R
------------------------	----------

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

F = 23<u>5</u>0	R
------------------------	----------

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

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 default display:

F = 2250
G = +10 REF = INT

Figure 2.5 shows all the menu items and how to make changes.

2.5.5 Alarm Indications

An alarm condition will occur if the local oscillator phase lock loop (PLL) comes out of lock. The Mute LED will light if you select to mute the Tx Signal and the Remote LED will light when you select the Remote mode.

2.5.6 10 MHz Reference Mode Operation

Internal Mode: The unit uses its own built-in 10 MHz OCXO. The Internal Reference is present on the Reference Output Connector, J18. REF = INT appears on the front panel display.

External Mode: The unit uses a 10 MHz Reference that is connected to the External Reference Input, J3. REF = EXT appears on the front panel display. The External 10 MHz Reference level must be +3dBm, ± 3 dB. If the External 10 MHz signal does not meet the unit's specified parameters then the unit will not function properly. The External Reference is present on the Reference Output connector, J18.

Auto Mode: The unit defaults to the External 10 MHz Reference as long as the level meets the +3dBm, ± 3 dB specification. REF = AUTO - E appears on the front panel display where the -E indicates that the unit is using the External 10 MHz Reference. The External Reference is present on the Reference Output connector, J18.

If the external 10 MHz Reference signal level is less than -1dBm, the unit switches to Internal 10 MHz Reference. REF = AUTO -I appears on the front panel display where -I indicates that the unit is using the Internal 10 MHz Reference. The Internal 10 MHz Reference is present on the reference output connector, J18.

Power Up	ON POWER UP		
	REV 1.00		
Normal Display	NORMAL DISPLAY		
	F = 2250 G = +10 Ref = INT		
			PUSH BUTTON
PUSHING MENU/EXECUTE SEQUENCE			
Menu 1 Set Frequency	F = 2250 R	SCROLL <>	
		SCROLL <>	PUSH BUTTON
Menu 5 Set Unit to Remote Operation	REMOTE OFF R	SCROLL <>	
		SCROLL <>	PUSH BUTTON
Menu 7 Select External 10 MHz Reference (option-E)	EXT REF OFF R	SCROLL <>	
		SCROLL <>	PUSH BUTTON
Menu 8 Set Remote Mode (option -Q)	RS485 R	SCROLL <>	
		SCROLL <>	PUSH BUTTON
Menu 9 Set RS-485 Address (option -Q)	ADDRESS = 00 R	SCROLL <>	
		SCROLL <>	PUSH BUTTON
Save Settings? At the end or when "R" is selected from any of the above menus	SAVE SETTINGS? Y N	SCROLL <>	PUSH BUTTON

FIGURE 2.5 Menu Display and Sequence



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