Micro 100-TX24™
Fast Ethernet Repeater

User's Guide

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Note: 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 instructions in this manual, may cause 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 his own expense.

Canadian Department of Communications Radio Frequency Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministères des Communications du Canada.

Note: This equipment has not been tested by the Canadian Department of Communications. However, the CDC accepts FCC test data.

Electromagnetic Interference Performance Compliance

The *Micro 100-TX24* repeater meets or exceeds the following EMI requirements:

- FCC Class A
- CISPR 22 (EN55022) Class A

Safety Compliance

The *Micro 100-TX24* repeater complies with the following safety standards:

- UL 1950 Second Edition, 1989; Second Edition, 1991 — Safety of Information Technology Equipment
- CSA Standard CAN/CSA-C22.2 No. 950-M-93 (Canadian Standards Association for Information Technology Equipment)
- TUV Rheinland EN60950/1988 + A1/1990 + A2/1991

European Community Immunity Test Standards

The *Micro 100-TX24* repeater complies with the following emissions standards:

- IEC 801-2 (Electrostatic Discharge)
- IEC 801-3 (Radiated Immunity)
- IEC 801-4 (Electrical Fast Transient/Burst)
- EN55101-4 (Conducted Immunity)

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About This Manual

This manual includes information about how to install and operate the *Micro 100-TX24* Fast Ethernet Repeater. We recommend that you read all chapters in this manual to become familiar with all of the repeater's features and to ensure a successful installation.

Intended Reader

This manual is written for network administrators and technicians responsible for hardware installation.

Organization of Contents

The contents of this manual are organized as follows:

Chapter 1 — Overview provides an operational overview of the *Micro 100-TX24* repeater and describes its components and features.

Chapter 2 — Planning Repeater Installation discusses special requirements for operating the repeater and provides charts that can help you plan the installation of the repeater.

Chapter 3 — Installing the Repeater provides instructions for mounting the repeater, connecting cable, interconnecting the repeater to another repeater, and connecting power to the repeater. Also included are instructions for installing a redundant power supply module.

Appendix A — Specifications includes the repeater's electrical, physical, and environmental specifications.

The **Glossary** provides terms related to the *Micro 100-TX24* repeater, as well as general networking terms.

Chapter 1 Introduction

The *Micro 100-TX24* Fast Ethernet Repeater provides 100BASE-TX functionality for 24 RJ-45 ports. The repeater's uplink capability lets you connect the repeater to another *Micro 100-TX24* repeater or other 100BASE-TX repeater. For backup power, you can install an optional redundant power supply. The *Micro 100-TX24* repeater's front panel makes it easy to view the current operating status.

Features

The *Micro 100-TX24* repeater includes these features:

- 24 shielded RJ-45 ports that support 100BASE-TX connections
- Uplink port that enables bridging to 100BASE-TX topologies
- LEDs that indicate power supply status (A and B), collisions, and port link/activity/partition status
- Modular power supply design for easy removal and replacement
- Auto-sensing power supply operates within the range of a 100-240 VAC, 50-60 Hz power source
- Optional dual-redundant power supply
- Class II support for 100BASE-TX
- Compatibility with the IEEE 802.3u 100BASE-TX repeater specification
- Chassis that can stand alone or be mounted in a standard, EIA 19-inch rack
- Surface-mount technology
- Conforms to FCC, CISPR, UL, TUV, CSA, and CE test standards

Package Contents

Before you start to install the *Micro 100-TX24* repeater, verify that this package contains the following items:

- *Micro 100-TX24* Fast Ethernet repeater
- AC power cord
- Rack-mount kit (two mounting brackets, eight 3/8-inch bracket screws, and four 1/2-inch rack-mount screws)
- Four adhesive-backed rubber feet
- *Micro 100-TX24 Fast Ethernet Repeater User's Guide*
- Registration card
- Warranty card

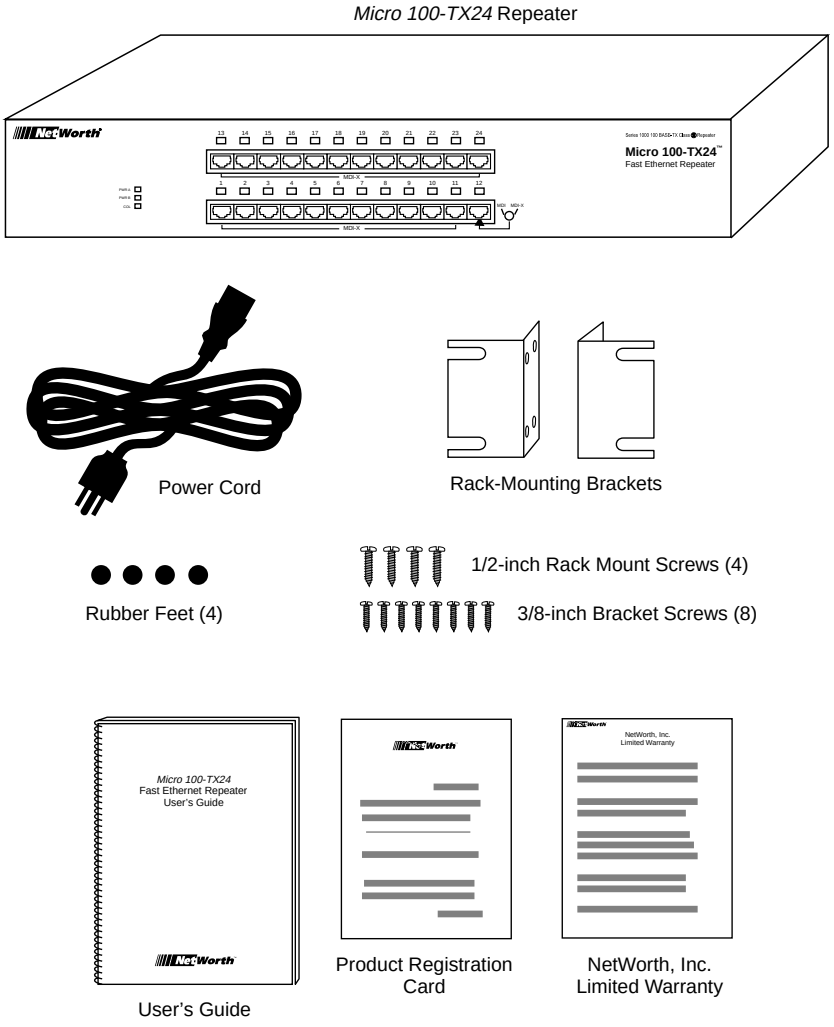

Figure 1-1: Micro 100-TX24 Package Contents

Operational Overview

This section provides an overview of the *Micro 100-TX24* repeater's components, which include the LED indicators, RJ-45 ports, and uplink ports, and discusses the basic functionality of the repeater. Figures 1-2 and 1-3 show the repeater's front and back panel.

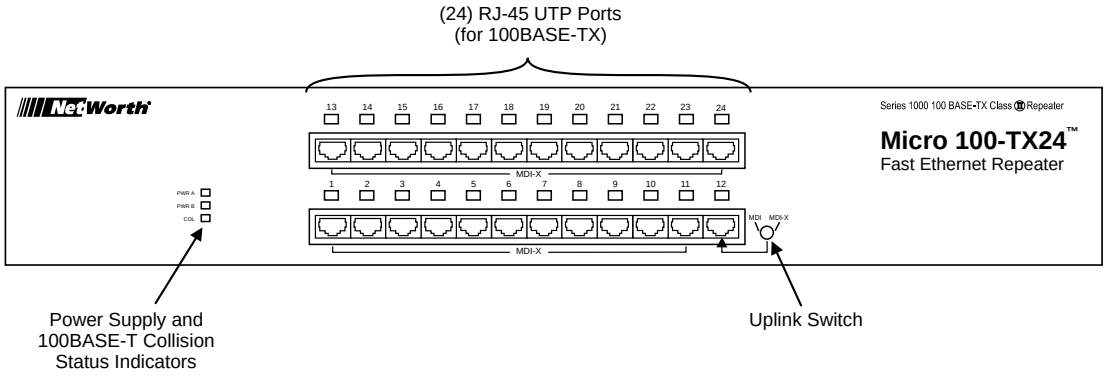

Figure 1-2: Micro 100-TX24 Repeater Front Panel

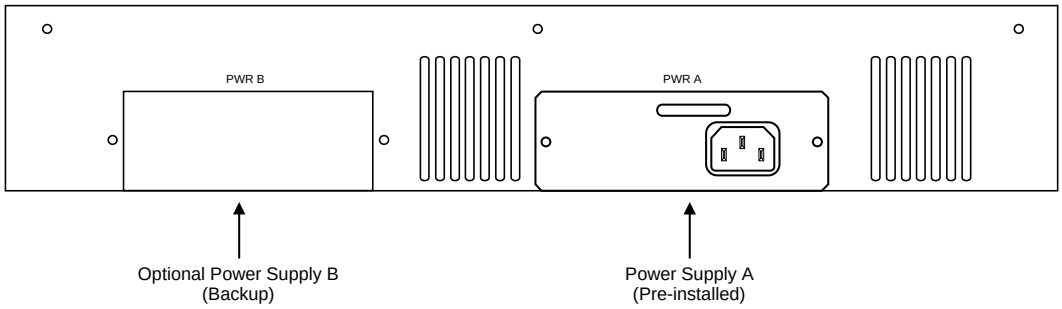

Figure 1-3: Micro 100-TX24 Repeater Back Panel

LED Indicators

The *Micro 100-TX24* repeater features several LED indicators that help you monitor the repeater's status.

- The LEDs on the left side of the front panel show the status of the power supplies as well as the 100BASE-TX collision status.
- The LEDs above the RJ-45 ports indicate the link, activity, and partition status for each of the ports.

Figure 1-4 shows the LED arrangement for the *Micro 100-TX24* repeater.

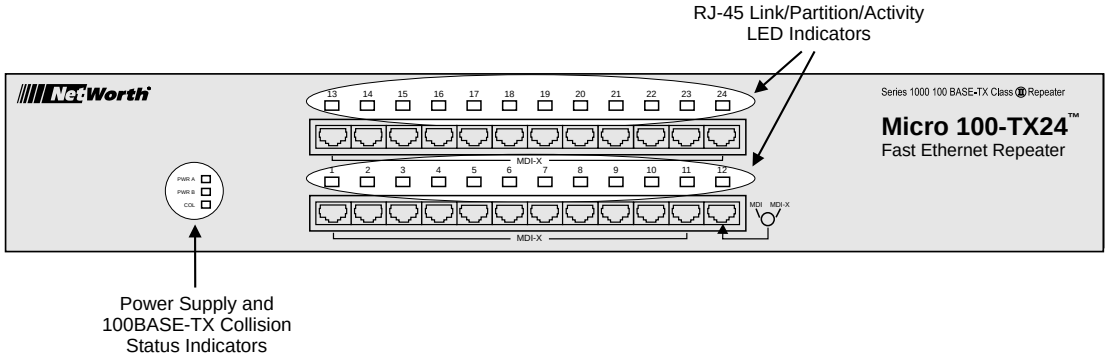

Figure 1-4: LED Indicators

The following chart shows the possible conditions of each LED and describes the meaning of each condition.

LED	Condition	Meaning
PWR A and **PWR B**	Steady Green	The power supply is currently functioning and providing power to the hub.
	Off	No power is supplied to the hub by the specified power supply.
	Steady yellow	The power supply is installed but not powered on or is defective.
COL	Flashing yellow	The hub detects a collision.
	Off	No collisions are occurring.
RJ-45	Steady green	A link condition is present.
	Steady yellow	The port is disabled (autopartitioned).
	Flashing green	There is activity at the port.
	Off	No link condition is present at the port or there is no connection at the port.

Note: *LEDs listed as "yellow" might appear orange on the hub's front panel.*

RJ-45 Ports

The *Micro 100-TX24* repeater has 24 RJ-45 ports that let you connect UTP cabling to workstations and servers in a 100BASE-TX network.

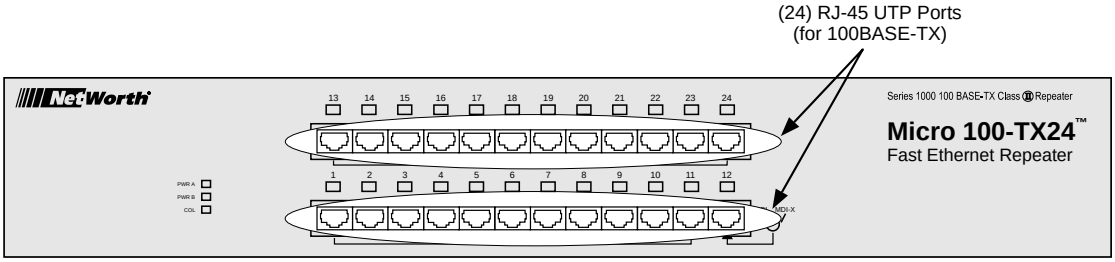

Figure 1-5: RJ-45 Ports

Uplink Switch

The uplink switch lets you convert the 12th port on the *Micro 100-TX24* repeater to an uplinkable “OUT” RJ-45 port. This lets you interconnect the *Micro 100-TX24* repeater to another *Micro 100-TX24* repeater or other 100BASE-TX repeater, allowing the two repeaters to be on the same segment.

IN ports use an internal *crossover* of the receive and transmit lines, enabling the port to connect to a network interface card using standard 8-wire UTP cable. OUT ports use a straight-through (uncrossed) connection.

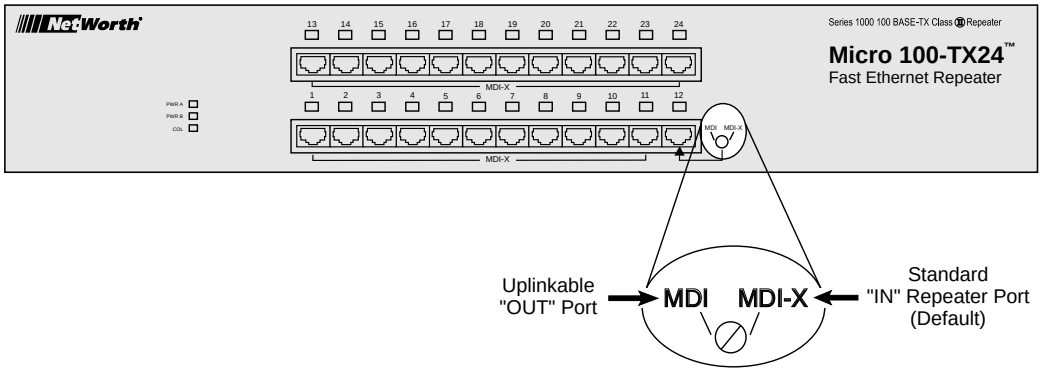

Figure 1-6: Uplink Switches

Chapter 2 Planning Repeater Installation

This chapter contains information that will help you prepare for installing the *Micro 100-TX24* repeater. This includes installation requirements and system planning charts.

Installation Requirements

To help ensure a correct installation, read this section to determine the environmental, electrical, spatial, and cable requirements.

Environmental Requirements

Be sure the operating environment for the repeater is within the following ranges:

- Temperature: 32º to 122ºF (0º to 50ºC)
- Humidity: 5% to 95% (non-condensing)
- Altitude: 0 to 10,000 feet (0 to 3 km)
- Clearance: minimum of 2 inches (5.1 centimeters) on each side of the repeater for proper ventilation

Electrical Requirements

The electrical requirements for a *Micro 100-TX24* repeater are as follows:

- 100 – 240 VAC
- 1.5 – 0.75 Amps (1.5A @ 100 VAC – 0.75A @ 240 VAC)
- 50 – 60 Hz

> ***Caution:*** *The power outlet must be a non-switched, three-pronged, grounded outlet. Do not use a three-to-two pronged adapter at the outlet. Doing so may result in electrical shock and/or damage to the repeater and will void your warranty.*

> ***Note:*** *If the supplied power cord is lost or damaged, replace it with a power cord of the same type and current rating (10A). The replacement cord should also meet required regulatory approvals to ensure emissions compliance.*

Spatial Requirements

The *Micro 100-TX24* repeater's dimensions are 3 inches (height) x 16.95 inches (width) x 14 inches (depth).

You can interconnect two *Micro 100-TX24* repeaters. If there is not enough space to mount the repeaters in a single rack or stack them on a single shelf, or if you want to place the repeaters in different locations, you can place them side by side on separate shelves or in separate racks. See "Twisted-Pair (UTP) Wire Requirements" for more information.

Be sure to allow at least 2 inches (5.1 centimeters) on each side of the repeater for proper air circulation and cable connections.

Twisted-Pair (UTP) Wire Requirements

The twisted-pair wiring you use to connect the repeater's RJ-45 ports must meet the following minimum specifications and requirements to ensure long-term reliability.

- The wiring must be unshielded twisted-pair (UTP) Category 5.
- Two pairs of the four-pair wiring are used for signalling.
- Depending on building codes, different insulation materials may be required. Plenum-rated or TEFLON®-coated wiring may be required in some areas.
- The wire gauge should be between 18 and 26 AWG. (Most telephone installations use 24-gauge wiring.)
- Solid copper

Installing New Wire

If you are installing the repeater where no wiring is present, or if existing wiring does not meet the above specifications, install new wiring. The new wiring should conform to national and local electrical wiring code requirements and meet the above specifications. When installing wire, it is a good idea to install extra pairs of wire for future expansion.

If you are unfamiliar with wiring installation or the applicable local electrical wiring code or the 100BASE-TX specification, you should have a professional, licensed (if applicable) installer perform the installation.

Straight-through twisted-pair cable is typically used to connect a repeater to a server or workstation. In a straight-through connection, Pin 1 at the repeater connects to Pin 1 at the server, Pin 2 at the repeater connects to Pin 2 at the server, and so on. Figure 2-1 shows the locations of pins on a standard RJ-45 plug on a twisted-pair cable.

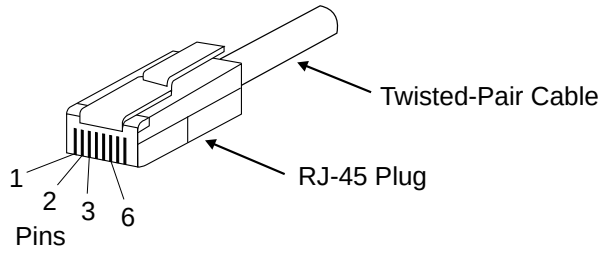

Figure 2-1: RJ-45 Plug Pin Locations

Tables 2-1 and 2-2 show the wiring in a straight-through and crossover twisted-pair cable.

Twisted Pair No.	Pin No.	Signal Description at DTE	To	Pin No.	Signal Description at Repeater
1	1 2	TD+ TD–	➠	1 2	RD+ RD–
2	3 6	RD+ RD–	➠	3 6	TD+ TD–

Table 2-1: Wiring in a Straight-Through Twisted-Pair Cable

Twisted Pair No.	Pin No.	Signal Description at DTE	To	Pin No.	Signal Description at Repeater
1	1 2	RD+ RD–	➠	3 6	TD+ TD–
2	3 6	TD+ TD–	➠	1 2	RD+ RD–

Table 2-2: Wiring in a Crossover Twisted-Pair Cable

System Planning Charts

The charts in Figures 2-2 and 2-3 provide a convenient way of planning the connections for your *Micro 100-TX24* repeater.

Micro 100-TX24 Repeater Setup and Cabling Chart

Date ☐

Unit Number ☐

Building ☐

Location ☐

Rack Mount ☐

Table ☐

Uplink Switch Setting

☐ MDI-X (default)

☐ MDI (uplinkable)

Port	Connects To
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	

Figure 2-2: Micro 100-TX24 Repeater Setup and Cabling Chart

Rack Inventory Chart

Use this chart to record the components installed in a particular rack. Date

Wiring Closet Number

Rack Number

Installer

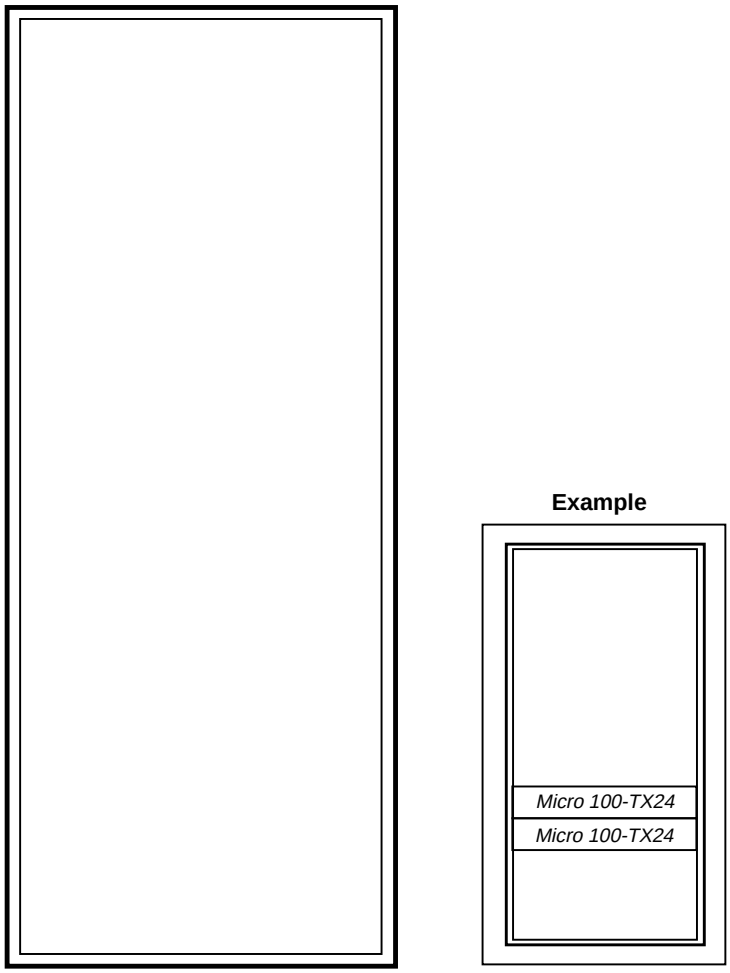

Figure 2-3: Rack Inventory Chart

Chapter 3 Installing the Repeater

This chapter explains how to mount the *Micro 100-TX24* repeater, attach cables, and interconnect the repeater to a second repeater.

Mounting the Repeater

You can place the *Micro 100-TX24* repeater on a level surface (table top or shelf, for example) or mount it in a standard EIA 19-inch rack.

Attaching the Rubber Feet

If you will place the repeater on a table top or shelf, attach the supplied adhesive-backed rubber feet as described in the following steps.

1. Turn the repeater over so that its bottom side faces up.
2. Remove the four rubber feet from their packaging.
3. Peel the protective paper backing off the rubber feet. Then position the feet in the recessed areas near the corners of the repeater and press the feet into place.
4. Turn the repeater to its upright position and place it on the mounting surface.

> ***Note:*** *Be sure you allow at least 2 inches on each side of the repeater for proper air flow.*

Rack-Mounting the Repeater

The *Micro 100-TX24* occupies two slots in a standard, 19-inch rack. To mount the *Micro 100-TX24* repeater in a rack, use the supplied installation kit. This kit includes two side mounting brackets, eight bracket screws, and four larger rack-mount screws.

To attach the brackets, follow these steps:

1. Remove the two screws from the left and right side of the repeater. (These screws are extras and are not needed to install the mounting brackets.)

2. Position the bracket as shown in Figure 3-1, and secure it with the smaller bracket screws. Then attach the remaining bracket to the other side of the repeater.

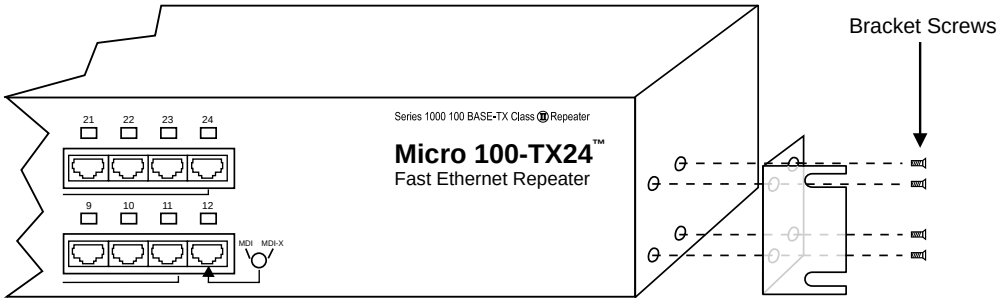

Figure 3-1: Attaching the Mounting Brackets

After you attach both mounting brackets, position the bracket slots over the desired holes on the rack (Figure 3-2). Then insert and tighten the supplied rack-mount screws.

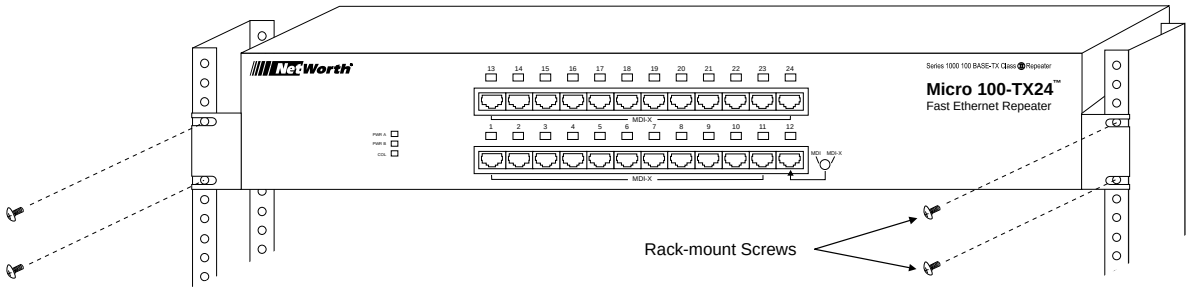

Figure 3-2: Positioning the Repeater in a Rack

Connecting Twisted-Pair Cable

Each RJ-45 port on the *Micro 100-TX24* repeater can accept a standard 8-wire twisted-pair (UTP) cable that ends with an RJ-45 connector. These ports can support cable lengths up to 100 meters.

To attach twisted-pair cable, plug one of the RJ-45 connectors into the selected port on the repeater. Connect the other RJ-45 connector into a 100BASE-TX workstation.

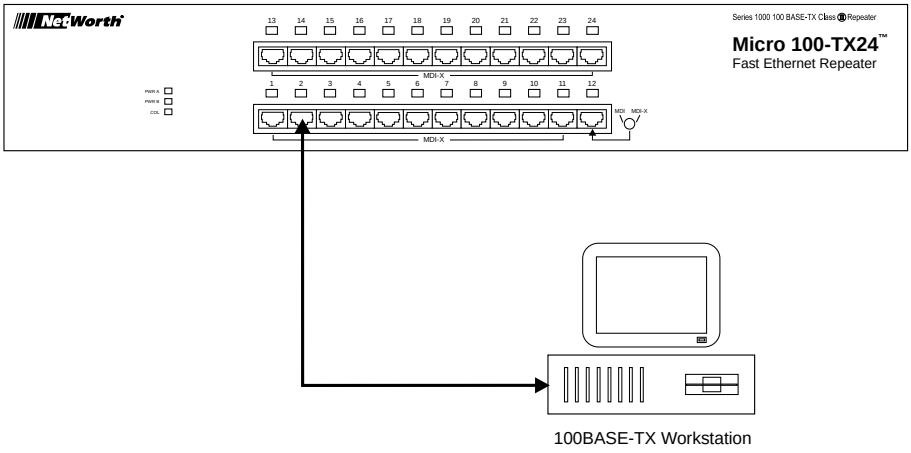

Figure 3-3: Connecting Twisted-Pair Cable

Setting the Uplink Switch

The uplink switch enables the 12th port on the *Micro 100-TX24* repeater to function as either standard "IN" RJ-45 ports or uplinkable "OUT" RJ-45 ports.

IN ports use an internal *crossover* of the receive and transmit lines, enabling the port to connect to a network interface card using standard 8-wire UTP cable. OUT ports use a straight-through (uncrossed) connection, which lets you interconnect the *Micro 100-TX24* repeater and another repeater without the need for special crossover cables and allows the two repeaters to be on the same segment.

The default setting for the uplink switch is **MDI-X** (Media Dependent Interface-Reversed — i.e., standard repeater port).

To convert Port 12 to an uplinkable port, use a small, slotted screwdriver, or a similar tool, to set the switch to the **MDI** position.

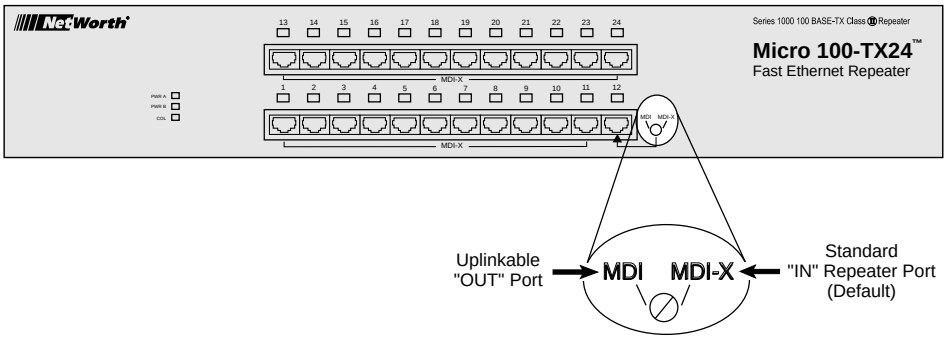

Figure 3-4: Uplink Switch

Interconnecting Repeaters

You can interconnect two *Micro 100-TX24* repeaters, providing up to 48 ports in the same collision domain (segment). You can also connect the *Micro 100-TX24* repeater to another 100BASE-TX repeater.

To connect the *Micro 100-TX24* repeater to another repeater, set the appropriate uplink switch as described under "Setting the Uplink Switch" and connect the repeaters as shown in Figure 3-5.

> ***Note:*** *The maximum distance between repeaters is 5 meters. The maximum distance from the repeater to a DTE is 100 meters. The total maximum end-to-end length of the collision domain is 205 meters.*

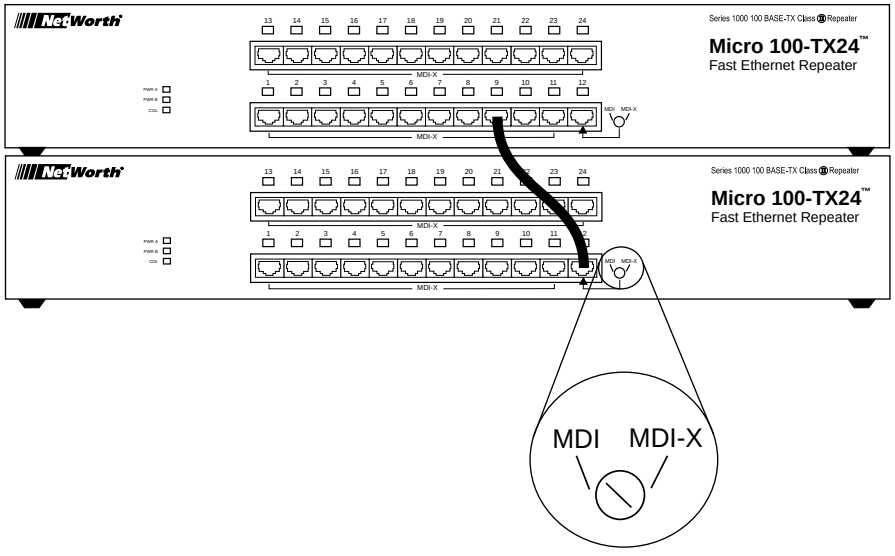

Figure 3-5: Interconnecting Micro 100-TX24 Repeaters

Connecting Power

Follow these steps to connect the *Micro 100-TX24* repeater to power:

1. Plug the female IEC power cable connector into the power connector on the back of the repeater.

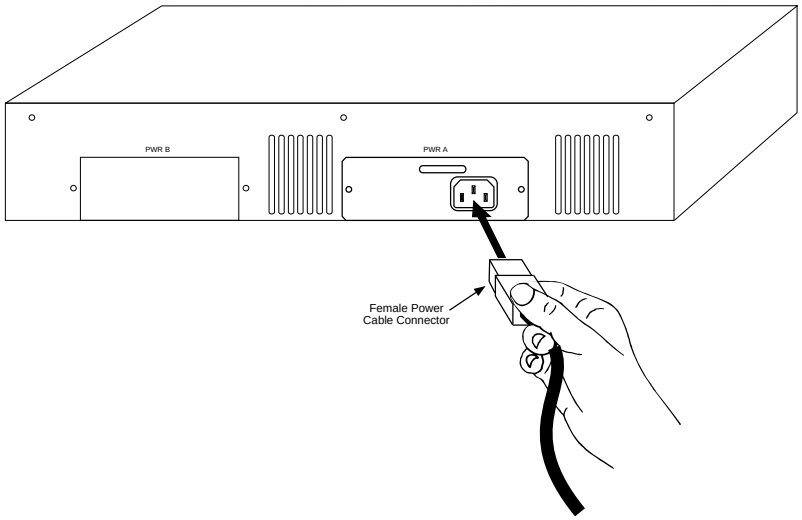

Figure 3-6: Connecting the Power Cable

2. Insert the power cable's three-pronged plug into a non-switched, grounded power source (e.g., wall outlet, power strip, or grounded extension cord). When you plug the power cable into the power source, the **PWR A** LED lights steady green.

> ***Notes:***
>
> *— The power source should be near the repeater and easily accessible.*
>
> *— The Micro 100-TX24 repeater has no power switch. Connecting the repeater to the power source via the power cable's three-pronged plug powers up the repeater.*

Disconnecting Power

To power down the repeater, disconnect the power cord's three-pronged connector from the power source. **The female power cable connector is not a TUV-tested disconnect. Therefore, do not unplug the female connector from the repeater to power down the repeater.**

Replacing the Power Supply

The power supply's modular design makes the power supply easy to replace. If it is necessary to replace the power supply, follow the instructions under "Installing a Redundant Power Supply Module."

Installing a Redundant Power Supply Module

The *Micro 100-TX24* repeater comes with a pre-installed, 90-watt power supply module (**PWR A**). You can install an optional redundant power supply module (**PWR B**) for backup power. Contact your NetWorth reseller for information about ordering an additional power supply module.

Follow these steps to install a redundant power supply module.

> ***Note:*** *You can install the redundant power supply module while the main power supply module is powered on.*

1. Remove the two screws from the **PWR B** cover plate and remove the plate. Be sure you keep the cover plate and screws in case you need them for future use.

2. Carefully insert the power supply module into the opening until its 10-pin connector engages with the internal power connector and the face of the module is flush with the repeater's back panel.

3. Secure the power supply by tightening its two spring screws.

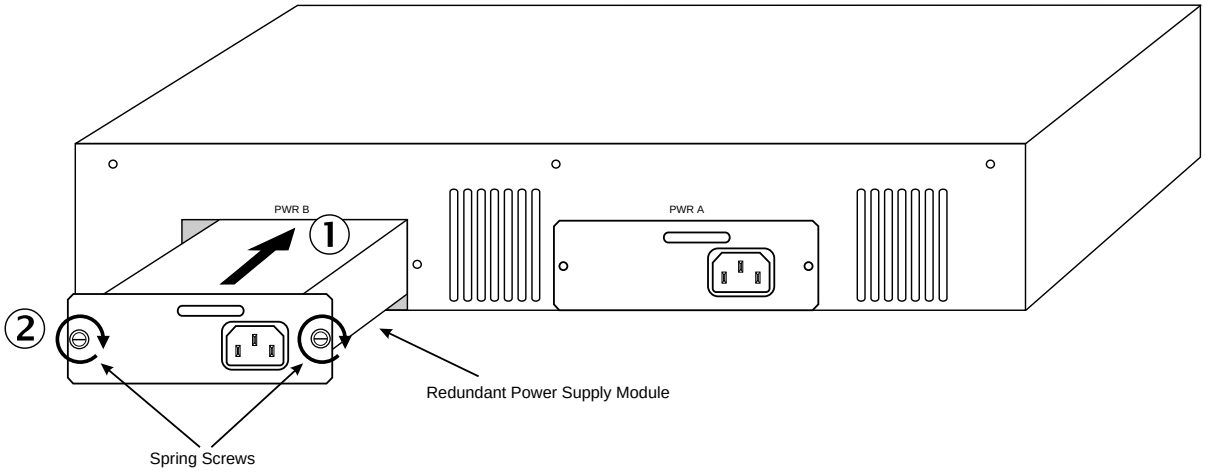

Figure 3-7: Installing a Redundant Power Module

4. Plug the female IEC power cable connector into the connector on the new power supply module.

5. Insert the power cable's three-pronged plug into a non-switched, grounded power source (e.g., wall outlet, power strip, or grounded extension cord).

   When you connect power, the **PWR B** LED indicator lights green to indicate that the power supply module is installed and functioning correctly.

> ***Note:*** *If the power supply module does not have power or is not functioning correctly, the* **PWR B** *LED indicator lights yellow.*

Appendix A Specifications

Electrical Specifications

Ports and Connectors

- 24 shielded RJ-45 repeater ports for 100BASE-TX
  - Port 12 — 100BASE-TX uplink port with MDI/MDI-X option

LED Indicators

- Power (**PWR A** and **PWR B**) and Collision (**COL**)
- 24 RJ-45 port LEDs to indicate 100BASE-TX status

Controls

- One two-position (MDI/MDI-X) uplink switch for uplink port

Power Requirements

- Voltage: 100 – 240 VAC
- Power: 1.5 – 0.75 Amps (1.5A @ 100 VAC – 0.75A @ 240 VAC)
- Frequency: 50 – 60 Hz

Power Consumption

- Maximum: 60 W

Power Cord (USA)

- 1800 mm (6 ft.), 10-amp

Power Supply

- 90W (autosensing)
  - +15VDC at 14 Amps; +12VDC at 2 Amps (no minimum load required)

Physical Specifications

Dimensions

- 3 x 16.95 x 14 inches (Height/Width/Depth)

Weight

- 9.9 pounds (4.5 kg)

Environmental Specifications

Operating Environment

- 32° to 122° F (0° to 50° C)
- 15% to 95% humidity at 50ºC (non-condensing)
- 0 to 10,000 feet (0 to 3 km)

Storage Environment

- 32° to 151° F (0° to 66° C)
- 15% to 95% humidity at 50ºC (non-condensing)
- 0 to 30,000 feet altitude (0 to 9 km)

Glossary

This section defines technical terms related to communications wiring environments, local area networks, and the *Micro 100-TX24* repeater.

100BASE-TX — An IEEE standard (802.3u) for high-speed Ethernet.

802.3 — An IEEE standard that governs Carrier Sense Multiple Access/Collision Detect (CSMA/CD) networks. 802.3, referred to as Ethernet, operates on different cable types (e.g., UTP, coax, fiber).

Category 5 Balanced Cable — Balanced 100 ohms and 120 ohms cables and associated connected hardware whose transmission characteristics are specified up to 100 MHz as per ISO/IEC 11801 and clause 23 of the IEEE 802.3 standard.

Class I Repeater — A type of 100BASE-T repeater with internal delay such that only one repeater set may exist between any two DTEs within a single collision domain.

Class II Repeater — A type of 100BASE-T repeater with internal delay such that only two or fewer such repeater sets may exist between any two DTEs within a single collision domain.

Collision — A collision occurs when two or more nodes try to transmit simultaneously. Large numbers of collisions may indicate a high network load.

Collision Domain — A single CSMA/CD network. If two or more Media Access Controllers (MAC) are within the same collision domain and both transmit at the same time, a collision will occur. MACs that are separated by a repeater are in the same collision domain. MACs that are separated by a bridge are within different collision domains.

DTE — Data Terminal Equipment. A DTE can be a source or destination communications device (typically a computer) that sends or receives network transmissions.

EIA — Electronic Industries Association. The EIA is an organization that sets electrical and electronic interface standards.

Hot-Swappable — The ability of a device (such as a redundant power supply) to be added to or removed from a hub without powering down the hub.

Hub — A device used to provide connectivity between DTEs. Hubs perform basic functions such as restoration of signal amplitude and timing, collision detection and notification, and signal broadcast to lower level hubs and DTEs.

IEC — International Electrotechnical Commission. The IEC, an organization comprised of committees from several different countries, sets international electrical and electronic standards.

IEEE — Institute of Electrical and Electronic Engineers. The IEEE, a membership organization made up of people in electronics related fields, is involved with setting standards for communications and computers.

Impedance	A measurement of the resistance to the flow of alternating current in an electrical circuit.
Inter-Repeater Link (IRL)	A mechanism for connecting two and only two repeater sets.
Inter-Packet Gap (IPG)	A delay or time gap between CSMA/CD packets intended to provide interface recovery time for other CSMA/CD sublayers and for the Physical Medium. For 10BASE-T, the IPG is 9.6 us (96 bit times). For 100BASE-T, the IPG is 0.96 us (96 bit times).
Jabbering	Continuous transmission from a node, generally as a result of a hardware or firmware failure.
Jabber Function	A mechanism for controlling abnormally long transmissions.
Latency	The length of time from the point at which the first bit of a packet enters a port to the point at which the first bit of the packet exits another port.
LED	Light Emitting Diode, typically used to indicate the operating status of a hub or module.
Link Pulse	A communication mechanism used in 10BASE-T networks to indicate link status and, in auto-negotiation equipped devices, to communicate information about abilities and negotiate communication methods. 10BASE-T uses Normal Link Pulses (NLPs) which indicate link status only. 10BASE-T and 100BASE-T nodes equipped with auto-negotiation exchange information using a Fast Link Pulse (FLP) mechanism which is compatible with NLP.
MAC	Media Access Controller
Manageable	A module is manageable if it contains an SNMP agent and there is a data communication path to that agent from an SNMP manager.
Media Independent Interface (MII)	A transparent signal interface between the MAC or repeater and the media transceiver device.
NIC	Network Interface Card. A NIC is a plug-in expansion board that enables nodes to send and receive data over the network.
Partition	The electrical disconnecting of a node from a LAN at its point of connection to a hub. The node remains physically attached. A node can be autopartitioned by the hardware when 30 consecutive frame errors occur. The reception of one good frame re-enables the autopartitioned port.
PDU	A Protocol Data Unit (PDU) is a packet that contains control information and optional data.
Port	An external connector used to connect PCs and other node devices to the network.
Repeater	A device that amplifies a signal at regular intervals in a communications circuit.
Repeater Set	A repeater unit plus its associated physical layer interfaces (MAUs or PHYs).

RJ-45	An 8-wire modular connector used for 10BASE-T Ethernet, 100BASE-T Ethernet, and some telephones.
Segment	A single collision domain. Each Fast Ethernet segment supports a 100 Mbps bandwidth. A multiple segment implementation increases the bandwidth of a Local Area Network.
Stack	A stack is a group of interconnected hubs.
Twisted Pair Wire	Two insulated copper wires twisted together. The twists vary in length to reduce the potential for signal interference between pairs. In cables greater than 25 pairs, the twisted pairs are grouped and bound together in a common cable sheath. Twisted pair cable is the most common type of transmission media.
Uplink	The connection from one hub to another, usually done to expand a network segment.
UTP	Unshielded Twisted Pair cable is usually connected using RJ-45 connectors.
Wiring Environment	Any building communications wiring system.
Wiring Closet	A room, closet or cabinet where station cable is terminated on crossconnect blocks and where the building communications system can be administered.

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