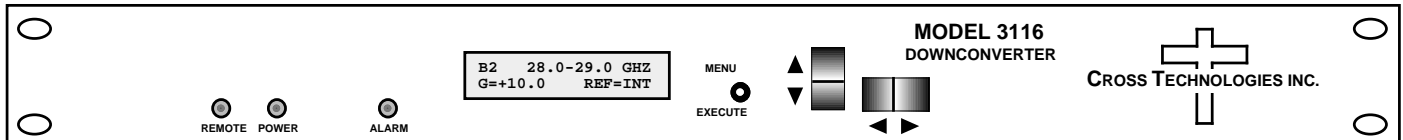


Instruction Manual

Model 3116-41-310

Multi-Band Block Downconverter

October 2018, Rev. 0



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INSTRUCTION MANUAL

MODEL 3116-41-310 Multi-Band Block Downconverter

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MODEL 3116-41-310

Multi-Band Block Downconverter

1.0 General

1.1 Equipment Description

The 3116-41-310 Ka-band Block Downconverter converts 27.5 - 31.0 GHz up to 0.95 - 1.95 GHz in four selectable fixed bands. The RF to L-band gain is +30 dB, adjustable in 0.5 ±0.5 dB steps. Front panel LEDs indicate Remote operation, PLL Alarm and DC Power. Band select, gain and internal/external/Auto reference frequency selection are controlled by front panel switches or remotely via RS 232C or RS485/422 (Ethernet Optional) and are viewable on the LCD Display. Connectors are 2.92mm female for the RF and BNC female for the L-Band and external reference input and reference output. In AUTO, the 10 MHz reference stays in external if the external level is in the +2 to +8 dBm range. The 3116 is powered by a 100-240 ± 10% VAC power supply, and housed in a 1 3/4" X 19" X 17" rack mount chassis.

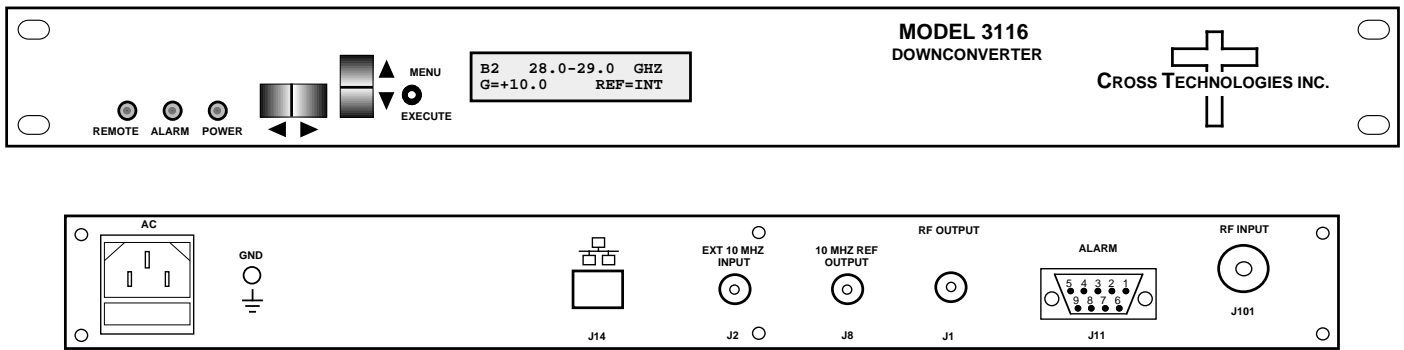


Figure 1. Model 3116-41-310 Multi-Band Block Downconverter, Front & Rear Panels

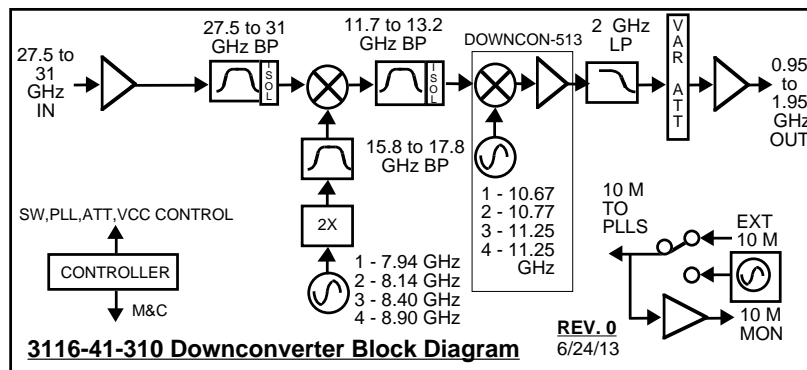


FIGURE 1-A Model 3116-41-310 Block Diagram

1.2 Technical Characteristics

TABLE 1.0 3116-41-310 Multi-Band Block Translator Specifications**					
Input Characteristics					
Input Impedance/Return Loss	50Ω/14 dB				
Frequency (GHz)	BAND 1:	27.5 to 28.5			
	BAND 2:	28.0 to 29.0			
	BAND 3:	29.0 to 30.0			
	BAND 4:	30.0 to 31.0			
Noise Figure, Maximum	20 dBm at maximum gain				
Input Level Range	-50 to -30 dBm				
Output Characteristics					
Impedance/Return Loss	50Ω / 14 dB				
Frequency (GHz)	0.95 to 1.95 GHz				
Output Level Range	-20 to 0 dBm				
Output 1 dB Compression	+10 dBm @ maximum gain				
Channel Characteristics					
Gain at F _C	+30 ±3 dB, (+30 to 0 dB variable in 0.5 ±0.5 dB steps)				
Image Rejection	> 60 dB, minimum				
Spurious, Inband	SIG. REL. <-50 dBc, -15 to 0 dBm out; 2XFc <-45 dBc; Signal Independent, <-60 dBm; 95-1.95 GHz out, G _{max}				
Spurious, Out of Band F _c ±2GHz	<-55 dBm, signal independent; 0.5-2.45 GHz out				
Intermodulation	<-50 dBc for two carriers at 4 MHz spacing, each at -10 dBm out, Gain = +30 dB				
Frequency Response	± 0.5 dB				
Frequency Sense	Non-Inverting				
LO Characteristics					
LO Frequency	Band Specific				
Frequency Accuracy	± 0.05 ppm max over temp internal reference; external reference input				
10 MHz Level In/Mon	+2 to +8 dBm in; Monitor Output = input level ± 1.0 dB, 50 ohms				
Phase Noise @ Frequency	100 MHz	1 kHz	10 kHz*	100 kHz	MHz
BBC/Hz	-65	-75	-80	95	-105

Technical Characteristics continued on page 5...

1.2 Technical Characteristics continued from page 4...

Controls, Indicators	
Band; Gain; 10M Ref. Selection	Direct readout LCD; pushbutton switches or remote
Remote; Alarm; Mute; Power	Yellow LED; Red LED; Yellow LED; Green LED
Remote	RS232C/RS485/422, 9600 baud (Ethernet Optional)
Other	
RF In Connector	2.92mm (40 GHz) female, 50Ω
L-Band Connector	BNC (female), 50Ω
10 MHz Connectors	BNC (female), 50Ω/75Ω
Alarm/Remote Connector	DB9 - NO or NC contact closure on Alarm
Size	19 inch, 1RU Standard Chassis 1.75" high x 17.0" deep
Power	100-240 ±10% VAC, 47- 63 Hz, 35 watts maximum
Available Options	
Remote M&C Ethernet Options	
W8	Ethernet with web browser Interface
W18	Ethernet with SNMP (and MIB) Interface
W28	Ethernet with with direct TCP/IP Interface
Available Connector Options	
297	297 - 50Ω 2.92 (RF), 75Ω BNC (L-BAND)
29N	29N - 50Ω 2.92 (RF), 50Ω N-type (L-BAND)
29S	29S - 50Ω 2.92 (RF), 50Ω SMA (L-BAND)
<p>**+0 to +50 degrees C Specifications subject to change without notice.</p> <p style="text-align: right;">© Cross Technologies, Inc. 2018</p>	

1.3 Monitor & Control Interface

The following tables summarize the commands and status queries applicable to the 3116-41-310 Multi-Band Translator.

* **PLEASE NOTE:** The two character {aa} prefix, shown in the table below, is present ONLY when RS485 is selected.

Table 2.0 Model 3116-41-310 M&C Commands

Table 2.0: Model 3116-41-310 M&C Commands		
Command	Syntax	Description
Set Frequency Band	{aaCNx}	x = 1 to select band 1: in = (27.5 to 28.5 GHz) out = (0.95 to 1.95 GHz)
		x = 2 to select band 2: in = (28.0 to 29.0 GHz) out = (0.95 to 1.95 GHz)
		x = 3 to select band 3: in = (29.0 to 30.00 GHz) out = (0.95 to 1.95 GHz)
		x = 4 to select band 4: in = (30.00 to 31.00 GHz) out = (0.95 to 1.95 GHz)
Set Gain	{aaCGxxx}	where:
		xxxx = 4 characters
		Range: +30.0 to 0 in 0.5 ±0.5 dB steps
Set Mute	{aaCMx}	where:
		x = 1 to mute the output x = 0 to unmute the output
Set External Reference	{aaCEx}	where:
		x = 0 to select internal reference
		x = 1 to select external reference x = 2 for auto-select
Set Reference Offset	{aaCOxxxxx}	where:
		-2000 ≤ xxxxx ≤ +2000

continued on page 7...

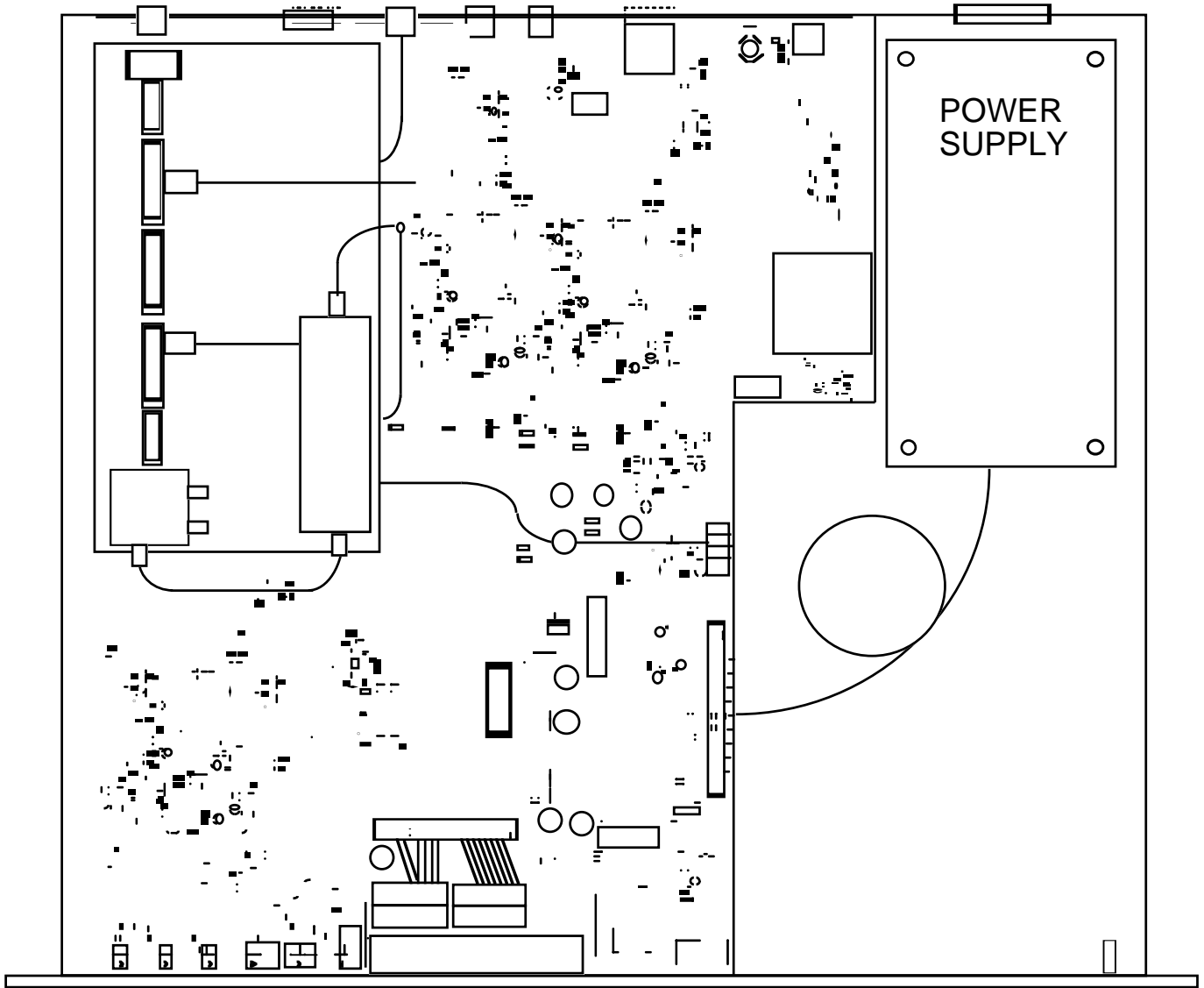
Table 2.0 Model 3116-41-310 M&C Commands (continued)

Table 2.0: Model 3116-41-310 M&C Commands (continued)		
Command	Syntax	Description
Frequency Band	{aaSN}	Returns {aaSNx} where:
		x = 1 if band is selected: in = (27.5 to 28.5 GHz) out = (0.95 to 1.95 GHz)
		x = 2 if band is selected: in = (28.0 to 29.0 GHz) out = (0.95 to 1.95 GHz)
		x = 3 if band is selected: in = (29.0 to 30.0 GHz) out = (0.95 to 1.95 GHz GHz)
		x = 4 if band is selected: in = (30.0 to 31.0 GHz) out = (0.95 to 1.95 GHz GHz)
Gain	{aaSG}	Returns {aaSGxxx} where:
		xxx = 3 characters
		Range: (0 to +30.0 in 0.5 ± 0.5 dB steps)
10 MHz reference	{aaSE}	Returns {aaSEx} where:
		x = 0 if Internal 10 MHz reference is selected
		x = 1 if External 10 MHz reference is selected
		x = 2 if in auto-select mode
Unit Status	{aaSA}	Returns {aaSA} where:
		x = 0 if alarm is off x = 1 if alarm is on
Reference Offset	{aaSO}	Returns {aaSOxxxxx} where:
		xxxxx is a signed number representing the ref. offset value
Model and firmware revision	{aaSV}	returns {aaSVxxxxxxxxyyyy} where:
		xxxxxxxx = unit model number
		yyyy = unit firmware rev.

2.0 Installation

2.1 Mechanical - The 3116-41-310 Multi-Band Block Translator consists of a controller board and RF plate assembly. A switching ± 12 , $+24$, $+5$ VDC power supply provides power for the assemblies. The 3116-41-310 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 3116-41-310 is assembled.

FIGURE 2.0 3116-41-310 Mechanical Assembly



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

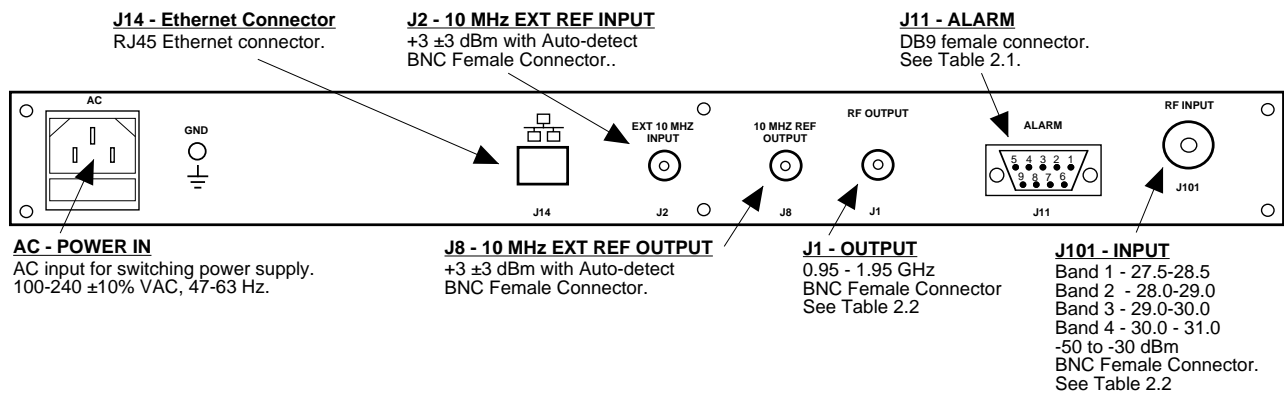


FIGURE 2.2 3116-41-310 Rear Panel Inputs and Outputs

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

TABLE 2.2 IF/RF Connector Options		
Option	L-BAND	RF
297	75Ω BNC	50Ω 2.92
29N	50Ω N-Type	50Ω 2.92
29S	50Ω SMA	50Ω 2.92

***Interface:** DB-9 Female
Protocol: RS485, RS422, or RS232C (selectable),
 9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit

2.3 Front Panel Controls and Indicators -

Figure 2.3 shows the front panel controls and indicators.

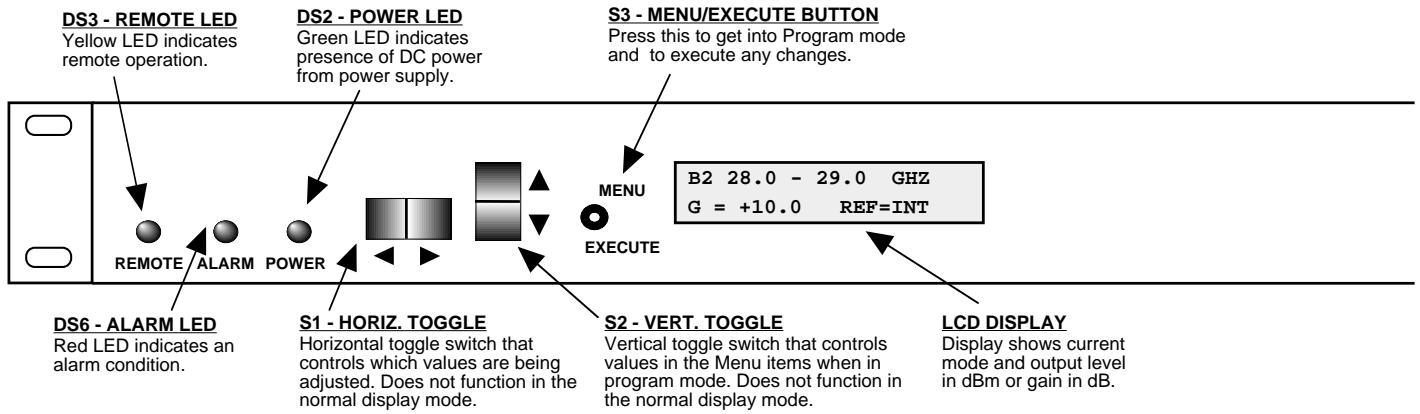


FIGURE 2.3 3116-41-310 Front Panel Controls and Indicators

2.4 Installation/Operation

Installing and Operating the 3116-41-310 Multi-Band Block Translator:

1. Connect a -27.5 dBm to 31.0 dBm signal to RF-BAND INPUT (J101) Figure 2.2.
2. Connect the RF OUTPUT (J1), to the external equipment.
3. Connect 100-240 \pm 10% VAC, 47 - 63 Hz to AC connector to the front panel.
4. Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.3).
5. Set the gain so that the output level is always within the range of +30 to 0 dBm (See Table 2.0).
6. Select either INT (for internal 10 MHz ref), or EXT (for external 10 MHz, +2 to +8 dBm reference that is inserted at J2).
7. AC Fuse - The fuse is a 1A/250V 1.25" x .25" (slow blow) and is inserted in the fuse F1 position.

NOTE: If a fuse continues to open, the power supply is most likely defective.

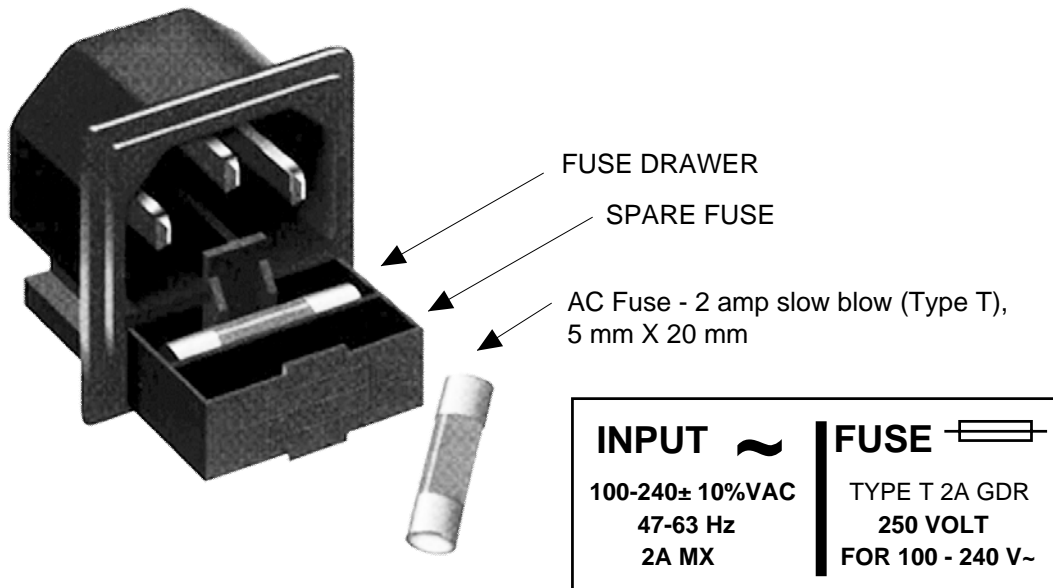


FIGURE 2.4 Fuse Location and Spare Fuse

2.6 Menu Settings

2.6.1 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 2.3):

Power Up

Normal Display

Menu 1	Frequency Band (1 to 3)
Menu 2	Gain in dB (+30 to 0 dB in 0.5 ±0.5 dB steps)
Menu 3	Mute TX Signal
Menu 4	Select 10 MHz Reference (Internal, External, Auto)
Menu 5	Set Reference Frequency Offset
Menu 6	Set Remote on/off
Menu 7	Set Secondary Communications Interface (Option Q)
Menu 8	Display Interior Temperature
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 2.3).

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.

2.6.2. 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.

3116-41-310 W8
REV 5.06

3. The present band, gain, 10 MHz reference and output frequency range are shown.

BAND 1	27.5-28.5 GHz
G = +10.0	REF = INT

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

2.6.3 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.

2.6.4 Band 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 BAND:

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 upconverter’s frequency load:

```
BAND = 2
```

Pressing the Up/Down switch down will select available frequency bands.

NOTE: CHANGES DO NOT TAKE PLACE ON BAND 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:

```
GAIN = +20.0      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 the default display:

```
B2          28.0 - 2.90 GHz
G = +10.0      REF = INT
```

Figure 2.5 (PG- 20) gives the menu items and how to make changes.

2.6.5 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 30 seconds and the system will return to the normal operating mode.

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.

Press the Up/Down switch to change the level in 0.5 ± 0.5 dB steps and then push the Menu/Execute switch to get to the Gain setting:

```
GAIN = +20.0      R
```

Press the Up/Down switch to change the gain in 0.5 or ± 0.5 dB steps:

```
GAIN = +21.0      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.

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:

```
B2          28.0 - 2.90 GHz
G = +10.0          REF = INT
```

Figure 2.5 (PG- 20) gives the menu items and how to make changes.

2.6.6 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.

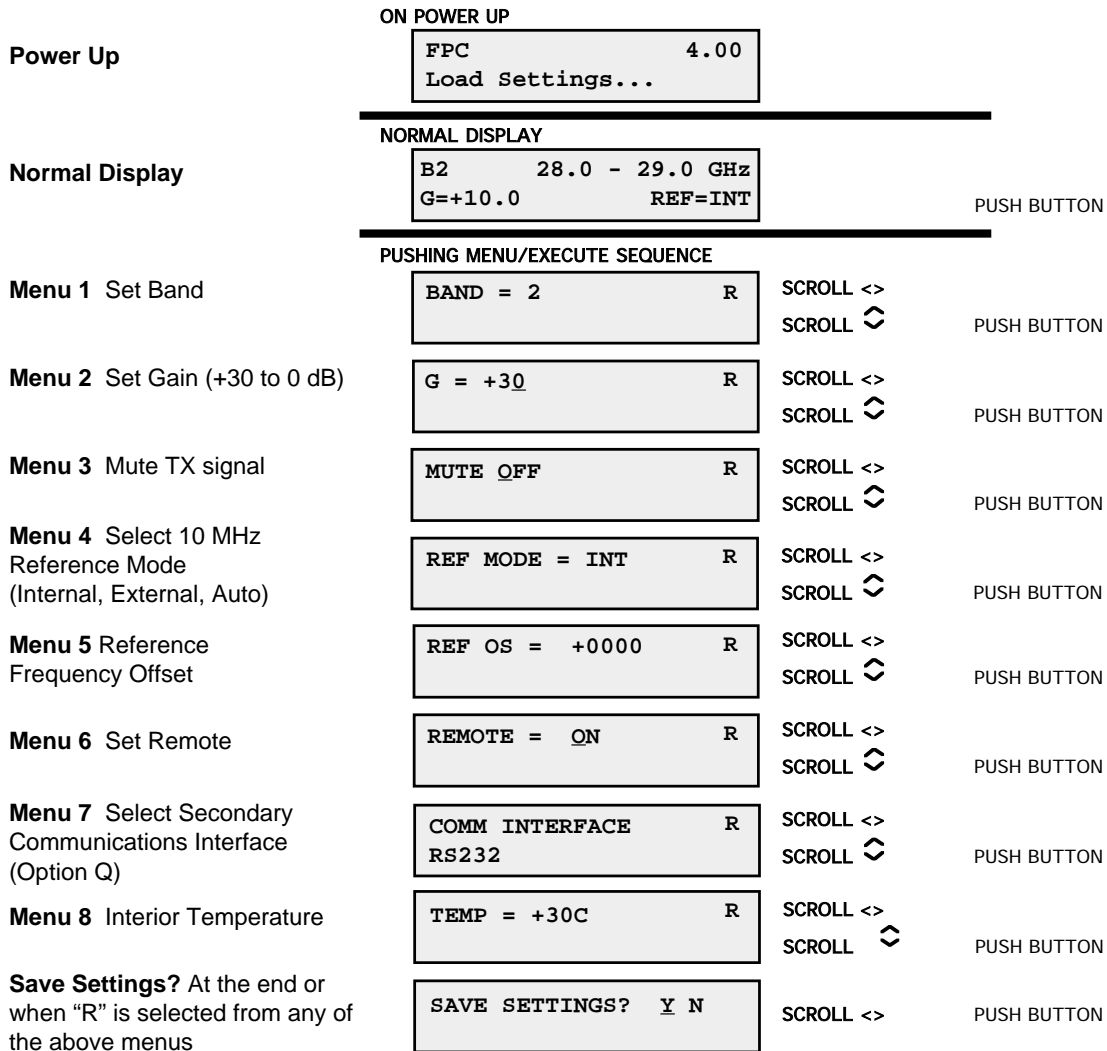


FIGURE 2.5 Menu Display and Sequence

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 multiunit 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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