
ETHERNET MULTI MEDIA REPEATER SPECIFICATIONS

Standards

IEEE 802.2, 802.3

Physical

Dimensions

7.1" x 5.1" x 2.5"

(180 mm x 130 mm x 64 mm)

Input Power

Power Supply Adapter

AC Input:

TN PN	Requirement	Location
3518	120 volts, 60 hertz, 28 watts	USA/Canada/Mexico
3516	230 volts, 50 hertz, 28 watts	Europe
3514	100 volts, 50-60 hertz, 28 watts	Japan
3517	240 volts, 50 hertz, 28 watts	United Kingdom
3515	240 volts, 50 hertz, 28 watts	Australia

DC Output:

9 volts at 500 mA maximum

MTBF

48170 hours

Environment

Temperature:	0-50°C (32° to 122° F)
Humidity	10-90%, non condensing
Altitude	0-10,000 feet

Warranty

5 years

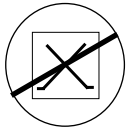
Ethernet™ 2-Port Multi Media Repeater (E-MMR-2)

7346.E

For assistance in installing, using, or maintaining the TRANSITION Networks Ethernet Multi Media Repeater, contact TRANSITION Networks Technical Support at:

(800) 260-1312

or contact your local distributor.



CAUTION: RJ connectors are NOT INTENDED FOR CONNECTION TO THE PUBLIC TELEPHONE NETWORK. Failure to observe this caution could result in damage to the public telephone network.

Der Anschluss dieses Gerätes an ein öffentliches Telekommunikationsnetz in den EG-Mitgliedstaaten verstösst gegen die jeweiligen einzelstaatlichen Gesetze zur Anwendung der Richtlinie 91/263/EWG zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Telekommunikationsendrichtungen einschliesslich der gegenseitigen Anerkennung ihrer Konformität.

Compliance Information

UL Listed

C-UL Listed (Canada)

CISPR/EN55022 Class A

FCC Regulations

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense.

Canadian Regulations

This digital apparatus does not exceed the Class A limits for radio noise for digital apparatus set out on the radio interference regulations of the Canadian Department of Communications.

European Regulations

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Copyright Restrictions

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10Base2 Cable Specifications

The physical characteristics of the 10Base2 cable must meet or exceed IEEE 802.3 10Base2 specifications.

Cable Characteristics:

Cable type:	Stranded Coaxial RG58 (ThinNet)
Impedance:	50 Ω @ 10 MHz
Mutual Capacitance:	24 pF/ft \pm 20% @ 10 MHz
Maximum Cable Length:	185 meters (610 feet)
Maximum number network connections:	30
Minimum distance between connections:	0.5 meters (1.6 feet)

Terminate 10Base2 cable at one end using a 50 ohm terminator and at the other end using a 50 ohm terminator grounded to earth ground.

10BaseT Cable and Connector Specifications

The physical characteristics of the 10BaseT cable must meet or exceed IEEE 802.3 10BaseT specifications.

10BaseT Cable Characteristics:

Category 3 wire or better is required; category 5 wire is recommended. Either shielded twisted pair (STP) or unshielded twisted pair (UTP) can be used. **DO NOT USE FLAT OR SILVER SATIN WIRE.**

Category 3:

Gauge	24 to 22 AWG
Attenuation	28 dB/1000' @ 10 MHz
Differential Characteristic Impedance	100 Ω \pm 10% @ 10 MHz

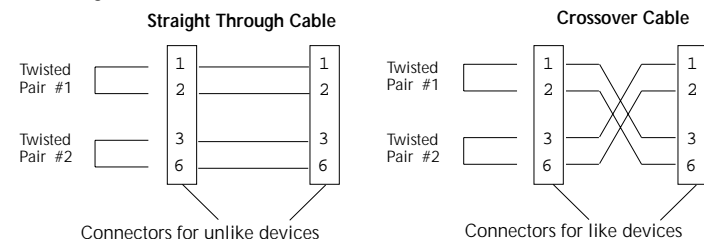
Category 5:

Gauge	24 to 22 AWG
Attenuation	20 dB/1000' @ 10 MHz
Differential Characteristic Impedance	100 Ω \pm 10% @ 10 MHz

Maximum Cable Length: 100 meters (330 feet)

10BaseT Connector Characteristics:

The two active pairs in a 10BaseT network are pins 1 & 2 and pins 3 & 6. Use only dedicated wire pairs (such as blue/white & white/blue, orange/white & white/orange) for the active pins. 10BaseT cable for unlike devices (such as hub to terminal device) must be configured as straight through; 10BaseT cable for like devices (such as hub to hub or terminal device to terminal device) must be configured as crossover.



ETHERNET CABLE SPECIFICATIONS

Maximum number of terminal devices on Ethernet network: 1024

10Base5 Cable and Connector Specifications

The physical characteristics of the 10Base5 cable must meet or exceed IEEE 802.3 10Base5 specifications.

10Base5 Cable Characteristics:

Cable type:	RG8 Solid Coaxial (ThickNet)
Impedance:	50 Ω @ 10 MHz
Capacitance:	26pF/ft
Maximum Cable Length:	500 meters (1650 feet)
Maximum number network connections:	100
Minimum distance between connections:	2.5 meters (8.2 feet)

Terminate 10Base5 cable at one end using a 50 ohm terminator and at the other end using a 50 ohm terminator grounded to earth ground.

AUI Cable and Connector Specifications

The cable is a special 4-pair individually shielded with an overall braided shield.

Maximum AUI Cable Length: 50 meters (165 feet)

AUI Connector Characteristics:

AUI Port:	Male DB-15 with locking posts.		
AUI Connection:	Cable shell must be grounded.		
Connector Legend:	1 Logic Ref.	6 Power Return	11 Logic Ref
	2 Collision+	7 N/C	12 Receive
	3 Transmit+	8 Logic Ref.	13 Power
	4 Logic Ref.	9 Collision--	14 Logic Ref.
	5 Receive+	10 Transmit-	15 N/C

10BaseFL Cable and Connector Specifications

The physical characteristics of the 10BaseFL cable must meet or exceed IEEE 802.3 10BaseFL specifications.

10BaseFL Cable Characteristics:

Fiber Optic Cable Recommended:	62.5/125 μ m multimode fiber
Optional:	100/140 μ m multimode fiber 85/125 μ m multimode fiber 50/125 μ m multimode fiber
Fiber Optic Transmitter Power:	Average power: -15.0 dBm Peak power: -12.0 dBm \pm 1dBm
Fiber Optic Receiver Sensitivity:	Average sensitivity: -27.4 dBm Bit error rate: $\leq 10^{-10}$

Maximum Cable Length: 2000 meters (6500 feet)

10BaseFL Connector Characteristics:

ST type connectors (SMA type available upon request)

Table of Contents

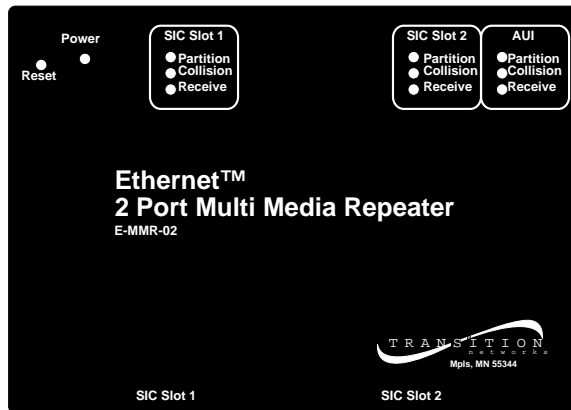
1 INTRODUCTION	1
The Multi Media Repeater	1
Multi Media Repeater Features	1
Networking the Multi Media Repeater	2
Multi Media Repeater Connectors, LEDS, and Switch	3
2 SITE CONSIDERATIONS.	4
Ensuring Correct Segment Number	5
Ensuring Correct 10BaseT Configuration	8
3 INSTALLATION.	7
Unpacking the Multi Media Repeater	7
Installing Multi Media Repeater on Flat Surface	8
Installing Slide-In Cards	9
Connecting Cable to Slide-In Cards	10
BNC Connector/10Base2 Connection	10
Twisted Pair Connector/10BaseT Connection	11
Female AUConnector/10Base5 or Transceiver Connection	12
Male AUICConnector/PC Connection	13
Fiber OpticConnector/10BaseFL Connection	13
Connecting Power to Multi Media Repeater	14
4 OPERATION	15
Monitoring Power LED	15
Monitoring Status LEDs	15
5 MAINTENANCE	16
Fault Isolation	16
Technical Support Contact	16
WARRANTY STATEMENT	17
CABLE SPECIFICATIONS.	19
ETHERNET MULTI MEDIA REPEATER TECHNICAL SPECIFICATIONS	21

1. INTRODUCTION

This guide is intended for the system or network administrator responsible for installing and monitoring a TRANSITION Networks Ethernet™ 2-Port Multi Media Repeater. A working knowledge of local area network (LAN) operations, including familiarity with communications protocols used on interconnected LANs, is assumed.

The Multi Media Repeater

The TRANSITION Networks Ethernet™ 2-Port Multi Media Repeater (MMR-2), is a small, multi-purpose Ethernet repeater that is site-configurable, using Slide In Cards (SICs), for various signal transmission media.



- SICs, if installed, provide fiber optic, male and female AUI, BNC, and/or RJ-45 connectors.
- Allows for future network expansion by swapping SICs.

The sole purpose of this remedy shall be provided the customer with the replacement or repair of non-conforming goods in the manner described in this Warranty statement. This exclusive remedy shall not be deemed to have failed of its essential purpose so long as TN is willing and able to repair or replace the defective item(s) or refund the purchase price.

TN reserves the right to inspect products claimed to be defective under warranty either at the customer's location or at TN's plant. TN assumes no liability for liability charges incidental to the adjustment, service, repairing, removal or replacement of the product, or other costs, or the expense of repairs made outside of its factory, except when made with TN's prior written consent. Additionally, Transition Networks reserves the right to charge for all testing and shipping incurred, if after testing, a return is classified as "No Problem Found".

TN's total liability in connection with the products and their installation to all persons and from all causes in the aggregate, whether in contract, tort, or strict liability, shall not exceed the amount paid to TN for the product directly related to the alleged damage. However, in no event shall TN have any liability to a customer or any third party for products manufactures according to the customer's specifications.

C. Return Procedure

The customer must follow this procedure for the return of defective items:

1. Locate the serial number(s) of the item(s) to be returned.
2. Determine the date the item(s) was received.
3. Contact Transition Networks Technical Support to determine if the problem can be corrected on site.

If not, and the product is covered by warranty, then:

- Call the distributor directly or contact TN.
- Request a Return Material Authorization (RMA).
- Ship the item, prepaid in original packaging to Transition Networks at the above address.
- Include the RMA number on the outside of the carton and/or on the Packing List.
- Include a copy of the RMA form.
- Include a copy of the original invoice or packing list (if possible) to expedite processing.
- The item(s) may be shipped by the customer or the distributor.
- Transition Networks will repair or replace the unit, at TN's discretion, and cover the cost of the return freight to the distributor or to the customer, whichever requested the RMA number.

If the item(s) was received **more than five years ago**, or if the item(s) is **no longer covered by warranty** for other reasons, then:

- Call the distributor or contact TN.
- Request a Material Repair Authorization number (MRA).
- Ship the item(s), prepaid, in the original packaging to Transition Networks at the above address.
- Include the MRA number on the outside of the carton add/or on the Packing List.
- Include a copy of the MRA form.
- Include a copy of the original invoice or packing list (if possible) to expedite processing.
- Only the customer (end-user) may send the items(s) to TN.
- TN will contact the customer after the item(s) have been received, inspected, and a cost estimate of the repair determined.
- The repair charges may be billed, with customer's approval, though the distributor, or on a prepaid or C.O.D. basis directly to the customer. The charges will include the cost of shipping.

The return authorization numbers are valid only for 90 days from the date issued.

Warranty Statement

A. Five Year Warranty

Transition Networks, Inc. (TN) warrants, for a period of five years, that TN products (with the exception of power supplies and fans that TN warrants for two years) will be free from defects in materials and workmanship, and will be in conformity with TN's specifications.

TN's warranty on products manufactured by or assembled for TN in accordance with a customer's specifications, is a five-year warranty that the goods conform to such specifications.

The warranty is invalidated if the goods have been subject to alterations, misuse, accident, Acts of God (e.g., damage by floods, lightning strikes, Etc.), tampering, improper maintenance, improper installation, or abuse. If the user is unsure about the proper means of installing or using the equipment, contact TN's free Technical Support or Network Design Services, which can be reached by:

Telephone 1.800.LAN.WANS or 612.941.7600
Fax 612.941.2322
E-mail techsupport@transition.com
Internet http://www.transition.com

THE ABOVE WARRANTY IS EXCLUSIVE AND EXTENDS ONLY TO PRODUCTS ASSEMBLED BY TRANSITION NETWORKS, INC. TO THE EXTENT PERMITTED BY LAW, TN DOES NOT MAKE AND DISCLAIMS ALL OTHER WARRANTIES, EXCEPT TITLE, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF DESCRIPTION, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT, AND ANY WARRANTY BASED UPON PRIOR WRITTEN OR ORAL REPRESENTATIONS REGARDING SUCH PRODUCTS MADE BY TN, ITS EMPLOYEES, AGENTS, OR REPRESENTATIVES.

B. Limitations and Exclusions

If the customer believes any goods sold by TN are defective and within the warranty period, the following general procedure will be followed:

1. Locate the serial number and delivery date of the item(s).
2. Notify TN within the warranty period.
3. TN will promptly issue a return authorization form for the goods.
4. Upon receiving the form, the customer will promptly return the item(s) at customer's own expense, shipped prepaid, to the distributor from which it was purchased, or directly to TN.

TN will only accept goods for return if the following conditions have been met:

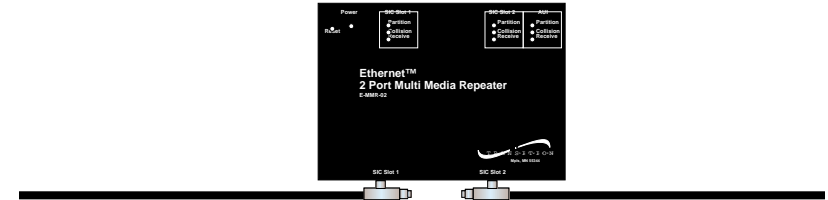
1. A return form is obtained from TN.
2. The freight charges have been prepaid by the customer.
3. Goods are re-packed in their original packaging.

If under warranty TN shall, at its option, (1) repair the goods free of charge (2) replace the goods free of charge, or (3) accept the return of the item(s) and credit the current price to the reseller (within 90 days of purchase), or (4) if the goods are not under warranty, will repair the item(s) at a minimum charge of USD \$200 (two hundred U.S. dollars) per item.

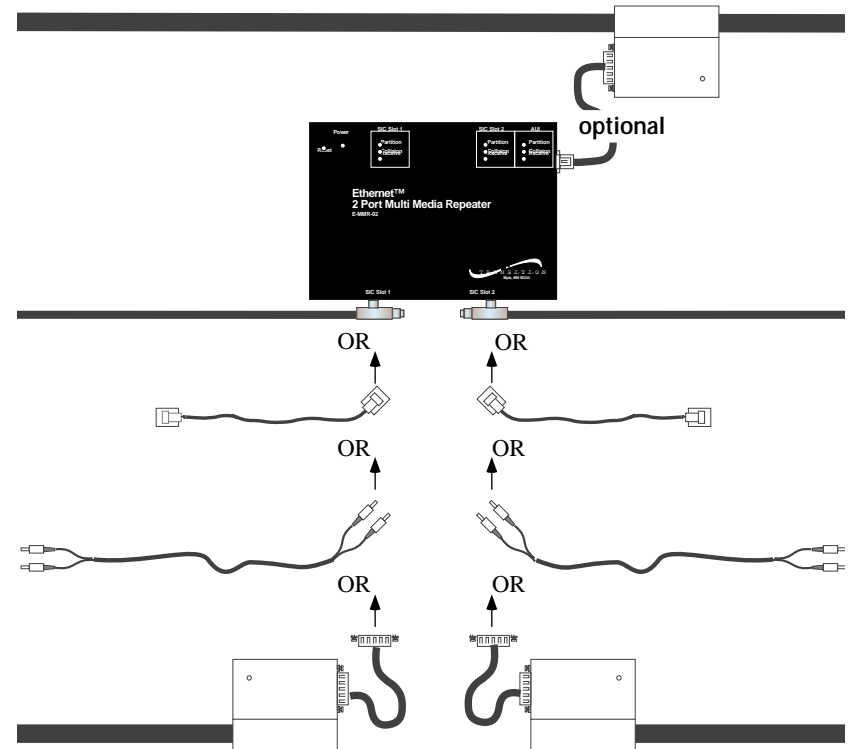
THIS IS THE EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY. IN NO EVENT SHALL TRANSITION NETWORKS BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, WHETHER FOR BREACH OF ANY CONDITION OF SALE, FOR NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, CONTRACT, OR OTHERWISE AND IRRESPECTIVE OF WHETHER TN IS INFORMED BY CUSTOMER OF THE POSSIBILITY OF SUCH DAMAGES IN ADVANCE OF THIS SALE.

Networking the Multi Media Repeater

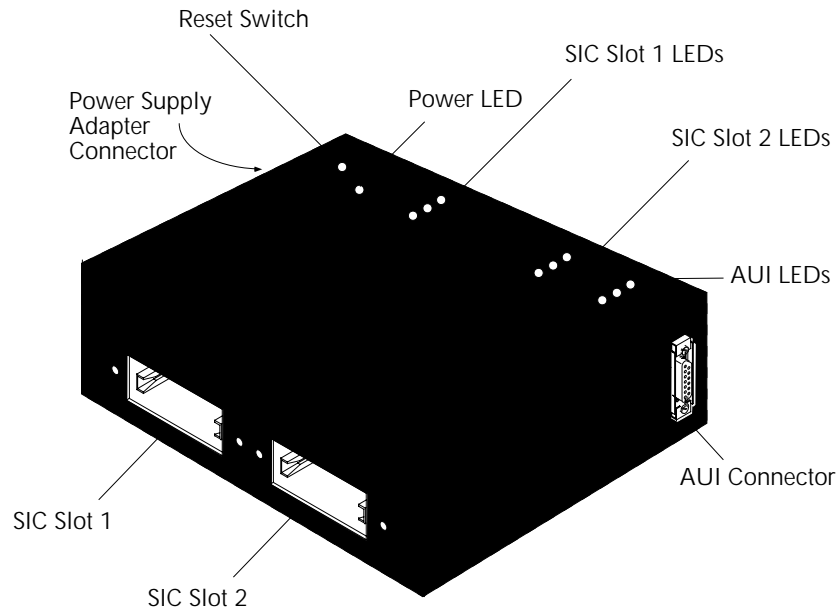
The Multi Media Repeater SIC slots can be used to connect two 10Base2 cables, extending the 10Base2 cable a distance of 200 meters (610 feet).



The SIC slots also can be used to connect two different media, selectable from among 10Base2, 10BaseT, 10BaseFL, and 10Base5, and the AUI connector can be used to attach to 10Base5 or, through a transceiver or media converter, to 10Base2, 10BaseT, or 10BaseFL.



Connectors, Switches and Status Indicators



Connectors

One (1) **AUI connector** is located on one side of the Multi Media Repeater. One (1) **power supply adapter** connector is located on the other side of the Multi Media Repeater.

NOTE: Slide-In cards (SICs), if installed, provide additional fiber optic, male and female AUI, BNC, and/or RJ-45 connectors

Reset Switch

The **Reset** switch reinitializes the Multi Media Repeater.

Status Indicators (LEDs)

The **Power** LED indicates the Multi Media Repeater connection to external power. One set of **Partition**, **Collision** and **Receive** LEDs indicate (for each port) the status of the Multi Media Repeater connections for each installed SIC and for the AUI.

5. MAINTENANCE

WARNING: DO NOT, UNDER ANY CIRCUMSTANCES, open and attempt to repair the Multi Media Repeater. Failure to observe this warning could result in personal injury or death from electrical shock.

NOTE: Failure to observe the above warning will immediately void the warranty.

Fault Isolation

If two network devices fail to communicate through the 0403 Pocket, consider the following:

- Are the LEDs described in the previous section functioning properly?
- Do network devices have Link Integrity enabled?
- Do network devices communicate when the Multi Media Repeater is not installed between them?
- Is flat or "silver satin" wire used in site internal wiring?
- Are internal wiring patch cords, punch down blocks, and wall jacks properly pinned or configured?
- Is the thinnet cable unbroken and properly connected?
- Are network interface cards properly configured?

Technical Support Contact

For assistance in fault isolation and in maintaining the Multi Media Repeater, contact:

Technical Support

(800) 260-1312

or your local distributor.

4. OPERATION

The Multi Media Repeater requires no intervention beyond occasionally monitoring the Power and Status LEDs.

Monitoring Power LED

The green **Power** LED is illuminated when the Multi Media Repeater is connected to power.

Monitoring Status LEDs

The **Partition** LED is illuminated when the Multi Media Repeater port registers thirty-one consecutive collisions.

The **Collision** LED is illuminated when the Multi Media Repeater port registers a collision.

The **Receive** LED is illuminated when the Multi Media Repeater port registers packets received.

2. SITE CONSIDERATIONS

The site for the Multi Media Repeater must provide:

- AC power outlet for each Multi Media Repeater
- Adequate ventilation
- Standard environmental conditions
- Isolation from electrical noise, including radio transmitters and broadband amplifiers, motors, high power electrical lines, or fluorescent light fixtures.

Additionally:

- The twisted pair cables should not run in the same conduit with power line cables,
- Phone lines should be separated from data cables,
- Flat or "silver satin" wires should not be used,
- RJ-45 connected cables should be configured as crossover or straight through according to installation requirements.

And:

- Since the Multi Media Repeater is an Ethernet repeater, the entire installation should comply with the IEEE Ethernet 802.3 specification.

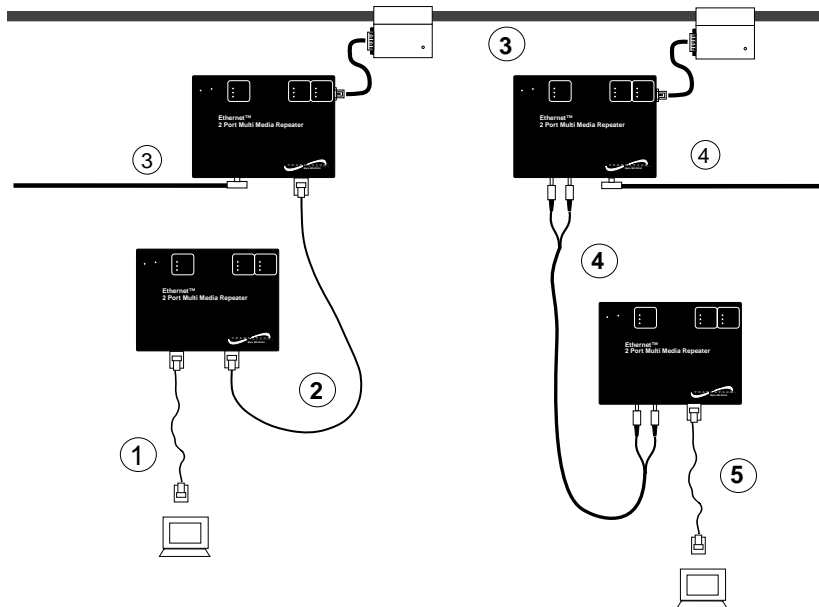
Ensuring Correct Segment Number

When connecting Pockets, the transmission path between any two Data Terminating Equipment (DTE) terminals can consist of no more than five segments. (A segment is the cable connection between cable interfaces in an Ethernet LAN.)

NOTE: Up to one-hundred 10Base5 connections can be made in one segment.

To assign segment numbers to cable connections:

1. Determine the two terminals in the network which are separated by the greatest number of segments.
2. Assign a segment path between the terminals by labeling the cable connected to one of the terminals "segment 1" and the segment connected to the other terminal "segment n" (n = total number of segments ≤ 5).
3. Verify that no segment paths contain more than n segments by assigning segment paths and numbers to all other terminals.



Connecting Power to Multi Media Repeater

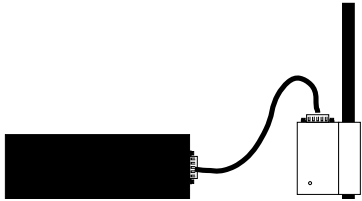
To power ON the Multi Media Repeater:

1. Locate the power receptacle on the back of the Multi Media Repeater.
2. Connect the Multi Media Repeater power connector end of the power supply adapter to the Multi Media Repeater.
3. Connect the external power connector end of the power supply adapter to external AC power.

NOTE: After the power supply adapter is connected to the Multi Media Repeater and to external power, the green **Power** LED is illuminated.

Male AUI Connector/PC Connection

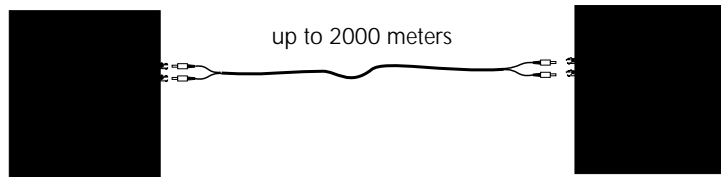
The male AUI card (E-AUI-DC-SIC) provides a male AUI connector for connection, through an AUI drop cable, to a 10Base5 port on a powered PC.



Fiber Optic Connector/10BaseFL Connection

The fiber optic card (E-FRL-SIC) provides one set of transmit (TX) and receive (RX) ST connectors to fiber optic cable.

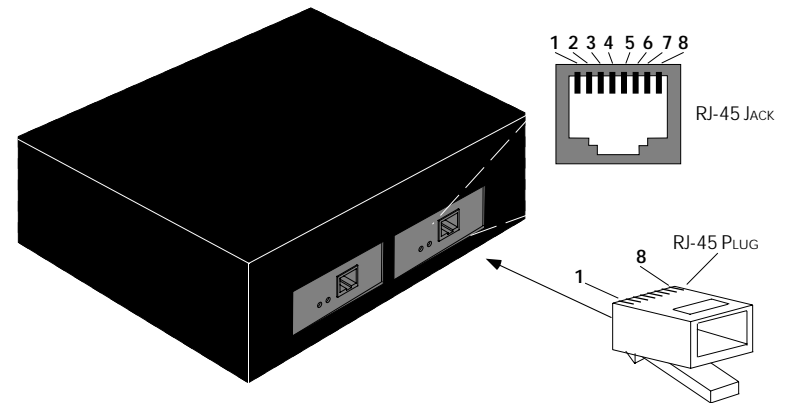
The redundant fiber optic card (E-FL/RED-SIC) provides a back-up fiber optic connection by using two sets of transmit (TX) and receive (RX) ST connectors to fiber optic cable.



Ensuring Correct 10BaseT Configuration

The 10BaseT cable and RJ-45 jacks for **Hub to Terminal** connections must be configured as **straight through**. The 10BaseT cable and RJ-45 jacks for **Hub to Hub** connections must be configured as **crossover**.

The two active pairs in a 10BaseT network are pins 1 & 2 and pins 3 & 6. Use only dedicated wire pairs (such as blue/white & white/blue, orange/white & white/orange) for the active pins.



Straight Through Cable at RJ-45 Plug

Hub	PC, transceiver, NIC, printer
RJ-45 Male	RJ-45 Male
1	1
2	2
3	3
6	6

Crossover Cable at RJ-45 Plug

Hub	Hub
RJ-45 Male	RJ-45 Male
1	3
2	6
3	1
6	2

3. INSTALLATION

To install the Multi Media Repeater:

- Unpack the Multi Media Repeater.
- Install Multi Media Repeater on flat surface.
- Optionally install Slide In Cards.
- Connect Cable to SIC connectors and/or AUI connector.
- Connect Multi Media Repeater to power.

Direction is provided in the pages that follow.

Unpacking the Multi Media Repeater

The Multi Media Repeater packing contents should include the following:

Item	Part Number
Multi Media Repeater Hub	E-MMR-2
Power Supply Adapter	3500, 3501, 3506, 3508, or 3510 (depending upon power configuration in country where installed)
User's Guide	7346

In addition, any of the following optional SICs may be included:

Item	Part Number
Thinnet Coaxial	E-CX-SIC
Fiber Optic	E-FRL-SIC
Twisted Pair	E-TBT-SIC
Female AUI	E-AUI-DT-SIC
Male AUI	E-AUI-DC-SIC
Bridge	E-BR-SIC
Redundant Fiber Optic	E-FL/RED-SIC

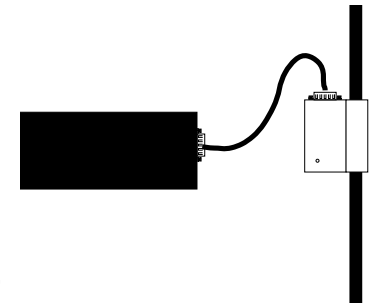
Female AUI Connector/10Base5, Transceiver Connection

The female AUI card (E-AUI-DT-SIC) provides a female AUI connector for connection to 10Base5 through an AUI drop cable or to 10Base2, 10BaseT, or 10BaseFL through a transceiver. NOTE: The bridge card (E-BR-SIC) also provides a female AUI connector.

Connecting 10Base5 Using AUI Drop Cable

To connect 10Base5 Cable to 8-Port 10BaseT female AUI connector:

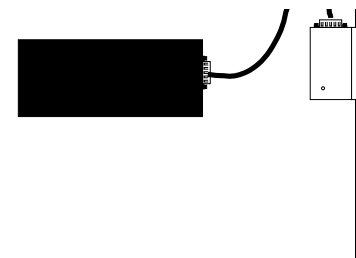
1. Locate or build IEEE 802.3 compliant AUI drop cable.
2. Connect AUI drop cable male DB-15 connector to the 8-Port 10BaseT AUI connector.
3. Connect AUI drop cable female DB-15 connector to the AUI port on a transceiver or media attachment unit (MAU).



Connecting to Network Using Transceiver

To connect 8-Port 10BaseT to network using transceiver:

1. Locate IEEE 802.3 compliant transceiver with male AUI DB-15 connector and correct network media connector.
2. Connect transceiver male AUI DB-15 connector to the 8-Port 10BaseT female AUI connector.
3. Connect transceiver network media connector to the network media.

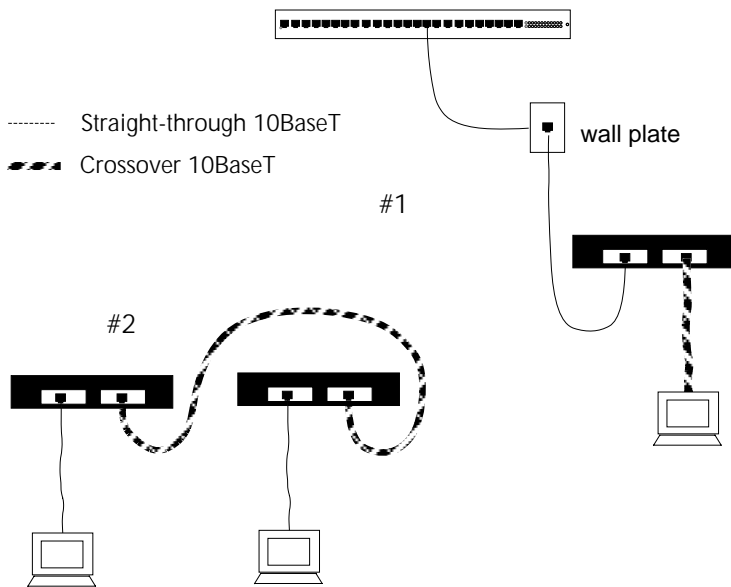


Twisted Pair Connector/10BaseT Connection

The twisted pair card (E-TBT-SIC) provides an RJ-45 connector to 10BaseT.

To connect 10BaseT Cable to Multi Media Repeater RJ-45 connectors:

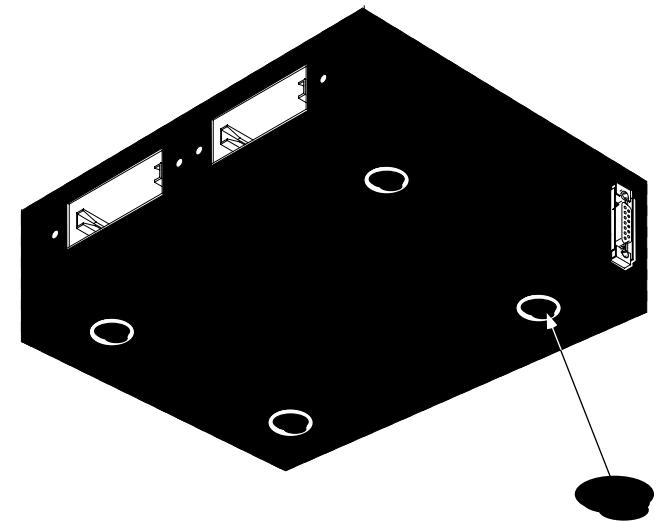
1. Locate or build 10BaseT cables with the following characteristics:
 - 802.3 compliant (See page 18)
 - correct (**straight through** or **crossover**) cable configuration for site installation (See page 7)
 - male RJ-45 plug connectors installed at both ends of cable.
2. Connect male RJ-45 plug connector at one end of 10BaseT cable to Multi Media Repeater RJ-45 jack connector.
3. Connect male RJ-45 plug connector at other end of 10BaseT cable to DTE terminal RJ-45 jack connector (using **crossover** cable orientation) or to RJ-45 jack connector (using **straight through** cable orientation).



Installing Multi Media Repeater on Flat Surface

To install the Multi Media Repeater on table, shelf, or other flat surface:

1. Carefully turn Multi Media Repeater to side.
2. Install four (4) rubber feet:
 - Remove protective paper from adhesive surface of rubber foot.



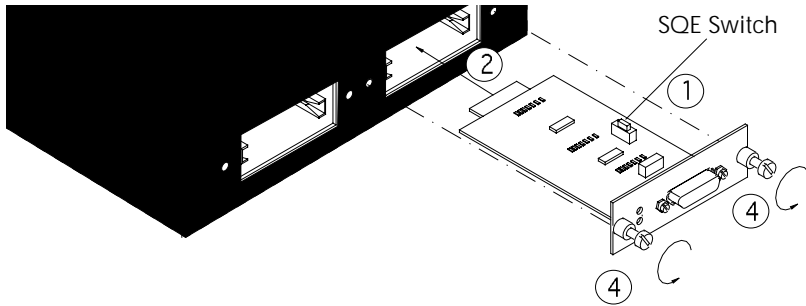
- Position rubber foot at bottom corner of Multi Media Repeater.
 - Secure rubber foot to Multi Media Repeater surface.
 - Repeat for remaining rubber feet.
3. Return Multi Media Repeater to upright position.

Installing Slide-In Cards

CAUTION: Wear a grounding device and observe electrostatic discharge precautions when installing Slide-In Cards. Failure to observe this caution could result in circuit board failure.

NOTE: Slide-in Cards can be hot-swapped.

To install a Slide-In Card:



1. Determine if the Slide-In Card has an SQE switch and, if so, verify that the SQE switch is in the OFF position:

NOTE: SQE switches must be set to the following OFF positions:

- | | |
|-------------------------|--|
| • UTP/STP card | TOWARD 20-pin edge connector |
| • Thinnet card | TOWARD 20-pin edge connector |
| • AUI-DCE | AWAY FROM 20-pin edge connector |
| • AUI-DTE card | Not Applicable |
| • Fiber Optic card | TOWARD 20-pin edge connector |
| • Redundant Fiber Optic | SQE jumper setting on board should be labeled; if not, holding card with 20-pin edge connector at top, jumper two leftmost pins. |
| • Bridge | Not Applicable |
2. With the Slide-In Card components facing up, carefully guide the Slide-In Card along the card guides until the Slide-In Card connector meets the Multi Media Repeater backplane.
 3. Firmly push the card into the slot until the Slide-In Card faceplate is flat against the Multi Media Repeater frame.
 4. Rotate the Slide-In Card thumbscrews into the Multi Media Repeater threaded holes.

Connecting Cable to SIC and/or AUI Connector

Connections between installed Multi Media Repeater SICs or between a Multi Media Repeater SIC and/or terminal device include:

- Female AUI Connector/10Base5
- Male AUI Connector/PC
- RJ Connector/10BaseT
- BNC Connector/10Base2
- ST Connector/Fiber Optic

BNC Connector/10Base2 Connection

The thinnet coaxial card (E-CX-SIC) provides a BNC connector to 10Base2.

NOTE: Verify that coax cables on Multi Media Repeater are terminated properly at both ends. (In a coax thinnet installation, the first and last device in a daisy-chain must be terminated with a 50 ohm terminator.)

Additionally, the 10Base2 segment must be grounded to "earth ground".

