

## Specifications

Warranty: 2 years

Power Supply: Internal Power Supply, Input AC 100 - 250 VAC, 47 - 63 Hz, 40W Max

Environment: 0 - 70°C, 5% - 90% humidity non-condensing, 0 - 10,000 ft. altitude

Dimensions: Free standing (rack mount adapters included) 19" W x 6.25" D x 3.4" H  
Desk top - 17" W x 6.25" D x 3.4" H

Accessories: Rack mounting tabs included for standard 19" wall racks  
Rubber feet for free standing

Safety Approvals: UL Listed  
C-UL Approved (Canadian Safety)

## 24 Port 10BaseT Ethernet Hub Model E-TBT-HB-1002 Users Manual

Manual #7306

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## FCC Regulations

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 used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own cost.

## Canadian Regulations

NOTE: This digital apparatus does not exceed the Class A limits for radio noise for digital apparatus set out on the Radio Interference Regulations of the Canadian Department of Communications.

## Technical Support

For more information about this product or other TRANSITION Networks products, call your local TRANSITION Networks distributor, or contact us by telephone at (612) 941-7600 or fax (612) 941-2322.

## Trademarks

Ethernet is a registered trademark of Xerox Corporation.

**Table 3: Approved European Power Cord Set Information**

Approval	Organization	Surface Printed or Embossed Harmonization Marking	Alternate Markings Utilizing black-red-yellow (thread length/mm)		
			Black	Red	Yellow
Belgium: technique	Comite Electro-Beige (CEBEC)	CEBEC-HAR	10	30	10
Verband Deutscher Elektrotechniker (VDE)e, V., Prufstelle	VDE-HAR		30	10	10
Technique de l'Electricite (UTE)	UTE-HAR		30	30	10
Institute del Marchio Qualita	IEMMEQU-HAR		10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC-HAR		10	10	30
N.V. tot Keuring van Electro-technische Matarialien (KEMA)	KEMA-KEUR-HAR		10	30	30
Svenska Elecktriska (SMEKO)	SEMKO-HAR		10	10	50
Osterreichischer Verband fur Electrotechnik (OVE)	OVE-HAR		30	10	50
Danmarks Elektriske (DEMKO) Materielkontroll	DEMKO-HAR		30	10	30
Institute for Industrial (IIRS) Research and Standards	IIRS-HAR		30	30	50
Norges Elektriske (NEMKO) Materielkontroll	NEMKO-HAR		10	10	70
National Standards Authority of Ireland (NSAI)	NSAI-HAR		30	30	50

# TRANSITION Networks, Inc.

## 24 Port 10BaseT Ethernet Hub

### Model E-TBT-HB-1002

### Installation Manual

#### Introduction

The 24 port 10BaseT Ethernet hub, Model E-TBT-HB-1002, is an Ethernet repeater that provides an economical and efficient networking system. It is rack mountable and is designed to meet the IEEE 802.3 10BaseT standards. Several repeaters can be cascaded together via thicknet/thinnet coaxial cable, fiber optic cable and/or twisted pair cable to build a large Ethernet network. The 24 port hub allows simple installation and expansion flexibility for your future networking requirements.

#### About 10BaseT (twisted pair) Topology

The IEEE 802.3 10BaseT specification is defined as Ethernet across twisted pair wire. This new technology for Ethernet (across twisted pair wire) represents a step forward in network cabling and management. Since 10BaseT utilizes twisted pair wire, the cost of networking is considerably less expensive than using coaxial cables. It is also much easier to install since it uses RJ-45 modular connectors.

Ethernet thick and thin (coax) networks are designed in a linear "bus" or "daisy chain" topology where 10BaseT (twisted pair) networks are designed in a "star" type topology. In a "star" topology the hub is located in the center of the configuration, with the individual nodes connected to the hub, spread out like spokes on a wheel. In a linear or "bus" topology, if you disconnect a device or accidentally open a

you would inadvertently disconnect users from your network. With a “star” topology this cannot happen, each node is isolated from each other, making the network much easier to control and manage. The 24 twisted pair ports are designed for 24 or 26 AWG twisted pair cable (meeting IEEE standards).

### **About the TRANSITION Networks 24 port Ethernet Hub**

The TRANSITION Networks Model E-TBT-HB-1002 hub is a free standing or rack mountable multiport repeater with 24 modular RJ-45 connections. In addition, an AUI port (DB-15 connector) is provided for another Ethernet interface. Included are two expansion slots for optional Slide In Cards; providing coaxial cable, fiber optic and twisted pair Ethernet connections.

**\*E-CX-SIC Coaxial cable interface slide in card**

**\*E-FRL-SIC Fiber optic interface slide in card**

**\*E-TBT-SIC Twisted pair interface slide in card**

These optional cards allow extended interface capabilities; providing greater flexibility for your network's present or future needs.

### **Redundancy Feature**

A special feature of the TRANSITION Networks 24 port hub is the Redundancy feature that allows dual connections when cascading hubs. This feature insures that if one line fails between hubs, another line provides transmission automatically. If both lines fail, a fault light on the front panel indicates trouble. The Redundancy feature requires the switch enabled (on side of the hub) and both optional Slide in Card ports be utilized. Either twisted pair or fiber optic

The following are network topology constraints that apply to 10BaseT as well as mixed media networks containing 10BaseT segments.

- 1) Repeater sets are required for all segment interconnection.
- 2) MAUs that are part of repeater sets count towards the maximum number of MAUs on a segment.
- 3) The transmission path permitted between any two DTEs may consist of up to five segments: four repeater sets (including optional AUIs), two MAUs and two AUIs.
- 4) When a network consists of four repeater sets and five segments, up to three of the segments may be coax and the remainder must be Link segments. When five segments are present, each FOIRL Link segment should not exceed 500 meters.
- 5) When a network path consists of three repeater sets and four segments, the maximum allowable length of the FOIRL segments is 1000 meters each as specified.

### **Fuse Information and Approved European Power Cord Sets**

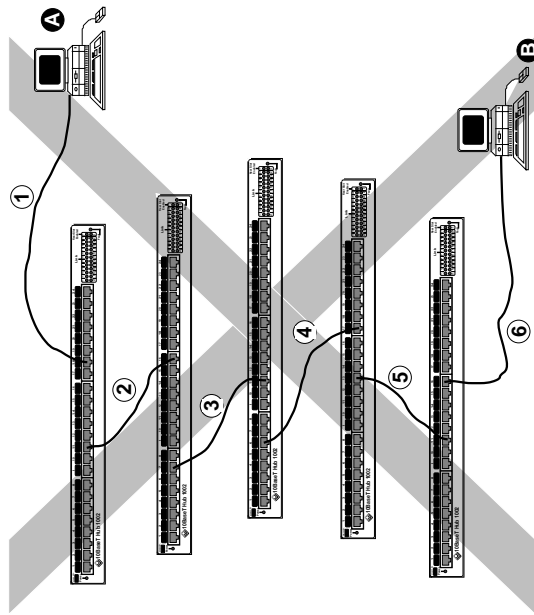
AC Inlet Fuse Information:

For installing new fuses, open the fuse cover using a small blade screw driver or similar tool.

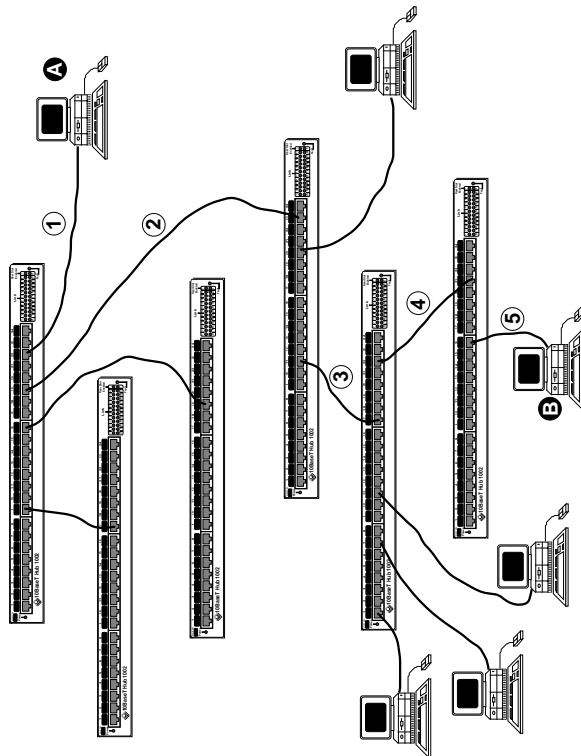
**Warning:**For continued protection against risk of fire, replace only with the same type of fuse.

Note: For replacement of North American style fuse, replace with 1/4 x 1 1/4 inch 250 V, 2 Amp, UL listed fuse.

For European replacement style fuses, replace with 5 x 20 mm, 250 Volt, 2 Amp fuses.



**FIG 7: FIVE SEGMENT RULE**

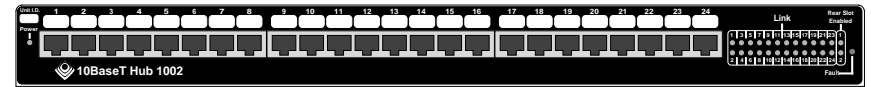


may be used. **Note: Coax slide in card (E-CX-SIC) may not be used for redundancy connection.**

### Shielded RJ-45 Connectors/Twisted pair wire

The 24 port hub is provided with shielded RJ-45 Modular connectors to meet European requirements. To fully utilize shielding capability, use AMP shielded male modular RJ-45 connectors; tying cable shield to the shielded connector. You may use shielded or unshielded 24 or 26 AWG twisted pair wire without loss of transmission distance. The maximum distance between the hub and a network device is 100 meters (330 feet). The use of flat cable (silver satin) patch cables are not recommended and may affect the system's overall performance.

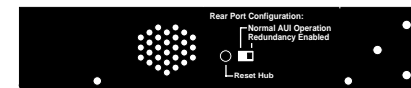
### Model 1002 Hub Views: Figure 1



**24 PORT HUB FRONT VIEW**



**24 PORT HUB REAR VIEW**



**24 PORT HUB SIDE VIEW**

### Hub Reset Switch

The Hub Reset switch is used if the hub locks up or a malfunction occurs. This switch is located on the side of the hub.

## Hub LED's

The 24 port Ethernet hub provides Power, Link, Fault and Rear Slot Enabled LED's, for monitoring convenience. Power is indicated after the unit is plugged into any AC outlet (100-240 VAC, 50-60 Hz) and with the rear power switch turned on. Link indicates the hub is receiving link pulses from a 10BaseT compliant device. Fault LED indicates the redundancy feature has failed and is not functioning. Rear Slot Enabled indicates which optional slots are active when the redundancy feature is utilized.

## Redundancy Switch

The redundancy switch is also located on the hub's side and is used for the redundancy feature utilizing the optional slide in cards. Both slots must be installed with any combination of fiber optic or twisted pair slide in cards.

## AUI (DB-15 female D-Sub) Connector

The AUI connector provides another port for connecting to a network via a transceiver or for cascading hubs. **NOTE: Do not cascade hubs together with an AUI cable!** If attaching a transceiver through an AUI cable, use only IEEE approved Ethernet AUI cables. Maximum distance for an AUI cable is 50 meters (150').

## Rules For Configuring Your Network

Follow these rules when configuring your network:

\* When connecting multiple hubs together on a backbone, you can use the AUI port of your hub; utilizing a transceiver (TN models E-CX-MC02, 03, 04 and 05) to attach to the backbone. A thicknet or thinnet backbone will allow you to run longer distances between hubs and provide better noise immunity because the cable is shielded. In addition, fiber

cable. Use only IEEE approved AUI cables. Check the connections.

\* The network interface card is improperly configured. Refer to users manual; verify proper configuration.

\* Another network device is disrupting communications of the device your are trying to bring on line. Remove that device and troubleshoot the problem on that line.

## Integrating Ethernet IEEE 802.3 Compatible Hardware

This information provides guidelines for integrating 10BaseT and non-10BaseT compatible hardware for use with the 24 port Ethernet hub in your network. The following table summarizes the delays for the various network media segments.

**Table 2**

Media Segment Type	Maximum Number MAUs per Segment	Maximum Segment Length (meters)	Minimum Medium Propagation Velocity*	Maximum Medium Delay per Segment (nano/sec)
Coax				
10Base5	100	500	0.77 c	2165
10Base2	30	185	0.65 c	950
Link				
FOIRL	2	1000	0.66 c	5000
10BaseT	2	100***	0.59 c	1000
AUI**1 DTE/MAU		50	0.65 c	257

\*c =  $3 \times 10$  to the 8th power, expressed in meters/second

\*\*AUI connection is not a segment

\*\*\* Maximum segment length depends on the cable characteristics

## Troubleshooting Your Installation

The first step after the wiring has been installed is to connect two devices (such as the file server and a workstation) to the hub to see if they will communicate with each other. Use your operating system software to locate each device. When you have verified that they communicate correctly, you can continue to connect other network devices to the hub.

If the two network devices do not communicate, or any additional device after the initial test, follow the procedures listed below.

- 1) Check the LINK indication on the front panel. If not lit, LINK has not been established.
- 2) Bypass the building wiring and test directly using test cables between the hub, workstation and server.
- 3) Verify that the individual devices are Ethernet compatible and can communicate with each other.
- 4) Examples of common internal wiring problems found:
  - \* The internal (building or premise) wiring is not properly configured (punch down blocks, wall jacks, patch cables).
  - \* Flat or “silver satin” telephone wire used for patch and line cords. These may have reverse pinning, replace and use level 4 grade cable.
  - \* The maximum distance from a hub to network device cannot exceed 100 meters (330 feet).

- 5) Examples of common network problems:

optic connection between two hubs can be provided through fiber optic transceivers (TN model E-FRL-MC01) connected to the AUI port.

- \* Do not cascade hubs directly together with an AUI cable.
- \* When cascading hubs via twisted pair, a cross over cable is required (see section on cascading hubs).
- \* Be sure your network configuration does not exceed the maximum distance and MAU limitations set forth by the 10BaseT standards. Refer to IEEE 802.3 specifications or check with a professional network installer.
- \* When connecting your network devices to the hub via twisted pair cable, the maximum twisted pair length is 100 meters (330 feet) and is equal to one segment. Use a straight through cable assembly.
- \* Choose a centrally located area for the hub installation. Separate Data and Voice transmission lines. Use only a dedicated cable, per device to prevent crosstalk. Utilize level 4 cable or better.
- \* The text of this manual assumes that the reader is familiar with network systems in general.

## Choosing an Installation Location

The installation location you choose must have the following:

- \* An AC power outlet (100-240 VAC, 50-60 Hz) for the hub’s power cord connection.
- \* Suitable rack space to mount the hub for proper ventilation.

\* An environment within the requirements for the product as described on page 18.

\* The hub or twisted pair wiring **IS NOT** located close to any sources of electrical noise (such as radio transmitters and broadband amplifiers, motors, high power electrical lines, unshielded data cables, and fluorescent light fixtures).

\* The twisted pair cable does not run in the same conduit with power lines or other data cables.

\* Phone lines should be separated from data cables.

### Utilizing Existing Twisted Pair Wiring

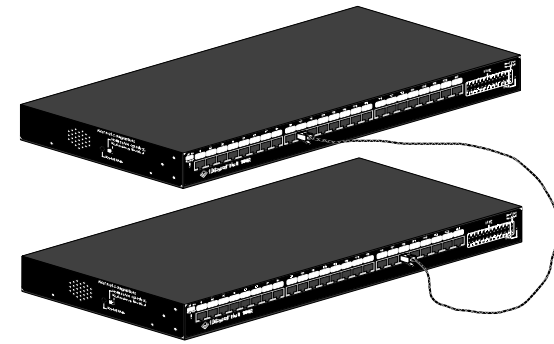
You may be able to use the existing twisted pair wiring in your installation. Determine the following:

\* Identify the manufacturer of the twisted pair wire installed in the building(s). If identifiable, contact the manufacturer (or distributor/installer) and have them send you the wire specifications or have them determine if the cable meets the 10BaseT requirements listed on page 7.

\* Make sure the cable run is in a star configuration and all of the cables are run to a central location which is easily accessible.

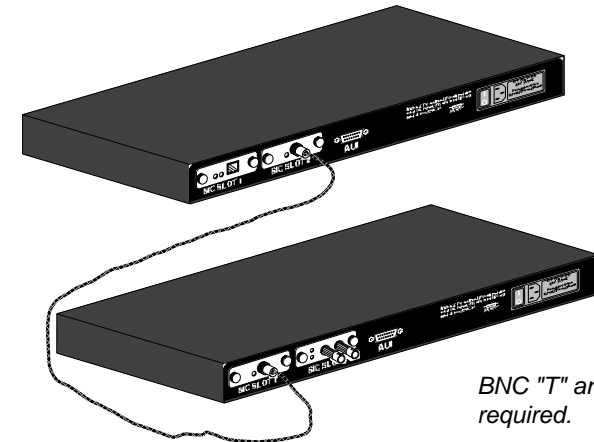
\* In your central location, look at your punch down blocks and bridging panels. Make sure the wiring used is not "Straight or Flat telephone wire". This must be replaced with twisted pair wire.

\* After you have determined that your cable meets the requirements for 10BaseT, you may install an RJ-45 jack at each location for a network device.



HUB CASCADING VIA FRONT CONNECTORS

FIG 4: HUB CASCADING VIA FRONT CONNECTORS



*BNC "T" and terminator required.*

FIG 5: HUB CASCADING VIA SLIDE IN CARD

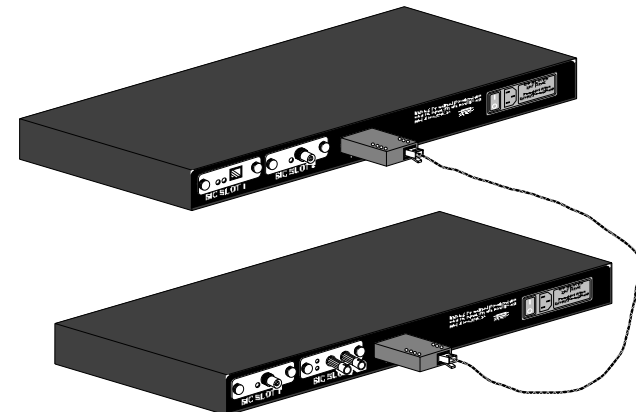


FIG 6: HUB CASCADING VIA TRANSCEIVERS ON AUI

## Slide in Card Indicator Lights

<b>E-CX-SIC</b>	<b>Power indication only</b>
<b>E-FRL-SIC</b>	<b>Power and Link indication</b>
<b>E-TBT-SIC</b>	<b>Power and Link indication</b>

The Slide In Cards are installed in the rear of the hub and can only be installed one way. If seated properly, the power indicator LED will light. When Link has been established, the Link LED will light on the E-FRL-SIC and E-TBT-SIC cards. See Figure 3 below:

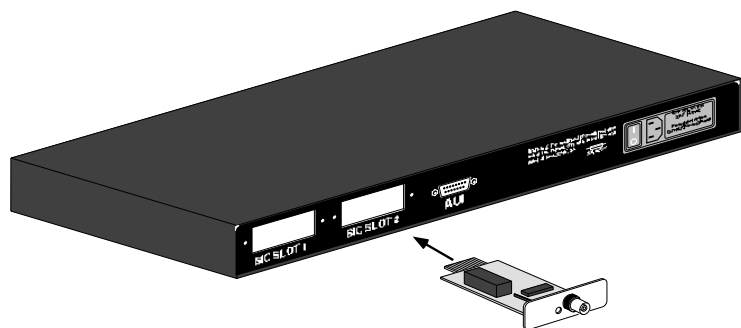


FIG 3: SIC CARD INSTALLATION VIEW

## Cascading Hubs

Ethernet hubs may be cascaded together to support larger networks. When cascading the 24 port hub to another Ethernet hub, a crossover cable is required (See page 9 for pinning instructions). Also, when cascading via the optional Slide In Card (E-TBT-SIC), or cascading through transceivers connected to AUI ports, a crossover cable is required. Note: Do not cascade hubs via AUI ports with an AUI cable.

Make sure there are no double lines or branches punched down together. The system may work for a while, but the non-connected branch will act like an antenna (picking up unwanted noise) and slow down the network. Eliminate any branches.

## Installing New Twisted Pair Wire

If the existing wire in your building(s) does not meet IEEE 802.3 specifications, you may want to install new wiring. If you have a noisy (electrical noise) environment, you may select shielded twisted pair wire. If shielded twisted pair wire is used, the shield may be connected to chassis ground through the shielded modular RJ-45 Amp connector (see page 3).

## Wiring Specifications

### Twisted Pair Media

The cabling between nodes on the network must be twisted pair cable. Shielded twisted pair is also available. The physical characteristics must meet or exceed those set forth by the IEEE 802.3 10BaseT specifications. Generally, Level 4 wire or better is recommended. The cable must have a minimum of 2 pairs of twisted 22-26 AWG wire. **“Flat or Straight” wire is not recommended.**

-Gauge	22 to 26 AWG
-Attenuation	Less than 11.5 dB between 5 and 10 MHz
-Differential Characteristic Impedance	85 to 110 $\Omega$ @ 10 MHz
-Maximum Distance	100 Meters (330 Feet)*

### Fiber optic cable specifications for E-FRL-SIC option

Recommended fiber optic cable:  
62.5/125 µm multimode fiber

The following Fiber optic cable can be used:  
100/140 µm multimode fiber  
85µm multimode fiber  
50/125 µm multimode fiber

### Coax cable RG-58 specifications for E-CX-SIC option

Coax type: Coax RG-58 thin-net cable, 50 ohms. Cable must meet the Ethernet IEEE 802.3 specification for a thin coax segment.

Coax Segment Distance: Maximum distance of 185 meters (610 feet)

Table 1 illustrates the individual wires that make up a straight through twisted pair modular cable. Each pair has designated pin connections on an RJ-45 modular connector. There are only two active pairs in a 10BaseT network.

10BaseT pinning for **straight through cabling** (from hub to network device): Pins 1 and 2 are paired, and pins 3 & 6 are paired. Use only dedicated wire pairs (such as blue/white, white/blue, or orange/white, white/orange, etc.).

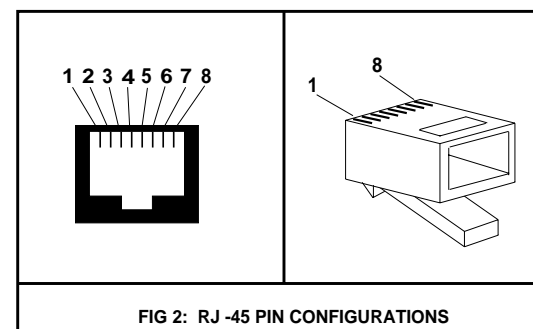
**Table 1A**

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

**Crossover Cable** for cascading hubs or connecting transceiver to transceiver.

**Table 1B**

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



### Installing Optional Slide In Cards

Optional Slide In Cards provide added capability to your network. These are available in Coax (E-CX-SIC), Fiber optic (E-FRL-SIC) and Twisted pair (E-TBT-SIC) cabling. (See cabling specifications on page 7&8.) With the optional Slide In Cards you can cascade to other hubs or connect to a different backbone media. In addition, the hub redundancy feature may also be utilized using either Twisted pair or Fiber optic Slide In Cards (see page 2).

When installing Slide in Cards, note the following: 1) The Coax Slide in Card (E-CX-SIC), may not be used for the redundancy feature and requires a coax T (and terminator if at the end of a segment). 2) The SQE switch must be set to OFF. 3) Before installing Slide in Cards, disconnect AC power to the hub.