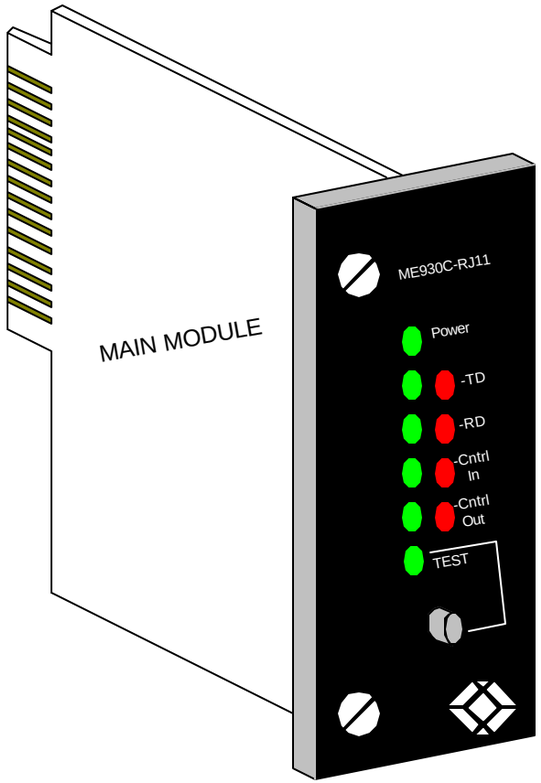
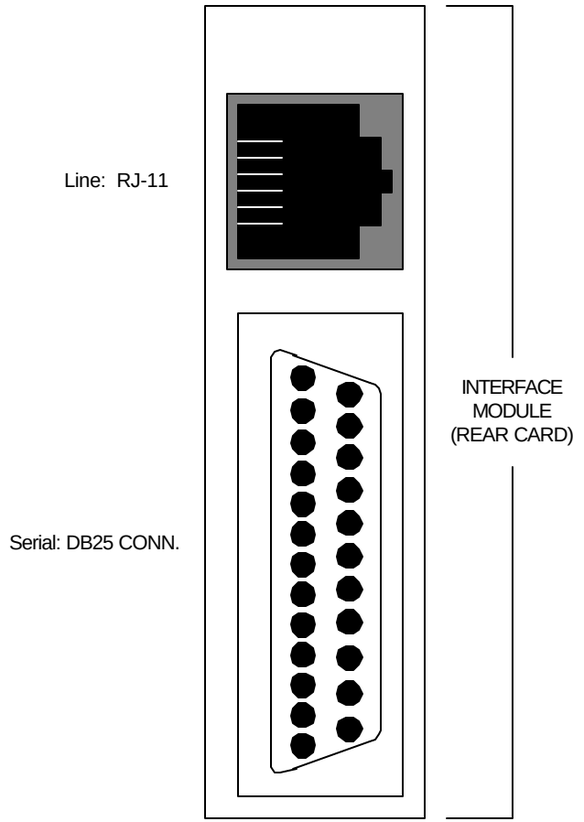
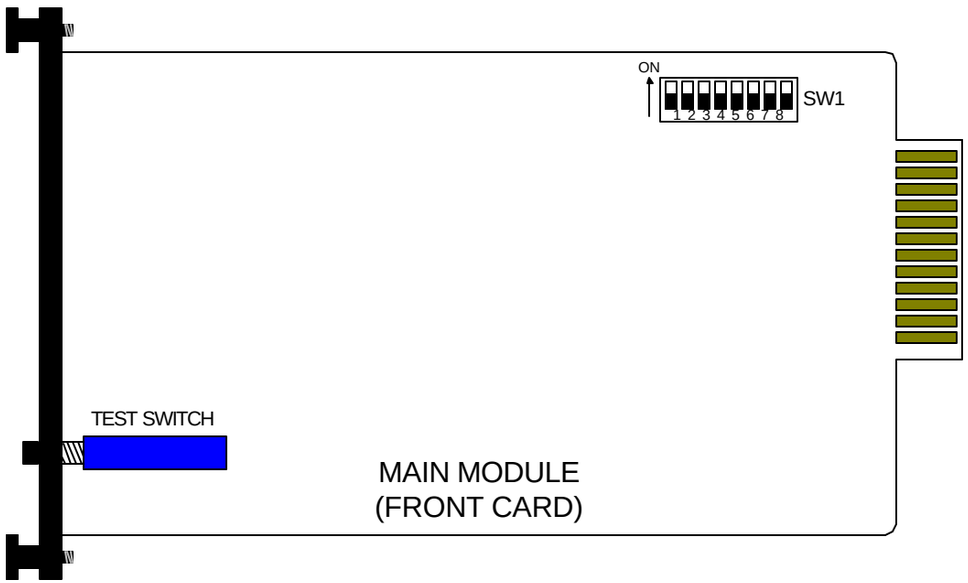
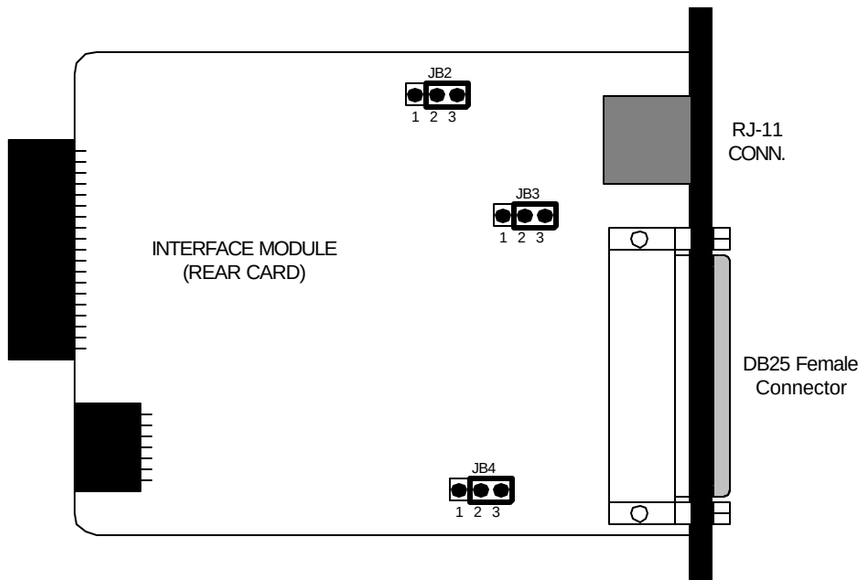
ME930C-RJ11


MAIN MODULE
ME930C-RJ11
Power
-TD
-RD
-Cntrl In
-Cntrl Out
TEST


Line: RJ-11
Serial: DB25 CONN.
INTERFACE MODULE (REAR CARD)


ON
SW1
1 2 3 4 5 6 7 8
TEST SWITCH
MAIN MODULE
(FRONT CARD)


JB2
1 2 3
RJ-11 CONN.
JB3
1 2 3
INTERFACE MODULE
(REAR CARD)
DB25 Female Connector
JB4
1 2 3

SPECIFICATIONS:

Interfaces: Local: EIA/TIA RS-232C/ITU-T V.24, V.28;
Line Proprietary balanced 4-wire.

Protocol: Synchronous

Clock Source: Internal or external (from DTE), user-selectable; with special cabling, can also use recovered receive clock.

Data Rate: 19.2, 14.4, 9.6, 7.2, 4.8, 2.4, or 1.2 kbps (user-selectable).

Flow Control: RTS/CTS (hardware--RTS/CTS delay can be 0, 8, or 53 ms, user-selectable); can also pass through X-ON/X-OFF (software).

Carrier Control: Constantly on or controlled by RTS (user-selectable).

Operation: Point-to-Point or Multipoint.

Line Type: 4-wire unconditioned twisted pair, 19 to 26 AWG, with 20 pF/ft. (65.6 pF/m) or better capacitance.

Optical Isolation: 150 Vrms minimum.

User Controls: Front-panel test pushbutton;
8-position DIP switch for various options mounted on front half-card;
(3) Jumpers for grounding options mounted on rear half-card.

Diagnostics: Simultaneous local and remote analog loopback, controlled with front-panel pushbutton.

Indicators: (10) Front-mounted LED's:
(1) Power; (1) Test; (2) for TD; (2) for RD; (2) for Control In; and (2) for Control Out.

Connectors: (1) DB25 female for RS-232
(1) 6-wire RJ-11 (RJ-12) for line;
(1) 50-pin card-edge on each half-card for mating interconnection and chassis attachment.

Surge Protection: Silicon Avalanche Diodes capable of dissipating 600 watts RMS within 1 millisecond (initial response time less than 1 picosecond.

Power: Input 10-VAC from MicroRack chassis (which has a switchable 120-VAC or 240-VAC power supply); Consumption: 700 mW typical.

INTRODUCTION:

The Sync MP Line Driver Card operates in full duplex over four-wire cable (two unconditioned twisted pairs). The Card supports data rates up to 19.2 Kbps and has a maximum range of 10 miles (at 1200 bps over 19-AWG wire). The Card also passes one control signal in each direction and features both optical isolation and Silicon Avalanche Diode surge protection on the data-line side. It can use its internal clock or the external clock from the attached DTE.

The Sync MP Line Driver Card is designed to be mounted in our MicroRack system (product codes RM202, RM204, RM208, and RM216), a chassis that takes up 2U (3.5", 8.9 cm) of vertical space in a 19" rack. This chassis has a switchable 115/230-volt power supply and hosts cards with a mid-plane architecture: One "function" half-card slides into the front of the chassis and mates in the middle with a "connector" half-card that slides into the rear of the chassis.

The Sync MP Line Driver Card has two built-in diagnostic tools: local and remote loopback test. Additionally, LED's on the Card's front panel allow you to visually monitor communication.

CONFIGURATION:

This chapter describes the location and orientation of the Sync MP Line Driver Card's configuration switch, provides detailed instructions for setting each switch position, and describes jumper settings for the rear half-card.

As shown on the first page, the Card's "function" front half has an eight-position DIP switch labeled "SW1" that you can use to configure the Card for any of a wide range of synchronous applications. This DIP switch is accessible when the Card is slid out of the rack chassis. Once configured, the Card is designed to operate transparently, without need for frequent reconfiguration: Just set it and forget it!

The Orientation and Default Settings of the DIP Switch:

The eight-position DIP switch on the Sync MP Line Driver Card allows you to specify the Card's data rate, clocking method, RTS/CTS delay, and carrier-control method. The table below summarizes the factory-default settings of these switch positions.

POSITION	FUNCTION	FACTORY-DEFAULT	
1	Data Rate	OFF	
2	Data Rate	OFF	9600
3	Data Rate	ON	
4	Reserved for future use	(N/A)	
5	Transmit Clock	ON	Internal
6	RTS/CTS Delay	ON	(8ms)
7	RTS/CTS Delay	OFF	(8ms)
8	Carrier Control	OFF	Constant

Detailed Switch Settings:

This section provides detailed information about the function of each DIP-switch position and lists all of their possible settings. Use this section as a configuration guide for applications where the Sync MP Line Driver Card's default settings would not provide correct results.

1. **Data Rate (Positions 1 through 3)** are set in combination to allow the Card to be used at data rates from 1200 bps up to 19,200 bps.

Pos. 1	Pos. 2	Pos.3	Data Rate in bps:
ON	ON	ON	1200
OFF	ON	ON	2400
ON	OFF	ON	4800
ON	ON	OFF	7200
OFF	OFF	ON	9600 (Default)
OFF	ON	OFF	14,400
ON	OFF	OFF	19,200 Settings are identical
OFF	OFF	OFF	19,200 Settings are identical

2. **Position 4 is reserved for future use. DO NOT change its setting.**

Continued on next page:

3. **Transmit Clock (position 5)** is used to specify the Card's clocking method. The Card will provide an internal clock on DB25 Pin 15 if position 5 is set to OFF (the default), or receive an external clock from the attached DTE on DB25 Pin 24 if position 5 is set to ON. Although the Card can't be directly set to use recovered receive clock from the remote Card, it always outputs that signal on DB25 Pin 17. So you can "trick" the local Card into using receive clock by setting it for external clock (position 5 ON) and attaching a special cable to its DB25 connector. This cable must not only pass Pin 17 on the Card to Pin 17 on the DTE (which must be set for receive clock) but must also loop Pin 17 on the Card back to Pin 24 (the external clock lead) on the Card. If you want such a cable, please call Black Box for technical support.

4. **RTS/CTS Delay (Positions 6 and 7)** are used together to specify RTS/CTS delay. After request to send (RTS) is raised by the host terminal, the Card raises CTS after a slight delay in order to give the remote terminal time to receive an incoming signal. Depending on the type of environment, select either no delay or an 8- or 53-ms delay.

Pos. 6	Pos. 7	Delay in milliseconds:
ON	ON	Zero (no delay)
ON	OFF	8-ms (default)
OFF	OFF	53-ms

5. **Carrier Enable (Position 8)** is used to specify how the carrier signal is raised. In most point-to-point, full-duplex applications, the carrier signal can remain constantly "high", so you can leave this set to "constant carrier" (position 8 OFF, the default). But in multipoint environments, although each slave can be left set to "constant carrier", you must set the host to "controlled by RTS" (position 8 ON).

Configuring the Rear Half-Card:

The rear "connector" half-card of the Sync MP Line Driver Card has one RS-232 interface (a DB25 female connector) and one balanced 4-wire interface (a 6-wire RJ-11, sometimes call RJ-12, female connector). Prior to installation, you will need to examine this half-card and be sure its jumpers are configured properly for your application. The figure on page 1 shows where the jumpers are. These jumpers determine various grounding characteristics for the RS-232 and twisted-pair lines.

The table below summarizes the factory-default settings of the jumpers. Following this overview is a detailed description of each strap's function.

Jumper	Function	Factory-Default Setting:
JB2	Line Shield and Frame Ground	Jumper on positions 2 & 3 (grounds isolated)
JB3	DTE Shield (Pin 1) and Frame Ground	Jumper on positions 2 & 3 (grounds isolated)
JB4	Frame Ground and Signal Ground	Jumper on positions 2 & 3 (grounds isolated)

JB2: Line Shield and Frame Ground jumper affects the grounding on the 4-wire line interface. With pegs 1 and 2 connected, this jumper links RJ-11 Pins 1 and 6 to the Card's frame ground. If you're using shielded twisted-pair cable, these pins can be used as connection points for the twisted-pair cable's shield (but the shield should be connected to one of the two Cards only--*never* to both!). With pegs 2 and 3 connected (the default setting), Pins 1 and 6 remain connected to each other, but are "lifted" (isolated) from the Card's frame ground.

Pegs 1 & 2 connected = Line shield tied to frame ground.
Pegs 2 & 3 connected = Line shield isolated from frame ground (default)

JB3: DTE Shield (DB25 Pin 1) and Frame Ground jumper affects the grounding on the RS-232 interface to the DTE. With pegs 1 and 2 connected, this jumper links DB25 Pin 1 (the RS-232 "Shield" or "Protective Ground" lead) to the Card's frame ground. (If you are using shielded RS-232 cable with the shield connected to Pin 1, it should be connected at one end of the cable only--*never* at both ends!). With pegs 2 & 3 connected (the default setting), Pin 1 is "lifted" (isolated) from the Card's frame ground.

Pegs 1 & 2 connected = DTE shield (DB25 Pin 1) tied to frame ground.
Pegs 2 & 3 connected = DTE shield isolated from frame ground (default).

J**B4: Signal Ground and Frame Ground jumper** also affects the grounding on the RS-232 interface--signal ground in this case. With pegs 1 and 2 connected, this jumper links DB25 Pin 7 (the RS-232 "Signal Ground" lead) to the Card's frame ground. With pegs 2 and 3 connected (the default setting), Pin 7 is "lifted" (isolated) from the Card's frame ground.

Pegs 1 & 2 connected = Signal Ground (DB25 Pin 7) tied to frame ground.
Pegs 2 & 3 connected = Signal Ground isolated from frame ground (default)

INSTALLATION:

This chapter describes the functions of the MicroRack system, tells how to install the front and rear half-cards of the Sync MP Line Driver Card in its chassis, and provides diagrams for wiring the interface connections correctly.

The MicroRack Chassis:

The 16-Port MicroRack chassis (our product code RM216), has slots for 16 short-range modem cards, as well as its own power supply. Measuring only 3.5" (8.9 cm) high, the MicroRack is designed to occupy only 2U of vertical space in a 19" rack. Sturdy front handles allow the MicroRack to be extracted and transported conveniently. If your short-range communications needs are more modest, we also offer 2-port (RM202), 4-port (RM204), and 8-port (RM208) versions of the MicroRack chassis.

The MicroRack's Power Supply:

The power supply preinstalled in the MicroRack uses the same mid-plane architecture as the modem cards. The front half-card is then secured with spring-loaded thumbscrews and the rear half-card with conventional metal screws. The power supply's on/off switch is located on its front panel. When the power supply is plugged in and switched on, a red LED on the supply's front panel will glow. Since the MicroRack is a "hot-swappable" rack, it is not necessary for you to install the Sync MP Line Driver Card (or any other compatible cards) before switching on the power supply, and you can switch off the power supply at any time without harming the installed cards.

If you should ever need to replace the power supply's fuse or switch the power supply from 115 VAC to 230 VAC, please refer to the MicroRack's manual.

Installing the Sync MP Line Driver Card:

As described earlier, the Sync MP Line Driver Card is made up of a front "function" half-card and a rear "connector" half-card. The two half-cards meet inside the rack chassis and plug into each other with mating 50-pin card-edge connectors. Use the following steps as a guideline for installing each Sync MP Line Driver Card in the MicroRack Chassis. (Note that the MicroRack supports "hot-swapping", so you don't have to turn it off before installing or removing cards.)

1. Slide the rear "connector" half-card into the back of the chassis along the chassis' metal rails.
2. Secure the rear half-card using the included metal screws.
3. Slide the "function" half-card into the front of the chassis. It should meet the rear half-card when it's almost all the way inside the chassis.
4. Push the front half-card gently into the card-edge receptacle of the rear half-card. It should click into place.
5. Secure the front half-card using its spring-loaded thumbscrews.

Connecting Cables to the Card:

As mentioned earlier, the rear "connector" half-card of the Sync MP Line Driver Card has one RS-232 port (a DB25 female connector) for local connections and one 6-wire twisted-pair port for connections between line drivers.

Making the RS-232 Connection:

NOTE:
If you want the Card to use receive clock,
the RS-232 cable must be specially pinned.

The RS-232 port is pinned out as DCE (Data Communications Equipment) according to the EIA/TIA RS-232C and ITU-T V.24 interface standards. It can be connected to other RS-232 equipment in these ways:

1. To DTE's (Data Terminal Equipment) with DB25 RS-232 connectors, such as those on sync terminals or the second COM port on many PC's: Use straight-through-pinned shielded cable such as our product code EDN25C.
2. To DTE's with DB9 male RS-232 connectors, such as the first COM port on many PC's: Use shielded AT modem cable such as our product code EVMBMC.
3. To other DCE's with DB25 female connectors, such as modems or muxes: Use shielded synchronous RS-232 tail-circuit cable such as our product code EYN255C.

Making the Twisted-Pair Connection:

The Sync MP Line Driver Card operates full duplex over two twisted pairs. In all applications, the twisted-pair wire must be 26 AWG or thicker, unconditioned, dry metallic wire.

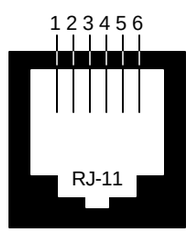
CAUTION:
The Card can only communicate in a closed data circuit with another Sync MP Line Driver Card.
Trying to connect two of these Cards across a dialup analog circuit, such as those used by telephones and standard analog modems, WILL NOT work and might damage both the cards and the phone line.

A. Point-to-Point Twisted Pair Connection:

The 4-wire port is prewired for a standard telco wiring environment. Establishing a 4-wire twisted-pair circuit between two or more Sync MP Line Driver Cards requires a shielded or unshielded crossover cable as shown below. (You can build such cables from bulk CAT5 cable such as our product code EVNSL70A.) Note that (a) although positive and negative are shown here, the Card is not actually sensitive to polarity; (b) you can connect the cable shield to Pin 1 or 6 at one end (DO NOT connect the shield at both ends!); and (c) the color codes listed are standard for this type of wiring, but the colors of your wires might be different.

Pinouts for RJ-11 to RJ-11 Cabling:

Local RJ-11			Remote RJ-11	
Signal	**Pin#**		**Pin#**	**Signal**
GND	1	———	6	GND
RCV-	2	———	4	XMT-
XMT+	3	———	5	RCV+
XMT-	4	———	2	RCV-
RCV+	5	———	3	XMT+
GND	6	———	1	GND



B. Multipoint Twisted-Pair Connections:

The Sync MP Line Driver Card supports multipoint applications using a star topology. You just have to be sure that carrier control, determined by the setting of position 8 of DIP switch SW1, is set correctly for each of your Cards. Maximum distance between the units will vary based on the number of drops, data rate, wire gauge, etc. The drawing on page 6 shows how to properly wire the Card's two-pair cabling for a multipoint star topology. Note that no ground connection is needed.

Continued on next page:

OPERATION:

Once you have configured each Sync MP Line Driver Card and connected the cables to them, you are ready to operate them. This chapter describes the Card's LED status monitors, the power-up procedure, and the use of the Card's built-in loopback test modes.

LED Status Monitors:

The Sync MP Line Driver Card has ten front-panel status LED's that indicate the condition of the Card-to-Card and Card-to-local-device links. The drawing on the first page shows the relative front-panel positions of the LED's and below that are descriptions of each LED's function.

1. The green "PWR" LED glows when power is being applied to the Card through its mid-plane chassis connection.
2. The green "TD" and "RD" indicators blink to show positive-state data activity. The red "TD" and "RD" indicators blink to show negative-state data activity. Solid red indicates a connection in an idle state.
3. The green "Control In" and "Control Out" indicators glow solid to show that the inband control signal is ON, while the red "Control In" and "Control Out" indicators glow solid to show that the control signal is OFF. Here's how this works (assuming that both DTE's are set for hardware flow control): If the local DTE needs the remote DTE to start sending data, it should raise RTS (the signal that comes into the Card on DB25 Pin 4). This causes the local Card to put its transmit leads in a low-impedance (positive/negative) state and simultaneously lights its green Control In LED. The remote Card senses the low impedance on the transmit lines, raises CD (the signal that goes out to the Remote DTE on the Card's DB25 Pin 8), and lights its green Control Out LED.
   When the remote DTE senses that CD is ON, it will begin transmitting.
   When the local DTE wants the remote DTE to stop sending data, it should drop RTS. This causes the local Card to put its transmit leads in a high-impedance (zero) state and simultaneously lights its red Control In LED. The remote Card senses the high impedance on the transmit lines, drops CD to the remote DTE, and lights its red Control Out LED. When the remote DTE senses that CD is OFF, it will interpret this as loss of carrier and cease transmitting until CD comes back ON again.
4. The green "TEST" LED will glow when the loopback test modes are activated.

Power-Up:

There is no power switch on the Sync MP Line Driver Card: Power is automatically applied to the Card when its card-edge connector makes contact with the MicroRack chassis' mid-plane socket (as long as the chassis' power supply is turned on). Note once again that the Card is "hot-swappable"--it will not be damaged by plugging it in or removing it while the MicroRack is powered up.

When the local and remote Cards are both powered up and are passing data normally, the LED's should look like this:

PWR = green
TD & RD = flashing red and green
Control In & Control Out = green
TEST = off

Test Modes:

The Sync MP Line Driver Card performs two diagnostic loops: local analog loopback and remote analog loopback. These test modes are activated simultaneously by pressing the "Test" button on the Card's front panel so that it latches in the "in" position.

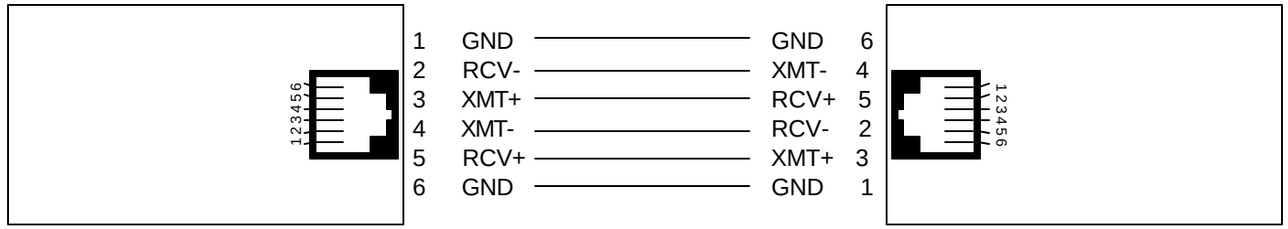
Local Analog Loopback:

When you press "Test" on the local Card, local analog loopback causes any data sent to the local Card by the local RS-232 device to be echoed back to that RS-232 device. For example, characters typed on the keyboard of a terminal will appear on the terminal screen. If characters are not echoed back, check the connection between the local RS-232 device and the local Card. All Cards in the system should be tested in this manner.

Remote Analog Loopback:

When you press "Test" on the local Card, remote analog loopback causes any characters sent from the remote Card to the local Card to be returned to the remote Card. (Because of this, make sure that only one of the Cards is in test mode at any given time--if they both are, neither of them will be sending any data to the other, and the test will not work). If no characters are echoed back, check the wiring between the two Cards. Make sure that cabling between the units is wired as described on the next page.

4-WIRE POINT-TO-POINT APPLICATION



4-WIRE MULTIPOINT APPLICATION