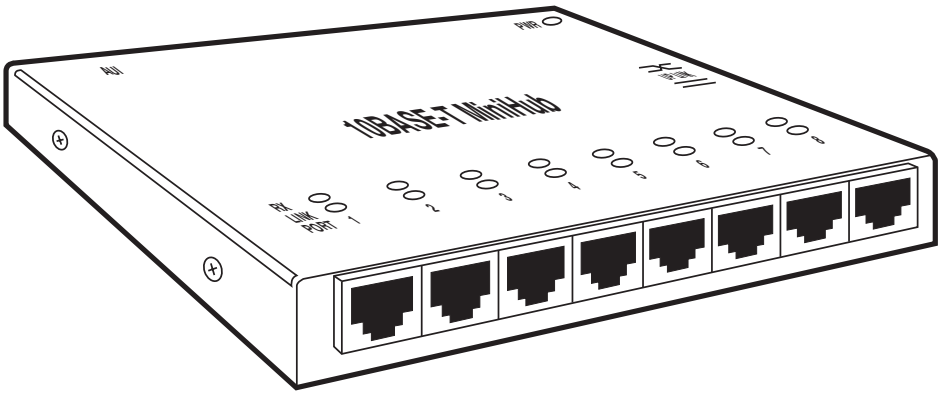
BLACK BOX®
NETWORK SERVICES

SEPTEMBER 1995
LE2601A

10BASE-T MiniHub



CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: **www.blackbox.com** • E-mail: **info@blackbox.com**

FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of IndustryCanada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

TRADEMARKS

UL® is a registered trademark of Underwriters Laboratories, Incorporated.

Velcro® is a registered trademark of Velcro USA, Inc.

Any other trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

Contents

1. Specifications

Standards — Ethernet V2.0, IEEE 802.3: 10BASE-T
(the Hub is a physical-layer standard Ethernet product and operates independently of all software)

Connectors — (7) RJ-45 female: (6) station ports, (1) switch-selectable uplink/station port, (1) DB15 male AUI port

Indicators — (17) LEDs: (8) LINK, (8) RX, (1) PWR

Switches — (1) uplink switch on side of unit

Performance — Data Rate: 10 Mbps, Partitioning: Enforced after 32 consecutive collisions; Reconnect: Occurs after 512 bits error-free transmission

Maximum Ethernet Segment Lengths — UTP (Unshielded 10BASE-T): 328 ft. (100 m); STP (Shielded 10BASE-T): 492 ft. (150 m)

Operating Environment — Ambient Temperature: 32 to 122°F (0 to 50°C);
Storage Temperature: -4 to 140°F (-20 to 60°C)

Power — Powered from AUI interface of Ethernet device connected to AUI on hub

Size — 0.8"H x 5.0"W x 4.4"D (1.9 x 12.7 x 11.2 cm)

Weight — 1 lb. (0.45 kg)

2. Introduction

2.1 Inspecting the Package and Product

Examine the shipping container for obvious damage before installing this product; notify the carrier of any damage that you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and make sure that the items listed below are included:

- 10BASE-T MiniHub
- (1) pair of mounting ears
- (1) Velcro® tape section, approximately 3 inches long
- This User's Guide

Remove the 10BASE-T MiniHub from the shipping container. Be sure to keep the shipping container in case you need to ship the unit at a later date.

If any items are missing or damaged, contact your supplier.

2.2 Description

The 10BASE-T MiniHub is an 8-port 10BASE-T workplace hub in a very compact package. It is powered from the AUI of an Ethernet device, not an AC supply, although an optional one is available. It is simple to install and use in an office or lab environment, requiring no special rack cabinets or wiring-closet apparatus. The MiniHub is a standard physical-layer Ethernet product and operates independently of all software.

The 10BASE-T MiniHub is also well-suited for small-to-medium sized office or lab environments (up to 9 persons) that need an independent Ethernet network. Small independent networks built using the Hub are easily expanded by cascading hubs of equal or greater capacity. See **Section 3.4** for more about the Up-Link switched-port feature.

The 10BASE-T MiniHub's small size makes it very useful for demonstration situations in conference rooms and in exhibitions where a temporary network or network expansion is needed. The 10BASE-T MiniHub takes up minimal space and requires no AC power, and is rugged enough to be carried in a coat pocket.

The 10BASE-T MiniHub fits easily into the workplace environment. It ican be mounted on a tabletop or shelf, or, with the included Velcro® strip, on a wall surface, or on the back or side of a desk or cabinet. All of the wiring connectors are in the same place, so that wiring space is neat and minimal.

The 10BASE-T MiniHub includes Link and RX LEDs for each RJ-45 port, and one LED for power, located in the upper right corner. Since each LED is near the port it monitors, it is easy to associate the status LED for each of the ports with the appropriate port.

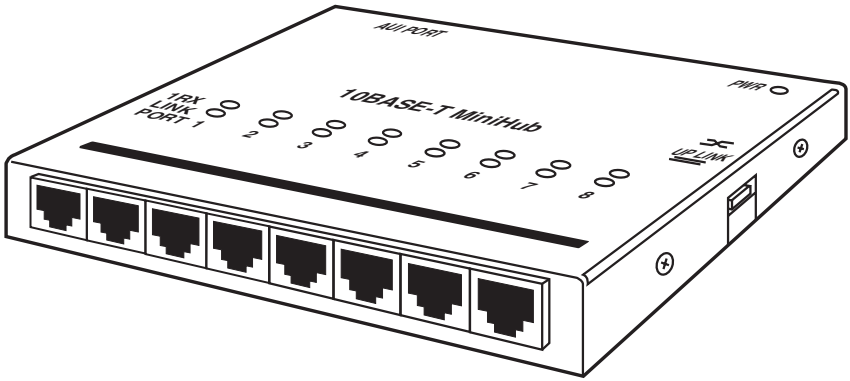


Fig. 2-1. Top View—10BASE-T MiniHub.

2.3 Features and Benefits

- Interconnect to an existing Ethernet network—The 10BASE-T MiniHub provides an Up-Link switch for port #8 to be used to connect it into an existing Ethernet environment (such as the central hub for the building or area) via 10BASE-T wiring.

- Interoperable with other Ethernet devices—The 10BASE-T MiniHub is completely interoperable with other Ethernet-compliant network devices. Each is fully compliant with IEEE 802.3 specifications for 10 Mbps CSMA/CD operation. This allows the Hub to be integrated within any standard Ethernet network and to operate with all standard software.

- Installation versatility—The 10BASE-T MiniHub is simple and easy to install in almost any office or lab location. The tiny package is very unobtrusive.

- Robust Network Operations—The 10BASE-T MiniHub uses the "star" network topology and has automatic per-port partitioning and reconnection. A fault on one segment is isolated from the rest of the network, avoiding most network downtime.

- LEDs simplify network installation and maintenance—The 10BASE-T MiniHub is equipped with a full complement of LEDs to provide status about basic network activity. Eight Link LEDs offer a very simple way for operational connections to be verified at the end of each 10BASE-T segment.

- Low-cost, standalone 10BASE-T connectivity—Operating in a standalone environment as a self-sufficient device, the 10BASE-T MiniHub offers a very low cost method of providing small workgroups access to a variety of Ethernet networking services such as file sharing, email, printer sharing, and other computer information.

The 10BASE-T MiniHub is used as a standalone unit to network a local personal multi-user system such as shown in **Figure 2-2**.

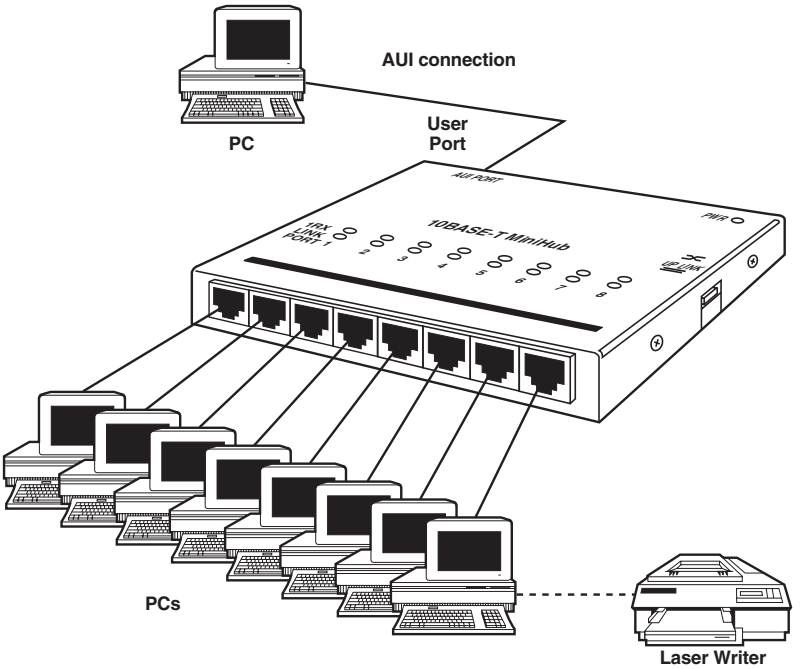


Fig. 2-2. Hub Used in a Standalone Network.

Up to 8 RJ-45 user ports are available where only 10BASE-T wiring is used, and full-length Ethernet segments are supported on all 8 segments. In this application, the "Up-Link" switch is in the straight-through or = position, so that port #8 on the front of the unit is a user port (not an up-link to another hub).

3. Installation

Installation of a 10BASE-T MiniHub is a very simple procedure. First, locate the Ethernet device that will provide power to the Hub through its AUI port), and connect a transceiver cable (LCN210 or LCN200) between that device and the Hub. When power is applied the green "PWR" LED will light.

3.1 Table-Top or Shelf Mounting

The 10BASE-T MiniHub is easily mounted on a table-top or shelf, and has four rubber feet to provide stability and keep it from scratching finished surfaces. A piece of Velcro may be used to add additional stability if desired. When properly installed, the LED status indicators will be in plain view and easy to read. Plug in two or more Ethernet cable segments, and your network is in operation.

The rugged steel case of the 10BASE-T MiniHub will protect it from accidental damage in an office or lab setting. Keep an open area around the unit so that convection cooling can occur while the unit is in operation.

3.2 Wall (or Vertical Surface) Mounting

A piece of Velcro mounting tape is supplied with the unit, and may be used to mount a MiniHub in a vertical position. Stick one side of the Velcro on the bottom of the MiniHub between the rubber feet. Stick the other side of the Velcro to the desired vertical mounting location. This permits the compact hub to be mounted on a wall surface, on the side of a server unit cabinet, on the back of a desk, or in other similar convenient locations in the workplace where the associated cables are out of the way.

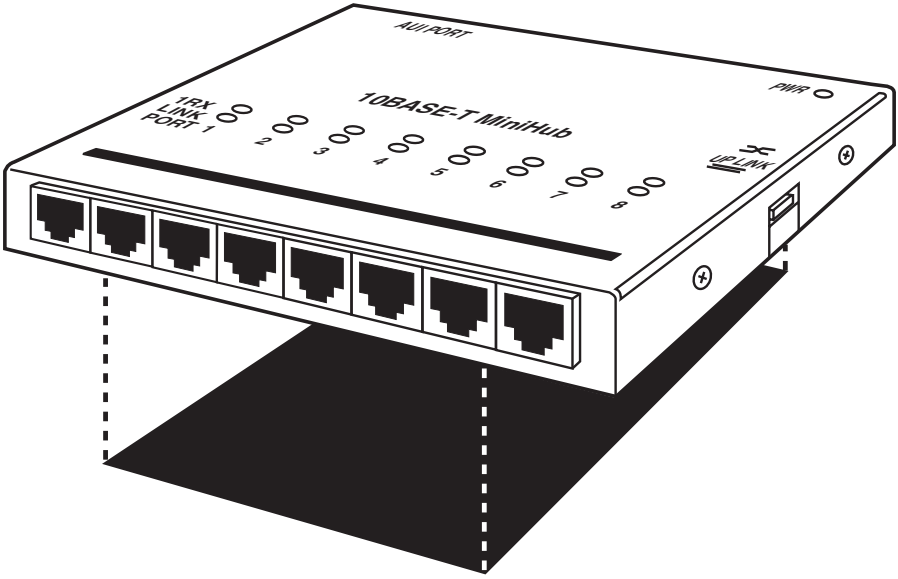


Fig. 3-1. 10BASE-T MiniHub, Velcro Mounting.

As an alternative to Velcro mounting, small brackets for mounting with screws may be used. The metal screws in each side of the case may be used to attach the brackets. Use of the optional brackets permits the Hub to be mounted in almost any desired position.

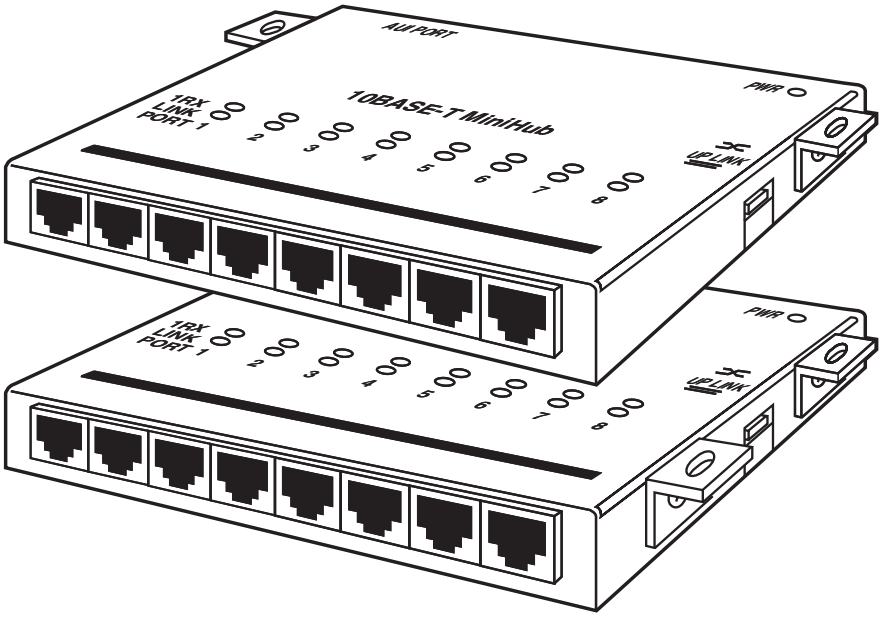


Fig. 3-2. 10BASE-T MiniHub, Optional Bracket Mounting.

3.3 Twisted Pair Segment Connections

Follow these steps:

1. Using standard 10BASE-T media, insert the plug on one end of the network cable into one of the RJ-45 female ports on the 10BASE-T MiniHub. Even though the Hub's ports are of the shielded type, they will accept and operate properly with either unshielded or shielded RJ-45 twisted-pair wiring plugs.
2. Connect the other end of each network segment to the applicable workstation or user device. The "Link" LED will be lit for each port where the connection is made on both ends of the segment, and where the AC power is on at each end as well, iin other words, when the segment circuit is established and is ready to use.
3. For the port #8 up-link options, see **Section 3.4**.

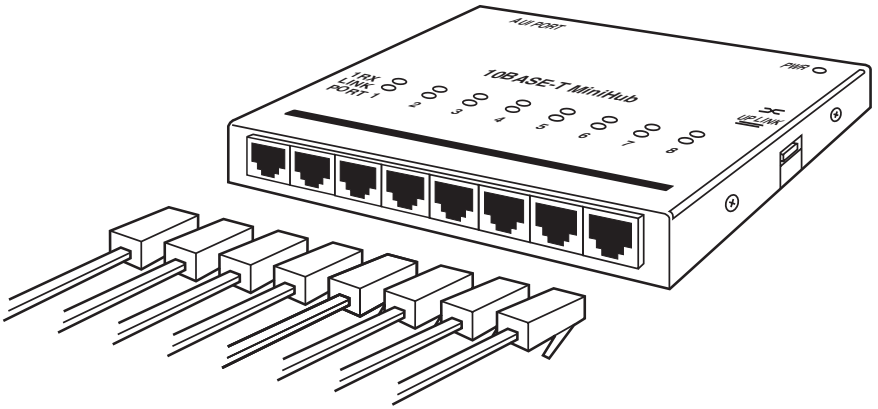


Fig. 3-3. Twisted-Pair Segment Connections.

3.4 Up-Link Option on Port #8, Up-Link Switch

For RJ-45 port #8 only, the Up-Link crossover switch on the right side of the MiniHub is used to select either a normal 10BASE-T wiring segment connection to a user device (switch in the "=" position) or a special network up-link 10BASE-T wiring segment connection to another hub or concentrator (switch in the "X" position). A special crossover cable for up-links is not needed with the MiniHub because of the built-in up-link switch feature.

Up-Link Option Used for Cascading

Hubs may be cascaded in order to expand networks. For example, a MiniHub may be cascaded via its port #8 up-link into any port of another MiniHub. Since each MiniHub provides full repeater functionality, cascaded units can operate together even though there may be a full segment of distance between them. Based on the "four-repeater rule" defined by Ethernet standards, there may be a maximum of four units in any one chain between any two users.

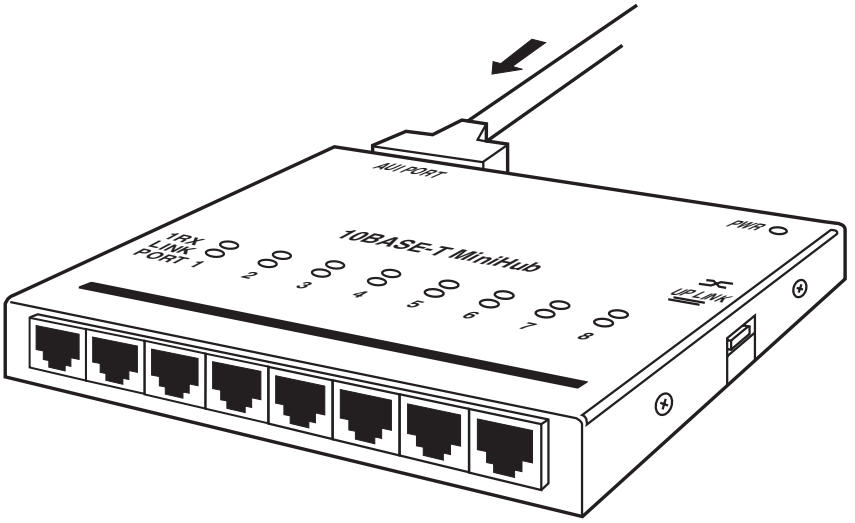


Fig. 3-4. Up-Link Option on Port #5.

4. Operation

This section details the various operational features of the 10BASE-T MiniHub, including a description of the LED indicators. The 10BASE-T MiniHub is fully compliant with the Ethernet Version 2/IEEE 802.3 repeater specification for CSMA/CD 10 Mbps operation and will function accordingly.

- Power On (PWR) LED—lights green to show functional DC power.
- Link Status (Link) LED—The 10BASE-T MiniHub includes a Link LED for each port. It indicates by illuminating in green that there is proper connectivity on its 10BASE-T network segment. The Link LED will turn off if connectivity is lost between the ends of the segment or a loss of power occurs in the unit at either end.
- Receive Packets (RX) LED—The RX LEDs, one for each RJ-45 port, illuminate intermittently in green to indicate that data packets are being received from the segment. This provides a visual indication of network activity, and is also helpful in troubleshooting.
- Partitioning and re-connection—The 10BASE-T MiniHub will automatically partition any port where 32 consecutive collisions occur or after 6.5 milliseconds of continuous transmissions. Network integrity is checked every 800 milliseconds and segment re-connection occurs after one 512-bit packet is transmitted without an error.
- Preamble regeneration—The 10BASE-T MiniHub will add bits to the preamble so that the output packet contains at a minimum a 64-bit preamble per the Ethernet standard.
- Collisions—When carrier is detected simultaneously on multiple ports, a jam pattern is generated on each port to create a collision condition. When a collision signal from one port is detected, it generates a jam pattern to the other ports.
- Fragment extension—The 10BASE-T MiniHub will automatically add bits to a received data packet of less than 96 bits (a “fragment”) so that the minimum output packet to the other port is 96 bits long.

5. Troubleshooting

The 10BASE-T MiniHub is designed to provide reliability and consistently high performance in all network environments. The installation of the 10BASE-T MiniHub is a simple procedure (see **Chapter 3, Installation**. Operation is very simple and is described in **Chapter 4, Operation**.

If problems develop during installation or operation, this section should help to locate, identify, and correct such problems. Follow the suggestions listed here before you contact Technical Support. However, if you are unsure of any procedure described in this section, or if the 10BASE-T MiniHub is not operating as expected, do not attempt to repair or alter the unit. Contact Technical Support for assistance.

5.1 Before Calling for Assistance

1. If you encounter difficulty when installing or operating the 10BASE-T MiniHub, refer back to **Chapter 3, Installation** and **Chapter 4, Operation**. Check to make sure that the various other components of the network are operable.

2. Check the cables and connectors to make sure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation.

3. Make sure that the AUI cable is properly connected to the unit and to the Ethernet device AUI port. Use the PWR LEDs to verify that the unit is receiving proper power.

4. If the problem is isolated to a network device other than the 10BASE-T MiniHub, replace the problem device with a known good device. Verify whether of not the problem is corrected. If not, go to **Step 5** below. If the problem is corrected, the 10BASE-T MiniHub and its associated cables are functioning properly.

5. If the problem continues after completing **Step 4** above, contact Technical Support by fax or by phone for assistance.

5.2 When Calling for Assistance

Please be prepared to provide the following information:

1. A complete description of the problem, including the following points:

a. The nature and duration of the problem;

b. Situations in which the problem occurs;

c. The components involved in the problem;

d. Any particular application that, when used, appears to create the problem;

2. An accurate list of products involved, with part numbers and serial numbers. Include the date that you purchased each product from your supplier.

4. A record of changes that have been made to your network configuration before the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

5.3 Return Material Authorization (RMA) Procedure

All returns for repair must be accompanied by a return material authorization (RMA) number. To obtain an RMA number, call Black Box. When calling, please have the following information available:

- Name and phone number of your contact person
- Name of your company/institution
- Your shipping address
- Product name
- Serial number
- Sales order number
- Date of installation
- Failure symptoms, including a full description of the problem.

We will carefully test and evaluate all returned products and will repair products if possible. However, if the problem cannot be duplicated by Black Box, the unit will be returned as "No problem found."

5.4 Shipping and Packaging Information

If you need to ship the unit back to Black Box, please follow these instructions:

1. Package the unit carefully. We recommend that you use the original container if available. Units should be wrapped in a bubble-wrap plastic sheet or bag for shipping protection. (You may keep all connectors and this User's Guide.)

CAUTION

Do not pack the unit in styrofoam "popcorn" type packing material. This material may cause electrostatic shock damage to the unit.

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.

3. Ship the package prepaid back to Black Box.

© Copyright 1995. Black Box Corporation. All rights reserved.

1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746