REPEATER MEDIA INTERFACE MODULES (TPRMIM/FORMIM/CXRMIM)

INSTALLATION GUIDE

CABLETRON SYSTEMS

The Complete Networking Solution™

CABLETRON SYSTEMS, P. O. Box 5005, Rochester, NH 03866-5005

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SAFETY

It is the responsibility of the person who sells the system to which the TPRMIM, FORMIM, CXRMIM or EPIMs will be a part to ensure that the total system meets allowed limits of conducted and radiated emissions.

Designed in accordance with UL478, UL910, NEC 725-2(b), CSA, IEC, TUV, VDE Class A. Meets FCC Part 15, Class A limits.

CONTENTS

CHAPTER 1

INTRODUCTION

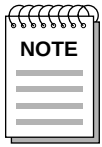
Welcome to the Cabletron Systems' **Repeater Media Interface Module (RMIM™) Installation Guide**. This manual is a reference guide for Cabletron's family of RMIMs. These modules incorporate the Repeater Interface Controller (RIC). The RIC is a multi-port repeater that enables the RMIMs to autonomously repeat packets without channeling them to a repeater module. The following RMIMs incorporate RIC technology:

- **TPRMIM-20™ & TPRMIM-22™** – The TPRMIM-20 provides nine 10BASE-T RJ45 Unshielded Twisted Pair (UTP) ports and one slot for a Cabletron Systems Ethernet Port Interface Module (EPIM). The TPRMIM-22 provides twenty-one 10BASE-T RJ45 UTP ports and one EPIM slot.

- **TPRMIM-33™ & TPRMIM-36™** – The TPRMIM-33 has one 50-pin champ connector providing twelve 10BASE-T twisted pair ports and one EPIM slot. The TPRMIM-36 has two 50-pin champ connectors providing twenty-four 10BASE-T twisted pair ports, one AUI connector, and one EPIM slot.

- **CXRMIM™** – The CXRMIM is equipped with twelve 10BASE-2 coaxial connectors and one EPIM slot.

- **FORMIM-22™** – The FORMIM-22 is equipped with twelve FOIRL/10BASE-FL ports with ST type connectors.



*This manual uses the term **RMIM** when describing features and functions that are common to the TPRMIM-20, TPRMIM-22, TPRMIM-33, TPRMIM-36, CXRMIM, and FORMIM-22.*

1.1 USING THIS MANUAL

Read this manual to gain a full understanding of the features and capabilities of the Cabletron Systems RMIMs. You should have a general working knowledge of Ethernet or IEEE 802.3 type data communications networks and their physical layer components before installing the RMIMs.

Chapter 1, **Introduction**, discusses the contents of this manual, briefly describes capabilities and special features of the RMIMs, and concludes with a list of related manuals.

Chapter 2, **Installation Requirements/Specifications**, describes installation requirements, network guidelines, and operating specifications for the RMIMs and EPIMs.

Chapter 3, **Installing the RMIM**, contains instructions for setting the RMIM jumpers and installing the RMIMs into the MMAC/FNB. This chapter also explains how to connect network segments to the RMIMs and EPIMs.

Chapter 4, **Testing the RMIMs**, provides procedures for testing and troubleshooting the installation of the RMIMs. It also explains how to use Cabletron Systems' LANVIEW diagnostic and monitoring system.

Appendix A, **Twisted Pair Wiring Tables**, contains wiring pinouts for Punchdown Block applications.

Appendix B, **EPIM Specifications**, provides specifications and switch settings for the Ethernet Port Interface Modules (EPIMs).

1.2 GETTING HELP

If you need additional support related to the Cabletron Systems RMIMs, or if you have any questions, comments, or suggestions concerning this manual, contact Cabletron Systems Technical Support:

By phone ..... (603) 332-9400
Monday-Friday; 8am - 8pm EST
By CompuServe® ..... GO CTRON from any ! prompt
By Internet mail ..... support@ctron.com

1.3 RMIM OVERVIEW

Cabletron Systems Repeater Media Interface Modules provide connections to 10BASE-T, 10BASE-2, and FOIRL/10BASE-FL based Ethernet networks. Figure 1-1 shows each module.

RMIMs repeat, retime, and regenerate each packet ensuring data integrity and maximum data path distance. RMIMs also have a Fault Isolation feature that automatically segments problem ports from the network. When the problem port receives a good packet, the RMIM automatically reconnects the port to the network.

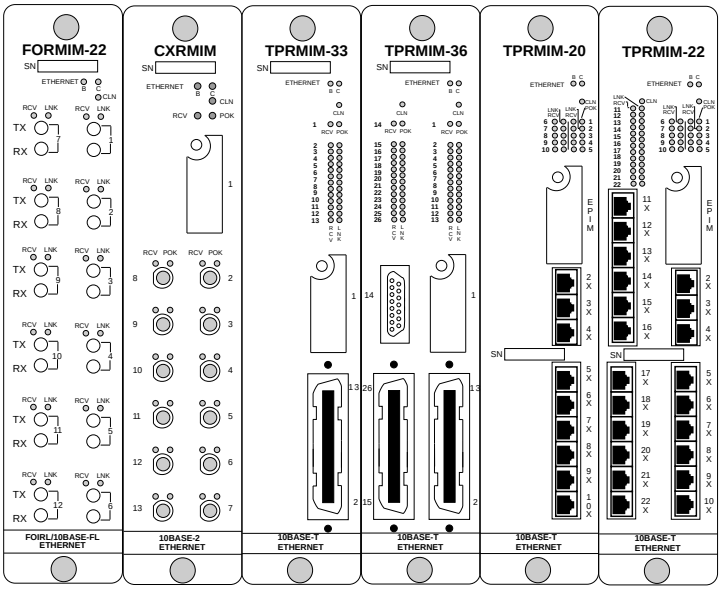


Figure 1-1. Repeater Media Interface Modules

The RMIMs are designed, when managed by Cabletron's Ethernet Management Module for Ethernet (EMME or EMM-E6), to provide you with the capability to add two additional Ethernet networks (B or C) to your existing Multi Media Access Center® (MMAC) over the Flexible Network Bus (FNB). Sections 1.5, 1.6 and 1.7 of this chapter describe features of the MMAC, the EMME and the EMM-E6.

1.4 RMIM FEATURES

Repeater Functionality

The RMIM IEEE 802.3 compliant repeater provides the MMAC with the ability to achieve maximum length data paths on each Ethernet network. To attain these maximum length data paths, the RMIM retimes data packets and regenerates the preamble of each data packet that enters the MMAC.

Additionally, the RMIM repeater functionality ensures that problem segments connected to any port on the MMAC/FNB will not affect any other segments connected to the MMAC/FNB. If 32 consecutive collisions are detected on any segment, or if a collision detector is on for more than 110 μs, the RMIM will automatically partition that segment from the MMAC/FNB. The segment will automatically be reconnected to the MMAC/FNB when a packet is received from the segment (or transmitted onto the segment, if using coaxial cable) without causing a collision.

RIC technology provides an inter-RIC bus that allows for communication between the RMIMs, allowing multiple RICs to be cascaded. The multiple RICs communicating over the RIC bus act as a single logical repeater. This is a significant advantage, since in the past, Ethernet networks were limited to four serially linked repeaters. With cascading RIC repeaters, each of which support 13 cable segments, you can build a much larger network than you could with stand-alone repeaters.

Unmanaged Grouped Module (Subnet) Capability

You can set Jumpers on the MMAC-installed RMIM to create an “unmanaged module group” of boards using the B or C channel. The RMIM and all boards to its left in the MMAC chassis no longer communicate across the FNB backplane to the EMME, EMM-E6 or any modules to the right of the unmanaged module group. This provides two additional “unmanaged” Ethernet networks. The networks cannot be seen or managed from the EMME or EMM-E6 installed in the MMAC. Section 3.2 describes how to set the RMIM jumpers.

Stand-alone Capability

You can also use the MMAC-installed RMIM as an “unmanaged” stand-alone repeater.

Remote Network Management Capabilities

You can manage the RMIMs remotely by any SNMP network management system. Cabletron Systems offers the following remote management packages:

- Cabletron Systems SPECTRUM®
- Cabletron Systems Remote LANVIEW®/Windows™
- SPECTRUM Portable Management Applications

Ethernet Port Interface Modules

Cabletron Systems' Ethernet Port Interface Modules (EPIMs) provide additional connection to the Ethernet network. Table 1-1 describes each EPIM.

Table 1-1. EPIMs

EPIM	MEDIA TYPE	CONNECTOR
EPIM-A	AUI	DB15 (Female)
EPIM-C	10BASE-2 Thin Coaxial	BNC
EPIM-T	10BASE-T Unshielded Twisted Pair	RJ45
EPIM-X	Standard Transceiver	DB15 (Male)
EPIM-F1	Multimode Fiber	SMA
EPIM-F2	Multimode Fiber	ST
EPIM-F3	Single Mode Fiber	ST

LANVIEW LEDs

The RMIMs incorporate LANVIEW, Cabletron Systems' built-in diagnostic and status monitoring LED system. LANVIEW LEDs help you rapidly diagnose device, port, and link problems. You can also view Ethernet status LEDs to determine if the RMIM is running on Ethernet B, Ethernet C, or stand-alone mode. Chapter 4 describes each LED.

1.5 THE MULTI MEDIA ACCESS CENTERS WITH FNB

Cabletron Systems Multi Media Access Center with Flexible Network Bus (MMAC/FNB) provides three separately repeated Ethernet segments: Ethernets A, B, and C. The Cabletron Systems non-repeating Media Interface Modules (MIMs) operate on Ethernet A, while the RMIMs are designed to operate on Ethernet segments B and C. See Figure 1-2.

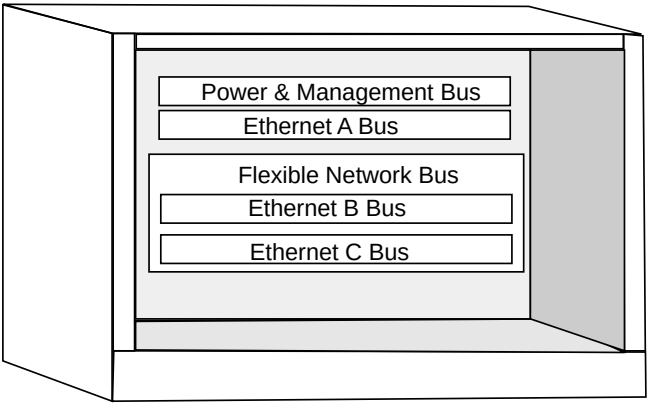


Figure 1-2. MMAC with FNB

The modular design of the MMAC allows the RMIMs to co-exist with other MIMs to provide a variety of different media connections at one point. This means that the RMIM can be used by itself or in conjunction with any combination of other MIMs accommodating Twisted Pair, Fiber Optic Cable, Thick or Thin Ethernet Coaxial Cabling, or AUI Cabling. Figure 1-3 shows a sample configuration.

1.6 THE EMME

The Ethernet Management Module for Ethernet (EMME) provides management, bridging, and routing (optional feature) for four Ethernet channels; channels A, B, and C on the MMAC backplane and channel D from the EMME AUI port. The four EMME channels access the same shared memory so that packets received on one channel can be forwarded to any or all of the other channels.

The EMME uses Ethernet Channel A on the MMAC backplane to transmit and receive data from Cabletron Systems non-repeater MIMs (i.e., TPMIMs, FOMIMs, THN-MIMs). The EMME provides repeater functionality for these MIMs.

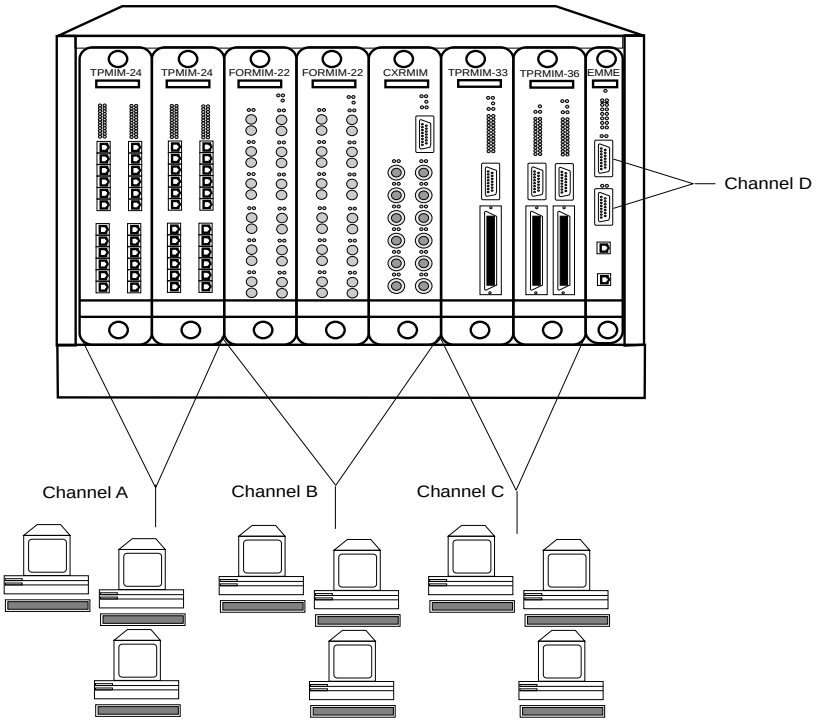


Figure 1-3. Ethernets A, B, and C

Ethernet channels B and C transmit and receive packets over the Repeater Interface Controller (RIC) management bus on the FNB to Cabletron Systems RMIMs (TPRMIM, FORMIM, and CXRMIM). RMIMs can repeat packets autonomously without channeling them through the EMME.

Two redundant AUI ports on the EMME's front panel let you access Ethernet channel D. The AUI ports allow you to connect the module to a variety of Ethernet transmission media including twisted pair, fiber optic, or thick or thin Ethernet coaxial cable.

When using the Cabletron Systems EMME along with the RMIMs, you have the network management capabilities that enable you to control the RMIM and its attached segments. For example, you can gather information on the number of good packets and collisions that pass through each port on the RMIM.

1.7 THE EMM-E6

The EMM-E6 (Ethernet Management Module) is a six port bridge/router module with four Ethernet bridge/router ports and two user selectable bridge/router ports. The EMM-E6 provides management, bridging, and routing for three Ethernet channels; channels A, B, and C on the MMAC backplane and a fourth external Ethernet segment (channel D) via an Ethernet Port Interface module (EPIM). Two Bridge/Router Interface Module (BRIM) ports can be configured to provide additional bridging or feeder node routing on Ethernet, Token Ring, FDDI, ATM or Wide Area Networks (WAN).

The EMM-E6 uses Ethernet Channel A on the MMAC backplane to transmit and receive data from Cabletron Systems non-repeater MIMs (i.e., TPMIMs, FOMIMs, THN-MIMs). The EMM-E6 provides repeater functionality for these MIMs.

Ethernet channels B and C transmit and receive packets over the Repeater Interface Controller (RIC) management bus on the FNB to Cabletron Systems RMIMs (TPRMIM, FORMIM, and CXRMIM). RMIMs can repeat packets autonomously without channeling them through the EMM-E6.

The EMM-E6 provides two slots for optional EPIMs on the front panel. The EPIMs provide an Ethernet D channel for various transmission media connections (twisted pair, fiber optic, and thick or thin Ethernet coaxial cable). Using two EPIMs provides redundancy for the external network connection but note that only one EPIM operates at any given time.

The two Bridge Router Interface Modules (BRIMs) perform the same bridging functions as EPIMs, however, unlike EPIMs, BRIMs bridge packets from one transmission type to another (e.g., Ethernet to FDDI, ATM to Wide Area, etc.).

1.8 RELATED MANUALS

The manuals listed below should be used to supplement the procedures and other technical data provided in this manual. The procedures in them will be referenced, where appropriate, but will not be repeated.

Cabletron Systems' **Multi Media Access Center (MMAC-M8FNB, MMAC-5FNB, MMAC-M3FNB) Overview and Set Up Guide**

Cabletron Systems' **Ethernet Management Module (EMME) User's Guide**

Cabletron Systems' **EMM-E6 Installation Guide**

CHAPTER 2

INSTALLATION REQUIREMENTS/SPECIFICATIONS

This Chapter describes cable requirements, network guidelines, and operating specifications for the RMIMs. Be sure that you read this chapter before you install the RMIMs. Your network must meet the requirements and conditions specified in this chapter to obtain satisfactory performance from this equipment. Failure to follow these guidelines could result in poor network performance.

2.1 NETWORK CABLE REQUIREMENTS

Take care in planning and preparing the cabling and connections for your network. The quality of the connections and the length of cables are critical factors in determining the reliability of your network. The following sections describe cable requirements for each media type.

2.1.1 10BASE-2 Thin-Net Network Requirements

When connecting a 10BASE-2 thin-net coaxial segment to the CXRMIM or EPIM-C, your network must meet the following requirements:

Cable Type

50 ohm RG-58A/U type coaxial cable must be used when making up a thin-net cable segment.

Length

The thin-net segment must be no longer than 185 meters.

Terminators

A 50 ohm terminator must be connected to the far end of each thin-net segment.

Connectors

A maximum of 29 tee-connectors may be used throughout the length of cable segment for host connections. If an excessive number of barrel connectors are used within the cable segment, such as finished wall plates with BNC feed-throughs, then a reduced number of host connections may be required. For special network design, contact Cabletron Systems Technical Support.

Grounding

For safety, ground only one end of a thin-net segment. Do NOT connect EPIM or CXRMIM BNC ports to earth ground.

Connecting a thin-net segment to earth ground at more than one point could produce dangerous ground currents. The BNC ports of the CXRMIM are connected to earth ground, eliminating the need of grounding the segments connected to the BNC ports. The EPIM-C provides a switch to select either internal or external termination.

2.1.2 10BASE-T Twisted Pair Network Requirements

When connecting a 10BASE-T Twisted Pair Segment to a TPRMIM-20/22/33/36 or EPIM-T, your network must meet the following requirements:

Length

The IEEE 802.3 10BASE-T standard requires that 10BASE-T devices transmit over a 100 meter (328 foot) link using 22-24 AWG unshielded twisted pair wire. However, cable quality largely determines maximum link length. If you use high quality, low attenuation cable, you can achieve link lengths of up to 200 meters. Cable delay limits maximum link length to 200 meters, regardless of the cable type.

Insertion Loss

The maximum insertion loss allowed for a 10BASE-T link is 11.5 dB at all frequencies between 5.0 and 10 MHz. This includes the attenuation of the cables, connectors, patch panels, and reflection losses due to impedance mismatches in the link segment.

Impedance

Cabletron Systems 10BASE-T Twisted Pair products will work on twisted pair cable with 75 to 165 ohms impedance. Unshielded twisted pair cables typically have an impedance of between 85 to 110 ohms.

Shielded twisted pair cables, such as IBM Type 1 cable, can also be used. You should remember that the impedance of IBM Type 1 cable is typically 150 ohms. This increases the signal reflection caused by the cable, but since the cable is shielded, this signal reflection has little effect on the received signal's quality due to the lack of crosstalk between the shielded cable pairs.

Jitter

Intersymbol interference and reflections can cause jitter in the bit cell timing, resulting in data errors. A 10BASE-T link must not generate more than 5.0 nsec of jitter. If your cable meets the impedance requirements for a 10BASE-T link, jitter should not be a concern.

Delay

The maximum propagation delay of a 10BASE-T link segment must not exceed 1000 nsec. This 1000 nsec maximum delay limits the maximum link segment length to no greater than 200 meters.

Crosstalk

Crosstalk is caused by signal coupling between the different cable pairs contained within a multi-pair cable bundle. 10BASE-T transceivers are designed so that the user does not need to be concerned about cable crosstalk, provided the cable meets all other requirements.

Noise

Noise can be caused by either crosstalk or externally induced impulses. Impulse noise may cause data errors if the impulses occur at very specific times during data transmission. Generally, the user need not be concerned about noise. If noise-related data errors are suspected, it may be necessary to either reroute the cable or eliminate the source of the impulse noise.

Temperature

Multi-pair PVC 24 AWG telephone cables typically have an attenuation of approximately 8 to 10 dB/100m at 20°C (68°F). The attenuation of PVC insulated cable varies significantly with temperature. At temperatures greater than 40°C (104°F), we strongly recommend that you use plenum-rated cables to ensure that cable attenuation remains within specification.

2.1.3 FOIRL/10BASE-FL Multimode Fiber Optic Network Requirements for the FORMIM

When connecting a multimode fiber optic segment to a FORMIM-22, EPIM-F1, or EPIM-F2, your network must meet the following requirements:

Table 2-1. Multimode Fiber Optic Cable Specifications

Cable Type	Attenuation	Maximum Cable Length
50/125 µm	13.0 dB or less	The maximum allowable fiber optic cable length is 2 km (2187.2 yards).
62.5/125 µm	16.0 dB or less	
100/140 µm	19.0 dB or less	

Attenuation

You must test the fiber optic cable with a fiber optic attenuation test set adjusted for an 850 nm wavelength. This test verifies that the signal loss in a cable is within an acceptable level. Table 2-1 shows the attenuation for each Multimode cable type.

Fiber Optic Budget and Propagation Delay

When determining the maximum fiber optic cable length, the fiber optic budget delay and total network propagation should be calculated and taken into consideration before fiber optic cable runs are incorporated in any network design.

Fiber optic budget is the combination of the optical loss due to the fiber optic cable, in-line splices, and fiber optic connectors.

Propagation delay is the amount of time it takes data to travel from the sending device to the receiving device. Total propagation delay allowed for the entire network is 25.6 µsec, if the total propagation delay between any two nodes on the network exceeds 25.6 µsec, then bridges should be used.

2.1.4 FOIRL/10BASE-FL Single Mode Fiber Optic Network Requirements for the FORMIM

When connecting a single mode fiber optic segment to an EPIM-F3, your network must meet the following requirements:

Table 2-2. Single Mode Fiber Optic Cable Specifications

Cable Type	Attenuation	Maximum Cable Length
8/125-12/125 µm	10.0 dB or less	The maximum allowable fiber optic cable length is 5 km (3.1 miles) with bridges at each segment end. However, IEEE 802.3 FOIRL specifications specify a maximum of 1 km (1093.6 yards).

Attenuation

You must test the fiber optic cable with a fiber optic attenuation test set adjusted for a 1300 nm wavelength. This test verifies that the signal loss in a cable is 10.0 dB or less for any given single mode fiber optic link.

Fiber Optic Budget and Propagation Delay

Fiber optic budget is the combination of the optical loss due to the fiber optic cable, in-line splices, and fiber optic connectors. When determining the maximum fiber optic cable length, the fiber optic budget (total loss of 10.0 dB or less between stations) and total network propagation delay should be calculated and considered before fiber optic cable runs are incorporated in any network design.

Propagation delay is the amount of time it takes data to travel from the sending device to the receiving device. Total propagation delay allowed for the entire network is 25.6 µsec, if the total propagation delay between any two nodes on the network exceeds 25.6 µsec, then bridges should be used.

2.1.5 Transceiver/AUI Requirements for the TPRMIM-36

To connect external network segments to the EPIM-A, EPIM-X, or the AUI port on the TPRMIM-36, you need an AUI cable. The TPRMIM-36 and EPIM-A require a transceiver to connect to the segment. The EPIM-X has built-in dual transceivers and can be connected directly to the segment. The EPIM-X is used primarily for connecting cascading devices.

When connecting an external network segment to a TPRMIM-36, EPIM-A, or EPIM-X, your network must meet the following requirements:

Transceiver/Ethernet Device (EPIM-A/TPRMIM-36)

The transceiver or Ethernet Device to which the EPIM-A or TPRMIM-36 will be connected must meet IEEE 802.3 standards, and/or Ethernet Version 1.0 or Version 2.0 requirements.

AUI Cable

The AUI cable connecting the module to a device must be IEEE 802.3 type cable.

Length

The AUI Cable must not exceed 50 meters in length. If 28 AWG thin office drop AUI cable is used, then the maximum cable length is limited to 50 feet (15.24 meters).

Grounding

The connector shell of the EPIM-A and the EPIM-X are connected to earth ground.

2.2 RMIM NETWORK PORT SPECIFICATIONS

The following sections provide port specifications for each RMIM.

2.2.1 TPRMIM-20/22 RJ45 Connector Specifications

The TPRMIM-20 and the TPRMIM-22 provide RJ45 connectors to attach twisted pair segments to the network. Figure 2-1 shows the pinouts for the RJ45 connectors.

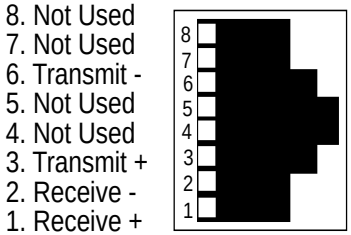


Figure 2-1. RJ45 Network Ports

2.2.2 TPRMIM-33/36 Champ Connector Specifications

The TPRMIM-33 and TPRMIM-36 provide 50-pin Champ connectors to attach twisted pair segments to the network as shown in Figure 2-2. Table 2-3 shows the pinouts for the Champ connector.

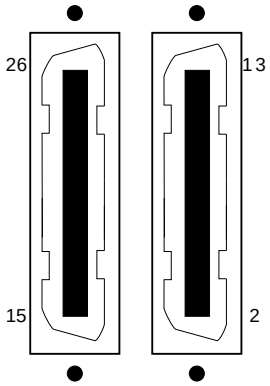


Figure 2-2. 50-Pin Champ Connector

Table 2-3. 50-Pin Champ Connector Pinouts

Pin	Signal	Wire Color	Pin	Signal	Wire Color
1	RX 1-	Blue/White	26	RX 1+	White/Blue
2	TX 1-	Orange/White	27	TX 1+	White/Orange
3	RX 2-	Green/White	28	RX 2+	White/Green
4	TX 2-	Brown/White	29	TX 2+	White/Brown
5	RX 3-	Gray/White	30	RX 3+	White/Gray
6	TX 3-	Blue/Red	31	TX 3+	Red/Blue
7	RX 4-	Orange/Red	32	RX 4+	Red/Orange
8	TX 4-	Green/Red	33	TX 4+	Red/Green
9	RX 5-	Brown/Red	34	RX 5+	Red/Brown
10	TX 5-	Gray/Red	35	TX 5+	Red/Gray
11	RX 6-	Blue/Black	36	RX 6+	Black/Blue
12	TX 6-	Orange/Black	37	TX 6+	Black/Orange
13	RX 7-	Green/Black	38	RX 7+	Black/Green
14	TX 7-	Brown/Black	39	TX 7+	Black/Brown
15	RX 8-	Gray/Black	40	RX 8+	Black/Gray
16	TX 8-	Blue/Yellow	41	TX 8+	Yellow/Blue
17	RX 9-	Orange/Yellow	42	RX 9+	Yellow/Orange
18	TX 9-	Green/Yellow	43	TX 9+	Yellow/Green
19	RX 10-	Brown/Yellow	44	RX 10+	Yellow/Brown
20	TX 10-	Gray/Yellow	45	TX 10+	Yellow/Gray
21	RX 11-	Blue/Violet	46	RX 11+	Violet/Blue
22	TX 11-	Orange/Violet	47	TX 11+	Violet/Orange
23	RX 12-	Green/Violet	48	RX 12+	Violet/Green
24	TX 12-	Brown/Violet	49	TX 12+	Brown
25	N/C	Gray/Violet	50	N/C	Violet/Gray

2.2.3 CXRMIM Coaxial Connector Specifications

Connector Type

The CXRMIM is equipped with BNC receptacles, with a gold center contact, for use with BNC type tee-connectors and RG-58 thin-net cable. Thick coaxial cable may be used with a thick to thin barrel connector.

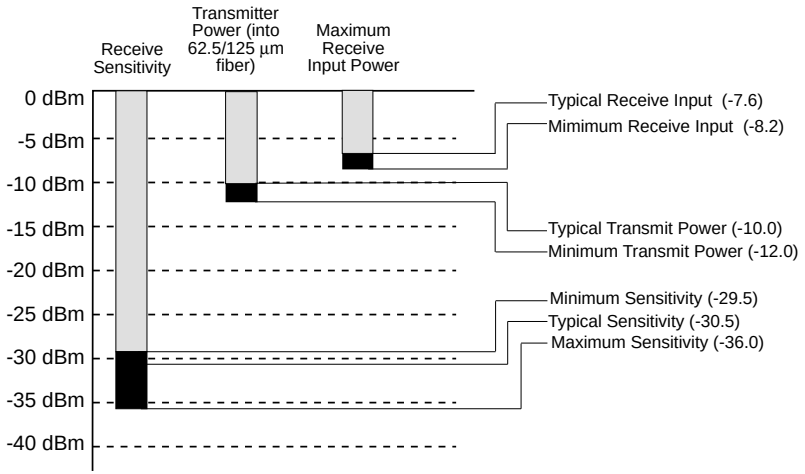
Termination

The BNC ports on the CXRMIM are internally terminated.

2.2.4 FORMIM-22 ST Connector Specifications

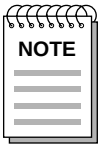
Connector Type

The FORMIM-22 is equipped with ST fiber optic ports. Specifications for the ST ports are listed below.



Error Rate: Better than 10^{-10}

Figure 2-3. FORMIM-22 Transceiver Sensitivity



The transmitter power levels and receive sensitivity levels given in Figure 2-3 are Peak Power Levels after optical overshoot. You must use a Peak Power Meter to correctly compare the values given above to those measured on any particular port. If you measure power levels with an Average Power Meter, then 3 dBm must be added to the measurement to correctly compare those measured values to the values listed (i.e., -30.5 dBm peak = -33.5 dBm average).

Table 2-4. FORMIM-22 Specifications

Parameter	**Typical**	**Minimum**	**Maximum**
Transmitter Peak Wavelength	820 nm	790 nm	860 nm
Rise Time/ Fall Time	4 nsec 4 nsec	- -	10 nsec 10 nsec
Spectral Width	-	-	75 nm
Duty Cycle	50%	48%	52%

2.3 OPERATING SPECIFICATIONS

The section provides operating specifications for the RMIMs. Cabletron Systems reserves the right to change these specifications at any time without notice.

REPEATER FUNCTIONALITY

Preamble

Input:	Minimum of 40 bits. Maximum is the number of bits received.
Output:	Minimum of 64 bits, last 2 bits are 1, 1. Maximum is the number of bits received plus 6.
JAM Output:	If a collision occurs on one of the segments, a pattern of 1, 0 is sent to the other segments.
Minimum Packet:	96 bits including preamble (Packet Repeated fragments are extended using the JAM [1, 0] data pattern).
FAULT Protection:	Each segment will disconnect itself from the other segments if 32 consecutive collisions occur, or if the collision detector of a segment is on for longer than approximately 110 µs. This FAULT protection will reset automatically after one packet is transmitted onto or received from the FAULT protected segment without causing a collision.

REPEATER FUNCTIONALITY (cont.)

Table 2-5. Delay Times (Port x In to Port x Out)

	Port In to Port Out	Start of Packet	Collision to Jam	Cessation of Jam
TPRMIM-33 TPRMIM-36 TPRMIM-20 TPRMIM-22	Twisted Pair to Twisted Pair	1.02 µs	1.26 µs	1.40 µs
	Twisted Pair to EPIM/AUI	.8642 µs	1.16 µs	1.13 µs
	EPIM/AUI to Twisted Pair	.685 µs	.570 µs	1.23 µs
CXRMIM	Coaxial to Coaxial	1.30 µs	1.4 µs	1.20 µs
	Coaxial to EPIM	1.20 µs	1.30 µs	1.10 µs
	EPIM to Coaxial	1.00 µs	700 ns	500 ns
FORMIM-22	Fiber Optic to Fiber Optic	1.10 µs	900 ns	800 ns

LED INDICATORS

Table 2-6. LED Descriptions

LED Name	RMIM/EPIM	Description
Ethernet B, C	TPRMIM-33/36 TPRMIM-20/22 CXRMIM FORMIM	When lit, indicates that the RMIM is operating on either the Ethernet B or C channel on the FNB. If neither of the LEDs are lit, the RMIM is in stand-alone mode.
CLN (Collision)	TPRMIM-33/36 TPRMIM-20/22 CXRMIM FORMIM	When flashing, indicates that a collision has occurred on one or more of the segments attached to the RMIM. Collisions occur normally on an Ethernet network, so a flashing LED does not necessarily indicate an error condition. The frequency of flashes may increase as network activity increases.
RCV (Receive)	TPRMIM-33/36 TPRMIM-20/22 CXRMIM FORMIM	When flashing, indicates that the port is receiving a data packet from the attached segment. The frequency of flashes may increase as network activity increases.
LNK (Link)	FORMIM EPIM-F1, F2, F3 EPIM-T TPRMIM-33/36 TPRMIM-20/22	When lit, indicates a link signal has been received from the device on the other end of the segment. The LED remains lit as long as the link is maintained.
POK (Port OK)	CXRMIM TPRMIM-33/36 TPRMIM-20/22	When lit, indicates the port is not segmented.
PWR (Power)	EPIM-A	When lit, indicates that the EPIM-A is providing power to the transceiver that is connected to it.
SQE	EPIM-X	When lit, indicates that the internal transceiver's SQE test is enabled. When unlit, the test is disabled.

ENVIRONMENTAL REQUIREMENTS

Operating temperature:	+5° to +40°C (41° to 104°F)
Non-operating temperature:	-30° to +80°C (-22° to 176°F)
Operating humidity:	5 to 95% (non-condensing)

PHYSICAL

Dimensions:	34.04 D x 29.21 H x 5.08 W cm (13.4 D x 11.5 H x 2.0 W in)

CHAPTER 3

INSTALLING THE RMIM

This chapter explains how to set the RMIM jumpers and install RMIMs into the MMAC/FNB. It also provides instructions for connecting network segments to the RMIM ports and to the available Ethernet Port Interface Modules (EPIMs). Ensure that your network meets the guidelines and requirements listed in Chapter 2, **Installation Requirements/Specifications**, before installing the RMIMs.

Sections of this Chapter follow:

- Unpacking the RMIM
- Setting the RMIM Jumpers
- Installing the RMIM into the MMAC
- Connecting the RMIM to the Network

3.1 UNPACKING THE RMIM

To unpack the RMIM:

1. Remove the shipping material covering the RMIM in the shipping box.
2. Carefully remove the RMIM from the shipping box. Leave the RMIM in its conductive bag until you are ready to install it.
3. Visually inspect the RMIM. If it appears damaged, contact Cabletron Systems Technical Support immediately.

3.2 SETTING THE RMIM JUMPERS

Each RMIM has two Ethernet jumpers and one Unmanaged Module Group (Subnet) jumper.

Figure 3-1 shows the location and jumper number for each RMIM.

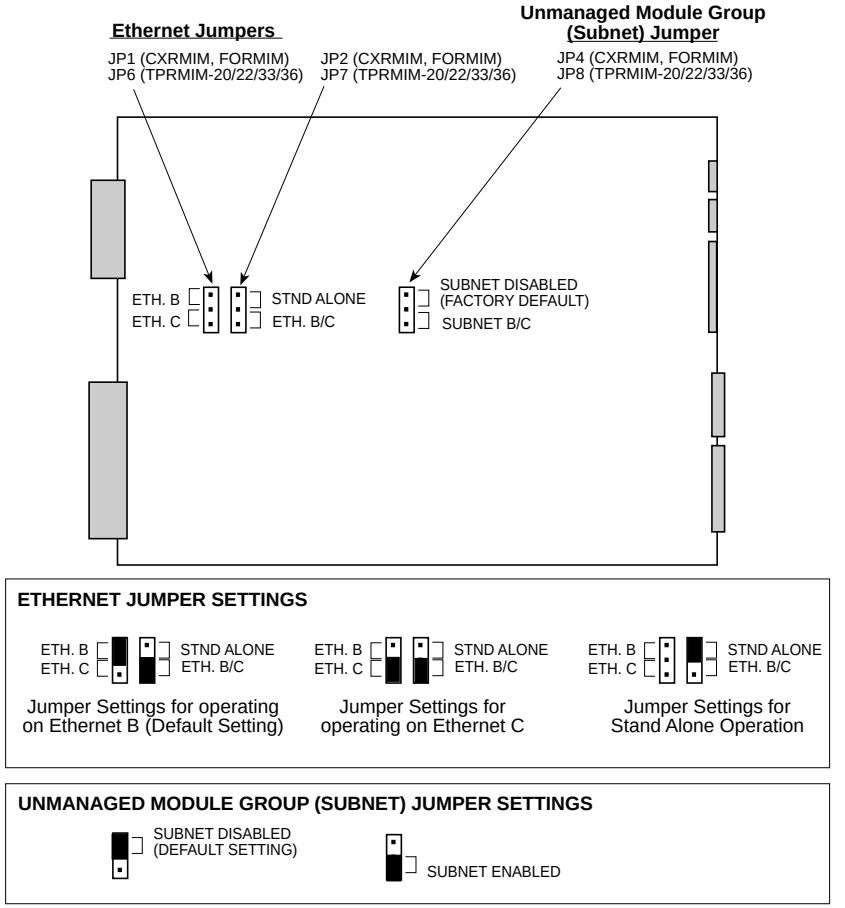


Figure 3-1. RMIM Jumper Configurations

3.2.1 Setting the Ethernet Jumpers

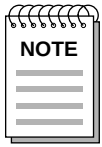
The Ethernet jumpers determine how your RMIM operates on the network. You can set the jumpers so that the RMIM operates on Ethernet B, Ethernet C, or in stand-alone mode.

Refer to Figure 3-1 and configure the RMIM jumpers as follows:

- **To operate on Ethernet B**: Place the JP1/JP6 jumper over the center pin and the ETH. B pin, and place the JP2/JP7 jumper over the center pin and the ETH. B/C pin.

- **To operate on Ethernet C**: Place the JP1/JP6 jumper over the center pin and the ETH. C pin, and place the JP2/JP7 jumper over the center pin and the ETH. B/C pin.

- **To operate in stand-alone mode**: Place the JP2/JP7 jumper over the center pin and the STAND ALONE pin.



If you use an EMME or an EMM-E6 to manage the RMIM, the EMME or EMM-E6 management software settings will take priority over the RMIM hardware jumper settings.

3.2.2 Setting the Unmanaged Module Group (Subnet) Jumper

RMIMs allow grouping of the B and C channels into unmanaged modules to provide two additional Ethernet networks. These additional networks **cannot** be seen or controlled from the EMME or EMM-E6 installed in the MMAC-FNB.

When using the Unmanaged Module Group Jumper, the EMME and EMM-E6 will not bridge/route packets to or from the RMIM with the enabled jumper or any RMIMs to the left of the jumpered RMIM. Setting this jumper breaks the backplane into a separate network containing the RMIM with the enabled jumper and all RMIMs to the left of that jumpered RMIM. The channel B RMIMs will only talk to any RMIM that is set to channel B and the channel C RMIMs will only talk to any RMIM that is set on channel C.

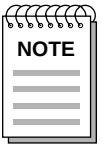
Setting the Unmanaged Module Group jumper for more than one RMIM breaks the backplane of the FNB into another separate unmanaged grouped network.

To place an RMIM into an unmanaged module group:

1. On only one RMIM, (even if more than one RMIM is to be in this group) place the subnet jumper (JP8 on the TPRMIMs or JP4 on the CXRMIM and FORMIM) in the ENABLE position as shown in Figure 3-1.

2. The jumper must be in the DISABLE position for any other MIMs included in this unmanaged group.

3. Install the MIMs into the MMAC. The MIM with the subnet jumper enabled in step 1 must be installed closest to the EMME or EMM-E6 as shown in Figure 3-2.



You must install MIMs that are not in the unmanaged module group closest to the EMME or EMM-E6. Install unmanaged MIMs next, followed by all non-repeater RMIMs. Figure 3-2 shows the correct sequence.

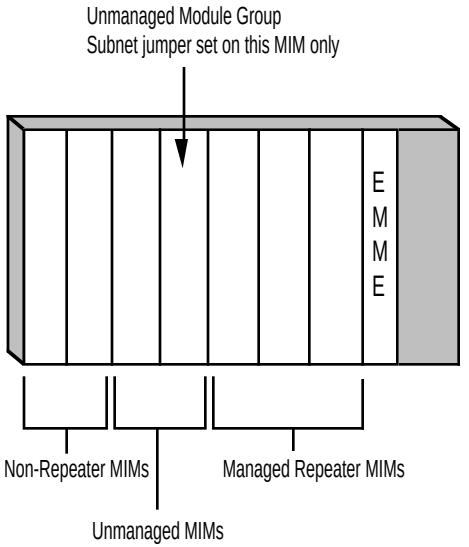
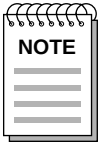


Figure 3-2. Location of MIMs in the MMAC

3.3 INSTALLING THE RMIM INTO THE MMAC

The RMIM must be installed in an MMAC equipped with a Flexible Network Bus (either an MMAC-3FNB, MMAC-5FNB or an MMAC-8FNB).



The FNB is a full-height, full-width backplane that links Cabletron Systems Ethernet, FDDI or Token Ring products. Upgrades kits for MMAC-3s and MMAC-8s (without an FNB) are currently available. Contact Cabletron Systems Technical Support for more information.

Two types of MMACs currently support FNB architecture — shunting and non-shunting. Shunting MMAC-FNBs allow modules to continue communicating on their perspective buses, regardless of whether there is an empty slot between them in the chassis.

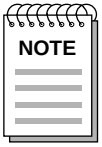
The following table lists the part numbers of the MMAC chassis that have shunting capabilities.

Table 3-1. MMACs with Shunting Capabilities

MMAC Chassis	Part #
MMAC-3FNB	FC000000000 or above
MMAC- 5FNB	CC000000000 or above
MMAC-8FNB	CG000000000 or above
MMAC-M3FNB	all
MMAC-M5FNB	all
MMAC-M8FNB	DK000000000 or above

Cabletron has designed the RMIMs to be easily installed into the MMAC/FNB. When you install the module, the following guidelines must be followed:

- You cannot install the RMIM into Slot 1 (first slot), which is reserved for the Ethernet Management Module (EMME or EMM-E6), the IRM, IRM2, IRM3, or IRBM.



The RMIMs can only be managed by an EMME or EMM-E6. You can install an IRM, IRM2, IRM3, or an IRBM into slot 1 to manage other boards in your MMAC, but it will not provide any management for the repeater modules.

- If an EMME or EMM-E6 management module is installed in an MMAC with a non-shunting backplane, all RMIMs used in the chassis must be installed next to it.

- If installing Token Ring or FDDI modules, they must be installed to the left of all installed RMIMs.

- When installing an RMIM into an MMAC/FNB, be sure the required power supply module is installed in the MMAC to provide power to the module.

Install the RMIM into the MMAC as follows:

1. Slide the module (Fig. 3-3) into the MMAC's card cage. Be sure that the card is in the top and bottom slots of the case.

2. Secure the module to the MMAC by turning the knurled knobs. Be sure the module is firmly attached to the MMAC by turning the knurled knobs. Failure to do so may result in improper operation.

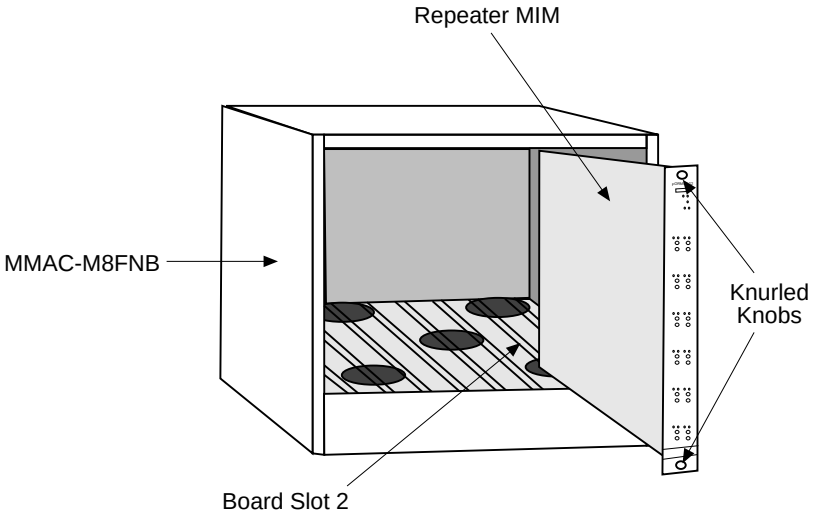


Figure 3-3. Installing the RMIM

3.3.1 Installing an EPIM

The CXRMIM and the TPRMIMs provide a slot for one of Cabletron's Ethernet Port Interface Modules (EPIMs). EPIMs allow you to connect a variety of media to your RMIM. This section explains how to install an EPIM into an RMIM.

Install the EPIM into the RMIM as follows:

1. Remove the blank cover plate from the EPIM slot.

2. Slide the EPIM you are installing into the EPIM slot (Fig. 3-4). Be sure that the card is in the top and bottom guides of the slot.

3. Press the EPIM in place until the EPIM faceplate is flush with the faceplate of the MIM.

4. When the EPIM is firmly in place, tighten the small knurled screw to secure the EPIM to the RMIM.

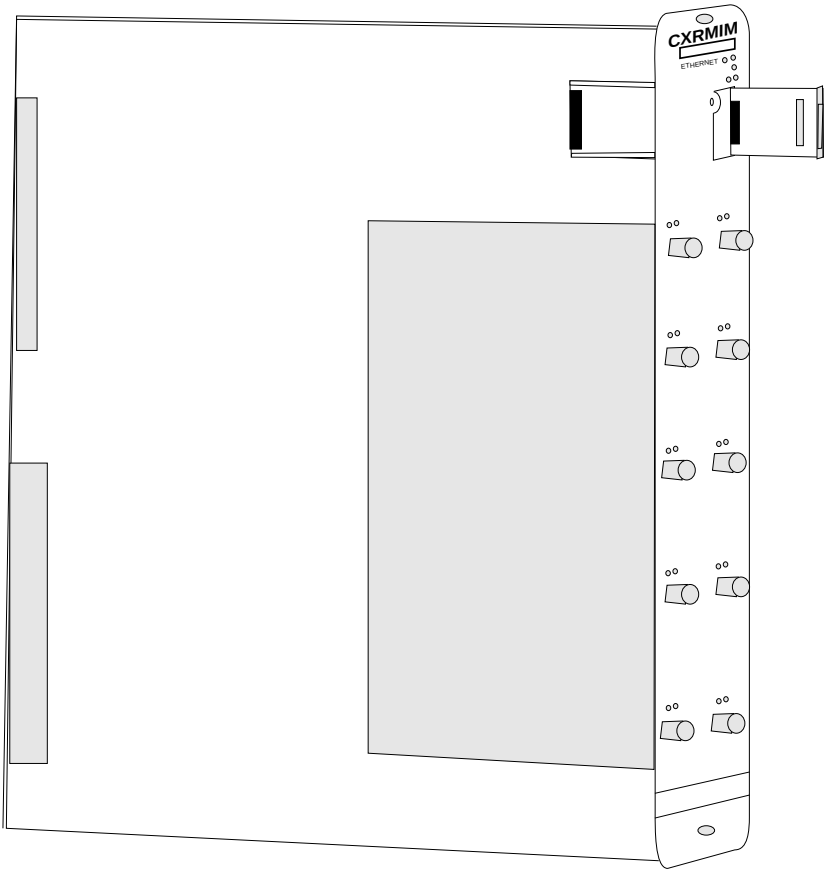


Figure 3-4. Installing an EPIM

3.4 CONNECTING THE RMIM/EPIM TO THE NETWORK

This section describes the types of connections for each RMIM and EPIM. Refer to the appropriate section for instructions that apply to your RMIM/EPIM.

3.4.1 Attaching Thin-Net Segments to the CXRMIM

The CXRMIM has 12 BNC connectors to accommodate 12 10BASE-2 or 10BASE-5 coaxial segments. Connect the thin-net segment to the CXRMIM as follows:

1. Attach the thin-net segment to each of the CXRMIM BNC ports as shown in Figure 3-5. Line up the slots with the pins, push the connector in, and turn clockwise to lock on.

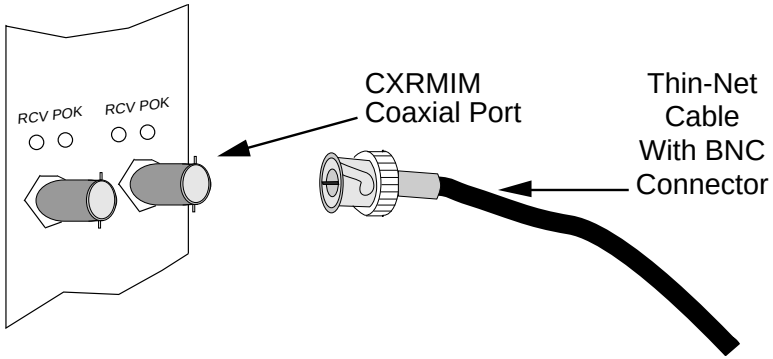
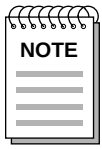


Figure 3-5. Attaching a Thin-Net Segment

2. Check that the device at the other end of the segment has power.

3. Check the Port OK (POK) LED for each port to ensure that the port is not segmented.



You can connect a thick coaxial segment to the CXRMIM by using a thick to thin barrel connector. However, do not extend the thick coaxial segment with a thin coaxial segment.

If communication cannot be established, contact Cabletron Systems Technical Support.

3.4.2 Connecting a Thin-Net Segment to an EPIM-C

To connect a thin-net segment to an EPIM-C:

1. Set the Internal Termination Switch (Fig. 3-6), located to the right of the port and labeled **TERM**, to:

   - The ON position if the thin-net segment connected directly to the port will be internally terminated at the port.

   - The OFF position if the thin-net segment will not be terminated at the port or externally terminated.

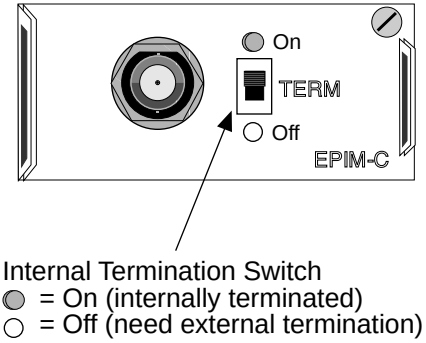


Figure 3-6. Internal Termination Switch

Do not double terminate your RMIM by internally terminating the EPIM-C port and terminating the thin-net segment with a tee-connector and a terminator.

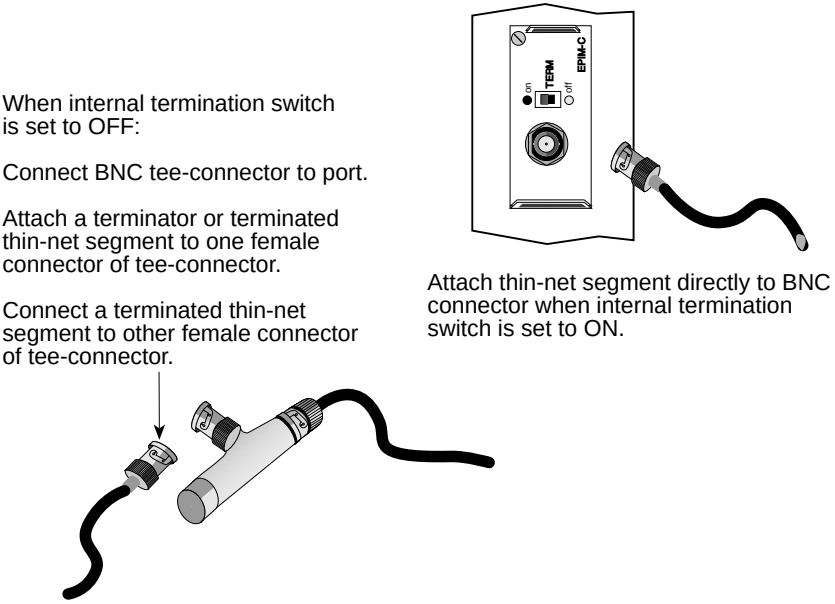


Figure 3-7. Connecting a Thin-Net Segment to an EPIM-C Internal Termination Switch in ON Position

2. If the Internal Termination switch is in the ON position, connect the thin-net segment directly to the BNC port as shown in Figure 3-7.

3. If the Internal Termination switch is in the OFF position:

   a. Attach a BNC tee-connector to the BNC port on the module.

   b. Attach the thin-net segment to one of the female connectors on the tee-connector.

   c. Attach another thin-coax segment or a terminator to the other female connector on the tee-connector.

3.4.3 Attaching a Twisted Pair Segment to the TPRMIM-20/22

The TPRMIM-20 has nine RJ45 unshielded twisted pair ports (UTP) and the TPRMIM-22 has twenty-one RJ45 UTP ports. The TPRMIM-20 and TPRMIM-22 have a Polarity Correction and Detection feature which allows packets to pass even if the polarity of the twisted pairs segment's receive link is reversed. A flashing LNK LED indicates reverse polarity.

To attach twisted pair segments to the network ports:

1. Insert the RJ45 connector from each twisted pair segment into the desired network port on the RMIM as shown in Figure 3-8.

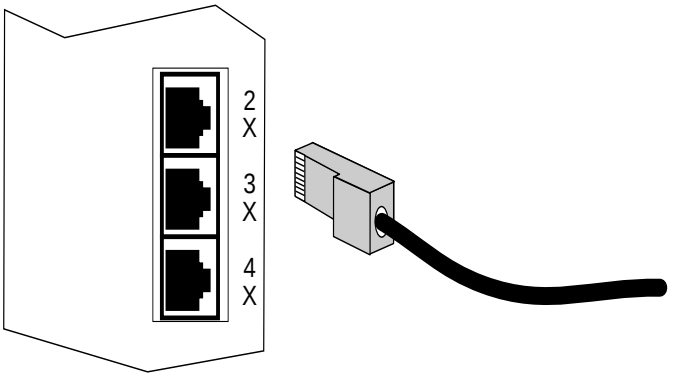


Figure 3-8. TPRMIM-20/22 Network Ports

2. At the device end of a segment, attach the segment to a 10BASE-T compliant Ethernet device.

3. Check that the Link light on the 10BASE-T Ethernet device and the **LNK** LED on the TPRMIM are on. If the LEDs are not on, perform each of the following steps until the LEDs are on:

    a. Check that the 10BASE-T device and the MMAC have power.

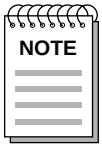
    b. Verify the cabling between the TPRMIM and the device.

    c. Check the cable for continuity.

If a link has not been established, contact Cabletron Systems Technical Support.

3.4.4 Attaching a Twisted Pair Segment to the TPRMIM-33/36

The TPRMIM-33 has a 50-pin Champ connector and the TPRMIM-36 has two 50-pin Champ connectors. This configuration of the TPRMIM allows you to run a 50-pin feeder cable from the TPRMIM to a Punch Down block. Each Champ connector can accommodate twelve 10BASE-T, twisted pair segments.



*Refer to **Appendix A** for information about wiring the TPRMIM-33/36 to a Punch Down Block.*

The TPRMIM-33 and TPRMIM-36 have a Polarity Correction and Detection feature which allows packets to pass even if the polarity of the twisted pairs segment's receive link is reversed. A flashing LNK LED indicates reverse polarity.

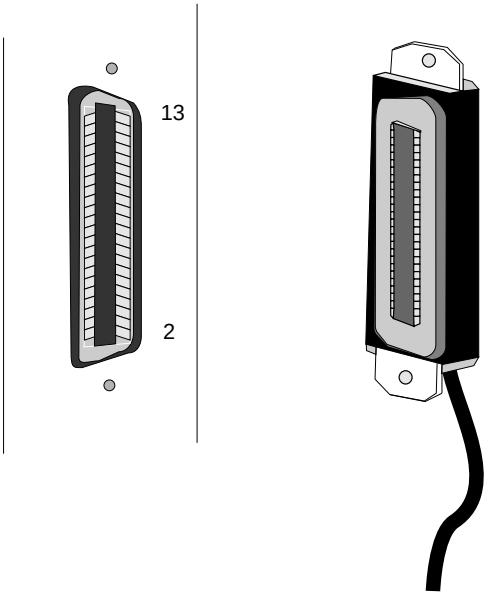


Figure 3-9. 50-Pin Champ Connector

To connect the TPRMIM-33/36 into an existing twisted pair wiring system:

1. Connect a 50-pin feeder cable to the Champ connector on the TPRMIM. See Figure 3-9.

2. Attach the feeder cable to the Punch Down Block, or patch panel. If using a TPRMIM-36, a second 50-pin feeder cable can be connected to the RMIM.

   In most cases, you can connect the feeder cable directly to a Champ connector located on the Punch Down Block. If not, you must wire the feeder cable to the Punch Down Block using the punch down information in Appendix A.

3. At the device end of a segment, attach the segment to a 10BASE-T compliant Ethernet device.

4. Check that the Link light on the 10BASE-T Ethernet device and the LNK LED on the TPRMIM are lit. If the LEDs are unlit, perform each of the following steps until the LEDs are lit:

   a. Check that the 10BASE-T device and the MMAC have power.

   b. Verify the cabling between the module and the 10BASE-T device.

   c. Check the cable for continuity.

If a link has not been established, contact Cabletron Systems Technical Support.

3.4.5 Connecting a Twisted Pair Segment to an EPIM-T

Before connecting a segment to the EPIM-T, check each end of the segment to determine if the wires have been crossed over for the proper connection. If the wires do not cross over, use the switch on the EPIM-T to internally cross over the RJ45 port. Refer to Figure 3-10 to properly set the EPIM-T cross-over switch.

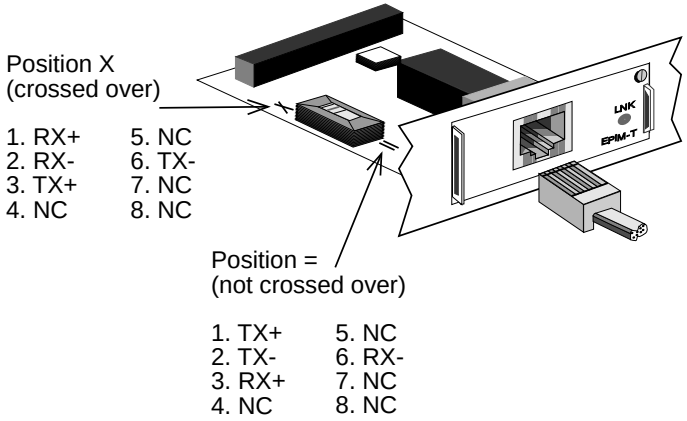


Figure 3-10. Connecting a Twisted Pair Segment to an EPIM-T

To connect an EPIM-T to a Twisted Pair Segment:

1. Connect the twisted pair segment (Fig. 3-10) to the module by inserting the RJ45 connector on the twisted pair segment into the RJ45 port on the module.

2. Check that the Link LED for the port is lit. If the LED is not lit, perform each of the following steps until it is:

    a. Check that the 10BASE-T device at the other end of the twisted pair segment is powered up.

    b. Verify that the RJ45 connector on the twisted pair segment has the proper pinouts. See Figure 3-10.

    c. Check the cable for continuity.

    d. Check that the twisted pair connection meets the dB loss and cable specifications outlined in 10BASE-T Twisted Pair Network Requirements.

If a link still isn't established, contact Cabletron Systems Technical Support.

3.4.6 Connecting a Fiber Optic Link Segment to a FORMIM, EPIM-F1, EPIM-F2, or EPIM-F3

When connecting a fiber optic link segment to a FORMIM, EPIM-F1 or an EPIM-F2, you must keep the following in mind:

- If you are connecting a fiber optic link segment with SMA 906 connectors to an EPIM-F1 with SMA ports, ensure that half alignment sleeves are in place on each connector. A full alignment sleeve will damage the receive port. SMA 905 connectors do not need alignment sleeves.

- If connecting a fiber optic link segment with ST connectors to a FORMIM, EPIM-F2 or EPIM-F3 with ST ports, keep in mind that ST connectors attach to ST ports much like BNC connectors attach to BNC ports. The connector is inserted into the port with the alignment key inserted into the alignment slot on the port. The connector is then turned to lock it down.

- The physical communication link consists of two strands of fiber optic cabling: the Transmit (TX) and the Receive (RX).

  The Transmit strand from the applicable port on the module is connected to the Receive port of a fiber optic Ethernet device at the other end of the segment (i.e., TX of the applicable port on the module goes to RX of the fiber optic device). The Receive strand of the applicable port on the module is connected to the Transmit port of the fiber optic Ethernet device (i.e., RX of the applicable port on the module goes to TX of the fiber optic device).

  We recommend that you label the fiber optic cable to indicate which fiber is Receive and which is Transmit. When you buy fiber optic cable from Cabletron Systems, it is labeled so that: at one end of the cable, one fiber is labeled 1, and the other fiber is labeled 2. This pattern is repeated at the other end of the cable. If you did not purchase your cable from Cabletron Systems, be sure you have labeled your cable in the described manner.

Do not touch the ends of the fiber optic strands, and do not let the ends come in contact with dust, dirt, or other contaminants. Contamination of the ends can cause problems in data transmissions. If the ends become contaminated, clean them with alcohol using a soft, clean, lint free cloth.

To connect a fiber optic link segment to a FORMIM, EPIM-F1, EPIM-F2 or EPIM-F3:

1. Remove the protective plastic covers from the fiber optic ports on the applicable port on the module and from the ends of the connectors on each fiber strand.

2. Attach the fiber labeled 1 (Fig. 3-11) to the applicable receive port, labeled RX, on the module.

3. Attach the fiber labeled 2 to the applicable transmit port, labeled TX, on the module.

4. At the other end of the fiber optic cable, attach the fiber labeled 1 to the transmit port of the device.

5. Attach the fiber labeled 2 to the receive port.

6. Check that the Link LED on the applicable port on the module is lit. If the LED is unlit, perform the following steps until it is:

    a. Check that the power is turned on for the device at the other end of the link.

    b. Verify that the fiber strands are properly “crossed over” between the applicable port on the module and the fiber optic device at the other end of the fiber optic link segment.

    c. Verify that the fiber connection meets the dB loss specifications outlined in Fiber Optic Network Requirements.

If a link still isn’t established, contact Cabletron Systems Technical Support.

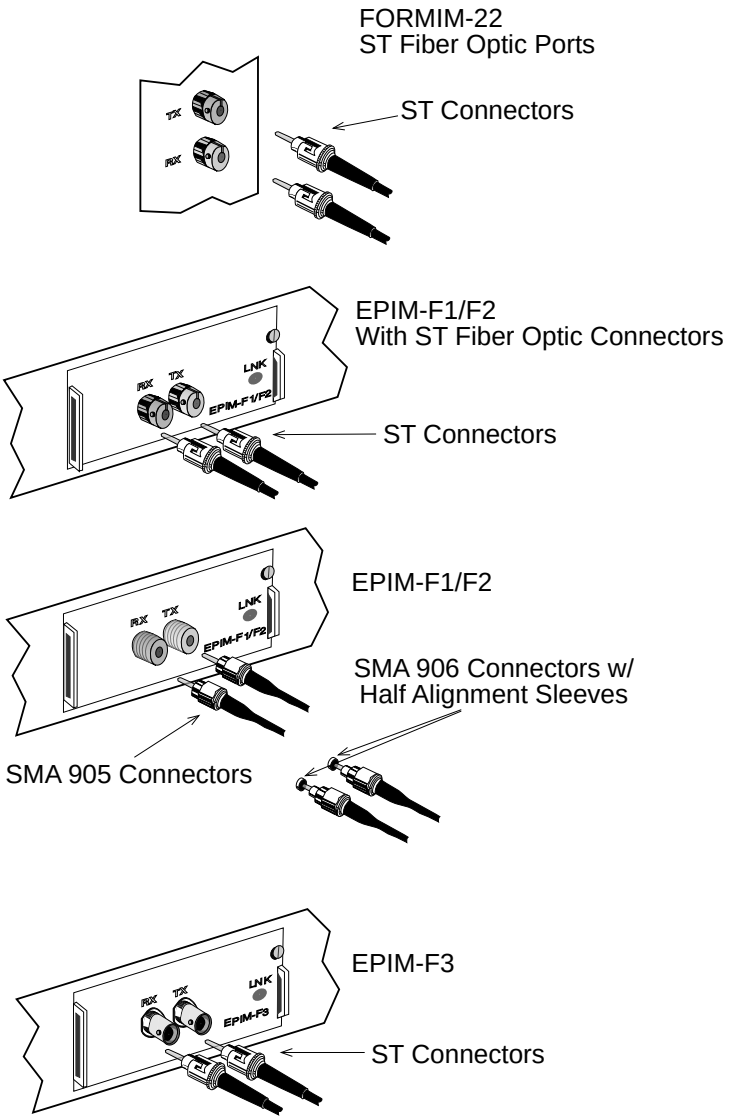


Figure 3-11. Connecting a Fiber Optic Link Segment to a FORMIM, EPIM-F1, EPIM-F2, or EPIM-F3

3.4.7 Connecting an AUI Cable to an EPIM-A or EPIM-X

The EPIM-A allows you to connect the module to a variety of Ethernet transmission media via an external transceiver, including twisted pair, fiber optic, and/or thick or thin Ethernet coaxial cable.

The EPIM-X has internal transceivers that allow you to use AUI cable to connect directly to another Ethernet device without using an external transceiver.

If you are connecting to an EPIM-A, be sure to disable the SQE test function on the transceiver you will be connecting to the AUI port; if you are using an EPIM-X, use the switch on the EPIM (Figure 3-12) to disable the SQE test. Failure to disable the SQE test will result in improper operation of the RMIM. Refer to the applicable transceiver manual.

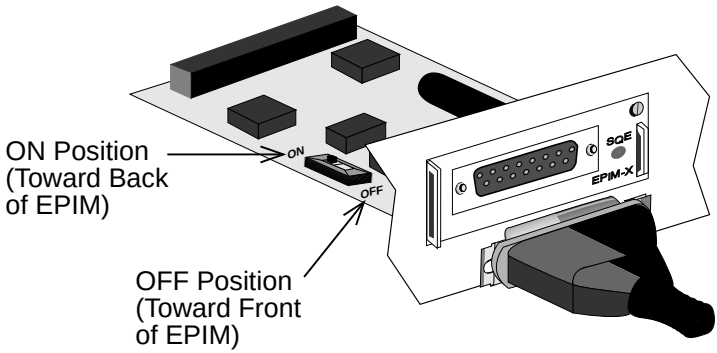


Figure 3-12. EPIM-X SQE Switch

To connect to the network via the AUI port:

1. If using an EPIM-A, attach an external transceiver to the segment to which the AUI Port will be attached. Refer to the applicable transceiver manual.

2. Attach the female end of an AUI cable, no more than 50 meters in length, to the transceiver.

3. Attach the male connector on the AUI cable (Fig. 3-13) to the AUI port on the TPRMIM-36, or EPIM-A.

4. If using an EPIM-X, connect the female end of the cable to the EPIM-X and the male end to the AUI connector on the device.

5. Move the slide latch on the AUI Port to secure it to the lock post on the AUI connector.

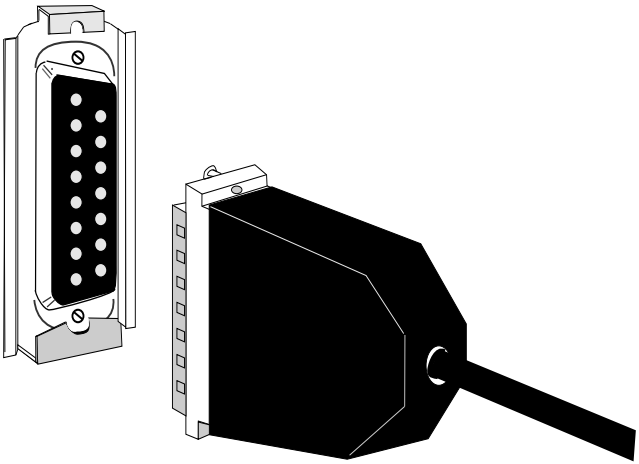


Figure 3-13. Connecting an AUI Cable to an AUI Port

CHAPTER 4

TESTING THE RMIMS

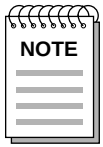
This chapter contains procedures to test the RMIMs with the EMME or EMM-E6 prior to making network connections, and again after installation.

4.1 PRE-INSTALLATION TEST

Before installing the RMIM in a live network, test the module in a controlled situation to ensure that it is repeating packets. This test requires an EMME or EMM-E6 and an RMIM installed in an MMAC/FNB. You perform the test with two workstations (Fig. 4-1).

1. Install the EMME or EMM-E6 and the RMIM (TPRMIM, FORMIM, or CXRMIM) into a stand-alone MMAC/FNB.

2. Connect the first workstation to either the RMIM, using the appropriate cable and transceiver, or to the EMME/EMM-E6 via the active repeater port, using a transceiver and the appropriate cable.

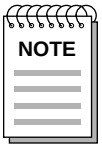


The AUI 1 port is the default active repeater port for the EMME (as is the EPIM 1 port for the EMM-E6). If you want to test modules using the AUI 2 port (EMME) or the EPIM 2 port (EMM-E6), you must use local management. See your local management guide for details.

3. Connect the second workstation to the RMIM you are testing, using the appropriate transceivers and cable.

4. Set the first workstation as the file server and the second as the client (refer to the workstation documentation for setting up the workstations as file server and client). When the workstations are properly set up, proceed to send packets between the workstations and verify that the module is operating properly.

If failures occur, contact Cabletron's Technical Support.



If using UNIX® workstations, a "ping" test will verify that the RMIM is operating properly.

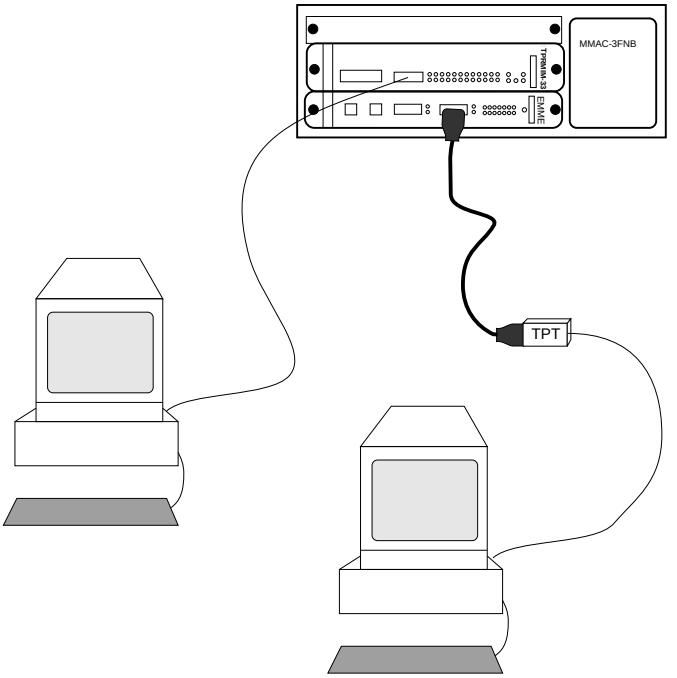


Figure 4-1. Pre-installation Test

4.2 INSTALLATION CHECK-OUT

After the EMME/EMM-E6 is connected to the network, verify that packets can be passed between the two Ethernet network segments via the EMME/EMM-E6. Again you can use two workstations set up as file server and client. Keep the server workstation stationary in the wiring closet with the EMME/EMM-E6, and use the client workstation to move around to each node that is connected to the RMIM (Figure 4-2).

1. After the EMME/EMM-E6 and RMIM are installed in the MMAC, connect the server workstation to either the RMIM, using the appropriate cable and transceiver, to the EMME AUI port using a transceiver and an AUI cable, or to the EMM-E6 EPIM port using a transceiver and the appropriate cable.

2. Going to each node connected to the MMAC, connect the client workstation and proceed to test the segment.

If failures occur, contact Cabletron Systems Technical Support.

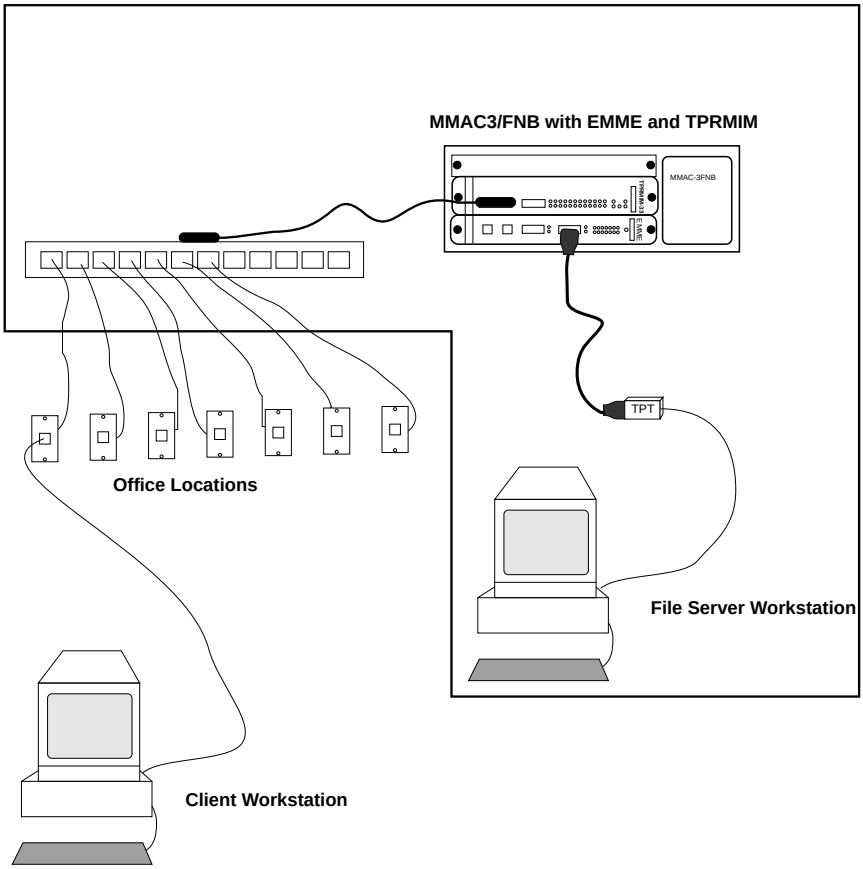


Figure 4-2. Installation Check-Out

Table 4-1. LANVIEW LEDs

LED Name	RMIM/EPIM	Description
Ethernet B, C	TPRMIM-33/36 TPRMIM-20/22 CXRMIM FORMIM	When lit, indicates that the RMIM is operating on either the Ethernet B or C channel on the FNB. If neither of the LEDs are lit, the RMIM is in stand-alone mode.
CLN (Collision)	TPRMIM-33/36 TPRMIM-20/22 CXRMIM FORMIM	When flashing, indicates that a collision has occurred on one or more of the segments attached to the RMIM. Collisions occur normally on an Ethernet network, so a flashing LED does not necessarily indicate an error condition. The frequency of flashes may increase as network activity increases.
RCV (Receive)	TPRMIM-33/36 TPRMIM-20/22 CXRMIM FORMIM	When flashing, indicates that the port is receiving a data packet from the attached segment. The frequency of flashes may increase as network activity increases.
LNK (Link)	FORMIM EPIM-F1, F2, F3 EPIM-T TPRMIM-33/36 TPRMIM-20/22	When lit, indicates a link signal has been received from the device on the other end of the segment. The LED remains lit as long as the link is maintained.
POK (Port OK)	CXRMIM TPRMIM-33/36 TPRMIM-20/22	When lit, indicates the port is not segmented.
PWR (Power)	EPIM-A	When lit, indicates that the EPIM-A is providing power to the transceiver that is connected to it.
SQE	EPIM-X	When lit, indicates that the internal transceiver's SQE test is enabled. When unlit, the test is disabled.

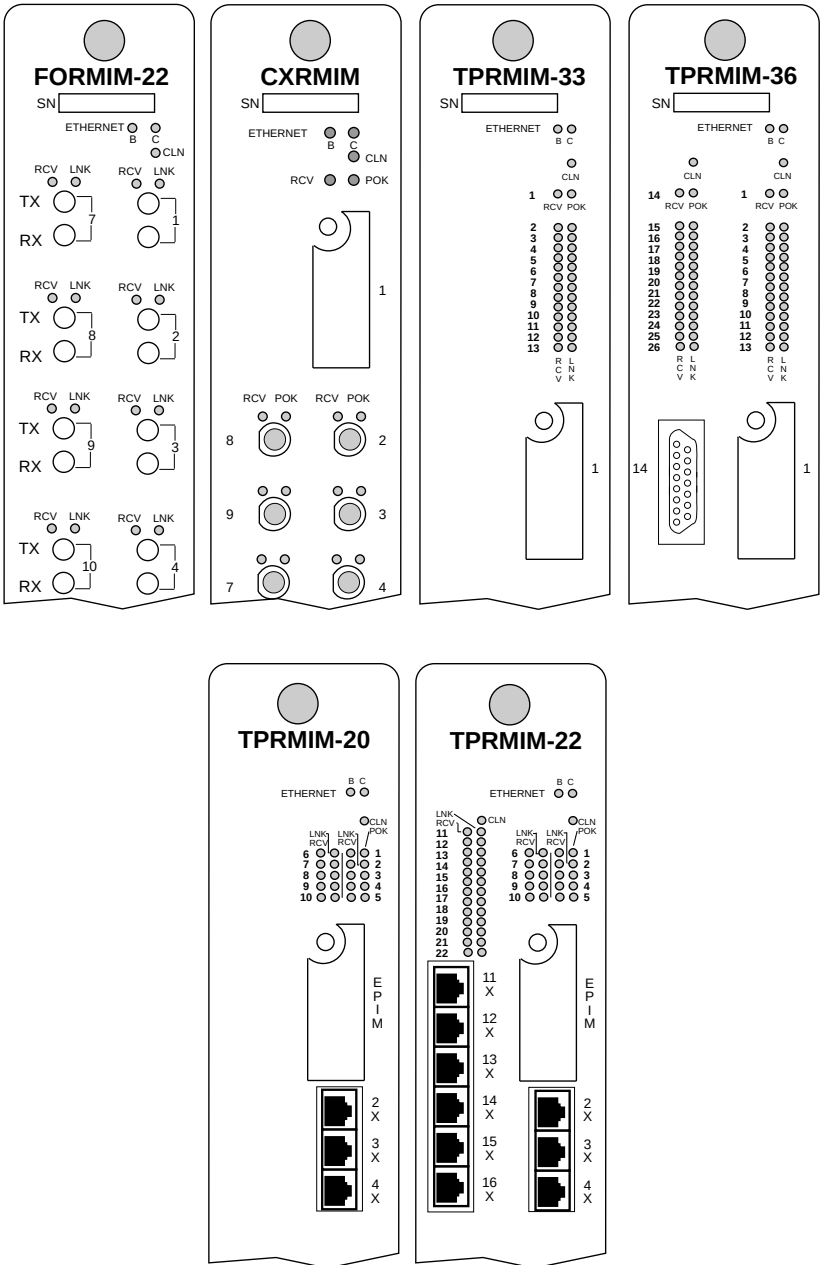


Figure 4-3. RMIM LEDs

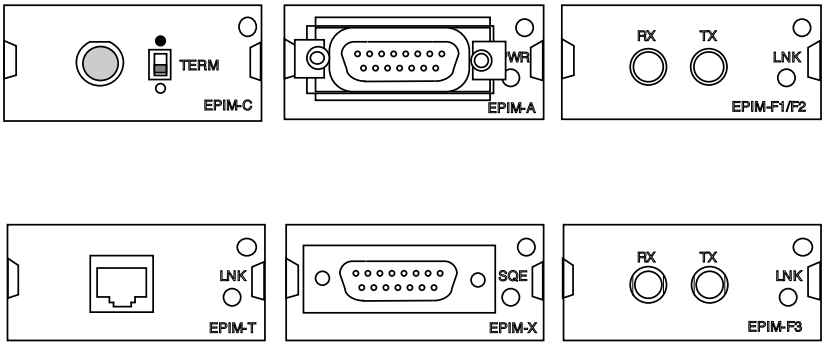


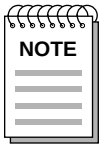
Figure 4-4. EPIM LEDs

APPENDIX A

TWISTED PAIR WIRING TABLES

This appendix contains twisted pair wiring tables which will assist you if you are using a Punch Down Block (see Figure A-1 on page A-9) to wire your twisted pair segments. The following tables are included in this appendix:

- Table A-1 Twisted Pair Wiring from a TPRMIM-33/36 to a Punch Down Block
- Table A-2 Twisted Pair Wiring from a Punch Down Block to a 10BASE-T Device
- Table A-3 Twisted Pair Wiring Summary



Pins 25 and 50 on Champ connector are not used.

Table A-1. Twisted Pair Wiring
from a TPRMIM-33/36 to a Punch Down Block

From TPRMIM		**Into and Out of 50-Pin Feeder Cable**			**Into Punch Down Block**		
Port 12/24							
	Pin	Pin			Pin		
RX+	48	48	Violet/Green	RX+	A45	Violet/Green	RX+
RX-	23	23	Green/Violet	RX-	A46	Green/Violet	RX-
TX+	49	49	Violet/Brown	TX+	A47	Violet/Brown	TX+
TX-	24	24	Brown/Violet	TX-	A48	Brown/Violet	TX-
Port 11/23							
	Pin	Pin			Pin		
RX+	46	46	Violet/Blue	RX+	A41	Violet/Blue	RX+
RX-	21	21	Blue/Violet	RX-	A42	Blue/Violet	RX-
TX+	47	47	Violet/Orange	TX+	A43	Violet/Orange	TX+
TX-	22	22	Orange/Violet	TX-	A44	Orange/Violet	TX-
Port 10/22							
	Pin	Pin			Pin		
RX+	44	44	Yellow/Brown	RX+	A37	Yellow/Brown	RX+
RX-	19	19	Brown/Yellow	RX-	A38	Brown/Yellow	RX-
TX+	45	45	Yellow/Gray	TX+	A39	Yellow/Gray	TX+
TX-	20	20	Gray/Yellow	TX-	A40	Gray/Yellow	TX-
Port 9/21							
	Pin	Pin			Pin		
RX+	42	42	Yellow/Orange	RX+	A33	Yellow/Orange	RX+
RX-	17	17	Orange/Yellow	RX-	A34	Orange/Yellow	RX-
TX+	43	43	Yellow/Green	TX+	A35	Yellow/Green	TX+
TX-	18	18	Green/Yellow	TX-	A36	Green/Yellow	TX-

Table A-1. Twisted Pair Wiring
from a TPRMIM-33/36 to a Punch Down Block (Continued)

From TPRMIM		Into and Out of 50-Pin Feeder Cable			Into Punch Down Block		
Port 8/20							
	Pin	Pin			Pin		
RX+	40	40	Black/Gray	RX+	A29	Black/Gray	RX+
RX-	15	15	Gray/Black	RX-	A30	Gray/Black	RX-
TX+	41	41	Yellow/Blue	TX+	A31	Yellow/Blue	TX+
TX-	16	16	Blue/Yellow	TX-	A32	Blue/Yellow	TX-
Port 7/19							
	Pin	Pin			Pin		
RX+	38	38	Black/Green	RX+	A25	Black/Green	RX+
RX-	13	13	Green/Black	RX-	A26	Green/Black	RX-
TX+	39	39	Black/Brown	TX+	A27	Black/Brown	TX+
TX-	14	14	Brown/Black	TX-	A28	Brown/Black	TX-
Port 6/18							
	Pin	Pin			Pin		
RX+	36	36	Black/Blue	RX+	A21	Black/Blue	RX+
RX-	11	11	Blue/Black	RX-	A22	Blue/Black	RX-
TX+	37	37	Black/Orange	TX+	A23	Black/Orange	TX+
TX-	12	12	Orange/Black	TX-	A24	Orange/Black	TX-
Port 5/17							
	Pin	Pin			Pin		
RX+	34	34	Red/Brown	RX+	A17	Red/Brown	RX+
RX-	9	9	Brown/Red	RX-	A18	Brown/Red	RX-
TX+	35	35	Red/Gray	TX+	A19	Red/Gray	TX+
TX-	10	10	Gray/Red	TX-	A20	Gray/Red	TX-

Table A-1. Twisted Pair Wiring
from a TPRMIM-33/36 to a Punch Down Block (Continued)

From TPRMIM		**Into and Out of 50-Pin Feeder Cable**			**Into Punch Down Block**		
Port 4/16							
	Pin	Pin			Pin		
RX+	32	32	Red/Orange	RX+	A13	Red/Orange	RX+
RX-	7	7	Orange/Red	RX-	A14	Orange/Red	RX-
TX+	33	33	Red/Green	TX+	A15	Red/Green	TX+
TX-	8	8	Green/Red	TX-	A16	Green/Red	TX
Port 3/15							
	Pin	Pin			Pin		
RX+	30	30	White/Gray	RX+	A9	White/Gray	RX+
RX-	5	5	Gray/White	RX-	A10	Gray/White	RX-
TX+	31	31	Red/Blue	TX+	A11	Red/Blue	TX+
TX-	6	6	Blue/Red	TX-	A12	Blue/Red	TX-
Port 2/14							
	Pin	Pin			Pin		
RX+	28	28	White/Green	RX+	A5	White/Green	RX+
RX-	3	3	Green/White	RX-	A6	Green/White	RX-
TX+	29	29	White/Brown	TX+	A7	White/Brown	TX+
TX-	4	4	Brown/White	TX-	A8	Brown/White	TX-
Port 1/13							
	Pin	Pin			Pin		
RX+	26	26	White/Blue	RX+	A1	White/Blue	RX+
RX-	1	1	Blue/White	RX-	A2	Blue/White	RX-
TX+	27	27	White/Orange	TX+	A3	White/Orange	TX+
TX-	2	2	Orange/White	TX-	A4	Orange/White	TX-

Table A-2. Twisted Pair Wiring
from a Punch Down Block to a 10Base-T Device

From Punch Down Block			To RJ45 Wallplate	Into Office Drop	Into 10BASE-T Device
Port 12/24			Pin	Pin	Pin
B45	Violet/Green	RX+	1 TX+	1 TX+	1 TX+
B46	Green/Violet	RX-	2 TX-	2 TX-	2 TX-
B47	Violet/Brown	TX+	3 RX+	3 RX+	3 RX+
B48	Brown/Violet	TX-	6 RX-	6 RX-	6 RX-
Port 11/23			Pin	Pin	Pin
B41	Violet/Blue	RX+	1 TX+	1 TX+	1 TX+
B42	Blue/Violet	RX-	2 TX-	2 TX-	2 TX-
B43	Violet/Orange	TX+	3 RX+	3 RX+	3 RX+
B44	Orange/Violet	TX-	6 RX-	6 RX-	6 RX-
Port 10/22			Pin	Pin	Pin
B37	Yellow/Brown	RX+	1 TX+	1 TX+	1 TX+
B38	Brown/Yellow	RX-	2 TX-	2 TX-	2 TX-
B39	Yellow/Gray	TX+	3 RX+	3 RX+	3 RX+
B40	Gray/Yellow	TX-	6 RX-	6 RX-	6 RX-
Port 9/21			Pin	Pin	Pin
B33	Yellow/Orange	RX+	1 TX+	1 TX+	1 TX+
B34	Orange/Yellow	RX-	2 TX-	2 TX-	2 TX-
B35	Yellow/Green	TX+	3 RX+	3 RX+	3 RX+
B36	Green/Yellow	TX-	6 RX-	6 RX-	6 RX-
Port 8/20			Pin	Pin	Pin
B29	Black/Gray	RX+	1 TX+	1 TX+	1 TX+
B30	Gray/Black	RX-	2 TX-	2 TX-	2 TX-
B31	Yellow/Blue	TX+	3 RX+	3 RX+	3 RX+
B32	Blue/Yellow	TX-	6 RX-	6 RX-	6 RX-

Table A-2. Twisted Pair Wiring
from a Punch Down Block to a 10Base-T Device (Continued)

From Punch Down Block			**To RJ45 Wallplate**	**Into Office Drop**	**Into 10BASE-T Device**
Port 7/19			Pin	Pin	Pin
B25	Black/Green	RX+	1 TX+	1 TX+	1 TX+
B26	Green/Black	RX-	2 TX-	2 TX-	2 TX-
B27	Black/Brown	TX+	3 RX+	3 RX+	3 RX+
B28	Brown/Black	TX-	6 RX-	6 RX-	6 RX-
Port 6/18			Pin	Pin	Pin
B21	Black/Blue	RX+	1 TX+	1 TX+	1 TX+
B22	Blue/Black	RX-	2 TX-	2 TX-	2 TX-
B23	Black/Orange	TX+	3 RX+	3 RX+	3 RX+
B24	Orange/Black	TX-	6 RX-	6 RX-	6 RX-
Port 5/17			Pin	Pin	Pin
B17	Red/Brown	RX+	1 TX+	1 TX+	1 TX+
B18	Brown/Red	RX-	2 TX-	2 TX-	2 TX-
B19	Red/Gray	TX+	3 RX+	3 RX+	3 RX+
B20	Gray/Red	TX-	6 RX-	6 RX-	6 RX-
Port 4/16			Pin	Pin	Pin
B13	Red/Orange	RX+	1 TX+	1 TX+	1 TX+
B14	Orange/Red	RX-	2 TX-	2 TX-	2 TX-
B15	Red/Green	TX+	3 RX+	3 RX+	2 TX-
B16	Green/Red	TX-	6 RX-	6 RX-	6 RX-
Port 3/15			Pin	Pin	Pin
B9	White/Gray	RX+	1 TX+	1 TX+	1 TX+
B10	Gray/White	RX-	2 TX-	2 TX-	2 TX-
B11	Red/Blue	TX+	3 RX+	3 RX+	3 RX+
B12	Blue/Red	TX-	6 RX-	6 RX-	6 RX-

Table A-2. Twisted Pair Wiring
from a Punch Down Block to a 10Base-T Device (Continued)

From Punch Down Block			To RJ45 Wallplate	Into Office Drop	Into 10BASE-T Device
Port 2/14			Pin	Pin	Pin
B5	White/Green	RX+	1 TX+	1 TX+	1 TX+
B6	Green/White	RX-	2 TX-	2 TX-	2 TX-
B7	White/Brown	TX+	3 RX+	3 RX+	3 RX+
B8	Brown/White	TX-	6 RX-	6 RX-	6 RX-
Port 1/13			Pin	Pin	Pin
B1	White/Blue	RX+	1 TX+	1 TX+	1 TX+
B2	Blue/White	RX-	2 TX-	2 TX-	2 TX-
B3	White/Orange	TX+	3 RX+	3 RX+	3 RX+
B4	Orange/White	TX-	6 RX-	6 RX-	6 RX-

Table A-3. Twisted Pair Wiring Summary

TPRMIM Champ		Punch Down Block		Wall Plate (If Required)		10BASE-T Ethernet Device
Port 12						
48 RX+		A45 RX+		PIN 1 TX+		PIN 1 TX+
23 RX-	25 Pin Feeder Cable	A46 RX-	4 Pair Twisted Distribution Cable	PIN 2 TX-	Office Drop	PIN 2 TX-
49 TX+		A47 TX+		PIN 3 RX+		PIN 3 RX+
24 TX-		A48 TX-		PIN 6 RX+		PIN 6 RX+
Port 11						
46 RX+		A41 RX+		PIN 1 TX+		PIN 1 TX+
21 RX-	25 Pin Feeder Cable	A42 RX-	4 Pair Twisted Distribution Cable	PIN 2 TX-	Office Drop	PIN 2 TX-
47 TX+		A43 TX+		PIN 3 RX+		PIN 3 RX+
22 TX-		A44 TX-		PIN 6 RX-		PIN 6 RX-
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
Port 1						
26 RX+		A1 RX+		PIN 1 TX+		PIN 1 TX+
1 RX-	25 Pin Feeder Cable	A2 RX-	4 Pair Twisted Distribution Cable	PIN 2 TX-	Office Drop	PIN 2 TX-
27 TX+		A3 TX+		PIN 3 RX+		PIN 3 RX+
2 TX-		A4 TX-		PIN 6 RX-		PIN 6 RX-

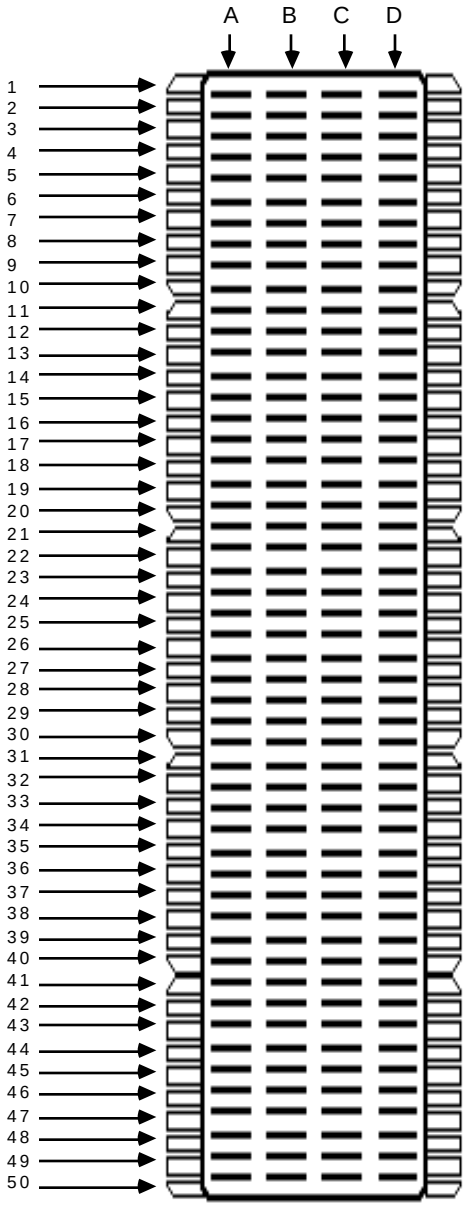


Figure A-1. Punch Down Block

APPENDIX B

EPIM SPECIFICATIONS

The TPRMIM-20/22/33/36 and CXRMIM provide a port for Cabletron Systems' EPIMs. EPIMs let you connect to the main network using different media types. Cabletron Systems offers a variety of EPIMs. The following sections explain specifications for each EPIM.

EPIM-T

The EPIM-T is an RJ45 connector supporting UTP cabling. It has an internal Cabletron Systems TPT-T™ 10BASE-T Twisted Pair Transceiver.

The slide switch on the EPIM-T determines the cross-over status of the cable pairs. If the switch is on the **X** side, the pairs are internally crossed over. If the switch is on the = side, the pairs are not internally crossed over. Figure B-1 shows the pinouts for the EPIM-T in both cross-over positions.

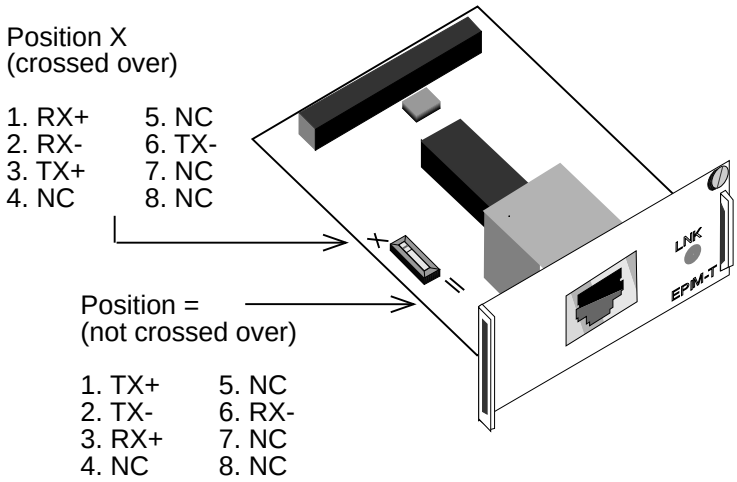


Figure B-1. EPIM-T Pinouts

EPIM-F1 and EPIM-F2

The EPIM-F1 and EPIM-F2 support Multimode Fiber Optic cabling. Each EPIM has an internal Cabletron Systems FOT-F™ Fiber Optic Transceiver. The EPIM-F1 is equipped with SMA Connectors and the EPIM-F2 is equipped with ST Connectors. Figure B-2 shows both EPIMs. Specifications for the EPIMs are listed below.

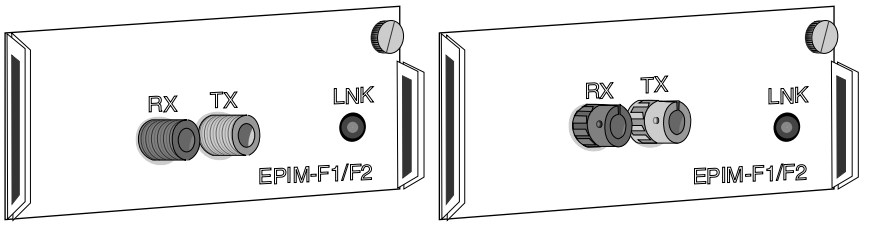


Figure B-2. EPIM-F1 and EPIM-F2

Parameter	Typical Value	Worst Case	Worst Case Budget	Typical Budget
Receive Sensitivity	-30.5 dBm	-28.0 dBm	—	—
Peak Input Power	-7.6 dBm	-8.2 dBm	—	—
Transmitter Power				
50/125 µm fiber	-13.0 dBm	-15.0 dBm	13.0 dB	17.5 dB
62.5/125 µm fiber	-10.0 dBm	-12.0 dBm	16.0 dB	20.5 dB
100/140 µm fiber	-7.0 dBm	-9.0 dBm	19.0 dB	23.5 dB
Error Rate	Better than 10^{-10}			

NOTE

The transmitter power levels and receive sensitivity levels listed are Peak Power Levels after optical overshoot. A Peak Power Meter must be used to correctly compare the values given above to those measured on any particular port. If Power Levels are being measured with an Average Power Meter, then 3 dBm must be added to the measurement to correctly compare those measured values to the values listed (i.e. -30.5 dBm peak=-33.5 dBm average).

EPIM-F3

The EPIM-F3 supports Single Mode Fiber Optic cabling. It has an internal Cabletron Systems FOT-F™ Fiber Optic Transceiver and is equipped with ST Connectors. Figure B-3 shows the EPIM-F3. Specifications for the EPIM-F3 are listed below.

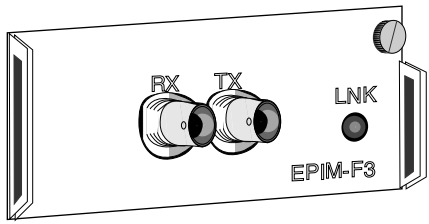
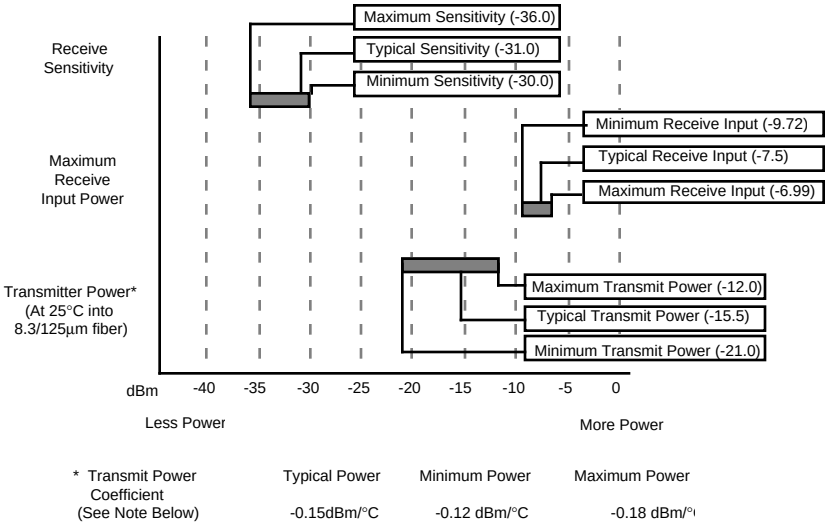


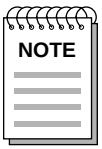
Figure B-3. EPIM-F3

NOTE

Transmitter Power decreases as temperatures rise and increases as temperatures fall. Use the Output Power Coefficient to calculate increased or decreased power output for your operating environment. For example, the typical power output at 25° C is -16.4 dBm. For a 4° C temperature increase, multiply the typical coefficient (-0.15 dBm) by four and add the result to typical output power (4 x -0.15 dBm + -16.4 = -17.0).



Parameter	Typical	Minimum	Maximum
Transmitter Peak Wave Length	1300 nm	1270 nm	1330 nm
Spectral Width	60 nm	-	100 nm
Rise Time/ Fall Time	3.0 nsec 2.5 nsec	2.7 nsec 2.2 nsec	5.0 nsec 5.0 nsec
Duty Cycle	50.1%	49.6%	50.7%
Bit Error Rate	Better than 10^{-10}		



The transmitter power levels given above are Peak Power Levels after optical overshoot. You must use a Peak Power Meter to correctly compare the values given above to those measured on any particular port. If you are measuring power levels with an Average Power Meter, add 3 dBm to the average power measurement to correctly compare the average power values measured to the values listed above (i.e., -33.5 dBm average + 3 dB = -30.5 dBm peak).

EPIM-C

The EPIM-C supports thin-net coaxial cabling and is equipped with an internal Cabletron Systems TMS-3™ Transceiver. You can use the TERM switch on the front of the EPIM-C to set the internal 50-ohm terminator. This eliminates the need to connect the port to a tee-connector and terminator. Figure B-4 shows the setting for the terminator switch.

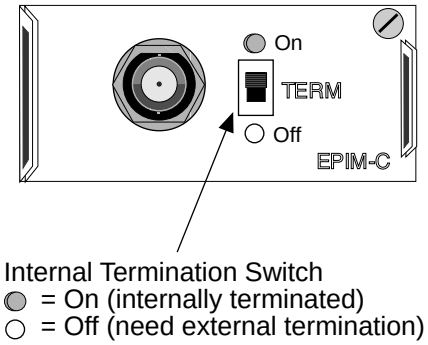


Figure B-4. EPIM-C

Connector Type

BNC receptacle, with gold center contact, for use with BNC type tee-connectors and RG-58 thin-net cable.

Grounding

For safety, only one end of a thin-net segment should be connected to earth ground. Connection to earth ground at more than one point on the segment may cause dangerous ground currents.

The BNC port of the Coaxial Interface Modules is not connected to earth ground.

EPIM-A and EPIM-X (AUI Port)

The EPIM-A is a DB15 female connector used to attach segments to an external transceiver. The EPIM-X is equipped with dual internal transceivers. It has a DB15 male connector used to attach segments to an AUI cable. Figure B-5 shows both modules.

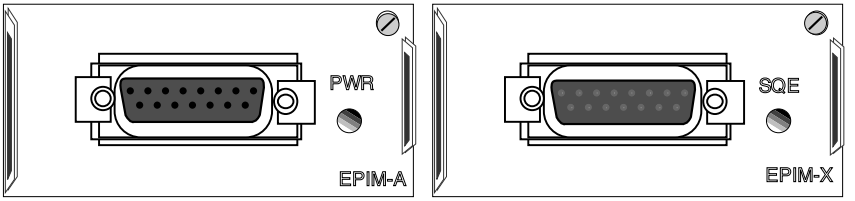


Figure B-5. The EPIM-A and EPIM-X

DB15 Pinouts

Pin	1	Logic Ref.	9	Collision -
	2	Collision +	10	Transmit -
	3	Transmit	11	Logic Ref.
	4	Logic Ref.	12	Receive -
	5	Receive +	13	Power (+12Vdc)
	6	Power Return	14	Logic Ref.
	7	No Connection	15	No Connection
	8	Logic Ref.		

Connector Shell: Protective Ground

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