



E1 TimeExpander

Network Timing Expander



097-45200-11

Issue 2

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FCC Regulatory Statement

Warning: This equipment generates, uses, and can radiate radio frequency energy, and if not used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Acronyms and Abbreviations

AIS	alarm indication signal
BITS	Building Integrated Timing Supply
CC	composite clock
CI	Clock Input card
COFA	change of frame alignment
CTAC	Customer Technical Assistance Center
DS1	digital signal, level 1 (1.544 Mb/s)
E1	European signal, level 1 (2.048 Mb/s)
ESD	electrostatic discharge
ESF	extended superframe
LOS	loss of signal
OOF	out of frame
PRC	Primary Reference Clock
RMA	Return Material Authorization
RU	rack unit (1.75 inches)
SDH	synchronous digital hierarchy
SONET	synchronous optical network
ST3E	Stratum 3 Enhanced clock card
TOLA	Timing Output Logic Level Automatic card

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Description

This chapter provides functional and physical descriptions.

Introduction

The E1 TimeExpander is a network timing expander that provides synchronization via 8 kHz, E1, or 2.048 MHz timing signals.

The E1 TimeExpander accepts reference signal(s) from a Primary Reference Clock (PRC), a suitable stratum clock, a network timing reference, or a timing signal derived from the overhead of an optical carrier (i.e., SONET or SDH). Under normal operating conditions, all clock signals are traceable to a PRC or Stratum-1.

The E1 TimeExpander is available in five different system configurations. The difference between the types is the mix of output cards. Table A lists the system part numbers, the number and type of cards included with each system, and the number and type of outputs each system provides.

Table A. Systems (990-45200-xx)

xx	Cards Installed					Outputs		
	TNC 090- 40020-22	CI-EA 090- 41910- 13	TOLA 090- 40023- 22	TOLA 090- 40023- 24	TO-EA 090- 45029- 21	8 kHz	2.048 MHz	E1
07	0	2	2	0	0	10	0	0
08	0	2	1	1	0	5	5	0
09	0	2	1	0	0	5	0	0
12	0	2	0	0	2	0	0 - 20	0 - 20
13	1	2	0	0	2	0	0 - 20	0 - 20

Notes:

1. CI-EA cards accept an E1 or 2.048 MHz analog timing reference input.
2. Refer to the Specifications chapter for additional information on each card type.
3. TO-EA cards are programmable to output E1 or 2.048 MHz timing signals.

Functional Description

Overview

Figure 1 shows a block diagram of the E1 TimeExpander. The E1 TimeExpander accepts reference inputs, develops stable timing output signals, provides timing outputs for other equipment, and provides an alarm interface for an office alarm system.

The clock input cards accept reference signals from a local Primary Reference Clock (PRC). Dual input cards provide redundancy. Each clock input card provides an output timing signal to a 4-kHz timing bus.

The clock card (optional) generates a signal from an input reference, buffers short-term timing variations, and provides long-term averaging of the input reference. If the input is disrupted or is out of tolerance, the clock card provides the necessary bridge in timing (holdover).

Timing output card options provide output timing signals in an 8 kHz signal, an E1 signal, or a 2.048 MHz signal.

Input Cards

An input signal is applied to each clock input card. A pair of clock input cards provides input reference signal redundancy.

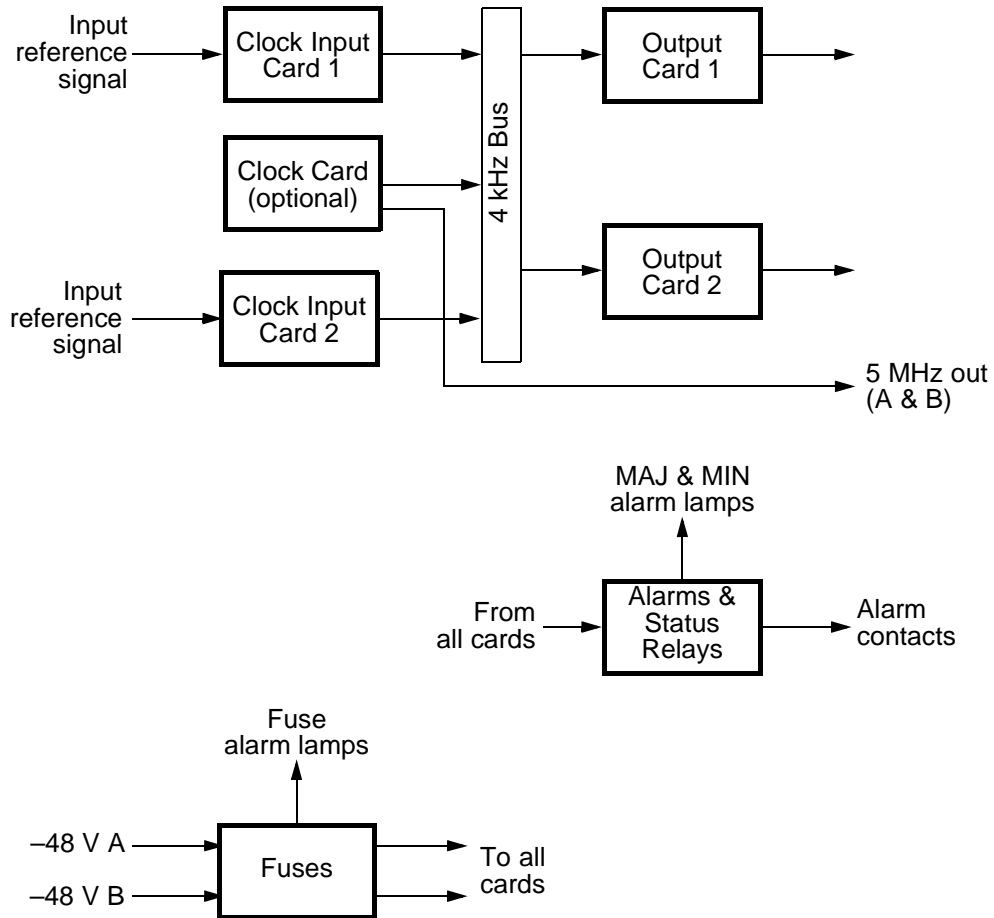
The clock input cards can accept either an E1 or 2.048 MHz reference signal.

The clock input cards generate a 4 kHz signal locked to the input reference signal. The 4 kHz signal is applied to a 4 kHz timing bus.

If the input reference fails for one clock input card, the signal from the redundant clock input card continues to be used until the failed reference is restored.

Transfer between clock input cards can be manually initiated by pressing either front-panel transfer (Xfr) switch.

Figure 1. Block Diagram



Clock Card

Under normal operating conditions, the clock card monitors the 4 kHz signals from both input cards. The clock card uses the signal from the first input card that becomes active.

If both input cards or reference signals fail, the clock card goes into holdover mode. This causes the output cards to automatically use the timing signal from the clock card.

The clock card is phase-locked to the 4-kHz signal from an input card. The clock card regenerates the timing signal using stable oscillators. Microprocessor control and management of the timing process provide stable timing signals if the input references fail. The clock card drives a third line in the 4-kHz bus.

The output of the clock card is taken from a synthesizer. The output stays locked to the reference input as long as the following factors are within the TNC limits defined by G.812:

- Frequency is within the pull-in range
- The maximum frequency step is not exceeded
- The rate of frequency change (slope) is not exceeded

The clock card provides two 5 MHz output signals directly to connectors at the rear of the shelf.

Output Cards

The output cards provide 8 kHz or 2.048 MHz timing output signals, depending on the type of output card installed. The output cards select one of the two signals on the 4 kHz timing bus to drive the output signals. The selection priority of the timing signals is as follows:

1. Clock (if present)

2. Clock Input 1

3. Clock Input 2

If no timing signals are present on the 4 kHz timing bus, the output card ST and INPUT lamps go off, the FAIL lamp lights, and the outputs are muted.

If the output card fails, the front panel FAIL lamp lights and a major alarm is generated. If one to five output drivers fail or are shorted, the front panel PORT ALM lamp lights.

It is recommended that network elements (NEs) which require two timing references (primary and secondary) be assigned output ports from two separate output cards for diversity. For example, assign the primary reference to port 1 on the output card in slot TO1, and the secondary reference to port 1 on the output card in slot TO2.

Alarm and Status Outputs

Major and minor shelf alarms are indicated on the front-panel by the lamps labeled MAJ and MIN. In addition, major and minor shelf alarms are provided as normally open and normally closed relay contacts on the rear of the shelf.

The following alarms have normally open relay contacts on the backplane: input 1 alarm, input 2 alarm, holdover alarm (not applicable), and port alarm.

Power

The -48 volt dc power supplied to the shelf from the office battery is protected by fuses on the shelf. After going through the fuses, the -48 volts is sent to each card in the shelf.

Physical Description

The E1 TimeExpander shelf front panel contains fuses for the office battery A and B feeds, and lamps for indicating system status.

The shelf contains two clock input cards and two timing output cards. The rear panel contains a terminal block for power; wire-wrap pins for reference input signals, output signals, and alarms.

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Installation

This chapter provides the steps required for installation and power-up.

Unpacking

Install the E1 TimeExpander using the instructions in the order given in this chapter. If any difficulties are encountered during the installation process, contact Symmetricom's Customer Technical Assistance Center (CTAC) at:

- 888-367-7966 (from inside the U.S.A. only – toll free)
- 408-428-7907

CTAC includes Product Technical Support for technical information, and Customer Service for information about an order, Return Material Authorizations (RMAs), and other information.

Warning: When handling electronic equipment, use local office procedures regarding electrostatic discharge (ESD), including:

- Use grounded wrist straps connected to equipment frame ground when handling cards.
- Store cards only in antistatic packaging provided by the factory.

Note: Save packing material. All equipment returned *must be packed in the original packing material*. Contact CTAC if additional packaging is needed.

Unpack equipment carefully; check for completeness against the purchase order. Notify Symmetricom if items are missing.

Inspect equipment for shipping damage, including bent or loose hardware, and broken connectors.

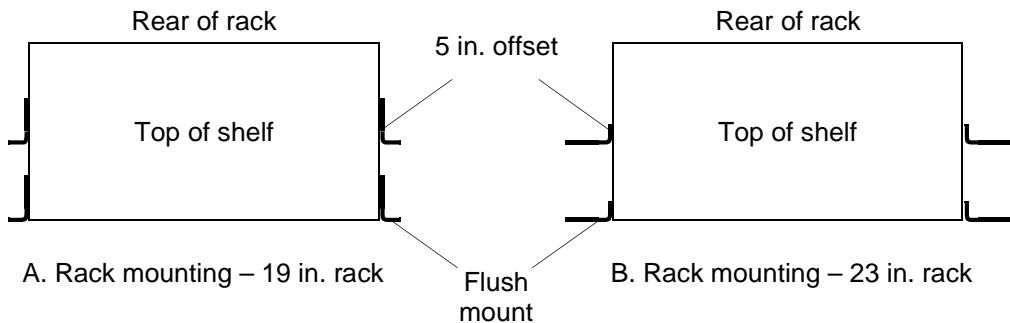
If equipment was damaged in transit, contact Customer Service to request an RMA, and notify the carrier.

Shelf Rack Mounting

The mounting ears, as shown in Figure 2, can be positioned for flush or 5 inch offset mounting, in either a 19 inch rack (Figure 2A) or a 23 inch rack (Figure 2B).

Position the mounting ears on the shelf for flush mounting or 5 inch offset mounting, as required. Attach the ears with the short leg outward for a 19 inch rack, or with the long leg outward for a 23 inch rack. After the ears are attached, mount the shelf in the rack.

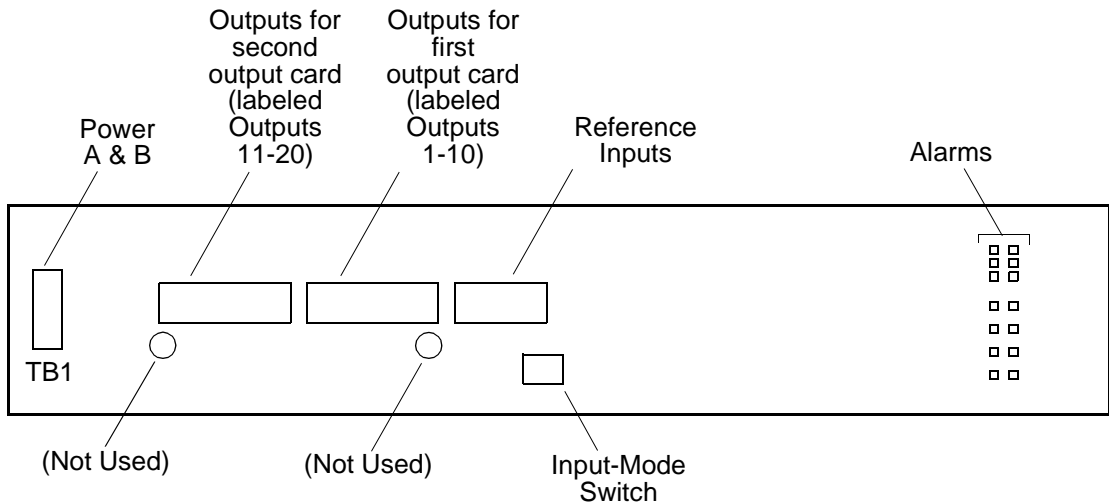
Figure 2. Rack Mounting Options



Cabling

All connections to the E1 TimeExpander are made on the rear of the shelf. Figure 3 shows the location of the items on the rear of the shelf.

Figure 3. Shelf Rear Panel Items



Frame Ground

Frame ground connects to terminal block TB1. The location of TB1 is shown in Figure 3. A detail of TB1 is shown in Figure 4. Make the ground connection, following one of the methods described below, depending on whether a rack ground rod is installed.

With Rack Ground Rod

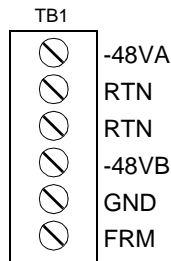
Strip the frame ground wire bare and secure it under the screw labeled FRM on TB1. Tighten the screw.

Solder the other end of the frame ground wire to the 6 AWG frame ground rod run vertically at the side of the rack using one of the following methods.

- Crimp an appropriate-size spade lug to the frame ground wire, then bend the lug around the 6 AWG rod, and solder.
- Strip enough insulation from the ground wire to permit three complete turns around the 6AWG rod, and solder.

Note: When soldering, use a 25 watt soldering iron to ensure the 6 AWG rod is heated sufficiently, to prevent a cold solder connection.

Figure 4. TB1



Without Rack Ground Rod

Strip the frame ground wire bare and secure it under the screw labeled FRM on TB1. Tighten the screw.

Crimp an appropriate-sized spade lug to the other end of the frame ground wire, and secure the lug to a convenient screw hole on the rack. Before inserting and tightening the screw, remove the paint and sand the area around the screw hole, to ensure proper conductivity.

Power

Warning: Ensure the fuses in the fuse panel used to power the E1 TimeExpander are removed before connecting the power leads. Do not apply power until directed to do so during Power-Up.

The -48 volt dc battery and battery return connect to terminal block TB1. The location of TB1 is shown in Figure 3. A detail of TB1 is shown in Figure 4.

If two office battery supplies (battery A and battery B) are not available, connect the single office battery to both the -48VA and -48VB terminals of TB1.

Ensure the power wires are long enough to go from the shelf rear panel to the fuse panel which will supply office battery.

Make the battery A connection by connecting the -48 volt dc lead to the -48VA terminal of TB1. Make the battery A return connection by connecting the return lead to the RTN terminal next to the -48VA terminal on TB1.

Make the battery B connection by connecting the -48 volt dc lead to the -48VB terminal of TB1. Make the battery B return connection by connecting the return lead to the RTN terminal next to the -48VB terminal on TB1.

Alarms

The location of alarm wire-wrap pins is shown in Figure e3. A detail of alarm pins is shown in Figure 5. The alarm pins provide dry-contact relay closure points.

For the major (MAJ) and minor (MIN) alarms, normally open (NO), common (C), and normally closed (NC) contacts are available. For the input 1 (INPUT 1), input 2 (INPUT 2), holdover (HOLDOVER), and port (PORT) alarms, common (C) and normally closed (NC) contacts are available.

Figure 5. Alarm Pins

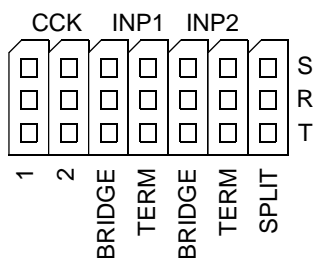
	MAJ	MIN
NO	<input type="checkbox"/>	<input type="checkbox"/>
C	<input type="checkbox"/>	<input type="checkbox"/>
NC	<input type="checkbox"/>	<input type="checkbox"/>
	C	NO
INPUT 1	<input type="checkbox"/>	<input type="checkbox"/>
	C	NO
INPUT 2	<input type="checkbox"/>	<input type="checkbox"/>
	C	NO
HOLDOVER	<input type="checkbox"/>	<input type="checkbox"/>
	C	NO
PORT	<input type="checkbox"/>	<input type="checkbox"/>

Note: Holdover alarms are not applicable in 990-45200-07, -08, -09, and -12 configurations.

Reference Inputs

The location of the reference inputs is shown in Figure 3. A detail of the wire-wrap pins used for reference inputs is shown in Figure 6.

Figure 6. Reference Inputs



Dual E1 (2.048 Mb/s) or Analog (2.048 MHz) Reference Inputs

Connect the first reference signal to the group of pins labeled INP1, and connect the second reference signal to the group of pins labeled INP2. Use the pins labeled BRIDGE for low-level signals, or use the pins labeled TERM to terminate high-level signals.

Set the Input Mode Switch to the NORM position. Refer to the Input Mode Switch section for details.

Note: Although pins are provided for tip (T), ring (R), and shield (S), the shield of a signal cable is normally grounded only at the signal source. Grounding the shield at both ends of the cable is *not* recommended.

Single E1 (2.048 Mb/s) or Analog (2.048 MHz) Reference Inputs

Connect a single reference input to the single set of pins labeled SPLIT. This input provides a 100 Ω termination and routes the single reference signal to both input cards.

Set the Input Mode Switch to the SPLIT position. Refer to the Input Mode Switch section for details.

Note: Although pins are provided for tip (T), ring (R), and shield (S), the shield of a signal cable is normally grounded only at the signal source. Grounding the shield at both ends of the cable is *not* recommended.

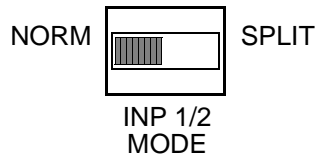
Input Mode Switch

The location of the input mode switch is shown in Figure 3. A detail of the input mode switch is shown in Figure 7, which shows the switch in the NORM position.

Set the input mode switch to one of the following positions:

- **SPLIT (right) position:** use this position when there is a single input reference signal connected to the SPLIT wire-wrap pins (the signal on this set of pins is routed to both input cards).
- **NORM (left) position:** use this position when there are two input reference signals, one connected to the INP1 wire-wrap pins and one to the INP2 wire-wrap pins.

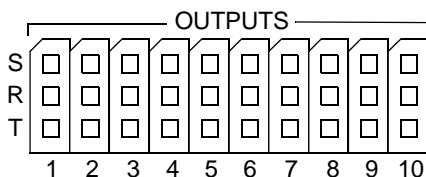
Figure 7. Input Mode Switch



Outputs 1–5 (TOLA Output Card)

The location of outputs for the first output card are shown in Figure 3. A detail of the wire-wrap pins for the first five outputs is shown in Figure 8. Outputs 1 through 5 are 8 kHz signals only. Wire-wrap pins are available for the tip (T), ring (R), and shield (S) of the output cable.

Figure 8. Outputs 1–5



Use the following pins:

<u>Output</u>	<u>Output Pin Group</u>	<u>Pins</u>
First	1	T & R
Second	3	T & R
Third	5	T & R
Fourth	7	T & R
Fifth	9	T & R

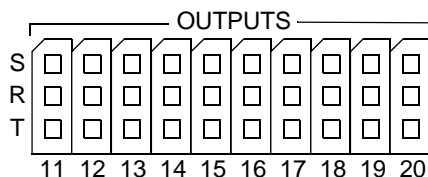
Notes:

1. The shield of a signal cable is normally grounded only at the signal source. Grounding the shield at both ends of the cable is not recommended.
2. Pin groups 2, 4, 6, 8, and 10 are used for RS-423 (TTL).

Outputs 6-10 (TOLA Output Card)

Outputs for the second output card can be 8 kHz or 2.048 MHz depending on the system configuration. The location of outputs for the second output card are shown in Figure 3. A detail of the wire-wrap pins for outputs 6 through 10 is shown in Figure 9. Wire-wrap pins are available for the tip (T), ring (R), and shield (S) of the output cable.

Figure 9. Outputs 6–10



Use the following pins:

<u>Output</u>	<u>Output Pin Group</u>	<u>Pins</u>
First	11	T & R
Second	13	T & R
Third	15	T & R
Fourth	17	T & R
Fifth	19	T & R

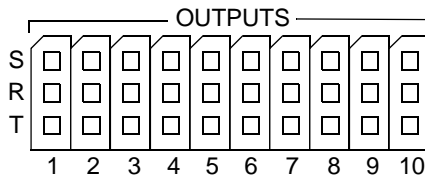
Notes:

1. The shield of a signal cable is normally grounded only at the signal source. Grounding the shield at both ends of the cable is not recommended.
2. Pin groups 12, 14, 16, 18, and 20 are used for RS-423 (TTL) on 990-45200-07 only.

Outputs 1–10 (TO-EA Output Card)

The location of outputs 1 through 10 is shown in Figure 3. A detail of the wire-wrap pins for the first ten outputs is shown in Figure 10. Outputs 1 through 10 are E1 or 2.048 MHz signals. Wire-wrap pins are available for the tip (T), ring (R), and shield (S) of the E1 or 2.048 MHz output cable.

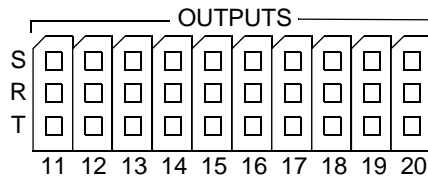
Figure 10. Outputs 1–10



Outputs 11–20 (TO-EA Output Card)

Outputs 11 through 20 may be E1 or 2.048 MHz signals or composite clock signals, depending on the system. In either case, the locations of outputs 11 through 20 is shown in Figure 3. A detail of the wire-wrap pins for outputs 11 through 20 is shown in Figure 11. Wire-wrap pins are available for the the tip (T), ring (R), and shield (S) of the output cable.

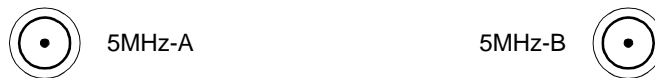
Figure 11. Outputs 11–20



5 MHz Outputs

The locations of the two 5 MHz outputs are shown in Figure 3. A detail of the 5 MHz outputs is shown in Figure 12. The 5 MHz outputs use SMC connectors. There is a connector for both an A output (5 MHz-A) and a B output (5 MHz-B).

Figure 12. 5 MHz Outputs



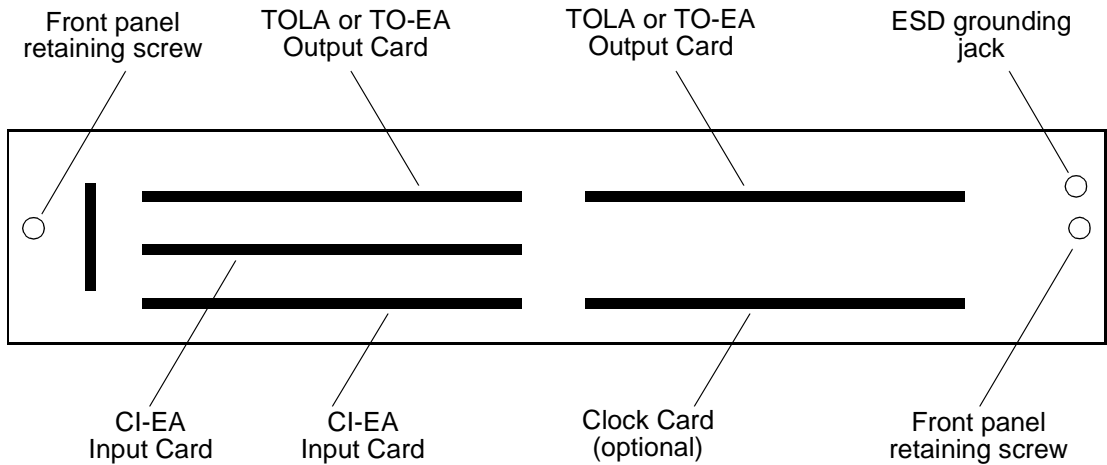
Card Options

The CI-EA input cards in the E1 TimeExpander have switches used to set options. To check and set the card options, follow the steps in Procedure A.

Procedure A. Option Switch Setting

Step	Action
<p>Use this procedure to change an option on a card. Refer to Figure 13 for the location of items in the shelf.</p> <p>Required Equipment:</p> <ul style="list-style-type: none">• Grounding wrist strap	
1	Refer to Figure 14 to check the factory settings of all options on all installed cards. If the factory settings of all cards correspond to the desired settings for each card, this procedure is completed; skip to Power-Up. To check or change the options on a card, continue with the next step.
2	Put on the grounding wrist strap and insert the wrist-strap plug into the grounding jack.
3	Loosen the retaining screws that secure the front panel, then remove the front panel.
4	Use the nylon loop connected to the card to pull the desired card out of the shelf.
5	Change the card switches to the desired settings using Figure 14.
6	Reinsert the card into the same location in the shelf. Ensure that the card is fully seated in the shelf connector.
7	To set the switches on the second CI-EA card, repeat Steps 4 through 6.
8	When all card switches have been set as desired, reinstall the front panel and secure the panel with the retaining screws.
9	Remove the grounding wrist strap. This procedure is completed.

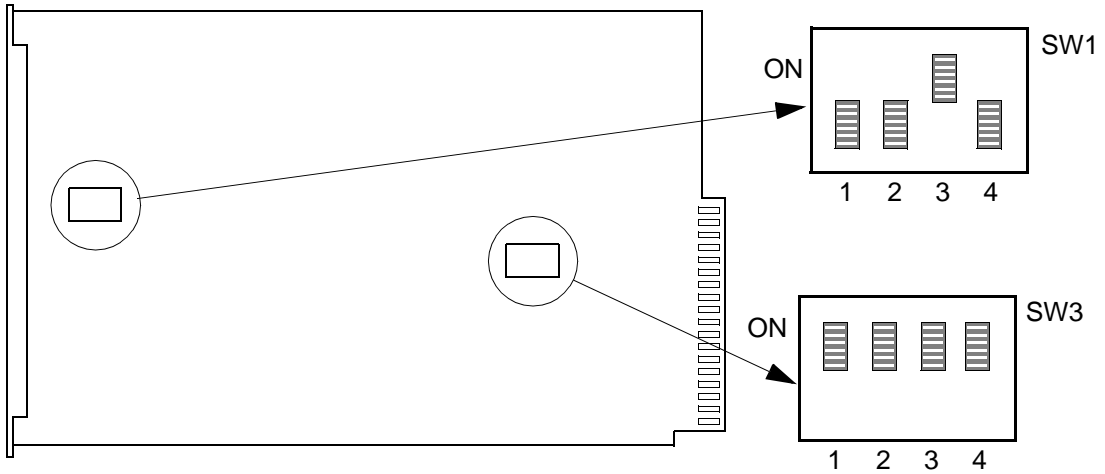
Figure 13. Shelf Item Locations



Notes:

1. The card name, located near the top or bottom edge of the card, can be seen after the card is removed.
2. No switches must be set on the TOLA cards. Do not change the TOLA card switch settings from the factory set position.
3. Switches must be set on TO-EA cards. Please refer to Table B for TO-EA switch settings.

Figure 14. CI-EA Card Switch Settings



Note: Switches are shown in factory-set position.

SW1 Settings

Section	Position	Meaning
1 and 2	Up	Not allowed
	Down	Normal
3	Up	CRC4 disabled
	Down	CRC4 enabled
4	Up	CAS enabled
	Down	CCS enabled

SW3 Settings

Position	Meaning
Up	E1 input (2.048 Mb/s)
Down	Analog input (2.048 MHz)
Note: All sections of SW3 must be set to the same position.	

Figure 15. TO-EA Card Switch Settings

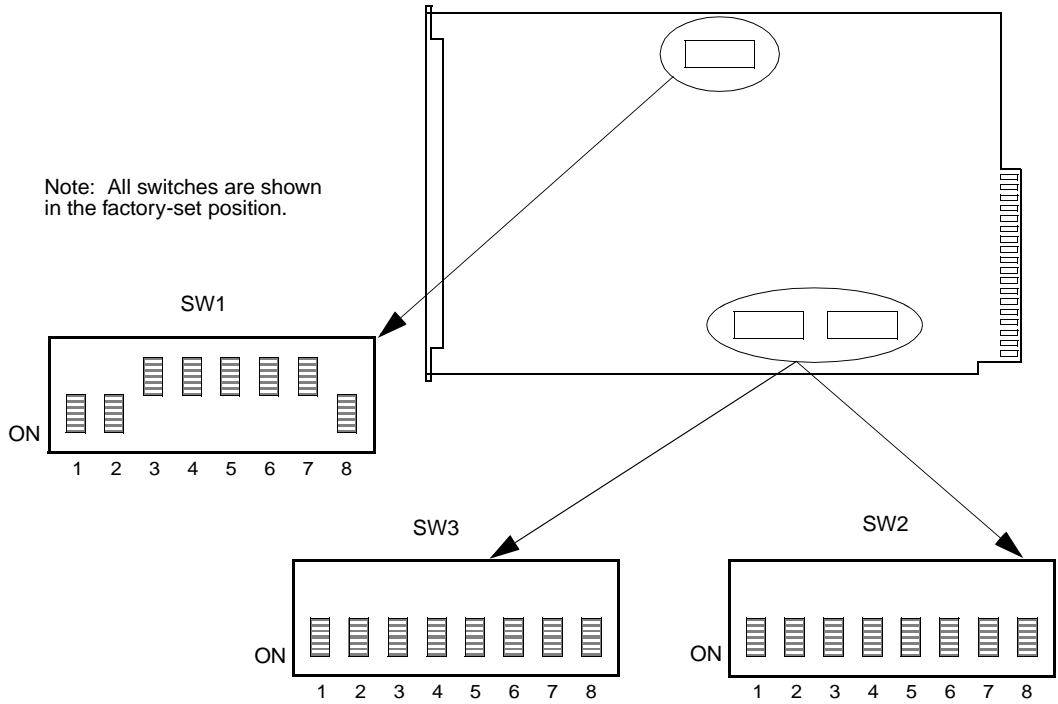


Table B. TO-EA Switch Settings

Section	Position	Meaning
<i>SW1 Settings</i>		
Note: If set for E1 output, only one framing format per card is permitted.		
1	Up	CAS framing
	Down	CCS framing
2	Up	CRC-4 Multiframe disabled
	Down	CRC-4 Multiframe enabled
3	Up	MINOR alarm initiated upon PORT ALM
	Down	MAJOR alarm initiated upon PORT ALM
4	Up	Squelches outputs on a per port basis during MINOR alarm
	Down	Sends AIS on a per port basis during MINOR alarm
5 & 6	Down	For factory use only; must be set to OFF
7	Up	Reverts back to input signal when it becomes available Caution: Use of revertive switching may result in phase offsets between cards.
	Down	Does not revert back to input signal when it becomes available
8	Down	Reserved; must be set to ON
Sections 1 through 8 on SW2 correspond to output ports 1 through 8; sections 1 and 2 on SW3 correspond to output ports 9 and 10. Ports can be designated for any combination of E1 and/or analog outputs		
<i>SW2 Settings</i>		
1 - 8	Up	Output port designated for analog signal
	Down	Output port designated for E1 signal

Table B. TO-EA Switch Settings (Cont'd)

Section	Position	Meaning
<i>SW3 Settings</i>		
Sections 1 and 2 correspond to output ports 9 and 10		
1	Up	Output port 9 designated for analog signal
	Down	Output port 9 designated for E1 signal
2	Up	Output port 10 designated for analog signal
	Down	Output port 10 designated for E1 signal
3	Up	N/A
	Down	Reserved; must be set to ON
4 - 8	Down	Reserved; must be set to ON

Power-Up

To power and test the E1 TimeExpander, follow the steps in Procedure B.

Procedure B. Power-Up

Step	Action	Result
------	--------	--------

Use this procedure to power-up and test the TimeExpander. Refer to Figur e6 to connect the reference input signals in this procedure.

Note: If no clock card is used with the TimeExpander, loss of signal to Inputs 1 and 2 will cause the TimeExpander to fail.

Test Equipment:

- Digital volt-ohmmeter (Fluke 77 or equivalent)

1	Apply power to the TimeExpander by installing the fuses in the external fuse panel that powers the TimeExpander. Push in "A" fuse. Push in "B" fuse.	<ul style="list-style-type: none">– MAJ lamp is lit red.– MIN lamp is lit red. – 48V "B" lamp is lit red.– FAIL lamp lit red on output cards. – 48V "B" lamp extinguishes.
2	Connect Input 1.	<ul style="list-style-type: none">– Signal lights green.– Signal FAULT LED extinguishes.– MAJ lamp extinguishes after 20 s.– MIN lamp remains lit.
3	Connect Input 2.	<ul style="list-style-type: none">– Signal lights green.– Signal FAULT LED extinguishes.– MIN lamp extinguishes.– All LEDs are lit green.

Procedure B. Power-Up (Cont'd)

Step	Action	Result
4	On either Input 1 or Input 2, press the Xfr pushbutton.	The source active LED which is lit transfers from one input card to the other input card.
5	Remove the reference input connected to Input 2.	<ul style="list-style-type: none"> - MAJ lamp: off. - MIN lamp: lit red.
6	Use a volt-ohmmeter to check the alarm contacts on the rear of the shelf.	<ul style="list-style-type: none"> - MAJ: NO and C contacts are open. - MIN: NO and C contacts are closed. - INPUT 1: C and NO contacts are open. - INPUT 2: C and NO contacts are closed. - PORT: C and NO contacts are open.
7	Remove the reference input connected to Input 1.	<ul style="list-style-type: none"> - MAJ lamp: lit red. - MIN lamp: lit red. - Output cards: lit red (FAIL). - CIEA cards: lit red (signal fault).
8	Use a volt-ohmmeter to check the alarm contacts on the rear of the shelf.	<ul style="list-style-type: none"> - MAJ: NO and C contacts are closed. - MIN: NO and C contacts are closed. - INPUT 1: C and NO contacts are closed. - INPUT 2: C and NO contacts are closed. - PORT: C and NO contacts are open.
9	All inputs are now removed from back plane.	

Procedure B. Power-Up (Cont'd)

Step	Action	Result
10	<p>If using one E1 or 2.048 MHz reference: permanently connect the reference to the SPLIT pins (this is a terminated input for high level signals); set the INP 1/2 MODE switch on the rear of the shelf to the SPLIT position.</p> <p>If using two E1 or 2.048 MHz references: permanently connect one reference to the INP1 pins (BRIDGE for high level, TERM for low level); permanently connect the second reference to the INP2 pins (BRIDGE for high level, TERM for low level).</p>	<ul style="list-style-type: none"> - MAJ lamp: off. - MIN lamp: off. - SIG of both CIEA cards light green. - SRC ACT of Input CIEA lights green.
11	<p>On the OUTPUTS 1-10 wire-wrap pins on the rear of the shelf, temporarily connect the tip (T) and ring (R) pins together of any one output.</p>	<p>On Output Port: Port Alm lamp lights red.</p>
12	<p>Use a volt-ohmmeter to check the alarm contacts on the rear of the shelf.</p>	<ul style="list-style-type: none"> - MAJ: NO and C contacts are open. - MIN: NO and C contacts are open. - INPUT 1: C and NO contacts are open. - INPUT 2: C and NO contacts are open. - PORT: C and NO contacts are closed.
13	<p>Remove the connection made in Step 11.</p>	<p>None. This procedure is completed.</p>

Table C shows the TOLA-22 card output ports. Table D shows the TOLA-24 card output ports.

Table C. TOLA-22 Card Output Ports

PIN	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5
1	8 kb/s				
3		8 kb/s			
5			8 kb/s		
7				8 kb/s	
9					8 kb/s

Table D. TOLA-24 Card Output Ports

PIN	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5
1	2.048 MHz				
3		2.048 MHz			
5			2.048 MHz		
7				2.048 MHz	
9					2.048 MHz

Notes:

1. When viewing output on oscilloscope, use differential setup.
2. If viewing output with one probe, go from tip/ring to ground.

Troubleshooting

This chapter provides a description of the front-panel items, and troubleshooting information based on alarms and lamps.

Chapter 3

Front-Panel Items

The front-panel items are shown in Figures 16, 17, and 18. A description of these items and troubleshooting information is provided on the pages that follow.

Figure 16. Front Panel Indicators (Model 990-45200-07)

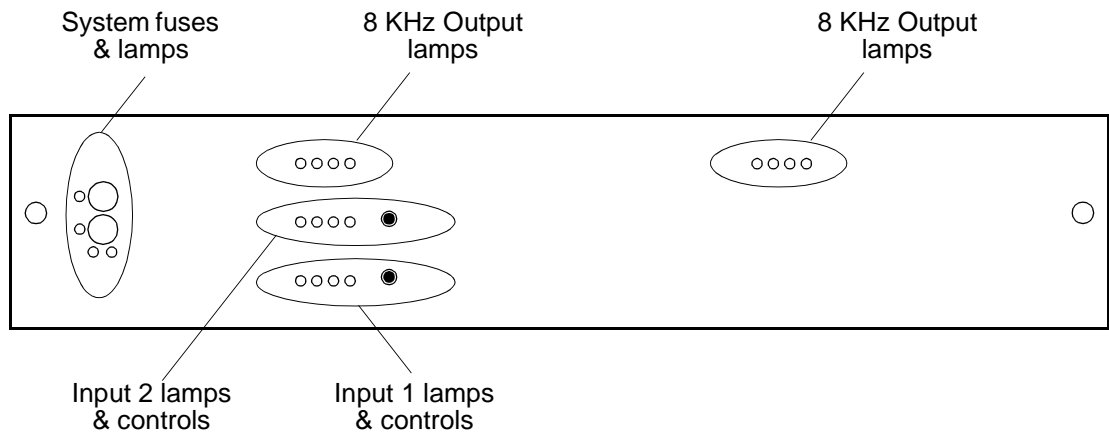


Figure 17. Front Panel Indicators (Model 990-45200-08)

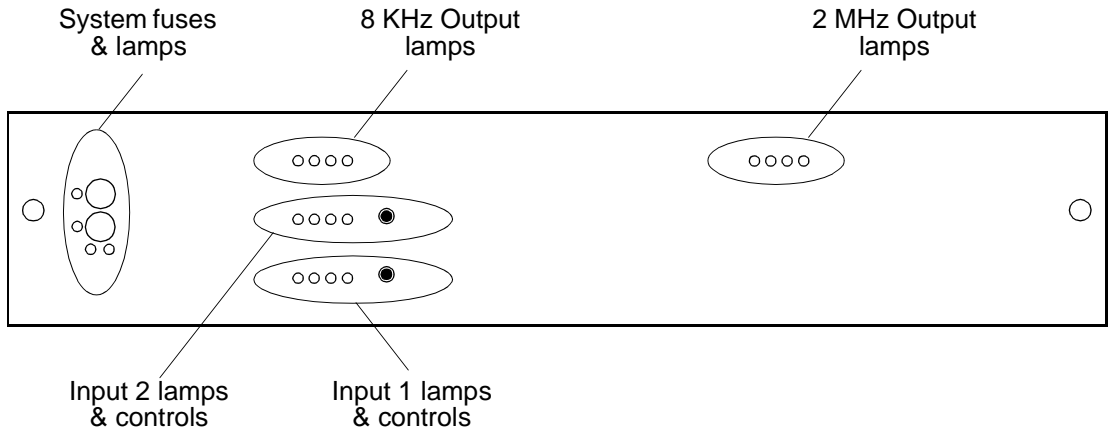


Figure 18. Front Panel Indicators (Model 990-45200-09)

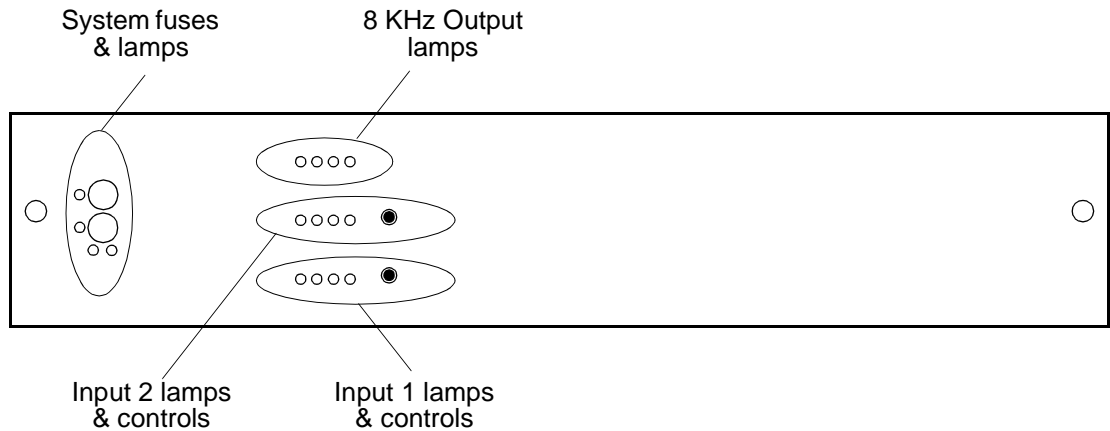


Figure 19. Front Panel Indicators (Model 990-45200-12)

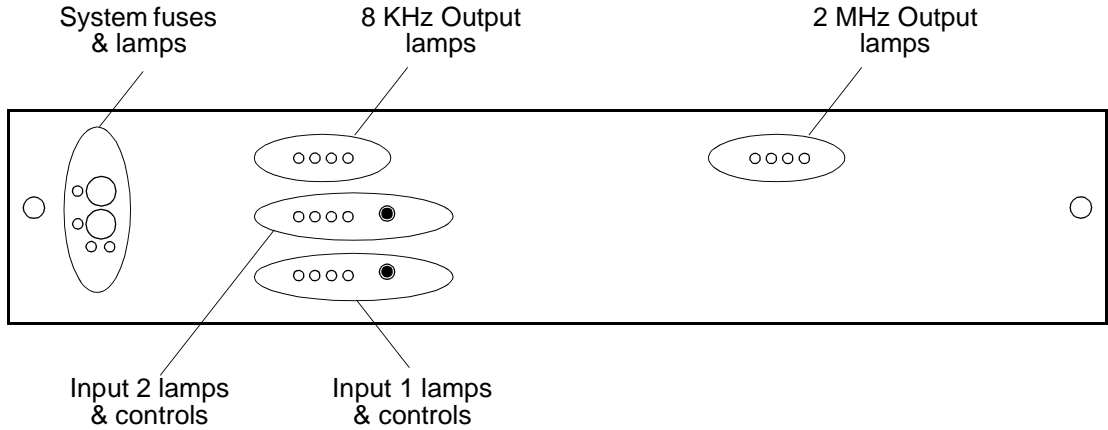
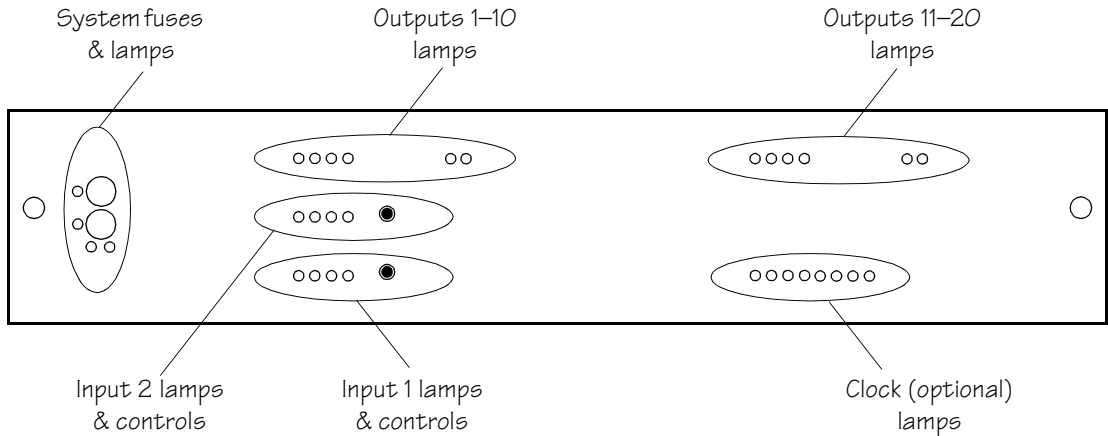


Figure 20. Front Panel Indicators (Model 990-45200-13)



System Fuses & Lamps

The location of all front-panel items for each system type is shown in Figures 16, 17, and 18. The system fuses and lamps are shown in Figure 21 and described in Table E.

Figure 21. System Fuses & Lamps

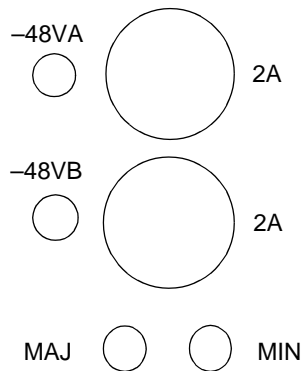


Table E. System Fuses & Lamps

Label	Type	Status	Description	Action
-48VA	Fuse	—	This is office battery A fuse (2A).	—
	Lamp	Red	Office battery A fuse is blown.	Replace office battery A fuse.
		Off	Office battery A fuse is ok.	None required.
-48VB	Fuse	—	This is office battery B fuse (2A).	—
	Lamp	Red	Office battery B fuse is blown.	Replace office battery B fuse.
		Off	Office battery B fuse is ok.	None required.
MAJ	Lamp	Red	A card has failed.	Check card lamps.
		Off	Normal condition.	None required.
MIN	Lamp	Yellow	A fuse has blown, or there is a problem with an input or output signal.	Check fuse lamps, then check card lamps.
		Off	Normal condition.	None required.

Input Lamps & Controls

The location of input lamps and controls is shown in Figures 16, 17, and 18. These lamps and controls are grouped under the label Input 1 or Input 2. The individual input lamps and controls are shown in Figure 22, and described in Table F.

Figure 22. Input 1 & Input 2 Lamps & Controls

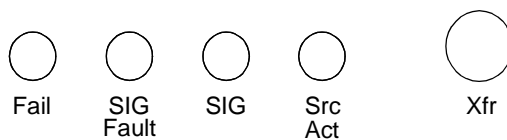


Table F. Input Lamps & Controls

Label	Type	Status	Description	Action
Fail	Lamp	Red	Input card or input reference signal has failed.	Check input reference signal for proper signal type (E1 or 2048 kHz analog), level, frequency, and framing. If ok, replace card per Procedure C.
		Off	Normal condition.	None required.
SIG Fault	Lamp	Red	Input reference signal is not present.	Check input reference signal for proper signal type (E1 or 2048 kHz analog), level, frequency, and framing.
		Off	Input reference signal is present.	None required.
SIG	Lamp	Green	Input reference signal is present.	None required.
		Off	Input reference signal is not present.	Check input reference for proper signal type (E1 or 2048 kHz analog), level, and frequency.
Src Act	Lamp	Green	Input card is on-line providing a reference to output card(s).	None required.
		Off	Input card is in standby mode.	None required.
Xfr	Push-button switch	—	When pressed, switches the source active (Src Act) status from one input card to the other.	None required.

Output Lamps

The location of the output lamps is shown in Figures 16, 17, and 18. These lamps are grouped under the label 8 KHz Output or 2 MHz Output. The individual output lamps are shown in Figure 23 and described in Table G.

Figure 23. 8 kHz (Model 990-45200-07, -08, & -09) and 2.048 MHz (Model 990-45200-08) Output Lamps

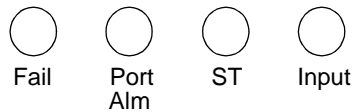


Table G. 8 kHz (Model 990-45200-07, -08, & -09) and 2.048 MHz (Model 990-45200-08)
Output Lamps

Label	Status	Description	Action
Fail	Red	This card has failed or there is a loss of all input references to this card.	If the Input lamp is lit green, replace this output card per Procedure eC. If the Input lamp is not lit green, check the Input cards.
	Off	Normal condition.	None required.
Port Alm	Red	1 to 5 outputs have failed, have been externally shorted, or have not been terminated.	Check for external shorts and unterminated outputs. If ok, replace this card per Procedure C.
	Off	1 to 5 outputs have not failed or have not been externally shorted.	None required.
ST	Green	This card is receiving a reference signal from the clock card.	Not applicable.
	Off	This card is not receiving a reference signal from the clock card. (Normal indication if not equipped with a clock card.)	None required.
Input	Green	This card is receiving a reference signal from one or more of the following: input card 1 or input card 2.	None required.
	Off	This card is not receiving a reference signal from either clock input card 1 or clock input card 2.	Check input reference for proper signal type, level, frequency, and framing.

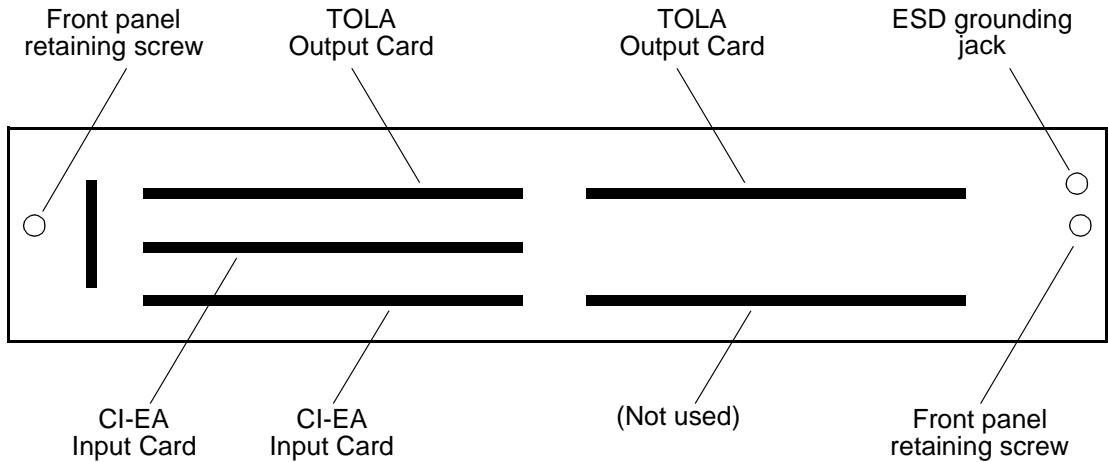
Card Replacement

Procedure C provides the steps for replacing cards in the E1 TimeExpander.

Procedure C. Card Replacement

Step	Action
<p>Use this procedure to replace a card. Refer to Figure 24 for the location of items in the shelf.</p> <p>Required Equipment:</p> <ul style="list-style-type: none">• Grounding wrist strap	
1	Put on a grounding wrist strap and insert the wrist-strap plug into the grounding jack on the front panel.
2	Loosen the retaining screws that secure the front panel, then remove the front panel.
3	Use the nylon loop connected to the card being replaced to pull the card out of the shelf.
4	Ensure that the switch settings on the replacement card are set the same as on the card being replaced.
5	Install the replacement card.
6	Reinstall the front panel and secure the panel with the retaining screws.
7	Remove the grounding wrist strap. This procedure is completed.

Figure 24. Location of Shelf Items



Note: The card name, located near the top or bottom edge, can be seen after the card is removed.

Returning Equipment

When returning defective equipment for factory repair, obtain the following information prior to calling Symmetricom:

- A complete description of the trouble (alarms, equipment behavior, etc.), part number, serial number, issue/revision level, and warranty expiration date.
- If the warranty has expired, a purchase order with “bill to” information.
- A customer field technical contact including address, phone number and FAX number.
- Return shipping information.

To return defective or damaged equipment, follow Procedure D.

Repaired equipment is typically shipped within 30 days of receipt by Symmetricom, or per contract terms. Shipping costs to Symmetricom are paid by the customer; shipping costs back to the customer are paid by Symmetricom.

Procedure D. Returning Equipment

Step	Action
1	<p>Call Symmetricom's Customer Technical Assistance Center at one of the following numbers to obtain a Return Material Authorization (RMA) number and shipping address:</p> <p style="padding-left: 40px;">From inside the U.S., call 888-367-7966 toll free From outside the U.S., call 408-428-7907</p> <p>Retain the RMA number for future reference. The RMA number is used by Symmetricom for internal tracking of the unit. Reference the RMA number in all communications with Symmetricom regarding the unit.</p>
2	<p>Pack the defective equipment, including a list containing all the information obtained above, in the original packing material. If the original packing material is not available, inform Symmetricom, and the appropriate shipping material will be provided.</p> <p>Equipment must be returned in the original packaging or approved replacement packaging, for the warranty to be honored.</p>
3	<p>Mark the RMA number and equipment serial number on the outside of the shipping carton.</p>
4	<p>Ship the equipment prepaid and insured to the address provided by the Customer Technical Assistance Center.</p>

Technical Assistance

For technical assistance, contact:

Symmetricom, Inc.

2300 Orchard Parkway

San Jose, CA 95131-1017

U.S.A. Call Center:

888-367-7966 (from inside U.S.A. only – toll free)

408-428-7907

U.K. Call Center:

+44 (0) 1189 699 799 (voice)

+44 (0) 1189 277 520 (fax)

Fax: 408-428-7998

E-mail: ctac@symmetricom.com

Internet: <http://www.symmetricom.com>

Sales

For sales assistance, contact:

Symmetricom, Inc.

2300 Orchard Parkway

San Jose, CA 95131-1017

U.S.A. Call Center:

888-367-7966 (from inside U.S.A. only – toll free)

408-428-7907

U.K. Call Center:

+44 (0) 1189 699 799 (voice)

+44 (0) 1189 277 520 (fax)

Fax: 408-428-7998

E-mail: info@symmetricom.com

Internet: <http://www.symmetricom.com>

Manual Updates

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To download the manual, go to:

<http://www.symmetricom.com>

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Specifications

This chapter provides product specifications.

Chapter 4

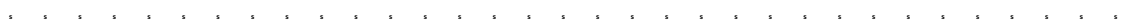
Reference Inputs

CI-EA Card

Connector Type:	Wire-wrap pins
Connector Label:	INP 1 (TERM or BRIDGE) INP 2 (TERM or BRIDGE) (Alternatively, a single signal can drive both inputs using the SPLIT connector)
Connector Location:	Rear panel
Number of Inputs:	1 per CI-EA card (shelf accepts 2 input cards)
Amplitude:	1.0 V to 3.5 V base-to-peak (TERM input) 0.1 to 0.35 V base-to-peak (BRIDGE input)
Jitter Tolerance	Per ITU G.823 (Table 2)
Impedance:	Terminated in 120 Ω (TERM input) Bridged (BRIDGE input)

E1 Input

Frequency:	2.048 Mb/s
Format:	Digital (ITU G.703, Table 6)
Line Code:	AMI or HDB3
Framing:	CAS CCS (with or without CRC-4 per ITU G.704)
Parameters Monitored:	OOF COFA AIS



LOS

Error Threshold

One or more OOFs in 10 s
Error rate of 10^{-6} (based on BPV)

Analog Input

Frequency:

2.048 MHz

Format:

Analog (ITU G.703, Table 10)

Wave Shape:

Square wave



Timing Outputs

TOLA Card (090-40023-22) Outputs

Connector Type:	Wire-wrap pins
Connector Label:	OUTPUTS 1–10 OUTPUTS 11–20
Connector Location:	Rear panel
Frequency:	8 kHz
Format:	Square wave
Type:	RS-422
Number of Outputs:	5 per card, 10 max per system (5 in connector OUTPUTS 1–10, plus 5 in connector OUTPUTS 11–20)
Impedance:	100 Ω
Amplitude:	2 V to 6 V pp

TOLA Card (090-40023-24) Outputs

Connector Type:	Wire-wrap pins
Connector Label:	OUTPUTS 11–20
Connector Location:	Rear panel
Frequency:	2.048 Mb/s
Format:	Square wave

Type:	RS-422 balanced
Number of Outputs:	5 in connector OUTPUTS 11–20
Impedance:	100 Ω
Amplitude:	2 V to 6 V pp

E1 / 2.048 MHz Outputs (Optional)

Connector Type:	Wire-wrap pin
Connector Label:	Outputs 1-10 Outputs 11-20
Connector Location:	Rear panel
Number of outputs:	10
Frequency:	E1 or 2.048 MHz (programmable)
Impedance:	120 Ω
Framing:	CCS or CAS, with or without CRC-4

Alarms

Connector Type:	Wire-wrap pins
Connector Label:	MAJ (NO, C, NC) MIN (NO, C, NC) INPUT 1 (C, NO) INPUT 2 (C, NO) HOLDOVER (C, NO) - not applicable PORT (C, NO)
Contact Type:	Dry contact
Contact Rating:	1 A @ 30 V dc 0.5 A @ 60 V dc 0.5 A @ 125 V ac
Major:	Deactivated when powered and not in major alarm; activated when not powered, or powered and in major alarm
Minor:	Deactivated when not powered, or powered and not in minor alarm; activated when powered and in minor alarm
Input 1:	Deactivated when not powered, or powered and Input 1 card is not in alarm; activated when powered and Input 1 card is in alarm
Input 2:	Deactivated when not powered, or powered and Input 2 card is not in alarm; activated when powered and Input 2 card is in alarm
Holdover:	Not applicable in 990-45200-07, -08, -09, and -12
Port:	Deactivated when not powered, or powered and neither output card has a port alarm; activated when powered and either output card has a port alarm

Power

Connectors:	Compression screw connection block
Connector Label:	TB1
Voltage:	-40 V dc to -56 V dc (A and B)
Current:	400 mA
Shelf Fuses:	2 A
Recommended Battery Feed Fuse:	3 A

Mechanical

Mounting:	19 in. rack 23 in. rack (with extension ears)
Rack Mounting Position:	Flush or 5 in. offset
Width:	15.1 in.
Height:	2.8 in.
Depth:	9 in.
Weight:	7.5 lb

Environmental

Operating Temperature:	0 °C to +50 °C
Operating Humidity:	0 % to 95 % RH (noncondensing)
Electromagnetic Compliance:	FCC Part 15, Sub Part B, Class A

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