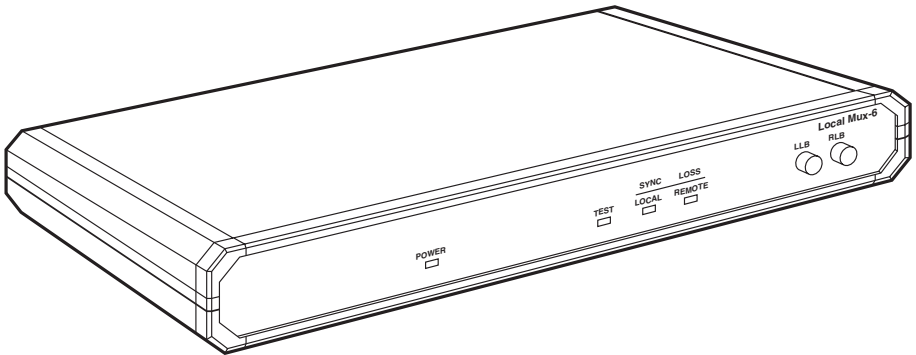




Local Mux-6



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**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.

**NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT****INSTRUCCIONES DE SEGURIDAD**

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

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1. Specifications

1.1 Sub-Channels

Transmission Format—Asynchronous

Data Rate—Up to 19.2 kbps (refer to **Table 2-1**)

Distortion—Refer to **Table 2-1**

Interface—EIA RS-232-C/CCITT V.24

Connectors—(6) DB25 female

Number of Sub-channels—Up to twelve by attaching a channel doubler to each of the connectors

Mode of Operation—Full duplex

1.2 Main Channel

Electrical Interface

Transmission Line—4-wire unconditioned telephone lines (two twisted pairs)

Operating Range—Maximum of 1.6 km (1 mile) on 22 AWG cable

Data Rate—1.2288 Mbps

Output Format—Balanced, transformer-isolated 6 V_{p-p} (on 100 Ω)

Input Resistance—100 Ω

Connector—Terminal block

1.3 General

Diagnostics

Local digital loopback—Activated by pushbutton.

Remote digital loopback—Activated by pushbutton.

Switches/Indicators

Power Indicator (Green)—On when unit is powered.

Test Indicator (Yellow)—On when local or remote unit is performing a loopback.

Local Sync Loss Indicator (Red)—On when synchronization is lost at local unit.

Remote Sync Loss Indicator (Red)—On when synchronization is lost at remote unit.

LLB Switch—When pressed, unit is performing local loopback.

RLB Switch—When pressed, unit is performing remote loopback.

Physical Description

Size—1.72"H (1U) x 13.3"W x 8.6"D (4.4 x 33.8 x 22 cm)

Weight—3.5 lb. (1.6 kg)

Environment

Temperature—32 to 122°F (0 to 50°C)

Humidity—Up to 90% non-condensing.

Power

Power Requirements—*MX515A*: 115 VAC, 60 Hz; *MX515AE*: 230 VAC, 50 Hz

2. Introduction

2.1 General

The Local Mux-6 is a full-duplex time-division asynchronous multiplexor enabling up to twelve async terminals to be multiplexed onto a single channel. The Local Mux-6 is intended for use in manufacturing facilities, building complexes, campuses, and other similar point-to-point applications.

2.2 Functional Description

The Local Mux-6 contains six sub-channels that can be expanded to twelve through connection of channel-doubler cables. The number of channels available (6/12) is set by a user-selectable strap.

When the unit is set for six channels, each channel can be used to transmit full-duplex data end to end. When the unit is set for twelve channels, each sub-channel can be used for either data or control-signal transmission, according to the specific application. For example, six channels can be used to transmit full-duplex data and six can be used to transmit control signals end to end, or else the full twelve channels can be used to transmit full duplex data end to end.

The Local Mux-6 comes with a 4-wire terminal block for transmission over two twisted pairs.

Multiplexing is implemented using an over-sampling technique. Each of the twelve channels is sampled at 78.6 kbps. **Table 2-1** summarizes Local Mux-6 performance.

NOTE

Whenever possible (if the number of channels is less than or equal to 6), we recommend that you operate the Local Mux-6 in the six-channel mode, which results in less distortion.

Table 2-1. Performance in Various Modes of Operation.

No. of Sub-channels in use	Max Data Rate (Kbps)	Electrical Distortion (%)
6	19.2	12.5
6	38.4	—
12	19.2	25.0

2.3 Applications

The Local Mux-6 is used mainly for point-to-point configurations where distances of up to several kilometers are involved. A typical application is demonstrated in **Figure 2-1**, where a cluster of terminals is connected to a host computer through a single link. Different configurations are available using the 4-wire transmission media. The maximum data rate in a point-to-point configuration is 19.2 kbps for 12 data subchannels, 6 data subchannels, or 6 data and 6 control subchannels.

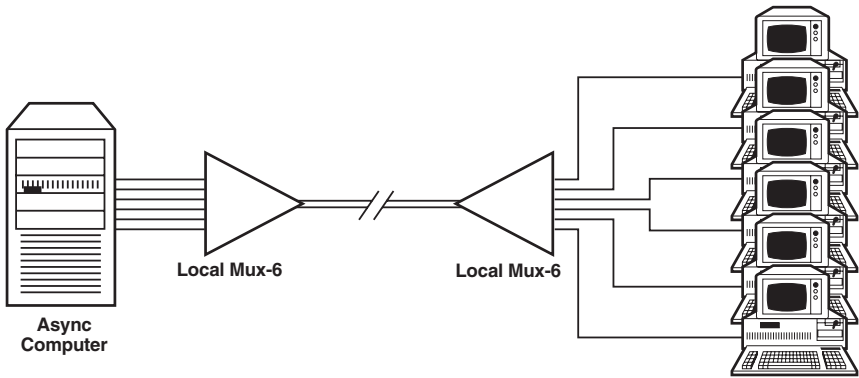


Figure 2-1. Typical Point-to-Point Installation.

For installations involving clusters of terminals distributed in several locations, Local Mux-6 units may be installed in a ring-type configuration (refer to **Figure 2-2**). At each site the unconnected channels must be bypassed by shorting Pins 2 and 3 of the relevant sub-channel connector.

Table 2-2. Distortion.

Data Rate on Each Sub-Channel	Distortion per Node (%)	Number of Nodes/Sites
19.2 kbps	25.00	2
9.6 kbps	12.50	3
4.8 kbps	6.250	4
2.4 kbps	3.125	8
1.2 kbps	1.5625	16

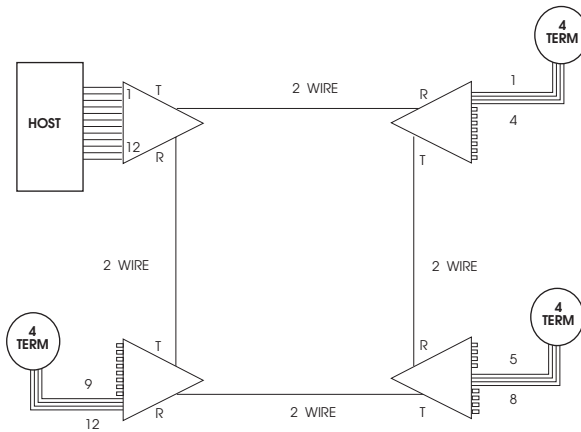


Figure 2-2. Typical Ring Installation.

3. Installation

3.1 Site Preparation

The Local Mux-6 must be installed within 5 feet (1.5 m) of a grounded AC outlet.

3.2 Setup

1. Unscrew the two upper cover screws located at the back of the unit (refer to **Figure 3-3**).
2. Slide the rear drawer out.
3. Locate the strap marked “select 6 or 12 channels” (indicated by an arrow on the circuit board). For up to 6 channels with no control applications, place the strap between the center pin, and the one marked “6.” For any other applications, place the strap between the center pin and the one marked “12” (refer to **Figure 3-1**).
4. Locate the strap marked GND. According to your requirements, set the signal ground to be connected to shielding (chassis) ground or floating (NC).
5. Replace the rear drawer.
6. Fasten the two upper cover screws at the back of the unit.

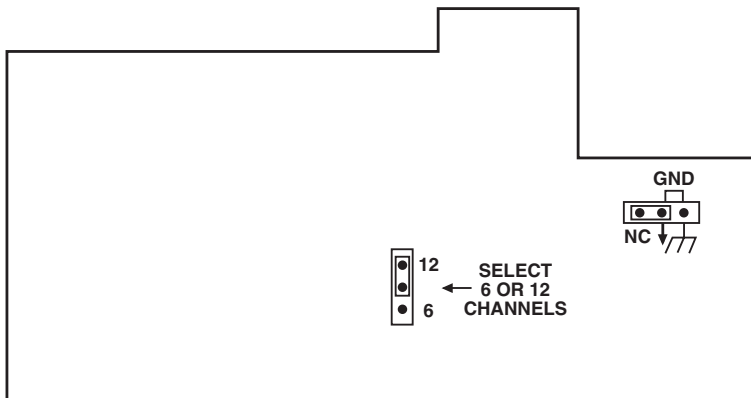


Figure 3-1. Strapping Diagram.

3.3 Installation in 19" Racks

3.3.1 GENERAL

The Local Mux-6 can be installed in a 19" rack. Its height is slightly less than 1U (1.75"), and the width is slightly less than the available mounting width.

WARNING

Disconnect the units from mains power while performing the following procedures. If you don't, you could be shocked!

3.3.2 INSTALLATION OF A UNIT

The rack adapter components for single-unit installation include two short brackets. The brackets are fastened by means of screws to the side walls for the case, as shown in **Figure 3-2**. The brackets are attached to the two side walls of the unit.

1. To prepare the unit for rack installation, attach the two brackets to the side walls of the unit. Each bracket is fastened by means of two screws (with flatwashers), which are inserted into the two front holes on the wide wall (nuts are already in place, on the inner side of the wall).
2. After attaching the brackets, the unit is ready for installation in the 19" rack. Fasten the brackets to the side rails of the 19" rack by means of four screws—two per side.

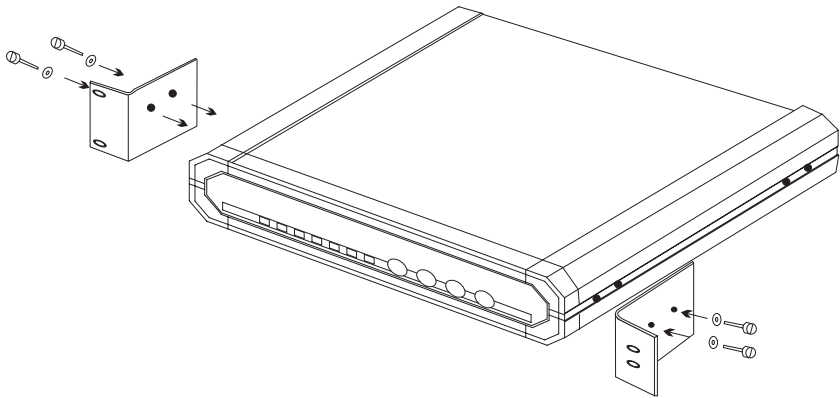


Figure 3-2. Installation of a Unit in a 19" Rack.

3.4 Electrical Installation

In the following discussions, refer to **Figure 3-3** (rear panel).

3.4.1 AC POWER

AC power is supplied to the Local Mux-6 through a 5 feet (1.5 m) cord terminated by a grounded 3-wire plug. The AC cord is fused at the rear panel AC power receptacle of the unit. A slow-blow fuse of 0.1A is required for 230V operation, and a 0.2A fuse is required for 115V operation.

3.4.2 SUB-CHANNELS

Six D-type 25-pin female connectors on the rear panel enable connection to the unit. Detailed information about the signals present at these connectors is given in **Table 3-1**. For twelve-channel operation, channel doublers (CD) are required. Refer to **Figure 3-4** for the pinout of the CD. For six-channel operation, with full duplex data and end-to-end control signals on each channel, refer to **Figure 3-5** (DTR to DSR control signal) or to **Figure 3-6** (RTS to DCD control signal).

3.4.3 MAIN CHANNEL

A 5-screw terminal block is located at the rear panel, marked TX-A, TX-B, CHASSIS GND, RX-A, RX-B for connecting transmit and receive wires and the cable shield (if available). TX connectors at the local unit must be connected to RX connectors at the opposite unit.

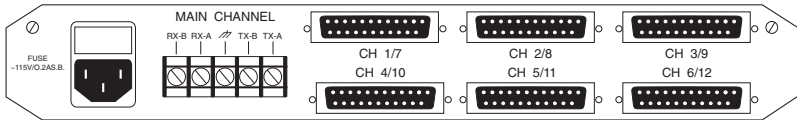


Figure 3-3. Rear Panel.

Table 3-1. Sub-Channel Connector Pin Assignment.

CCITT V.24	EIA RS-232C	Pin No.	Signal Name	Description
101	AA	1	Protective Ground	Chassis ground. May 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 from a terminal or other source into the Local Mux-6.
104	BB	3 (16)	Receive Data	Serial digital data output from the Local Mux-6.
105	CA	4 (19)	Request to Send	A positive level to the Local Mux-6 when data transmission is desired.
106	CB	5 (13)	Clear to Send	A positive level from the Local Mux-6 (if data transmission is possible).
107	CC	6 (21)	Data Set Ready	A positive DC voltage (+8V) from the Local Mux-6 indicating the unit is powered.
109	CF	8 (12)	Receive Line Signal Detector (Carrier Detect)	A positive level from the Local Mux-6 except when either a sync loss occurs or remote loopback is performed.
—	—	9 10	+8 volts -8 volts	These signals are reserved for data-set testing and for powering miniature modems.
NOTE: Pin numbers in parentheses are for the secondary channel available when using a channel-doubler cable.				

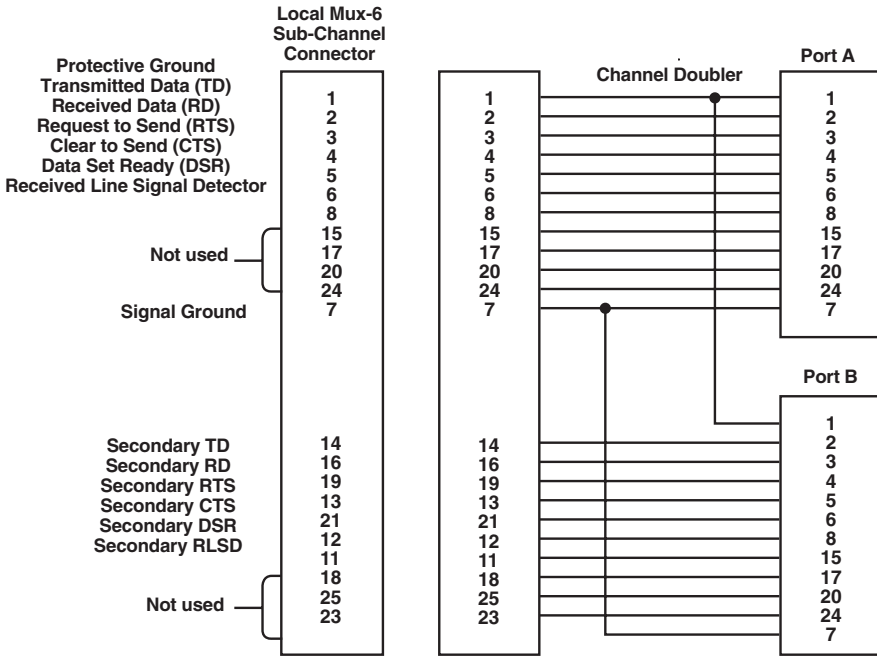


Figure 3-4. Connecting Channel Doubler to Local Mux-6 Sub-Channel.

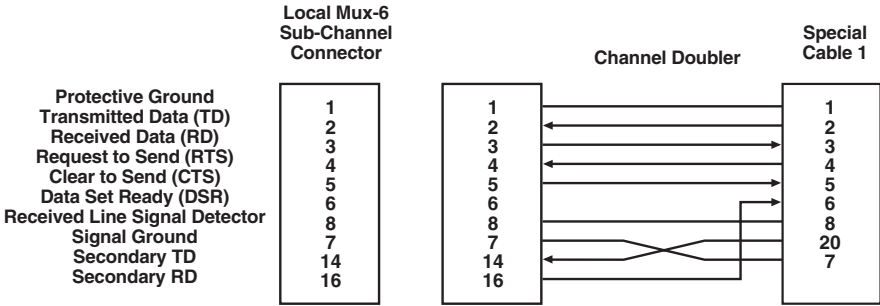


Figure 3-5. DTR to DSR End-to-End Control Signal.

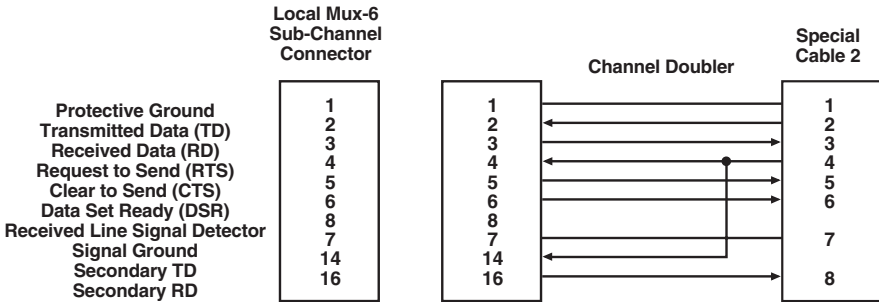


Figure 3-6. RTS to DCD End-to-End Control Signal.

4. Operating Instructions

4.1 General

This chapter covers:

- A list of controls and indicators together with their functions.
- An operating procedure covering turning on the power, operating instructions, and turning off the power.
- Information on strapping.
- A unit system test procedure for use by the operator and technician.

Installation procedures given in **Chapter 3** must be completed and checked before operating the Local Mux-6.

4.2 Controls and Indicators

Tables 4-1 and **4-2** list the function of the Local Mux-6 indicators and switches. The Local Mux-6 front panel is shown in **Figure 4-1**.

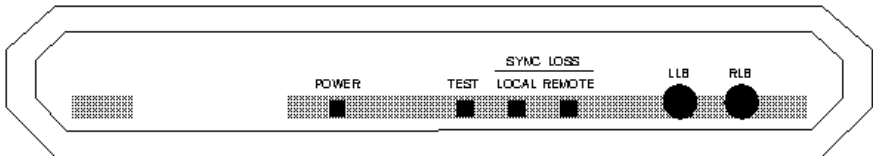


Figure 4-1. Local Mux-6 Front Panel.

Table 4-1. Local Mux-6 Indicators.

Item	Indicator	Function
1	Power	Green LED lights when power is present.
2	Test	Yellow LED lights when either local or remote unit is performing a test.
3	Local Sync Loss	Red LED lights when synchronization is lost at the local unit.
4	Remote Sync Loss	Red LED lights when synchronization is lost at the remote unit.

Table 4-2. Local Mux-6 Switches.

Item	Switch	Function
5	LLB	When pressed (pushed in) the unit performs local loopback.
6	RLB	When pressed (pushed in) the unit performs remote loopback.

4.3 Operating Procedure

WARNING

BEFORE SWITCHING ON THIS INSTRUMENT, the protective earth terminals of this instrument must be connected to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Do NOT use an extension cord (power cable) without a protective conductor (grounding).

Make sure that only fuses with the required rated current are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

Whenever it is likely that the protection offered by fuses has been impaired, the instrument must be made inoperative and secured against any unintended operation.

Turning On the Power

Apply AC power by connecting the AC power cord to an acceptable AC source. If the power indicator lights, then the Local Mux-6 is powered. If the local and remote Local Mux-6 units are in operation and properly connected via the main channel, no other indicator should be ON. If any other indicators light, refer to **Section 4.5** for troubleshooting information.

Operation

The Local Mux-6 operates entirely unattended except when performing system tests.

Turning Off the Power

To turn off Local Mux-6, simply remove the AC power cord from the AC source.

Operational Field Strapping Changes

If you need to reconfigure the Local Mux-6 for twelve-channel mode or six-channel mode, follow the appropriate set-up procedure described in **Section 3-2**.

4.4 System Tests

Two system tests are available in the Local Mux-6: local loopback and remote loopback.

Local Loopback

When performing local loopback, the data from the local transmitter is looped back to the local receiver at the digital level, thus checking all local digital circuitry for proper operation. This test is activated by pressing the LLB push-button on the front panel. If the local unit is operating properly, the yellow TEST indicator should light, and all other indicators should be OFF.

If the local and remote units are properly connected via the main channel, the local transmitter analog interface and both the remote analog and digital receiver sections are checked. The yellow TEST indicator on the remote unit should also be lit if the units are properly connected.

Remote Loopback

Remote loopback loops back data from the remote receiver to the remote transmitter, thus checking:

- All local digital circuitry
- Both local and remote analog interfaces
- Main channel link
- Remote digital receiver section.

This test is performed by pressing the RLB push-button on the front panel. If both local and remote units operate properly, the yellow TEST indicators should be lit at both units and all other indicators should be OFF.

NOTE

When either the local or the remote loopback test is performed, the following signals at the remote unit sub-channels are set to OFF (negative voltage) condition: Received Data (Circuit 104), Clear to Send (Circuit 106), Receive Line Signal Detector (Circuit 109)

4.5 Fault Isolation and Troubleshooting

The symptoms and corresponding procedures listed in **Table 4-3** enable the user to identify, isolate, and correct faults in accordance with the knowledgeable tools and replacement parts available.

WARNING

These service instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Table 4-3. Fault Isolation and Troubleshooting.

Symptom	Action
All front-panel indicators are OFF.	(a) Check that power is supplied to the unit. (b) Check the fuse inside the AC receptacle on the rear panel and replace it with a new one. (c) Replace unit. The fault is probably in the unit's power-supply circuits.
Red LOCAL SYNC LOSS is ON	(a) Perform LLB. Yellow TEST indicator should light and LOCAL SYNC LOSS should go OFF. If not, replace the local unit. Otherwise, proceed to step (b). (b) Perform local RLB. Yellow TEST indicator should light and LOCAL SYNC LOSS should go OFF. In that case, replace the remote unit. Otherwise, proceed to step (c). (c) Perform steps (a) and (b) at the remote site. If the fault is still not located, replace both units one at a time. If the problem remains, the main-channel link between the units is probably defective and should be checked.
Red REMOTE SYNC LOSS is ON	Perform all the tests as in the case of LOCAL SYNC LOSS, starting at the remote site.



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