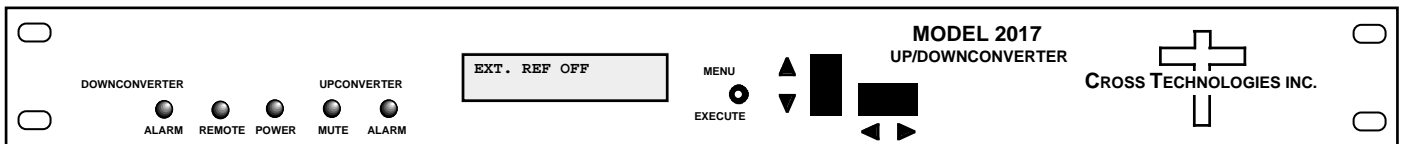


# Instruction Manual

# Model 2017-T03-400

## Test Up/Downconverter

November 2011 Rev. 0



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# INSTRUCTION MANUAL

## MODEL 2017-T03-400 Test Up/Downconverter

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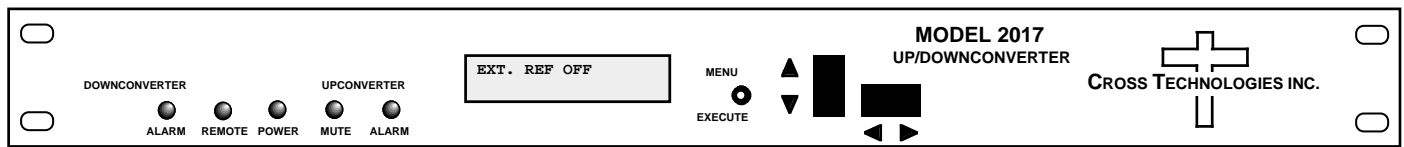
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# MODEL 2017-T03-400 Test Up/Downconverter

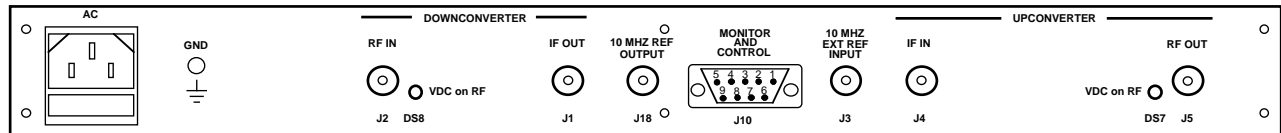
## 1.0 General

### 1.1 Equipment Description

The 2017-T03-400 Test L-band Up/Downconverter converts a 225-400 MHz block to/from the 1100-1275 MHz block with a fixed 875 MHz LO. The 2017-T03-400 is used in applications such as connecting L-band modems to signals in the 225-400 MHz band. In this application, when converting 225-400 to L-band, the modem itself contains internal filtering making it unnecessary for the 2017-T03-400 to filter out all the other products (LO; lower sideband is 30 dBC down). In the 2017-T03-400 down conversion, because the L-band modem's transmit output is a clean signal with no image frequency, the signal can be converted to 225-400 with minimum filtering (30 dBC min. image rejection). Front panel LEDs indicate DC power, PLL alarm, and remote operation. Connectors are 50 ohm BNC female for IF and RF. It is powered by a 100-240 ± 10% VAC power supply and housed in a 1.75" X 19" X 16" 1RU chassis.

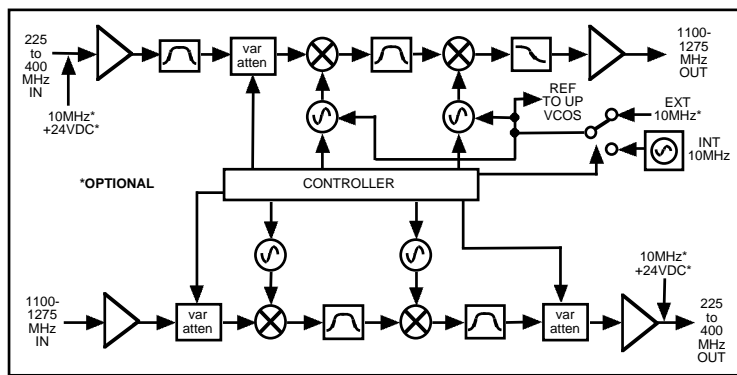


FRONT PANEL



REAR PANEL

**Figure 1.1 Model 2017-T03-400 Front and Rear Panels**



**Figure 1.2 Model 2017-T03-400 Test Up/Downconverter Block Diagram**

## 1.2 Technical Characteristics

**TABLE 1.0 2017-T03-400 Test Up/Downconverter Specifications\***

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

#### Input Characteristics (IF)

Impedance/Return Loss 50 Ω /12 dB  
 Frequency 225-400 MHz Block  
 Input Level -40 to -10 dBm

#### Output Characteristics (RF)

Impedance/Return Loss 50 Ω/12 dB  
 Frequency 1100 to 1275 MHz Block  
 Level -40 to -10 dBm  
 1 dB compression 0 dBm

#### Channel Characteristics

Gain 0 ±2 dB, Fixed  
 Frequency Sense Non-inverting  
 Low Side & Band Rejection 30 dBC min., 40 dBC typ.

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

#### Input Characteristics (RF)

Impedance/Return Loss 50 Ω /12 dB  
 Frequency 1100 to 1275 MHz Block  
 Level -40 to -10 dBm

#### Output Characteristics (IF)

Impedance/Return Loss 50 Ω/12 dB  
 Frequency 225-400 MHz Block  
 Output level -40 to -10 dBm  
 1 dB compression 0 dBm

#### Channel Characteristics

Gain 0 ±2 dB, Fixed  
 Freq. Sense (selectable) Non-inverting  
 Image Rejection 30 dBC min., 40 dBC typ.

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

#### Channel Characteristics

Frequency Response ±1.5 dB, over band; ±0.75 dB, 36 MHz BW.  
 Spurious Response <-30 dBC, < -40 dBC typ., any 36 MHz band, Signal Related.  
 Spurious Response, LO < 0 dBC, < -10 dBC typ. at -10 dBm in and out; at L-band input and output.  
 Group Delay, max. 0.015 ns/MHz<sup>2</sup> parabolic; 0.05 ns/MHz linear; 1 ns ripple any 36 MHz band.

#### Synthesizer Characteristics

Frequency Accuracy ± 1.0 ppm internal reference (±0.01 ppm, Option -H).  
 Frequency Step None, fixed 875 MHz LO.  
 10 MHz In/Out Level 3 dBm ± 3 dB, (Option -E).

Phase Noise @ Freq	10MHz	1kHz	10kHz	100kHz	1MHz
dBc/Hz	70	70	80	90	100

#### Controls, Indicators

Frequency/Gain Selection None  
 Power Green LED  
 Alarm Red LED  
 Remote RS232C, 9600 baud, to monitor alarm status only.

#### Other

RF Connectors 50Ω BNC (female) (See Table 2.2 for connector options).  
 IF Connectors 50Ω BNC (female) (See Table 2.2 for connector options).  
 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, 25 watts max.

#### Available Options

-E External 10 MHz Reference  
 -H High Stability (±0.01ppm) internal reference

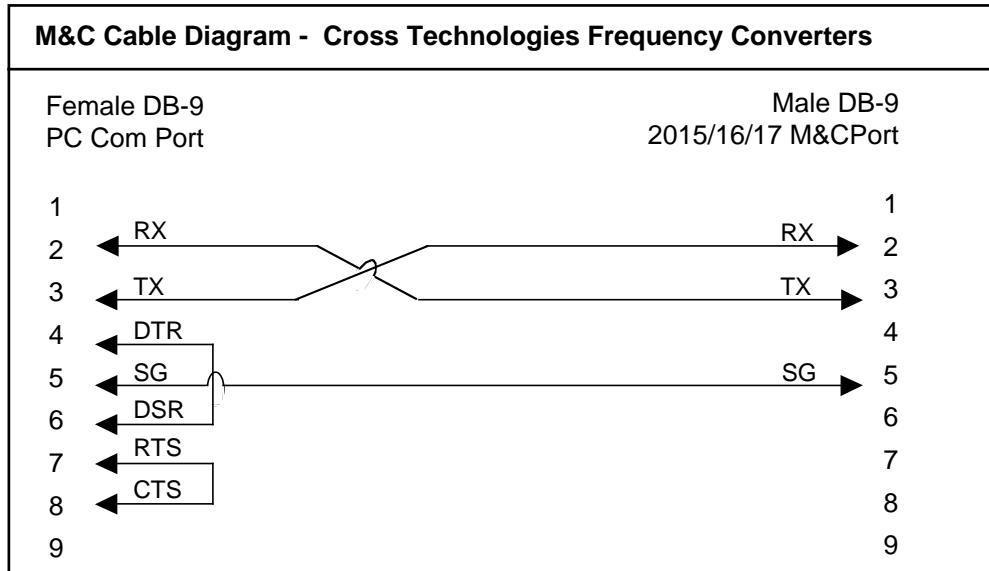
**Connectors/Impedance** See Table 2.2

\*+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-T03-400 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.

<b>Table 1.1 2017-T03-400 Status Requests</b>		
Command	Syntax*	Description
Command Status	{aaS1}	Returns {aaS1MNO}
External 10MHz (option -E)	{aaS2}	Returns {aaS2b}
		• b = 1 - External 10MHz selected

## **C) Commands**

Table 1.2 lists the commands for the 2017-T03-400 and briefly describes them. After a command is sent the 2017-T03-400 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

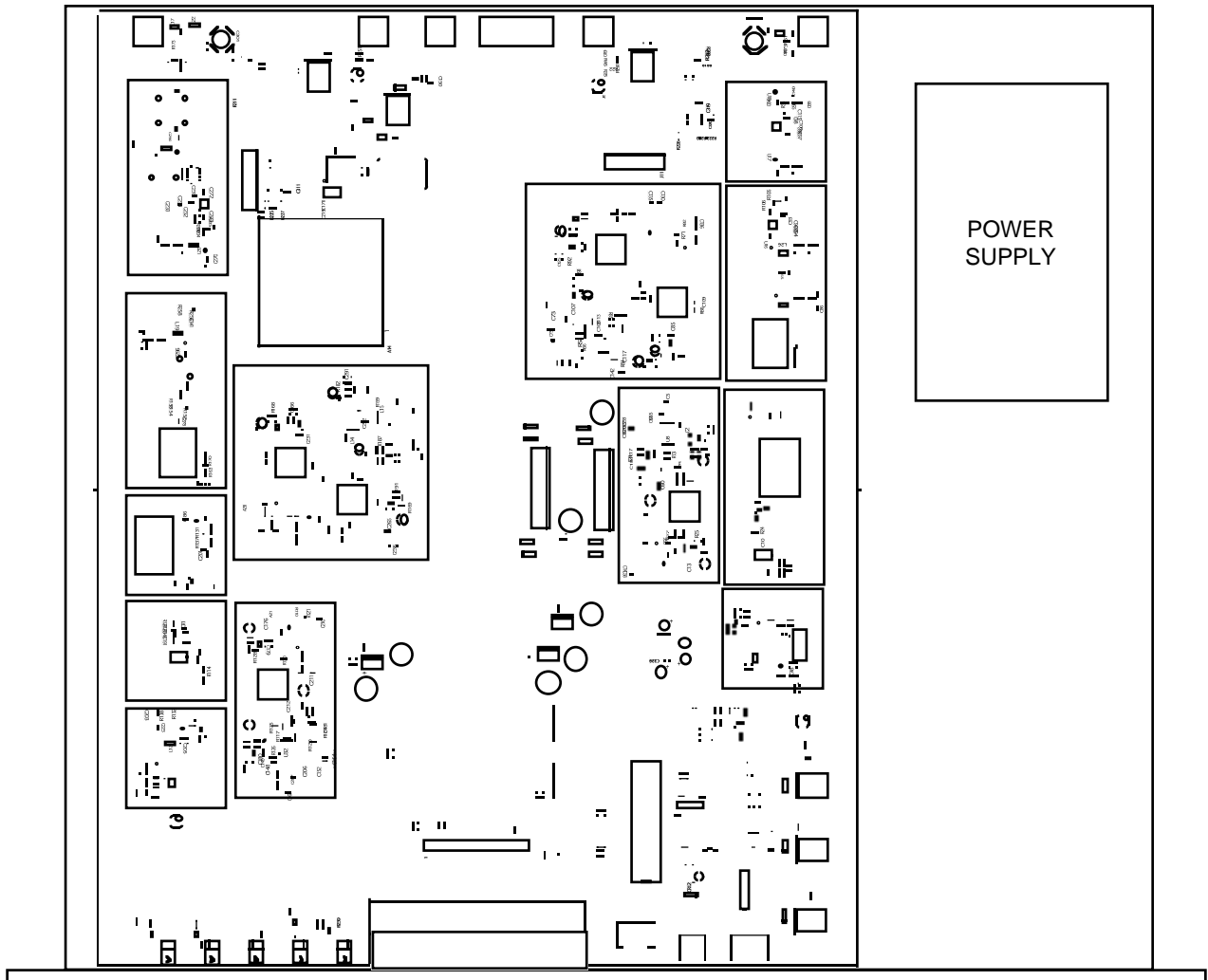
\* PLEASE NOTE: The two character {aa}(00-31) prefix, in the table below, should be used ONLY when RS-485, (OPTION-Q), is selected.

<b>Table 1.2 2017-T03-400 Commands</b>		
Command	Syntax*	Description
External 10MHz (Option -E)	{aaCEx}	where x =:
		• 0 to disable External 10MHz reference signal
		• 1 to enable External 10MHz reference signal
Enable Remote	#	Just # sign
Disable Remote	{aaCRO}*	{CR and zero}

## **2.0 Installation**

### **2.1 Mechanical**

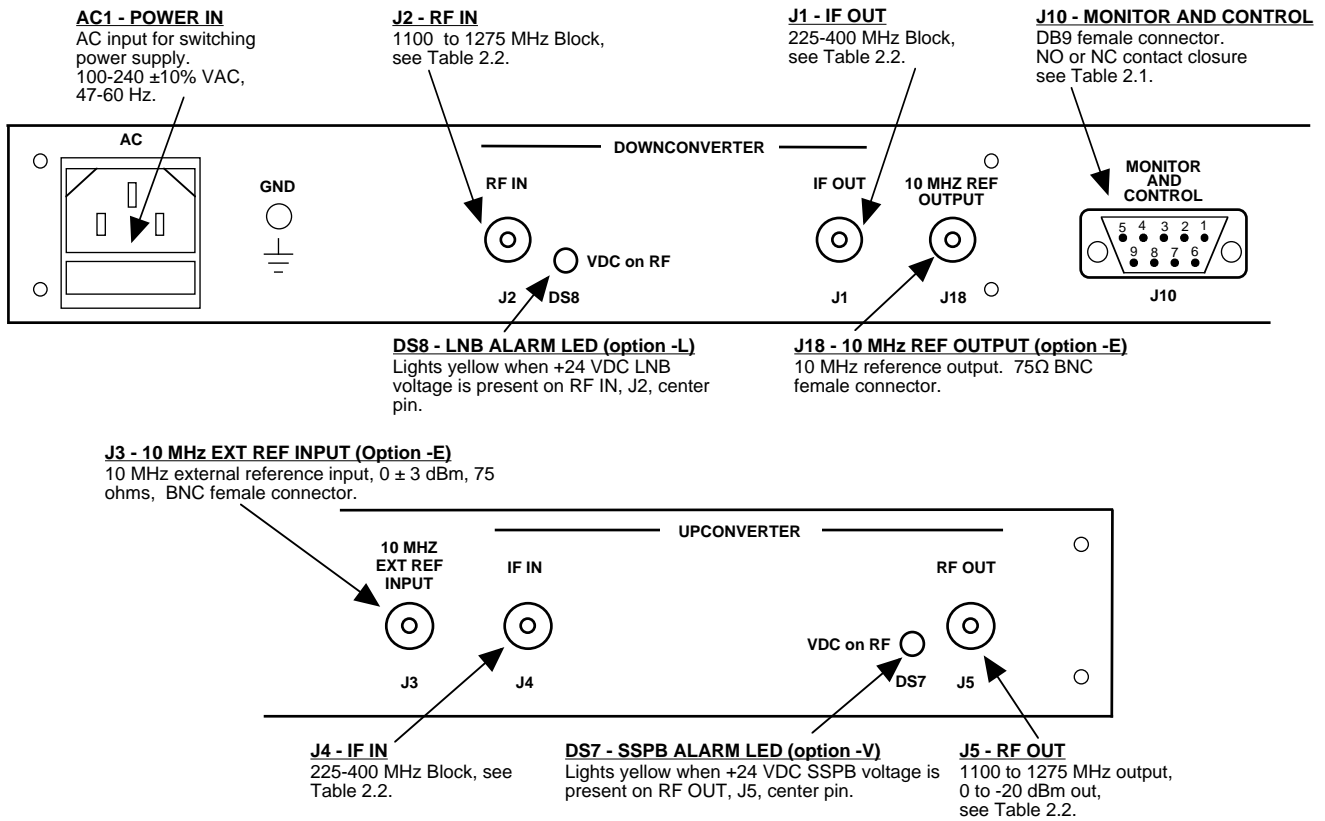
The 2017-T03-400 consists of one RF/Controller PCB housed in a 1 RU (1 3/4 inch high) by 16 inch deep chassis. A switching,  $\pm 12$ , +5, +24 VDC power supply provides power for the assemblies. The 2017-T03-400 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2017-T03-400 is assembled.



**Figure 2.0 Model 2017-T03-400 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-T03-400 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**

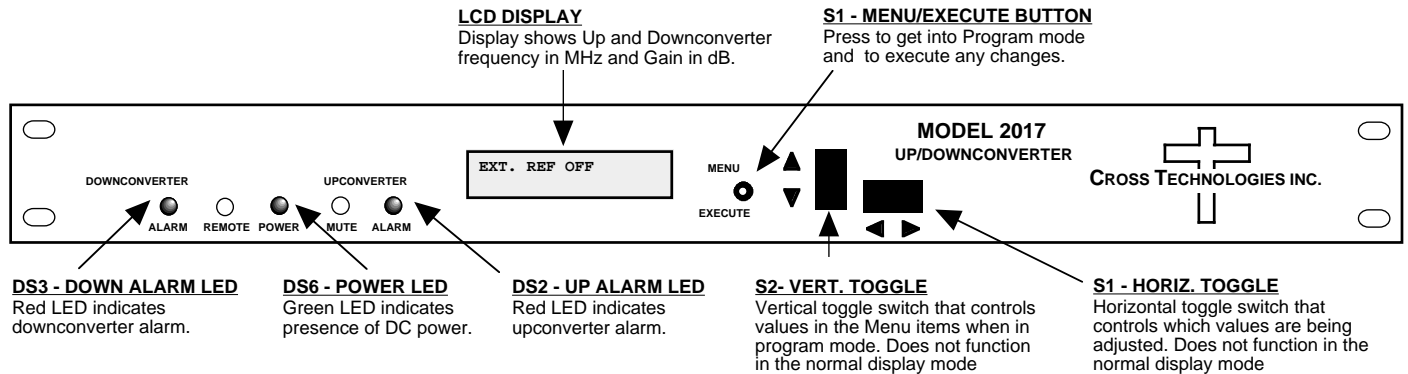
Interface: DB-9 Male

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, 50Ω	BNC, 50Ω
-B	BNC, 75Ω	BNC, 75Ω
-C	BNC, 75Ω	BNC, 50Ω
-D	BNC, 50Ω	BNC, 50Ω
-N	BNC, 75Ω	Type N, 50Ω
-M	BNC, 50Ω	Type N, 50Ω

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



**Figure 2.2 Model 2017-T03-400 Front Panel Controls and Indicators**

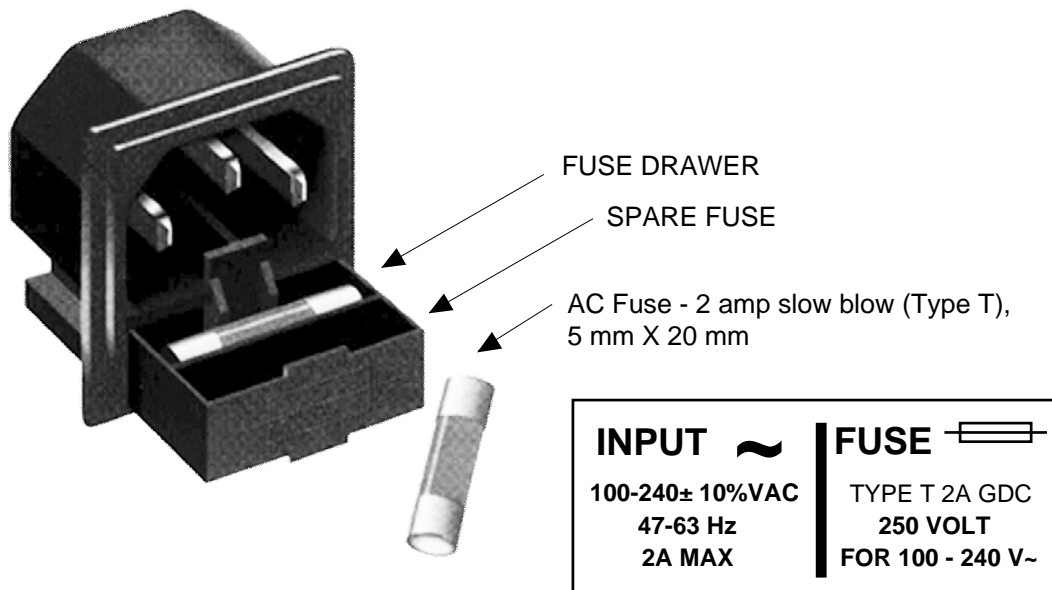
## 2.4 Installation / Operation

### 2.4.1 Installing and Operating the 2017-T03-400, Test 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  $\pm$ 10% VAC, 47 - 63 Hz to AC on the back panel.
- 4.) Be sure DS6 (Green, DC Power) is on and DS2 Upconverter Alarm and DS3 Downconverter Alarm are off (Figure 2.2).

### 2.4.2 Installing and Operating the 2017-T03-400, Test Downconverter Section

- 1.) Connect a -40 dBm to -10 dBm signal to RF In, J2 (Figure 2.1).
- 2.) Connect the IF OUT, J1, to the external equipment.
- 3.) Connect 100-240  $\pm$ 10% VAC, 47 - 63 Hz to AC on the back panel



**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**      Set Unit to Remote Operation

---

**Menu 2**      Select External 10 MHz Ref (option -E)

---

**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 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.



EXT REF OFF

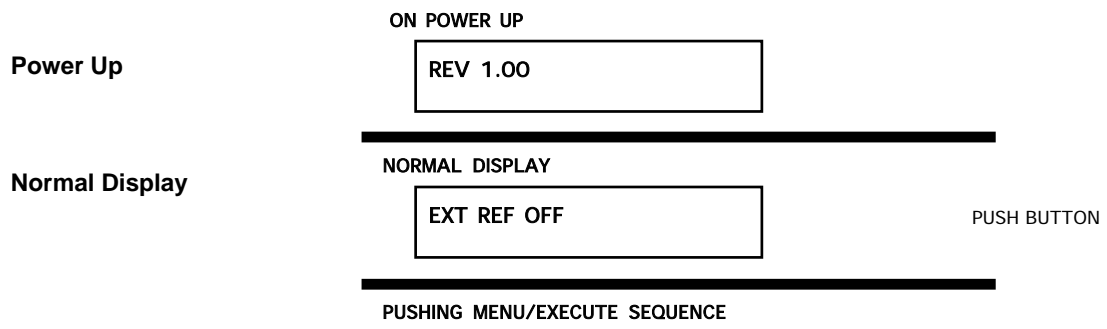
The unit is now operational and ready for any changes the operator may desire.

### 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 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.
- 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.



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