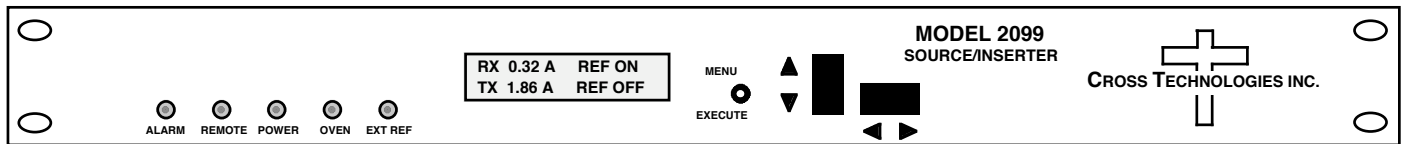


# Instruction Manual

# Model 2099-17 10MHz Source/Insertter

April 2009 Rev D



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# INSTRUCTION MANUAL

## MODEL 2099-17 10MHz Source/Inserter

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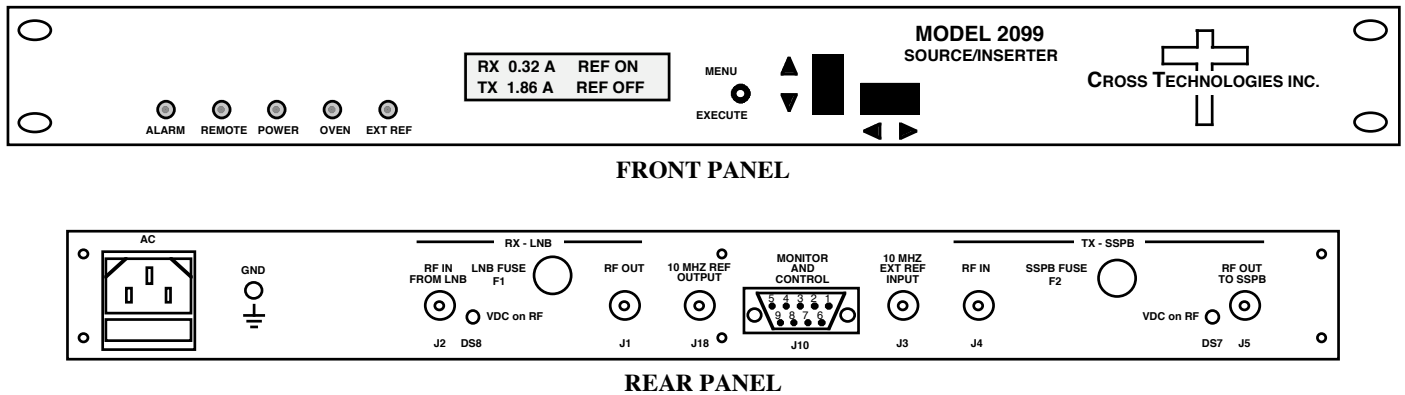
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# MODEL 2099-17 10MHz Source/Inserter

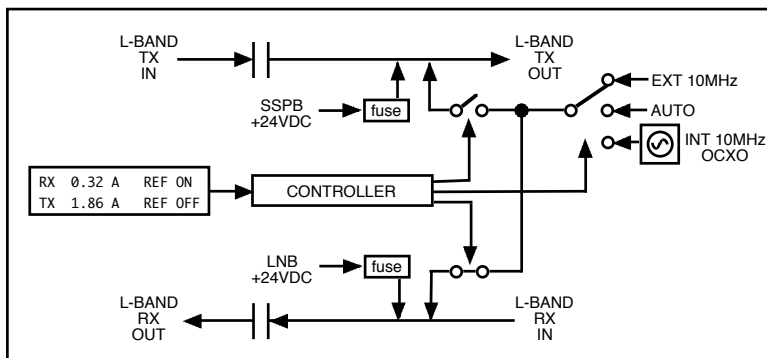
## 1.0 General

### 1.1 Equipment Description

The 2099-17 10 MHz Source / Inserter is a 10 MHz,  $\pm 0.01$  ppm oven controlled crystal oscillator (OCXO) with circuitry to insert the 10 MHz signal and DC voltage on L-band lines for an LNB and SSPB. Multi-function push button switches select internal or external 10 MHz and insertion of 10 MHz on the L-band lines. LEDs indicate alarm (red), remote operation (yellow), DC power (green), OCXO oven warm-up (yellow), and presence of external 10MHz reference (yellow). Remote control allows remote configuration of front panel commands and monitoring LNB and SSPB current. Parameter selection and LNB and SSPB current appear on the LCD display. Connectors are BNC female for RF and 10 MHz external input and output signals. LNB or SSPB +24 VDC can be inserted on the RF lines by installing the fuses. AC power is 100-240  $\pm 10\%$  VAC, 47-63 Hz. The 2099-17 is housed in a 1 RU chassis, 16" deep.



**FIGURE 1.1 Model 2099-17 Front and Rear Panels**



**FIGURE 1.2 Model 2099-17 10MHz Source/Inserter Block Diagram**

## 1.2 Technical Characteristics

**TABLE 1.0 2099-17 10MHz Source/Inserter Specifications\***

### -----10 MHz REFERENCE-----

#### Oscillator

Frequency	10 MHz
Stability	± 0.01 ppm max over temp
Aging	± 0.001 ppm per day • ± 0.1 ppm per year
Warm Up	± 0.1 ppm, 4 minutes • ± 0.01 ppm, 1 hour
Tuning Adjustment	± 0.5 ppm

Phase Noise @ Freq	10Hz	100Hz	1kHz	10kHz
dBc/Hz	-110	-140	-155	-160

#### 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, 18 dB
Level	+3 dBm ± 3 dB
Harmonics (Output)	< -30 dBc, < -40 dBc typ.

### -----RX & TX L-BAND INSERTION-----

#### RF Input/Output Characteristics

Frequency	950 - 2150 MHz
Impedance	50Ω
Return Loss	>12 dB, 0.95-1.5 GHz >10 dB, 1.5-2.15 GHz
Insertion Loss	< 1 dB, 0.95-1.5 GHz < 2 dB, 1.5-2.15 GHz
Frequency Response	±1.0 dB, 950 - 2150 MHz; ± 0.5 dB, 36 MHz BW

#### LNB, SSPB DC Power Characteristics

Voltage/Current	LNB +24 VDC, 0.5 A, max.; SSPB +24 VDC, 2.5 A, max. LNB +24 VDC, 0.5 A, max.; SSPB +48 VDC, 2.5 A, max. ( <b>option V48</b> )
Load Regulation	Call for other voltages ±5 %

### -----CHASSIS/OTHER-----

#### Controls & Indicators

INT/EXT 10 MHz Select	direct readout LCD • manual or remote selection
10 MHz Insert Select	direct readout LCD • manual or remote selection
LNB, SSPB Current	direct readout LCD • remote monitor
Power, Alarm, Remote	Green LED, Red LED, Yellow LED
Oven Warm-up, Ext Ref	Yellow LED, Yellow LED
Remote	RS232C, 9600 baud (RS485, <b>option Q</b> )

#### Other

RF Connectors	BNC, 50Ω (female) (BNC, 75Ω, <b>option B</b> ) (Type F, 75Ω, <b>option F</b> )
10 MHz Connectors	BNC, 50Ω/75Ω (female)
Alarm/Remote Connector	DB9 (female) - NO or NC contact closure on Alarm
Size	19 inch, 1RU standard chassis • 1.75”H x 16.0”D
Power	100-240 ±10% VAC, 47-63 Hz, 90 Watts max.

\*+10°C to +40°C; Specifications subject to change without notice.

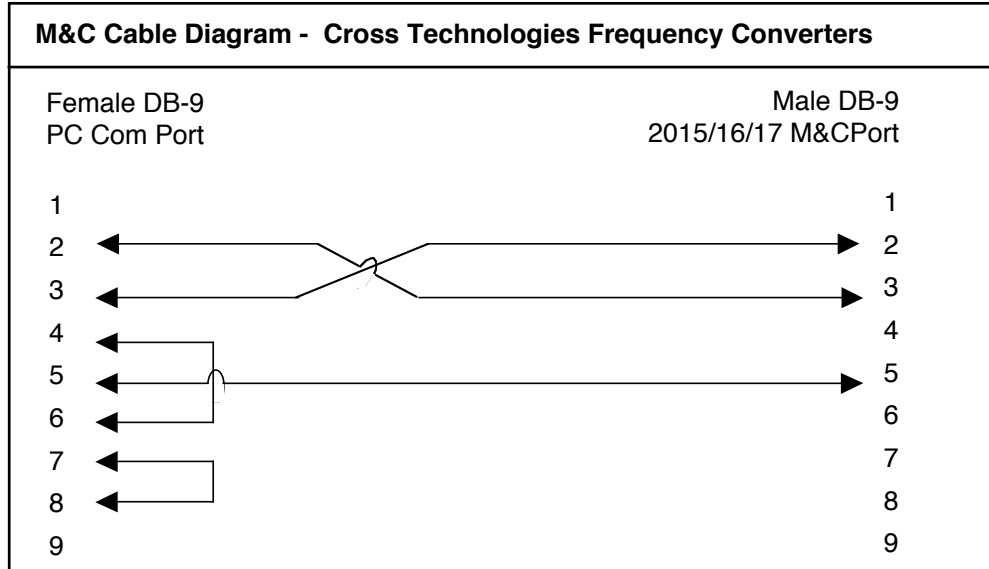
### 1.3 Environmental Use Information

- 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 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.

## 1.4 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 female

<b>J10 Pinouts (RS-232C/422/485)</b>	
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 2099-17 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 2099-17 Status Requests</b>		
<b>Command</b>	<b>Syntax*</b>	<b>Description</b>
Command Status	{aaS2}	Returns {aaS2bcde} where:
		• b = 0 (Internal), 1 (External), or 2 (Auto) Reference
		• c = 1 - 10MHz inserted on upconverter RF (J5)
		• d = 1 - 10MHz inserted on downconverter RF (J2)
		• e = 1 - FAULT! occurred in Auto Reference mode **
LNB Current	{aaS3}	Returns {aaS3bb} where:
		• bb = LNB current, range 00 to 50 (0 to 500 ma)
SSPB Current	{aaS4}	Returns {aaS4bbb} where:
		• bbb = SSPB current, range 000 to 250 (0 to 2500 ma)
Reference Offset	{aaS8}	Returns {aaS8bbbb} where:
		• bbbb = Reference Offset, range 500 to -500

\*\* FAULT! occurs when in Auto Reference mode and the external reference fails. This status will be reset ONLY upon manually or remotely reselecting Internal, External, or Auto Reference mode (see Table 1.2 and Fig 2.4).

## C) Commands

Table 1.2 lists the commands for the 2099-17 and briefly describes them. After a command is sent the 2099-17 sends a return “>” indicating the command has been received and executed.

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

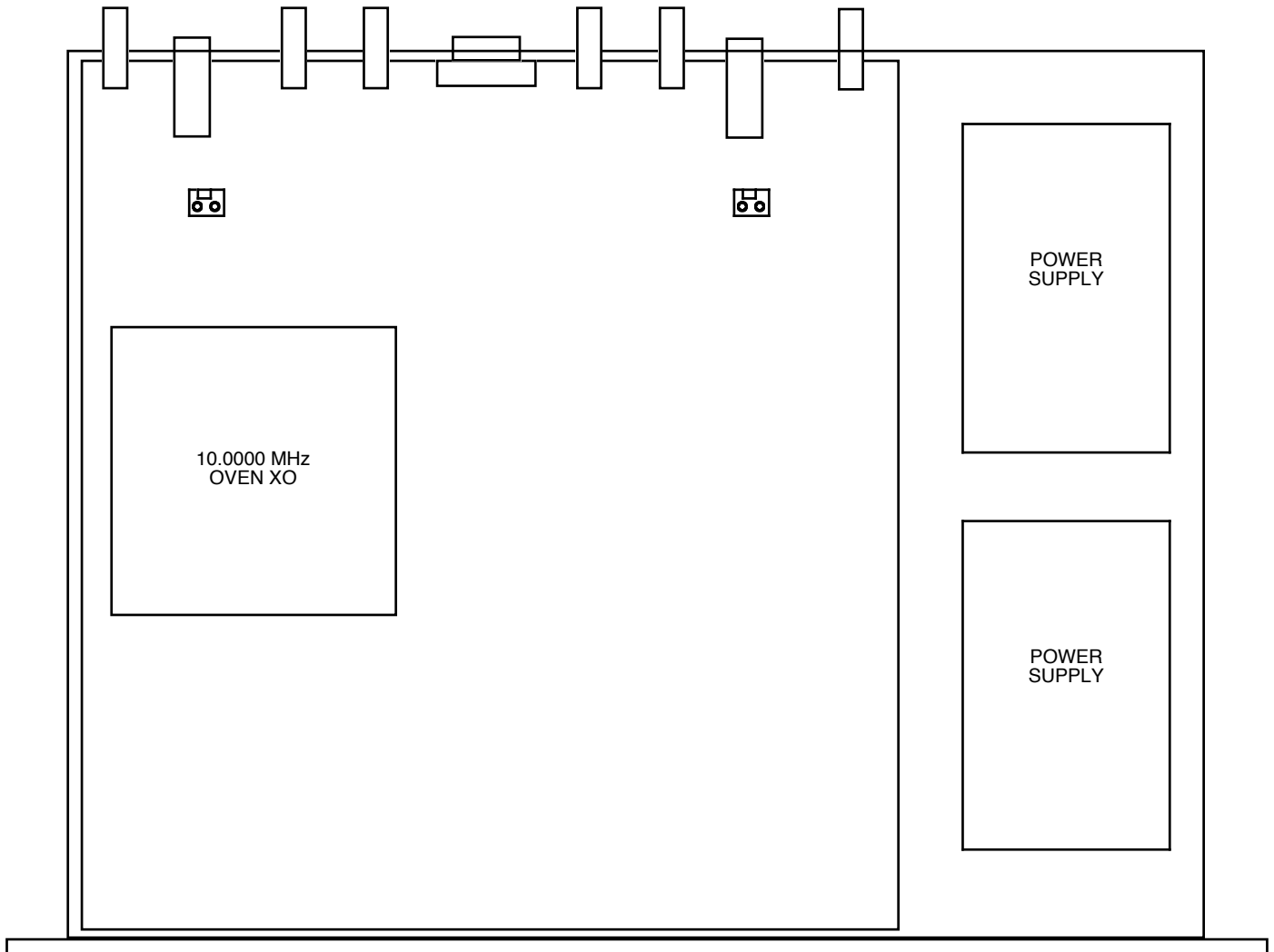
- { = start byte
- aa = Address (**RS-485 only**)
- C = 1 character, either C (command) or S (status)
- N = 1 character command or status request
- D = 1 character or more of data (depends on command)
- } = stop byte

\* 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 2099-17 Commands		
Command	Syntax*	Description
External 10MHz	{aaCEx}	where x =: <ul style="list-style-type: none"> <li>• 0 for External 10MHz Reference signal</li> <li>• 1 for Internal 10MHz Reference signal</li> <li>• 2 for Auto 10MHz Reference</li> </ul>
Insert 10MHz on TX RF	{aaC5x}	where x =: <ul style="list-style-type: none"> <li>• 0 to disable 10MHz transmitter insertion on RF (J5)</li> <li>• 1 to enable 10MHz transmitter insertion on RF (J5)</li> </ul>
Insert 10MHz on RX RF	{aaC6x}	where x =: <ul style="list-style-type: none"> <li>• 0 to disable 10MHz receiver insertion on RF (J2)</li> <li>• 1 to enable 10MHz receiver insertion on RF (J2)</li> </ul>
Frequency Offset Adjust	{aaC8xxxx}	where xxxx =: <ul style="list-style-type: none"> <li>• xxxx = 3 or 4 characters</li> <li>• Range: 2000 to -2000</li> </ul>
Enable Remote	#	Just # sign
Disable Remote	{aaCRO}	{CR and zero}

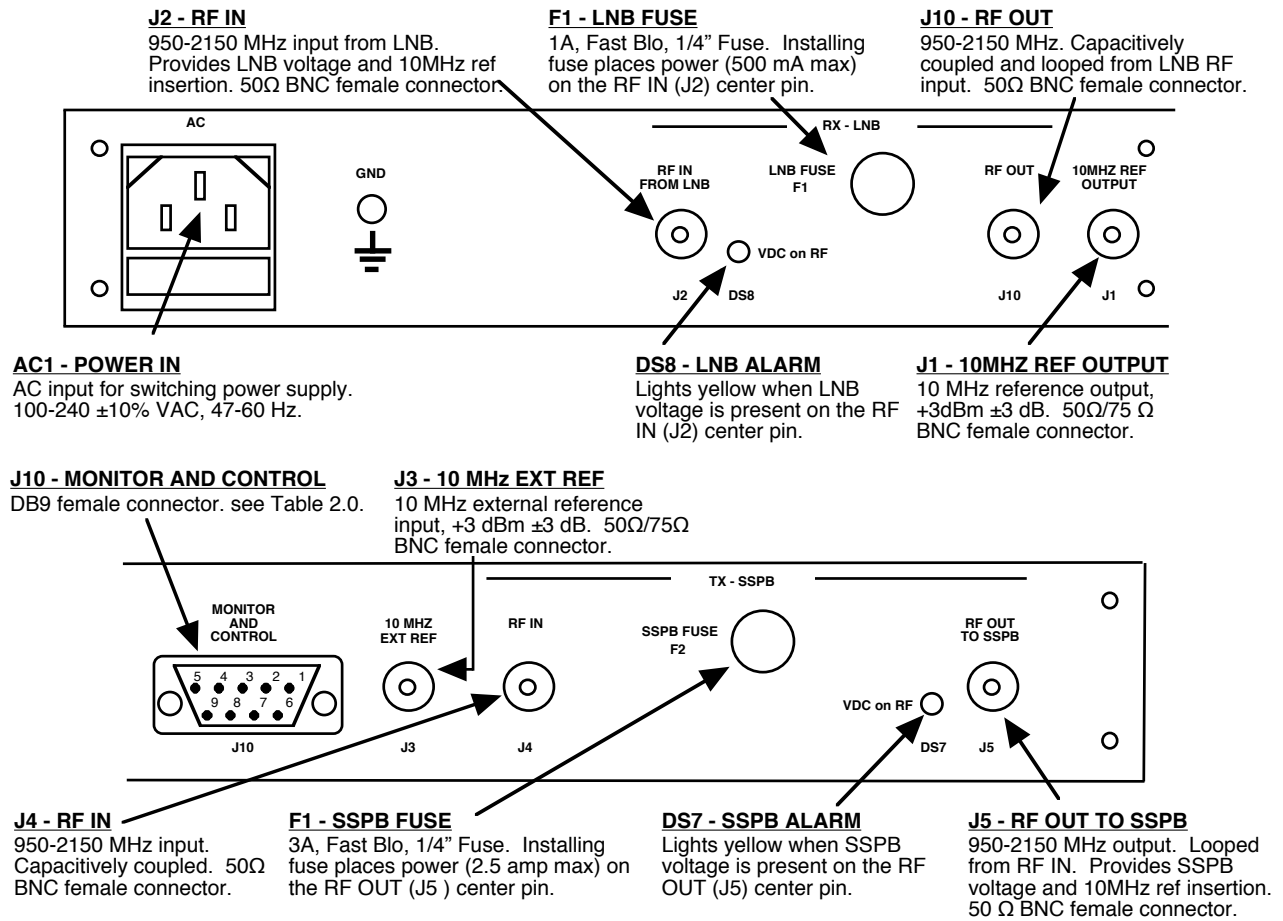
## 2.0 Installation

**2.1 Mechanical** - The 2099-17 consists of one RF 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. A separate +24VDC power supply (+48VDC, **option V48**) provides power for the SSPB. The 2099-17 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2099-17 is assembled.

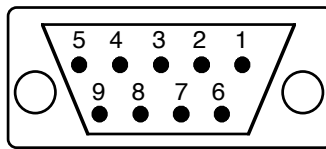


**FIGURE 2.0 2099-17 Mechanical Assembly**

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

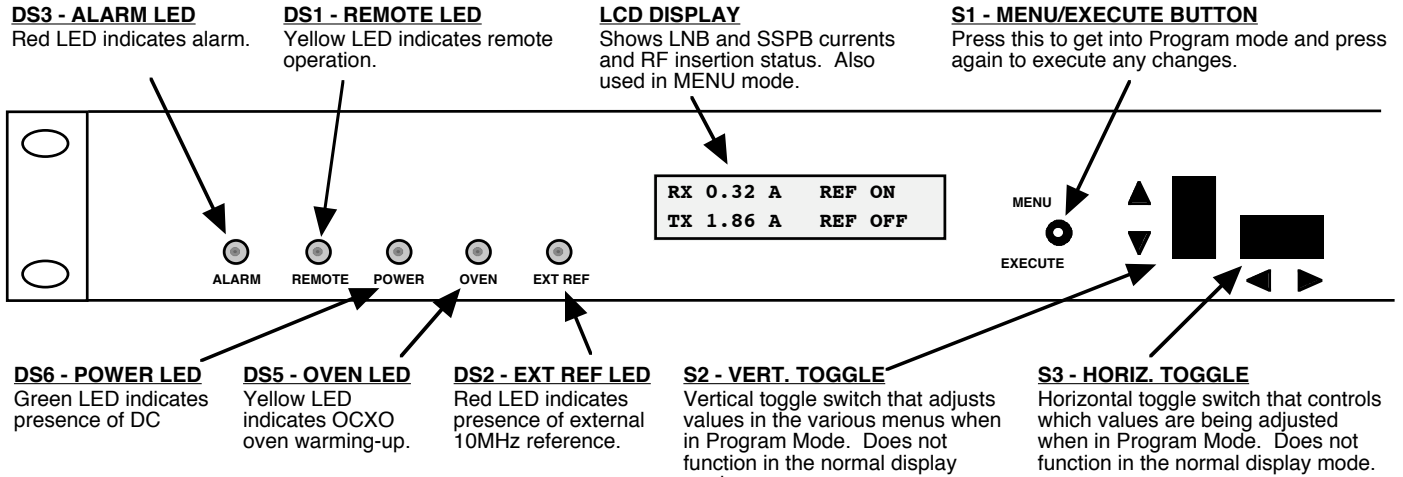


**FIGURE 2.1 2099-17 Rear Panel Outputs**



Pin	Function
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
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.

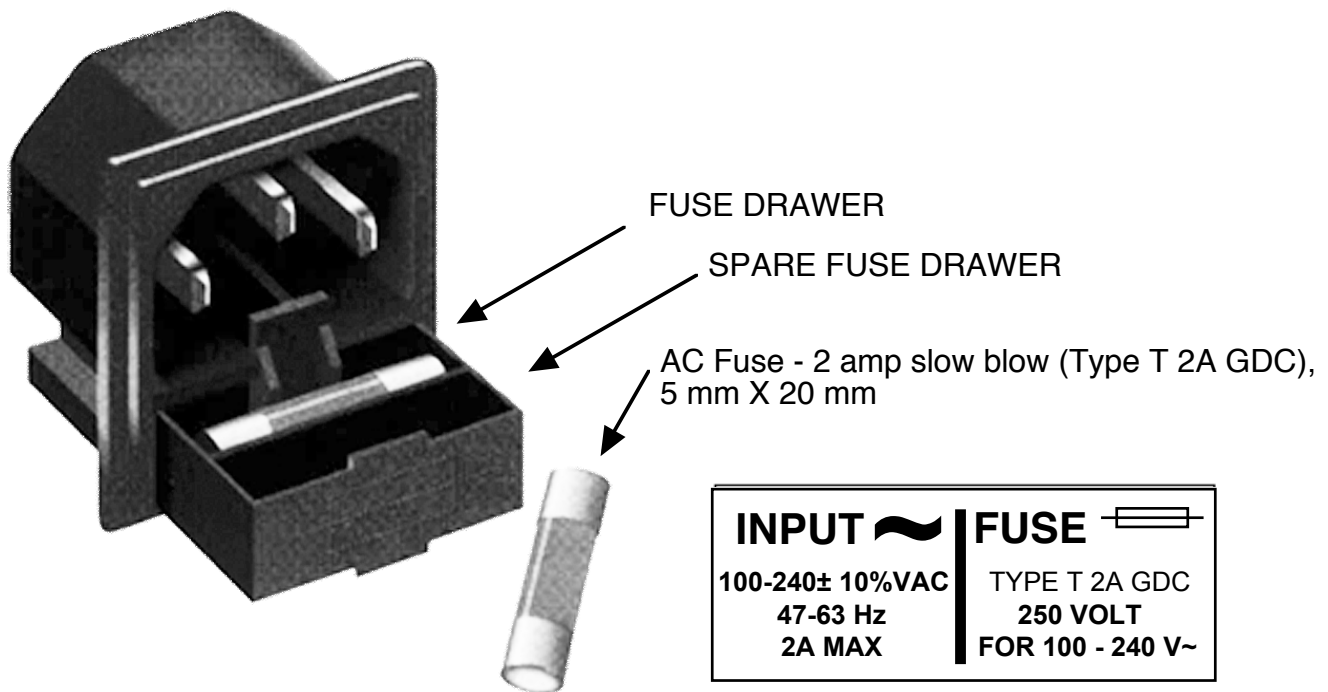


**FIGURE 2.2 2099-17 Front Panel Controls and Indicators**

## 2.4 Installation / Operation

### 2.4.1 Installing and Operating the 2099-17 10MHz Source/Inserter

1. Connect RF IN (FROM LNB), J2, to the LNB (Figure 2.1).
2. Connect RF OUT (TO SSPB), J5, to the SSPB (Figure 2.1).
3. Install 500 mA fast-blo fuse in LNB fuseholder, F1, if power is to be inserted on RX RF IN (FROM LNB), J2.
4. Install 2.5A fast-blo fuse in SSPB fuseholder, F2, if power is to be inserted on TX RF OUT (TO SSPB), J5.
5. Connect 100-240  $\pm$ 10% VAC, 47 - 63 Hz to AC connector on the back panel.
6. Be sure DS1 (green, POWER) is on (Figure 2.2).
7. Wait for DS5 (yellow, OVEN) to go off and/or contact closure at DB9 ALARM connector, J11, to occur to insure that the oscillator oven is stabilized.
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** Set Unit to Remote Operation

**Menu 2** Select Internal, External, or Auto 10 MHz Ref

**Menu 3** Select Transmit Reference Out

**Menu 4** Select Receive Reference Out

**Menu 5** Set RS-485 mode (option Q)

**Menu 6** Set RS-485 address (option Q)

**Menu 7** Reference Offset

**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.

REV 1.00
----------

3. The present RX (LNB) and TX (SSPB) current and the 10MHz RF insertion status is shown.

RX 0.32A	REF ON
TX 1.86A	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 will alternately turn any ON/OFF function (such as REMOTE) on or off regardless of the direction operated. In the case of the INT/EXT/AUTO reference setting, the vertical switch will scroll between the three selections.

<b>Power Up</b>	ON POWER UP REV 1.00			
<b>Normal Display</b>	NORMAL DISPLAY RX 0.32 A REF ON TX 1.86 A REF OFF			PUSH BUTTON
<b>Menu 1</b> Set Unit to Remote Operation	REMOTE OFF R	SCROLL <> SCROLL <>		PUSH BUTTON
<b>Menu 2</b> Select 10 MHz Reference INT, EXT, or AUTO	INT REF _ R	SCROLL <> SCROLL <>		PUSH BUTTON
<b>Menu 3</b> Select Transmit Reference Out	TX REF OUT OFF R	SCROLL <> SCROLL <>		PUSH BUTTON
<b>Menu 4</b> Select Receive Reference Out	RX REF OUT OFF R	SCROLL <> SCROLL <>		PUSH BUTTON
<b>Menu 5</b> Set Remote Mode (option Q)	RS 485 OFF R	SCROLL <> SCROLL <>		PUSH BUTTON
<b>Menu 6</b> Set RS-485 Address (option Q)	ADDRESS = 00 R	SCROLL <> SCROLL <>		PUSH BUTTON
<b>Menu 7</b> Reference Offset	FREQ ADJUST Offset = +000 R	SCROLL <>		PUSH BUTTON
<b>Save?</b> When "R" is selected from any above menu or at the end	SAVE SETTINGS? Y N	SCROLL <>		PUSH BUTTON

**Figure 2.4 Menu Display and Sequence**



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