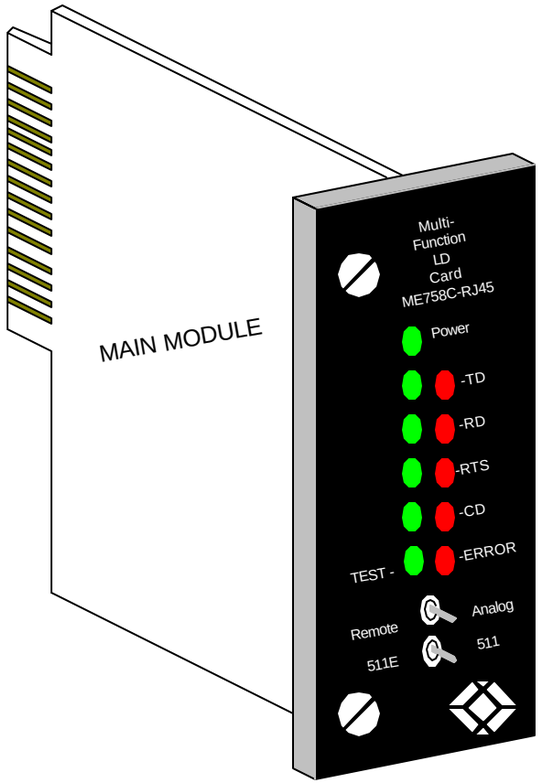
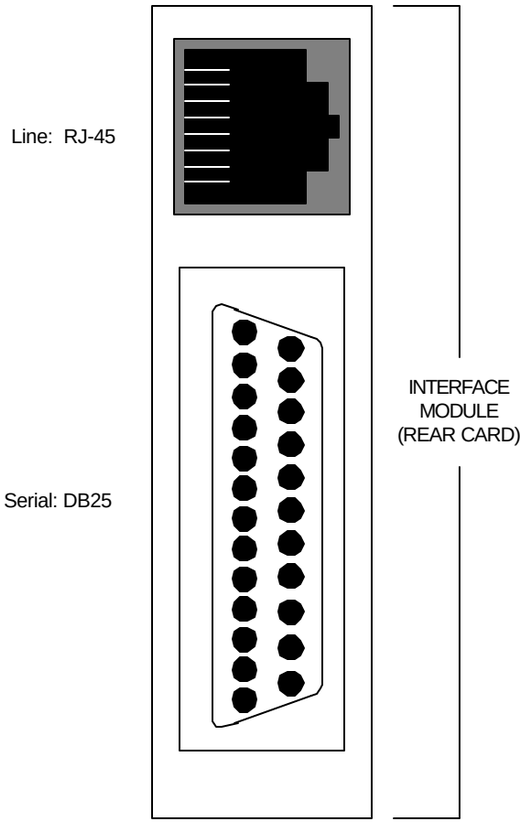
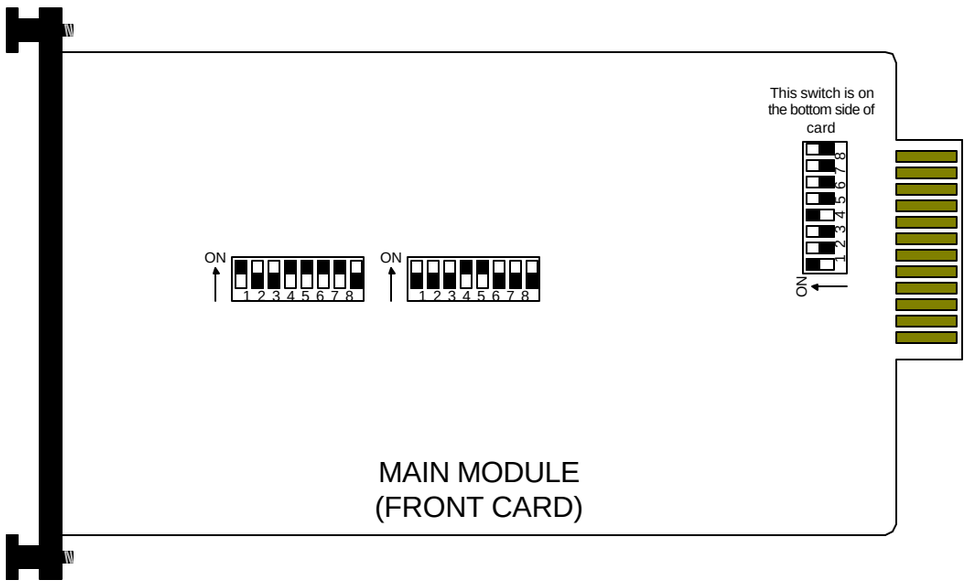
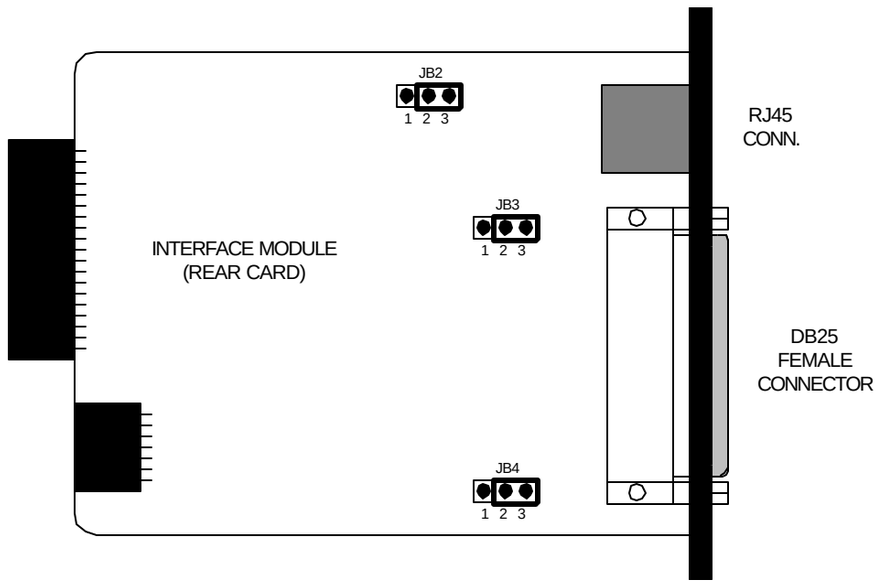
ME758C-RJ45


MAIN MODULE
Multi-
Function
LD
Card
ME758C-RJ45
Power
-TD
-RD
-RTS
-CD
-ERROR
TEST -
Analog
Remote
511
511E


Line: RJ-45
Serial: DB25
INTERFACE
MODULE
(REAR CARD)


This switch is on
the bottom side of
card
ON
1 2 3 4 5 6 7 8
MAIN MODULE
(FRONT CARD)


JB2
1 2 3
JB3
1 2 3
JB4
1 2 3
INTERFACE MODULE
(REAR CARD)
RJ45
CONN.
DB25
FEMALE
CONNECTOR

SPECIFICATIONS:

Hardware Required: Cards can be installed only in MicroRacks (RM202, RM204, RM208 and RM216)

Cable Required: For modem-to-modem line: Two- or four-wire unconditioned twisted-pair, 19 to 26 AWG

Interfaces: Serial: EIA/TIA-561 (compatible with EIA RS-232 and ITU-TSS [CCITT] V.24);
Line: Two- or four-wire telco;
Internal: Card-edge for module--MicroRack interconnection.

Protocol: Asynchronous or Synchronous.

Clock Source: Internal, external (from DTE) or received (from other Card) (user-selectable).

Data Format: Word length (including start bit, data bits, stop bits, and parity bit) must equal 8, 9, 10, or 11 bits. (user-selectable)

Flow Control: Transparent to all types of software (X-ON/X-OFF, robust X-ON/X-OFF, etc.) flow control; can be set to support hardware flow control.

Operating Mode: 2-wire half-duplex or 4-wire half- or full-duplex. (user-selectable).

Data Rates: 57.6, 38.4, 28.8, 19.2, 14.4, 9.6, 7.2, 4.8, 3.6, 2.4, or 1.2 Kbps (user-selectable)

Maximum Distance: See chart.

Isolation: 1500 volts RMS minimum using customer transformers.

Surge Protection: Silicon Avalanche Diodes.

Surge-Response Time: 1 ps.

Maximum Surge Protection: 600 watts dissipated after 1 ms.

User Controls: (2) Front-panel toggle switches: Remote or (local) Analog loopback; 511 or 511/E V.52 diagnostics;
(3) 8-Position DIP switches on main module:
(1) for data rate, clock source, protocol, and carrier control;
(1) for 2- or 4-wire operation, diagnostics, RTS/CTS delay, signaling-rate range, and word length;
(1) for input impedance, point-to-point or multipoint operation, remote loopback-test initiation, and anti-stream control.
(3) Frame-ground-connection jumpers on interface module: To Line Shield, DTE Shield (Protective Ground), and Signal Ground
.

Indicators: (11) Front-panel LED's:
(1) each for Power, Test, Error;
(2) each for TD, RD, RTS, AND CD.

Diagnostics: ITU-TSS V.54 remote digital and local analog loopbacks; ITU-TSS V.52 BERT testing.

Connectors: On Main Board: (1) 50-position card-edge male (to MicroRack);
On Interface Module: (1) 50-position card-edge male (to MicroRack); (1) 8-pin RJ-45 female for modem-to-modem line,
(1) DB25 female for modem-to-DTE line.

Power: From MicroRack's power supply.
Input: 120 VAC or 240 VAC (user-selectable);
Output: 10 VAC.
Consumption: 1.8 watts typical

Fuse: On MicroRack:
400 ma when power supply is set to 120-VAC input;
200 ma when power supply is set to 240-VAC input.

INTRODUCTION:

The Multi-Function LD Card is a short-range modem on a dual rack card (it has a main [front] module and an interface [rear] module). The Card operates across two wires (half-duplex) or four wires (full- or half-duplex), communicating synchronously or asynchronously, up to a maximum range of 20 miles (32.2 km). You can set the Card to any of twelve data rates from 1.2 to 57.6 Kbps. Local and remote modems on Multi-Function LD Cards always communicate with each other synchronously. When connected to an asynchronous RS-232 device, the Card performs synchronous--asynchronous conversion.

The Card has several features that enhance its overall performance, including automatic equalization, automatic gain control, and anti-streaming timer, transformer isolation, and Silicon avalanche Diode surge protection. The Card also has strong diagnostics: It features V.52-compliant bit-error-rate (BERT) pattern tests and two V.54 test modes. with the Card's 11 easy-to-read front-panel LED's you can easily monitor the status of data transmission and diagnostic testing.

The Multi-Function LD Card is fabricated using the latest surface-mount technology, so you get high-quality short-range modem performance on a convenient rack card. The Card is available with a DB25 connector and RJ-45 line-interface connectors, on its interface (rear) module. It fills one function-card slot in our MicroRacks (RM202, RM204, RM208, or RM216).

CONFIGURATION:

Setting the Switches on the Main Module:

The Multi-Function LD Card has three 8-position DIP switches -- S1, S2, and S3 mounted on the circuit board of its main (front) module, as shown on the first page. These configuration switches allow you to select data rates, clocking methods, V.52 and V.54 tests, word lengths, extended signaling rates, sync or async protocol, 2- or 4-wire operation, anti-stream control, and input impedance.

Configuration Switch "S1":

Use the individual positions on DIP switch S1 to set data rate, clock source, sync vs. async protocol and carrier-control method. The factory-default settings are summarized in the Table below.

Position	Function	Default Settings	
S1-1	DATA RATE	On	9600
S1-2	DATA RATE	Off	9600
S1-3	DATA RATE	Off	9600
S1-4	DATA RATE	On	9600
S1-5	CLOCK SOURCE	On	Internal
S1-6	CLOCK SOURCE	On	Internal
S1-7	PROTOCOL	On	Asynchronous
S1-8	CARRIER CONTROL	Off ON	Constantly

S1 Positions 1 through 4: Data-Rate Setting determines the data rate (valid for both synchronous and asynchronous protocols) of the Multi-Function LD Card.

S1-1	S1-2	S1-3	S1-4	Setting:
ON	ON	ON	ON	1200 bps
OFF	ON	ON	ON	1800 bps
ON	OFF	ON	ON	2400 bps
OFF	OFF	ON	ON	3600 bps
ON	ON	OFF	ON	4800 bps
OFF	ON	OFF	ON	7200 bps
ON	OFF	OFF	ON	9600 bps (default)
OFF	OFF	OFF	ON	14.4 Kbps
ON	ON	ON	OFF	19.2 Kbps
OFF	ON	ON	OFF	28.8 Kbps
ON	ON	OFF	OFF	38.4 Kbps
OFF	ON	OFF	OFF	57.6 Kbps

S1 Positions 5 and 6: Clock Source determine which transmit-clock source the Multi-Function LD Card uses.

S1-5	S1-6	Setting:
ON	ON	Internal transmit clock (default)
OFF	ON	Receive-recover clock
ON	OFF	External transmit clock

S1 Position 7: Protocol determines whether the Multi-Function LD Card operates synchronously or asynchronously.

S1-7	Setting:
ON	Asynchronously (default)
OFF	Synchronously

S1 Position 8: Carrier-Control Method determines whether the carrier is "constantly on" or "controlled by RTS". In the "controlled by RTS" setting, the Switch can support switched-carrier, multipoint, or hardware flow-control applications.

S1-8	Setting:
OFF	Constantly ON (default)
ON	Controlled by RTS

Configuration Switch "S2"

Use the individual positions on DIP switch S2 to set word length, signaling-rate range, RTS/CTS delay, or 2- or 4-wire operation, as well as to control diagnostic testing. The factory-default settings are summarized in the table below.

Position	Function	Default Settings	
S2-1	Not Used	N/A	
S2-2	2-Wire/4-Wire	Off	4-Wire
S2-3	V.52, V.54 Tests	Off	Normal Operation
S2-4	RTS/CTS Delay	On	7 ms
S2-5	RTS/CTS Delay	On	7 ms
S2-6	Signaling-Rate Range	On	-2.5 to +1%
S2-7	Word Length	Off	10 bits
S2-8	Word Length	Off	10 bits

S2 Position 2: 2-Wire vs. 4-Wire Operation, determines whether the Multi-Function LD Card operates in 2-wire or 4-wire mode.

S2-2	Operation:
OFF	4-Wire (full- or half-duplex) (default)
ON	2-Wire (half-duplex only)

S2 Position 3: V.52 and V.54 Diagnostic Testing. To reset the V.54 circuit, turn switch S2 position 3 ON, then back OFF.

S2-3	Test Mode:
OFF	Normal Operation (default)
ON	Test Disabled

S2 Positions 4 and 5: RTS/CTS Delay determines the amount of time the Multi-Function LD Card waits after it "sees" RTS before it sends CTS. Possible settings are no delay, 7 ms, or 53 ms.

S2-4	S2-5	RTS/CTS Delay:
ON	ON	7 ms (default)
ON	OFF	53 ms
OFF	ON	No Delay
OFF	OFF	No Delay

S2-6: Signaling-Rate Range, determines the degree of asynchronous data-rate fluctuation that the Multi-Function LD Card will accept (that is, how much variance from a given frequency level the Card will tolerate).

S2-6	Signaling-Rate Range:
OFF	-2.5% to +1% (default)
ON	-2.5% to +2.3%

S2-7 and S2-8: Word Length, determines the word length that the Multi-Function LD Card will expect for synchronous or asynchronous data. For example, if you are using the most common data format (1 start bit, 8 data bits, 1 stop bit, and no parity), you would use the factory-default word-length setting (10 bits).

S2-7	S2-8	Word Length:
ON	OFF	8 bits
ON	ON	9 bits
OFF	OFF	10 bits (default)
OFF	ON	11 bits

Configuration Switch "S3"

Use the individual positions on DIP switch S3 to set antistream control, receive (input) impedance, and point-to-point/multipoint, as well as to enable or disable local and remote loopbacks. The factory-default settings are summarized in the table below.

POSITION	FUNCTION	DEFAULT SETTING	
S3-1	Input Impedance	On	200 ohms
S3-2	Input Impedance	Off	200 ohms
S3-3	Reserved	N/A	
S3-4	Point-to-Point/Multipoint	On	Point-to-Point
S3-5	DTE Local Loopback	Off	Disabled
S3-6	DTE Remote Loopback	Off	Disabled
S3-7	Antistream Control	Off	Disabled
S3-8	Antistream Control	Off	Disabled

S3-1 and S3-2: Input Impedance, determines the Multi-Function LD Card's input impedance. Choose the optimum impedance setting for your application. In long-distance applications, the impedance of the cable must match the impedance of the load (or resistor) of the Multi-Function LD Card: Thicker-gauge cables require a lower ohm setting, while thinner-gauge cables require a higher ohm setting. Also, higher data rates call for a lower ohm setting, and lower data rates dictate a higher ohm setting. The table below lists our recommendations for setting this switch.

S3-1	S3-2	Input Impedance:
ON	ON	130 ohms
ON	OFF	200 ohms (default)
OFF	ON	320 ohms
OFF	OFF	High (minimum 2000 ohms)

Cable Gauge	Data Rates in Kbps											
	1.2	1.8	2.4	3.6	4.8	7.2	9.6	14.4	19.2	28.8	38.4	57.6
19	320	320	200	200	200	200	200	130	130	130	130	130
22	320	320	320	200	200	200	200	200	130	130	130	130
24	320	320	320	320	200	200	200	200	200	130	130	130
26	320	320	320	320	320	200	200	200	200	200	130	130

S3-4: Mode Selection, determines whether the Multi-Function LD Card operates in point-to-point or multipoint mode.

S3-4	Operation:
ON	Point-to-Point (also multipoint as the "master") (default)
OFF	Multipoint (as a "slave")

S3-5: DTE RS-232 Initiation of Local Loopback Test, determines whether or not the attached DTE can initiate the Multi-Function LD Card's local analog loopback test by raising the Local Loopback (LL) signal on Pin 18 of the RS-232 interface.

S3-5	DTE Initiation of Local Loopback:
ON	Enabled
OFF	Disabled (default)

S3-6: DTE RS-232 Initiation of Remote Loopback Test, determines whether or not the Multi-Function LD Card's remote analog loopback test can be initiated by raising the Remote Loopback (RL) signal on Pin 21 of the RS-232 interface.

S3-6	DTE Initiation of Remote Loopback:
ON	Enabled
OFF	Disabled (default)

S3-7 and S3-8: Antistream Control, determines the timeout period for the Multi-Function LD Card's antistream-control timer, or to disable the timer entirely.

S3-7	S3-8	Setting:
OFF	OFF	Disabled (default)
OFF	ON	12.5 Seconds
ON	OFF	50 Seconds
ON	ON	12.5 Seconds

Setting the Jumpers on the Interface Module:

Before you install the Card, you should examine the interface module you have selected and make sure that it is configured for your application. Each interface module has three jumpers on its circuit board. The possible settings of the Multi-Function LD Card's jumpers can be either on pegs 1 and 2 or on pegs 2 and 3. These jumpers determine various grounding and signal characteristics for the serial and modem-to-modem lines. The positions of the jumpers can be viewed on the first page for the interface module.

Line Interface: Line Shield Connection to Frame Ground (JB2):

This jumper applies to the line interface. When this jumper is in positions 1 and 2, it links RJ-45 Pins 2 and 7 on the corresponding line to the interface module's frame ground. (If you are using shielded twisted-pair cable, the shield can be connected to these pins.) In positions 2 and 3, RJ-45 pins 2 and 7 remain connected to each other, but are disconnected ("lifted") from frame ground.

JP2:

Positions 1 and 2 = Line Shield and FGND Connected
Positions 2 and 3 = Line Shield and FGND Not Connected (default)

CAUTION:

If you connect shield to frame ground, make sure that RJ-45 Pins 2 and 7, as well as the cable shield, are connected to ground at one end of the cable only. Connecting them at both ends of the cable will defeat the transformer isolation and will leave your system open to damage from ground loops.

Serial Interface: DTE Shield (Pin 1) Connection to Frame Ground (JB3)

This jumper applies to the serial interface. In position 1 and 2, this jumper links the Protective Ground (PGND) or "DTE Shield" lead (DB25 Pin 1 or 10-pin RJ Pins 1 and 10) of the RS-232 line to the interface module's frame ground (FGND). When this jumper is in positions 2 and 3, the RS-232 Protective Ground on DB25 Pin 1 or RJ-45 Pins 1 and 10 is disconnected ("lifted") from frame ground.

JB5

Positions 1 and 2 = PGND and FGND Connected
Positions 2 and 3 = PGND and FGND Not Connected (default)

Serial Interface: Signal Ground and Frame Ground (JB4)

This jumper also applies to the serial interface. In position 1 and 2, this jumper links the Signal Ground (SGND) lead (DB25 Pin 7 or 10-pin RJ Pin 5) of the RS-232 line to the interface module's frame ground (FGND). When this jumper is in positions 2 and 3, RS-232 Signal Ground on DB25 Pin 7 or 10-Pin RJ Pin 5 is disconnected ("lifted") from frame ground.

JB4

Positions 1 and 2 = SGND and FGND Connected
Positions 2 and 3 = SGND and FGND Not Connected (default)

INSTALLATION:

The MicroRacks: An Overview:

Multi-Function LD Cards are designed to be installed in our MicroRacks (product codes RM202 for the 2-card models, RM204 for the 4-card models, RM208 for the 8-card models, and RM216 for the 16-card models). You will install the Multi-Function LD Cards in any MicroRack the same way.

The MicroRacks Power Supply:

The power supply included with the MicroRacks uses the same mid-plane architecture as the line-driver cards. Slide the front module of the power supply into the MicroRack from the front, and slide the rear module in from the rear. The two modules plug into one another in the middle of the rack. Secure the front module with thumbscrews and the rear module with conventional metal screws; these screws and thumbscrews come with the rack.

Switching the Power Supply On and Off:

The MicroRack's power switch is located on the power supply's front panel. When the MicroRack is plugged in and switched on, the power supply will light the red LED on its front panel. Since the MicroRack is a "hot-swappable" rack, *you don't have to install any cards before switching on the power supply*. Also, the power supply may be switched off at any time without harming the installed cards, and you can install or remove cards without turning off the power supply. However, you should always unplug the power cord before removing, replacing, or switching the power supply or its fuses.

Replacing the Power Supply's Fuse:

The MicroRack's power supply uses a 400-mA fuse for 120-VAC circuits, and a 200-mA fuse for 240-VAC circuits. The fuse compartment is located just below the AC socket on the power supply's rear module. To replace the fuse, follow these steps:

1. Making sure the rack is turned off and unplugged, use a small screw-driver to pop the compartment open: It will slide open like a drawer.
2. Notice that there are two fuses in the compartment: The rear fuse is "active", and the front fuse is the "spare".
3. If the active fuse appears to be blown, remove it from the clips and replace it with the spare from the front of the compartment. Note the size and rating of the blown fuse before discarding it.
4. Order a new replacement fuse. Both 400-mA fuses (Littelfuse 239.400 or equivalent) and the 200-mA fuses (Littelfuse 239.200 or equivalent) measures 5 x 20 mm.

CAUTION:
For continued protection against the risk of fire, replace blown fuses only with fuses of the same type and rating.

Switching the Power Supply Between 120 and 240 Volts:

Although the MicroRack is shipped form the factory with a customer-specified power-supply configuration, you may change the configuration yourself. Follow these steps to switch the configuration of the power supply between 120 VAC and 240 VAC:

1. Making sure the rack is turned off and unplugged, remove the power supply's front module and locate the two-position switch (labeled either "110/220" or 115/230") near the back of the card. Slide the switch to the setting corresponding to your desired voltage.
2. Replace the existing fuses with fuses of the correct type.
3. If necessary, replace the power-supply cord with a country-specific cord. (For certain countries, your supplier might be able to give you a special quote on country-specific cords). Plug the cord back in.

Installing the Multi-Function LD Card in the MicroRack:

The Multi-Function LD Card is made up of a main (front) module and an interface (rear) module. The two cards meet inside the rack chassis; their mating 50-pin card-edge connectors plug into each other. Use these steps to install each Multi-Function LD Card into a MicroRack.

1. Slide the rear module into the back of the MicroRack on the metal rails.
2. Secure the rear module using the included metal screws.
3. Slide the front module into the front of the chassis. It should meet the rear module when it is almost completely in the chassis.
4. Secure the front module using the thumbscrews.

NOTE:
Since the MicroRacks allow "hot swapping" of cards, it is not necessary to power down the rack when you install or remove a Multi-Function LD Card.

The RS-232 Serial Cables and Connectors:

The Multi-Function LD Card's RS-232 port is always the lower port on its interface module. On the ME758C models it is a standard DB25 connector. The Multi-Function LD Card is wired as a DCE (Data Communications Equipment) device. Therefore, it would normally be connected to a DTE (Data Terminal Equipment) RS-232 device. You might need to run a special cable or use a special adapter if the serial port of the RS-232 device you want to attach is not the same type of connector as the one on your Card. Even if the serial ports on the Card and the DTE are both RJ-45 connectors, you might still need to use a specially pinned cable. Call Black Box Technical Support with these issues, or if you want to attach a DCE device to the card.

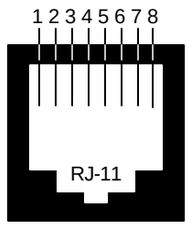
The Modem-to-Modem Line Cables and Connectors:

The Multi-Function LD Card's line port is always the upper port on its interface module. It is a 8-pin RJ-45 connector, pinned for a standard telco-wiring environment, as shown below. The Multi-Function LD Card operates half-duplex over two wires (one twisted pair) or full- or half-duplex over four wires (two twisted pairs). In all applications, the twisted-pair wire must be 26 AWG or thicker, unconditioned, dry, or metallic. Both shielded and unshielded cable yield favorable results.

NOTE:

The Multi-Function LD Card can only communicate in a closed data circuit with another Multi-Function LD Card. It will not work with dialup analog circuits, such as those used with standard modems. For further information about acceptable wire grades, call Black Box Technical Support.

The modem-to-modem cable connection must be specially cross-pinned, as shown below. If your cabling includes punchdown blocks, you can easily do the cross-pinning at a punchdown block. If you will be running cable directly between two Multi-Function LD Cards, you can get a custom cable from Black Box as a special quote, or you can use regular straight-through pinned cable and repin one of the RJ connectors (that is, rearrange the wiring connections between the terminal block and the actual contacts). You might need special crimping tools or new connectors; call Black Box for these items, or for technical support if you have difficulty.



RJ-45 (Two-Wire)

Signal	Pin#	Pin#	Signal
XMT+	4	4	XMT+
XMT-	5	5	XMT-

RJ-45 (Four-Wire)

Signal	Pin#	Pin#	Signal
N/A	1	8	N/A
GND	2	7	GND
RCV-	3	5	XMT-
XMT+	4	6	RCV+
XMT-	5	3	RCV-
RCV+	6	4	XMT+
GND	7	2	GND
N/A	8	1	NA/

OPERATION AND DIAGNOSTICS:

Once you have configured each Multi-Function LD Card and connected the cables, you are ready to operated the units.

Status LED's:

The Multi-Function LD Card features 11 front-panel status LED's (shown on the first page) that indicate the condition of the modem and the communication link.

The TD and RD Indicators:

The TD and RD indicators (one red and one green LED for each signal) blink when data activity occurs: The red LED's indicate a low RS-232 logic level, while the green LED's indicate a high RS-232 logic level. Also, since RS-232 devices idle in a low state, the red LED will be steadily lit if the connections are correct and the RS-232 device is in an idle state.

The RTS and CD Indicators:

The RTS and CD indicators (again, one red and one green LED for each signal) function much like the TD and RD LED's: The red LED's light for a "low" signal, while the green LED's light for a "high" signal. The RTS LED's light for an incoming RTS signal on the RS-232 side (DB25 Pin 4). The CD LED's light for an incoming signal on the line side and the resulting output signal on the RS-232 side (DB25 Pin 8).

The Power Indicator:

The green Power LED lights to indicate that the Card is receiving power.

The Test Indicator:

The green Test LED lights to indicate that V.52 or V.54 tests are running.

The Error Indicator:

The red Error LED has three functions:

A. When the Card is in test mode (green Test LED is lit), the Error LED glows red when bit errors occur.
B. When the Card is in not in test mode (green TEST LED is dark), the Error LED is used to indicate an RTS streaming condition.
C. The Error LED can also indicate line-quality problems such as:
    1. The improper use of "flat satin" (non-twisted-pair) cable, or low-quality twisted-pair cable, to connect the modems.
    2. One or more broken wires in the 4-wire twisted-pair cable.
    3. Broken or corroded connectors.

Diagnostic Testing Using the Error LED:

Testing Cable Quality:

Note:
The Error LED's circuitry is designed to detect line quality across 4-wire twisted-pair cable only, and might not function properly with 2-wire cable.

If there is any question as to the quality of your line, we recommend the following test:

1. Disconnect both local and remote modems from their attached RS-232 DTE devices. Make sure the red TD, RD, and RTS LED's are all lit.
2. Set the input impedance of both modems to 200 ohms by setting switch S3 position 1 "On" and S3 positions 2 "Off".
3. Set the data rate on both modems to 9.6 Kbps by setting switch S1 position 1 "On," S1 position 2 "Off", S1 position 3 "Off", and S1 position 4 "On".
4. On the local modem, set carrier control for "Constant On" by setting switch S1 position 8 "Off".
5. On the remote modem, set carrier control to "Controlled by RTS" by setting switch S1 position 8 to "On".
6. Move both front-panel toggle switches to the center (neutral) position. (The Test LED should not light.)
7. Connect both modems to the 4-wire twisted-pair cable to be tested.
8. Here's how to interpret the results:
    A. If the quality of the line is good, neither modem's Error LED will light. The local modem's red CD LED will light, and the remote modem's green CD LED will light.
    B. If there is flat satin cable in the line somewhere between the modems, the local modem's Error LED and green CD LED will both light. On the remote modem, the remote modem's green CD LED will light, but the Error LED will stay dark.

NOTE:
We cannot guarantee that the Card will accurately detect small pieces of flat satin cable in the line if they are farther than 1500 ft. (457.2 m) from the local modem.

    C. If one wire among the four twisted-pair wires is broken, the Error LED and the green CD LED will both light on at least one of the modems.

Detecting Streaming Errors:

When the Multi-Function LD Card is not in test mode (its green Test LED is dark), the front-panel Error LED can also indicate streaming errors. When the Card's antistreaming circuitry is enabled (one or both of switch S3 positions 7 and 8 set to "ON"), the RTS signal from the attached DTE is timer-controlled. The timer begins to count down when the DTE raises RTS. If RTS remains high for longer than the preset timeout period, the antistream circuit will force RTS low. The Error LED will light, indicating a streaming condition (RTS continually on). This feature prevents a malfunctioning terminal from tying up a computer port in a multidrop or polling environment.

When the DTE drop RTS, the antistreaming timer is automatically reset and the Error LED goes dark. The time-out period is user-selectable for 12.5 or 50 seconds.

Power-UP:

There is no power switch on the Multi-Function LD Card: Power is automatically applied to the Card whenever--and for as long as--its card-edge connector is plugged into the MicroRack's mid-plane socket and the MicroRack's power supply is turned on.

NOTE:
The Multi-Function LD Card is a "hot-swappable" card--it will not be damaged by plugging it in or removing it while the rack is powered up.

When the local and remote Multi-Function LD cards are both powered up and are passing data normally, the LED's on the cards will look like this:

Power: Steadily lit
TD and RD: Flashing red and green
RTS and CD: Green steadily lit, red dark
Test and Error: Dark

The Multi-Function LD Card has been performance-tested using twisted-pair cable with these characteristics:

Wire Gauge	Capacitance	Resistance
19 AWG	83 nf/mi. or 15.72 pf/ft.	16.3 ohm/1000 ft. (53.5 ohm/km)
22 AWG	83 nf/mi. or 15.72 pf/ft.	32.6 ohm/1000 ft. (107 ohm/km)
24 AWG	83 nf/mi. or 15.72 pf/ft.	51.6 ohm/1000 ft. (169.5 ohm/km)
26 AWG	83 nf/mi. or 15.72 pf/ft.	82.4 ohm/1000 ft. (270.2 ohm/km)

If you use the Multi-Function LD Card with a differnt type of twisted-pair cable, make sure that the cable has characteristics similar to, or better than, those listed above (for example, lower capacitance or lower resistance). Bench tests yield the following data-rate/maximum-distance results:

Data Rate in bps	Maximum Distance in miles (km)			
	19 AWG	22 AWG	24 AWG	26 AWG
57,600	12 (19.3)	7 (11.3)	5.3 (8.5)	4 (6.4)
38,400	13 (20.9)	7.5 (12.1)	6.2 (10)	4.2 (6.8)
28,800	14 (22.5)	8 (12.9)	6.6 (10.6)	4.6 (7.4)
19,200	16 (25.7)	8.5 (13.7)	7 (11.3)	5.1 (8.2)
14,400	17 (27.4)	11 (17.7)	9.2 (14.8)	6.5 (10.5)
9600	18.5 (29.8)	13 (20.9)	10.4 (16.7)	7.5 (12.1)
7200	19 (30.6)	13.5 (21.7)	10.9 (17.5)	8 (12.9)
4800	19.5 (31.4)	14 (22.5)	11.3 (18.2)	8.8 (14.2)
3600	20 (32.2)	14.5 (23.3)	11.5 (18.5)	8.8 (14.2)
2400	20.5 (33)	15 (24.1)	11.6 (18.7)	9 (14.5)
1800	20.5 (33)	15 (24.1)	11.5 (18.5)	8.9 (14.3)
1200	20 (32.2	15 (24.1)	11.4 (18.3)	8.9 (14.3)