Instruction Manual

Model 3116-30#-1200

Agile Block Downconverter

May 2023, Rev. 0
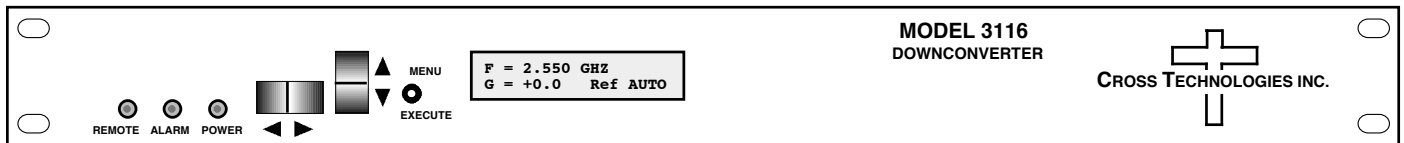
```
                            MENU    F = 2.550 GHZ
                             ▲       G = +0.0   Ref AUTO
                             ▼ ○
  ● ● ●                       EXECUTE
REMOTE ALARM POWER  ◄ ►
```

MODEL 3116
DOWNCONVERTER

CROSS TECHNOLOGIES INC.

When ordering parts from Cross Technologies, Inc., be sure to include the equipment
model number, equipment serial number, and a description of the part.

CROSS TECHNOLOGIES, INC.

6170 Shiloh Road
Alpharetta, Georgia 30005

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

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com

INSTRUCTION MANUAL

MODEL 3116-30#-1200 Block Downconverter

<u>**WARRANTY**</u> - The following warranty applies to all Cross Technologies, Inc. products.

All Cross Technologies, Inc. products are warranted against defective materials and workmanship for a period of one year after shipment to customer. Cross Technologies, Inc.'s obligation under this warranty is limited to repairing or, at Cross Technologies, Inc.'s option, replacing parts, subassemblies, or entire assemblies. Cross Technologies, Inc. shall not be liable for any special, indirect, or consequential damages. This warranty does not cover parts or equipment which have been subject to misuse, negligence, or accident by the customer during use. All shipping costs for warranty repairs will be prepaid by the customer. There are not other warranties, express or implied, except as stated herein.

CROSS TECHNOLOGIES, INC.

6170 Shiloh Road
Alpharetta, Georgia 30005

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

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com
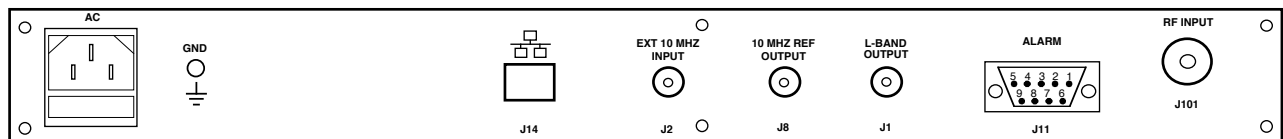
MODEL 3116-30#-1200 Block Downconverter

1.0 General

1.1 Equipment Description

The 3116-30#-1200 Downconverter converts 2.0 - 3.0 GHz to 1.2 ±0.40 GHz with low phase noise and flat frequency response. Dual conversion frequency translation is via 6.20 to 6.40 GHz and 5.00 GHz local oscillators. Front panel LEDs provide indication of DC Power, External 10 MHz, and PLL Alarm. The gain is +0 dB. Connectors are Type N female for the RF and BNC female for the L-Band and external reference input and reference output. A three-way switch controls which 10 MHz reference is being used. In the INT position, the internal reference is used, in the EXT position, the external reference is used, and in the AUTO position, the internal reference is used unless a 3 dBm ± 3 dB, 10MHz reference signal is connected to the external reference input. The 3116 is powered by a 100-240 ± 10% VAC power supply, and mounted in a 1 3/4" X 19" X 14" rack mount chassis.
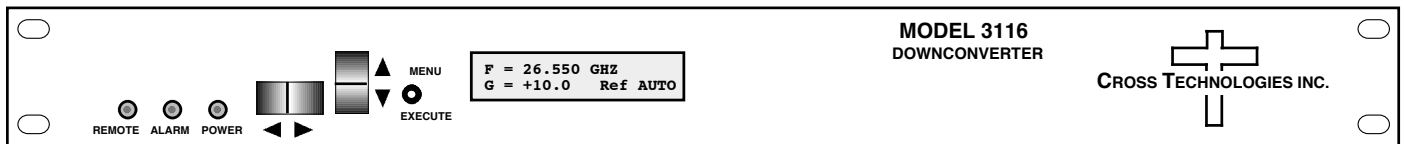
FRONT PANEL - 3116-30#-1200

REAR PANEL - 3116-30#-1200 (Shown with optional RJ45 Ethernet Connector)

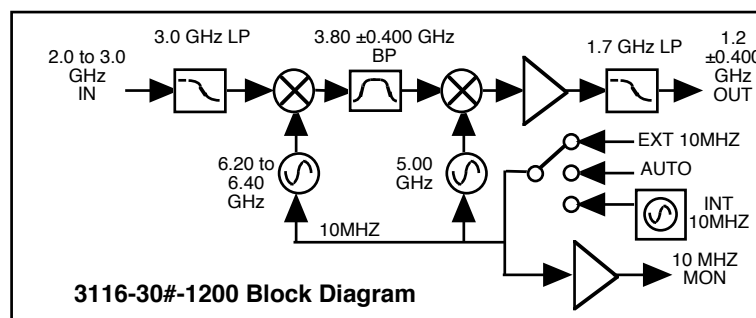**FIGURE 1.1   3116-30#-1200 Front and Rear Panels**

3116-30#-1200 Block Diagram

FIGURE 1.2   3116-30#-1200 Block Diagram

1.2 Technical Characteristics

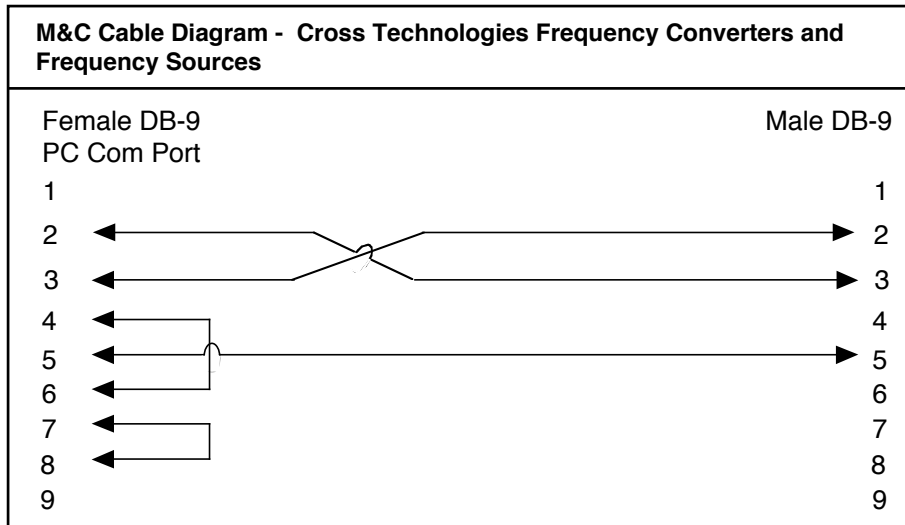| TABLE 1.0 3116-30#-1200 Agile Block Downconverter Specifications*	
Input Characteristics (RF)	
Impedance / Return Loss	50Ω / 14 dB
Frequency	2.0 to 3.0 GHz
Noise Figure, Maximum	30 dB Gmax, Fc
Input Level Range	-25 to -5 dBm, at Fc
Input 1 dB Compression	+5 dBm, at Fc
Output Characteristics (L-Band)	
Impedance / Return Loss	50Ω / 14 dB
Frequency	1200 ± 400 MHz
Output 1 dB Compression	+5 dBm, at Fc
Channel Characteristics	
Gain	+0 dB ±2 dB, at Fc
Image Rejection	> -60 dB, minimum
Spurious, In Band	<-45 dBc in band, -5 dBm out
Spurious, Out of Band	< -50 dBm; 0.4 - 0.8 GHz and 1.6 - 2.5 GHz
Intermodulation	< -50 dBC for two carriers at Fc ± 2MHz, each at -15 dBm out
Frequency Reponse	±2.0 dB, 1200 ± 400 MHz out; ± 0.5, 40 MHz BW
Frequency Sense	Non-inverting
LO Characteristics	
Frequency Step	1 MHz (Option X1, 100 kHz frequency step)
Frequency Accuracy	± 0.01 ppm maximum over temp. internal reference; external reference input
External 10 MHz Level	3 to ± 3 dB, with Auto-detect

Phase Noise @ F (Hz) >	100 Hz	1kHz	10kHz	100kHz	1MHz
Standard dBC/(Hz)	-60	-70	-80	-90	-100

Controls, Indicators	
Freq./Gain, Ext. Ref. Selection	Direct Readout LCD; pushbutton or remote
Power, Alarm, Remote	Green LED, Red LED, Yellow LED
Remote	RS232C/RS485/422, 9600 baud (Ethernet Options - W8, W18, W28, W828)
Other	
RF Connector	N- type (female), 50Ω
L-Band Connector	BNC (female), 75Ω
10 MHz Connectors	BNC (female) 75Ω, works with 50Ω or 75Ω
Alarm / Remote Connector	DB9 - NO or NC Contact Closure on Alarm
Size	19 inch, Standard Chassis, 1.75" high X 14.0" deep
Power	100-24 ±10% VAC, 47-63 Hz, 30 watts max.

Connectors / Impedance		Remote M&C Ethernet Options	
S -	50Ω SMA (RF), 50Ω BNC (L-BAND)	- W8	Ethernet with Web Browser Interface
SS-	50Ω SMA (RF), 50Ω SMA (L-BAND)	- W18	Ethernet with SNMP & Web Browser Interface
Available Connector Options, See Table 2.2		- W28	Ethernet: with Direct TCP/IP Interface
*10˚C to 40˚C; Specifications subject to change without notice.		- W828	Ethernet: W8 +W18 +W28

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)

M&C Cable Diagram - Cross Technologies Frequency Converters and Frequency Sources

Female DB-9   Male DB-9
PC Com Port

Female DB-9 PC Com Port	Male DB-9
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Connector: Rear panel, DB-9 male

J10 Pinouts (RS-232C/422/485)	
Pin	**Function**
1	Rx- (RS485)
2	Rx+ (RS-232C) (RS485)
3	Tx+ (RS-232C) (RS485)
4	Tx- (RS485)
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

B) <u>Status Requests</u> - Table 1.1 lists the status requests for the 3116-30#-1200 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 1.1 3116-30#-1200 Downconverter Status Requests		
Command	Syntax *	Description
Get Frequency	{aaSF}	returns {aaSFxxxxxxx} where:
		• xxxxxxx = Converter's output frequency in kHz.
Get Internal 10 MHz Reference Offset	{aaSO}	Returns {aaSOxxxxx} where:
		• xxxxxx = Internal 10 MHz reference frequency offset.
Get 10 MHz Reference Mode	{aaSE}	Returns {aaSEx} where:
		• x = 0 if the converter's 10 MHz reference mode is set to Internal
		• x = 1 if the converter's 10 MHz reference mode is set to External
		• x = 2 if the converter's 10 MHz reference mode is set to Auto
Get Mute	{aaSM}	Returns {aaSMx} where:
		• x = 0 if the converter's RF output is NOT muted (RF output is ON)
		• x = 1 if the converter's RF output is muted (RF output is OFF)
Get 10 MHz Reference Status	{aaSB}	Returns {aaSBx} where:
		• x = 0 if the currently selected 10 MHz reference is Internal
		• x = 1 if the currently selected 10 MHz reference is External
Get Summary Alarm Status	{aaSA}	Returns {aaSAx}where:
		• x = 0 when there is no summary alarm condition
		• x = 1 if there is a summary alarm condition
Get IP Address (Ethernet Option)	{Si}	Returns {Sixxx.xxx.xxx.xxx} where:
		• xxx.xxx.xxx.xxx = IP address
Get Subnet Mask (Ethernet Option)	{Ss}	Returns {Ssxxx.xxx.xxx.xxx} where:
		• xxx.xxx.xxx.xxx = subnet mask
Get Product/Model info	{Sv}	Returns {Sv3116-30#-1200y..yverZZZZ} where:
		• 3116-xx is the product model number
		• y..y = list of options, if any
		• '"ver" = separates model & options from firmware version
		• ZZZZ = firmware version (e.g., 4.00)

C) Commands

Table 1.2 lists the commands for the 3116-30#-1200 and briefly describes them.

After a command is sent the 3116 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 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 1.2 3116-30#-1200 Downconverter Commands		
Command	**Syntax ***	**Description**
Set Frequency	{aaCFxxxxxxx}	where:
		• xxxxxxx = Converter frequency in kHz
		Range: 2400000 to 2600000 in 1 MHz steps (100 kHz steps, option X1)
		Example: {CF2550000} sets the converter's input frequency to 2550 MHz
Set Internal 10 MHz Reference Offset	{aaCOxxxxx}	where:
		• xxxxx = Internal 10 MHz reference frequency offset.
		Range: -2000 to +2000
Set 10 MHz Reference Mode	{aaCEx}	where:
		• x = 0 if the converter's 10 MHz reference mode is set to Internal
		• x = 1 if the converter's 10 MHz reference mode is set to External
		• x = 2 if the converter's 10 MHz reference mode is set to Auto
Set Mute	{aaCMx}	where:
		• x = 0 if the converter's RF output is NOT muted (RF output is ON)
		• x = 1 if the converter's RF output is muted (RF output is OFF)

2.0 Installation

2.1 Mechanical

The 3116 is powered by a 100-240 ± 10% VAC power supply, and housed in a 1 3/4" X 19" X 14" rack mount chassis. The 3116-30#-1200 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 3116-30#-1200 is assembled.
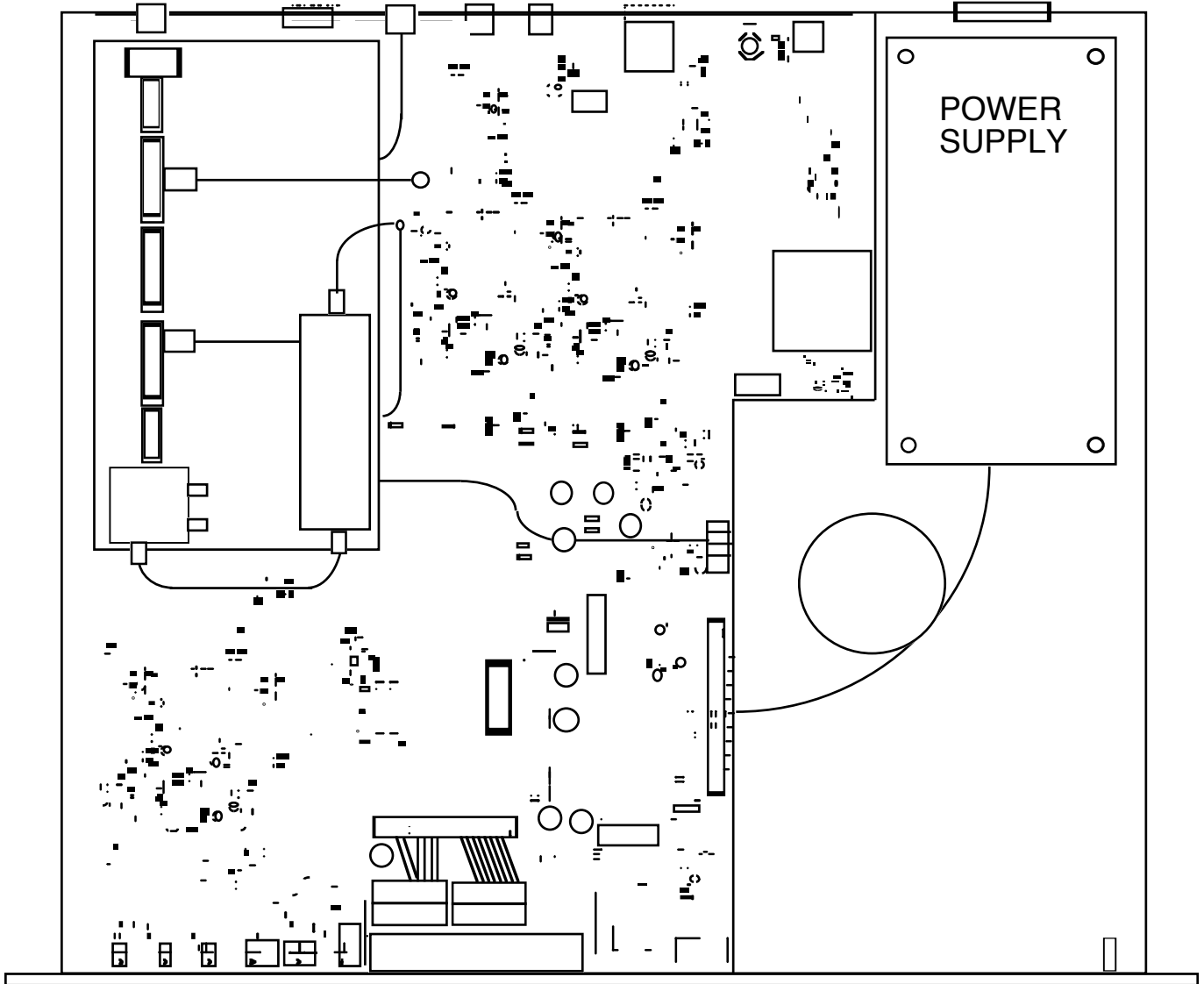

POWER
SUPPLY

FIGURE 2.0   3116-30#-1200 Mechanical Assembly

2.2 Rear Panel Input/Output Signals

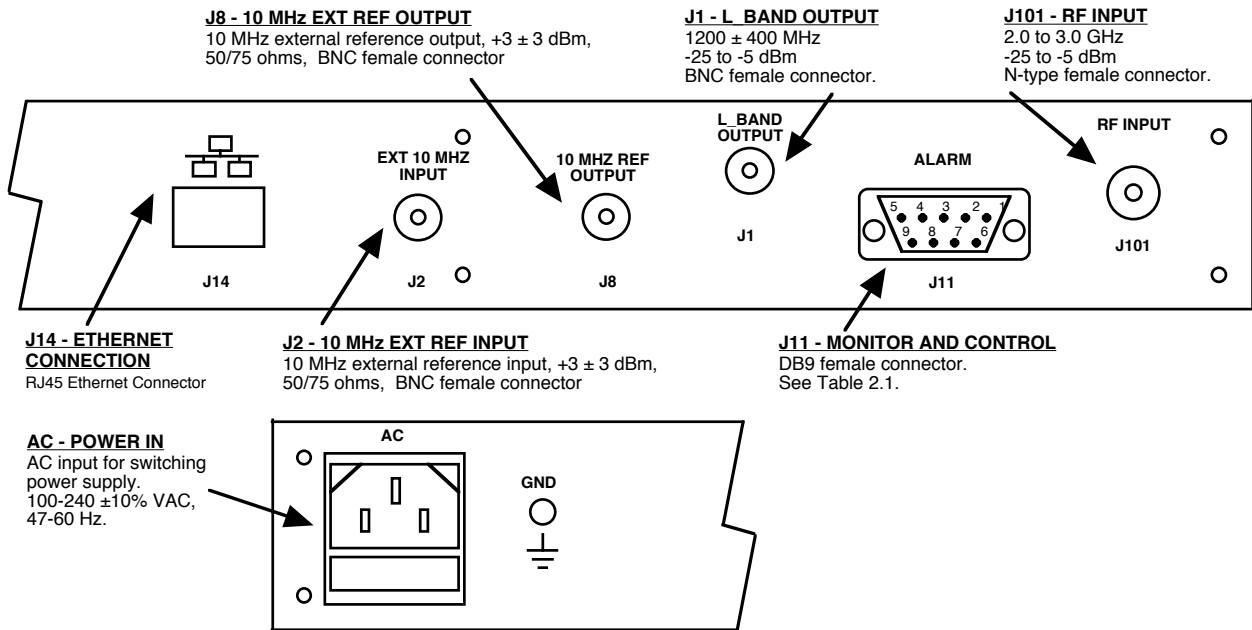Figure 2.1 shows the input and output connectors on the rear panel.

J8 - 10 MHz EXT REF OUTPUT
10 MHz external reference output, +3 ± 3 dBm,
50/75 ohms, BNC female connector

J1 - L BAND OUTPUT
1200 ± 400 MHz
-25 to -5 dBm
BNC female connector.

J101 - RF INPUT
2.0 to 3.0 GHz
-25 to -5 dBm
N-type female connector.

J14 - ETHERNET CONNECTION
RJ45 Ethernet Connector

J2 - 10 MHz EXT REF INPUT
10 MHz external reference input, +3 ± 3 dBm,
50/75 ohms, BNC female connector

J11 - MONITOR AND CONTROL
DB9 female connector.
See Table 2.1.

AC - POWER IN
AC input for switching
power supply.
100-240 ±10% VAC,
47-60 Hz.

FIGURE 2.1   3116-30#-1200 Rear Panel I/O's

TABLE 2.1 J10 Pinouts*	
Pin	Function
1	Rx- (RS485)
2	Rx+ (RS-232C) (RS485)
3	Tx+ (RS-232C) (RS485)
4	Tx- (RS485)
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

TABLE 2.2 Connector Options		
Option	RF	L-Band
-STD.	50Ω Type N	50Ω BNC
-N	50Ω Type N	75Ω BNC
-S	50Ω SMA	50Ω BNC
-SS	50Ω SMA	50Ω SMA

*Remote Serial Interface
Interface: DB-9 Male Protocol: RS-232C (RS-232C/422/485),
9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit.

2.3 Front Panel Controls and Indicators

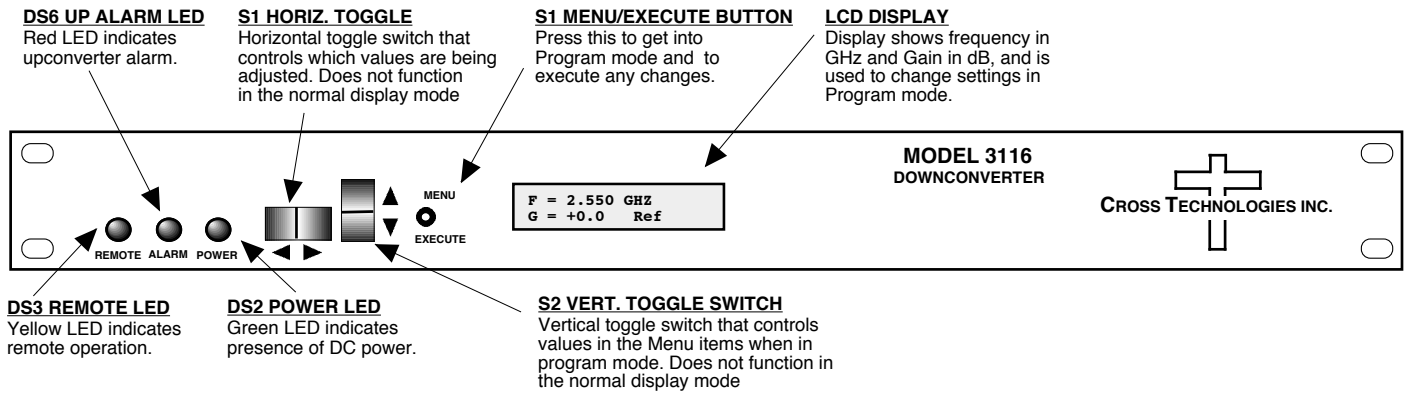Figure 2.2 shows the front panel controls and indicators.

DS6 UP ALARM LED
Red LED indicates
upconverter alarm.

S1 HORIZ. TOGGLE
Horizontal toggle switch that
controls which values are being
adjusted. Does not function
in the normal display mode

S1 MENU/EXECUTE BUTTON
Press this to get into
Program mode and to
execute any changes.

LCD DISPLAY
Display shows frequency in
GHz and Gain in dB, and is
used to change settings in
Program mode.

MENU

EXECUTE

```
F = 2.550 GHZ
G = +0.0   Ref
```

MODEL 3116
DOWNCONVERTER

CROSS TECHNOLOGIES INC.

REMOTE ALARM POWER

DS3 REMOTE LED
Yellow LED indicates
remote operation.

DS2 POWER LED
Green LED indicates
presence of DC power.

S2 VERT. TOGGLE SWITCH
Vertical toggle switch that controls
values in the Menu items when in
program mode. Does not function in
the normal display mode

FIGURE 2.2   3116-30#-1200 Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 3116-30#-1200

1. Connect a -25 dBm to -5 dBm signal to RF IN, J101 (Figure 2.1).
2. Connect the L-BAND OUT, J1, to the external equipment.
3. Connect 100-240 ±10% VAC, 47 - 63 Hz to AC connector on the back panel.
4. Make sure the output stays within -25 to -5 dBm with the input level provided.
5. Be sure DS2 (green, DC Power) is on and DS6 (red, Alarm) is off (Figure 2.2).
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 2.3. There is a spare fuse in the near slot. If a fuse continues to open, the power supply is most likely defective.

FUSE DRAWER

SPARE FUSE

AC Fuse - 2 amp slow blow (Type T), 5 mm X 20 mm

INPUT ～	FUSE ▭
100-240± 10%VAC	TYPE T 2A GDC
47-63 Hz	**250 VOLT**
2A MAX	**FOR 100 - 240 V~**
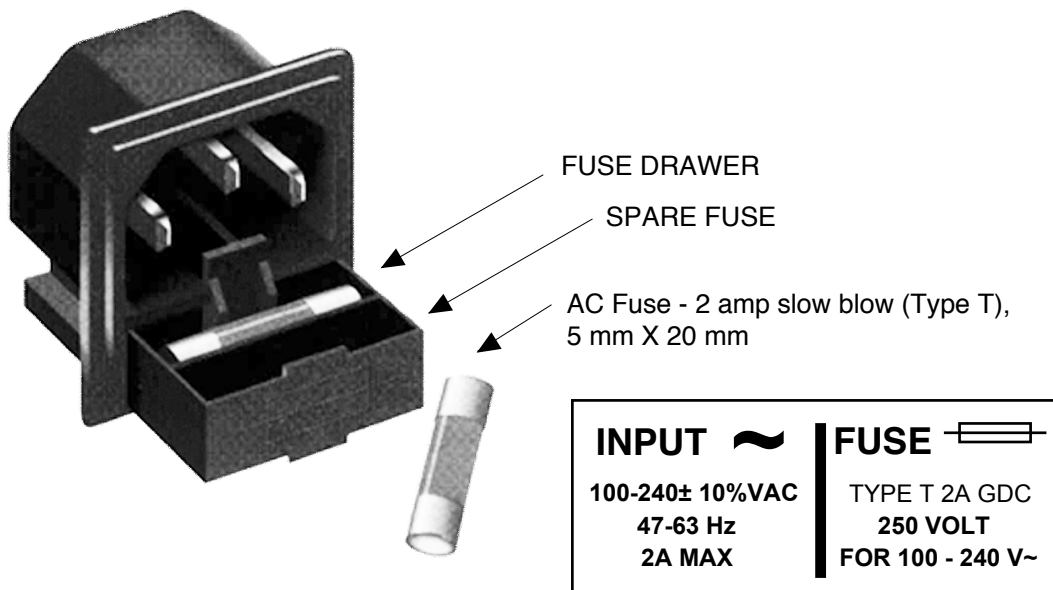
FIGURE 2.3   Fuse Location and Spare Fuse

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   Set Frequency
Menu 2   Set Mute
Menu 3   Set Reference Mode
Menu 4   Set Reference Offset
Menu 5   Set Remote
Menu 6   Set Remote Interface
Menu 7   Set RS-485 Address

Save Menu When "R" is selected from any above menu or at the end.

Alarm indications appear on the LEDs (see Figure 2.2).
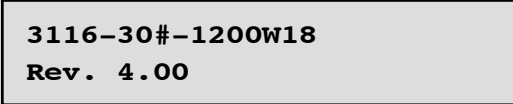
All program changes must start with the operation of the Menu/Execute switch and must also end with the operation of the Menu/Execute switch verified by the "Save Settings?" Menu. If this sequence is not followed, none of the changes will take effect. If programming is initiated and no operator action 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 OPERATING PARAMETERS OF A UNIT ARE 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 Model and Software version will be displayed.

```
 3116-30#-1200W18
 Rev. 4.00
```

     3. The present frequency and gain of the downconverter is shown.

```
F = 2.550 GHz
G = 0.0    REF AUTO
```

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

2.5.3 Control Switches

    1. <u>Menu/Execute</u> - 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. <u>Horizontal Switch</u> - This switch is mounted so its movement is horizontal and moves the display cursor left or right.

    3. <u>Vertical Switch</u> - This switch is mounted so its movement is vertical and has two functions:

       a. During gain changes, the vertical movement will raise or lower the number in the direction of the arrows.

       b. For other functions such Remote 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.
The Remote LED will light when you select the Remote mode.

2.5.5 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, J8. 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, J2.
REF = EXT appears on the front panel display. The External 10 MHz Reference level
must be +3dBm, ±3dB. 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, J8.

Auto Mode: The unit defaults to the External 10 MHz Reference as long as the level meets the +3dBm,
±3dB 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, J8.

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, J8.

FIGURE 2.4   Menu Display and Sequences

Power Up 1:

ON POWER UP (1)

```
= = =  IP Addr  = = =
192.168.123.002
```

Power Up 2:

ON POWER UP (2)

```
3116--30#-1200
Rev. 5.00
```

Normal Display

NORMAL DISPLAY

```
F = 2.550 GHz
G = 0.0     REF AUTO
```
PUSH BUTTON

PUSHING MENU/EXECUTE SEQUENCE

Menu 1 Set Frequency

```
F = 2.565 GHz              R
```
SCROLL <>
SCROLL ⌄⌃   PUSH BUTTON

Menu 2 Set Mute

```
MUTE = ON                  R
```
SCROLL <>
SCROLL ⌄⌃   PUSH BUTTON

Menu 3 Set Reference Mode

```
REF MODE = AUTO            R
```
SCROLL <>
SCROLL ⌄⌃   PUSH BUTTON

Menu 4 Set Reference Offset

```
INTERNAL  FREQ  ADUST      R
OFFSET = -1225
```
SCROLL <>
SCROLL ⌄⌃   PUSH BUTTON

Menu 5 Set Remote

```
REMOTE =  ON               R
```
SCROLL <>
SCROLL ⌄⌃   PUSH BUTTON

Menu 6 Set Remote Interface

```
INTERFACE =  RS232         R
```
SCROLL <>
SCROLL ⌄⌃   PUSH BUTTON

Menu 7 Set RS485 Address

```
RS485  ADDRESS = 0         R
```
SCROLL <>
SCROLL ⌄⌃   PUSH BUTTON

Save? When go to end

```
SAVE SETTINGS?      Y N
```
SCROLL <>
SCROLL ⌄⌃   PUSH BUTTON

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.

CROSS TECHNOLOGIES, INC.

6170 Shiloh Road
Alpharetta, Georgia 30005

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

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com

Printed in USA