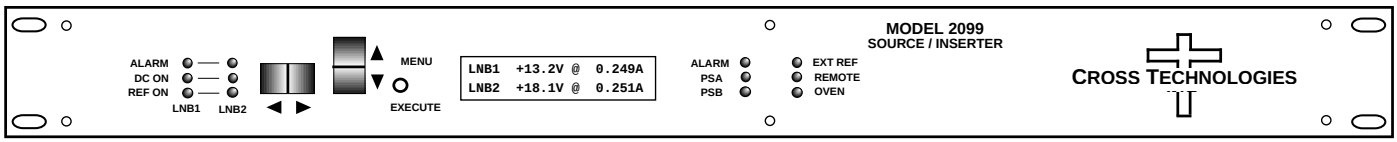
Instruction Manual

Model 2099-1318

10MHz Source/Inserter, Redundant Power

August 2017, Rev. A



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INSTRUCTION MANUAL

MODEL 2099-1318 10MHz Source/Inserter, Redundant Power

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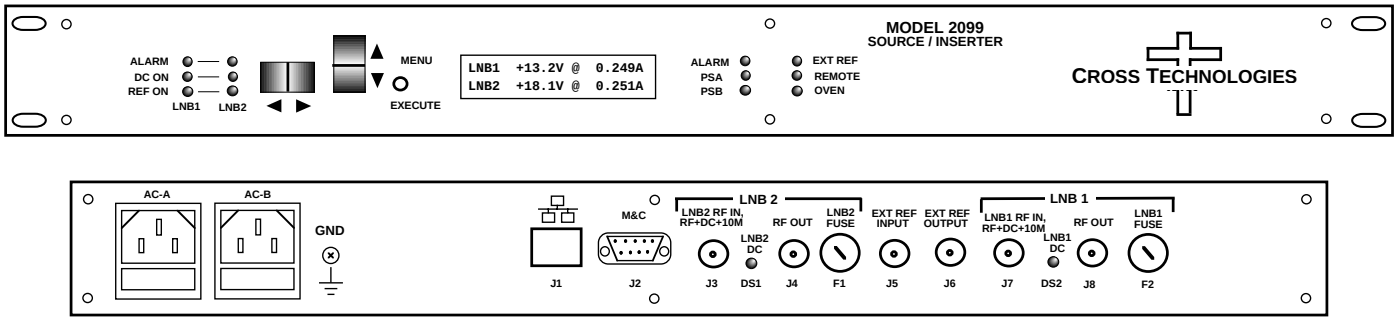
Model 2099-1318
10MHz, 13V, and 18V Source/Inserter, Redundant Power

1.0 General

1.1 Equipment Description

The 2099-1318 10 MHz Source/Inserter provides a 10 MHz, ± 0.01 ppm oven controlled crystal oscillator (OCXO) with circuitry to insert the 10MHz signal and either of two DC voltages (+13 or +18 VDC) on two L-band lines for two LNBs. Multi-function switches select either +13 or +18 VDC LNB power for insertion on either/both LNB lines, internal or External (Option E) 10 MHz, and insertion of 10 MHz on the L-band lines. LEDs indicate DC power (green), Reference insertion (green), alarm (red), remote operation (yellow), and OCXO oven warm-up (yellow). The External Reference option (Option E) provides an external reference input which can be used to lock the internal 10 MHz source to a high stability external frequency reference or it may be inserted directly into the L-Band lines. Remote control allows remote configuration of front panel commands and monitoring LNB1 and LNB2 voltage and current. Parameter selection and each LNB voltage and current appear on the LCD display. Connectors are BNC female for RF and 10 MHz input and output signals. Redundant AC power is 100-240 ± 10% VAC, 47-63 Hz. The chassis is 1 RU, 12" deep.



Front and Rear Panels (Shown with Option - E)

FIGURE 1.1 Model 2099-1318 Front and Rear Panels

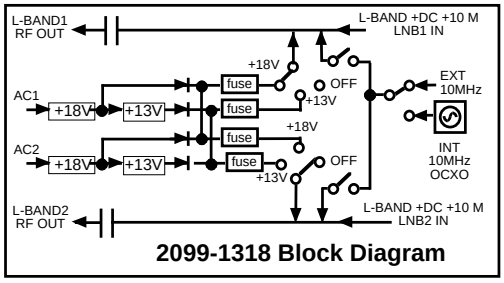


FIGURE 1.2 Model 2099-1318 10MHz Source/Inserter Block Diagram

1.2 Technical Characteristics

TABLE 1.0 2099-1318 10MHz Source/Inserter*

TABLE 1.0 2099-1318 Source Inserter*	
10 MHz Reference	
Output Characteristics (on L-Band RF)	
Level	+2 dBm ±2 dB
Harmonics	< -30 dBC, < -40 dBC Typ.
Level to non-insert end	< -20 dBm, < -30 dBm Typ.
Input/Output Characteristics (on BNC Connectors)	
Impedance, Return Loss	50Ω / 75Ω, 14 dB
Level	+3 dBm ± 3 dB
Harmonics (Output)	< -30 dBC, < -40 dBC Typ.
Oscillator	
Stability	± 0.01 ppm max. over temp
Aging, per day	± 0.001 ppm
Aging, per year	± 0.1 ppm
Warm Up, 4 Minutes	± 0.1 ppm
Warm Up, 1 Hour	± 0.01 ppm
Tuning Adjust	± 0.5 ppm

L-Band Insertion	
RF Input/Output Characteristics	
Frequency	950 to 2150 MHz & 10MHz
Impedance	50Ω
Return Loss	> 12 dB, 0.95 to 1.5 GHz > 10 dB, 1.5 to 2.15 GHz
Insertion Loss	< 1dB, 0.95 to 1.5 GHz < 2 dB, 1.5 to 2.15 GHz
Frequency Response	±1.0 dB, 950 to 2150 MHz; ±0.5 dB, 36 MHz BW
LNB1, LNB2 DC Power Characteristics	
Voltage/Current PWR1	+13 ±1 VDC, 0.5 A, max. OR
Voltage/Current PWR2	+18 ±1 VDC, 0.5 A, max.
Load Regulation	±5 %

Phase Noise @ Frequency	10 Hz	100 Hz	1 kHz	10 kHz
dBC/Hz	110	140	149	149

Chassis / Other	
Control Indicators	
Internal/External 10 MHz Select	FP Switch or M&C Select; External Yellow LED
10 MHz Insert Select	FP Switch or M&C Select; Green LED
LNB1, LNB2 Insert	FP Switch or M&C Select; Green, Rear Yellow LED
LNB1, LNB2 Volts and Amps	Front Panel Display and M&C
Power, Alarm, Reference	Green LED, Red LED, Green LED
Oven, External Reference, Remote	Yellow LED, Yellow LED, Yellow LED
Other	
RF Connectors	BNC, 50Ω (female) Standard. See Data Sheet for other connector options
10 MHz Connectors	BNC, 50 (female) **(Works for 50Ω or 75Ω)**
Alarm/Remote Connector	DB9 (female) - NO or NC Closure on Alarm
Size	19 inch, 1 RU Chassis, 1.75” High X 12.0” Deep
Power, Redundant Standard	100 - 240 ±10% VAC, 47 - 63 Hz, 50 watts maximum
*10˚C to 40˚C; Specifications subject to change without notice	

Continued on page 5...

1.2 Technical Characteristics Continued...

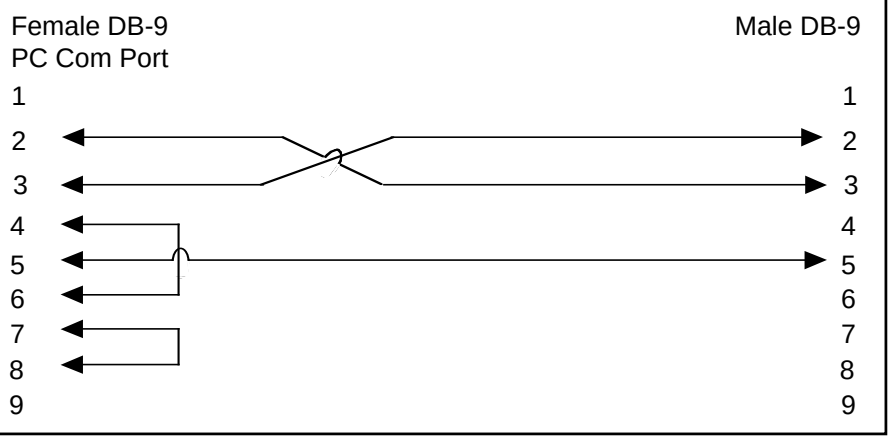
Options	
- E	External 10 MHz Reference, Auto Detect and Restore
Common Interface/Standard RS232	
- W8	Ethernet, with Web Browser
- W18	Ethernet, with Web Browser and SNMP
- W28	Ethernet, with TCP/IP, Telnet®
Connectors/Impedance	
- B	75Ω BNC
- F	75Ω F-Type
- NN	50Ω N-Type
*10˚C to 40˚C; Specifications subject to change without notice	

1.3 Monitor and Control Interface

A.) Remote Serial Interface

Protocol: RS-232C/422/485, 9600 baud rate, no parity, 8 data bits, 1 start bit, and 1 stop bit.

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



Connector: Rear panel, DB-9 female

TABLE 2.1 J19 Pinouts (DB9)

Pin	Function
1	Rx- (RS 485)
2	Rx+ (RS-232C) (RS485)
3	Tx+ (RS-232C) (RS485)
4	Tx- (RS485)
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Open=ALARM
8	Not Used
9	Alarm Relay: Closed=ALARM

B.) Status Requests

Table 1.1 lists the status requests for the 2099-1318 10MHz Source/Inserter 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 2099-1318 Status Requests

Command	Syntax*	Description
Get Selected LNB1 Voltage	{aaSV}	Returns {aaSVxx}
		where: xx = 13 if +13 VDC is selected.
		xx = 18 if +18 VDC is selected.
Get LNB1 DC Voltage Insert State	{aaSS}	returns {aaSSx}
		where: x = 1 if DC voltage is inserted on the LNB1 loop through.
		x = 0 if DC voltage is disabled on the LNB1 loop through.
Get LNB1 10MHz Reference Insert State	{aaSD}	returns {aaSDx}
		where: x = 1 if the 10 MHz reference is inserted on the LNB1 loop through.
		x = 0 if the 10 MHz reference is disabled on the LNB1 loop through.
Get Selected LNB2 Voltage	{aaSN}	returns {aaSNxx}
		where: xx = 13 if +13 VDC is selected
		x x = 18 if +18 VDC is selected
Get LNB2 DC Voltage Insert State	{aaSL}	returns {aaSLx}
		where: x = 1 if DC voltage is inserted on the LNB2 loop through.
		x = 0 if DC voltage is disabled on the LNB2 loop through.
Get LNB2 10 MHz Reference Insert State	{aaSB}	returns {aaSBx}
		where: x = 1 if the 10 MHz reference is inserted on the LNB2 loop through.
		x = 0 if the 10 MHz reference is disabled on the LNB2 loop through.
Get LNB1 Inserted Voltage and Current	{aaSJ}	returns {aaSJxxxxx,yyyyy}
		where: xxxxx = Measured DC voltage inserted on the LNB1 loop through.
		where: yyyyy = Measured DC current inserted on the LNB1 loop through.
Get LNB2 Inserted Voltage and Current	{aaSK}	returns {aaSKxxxxx,yyyyy}
		where: xxxxx = Measured DC voltage inserted on the LNB2 loop through.
		where: yyyyy = Measured DC current inserted on the LNB2 loop through.
Get 10 MHz Reference Operating Mode	{aaSM}	returns {aaSMx}
		where: x = 1 if the mode is Internal Reference.
		x = 2 if the mode is External Pass.
		x = 3 if the mode is External Pass Auto.
		x = 4 if the mode is External Lock.
		x = 5 if the mode is External Lock Auto.
Get IP address (ethernet optional)	{Si}	returns {aaSixxx.xxx.xxx.xxx}
		where xxx.xxx.xxx.xxx = IP address
Get subnet mask (ethernet optional)	{Ss}	returns {Ssxxx.xxx.xxx.xxx}
		where xxx.xxx.xxx.xxx = subnet mask

Status Request Continued on page 8....

B.) Status Request (continued from page 7...)

Table 1.1 2099-1318 Status Requests (continued...)		
Command	**Syntax***	**Description**
Get alarm status (ethernet optional)	{SA}	returns {SA}
		where a = LNB Alarm State (0 for alarm off; 1 for alarm on)
		b = LNB alarm state (0 for alarm off; 1 for alarm on)
		c = Summary alarm state (0 for alarm off; 1 for alarm on)
Get all monitored statuses	{Sa}	returns{Sabcdefghijklmn}
		where:
		b = DC CONV A status (0 = ok, 1 = voltage too high, 2 = voltage too low)
		c = DC CONV B status (0 = ok, 1 = voltage too high, 2 = voltage too low)
		d = +18V PSA status (0 = ok, 1 = voltage too high, 2 = voltage too low)
		e = +18V PSB status (0 = ok, 1 = voltage too high, 2 = voltage too low)
		f = LNB1 V status (0 = ok, 1 = voltage too high, 2 = voltage too low)
		g = LNB1 I status (0 = ok, 1 = current too high)
		h = LNB2 V status (0 = ok, 1 = voltage too high, 2 = voltage too low)
		i = LNB2 I status (0 = ok, 1 = current too high)
		j = Internal Reference Mode status(0 = ok, 1 = internal reference low and Internal Reference Mode is selected)
		k = External Reference Mode status(0 = ok, 1 = external reference low and External Pass Reference Mode is selected)
		l = External Pass Auto Reference Mode status(0 = ok, 1 = external reference low and External Pass Auto Reference Mode is selected)
		m = External Lock Reference Mode status(0 = ok, 1 = external reference low, 2 = pll cannot lock)
		n = External Lock Auto Reference Mode(0 = ok, 1 = external reference low, 2 = pll cannot lock)
Get product/model info	{Sv}	returns {Sv2099-1318y..yverZZZZ}
		where 2099-1318 = product model
		y..y = list of options, if any
		"ver" = separates model & options from firmware version
		ZZZZ = firmware version (e.g., 4.00)
Get Reference Frequency offset	{aaSO}	returns {aaSOxxxxx}
		where xxxxx = offset value

C.) Commands

Table 1.2 lists the commands for the 2099-1318 10MHz Source/Inserter and briefly describes them. After a command is sent the 2099-1318 10MHz Source/Inserter 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-digit command or status number, 1 through 9
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 2099-1318 Commands

Command	Syntax*	Description
Set LNB1 DC Voltage Insert	{aaCSx}	where: x = 1 to enable DC Voltage on the LNB1 loop through.
		x = 0 to disable DC Voltage on the LNB1 loop through.
Set LNB1 10 MHz Reference Insert	{aaCAx}	where: x = 1 to enable the 10 MHz reference on the LNB1 loop through.
		x = 0 to disable the 10 MHz reference on the LNB1 loop through.
Set LNB1 Voltage	{aaCVxx}	where: xx = DC voltage available for inserting on the LNB1 RF loop through.
		There are two valid values, either 13 or 18.
		example: {CV18} sets the LNB1 voltage to +18 VDC.
		note: When the LNB1 voltage changes the LNB1 DC insert will automatically
		turn off to safeguard any external equipment. The LNB1 DC insert will
		have to be set to on after any LNB1 voltage change.
Set LNB2 DC Voltage Insert	{aaCLx}	where: x = 1 to enable DC Voltage on the LNB2 loop through.
		x = 0 to disable DC Voltage on the LNB2 loop through.
Set LNB2 10 MHz Reference Insert	{aaCBx}	where: x = 1 to enable the 10 MHz reference on theLNB2 loop through.
		x = 0 to disable the 10 MHz reference on the LNB2 loop through.
Set LNB2 Voltage	{aaCNxx}	where: xx = DC voltage available for inserting on the LNB2 RF loop through.
		There are two valid values, either 13 or 18.
		example: {CN18} sets the LNB2 voltage to +18 VDC.
		note: When the LNB2 voltage changes the LNB2 DC insert will automatically
		turn off to safeguard any external equipment. The LNB2 DC insert will
		have to be set to on after any LNB2 voltage change.
Set 10 MHz Reference Operating Mode	{aaCMx}	where: x = 1 to set the mode to Internal Reference.
		x = 2 to set the mode to External Pass.
		x = 3 to set the mode to External Pass Auto.
		x = 4 to set the mode to External Lock.
		x = 5 to set the mode to External Lock Auto.
Clear Fault (External Lock Auto Mode)	{aaCFx}	where : x = 1 to clear a FAULT condition.
Set Reference Frequency Offset	{aaCOxxxxx}	where : xxxxx = offset value
		range: -2000 to +2000

2.0) Installation

2.1) Mechanical

The 2099-1318 10MHz Source/Inserter consists of one RF PCB housed in a 1 RU (1 3/4 inch high) by 12 inch deep chassis. Redundant switching, +18 VDC power supplies provides power for the assemblies. The 2099-1318 10MHz Source/Inserter can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2099-1318 10MHz Source/Inserter is assembled.

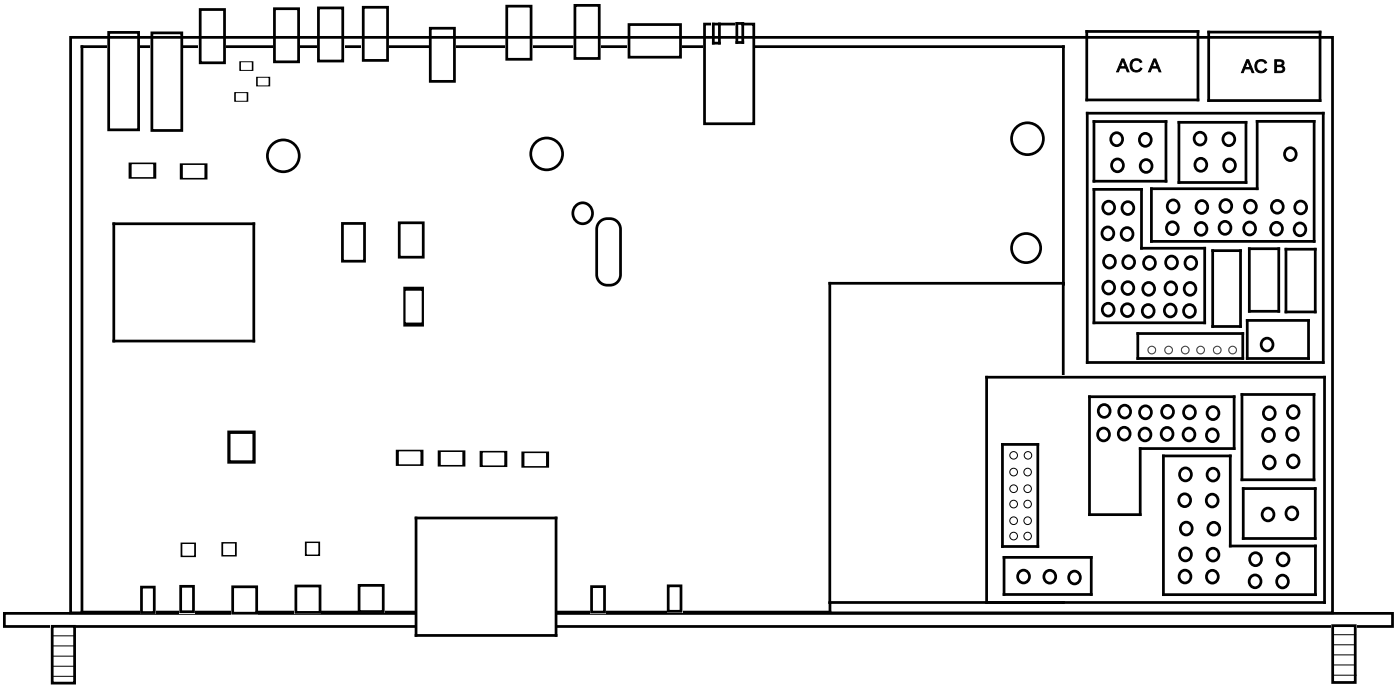


FIGURE 2.0 2099-1318 10MHz Source/Inserter Mechanical Assembly

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

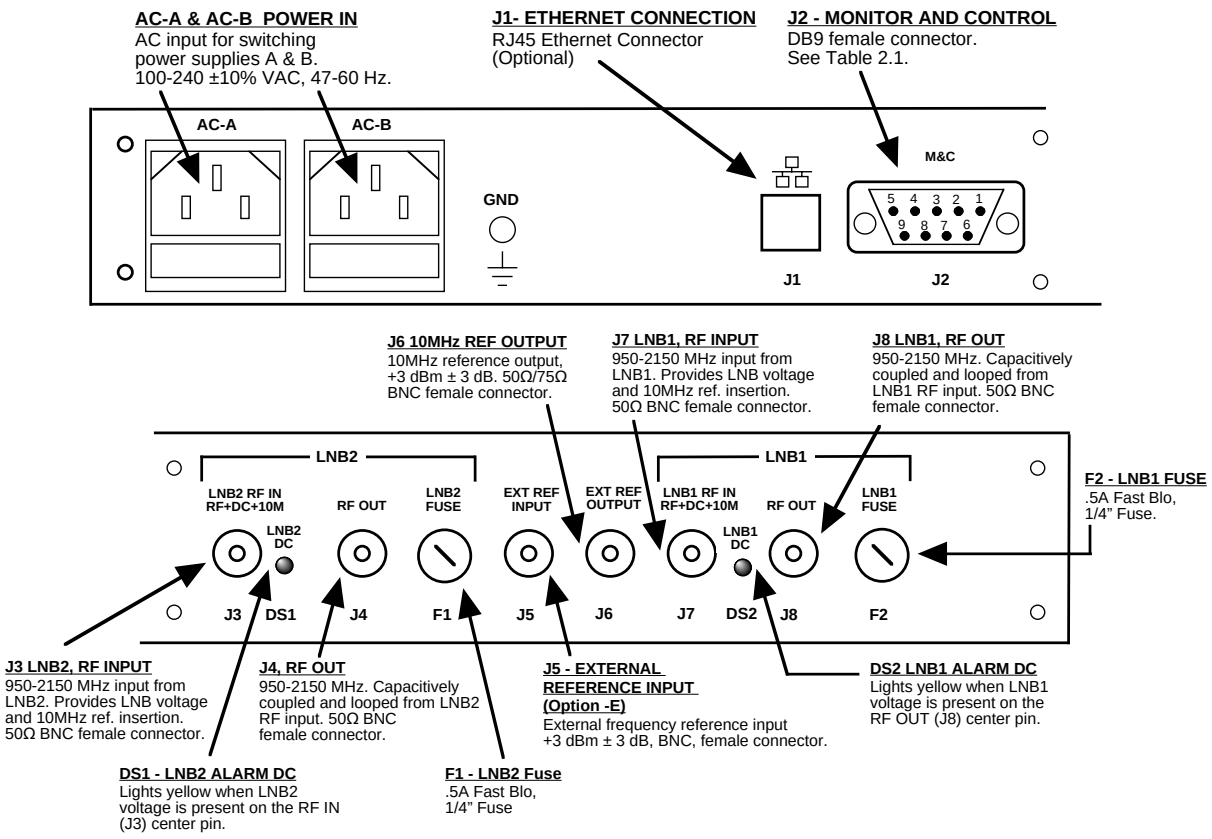


FIGURE 2.1 2099-1318 Rear Panel Outputs

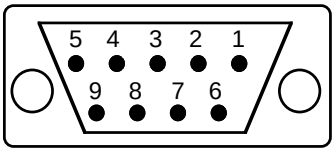


TABLE 2.1 J19 Pinouts (DB9)	
Pin	**Function**
1	Rx- (RS 485)
2	Rx+ (RS-232C) (RS485)
3	Tx+ (RS-232C) (RS485)
4	Tx- (RS485)
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Open=ALARM
8	Not Used
9	Alarm Relay: Closed=ALARM

2.3 Front Panel Indicators -The following are the front panel indicators.

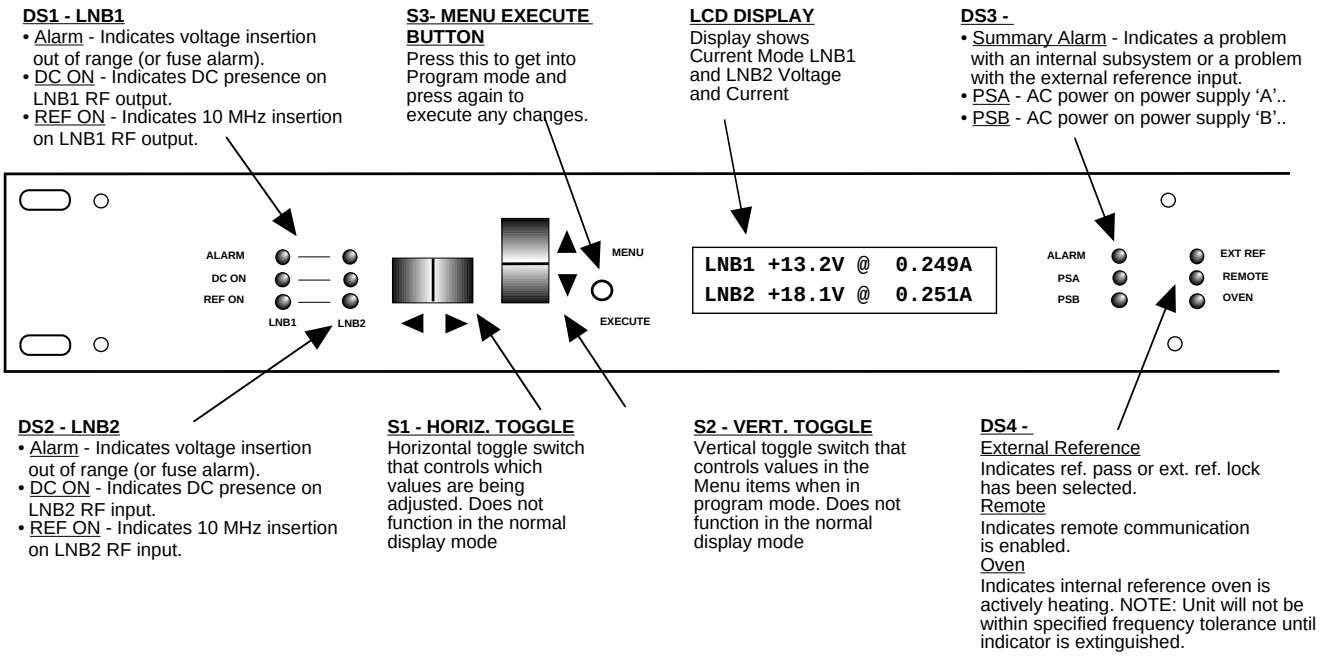


FIGURE 2.2 2099-1318 Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 2099-1318 10MHz Source/Inserter

1. **PLEASE NOTE: Unit must have 1 RU Air Space above and 1 RU Air Space below.**
2. Connect 100-240 ±10% VAC, 47-63 Hz to AC-A and AC-B connectors (Figure 2.1).
3. Be sure PSA and PSB LEDs (green, POWER) are on (Figure 2.2).
4. Be sure the ALARM LED) is off and/or contact closure at DB9 ALARM connector, J2, is not in an alarm condition.
5. Wait for DS4 LED (yellow, OVEN) to go off to insure that the oscillator oven is stabilized.
6. (Option -E only) Choose one of the five (5) modes (Internal, Ext Pass, Ext Pass Auto, Ext Lock, or Ext Lock Auto) in which to operate the unit.
7. 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.
8. 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.

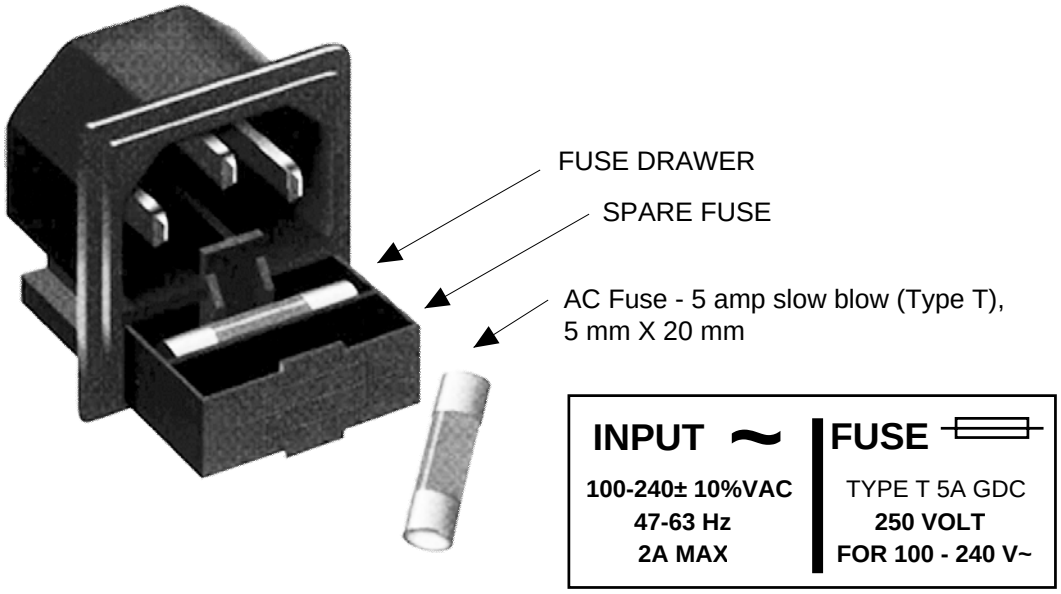


FIGURE 2.3 Fuse Location and Spare Fuse

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	Select Reference Mode (option E)
Menu 2	Select LNB1 DC Voltage
Menu 3	Select LNB1 DC insert On/Off
Menu 4	Select LNB1 reference insert On/Off
Menu 5	Select LNB2 DC Voltage
Menu 6	Select LNB2 DC insert On/Off
Menu 7	Select LNB2 Reference insert On/Off
Menu 8	Adjust Internal Reference Frequency Offset
Menu 9	Select Remote Operation On/Off
Menu 10	Select Remote Interface (232, 422, or 485)
Menu 11	Select RS485 Address
Menu 12	Measured 18 VDC From Power Supplies AC-A & AC-B
Menu 13	Measured 13 VDC From DC to DC Converters

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

Alarm indications appear on the LED (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. No program changes will be evident until they are verified at the "**SAVE SETTINGS?**" Menu.

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.

```
2099-1318
4.0
```

3. The present LNB1 and LNB2 inserted voltage and current are shown.

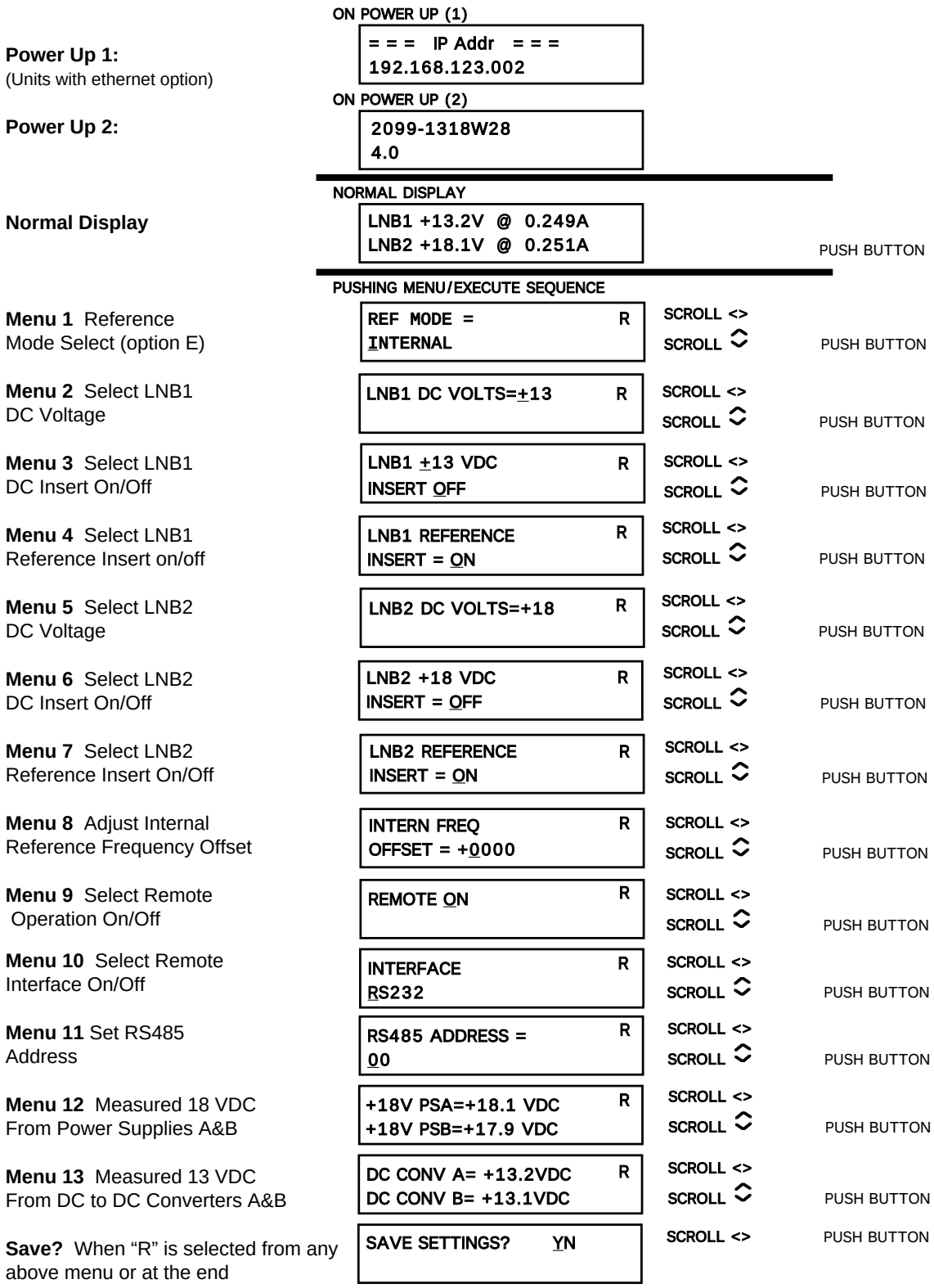
```
LNB1  +13.2V @ 0.244A
LNB2  +18.1V @ 0.259A
```

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 will toggle settings such as ON/OFF and RS232/422/485. In the case of the LEVEL setting, the vertical switch will increase or decrease the digit that is selected (within the limits of operation).

Figure 2.4 Menu Display and Sequence



(NOTE: See next page for possible alarm conditions)

Alarm Conditions

If any alarm is on then the status of nine possible alarm conditions will be displayed at the end of the menu.

	Normal (No Alarm Condition)	Alarm Condition
STATUS 1:	PSA 18V ok	PSA 18V high PSA 18V low
STATUS 2:	PSB 18V ok	PSB 18V high PSB 18V low
STATUS 3:	DC Conv A ok	DC conv a high DC conv a low
STATUS 4:	DC Conv B ok	DC conv b high DC conv b low
STATUS 5:	LNB1 V Insert ok LNB1 V Insert off	LNB1 v insert high LNB1 v insert low
STATUS 6:	LNB1 i Insert ok LNB1 i Insert off	LNB1 i insert high LNB1 i insert low
STATUS 7:	LNB2 v Insert ok LNB2 v Insert off	LNB2 v insert high LNB2 v insert low
STATUS 8:	LNB2 I Insert ok LNB2 I Insert off	LNB2 I insert high LNB2 I insert low
STATUS 9:	Reference ok	Internal Ref low External Ref low Ref PLL Not Locked

3.0 Alarm Operations

LNB Power Supply Alarms

1. **DC CONV A (LNB1 V2A Monitor)**
   This is the +13V DC voltage from DC to DC converter A. The summary alarm indicator and contact closure will be set if this voltage is greater than 14V or less than 12V.

2. **DC CONV B (LNB2 V2B Monitor)**
   This is the +13V DC voltage from DC to DC converter B. The summary alarm indicator and contact closure will be set if this voltage is greater than 14V or less than 12V.

3. **+18V PSA (LNB1 V1A Monitor)**
   This is the +18V DC voltage from power supply A. The summary alarm indicator and contact closure will be set if this voltage is greater than 19V or less than 17V. The unit's Power Supply AC-1 input must be detected before this voltage is monitored for alarm purposes.

4. **+18V PSB (LNB2 V1B Monitor)**
   This is the +18V DC voltage from power supply B. The summary alarm indicator and contact closure will be set if this voltage is greater than 19V or less than 17V. The unit's Power Supply AC-B input must be detected before this voltage is monitored for alarm purposes.

5. **LNB1 V Monitor**
   This is the DC voltage that is inserted at the LNB1 RF loop through. The LNB1 alarm indicator and alarm contact closure will be set if the selected voltage (either +13V or +18V) is too high or too low. If +13V is selected then the unit will alarm if the voltage is greater than 0.14V or less than 0.13V. If +18V is selected then the unit will alarm if the voltage is greater than 19V or less than 17V.

6. **LNB1 I Monitor**
   This is the current that is measured at the LNB1 RF loop through. The summary alarm indicator and contact closure will be set if the current is greater than 600 milliamps.

7. **LNB1 V Monitor**
   This is the DC voltage that is inserted at the LNB1 RF loop through. The summary alarm indicator and contact closure will be set if the voltage is greater than 19V or less than 17V. If +18V is selected, less than 12V or greater than 14V if +13V is selected.

8. **LNB2 I Monitor**
   This is the current that is measured at the LNB2 RF loop through. The summary alarm indicator and contact closure will be set if the current is greater than 600 milliamps.

10 MHz Reference Alarms

1. **Internal Reference Mode**
   The summary alarm indicator and contact closure will be set if the internal reference is not detected by the internal reference power detector. The external reference indicator will always be off in this mode.

2. **External Pass Reference Mode**
   The summary alarm indicator and contact closure will be set if the external reference power is less than -5 dBm, +/- 1 dBm. The external reference indicator will always be on in this mode.

3. **External Pass Auto Reference Mode**
   The summary alarm indicator and contact closure will be set if the external reference power is less than -5 dBm, +/- 1 dBm. The external reference indicator will always be on in this mode.

4. **External Lock Reference Mode**
   The summary alarm indicator and contact closure will be set if the external reference power is less than -5dBm, +/- 1 dBm. The summary alarm indicator and contact closure will be set if the internal reference cannot lock to the external reference. The external reference indicator will always be on in this mode.

5. **External Lock Auto Reference Mode**
   The summary alarm indicator and contact closure will be set if the external reference power is less than -5dBm, +/- 1 dBm. The summary alarm indicator and contact closure will be set if the internal reference cannot lock to the external reference. The external reference indicator will always be on in this mode.

4.0 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.

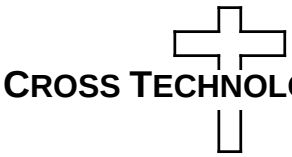
C. **Elevated Operating Ambient Temperature** - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack may be greater than room ambient temperature. Therefore, consideration should be given to Tmra.

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.



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Printed in USA