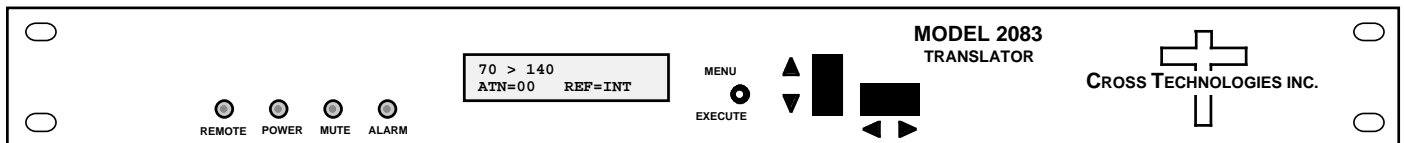


# Instruction Manual

# Model 2083-714A Frequency Translator

April 2011, Rev. D



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6170 Shiloh Road  
Alpharetta, Georgia 30005

(770) 886-8005  
FAX (770) 886-7964  
Toll Free 888-900-5588

WEB [www.crosstechnologies.com](http://www.crosstechnologies.com)  
E-MAIL [info@crosstechnologies.com](mailto:info@crosstechnologies.com)

# INSTRUCTION MANUAL

## MODEL 2083-714A Frequency Translator

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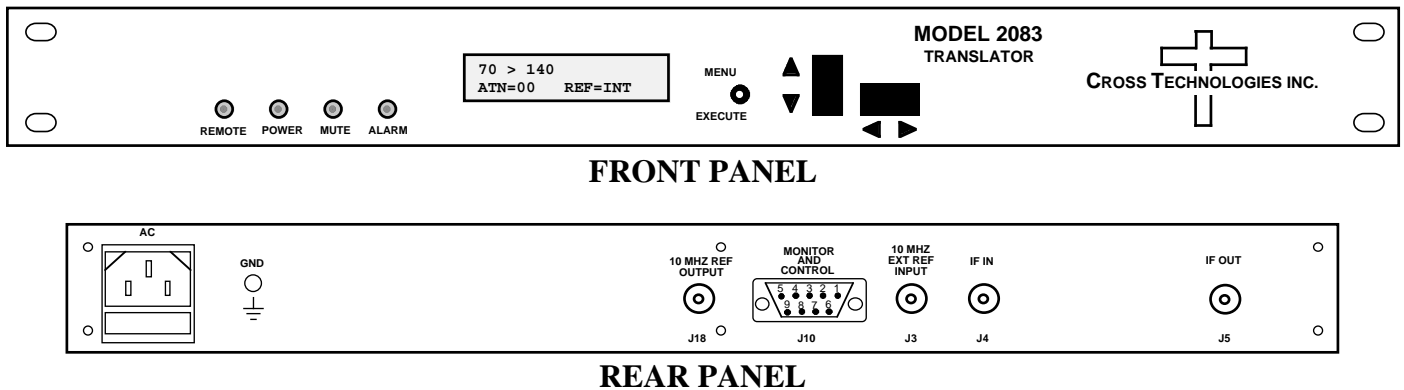
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# MODEL 2083-714A Frequency Translator

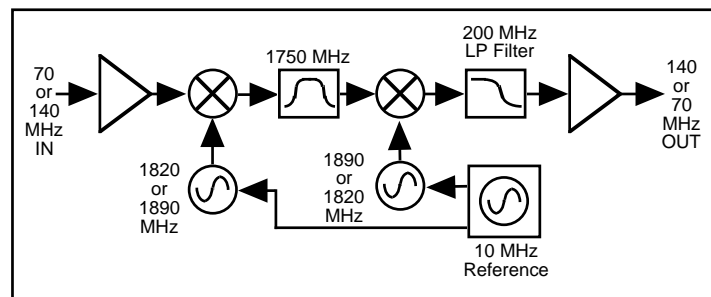
## 1.0 General

### 1.1 Equipment Description

The 2083-714A Frequency Translator converts a 70 MHz signal to 140 MHz or a 140 MHz signal to 70 MHz with no spectrum inversion, low group delay, and flat frequency response. The 140 MHz end center frequency is adjustable from 110 to 170 MHz in 1 MHz steps. The 70 MHz or 140 MHz IF input is mixed with synthesized local oscillator (LO) signals, first to 1750 MHz and finally to 140 MHz or 70 MHz. Multi-function push button switches select the translation, gain, and the 140 MHz end center frequency (adjustable from 110 to 170 MHz). Frequency translation and gain (-10 to 0 dB, adjustable in 1 dB steps) settings appear on the LCD display. Front panel LEDs light when DC power is applied (green), a PLL alarm occurs (red), the signal is muted (yellow), or remote control is active (yellow). A 10 MHz input allows for connection of an external 10 MHz reference. The 10 MHz output contains the 10 MHz reference signal (be it internal or external). Connectors are BNC female for the IF and 10 MHz input and output. The 2083-714A Translator is housed in a 1 3/4" X 19" X 16" deep rack mount chassis. **Option -H** provides a 0.01 ppm high stability reference.



**FIGURE 1.1 Model 2083-714A Front and Rear Panels**



**FIGURE 1.2 Model 2083-714A Translator Block Diagram**

## 1.2 Technical Characteristics

**TABLE 1.0 2083-714A Frequency Translator Specifications\***

### Input Characteristics

Impedance/Return Loss	75 $\Omega$ /18 dB
Frequency, Fc, 70 > 140	70 MHz
Frequency, Fc, 140 > 70	110 to 170 MHz, adjustable in 1 MHz steps
Input Level	-20 to -10 dBm
Input 1 dB compression	0 dBm

### Output Characteristics

Impedance/Return Loss	75 $\Omega$ /18 dB
Frequency, Fc, 70 > 140	110 to 170 MHz, adjustable in 1 MHz steps
Frequency, Fc, 140 > 70	70 MHz
Output level	-30 to -10 dBm
Output 1 dB compression	0 dBm

### Channel Characteristics

Attenuation	0 to 10 dB; selectable in 1dB steps
Bandwidth	$\pm 18$ MHz, $\pm 0.5$ dB; $\pm 40$ MHz, $\pm 1.0$ dB (100 MHz through 180 MHz)
Spurious Response	< -50 dBC (in-band and out-of-band)
Group Delay, max	0.01 ns/MHz <sup>2</sup> , parabolic; 0.03 ns/MHz, linear, 1 ns ripple 36 MHz BW
Frequency Sense	Non-inverting

### Synthesizer Characteristics

Frequency Accuracy	$\pm 70$ Hz max over temp; $\pm 1.0$ ppm internal ref ( $\pm 0.01$ ppm option <b>-H</b> )
Reference	10 MHz Internal or External (selectable)
10 MHz level (In and Out)	+3 dBm, $\pm 3$ dB, 50 or 75 ohms
Step Size, 140 MHz end	1 MHz, 110 to 170 center frequency, Fc

Phase Noise @ Freq	100 MHz	1kHz	10kHz	100kHz	1MHz
dBC/Hz	-75	-80	-85	-100	-110

### Controls, Indicators

Frequency Selection	pushbutton switches; setting shown on LCD display
Gain Selection	pushbutton switches; setting shown on LCD display
Power	Green LED
Alarm	Red LED
Remote	Yellow LED, RS232C, 9600 baud
Mute	Yellow LED

### Other

IF Connectors	BNC (female), 75 $\Omega$
10 MHz Connectors	BNC (female), 50/75 $\Omega$
Alarm/Remote Connector	DB9 - NO or NC contact closure on Alarm
Size	19 inch, 1RU standard chassis 1.75" high X 16.0" deep
Power	100-240 $\pm 10\%$ VAC, 47-63 Hz, 30 W max

### Options

- D	BNC, female, 50 ohms for IF In and Out
- H	High Stability ( $\pm 0.01$ ppm) internal reference
- Q	RS485 Remote Interface
Connectors/Impedance	D - 50 $\Omega$ BNC (RF), 50 $\Omega$ BNC (IF)

\*+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.

**Connector:** Rear panel, DB9 female

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 Open
8	Not Used
9	Alarm Relay: Normally Closed

**B) Status Requests** Table 1.1 lists the status requests for the 2083-714A and briefly describes them.

TABLE 1.1 2083-714A Status Requests		
Command	Syntax	Description
Command Status	{S1}	Returns {S1bbbccdefg} where:
		• bbb = 140 MHz End Center Frequency (110 or 170)
		• cc = Attenuation (00 to 10)
		• d = Mute Status (0=Mute, 1=Unmute)
		• e = Alarm Status (0=No Alarm, 1=Alarm)
		• f = Reference Status (0=Internal, 1=External)
		• g = Frequency Translation Mode (0=140 to 70, 1=70 to 140)

**C) Commands** Table 1.2 lists the commands for the 2083-714A and briefly describes them. After a command is sent the 2083-714A sends a return “>” indicating the command has been received and executed.

**General Command Format** - The general command format is {CND...}, where:

{ = start byte

C = 1 character, either C (command) or S (status)

N = 1-digit command or status character

D = 1 character or more of data (depends on command)

} = stop byte

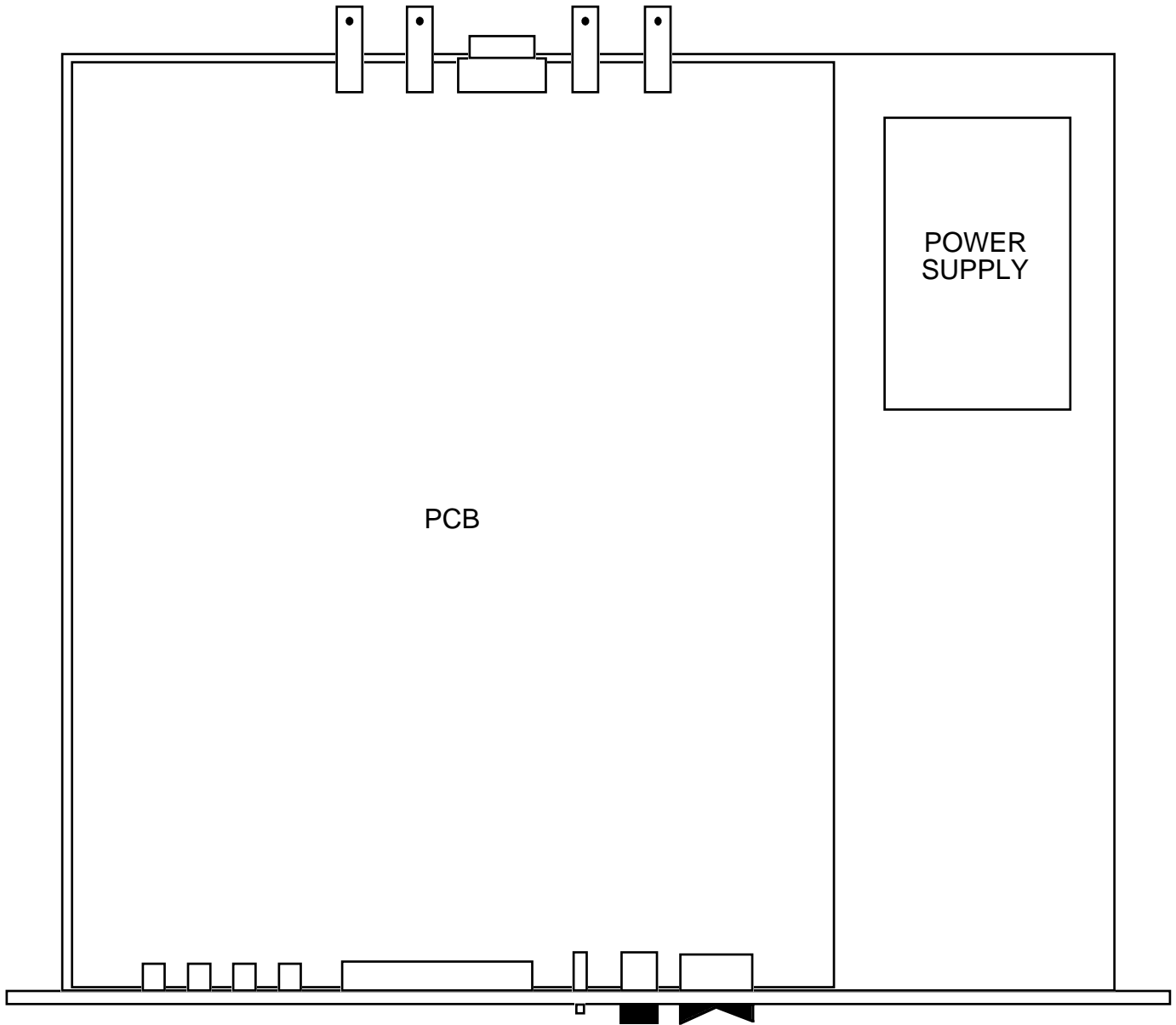
TABLE 1.2 2083-714A Commands		
Command	Syntax	Description
Set Frequency Translation Mode	{C1x}	where: <ul style="list-style-type: none"> <li>• x = 0 for 140 to 70 Mode</li> <li>• x = 1 for 70 to 140 Mode</li> </ul>
Set 140 MHz End Center Frequency	{C2xxx}	where: <ul style="list-style-type: none"> <li>• xxx = 3 characters</li> <li>• Values: from 110 to 170 (110 to 170 MHz Fc)</li> </ul>
Set Attenuation	{C3xx}	where: <ul style="list-style-type: none"> <li>• xx = 2 characters</li> <li>• Range: 00 to 10 (0 to 10 dB, in 1 dB steps)</li> </ul>
Mute Output	{CAx}	where x =: <ul style="list-style-type: none"> <li>• 0 to mute output</li> <li>• 1 to Unmute Output</li> </ul>
External Reference	{CEx}	where x =: <ul style="list-style-type: none"> <li>• 0 for Internal Reference</li> <li>• 1 for External Reference</li> </ul>
Enable Remote	#	Just # sign
Disable Remote	{CRO}	{CR and zero}

## 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 servicable 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 RE-INSTALLED** prior to Top Cover screw replacement. **FAILURE TO DO** this may cause **INGRESS** and/or **EGRESS** emission problems.

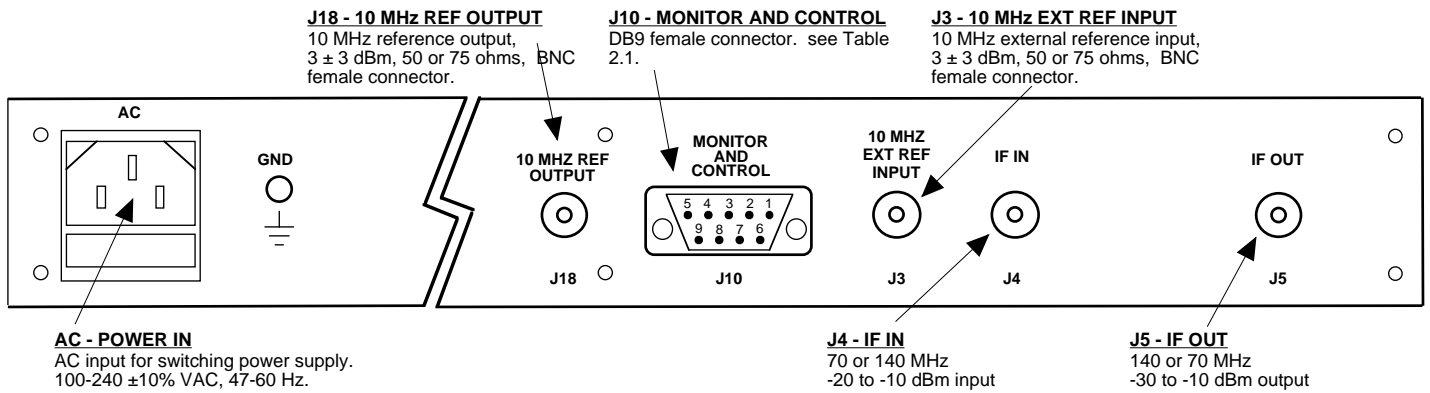
## 2.0 Installation

**2.1 Mechanical** - The 2083-714A consists of one RF/Controller PCB housed in a 1 RU (1 3/4 inch high) by 16 inch deep chassis. A switching,  $\pm 12$ , +24, +5 VDC power supply provides power for the assemblies. The 2083-714A can be secured to a rack using the 4 holes on the front panel but must be supported by a bracket on the bottom. Figure 2.0 shows how the 2083-714A is assembled.



**FIGURE 2.0 2083-714A Mechanical Assembly**

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



**FIGURE 2.1 2083-714A Rear Panel I/O's**

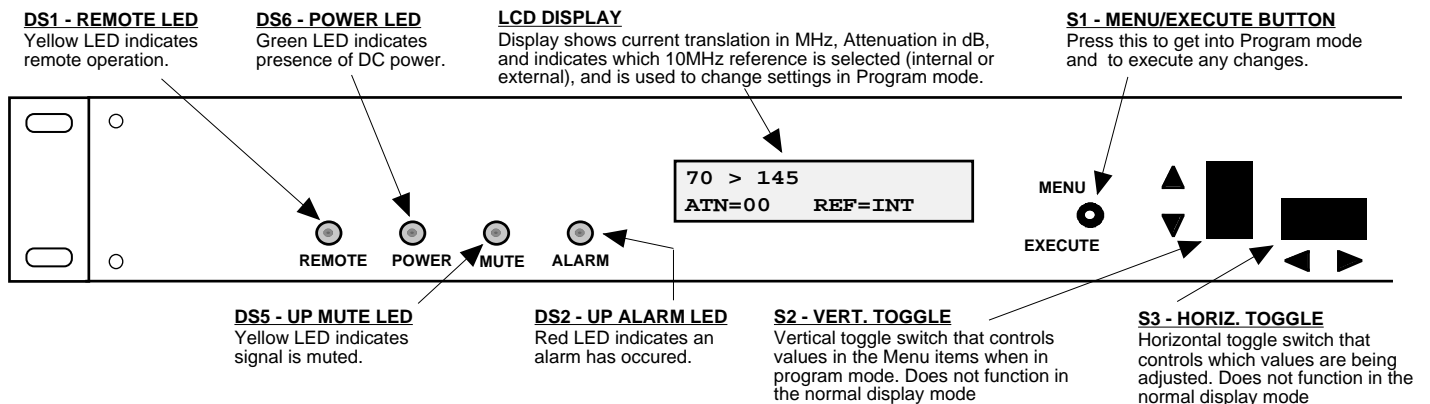
TABLE 2.1 J10 Pinouts (RS-232C*)	
Pin	Function
1	Not Used
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Not Used
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

**\*Remote Serial Interface**

Interface: DB9 Male

Protocol: RS-232C, 9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit

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

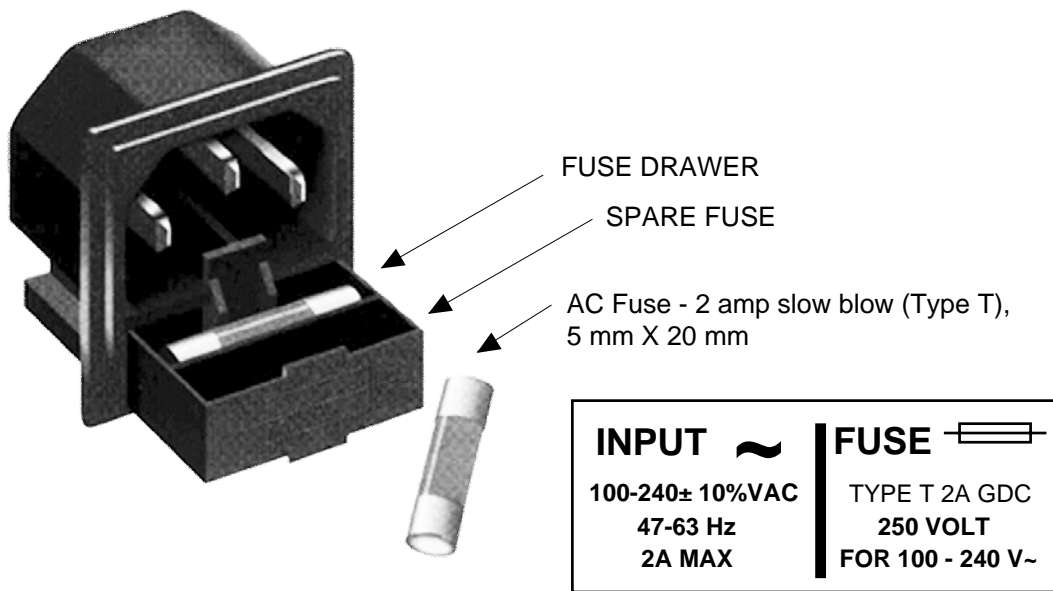


**FIGURE 2.2 2083-714A Front Panel Controls and Indicators**

## 2.4 Installation / Operation

### 2.4.1 Installing and Operating the 2083-714A Frequency Translator

1. Connect a -10 dBm to -20 dBm signal to IF IN, J4 (Figure 2.1).
2. Connect the IF OUT, J5, to the external equipment.
3. Connect 100-240  $\pm$ 10% VAC, 47 - 63 Hz to AC connector on the back panel.
4. Set the desired frequency translation mode ( 70 > 140 or 140 > 70) (See Section 2.5 Menu Settings).
5. Set the 140 MHz end frequency (IF IN or IF OUT) (See Section 2.5 Menu Settings).
6. Set the actual input level used ( -10 to -20 dBm) (See Section 2.5 Menu Settings).
7. Set the attenuation for 0 to 10 dB (See Section 2.5 Menu Settings).
8. Be sure DS6 (green, POWER) is on and DS2 (red, ALARM) is off (Figure 2.2).
9. **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** Frequency Translation Mode (70 > 140 MHz or 140 > 70 MHz)

**Menu 2** 140 MHz end center frequency (110 to 170 MHz in 1 MHz steps)

**Menu 3** Input Level in dBm (-20 to -10)

**Menu 4** Attenuation in dB (0 to 10)

**Menu 5** Mute

**Menu 6** Select External 10 MHz Ref

**Menu 7** Set Unit to Remote Operation (Note: the local controls still function when in REMOTE)

**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 30 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.

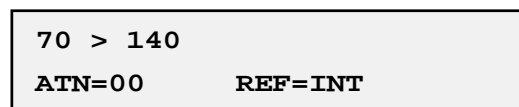
When power is first applied, the LCD display goes through three steps.

1. The LCD goes black to show all segments are functioning.
2. The software version will be displayed.



REV 1.52

3. The present frequency translation, attenuation, and INT/EXT Reference is shown.



70 > 140  
ATN=00      REF=INT

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 attenuation changes, the vertical movement will raise or lower the number selected.
  - b. For other functions such as Mute on/off, the vertical switch will alternately turn the function on or off.

### 2.5.4 Frequency Translation Mode Changes (70 > 140 MHz or 140 > 70 MHz)

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 Translation:

1. 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 frequency translation:

```
70 > 140 _ R
```

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

```
140 > 70 _ R
```

**NOTE: CHANGES DO NOT TAKE PLACE ON FREQUENCY TRANSLATION 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 the next item:

```
IF IN = 140 MHz R
```

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:

```
140 > 70  
ATN=00 REF=INT
```

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

## 2.5.5 140 MHz End Center Frequency Changes

The 140 MHz end (whether the Input or Output) can have the center frequency adjusted from 110 to 170 MHz. **Note that when the 140 MHz end is the Input, you must be sure that the input bandwidth can properly pass through the 36 MHz bandwidth filter used in the translation.** When the 140 MHz side is the Output it will cause the 36 MHz bandwidth signal from the 70 MHz input to be centered at the output center frequency that is selected.

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 Translation:

### 140 > 70 TRANSLATION MODE 140 MHZ END CENTER FREQUENCY CHANGES :

To change the 140 MHz end frequency, push the Menu/Execute switch until you get to:

```
IF IN = 140 MHz      R
```

Press the Up/Down switch to change the frequency in 1 or 10 MHz steps.

```
IF IN = 150 MHz      R
```

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

```
IF IN = 150 MHz      R
```

Pressing the Up/Down switch down will toggle the digit selected until you have the desired frequency.

**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 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:

```
150 > 70  
ATN=00      REF=INT
```

**70 > 140 TRANSLATION MODE 140 MHZ END OUTPUT CENTER FREQUENCY CHANGES :**

To change the 140 MHz end frequency, push the Menu/Execute switch until you get to:

```
IF OUT= 140 MHz      R
```

Press the Up/Down switch to change the frequency in 1 or 10 MHz steps.

```
IF OUT= 150 MHz      R
```

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

```
IF OUT= 150 MHz      R
```

Pressing the Up/Down switch down will toggle the digit selected until you have the desired frequency.

**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 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 :

```
70 > 150  
ATN=00      REF=INT
```

Figure 2.4 gives the menu items and how to make changes

## 2.5.6 Input Level and Attenuation Changes

To change the Input Level, push the Menu/Execute switch until you get to:

```
INLVL = -20           R
```

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.

Figure 2.4 gives the menu items and how to make changes

**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.**

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 30 seconds, and the system will return to the normal operating mode.

To change the translator attenuation, push the Menu/Execute switch until you get to the ATTN setting:

```
ATTN = 00           R
```

Press the Up/Down switch to change the attenuation in 1 or 10 dB steps.

```
ATTN = 10           R
```

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

```
ATTN = 10           R
```

Pressing the Up/Down switch down will toggle the digit selected until you have the desired attenuation.

**NOTE: THE ATTENUATION WILL CHANGE AS IT IS ADJUSTED, 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
```

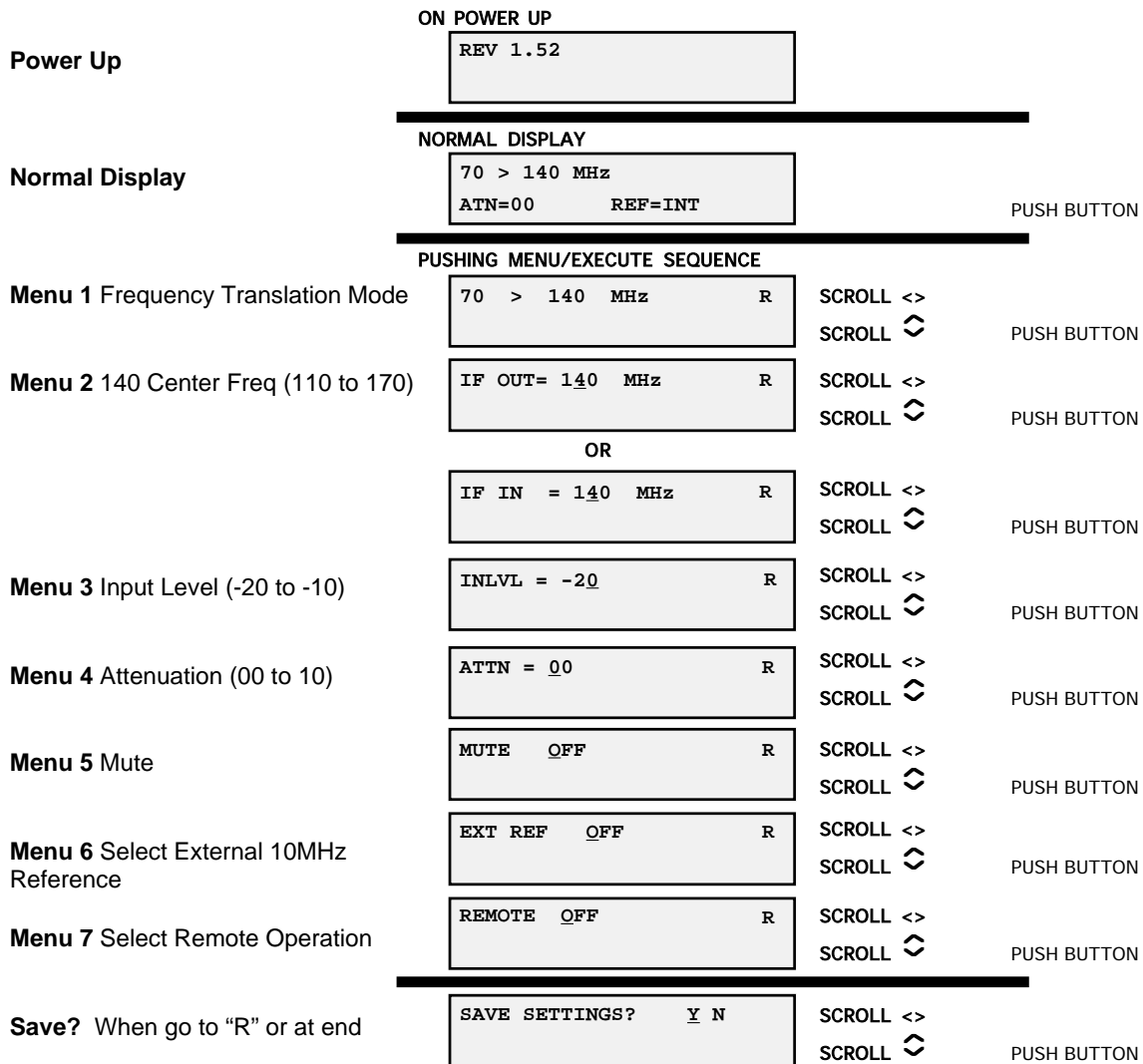
Selecting **Y** will save the new settings. Selecting **N** will revert to the previous settings.

```
150 > 70  
ATTN=10      REF=INT
```

Figure 2.4 gives the menu items and how to make changes

## 2.5.7 Alarm Indications

An alarm condition 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 2.4 Menu Display and Sequences**



6170 Shiloh Road  
Alpharetta, Georgia 30005

(770) 886-8005  
FAX (770) 886-7964  
Toll Free 888-900-5588

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E-MAIL [info@crosstechnologies.com](mailto:info@crosstechnologies.com)

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