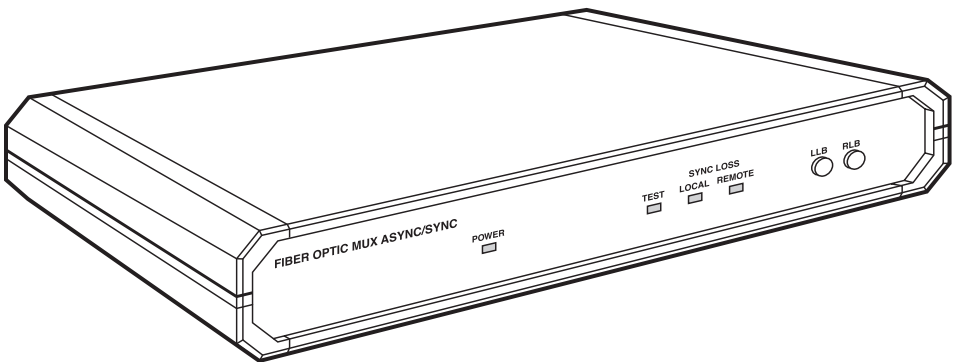




Async/Sync Fiber Optic Multiplexor



CUSTOMER
SUPPORT
INFORMATION

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: www.blackbox.com • E-mail: info@blackbox.com

FEDERAL COMMUNICATIONS COMMISSION AND CANADIAN DEPARTMENT OF COMMUNICATIONS RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is 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 necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.

TRADEMARKS USED IN THIS MANUAL

ST is a registered trademark of AT&T.

Freon is a registered trademark of E. I. du Pont de Nemours & Company.

Any other trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

Contents

Chapter	Page
1.0 Specifications	1
2.0 Introduction	3
2.1 Description	3
2.2 Applications	4
3.0 Configuration	6
3.1 Selecting the Number of Subchannels	7
3.2 Setting Synchronous Data Rates	7
3.3 Selecting the Transmit Clock (TC) Source	7
3.4 Setting the Ground	8
4.0 Installation	9
4.1 AC Power Requirements	9
4.2 Main Channel	9
4.3 Subchannels	10
5.0 Operation	12
5.1 Controls and Indicators	12
5.2 Operating Procedure	13
5.3 System Tests	13
6.0 Troubleshooting	15
6.1 Front-Panel Indicators Don't Light	15
6.2 Local Sync Loss LED Is ON	15
6.3 Remote Sync Loss LED Is ON	16
6.4 Calling Your Supplier	17
6.5 Shipping and Packaging	17

1.0 Specifications

Approvals —	FCC Class A, DOC Class/MDC classe A
Multiplexing Technique —	Time division
User Channels —	(6); (12) with Doubler Cable (EYN356)
Interface —	Channel: Serial EIA RS-232C/CCITT V.24, DCE; Composite: Dual fiberoptic
Protocols —	On 3 or 9 channels: Asynchronous only; On 3 channels: Asynchronous or synchronous (user-selectable)
Clock —	Internal, external from DTE, or external from remote modem (user-selectable)
Operating Mode —	Full duplex over dual fiberoptic cable
Speeds —	Channel: Asynchronous: Transparent to all speeds up to 38,400 bps; Synchronous: 1200, 2400, 4800, 9600, or 19,200 bps (user-selectable); Composite: 2.46 Mbps
Operating Range —	3.2 mi. (5.2 km)
Operating Wavelength —	820 nm
Optical Output —	-23 dBm minimum into 50/125 G. I. fiber; -16 dBm minimum into 100/140 G. I. fiber
Receiver Sensitivity —	-40 dBm minimum
Dynamic Range —	24 dBm minimum

ASync/Sync FIBER OPTIC MULTIPLEXOR

User Controls —	(8): (2) Front-mounted pushbuttons: Local Loopback, Remote Loopback; (6) Internal: (3) Jumpers: Number of Channels, Clock Source, Connected/Disconnected Grounds; (3) Rotary Switches: Synchronous Data Rate/Asynchronous for Channels 1 through 3
Indicators —	(4) Front-panel LEDs: Power, Test, Local Sync Loss, Remote Sync Loss
Diagnostics —	Local and remote digital loopback
Connectors —	(9) Rear-mounted: (6) DB25 female; (1) Power inlet; Units without “-ST” suffix: (1 TX, 1 RX) SMA 905 female; Units with “-ST” suffix: (1 TX, 1 RX) ST® female
Leads/Signals Supported —	RS-232: 1, 2, 3, 4, 5, 6, 7, 8, 15, 17, 20, 24 (PGD, TXD, RXD, RTS, CTS, DSR, SGD, DCD, TXCLK, RXCLK, DTR, and EXTCLK respectively)
Power —	From outlet over 5-ft. (1.5-m) detachable line cord: Consumption: 8.5 VA maximum; For 120-VAC, 60-Hz operation: Input range: 115 VAC \pm 10%, 47 to 63 Hz; For 240-VAC, 50-Hz operation: Input range: 230 VAC \pm 10%, 47 to 63 Hz
Fuse —	Slo-Blo: For 120 VAC: 0.2 A; For 240 VAC: 0.1 A
Temperature —	32 to 122°F (0 to 50°C)
Humidity —	Up to 95%, noncondensing
Size —	Standalone: 1.75"H x 13.3"W x 7.9"D (4.4 x 33.8 x 20 cm) Rackmount: 1.75"H x 19"W x 7.9"D (4.4 x 48.3 x 20 cm)
Weight —	Standalone: 3.5 lb. (1.6 kg) Rackmount: 3.85 lb. (1.75 kg)

2.0 Introduction

2.1 Description

The Async/Sync Fiber Optic Multiplexor is a full-duplex time-division synchronous/asynchronous multiplexor that enables up to 12 terminals to be multiplexed onto a single fiberoptic channel. (The mux's normal total of six subchannels can be increased to 12 by using channel-doubler cables, product code EYN356.) Channels 1 through 3 can be set to operate either synchronously or asynchronously, while the remaining three or nine channels always operate asynchronously.

Various configurations can be set up to suit your specific needs:

- Up to six asynchronous data channels with one control signal per channel at data rates up to 19,200 bps. (A control signal is the same as hardware flow control.) This signal, input to the local unit on Pin 14 (STXD, Secondary Transmitted Data), is transposed at the remote unit and output on Pin 16 (SRXD, Secondary Received Data). The control signal may require special cabling; the mux can process it only in 6-channel (not 12-channel) mode at up to 19,200 (not more) bps.
- Up to six asynchronous data channels without control signals at rates up to 38,400 bps. (Distortion increases at async speeds above 19,200 bps, preventing the use of control signals.)
- Up to six data channels: up to three operating synchronously at rates up to 19,200 bps and the rest operating asynchronously, with no control signals, at rates up to 38,400 bps.
- Up to 12 data channels: up to three operating synchronously and the rest operating asynchronously, with no control signals, all at rates up to 19,200 bps.

These configurations are set by adjusting the rotary switches and jumpers located on the main board (see **Chapter 3**).

The unit implements asynchronous multiplexing using an over-sampling technique. Each of the 12 channels is sampled at 76.8 kbps on the electrical side while on the optical side the rate of sampling is doubled. Table 2-1 on the next page summarizes the unit's performance in its various configurations.

Table 2-1. Performance in Various Configurations

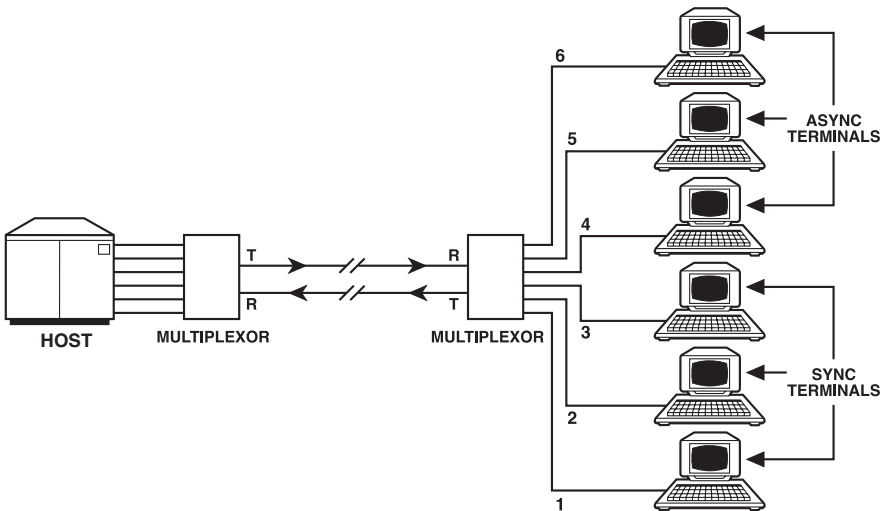
Total # of Subchannels	Max. # Subchannels In Use		Data Rate (kbps)		Distortion (%) (Async Channels)	Controls per Subchannel
	Sync	Async	Sync	Async		
6	3	6 minus sync	19.2	19.2	6.25	0
6	3	6 minus sync	19.2	38.4	12.5	0
6	3	6 minus sync	19.2	19.2	12.5	1
12	3	12 minus sync	19.2	19.2	12.5	0

NOTE: To reduce async distortion, operate the multiplexor in the 6-channel mode, at no more than 19,200 bps, whenever possible. There is no distortion on sync channels in any mode.

2.2 Applications

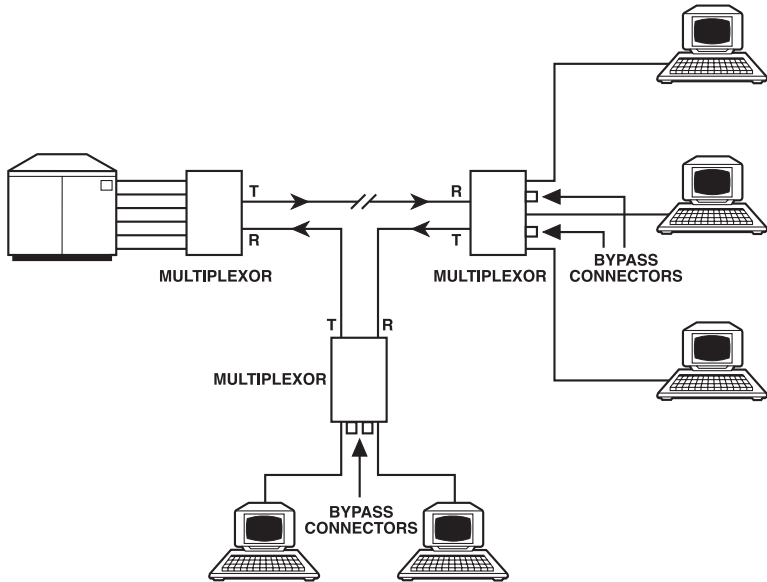
The primary application of the Async/Sync Fiber Optic Multiplexor is for point-to-point configurations where distances of up to several kilometers are involved. For example, where a cluster of terminals is connected to a host computer through a single link, as in Figure 2-1 below:

Figure 2-1. Typical point-to-point installation.



For installations involving clusters of terminals distributed in several locations, the Async/Sync Fiber Optic Multiplexor units may be installed in a ring-type (multipoint) arrangement, as shown below in Figure 2-2.

Figure 2-2. Typical ring (multipoint) installation.

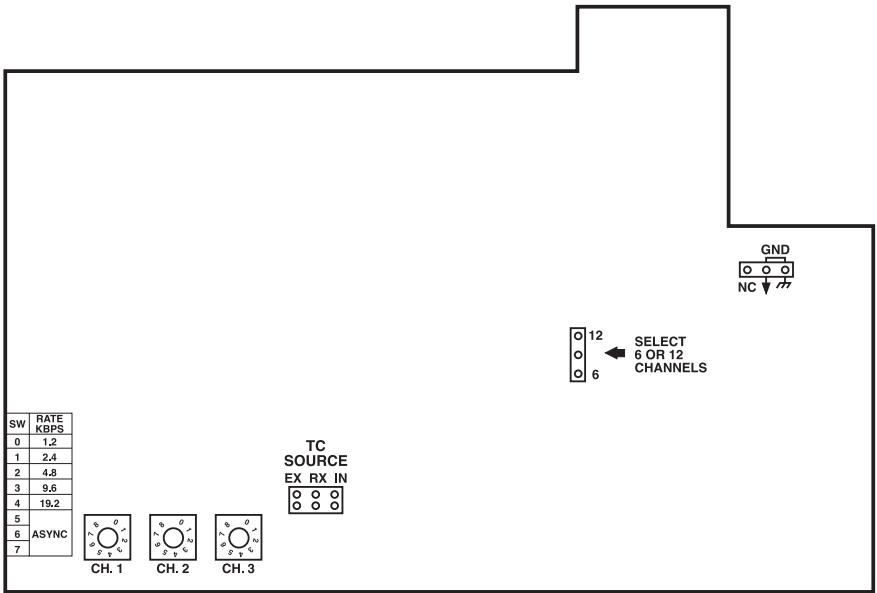


On each terminal-end mux in a ring arrangement, the unconnected channels must be bypassed by shorting Pin 2 to Pin 3 of the relevant subchannels' connectors. During synchronous operation, if a bypass is needed for a given unit's Channel 1, 2, or 3, the transmit-clock source in that unit should be set to "received clock" (RX; see **Section 3.3**). Not more than two adjacent units should operate in the RX mode.

3.0 Configuration

Four setup procedures must be completed before the multiplexor can be installed and operated: selecting the number of subchannels, setting synchronous data rates, selecting the transmit clock (TC) source, and setting the ground. Refer to the board layout in Figure 3-1, below, for the location of the straps (jumpers) and switches referred to in the rest of this chapter.

Figure 3-1. Internal strap and switch locations.



3.1 Selecting the Number of Subchannels

1. Unscrew the two upper-cover screws located at the back of the unit and slide the upper cover backward.
2. Locate the strap labeled “SELECT 6 OR 12 CHANNELS.”
3. For up to 6 channels with no controls, place the strap between the center pin and the one marked “6.” For any other application, place the strap between the center pin and the one marked “12.”

3.2 Setting Synchronous Data Rates

1. With the cover off the multiplexor, locate the three rotary data-rate switches marked “CH.1,” “CH.2,” and “CH.3,” and the rate table located to the left of these switches.
2. If you want to operate Channel 1, 2, or 3 in the synchronous mode, you must rotate the channel switch(es) to the appropriate data-rate setting(s) (refer to the rate table). If the synchronous mode isn’t needed, set the three switches to positions 5, 6, or 7 (asynchronous mode).

3.3 Selecting the Transmit Clock (TC) Source (Synchronous Operation Only)

1. With the cover still off the multiplexor, locate the strap marked “TC SOURCE.”
2. For normal synchronous operation (the Transmit-Clock signal is generated internally), place the strap over the “IN” column of pins. For loopback timing (the TC is synchronized to the Received-Clock signal from the remote modem), place the strap over the “RX” column of pins. If an External-Clock signal is provided by a DTE device on RS-232 Pin 24, place the strap over the “EX” column of pins. Only Channel 1 can accept an External Clock.

3.4 Setting the Ground

1. With the cover still off the multiplexor, locate the strap marked “GND.” According to your requirements, set the signal ground to either be connected to or disconnected from the shielding (chassis or protective) ground.
2. Slide the multiplexor cover back into place and fasten the screws.

4.0 Installation

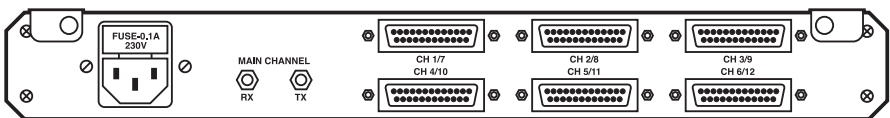
4.1 AC Power Requirements

AC power is supplied to the Async/Sync Fiber Optic Multiplexor through a 5-foot (1.5-meter) cord terminated by a grounded three-wire plug; therefore, the multiplexor must be placed within five feet of a grounded AC outlet. The AC cord is fused at the rear-panel AC-power receptacle of the unit. A 0.1-A Slo-Blo fuse is required for 230-VAC operation and a 0.2-A fuse is required for 115-VAC operation.

4.2 Main Channel

1. Remove the protective caps from the two fiberoptic connectors (“RX” and “TX”) on the rear panel of the multiplexor (see Figure 4-1, below) and keep them in a safe place for later use.
2. Apply Freon® spray to both connectors to clean the optical surfaces, which may be coated with dust from shipping.
3. Connect the transmitting fiber to the connector marked “TX” and the receiving fiber to the connector marked “RX.” If the connectors are SMA type, secure the fastening nuts tightly.
4. At the remote unit, the transmitting fiber must be connected to the “RX” connector and the receiving fiber to the “TX” connector.

Figure 4-1. The rear panel of a 230-VAC unit.



4.3 Subchannels

Six DB25 female connectors, located on the rear panel, enable the end-users to be connected to the unit. Detailed information about the signals present at these connectors is given in Table 4-1 on the next page. To operate the multiplexor with more than six channels, channel doublers are required (see Figure 4-2, below).

Figure 4-2. Connecting a channel-doubler cable to a subchannel.

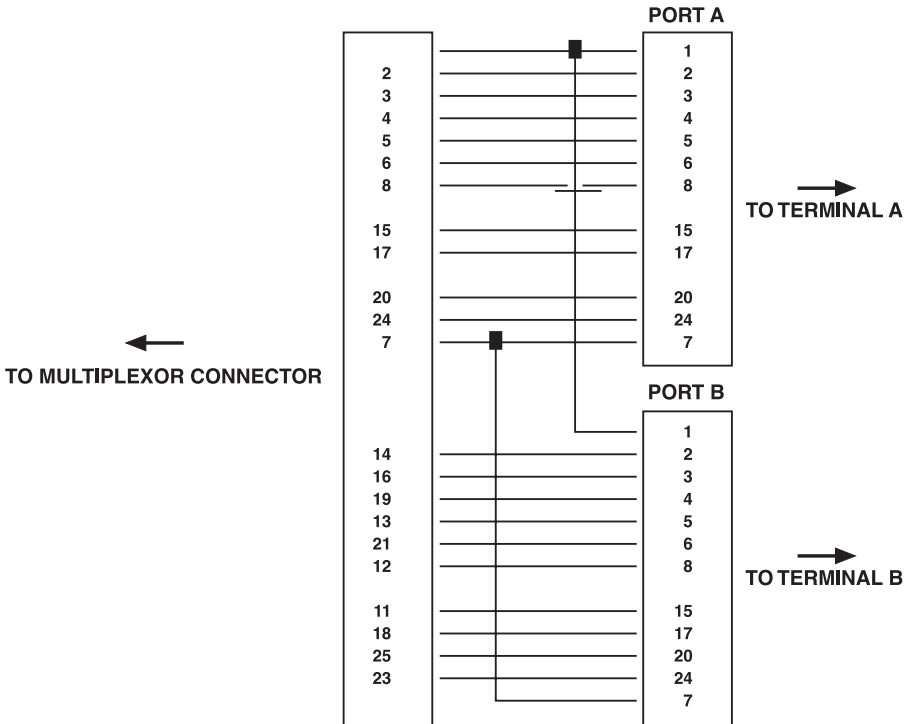


Table 4-1. Pin Assignments for Subchannel Connectors

CCITT V.24	EIA R5-232-C	Pin #	Signal Name	Description
101	AA	1	Protective Ground	Chassis ground. Can be isolated from Signal Ground.
102	AB	7	Signal Ground	Common signal- and DC-power-supply ground.
103	BA	2 (14)	Transmit Data	Serial digital data input from a terminal or other source to the multiplexor.
104	BB	3 (16)	Receive Data	Serial digital data output from the mux.
105	CA	4 (19)	Request to Send	A positive level to the mux when the DTE wants the mux to transmit data. Inside the mux, this pin is tied to Pin 5.
106	CB	5 (13)	Clear to Send	A positive level from the mux if it can transmit data. Inside the mux, this pin is tied to Pin 4; the mux "reflects" RTS back to the DTE without delay.
107	CC	6 (21)	Data Set Ready	A positive DC voltage (+8V) from the mux indicating the unit is powered.
108.2	CD	20 (25)	Data Terminal Ready	Pinned but not functional.
109	CF	8 (12)	Receive Line Signal Detector (Carrier Detect)	A positive level from the mux except when either a sync loss occurs or remote loopback is performed.
		9	+8V	These signals are reserved for data-set testing and for powering mini modems.
		10	-8V	
113	DA	24	External Clock	Available only for Channel 1. Clock input from a terminal or other source to the mux for synchronous transmission.
114	DB	15	Transmit Clock	Available only for Channels 1 to 3. Clock output from the mux for synchronous transmission.
115	DD	17	Received Clock	Available only for Channels 1 to 3. Clock output from the mux for synchronous reception.

NOTE: Pin numbers in parentheses represent secondary channels available when you use a channel-doubler cable.

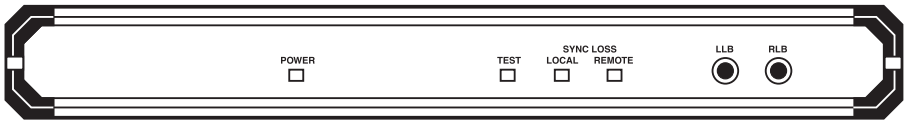
5.0 Operation

The installation procedures covered in the previous section must be completed and checked before the multiplexor can be operated properly.

5.1 Controls and Indicators

This section describes the front-panel controls and indicators (shown in Figure 5-1, below).

Figure 5-1. Front-panel controls and indicators.



5.1.1 CONTROLS

- Local Loopback (LLB) Button: Press to perform local loopback test.
- Remote Loopback (RLB) Button: Press to perform remote loopback test.

NOTE: If both buttons are pressed simultaneously, the action will be disregarded by the multiplexor and normal operation will continue.

5.1.2 INDICATORS

- Power: Green LED lights when power is ON.
- Test: Yellow LED lights when either the local or remote unit is performing a test.
- Local Sync Loss: Red LED lights when synchronization is lost at the local unit.
- Remote Sync Loss: Red LED lights when synchronization is lost at the remote unit.

5.2 Operating Procedure

CAUTION!

The protective-ground terminals of the multiplexor must be connected to the protective-ground conductor of the power cord. The mux's power-cord plug should be inserted only in (a) an outlet provided with a protective-ground contact or (b) an extension cord with a protective-ground conductor; any type of power connection that doesn't provide grounding leaves the mux defenseless.

1. Plug the multiplexor's AC power cord into an AC outlet. The Power LED will light up to indicate that the mux is ON. If the local and remote muxes are both operating and their main channels are properly connected with fiberoptic cable, no other LED should be ON. If other LEDs light up, please refer to **Chapter 6**.
2. To turn off the mux, simply remove its power cord from the outlet.

5.3 System Tests

The multiplexor performs two system tests: local loopback and remote loopback.

5.3.1 LOCAL LOOPBACK

When the mux performs local loopback, the data from the local transmitter is looped back to the local receiver at the digital level, which checks all local digital circuitry for proper operation.

To activate the local loopback test, press the "LLB" pushbutton located on the front panel of the multiplexor (see Figure 5-1). If the local unit is operating properly, the yellow Test LED should be lit and all other LEDs should be off.

Furthermore, if the local and remote units are properly connected across their main channels, the yellow Test LED on the remote unit should be lit too, which indicates that a check of the local transmitter's analog interface and both the analog and digital remote receiver's sections is being performed.

5.3.2 REMOTE LOOPBACK

Remote loopback sends data back from the remote receiver to the remote transmitter, which checks all local digital circuitry as well as both the local and remote analog interfaces, main channel link, and remote digital receiver section.

To activate the remote loopback test, press the “RLB” pushbutton located on the front panel of the multiplexor (see Figure 5-1). If both the local and remote units are operating properly, the yellow Test LEDs should be lit on both units and all other LEDs should be off.

NOTE: When either the local or remote loopback test is performed, the following signals at the remote unit’s subchannels are OFF (negative voltage):

- Receive Data (Circuit 104)
- Clear to Send (Circuit 106)
- Receive Line Signal Detector (Circuit 109)

6.0 Troubleshooting

This chapter lists some problems that might occur during installation and operation of your mux, along with some possible solutions.

CAUTION!

These service instructions are for use by qualified personnel only. To avoid shock, do not perform any service action not listed below.

6.1 Front-Panel Indicators Don't Light

1. Make sure power is being supplied to the unit. If the outlet the mux is plugged into does work, and the power cord shows no signs of being broken:
2. Try replacing the mux's fuse. If this doesn't help:
3. The fault might be in the unit's power-supply circuits. Call your supplier.

6.2 Local Sync Loss LED Is ON

1. Push the "LLB" button on the mux's front panel to trigger its local loopback test. If the Test LED comes ON and the Local Sync Loss LED goes OFF, go to Step 2. If this doesn't happen, try replacing the local unit:
 - A) If you don't have a replacement unit, call your supplier.
 - B) If the system works fine with the replacement unit, the original local unit is probably faulty. Send it to your supplier for repair.
 - C) If the system doesn't work even with the replacement unit, go to Step 2.
2. Push the "RLB" button on the mux's front panel to trigger its remote

loopback test. If the Test LED comes ON and the Local Sync Loss LED goes OFF, go to Step 3. If this doesn't happen, try replacing the remote unit:

A) If you don't have a replacement unit, call your supplier.

B) If the system works fine with the replacement unit, the original remote unit is probably faulty. Send it to your supplier for repair.

C) If the system doesn't work even with the replacement unit, go to Step 3.

3. Perform Steps 1 and 2 at the remote site (run the loopback tests from the remote modem). If the fault is still not located, try replacing both the remote and local units one at a time (if you haven't done this already):

A) If you don't have a replacement unit, call your supplier.

B) If the system works fine with one or the other replacement unit, the original unit is probably faulty. Send it to your supplier for repair.

C) If the system still doesn't work, the main-channel fiberoptic link between the units might be broken or defective and should be checked. If replacing the fiber cable doesn't work, call your supplier.

6.3 Remote Sync Loss LED Is ON

Follow the same procedure as that for the Local Sync Loss problem, but starting at the remote site.

6.4 Calling Your Supplier

If you determine that your multiplexor itself is malfunctioning, do not attempt to alter or repair the unit. Contact your supplier.

Before you do, make a record of the history of the problem. Your supplier will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

6.5 Shipping and Packaging

If you need to transport or ship your multiplexor:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the multiplexor for repair, make sure you include its power cord. If you are returning the multiplexor, make sure you include its cord and this manual. Before you ship, contact your supplier to get a Return Materials Authorization (RMA) number.

NOTES



© Copyright 1993. Black Box Corporation. All rights reserved.

1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746