

Allied Telesyn International

CentreCOM®

AT-MR415T

AT-MR815T

Multiport 10Base-T Micro Repeaters

Installation Guide

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Electrical Safety and Installation Requirements

U.S. Federal Communications Commission

DECLARATION OF CONFORMITY

Manufacturers Name: Allied Telesyn International
Manufacturers Address: 950 Kifer Road
Sunnyvale, CA 94086 USA

Manufacturers Telephone: 408-730-0950
Declares that the product: Multiport Ethernet Hub unit
Model Numbers: AT-MR415T and AT-MR815T

Complies with FCC Part 15B, Class B Limits:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device must not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

RADIATED ENERGY

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment, generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with instructions, may cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encourage to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.

Canadian Department of Communications

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Electrical Safety and Installation Requirements



STANDARDS: This product meets the following standards

RFI Emission EN55022 Class B

Immunity EN50082-1



SAFETY

Power to the hub must be sourced only from the adapter.

AUSTRALIA

Use a safety approved AC adapter of DC 7.5V to 12V, min 500mA

EUROPE - EC

Use TÜV licensed AC adapter of DC 7.5V, 500mA.

USA/CANADA

Use a UL Listed/CSA Certified AC adapter of DC 7.5V, 500mA.



LIGHTNING DANGER

DANGER: DO NOT WORK on equipment or CABLES during periods of LIGHTNING ACTIVITY.

Do not connect a telephone line into the signal connector.

OPERATING TEMPERATURE

This product is designed for a maximum ambient temperature of 40 degrees C.

ALL COUNTRIES: Install product in accordance with local and National Electrical Codes.



NORMEN: Dieses Produkt erfüllt die Anforderungen der nachfolgenden Normen.

Hochfrequenzstörung EN55022 Klasse B

Störsicherheit EN50082-1



SICHERHEIT

Der Buchse darf nur aus dem Adapter Strom zugeführt werden.

EUROPE - EC

Gebrauchen Sie einen von TÜV zugelassenen Wechselstromadapter für Gleichstrom 7,5 V, 500 mA



GEFAHR DURCH BLITZSCHLAG

GEFAHR: Keine Arbeiten am Gerät oder an den Kabeln während eines Gewitters ausführen

Verbinden Sie nicht das Telefonkabel mit dem Signalverbindungsstecker.

BETRIEBSTEMPERATUR

Dieses Produkt wurde für den Betrieb in einer Umgebungstemperatur von nicht mehr als 40° C entworfen.

ALLE LÄNDER: Installation muß örtlichen und nationalen elektrischen Vorschriften entsprechen.



Radiofrekvens forstyrrelsesemission EN55022 Klasse B

Immunitet EN50082-1

**SIKKERHED**

Strømforsyningen til apparatet må udelukkende tages fra tilpasningstransformatoren.

EUROPE - EC

Brug kun TÜV godkendt vekselstrømstransformator på 7.5 V jævnstrøm, 500 mA.

**FARE UNDER UVEJR**

FARE: UNDLAD at arbejde på udstyr eller KABLER i perioder med LYNAKTIVITET.

Tilslut ikke telefonledninger til signalstikforbindelsen.

BETJENINGSTEMPERATUR

Dette apparat er konstrueret til en omgivende temperatur på maksimum 40 grader C.

ALLE LANDE: Installation af produktet skal ske i overensstemmelse med lokal og national lovgivning for elektriske installationer.



RFI Emissie EN55022 Klasse B

Immunitet EN50082-1

**VEILIGHEID**

Stroom mag alleen via de adapter naar het apparaat toegevoerd worden.

EUROPE - EC

Gebruik een door TÜV gekeurde wisselstroomadapter van 7,5 Volt gelijkstroom, 500 milliampères

**GEVAAR VOOR BLIKSEMINSLAG**

GEVAAR: NIET aan toestellen of KABELS WERKEN bij BLIKSEM.

Sluit geen telefoonlijn aan op de signaalverbinding.

BEDRIJFSTEMPERATUUR

De omgevingstemperatuur voor dit produkt mag niet meer bedragen dan 40 graden Celsius.

ALLE LANDEN: het toestel installeren overeenkomstig de lokale en nationale elektrische voorschriften.



NORMES: ce produit est conforme aux normes de suivantes:

Emission d'interférences radioélectriques EN55022 Classe B

Immunité EN50082 - 1

**SÉCURITÉ**

L'alimentation du concentrateur doit être uniquement fournie par l'adaptateur.

EUROPE - EC

Utiliser un adaptateur secteur conforme TÜV de 7,5 V, 500 mA en courant continu.

**DANGER DE FOUDRE**

DANGER: NE PAS MANIER le matériel ou les CÂBLES lors d'activité orageuse.

Ne pas connecter une ligne téléphonique au connecteur de signaux.

TEMPÉRATURE DE FONCTIONNEMENT

Ce matériel est capable de tolérer une température ambiante maximum de 40 degrés Celsius.

POUR TOUS PAYS : Installer le matériel conformément aux normes électriques nationales et locales.



Radioaaltojen häirintä

EN55022 Luokka B

Kestävyys

EN50082-1



TURVALLISUUS

Tähtipisteeseen (hub) syötettävän virran pitää tulla ainoastaan sovittimesta.

EUROPE - EC

Käytä TÜV-lisensillä valmistettua verkkosovittinta, jonka tasajännitteen nimellisarvot ovat DC 7,5 V, 500 mA (milliampeeria).



SALAMANISKUVAARA

HENGENVAARA: ÄLÄ TYÖSKENTELE laitteiden tai KAAPELEIDEN KANSSA SALAMOINNIN AIKANA.

Älä liitä puhelinlinjaa signaalin liittimeen.

KÄYTTÖLÄMPÖTILA

Tämä tuote on suunniteltu ympäröivän ilman maksimilämpötilalle 40°C.

KAIKKI MAAT: Asenna tuote paikallisten ja kansallisten sähköturvallisuusmääräysten mukaisesti.



Emissione RFI (interferenza di radiofrequenza) EN55022 Classe B

Immunità

EN50082-1



NORME DI SICUREZZA

Questo dispositivo deve essere alimentato solo mediante l'adattatore.

EUROPE - EC

Utilizzare l'adattatore per c.a. da 7,5 V c.c. e 500 mA conforme alla normativa TÜV.



PERICOLO DI FULMINI

PERICOLO: NON LAVORARE sul dispositivo o sui CAVI durante PRECIPITAZIONI TEMPORALESCHIE.

Non collegare una linea telefonica al connettore del segnale.

TEMPERATURA DI FUNZIONAMENTO

Questo prodotto è concepito per una temperatura ambientale massima di 40 gradi centigradi.

TUTTI I PAESI: installare il prodotto in conformità delle vigenti normative elettriche nazionali.



RFI stråling

EN55022 Klasse B

Immunitet

EN50082-1



SIKKERHET

All strømtilførsel må komme fra adapteren.

EUROPE - EC

Benytt TÜV-godkjent AC-adapter på 7,5V DC, 500mA (milliamperer).



FARE FOR LYNNEDSLAG

FARE: ARBEID IKKE på utstyr eller KABLER i TORDENVER.

Telefonlinje må ikke koples til signalkontakten.

DRIFTSTEMPERATUR

Dette produktet er konstruert for bruk i maksimum romtemperatur på 40 grader celsius.

ALLE LAND: Produktet må installeres i samsvar med de lokale og nasjonale elektriske koder.



Emissão de interferência de radiofrequência EN55022 Classe B

Imunidade EN50082-1



SEGURANÇA

Use somente o adaptador fornecido para alimentação elétrica do hub.

EUROPE - EC

Use um adaptador de corrente alternada com saída DC de 7,5V e 500mA em conformidade com as especificações da TÜV.



PERIGO DE CHOQUE CAUSADO POR RAIOS

PERIGO: NÃO TRABALHE no equipamento ou nos CABOS durante períodos suscetíveis a QUEDAS DE RAIOS.

Não conecte uma linha telefônica ao conector de sinal.

TEMPERATURA DE FUNCIONAMENTO

Este produto foi projetado para uma temperatura ambiente máxima de 40 graus centígrados.

TODOS OS PAÍSES: Instale o produto de acordo com as normas nacionais e locais para instalações elétricas.



Emisión RFI EN55022 Clase B

Inmunidad EN50082-1



SEGURIDAD

La energía para el dispositivo central o "hub" debe provenir únicamente del adaptador.

EUROPE - EC

Utilizar un adaptador de corriente alterna autorizado TÜV de 7,5 voltios de corriente continua y 500 miliamperios.



PELIGRO DE RAYOS

PELIGRO: NO REALICE NINGUN TIPO DE TRABAJO O CONEXION en los equipos o en LOS CABLES durante TORMENTAS ELECTRICAS.

No conectar ninguna línea telefónica al conector de señales.

TEMPERATURA REQUERIDA PARA LA OPERACIÓN

Este producto está diseñado para una temperatura ambiental máxima de 40 grados C.

PARA TODOS LOS PAÍSES: Monte el producto de acuerdo con los Códigos Eléctricos locales y nacionales.



Radiostörning EN55022 Klass B

Immunitet EN50082-1



SÄKERHET

Endast anslutningsenheten får vara kraftkälla till centralen.

EUROPE - EC

Använd en växelströmsanslutningsenhet licensierad av TÜV. Likström 7,5V, 500mA.



FARA FÖR BLIXTNEDSLAG

FARA: ARBETA EJ på utrustningen eller kablarna vid ÅSKVÄDER.

Koppla inte telefonledning till signalkontakten.

DRIFTSTEMPERATUR

Denna produkt är konstruerad för rumstemperatur ej överstigande 40 grader Celsius.

ALLA LÄNDER: Installera produkten i enlighet med lokala och statliga bestämmelser för elektrisk utrustning.

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Chapter 1

Product Description

Overview

Welcome to Allied Telesyn International!

Allied Telesyn's *AT-MR415T/AT-MR815T Micro Repeaters* represent a compact, inexpensive solution for Local Area Network (LAN) applications.

AT-MR415T/AT-MR815T Micro Repeaters combine 10 Mbps of 10Base-T Ethernet connectivity with the same features and functionality of larger, more expensive repeaters. At the same time, they support full-length cable segments with the maximum number of supported devices allowed within IEEE standards.

While identical in structure, the *AT-MR415T Micro Repeater* differs from the *AT-MR815T Micro Repeater* in that the former has four (4) Unshielded Twisted Pair (UTP) ports whereas the latter has eight (8).

Features

Each AT-MR415T/AT-MR815T Micro Repeater:

- Is IEEE 802.3 compliant
- Is 10Base-T and Ethernet Version 1.0 and 2.0 compatible
- Has automatic packet regeneration, detection and correction
- Supports automatic port disconnect/connect (auto partitioning)
- Has test link capabilities
- Contains auto partitioning and jabber lock-up protection
- Has status and diagnostic LEDs
- Supports a 10Base-T uplink port and a MDI/MDI-X switch for network cascading
- Can be placed with other hubs in an optional standing chassis

Package Contents

The parts included with this product are listed below. Please check the equipment you received to make sure you have everything. Note that a correction or addendum may be included in the package.

- An AT-MR415T or AT-MR815T Micro Repeater
- One direct plug in type approved adapter rated 7.5Vdc, 500mA
- Customer Information and Registration Card
- Product Warranty Booklet
- Four (4) Rubber feet for desktop placement

Latest Technologies

ASIC/SMT

AT-MR415T/AT-MR815T Micro Repeaters have incorporated the latest technologies, including custom Application Specific Integrated Circuit (ASIC) and Surface Mount Technology (SMT). This results in enhanced functionality, increased reliability and improved performance.

Packet Regeneration

Packet regeneration is a high-performance network feature that includes packet preamble regeneration, retiming of data packets and the extension of collision fragments.

Link Integrity

The IEEE 802.3 defined link integrity test function continually monitors the twisted pair cable to ensure link continuity of the receive pair between the user node and the repeater.

Auto Partitioning

Also known as segmentation, each network segment will be automatically partitioned whenever 32 consecutive collisions are seen on the segment. A single valid packet will reset the segment and return it to an auto reconnecting state.

Jabber Lock-up Protection

Jabber lock-up protects the repeater from being overrun with data packets. It does this by isolating those segments with transmitted packets that exceed the maximum packet length. That is, jabber lock-up automatically prevents transmitted data from reaching the repeater if the transmitted data time exceeds a specified duration (usually 5 ms).

AT-MR415T

Figure 1 shows the front panel of an AT-MR415T.

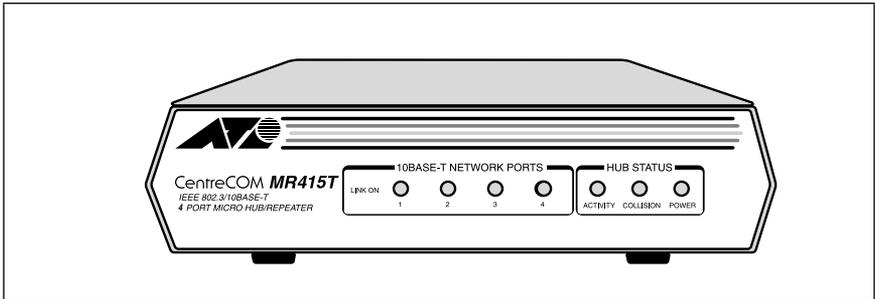


Figure 1: AT-MR415T Front Panel

Light Emitting Diodes (LEDs)

Four Link LEDs show the connectivity of each network port. Three additional LEDs indicate Activity, Collision and Power for the repeater itself.

Note that LEDs will not reflect real-time activity since a data packet is too fast for the human eye to distinguish. therefore the repeater artificially stretches the LED “on” time for easier observation.

❑ LINK ON lamp (green)

- There is a green LINK ON LED for each 10Base-T port. This LED is lighted when the twisted pair cable for the corresponding 10Base-T port is properly connected, the port has established a valid link, and the automatic port connect/disconnect function has been enabled.

In other words, the LED is lighted anytime a valid communications link has been established for the corresponding port. If the LED is not lighted, check the twisted pair cable to ensure a proper port connection has been made.

- ❑ **ACTIVITY lamp (green)**
 - This LED is lighted when packets are being sent or received through the repeater.
- ❑ **COLLISION lamp (amber)**
 - The COLLISION LED will flicker to indicate a collision. While occasional collisions are normal in Ethernet networks, a constantly illuminated COLLISION LED may indicate that there is a port with excessive traffic problems.
 - Continual flickering of the COLLISION LED may also indicate excessive frame collisions on a segment. This may be caused by an overloaded segment, a faulty cable, or a bad connection.
 - If this LED is lighted for an extended period of time, it is possible that there is a problem with the transceiver or cable.
- ❑ **POWER lamp (green)**
 - This LED lights when power is being received by the repeater from the AC to DC adapter.

Figure 2 shows the back panel of an AT-MR415T.

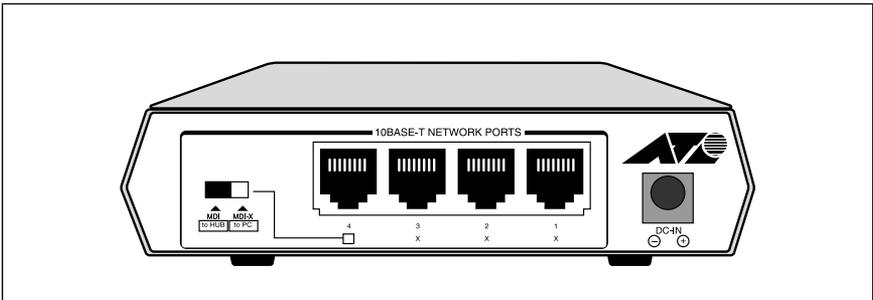


Figure 2: AT-MR415T Back Panel

Four UTP RJ45 network ports (including Port 4, an uplink port) are located on the back panel. It also shows the Direct Current (DC) power receptacle which is used in conjunction with the TUV-licensed Alternating Current (AC) adapter which is provided.

❑ MDI MDI-X Toggle Switch

- This switch allows you to set the cascade port (the port directly to the right of this switch). This cascade port, in turn, can be used to either connect to another repeater or as a normal 10Base-T port. The switch positions are as follows:

MDI (left position). This port can now be used to cascade to another repeater.

MDI-X (right position). Use this port as a normal 10Base-T port.

❑ 10Base-T Connector

- There is one 10Base-T connector for each port on the unit. Connect 10Base-T cables (twisted pair cable, UTP) into the desired RJ-45 ports.

❑ DC Power Jack

- This connector is used to provide power to the unit using the AC adapter.

AT-MR815T

Figure 3 shows the front panel of an AT-MR815T.

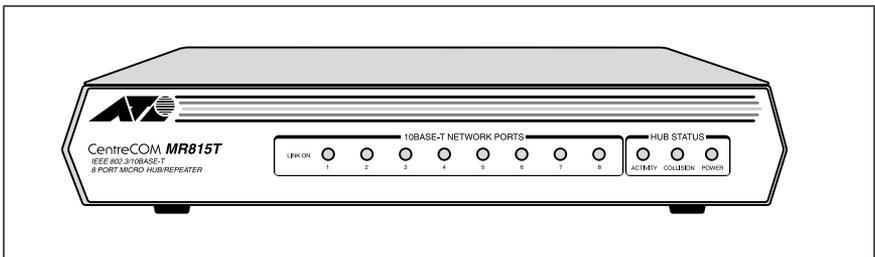


Figure 3: AT-MR815T Front Panel

Light Emitting Diodes (LEDs)

Eight LINK LEDs show the connectivity of each network port. Three additional LEDs indicate Activity, Collision and Power for the repeater itself.

❑ LINK ON lamp (green)

- There is a green LED for each 10Base-T port. This LED is lighted when the twisted pair cable for the corresponding 10Base-T port is properly connected, the port has established a valid link and the automatic port connect/disconnect function has been enabled.

In other words, the LED is lighted anytime a valid communications link has been established for the corresponding port. If the LED is not lighted, check the twisted pair cable to ensure a proper port connection has been made.

- ❑ **ACTIVITY lamp (green)**
 - This LED is lighted when packets are being sent or received through the repeater.
- ❑ **COLLISION lamp (amber)**
 - The COLLISION LED will flicker to indicate a collision. While occasional collisions are normal in Ethernet networks, a constantly illuminated COLLISION LED may indicate that there is a port with excessive traffic problems.
 - Continual flickering of the COLLISION LED may also indicate excessive frame collisions on a segment. This may be caused by an overloaded segment, a faulty cable, or a bad connection.
 - If this LED is lighted for an extended period of time, it is possible that there is a problem with the transceiver or cable.
- ❑ **POWER lamp (green)**
 - This LED lights when power is being received by the repeater from the AC to DC adapter.

Figure 4 shows the back panel of an AT-MR815T.

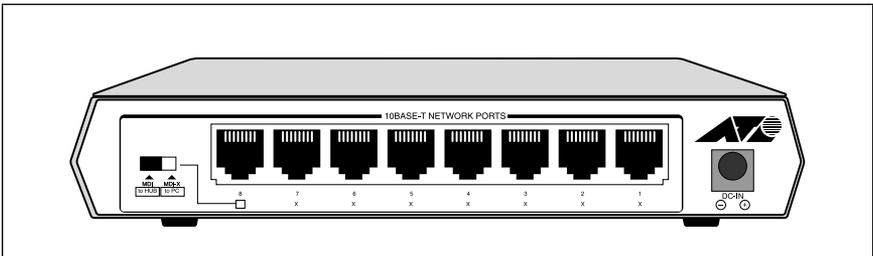


Figure 4: AT-MR815T back Panel

On the back panel are eight UTP RJ45 network ports (including Port 8, an uplink port). It also shows the Direct Current (DC) power receptacle which is used in conjunction with the TUV-licensed Alternating Current (AC) adapter which is provided.

❑ MDI MDI-X Toggle Switch

- This switch allows you to set the cascade port (the port directly to the right of this switch). The cascade port, in turn, can be used to either connect to another repeater or as a normal 10Base-T port. The switch positions are as follows:

MDI (left position). This port can now be used to cascade to another repeater

MDI-X (right position). Use this port as a normal 10Base-T port

❑ 10Base-T Connector

- There is one 10Base-T connector for each port on the unit. Connect 10Base-T cables (twisted pair cable, UTP) into the desired RJ-45 ports.

❑ Power Jack

- This connector is used to provide power to the unit using the direct plug in type approved adapter rated 7.5Vdc, 500mA.

Chapter 2

Installation

Site Requirements

Ventilation

AT-MR415T/AT-MR815T Micro Repeaters have openings on both sides for ventilation. Although these Micro Repeaters do not require an internal fan to aid in cooling, adequate ventilation is required. Ensure that the ventilation openings located on the sides of the chassis are never blocked.

Note

Maximum ambient temperature is 104° F (40° C).

Power

Be sure that the voltage and frequency to the AC adapter is compatible with the country of use and, therefore, the power provided. Since there is no external power switch, power is applied when the power cord from the AC adapter is connected to the DC receptacle of your repeater.

Note

Power to the hub must be sourced only from adapter in the package or direct plug in type approved adapter rated 7.5Vdc, 500mA.

Table 1 shows the model variations and different power arrangements for *AT-MR415T/AT-MR815T Micro Repeaters*

Table 1: Model Configurations

Model	Location	Voltage
AT-MR415T-10	North America	90/120 VAC
AT-MR815T-10	North America	90/120 VAC
AT-MR415T-20	Europe/Asia	200/240 VAC
AT-MR815T-20	Europe/Asia	200/240 VAC
AT-MR415T-30	United Kingdom	200/240 VAC
AT-MR815T-30	United Kingdom	200/240 VAC

UTP (RJ-45) Connectivity

A UTP cable with RJ-45 connectors is shown in Figure 5. For a 10Base-T link between a repeater and a Medium Attachment Unit (MAU) or Network Interface Controller (NIC), the cable is wired straight through.

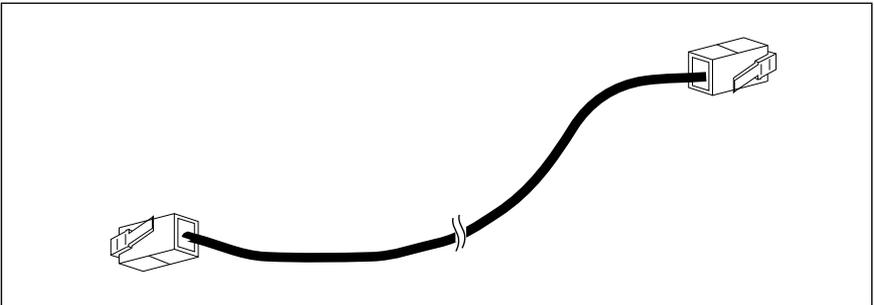


Figure 5: RJ-45 Connector

10Base-T UTP cables can be up to 100 meters (328 ft.) in length. The cable should be 22 to 26 AWG UTP wire with 100 Ω impedance. The *AT-MR415T/AT-MR815T Micro Repeater* uses RJ-45 modular connectors for 10Base-T connections.

Note

Do not connect standard telephone line into a signal connector.

10Base-T Cable

The *AT-MR415T/AT-MR815T Micro Repeater* supports full-length, fully repeated transmission and maximum node attachments which, for the UTP link, enables transmissions up to 100 meters (328 ft.).

A serious problem exists concerning identification of modular cable. There are various grades of voice-quality and data-quality cables available. These can appear to be similar, but their high-speed data transmission characteristics are radically different.

One reason for the identification problem the fact that some suppliers have sold purportedly data-quality cables manufactured with voice-quality cabling.

Data movement will be slow, collision-prone or even non-existent, if voice-quality cable is used in a 10Base-T network system. To confuse the issue even further, the LINK LED indicators on the front panel will usually indicate a valid link in such a case.

For the foregoing reasons, it is vital that all cabling used with 10Base-T connections is of Level 3, 4, or 5. In most cases, if a cable type is flat, it is typically not twisted and can cause problems. Generally, cable that is more or less round in section, gives better results.

The five common modular cable specifications and their applicability to 10Base-T network use are shown in Table 2.

Table 2: Twisted Pair Cable

Cable Level	Cable Description	AC Character	Specification	Twist/ Foot	10Base-T OK?
1	Unshielded Untwisted	N/A	CCITT	None	NO!
2	Individual UTP	100 Ω \pm 30 Ω	RS232 1BASE5 AT&T PDS	None	NO!
3	Typical Individual UTP	100 Ω \pm 15 Ω	T1, AT&T ISDN 10Base-T IBM Type 3	3-5	YES
4	Enhanced Individual UTP	100 Ω \pm 30 Ω	EIA, TIA 10Base-T NEMA	5-8	YES
5	Individual STP	100 Ω \pm 30 Ω	EIA, TIA 10Base-T	8-10	YES

Hub to MAU Wiring. The most typical UTP cable for the *AT-MR415T/AT-MR815T Micro Repeater* will be UTP Hub-to-UTP transceiver Data Terminal Equipment (DTE).

To configure your own cables, see Appendix A, “Technical Specifications” on page 23.

Quick Installation

If you are experienced with electronic networks in general and repeaters in particular, use the following procedure. If you are not certain, or would like to review the installation process, read this list and go on to the next section.

1. Carefully unpack your *AT-MR415T/AT-MR815T Micro Repeater*. Keep the packing materials until you have successfully installed the product.
2. Place the *AT-MR415T/AT-MR815T Micro Repeater* in a location with adequate ventilation and power receptacles.
3. Attach the power cable from your AC adapter into the DC-IN port which is located on the back panel.

Note

Power to the hub must be sourced only from the direct plug in type approved adapter rated 7.5Vdc, 500mA.

4. Apply power to the AC adapter by plugging it into an appropriate AC source.
5. Attach your 10Base-T UTP cables, with RJ-45 connectors attached, to the 10Base-T ports. If the UPLINK port is not used for cascading, you may connect a standard 10Base-T cable to port 4/8.

Note

Do not connect standard telephone line into the signal connector.

10Base-T Network Specifications

Table 3 provides an overview of the IEEE 802.3 specifications for 10Base-T network configurations using twisted-pair wiring.

Table 3: IEEE 802.3 Network Specifications

	10Base-T
Media	Unshielded Twisted Pair
Topology	Star, Tree
External Devices	Network Adapter Card
Maximum Segment Length	100 meters (328 ft.)
Maximum Devices per Segment	12
Maximum Devices per Network	1024

System Check

1. Check the LINK ON LED on the front panel for the first 10Base-T port that is connected. A steady green LED indicates continuity. A valid network connection is made from the connected port to a host or workstation on another port.
2. After a successful connection, disconnect the active 10Base-T connector and connect it to the next successive port. Continue this process until all 10Base-T ports have been validated with good network connections.
3. Establish a connection from a device connected to port 1 to a device connected to port 2.
4. Once the connection between devices attached to ports 1 and 2 has been successfully established, remove the RJ-45 connector from port 2 and connect it to each of the subsequent 10Base-T ports, 3 through 4 (or 2 through 8), to verify their functionality.
5. If all ports test successfully, install the rest of the 10Base-T RJ-45 connections and ensure that the LINK LED for each port is illuminated. Remember, the 10Base-T device on the opposite end of the UTP cable must be operational.

Note

The LINK LED validates the receive pair only. The opposite end of the UTP segment is responsible for validating the transmit pair.

Standalone Placement of the MR415T/MR815T

Both the MR415T and the MR815T can be standalone mounted.

When placing the unit horizontally, such as on top of a desk, use the rubber feet.

Attach the four rubber feet provided with the unit to the underside of the device in the four corners.

Figure 6 shows how the rubber feet are attached to an AT-MR415T.

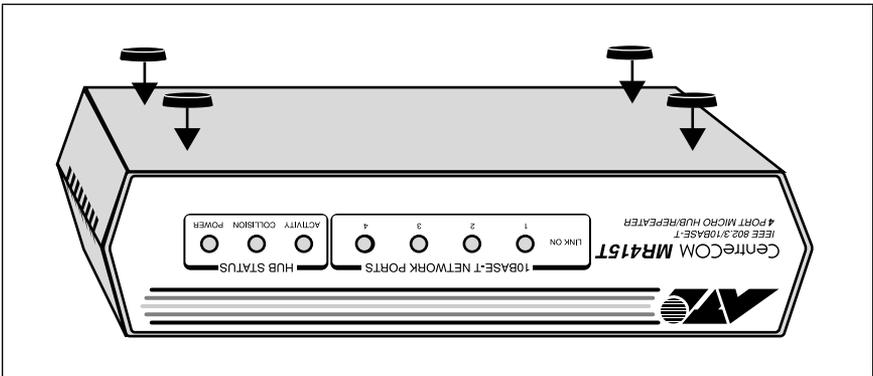


Figure 6: AT-MR415T Horizontal Mounting

Connecting to a Network

1. Remove all equipment from the box. Store the box and packing materials in a safe place in case the unit needs to be transferred in the future. It is desirable to pack all equipment carefully in the box it was originally shipped in.
2. Place the DC plug of the AC adapter into the DC Power Jack on the back of the unit.

————— Note —————

Power to the hub must be sourced only from adapter in the package or direct plug in type approved adapter rated 7.5Vdc, 500mA.

3. Plug the AC adapter plug into an electrical output of the appropriate power. Check the front of the unit to make sure the green POWER lamp is lit.

4. Plug all 10Base-T cables into the 10Base-T network ports (connectors) on the back of the unit. When connecting to the port directly to the right of the MDI MDI-X toggle switch, make sure the switch is set to MDI-X (right position) to use the port as a normal network connection. *See step 6 below for instructions on cascading two HUBs.*
5. Plug the opposite end of the 10Base-T cables into the network computers.
6. Perform the following to cascade two *AT-MR415T/AT-MR815T Micro Repeaters* together:

Port 4 of the AT-MR415T and port 8 of the AT-MR815T are designed to allow HUBs to be cascaded together (cascade port). To cascade an *AT-MR415T/AT-MR815T Micro Repeater* with an existing device, select MDI using the MDI MDI-X toggle switch and connect this port to any normal network port of the existing HUB using a straight twisted pair cable. Only select MDI on the HUB when using the cascade port to connect to another HUB.

Note

When cascading two HUBs together, be sure to provide a cascade port on one HUB and a normal UTP port on the other. This is done by selecting MDI-X on the HUB using the cascade port.

It is also possible to cascade an *AT-MR415T/AT-MR815T Micro Repeater* to another HUB using the 10Base-T port of the other HUB and a crossover twisted pair cable.

Note

It is difficult to distinguish between a straight twisted pair cable and a crossover twisted pair cable by visual inspection. When using both types of twisted pair cable, it is necessary to keep track of which cables are of which type. To avoid confusion, it is recommended that you avoid the use of crossover twisted pair cable.

The Four-Repeater Rule. The IEEE 802.3 standard provides general rules for 10Base-T cable length and network connections on single segments of cable or on point-to-point links with media attenuation and signal propagation delays. The basic rule is that, for any network, the maximum number of repeaters in the data path between any two nodes cannot exceed four.

Examples of Network Connections

A Local Area Network can be constructed as shown in Figure 7.

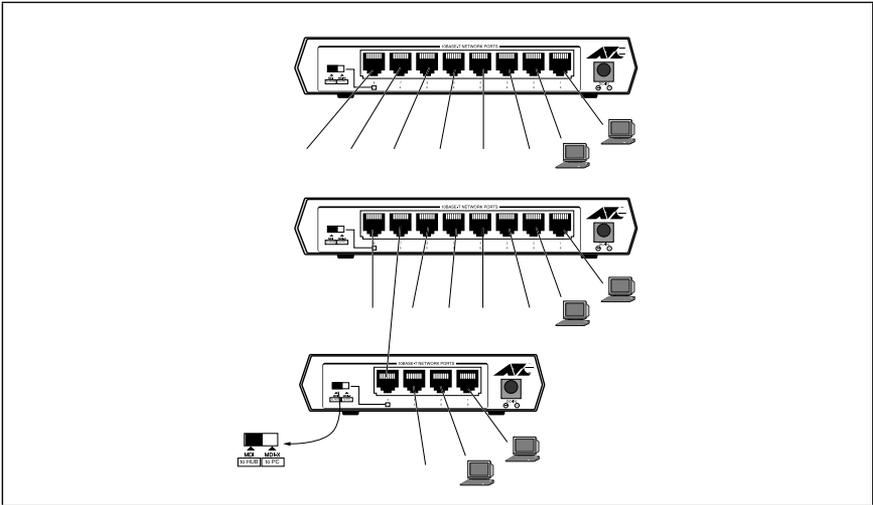


Figure 7: LAN Connectivity

A Local Area Network can be expanded as shown Figure 8.

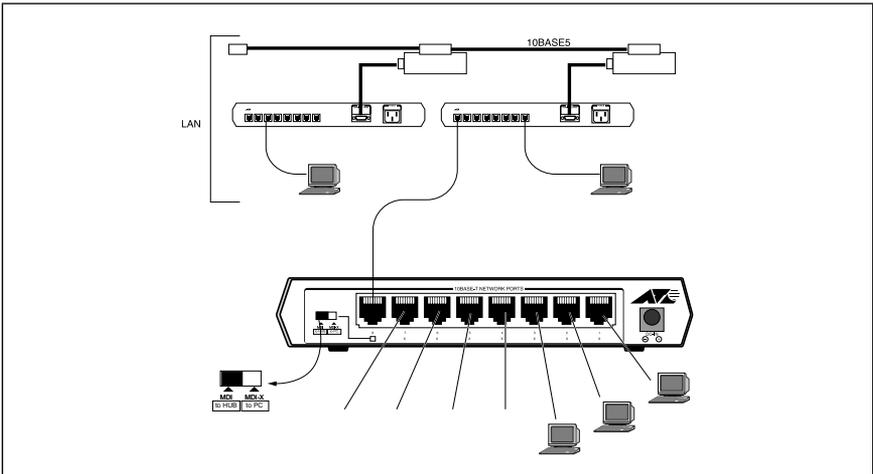


Figure 8: LAN Expansion

Note

Regardless of your current network configuration, the maximum number of *AT-MR415T/AT-MR815T Micro Repeaters* which can be cascaded together is four.

Before expanding a network through a T-port, consult the network administrator. Be sure that the expansion will not exceed the limit defined by the current LAN configuration before proceeding. See Figure 9.

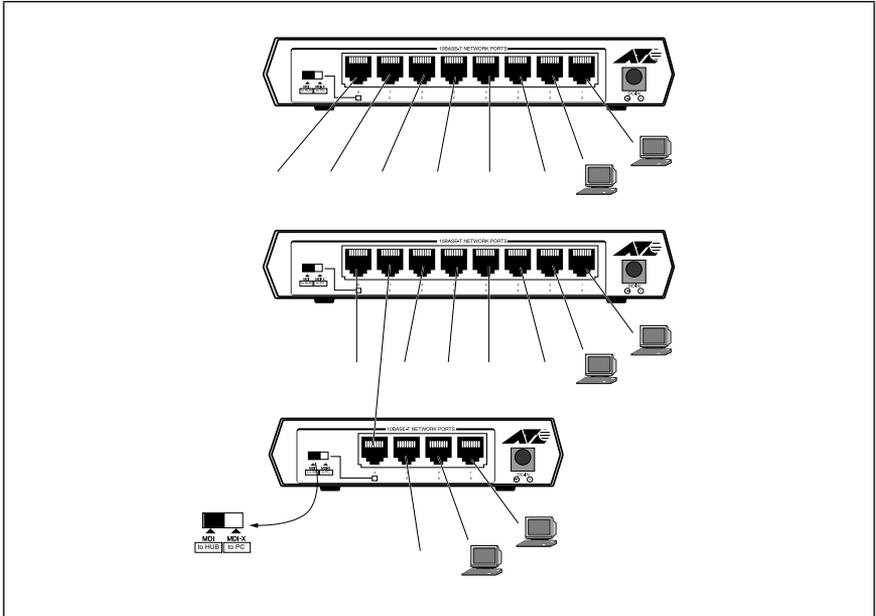


Figure 9: LAN Connectivity

Invalid Cascading. An example of invalid cascading is shown in Figure 10.

When sending packets over the network, it is possible to send information through up to four cascaded repeaters; however, five or more cascaded repeaters will not produce guaranteed results. Referring to Figure 10, there are four repeaters between PC A and PC B so the connection between PC A and PC B is possible; there are a total of five repeaters between PC A and PC C, making the connection between PC A and PC C invalid.

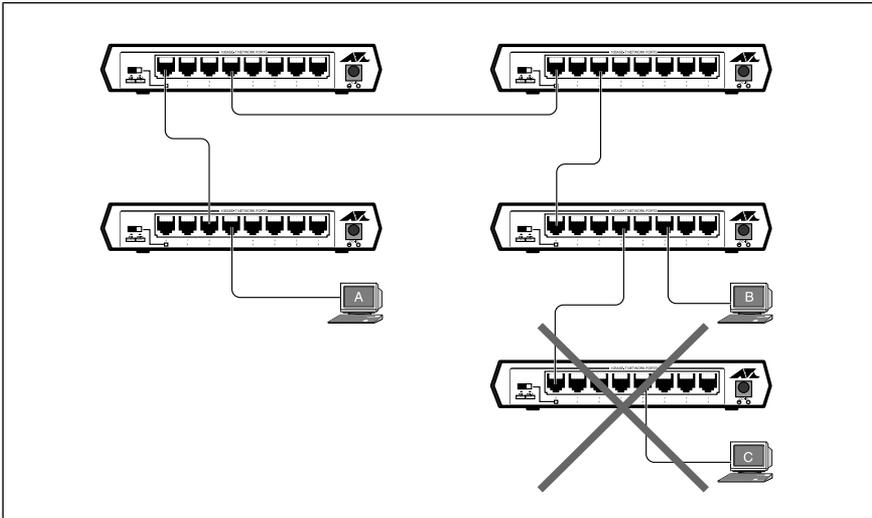


Figure 10: Invalid LAN Connectivity

Chapter 3

Troubleshooting

This chapter discusses testing *AT-MR415T/AT-MR815T Micro Repeaters* for a valid connection as well as steps to detect other problems.

Performing a Connection Test

In order to test for a valid connection, as well as confirm the correct operation of the network, follow the steps outlined below. Refer to Figure 11.

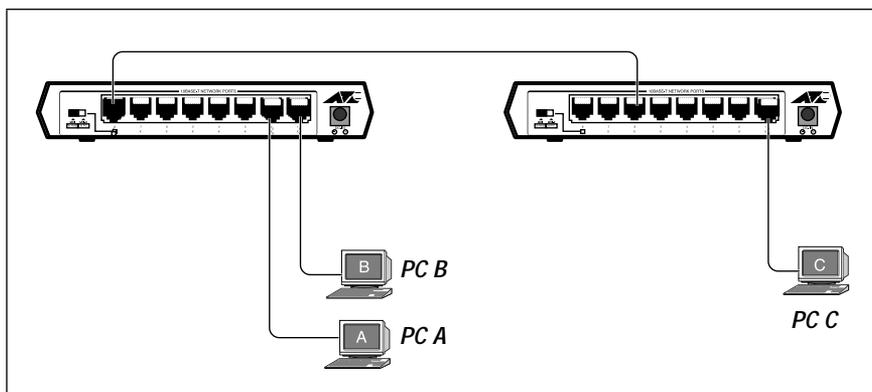


Figure 11: AT-MR815T Connection Test

1. Connect port 1 and port 2 of a single *AT-MR415T/AT-MR815T Micro Repeater* to two computers and turn on the HUB power supply by connecting the AC adapter. (In Figure 11 above, PC B is connected to port 1 and PC A is connected to port 2.)
2. Check to make sure the LINK ON lamps of both port 1 and port 2 are lighted.
3. Using your own software, confirm proper communication between machines by sending data from the computer connected to port 1 to the computer connected to port 2. (For example, if you have installed the CentreNET PC/TCP protocol, use the “PING” command.)

4. After confirming that port 1 and port 2 are operational, remove the power, reconnect one of the computers to another port, turn the power back on, then repeat the communications test of step 3. Do this with all of the ports of the *AT-MR415T/AT-MR815T Micro Repeaters*. When testing the cascade port, connect the port to a computer and select MDI-X using the MDI MDI-X toggle switch.
5. Verify the connection in each port by checking the LINK ON lamp and performing the communications test as described in steps 2 and 3.
6. Once each port of a single *AT-MR415T/AT-MR815T Micro Repeater* has been tested, check the connection between computers of two different repeaters (if your configuration has more than one repeater). For example, perform the communications test described in step 3 between PC A and PC C, then PC B and PC C. When cascading repeaters, select cascade mode on one repeater by selecting MDI using the MDI MDI-X toggle switch.

Troubleshooting

Is The Unit Receiving Power?

Check the POWER lamp on the front of the *AT-MR415T/AT-MR815T Micro Repeater*; this green LED should be lighted.

If the POWER lamp is not lighted, check both ends of the AC adapter. Make sure the AC adapter is plugged into a functioning wall outlet and that the DC plug is properly inserted into the *AT-MR415T/AT-MR815T Micro Repeater* DC Power Jack on the back of the unit.

Note

Power to the hub must be sourced only from adapter in the package or direct plug in type approved adapter rated 7.5Vdc, 500mA.

Note

There is no "power" switch on either the *AT-MR415T/AT-MR815T Micro Repeater* or AC adapter. If the AC adapter is properly connected, the repeater should be receiving power.

Is The Link On Lamp Lighted?

The LINK ON lamps on the front of the repeater will light when a proper connection between the corresponding 10Base-T port and the equipment connected to it is established. If this lamp is not lighted, check for the problems listed below and make corrections as necessary.

1. Problem 1:

The UTP (twisted pair) cable has been cut, damaged, or is the wrong type of cable.

Solution:

Try making the connection with a different cable. Be sure you are using an undamaged cable of the correct type.

2. Problem 2:

Connected equipment is not turned on or not operating properly.

Solution:

Check the connected equipment (computer, another repeater, etc.) and turn on the power.

3. Problem 3:

The MDI MDI-X toggle switch of the *AT-MR415T/AT-MR815T Micro Repeater* is on the wrong setting.

Solution 3:

When using the cascade port of the *AT-MR415T/AT-MR815T Micro Repeater*, the switch should be set to MDI; otherwise, the switch should be in the MDI-X position. When cascading two *AT-MR415T/AT-MR815T Micro Repeaters*, the unit using the cascade port should have the switch set to MDI, while the other unit should have its switch set to MDI-X.

When port 4 of the AT-MR415T or port 8 of the AT-MR815T are not connected to another repeater, but are used to connect to a computer or other equipment, the MDI MDI-X toggle switch should be set to MDI-X.

Appendix A

Technical Specifications

AT-MR415T

Physical

Width	112 mm (4.48 in.)
Height	98 mm (3.92 in.)
Depth	26 mm (1.04 in.)
Weight	280 g (9.9 oz.)
Installation options	Tabletop or rack-mount

Connector Ports

4	10Base-T RJ-45 Ethernet ports
---	-------------------------------

AT-MR815T

Physical

Width	175 mm (7 in.)
Height	98 mm (3.92 in.)
Depth	26 mm (1.04 in.)
Weight	430 g (15.2 oz.)
Installation options	Tabletop or rack-mount

Connector Ports

8	10Base-T RJ-45 Ethernet ports
---	-------------------------------

AT-MR415T/AT-MR815T

Electrical

Use only the wall mounted adapter provided with the product.

Countries/Power	Voltage	Frequency
Australia	240VAC	50Hz
United Kingdom	240VAC	50Hz
Common Market (EC) (except UK)	230VAC	50Hz
North America	120VAC	60Hz
Maximum Power Consumption	12 Watts	
Input current	0.5 A (500 mA) Maximum	

Environmental

Operating temperature	0° to +40° C (32° to 104° F)
Relative humidity	5% to 80%, non-condensing
Storage temperature	-20° to 60° C (-4° to 140° F)

Diagnostic LEDs

Individual port link status (4/8)

Hub status (3), specifying:

- Activity (both transmit and receive)
- Collision
- Power

Certification

Safety	UL 1950, CSA 22.2 No. 950 (Canadian Standards Association), TUV EN60950
Emission	FCC Part 15 Class B, VCCI Class 1, CDOC Class B, EN55022 (CISPR 22) Class B

10Base-T Pin Assignments

An Ethernet twisted-pair link segment requires two pairs of wires. Each wire pair is identified by solid and striped colored wires. For example, one wire in the pair might be red and the other wire, red with white stripes.

Connectors

Notice how the pins are numbered in Figure 12. Be sure to hold the connectors in the same orientation when connecting the wires to the pins.

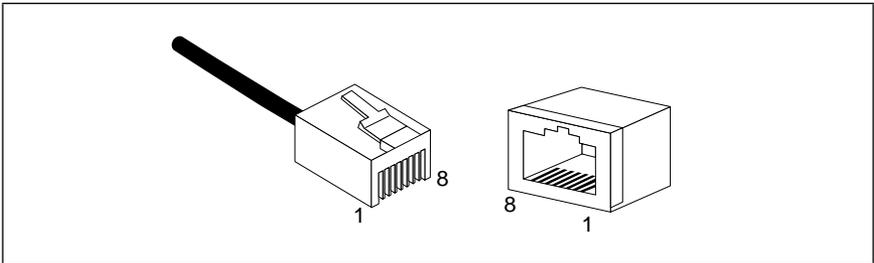


Figure 12: Connector Pin Numbers

Each twisted-pair link segment must have a male connector attached to both ends. According to the 10Base-T specification, pins 1 and 2 on the connector are used for transmitting data; pins 3 and 6 are used for receiving data, as shown in Table 4.

Table 4: Pin Assignments

Pin	Assignment *
1	TX+
2	TX-
3	RX+
6	RX-

*The "+" and "-" signs are used to represent the polarity of the two wires that make up each wire pair.

Straight-through Wiring

If the twisted-pair link segment is to join two ports on a switch, and only one of the ports has an internal crossover, the two pairs of wires must be straight-through, as shown in Table 5.

Table 5: Straight-through RJ-45 Pin Assignments

Hub	Device
1 (TX+)	1 (TX+)
2 (TX-)	2 (TX-)
3 (RX+)	3 (RX+)
6 (RX-)	6 (RX-)

Crossover Wiring

Two *AT-MR415T/AT-MR815T Micro Repeaters* can communicate only if the transmitter on one unit is connected to the receiver on the other unit. This reversal, or crossover function, can be implemented either in the wiring or in the device itself. When connecting *AT-MR415T/AT-MR815T Micro Repeaters*, a crossover must be implemented in the wiring. Refer to Table 6 for crossover pin assignments.

Table 6: Crossover RJ-45 Pin Assignments

AT-MR420TR/MR820TR	AT-MR420TR/MR820TR
1 (TX+)	3 (RX+)
2 (TX-)	6 (RX-)
3 (RX+)	1 (TX+)
6 (RX-)	2 (TX-)

5 - 4 - 3 Rule

In addition to IEEE requirements, Table 4 and Table 5, follow the “5-4-3 rule” to ensure that your configuration does not exceed the maximum 10Base-T data transmission path (the longest path through any given network).

The 5-4-3 rule describes the maximum path between any two devices or nodes (PCs or other stations) on the network. There can be:

- Up to five segments in series
- Up to four repeaters or multiport hubs
- Up to three populated segments (that is, segments attached to two or more PCs)*

* The remaining two segments are unpopulated; these are known as inter-repeater links or IRLs. This distinction between populated and unpopulated segments is significant for coaxial cable networks only.

Note

This rule is completely consistent with the IEEE 802.3 specification, and is meant only to summarize the configuration specification.

Appendix B

Glossary

10Base-T—IEEE 802.3 UTP Ethernet. Low-cost Level 3 or better UTP wiring affords 100 meters (328 ft.) of point-to-point link segments. UTP uses RJ-45 connectors and sometimes 50-pin AMP connectors to a patch panel and runs at 10 MHz.

BASEBAND COAXIAL SYSTEM—A system whereby information is directly encoded and impressed on the coaxial transmission medium. At any point on the medium, only one information signal at a time can be present without disruption.

BIT RATE (BR)—The rate of data throughput on the medium in bits per second. Ethernet specifies 10 million bits per second.

BIT TIME—The duration of one bit symbol (1/BR). Ethernet specifies a bit time of 100 ns.

CARRIER SENSE—In a LAN, an ongoing activity of a data station to detect whether another station is transmitting.

CARRIER SENSE MULTIPLE ACCESS with COLLISION DETECT (CSMA/CD)—This is the access method employed by IEEE 802.3 LAN transceivers, by which multiple stations compete for use of the transmission medium (coax cable) for data packet transmission. It provides for a level of error detection should that transmission be corrupted or impeded by contention for the transmission medium.

COLLISION—An unwanted condition that results from concurrent transmissions on the physical medium.

COLLISION PRESENCE—Provides the ability to detect simultaneous occurrence of Manchester-encoded data on the DI and DO and to report such an occurrence as a collision.

COMPATIBILITY INTERFACE—The MDI coaxial cable interface and the AUI branch cable interface, the two points at which hardware compatibility is defined to allow connection of independently designed and manufactured components to the baseband transmission system.

CROSSOVER—Wiring used when connecting a 10Base-T MAU to another 10Base-T MAU or a 10Base-T hub to another 10Base-T hub. For example, one 10Base-T MAU has the TD pair on the same pins as another 10Base-T MAU. If pins were wired straight, there would be two transmitters on one pair and no receiver. As a solution, the crossover cable crosses the TD pair with the RD pair, to connect the TD pins on one end to the RD pins at the other end.

CYCLIC REDUNDANCY CODE (CRC)—An algorithm used to check for and correct bit errors in data transmission.

DATA COMMUNICATION EQUIPMENT (DCE)—In RS232 specification a module, such as a modem, for connecting a DTE to other equipment. A repeater connected to a terminal or workstation for OMEGA management use is wired as a DCE.

DATA TERMINAL EQUIPMENT (DTE)—In RS232 specification a module typically at the end of a segment. The DTE could be an Ethernet workstation, repeater or bridge.

HARMONICA ADAPTER—This adapter provides a simple way to convert the 50-pin Telco connection to RJ-45 connections.

HEARTBEAT—See SQE

HOUSE WIRING—House wiring is the existing wiring inside a building. This wiring generally originates from one or more wiring closets, such as a telephone room. Some older buildings may have wiring unsuitable for 10 megabit data rates. In these circumstances, it is recommended that the wiring be tested with a 10Base-T signal/wire tester.

HUB/REPEATER—A hub is a central signal distributor. It is used in a wiring topology consisting of several point-to-point segments originating from a central point. The term hub is often used interchangeably with the term repeater. Multipoint 10Base-T, 10Base2 and fiber optic (10Base-FL, FOIRL) repeaters are considered hubs. See Repeater.

HUB-to-HUB WIRING—See MAU-to-MAU Wiring

HUB-to-MAU WIRING—UTP cables for 10Base-T hub-to-MAU or NIC cards are wired straight-through. An RJ-45 receptacle at the hub would wire pin-to-pin to the RJ-45 receptacle at the MAU.

IMPEDANCE—An electrical characteristic of a circuit dealing with the combination of the AC and DC resistance and the appearance of that resistance to attached circuits.

JABBER LOCK-UP—The MAU's ability to automatically inhibit the transmit data from reaching the medium if the transmit data time exceeds a specified duration. This duration is in the range of 20 ms to 150 ms. Jabber lock-up protects the medium from being overrun with data packets from a possibly defective device.

JAM—This is a term used to describe the collision reinforcement signal output by the repeater to all ports. The jam signal consists of 96 bits of alternating 1s and 0s. The purpose is to extend a collision sufficiently so that all devices cease transmitting.

JITTER—The fluctuation of the data packet in respect to a standard clock cycle. Jitter is undesirable and must be minimized.

LAN—See Local Area Network

LINK SEGMENT—The link segment of coaxial cable is a segment that has no MAU devices, but links together two LAN devices such as repeaters.

LINK TEST—In 10Base-T Ethernet there is a link test function that validates the UTP link. This consists of a pulse transmitted from point A on one pair that is validated at point B. Point B also transmits a pulse on the second pair to be validated by point A. These pulses occur during media idle states (in between packets).

LOCAL AREA NETWORK (LAN)—A type of limited-area broadcast network in which devices attached to a common transmission medium.

MEDIA ACCESS CONTROL (MAC)—IEEE specifications for the lower half of the data link layer (layer 2) that defines topology-dependent access control protocols for IEEE LAN specifications.

MANAGEMENT AGENT—Software that is used to view system activity and set system variables.

MAU—See Medium Attachment Unit

MAU-to-MAU, HUB-to-HUB WIRING—10Base-T MAU-to-MAU or hub-to-hub wiring generally requires a crossover cable located somewhere along the UTP cable run. This may commonly occur at the punch-down block or between the RJ-45 wall receptacle and the workstation.

MAU/TRANSCIVER—An Ethernet transceiver is a MAU. A 10Base-T MAU interfaces the UTP media to an AUI port on a workstation, repeater, bridge or other Ethernet device.

MDI/MDI-X—See Medium Dependent Interface

MEDIUM ATTACHMENT UNIT (MAU)—In a LAN, a device used in a data station to couple the DTE to the transmission medium.

MEDIUM DEPENDENT INTERFACE (MDI)—The mechanical and electrical interface between the trunk cable medium and the MAU. MDI-X is another version of the interface that enables like devices to connect using different pin-outs, thereby avoiding conflicts that occur when receiving and transmitting packets use the same pin-out.

MANAGEMENT INFORMATION BASE (MIB)—A data base of network configuration and performance information. The formal definition of a MIB includes the names of the objects it contains and the type of information retained. Management protocols such as SNMP and CMIP contain procedures for acquiring and exchanging MIB information.

PATCH PANEL—A 10Base-T patch panel may be used between a punch-down block and UTP workstation. The patch panel generally has a female RJ-45 connector on the front for each workstation and a Telco (RJ21) connector on the back, which is wired to a punch-down block. This provides a convenient way for the installer or network manager to connect the hub 10Base-T ports into the desired building locations.

PHYSICAL MEDIUM ATTACHMENT (PMA)—The portion of the MAU that contains the functional circuitry.

PHYSICAL SIGNALING (PLS)—That portion of the physical layer contained within the DTE that provides the logical and functional coupling between MAU and data link layers.

POLARITY CORRECTION—Many 10Base-T UTP ports have a polarity correction function. If the UTP wiring has RD- and RD+ inadvertently crossed, the polarity correction function will sample the signal and electrically swap the wires. If the TD- and TD+ wires are crossed, the correction would occur at the MAU on the other end of the UTP link. This occurs within a single pair and should not be confused with the crossover cable.

PROPAGATION DELAY—The time it takes a signal to travel from the input of a system component to the output. Usually measured in nanoseconds. IEEE 802.3 has specific propagation delay maxima for computing propagation budgets when designing a LAN. Cable length plays a major role in propagation delay; for example, a 50-meter (164-foot) AUI cable has a maximum allowable propagation delay of 257 ns. The propagation delay of cable depends on the length and velocity factor of the cable type. There are also propagation delays associated with electronics attached to the system.

PUNCH-DOWN BLOCK—The punch-down block is the wiring panel where the house wiring from the building's offices terminates. This is where many 10Base-T hubs would be located. Wiring installers use a special punch-down tool to insert the UTP wire for data and voice applications.

REPEATER—A device used to extend the length, topology, or interconnectivity of the physical medium beyond that imposed by a single segment, up to the maximum allowable end-to-end trunk transmission line length. Repeaters perform the basic actions of restoring signal amplitude, waveform and timing applied to normal data and collision signals.

RJ-45—This connector is a 10Base-T standard for connecting UTP cabling. It is inexpensive and easy to install onto UTP cable.

SIGNAL QUALITY ERROR (SQE) TEST—Signal indicates SQE function is active. The SQE message is sent by the MAU to the DTE in the presence of a collision.

SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)—SNMP is a TCP/IP protocol that generally uses the User Datagram Protocol (UDP) to exchange messages between a management information base and a management client residing on a network. Since SNMP does not rely on the underlying communication protocols, it can be made available over other protocols, such as XNS or DECnet.

SQE TEST—Commonly referred to as Heartbeat, is a special 802.3 signal sent by the MAU to the DTE to test the collision detection function. Some DTE want SQE and others do not. Repeaters do not want the SQE Test.

STANDALONE—Repeater operating as a hub on its own; i.e., not a module among other modules in a department concentrator chassis.

STRAIGHT-THROUGH—A type of wiring connection where the pins of one connector connect to the same pins of another connector. For example, pin 1 of one connector connects to pin 1 of another connector.

TCP/IP PROTOCOLS—A set of protocols for intercomputer communication, including network level (Internet Protocol), transport level (Transmission Control Protocol or TCP) and application level protocols (for example, Telnet terminal emulation). TCP/IP has been used for many years in two country-wide networks, the ARPANET and MILNET. Recently, TCP/IP has become very popular with users of a variety of multi-user computer systems and engineering workstations. Most UNIX computers use TCP/IP over Ethernet as the main intercomputer networking technology. TCP/IP is also popular among PC users, particularly as a means of communication with large multi-user computers.

TELCO CONNECTOR—A 50-pin receptacle that plugs into the front of the hub, enabling cables from external devices to connect to the hub.

TRUNK CABLE—Coaxial cable used for distribution of signals over long distances throughout a cable system.

UNSHIELDED TWISTED PAIR (UTP)—A cable used in 10Base-T wiring that consists of at least two twisted pairs of 22 to 26 AWG wire. The pairs should have at least 3 twists per foot and have an impedance of 100 Ω . Level 3, Level 4 and Level 5 UTP cables fit these criteria.

Appendix D

AT-MR415T/AT-MR815T Installation Guide Feedback

Please tell us what additional information you would like to see discussed in this guide. If there are topics you would like information on that were not covered in this guide, please photocopy this page, answer the questions and fax or mail this form back to Allied Telesyn. The mailing address and fax number are at the bottom of the page. Your comments are valuable when we plan future revisions of this guide.

On a scale of 1 to 10 (10 being most important), rate the importance of the following topics in this guide:

Overview	_____	Troubleshooting	_____
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