# TE100-DX16R/DX24R/DX32R
# 16/24/32 Ports Ethernet/Fast Ethernet Dual-Speed Stackable Hubs User's Guide

Rev. 01 (JULY, 1998)
505-0100-004
Printed In Taiwan

RECYCLABLE

## FCC Warning

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 this user's guide, 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 expense.

## CE Mark Warning

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

# TABLE OF CONTENTS

# ABOUT THIS GUIDE

This guide discusses how to install and use the 16/24/32 port dual-speed stackable Ethernet/Fast Ethernet Hubs

## Conventions

References in this manual to the 16/24/32 port dual-speed stackable Ethernet/Fast Ethernet Hubs are frequently written simply as “hub” or “hubs” where the text applies to all models. Model names are normally used only to differentiate between models where necessary.

Unless differentiated by model name, all information applies to all models.

## Overview of the User’s Guide

- Chapter 1, *Introduction*. Provides information on Fast Ethernet networks, and introduces the features of the 16/24/32 port dual-speed stackable Ethernet/Fast Ethernet Hubs.
- Chapter 2, *Unpacking and Setup*. Helps you get started in setting up the hub.

- Chapter 3,*Understanding Indicators*. Describes all LED indicators on the hub's front panel. Understanding these indicators is essential to effectively using the hub.
- Chapter 4, *Making Connections*. Provides information on connecting to the hub's twisted-pair, stacking hubs, and linking with other 100BASE-TX or 10BASE-T hubs.
- Appendix A, *Cables and Connectors*. Provides specifications on the cables and connectors used with the hubs.
- Appendix B, *Specifications*. Lists the hub's specifications.

# 1

# INTRODUCTION

This chapter introduces the 16/24/32 port dual-speed stackable Ethernet/Fast Ethernet Hubs, as well as giving some background information about the technology of the hubs use.

## Product Description

The dual-speed stackable Ethernet/Fast Ethernet hubs described in this manual are designed to allow easy migration and integration between 10Mbps Ethernet and 100Mbps Fast Ethernet, while providing manageability and flexibility in cable connections.

These hubs can operate with either IEEE 802.3 10BASE-T connections (twisted-pair Ethernet operating at 10 megabits per second), or IEEE 802.3u 100BASE-TX connections (twisted-pair Fast Ethernet operating at 100 megabits per second). All of the twisted-pair ports support NWay auto-negotiation, allowing the hub to automatically detect the speed of a network connection. This means you can connect all of your Ethernet and Fast Ethernet hosts to any hub in the series, without any rewiring required when a host is upgraded from 10Mbps to 100Mbps.

The hubs in the series, available in 16-port, 24-port and 32-port models, can be stacked with up to four hubs in a stack. A stack of four 32-port hubs gives a total of 128 Ethernet or Fast Ethernet

ports. An 16/24/32 port dual-speed stackable Ethernet/Fast Ethernet Hubs stack operates as a Class II Fast Ethernet repeater, allowing it to be linked to another Class II Fast Ethernet stack in the same collision domain.

In the basic configuration, the 10Mbps and 100Mbps segments are separate but it can be intercommunicate. Because each unit has built-in switch, so it can be intercommunicate and stacking up to four units.

Add-in module is also available, providing 100BASE-FX connection. The hubs in this series each have one slot for slide-in module.

# Product Features

The list below highlights the features and specifications of hubs in the series.

- Compatible with the IEEE 802.3 10BASE-T Ethernet and 802.3u 100BASE-TX, 100BASE-FX Fast Ethernet industry standards for interoperability with other Ethernet/Fast Ethernet network devices.
- Ethernet connections support Category 3 or better twisted-pair cables.
- Fast Ethernet connections support both shielded twisted pair and Category 5 unshielded twisted-pair cables.
- Fast Ethernet connections support a maximum distance of 100 meters from end-station to hub, and a total network diameter of 205 meters.
- 16, 24 or 32 NWay RJ-45 ports for connecting stations to the network.

- Built-in switch allows bridging between 10Mbps and 100Mbps segments.
- LED indicators for Power, FX Link/Rx, 100M Activity, 10M Activity, 10M Collision, 100M Collision, Switch Activity, 10M Link/Rx, and 100M Link/Rx.
- Two proprietary daisy-chain ports for cascading up to four hubs to form one logical hub.
- Uplink port allows easy linking of two Fast Ethernet hub stacks to further expand your network.
- Standard-size (19", 1U height), rack mountable
- Optional slide-in module: 100BASE-FX (see Chapter 4 *: Making Connections).*
- The total bandwidth of each stack is up to 140Mbps that includes one 100Mbps segment and four 10Mbps segments. (If per stack has stacking four units)

# 2

# UNPACKING AND SETUP

This chapter provides information on the unpacking and initial installation of your hub stack.

## Unpacking

Open the shipping cartons of your hub and carefully unpacks the contents. The carton should contain the following items:

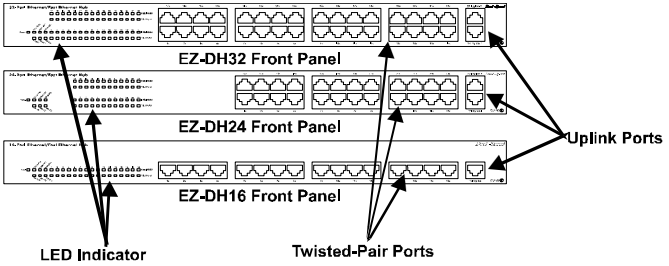
- One dual-speed stackable hub
- One AC power cord, suitable for your area's electrical power connections
- One daisy-chain cable
- Four rubber feet to be used for shock cushioning
- Screws and two mounting brackets
- This *User's Guide*

Inspect the hub and all accompanying items. If any item is damaged or missing, report the problem immediately to your dealer.

# Identifying External Components

This section identifies all the major external components of the hub. Both the front and rear panels are shown, followed by a description of each panel feature. The indicator panel is described in detail in the next chapter.

## *Front Panel*




- **LED Indicator Panel**

  Refer to the next chapter, *Understanding Indicators*, for detailed information about each of the hub's LED indicators.

- **Twisted-Pair Ports**

  Use any of these ports to connect stations to the hub. The ports are MDI-X ports, which means you can use ordinary straight-through twisted-pair cable to connect the hub to PCs, workstations, or servers through these ports. If you need to connect to another device with MDI-X ports such as another hub or an Ethernet switch, you should use a crossover cable, or

connect using the Uplink port (described below). For more information about crossover connection, see the *Crossover Cables* section.

- **Uplink Ports**

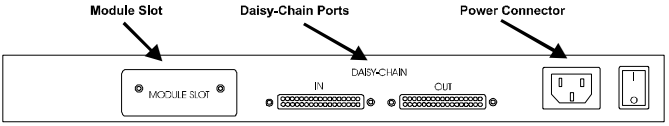
  The Uplink port is an MDI port, which means you can connect the hub (or hub stack) to another device with MDI-X ports using an ordinary straight-through cable, making a crossover cable unnecessary.

  In 32-port model, port 16 and the Uplink-1 port, port 32 and the Uplink-2 is really the same port, except that their pinouts are different. **Do not use both Port 16 and the Uplink-1 port, Port 32 and the Uplink-2 port at the same time.**

  In 24-port model, port 12 and the Uplink-1 port, port 24 and the Uplink-2 is really the same port, except that their pinouts are different. **Do not use both Port 12 and the Uplink-1 port, Port 24 and the Uplink-2 port at the same time.**

  In 16-port model, port 16 and the Uplink port, is really the same port, except that their pinouts are different. **Do not use both Port 16 and the Uplink port at the same time.**

# Rear Panel




- **Module Slots**

  Used to install module options for 100BASE-FX connection.

- **Daisy-Chain IN Port**

  When cascading a set of stackable dual-speed hubs, this port should be connected to the Daisy-Chain OUT port of the previous hub in the stack (usually placed immediately above it). A cascade of four hubs can be created in this way. The first and last hubs in the stack use only one of the daisy-chain ports, while the others use both.

- **Daisy-Chain OUT Port**

  Works in conjunction with the Daisy-Chain IN Port (see above). Connect this port to the Daisy-Chain IN Port of the next hub in the stack (usually placed immediately below it), using the enclosed daisy-chain cable.

- **AC Power Connector**

  For the power cord.

# Installing the Hub

## *Installation*

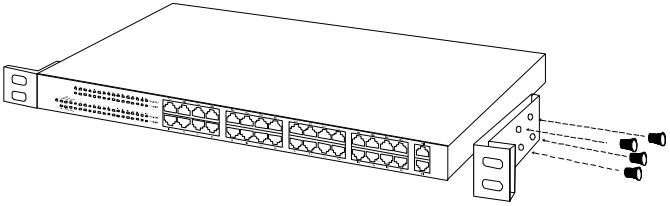
The site where you install the hub stack may greatly affect its performance. When installing, consider the following pointers:

- Install the hub stack in a fairly cool and dry place. See Appendix B, *Specifications*, for the acceptable temperature and humidity operating ranges.
- Install the hub stack in a site free from strong electromagnetic field generators (such as motors), vibration, dust, and direct exposure to sunlight.
- Leave at least 10cm of space at the front and rear of the hub for ventilation.
- Install the hub on a sturdy, level surface that can support its weight, or in an EIA standard-size equipment rack. For information on rack installation, see the next section, *Rack Mounting.*

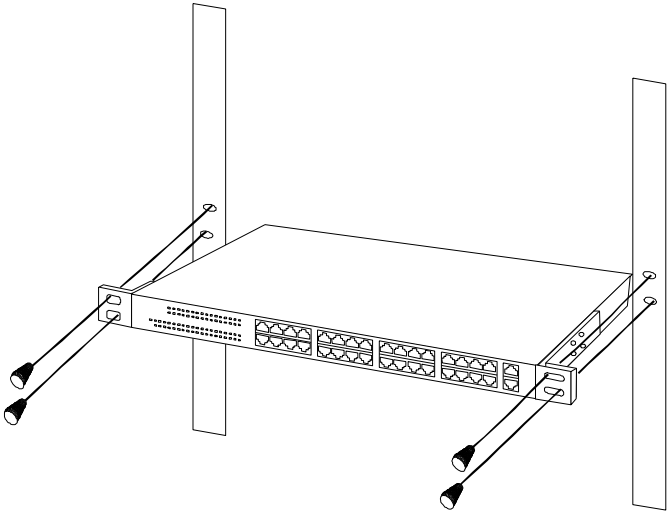
When installing the hub stack on a level surface, attach the rubber feet to the bottom of each device. The rubber feet cushion the hub and protect the hub case from scratching.

## *Rack Mounting*

The hub can be mounted in an EIA standard-size, 19-inch rack, which can be placed in a wiring closet with other equipment. Attach the mounting brackets at the hub's front panel (one on each side), and secure them with the provided screws.



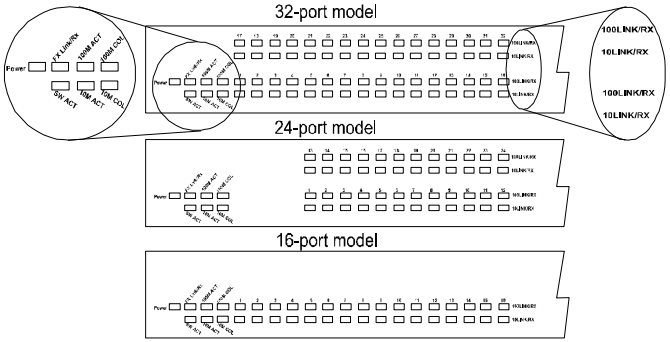
Then, use screws provided with the equipment rack to mount each hub in the rack.



# 3

# UNDERSTANDING INDICATORS

Before connecting network devices to the hub, take a few minutes to look over this section and familiarize you with the front panel LED indicators of your dual-speed hub, depicted below.



# Hub State Indicators

- **Power Indicator**

  This indicator lights green when the hub is receiving power; otherwise, it is off.

- **Switch Activity**

  This indicator green when the switch circuit active and the indicator blinking green when transfers signals between 10-Mbps and 100-Mbps network segments.

- **10M Activity, 100M Activity**

  These indicators indicate data packet on the respective 10Mbps Ethernet or 100Mbps Fast Ethernet segments will blink green.

- **10M Collision, 100M Collision**

  These indicators indicate data collisions on the respective 10Mbps Ethernet or 100Mbps Fast Ethernet segments of the hub. (If several hubs are stacked or linked together, all of them should detect and indicate the same collision, since collisions span the entire network segment.) Whenever a collision is detected, the respective COL indicator will briefly blink amber.

# 100BASE-FX Module Indicators

The FX Link/Rx, indicate a good link to a module installed.

# Port State Indicators

There have provide state indicators for each of the twisted-pair ports on the hub. Each port's LED status indicators report the port is working on 10Base-T mode or 100Base-TX mode, and indicator for link or receive status.

The following describes each indicator and the meaning of each condition:

- **10M Link/Rx**

  This indicator green when the port is connected to a 10Mbps Ethernet station , If the station to which the hub is connected is powered off, or if there is a problem with the link, the LED will remain off. And the indicator blinking green when the data will be received to all other connected ports.

- **100M Link/Rx**

  This indicator green when the port is connected to a 100Mbps Fast Ethernet station , If the station to which the hub is connected is powered off, or if there is a problem with the link, the LED will remain off. And the indicator blinking green when the data will be received to all other connected ports.

# 4

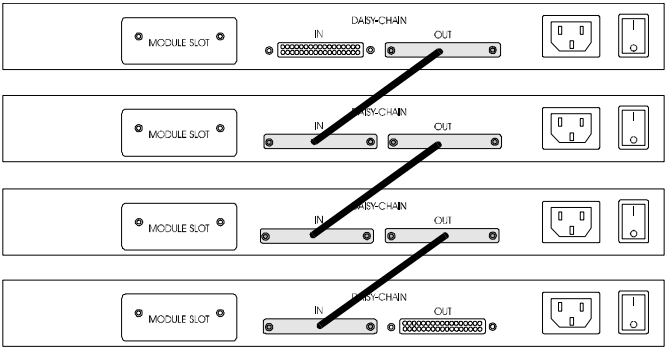
# MAKING CONNECTIONS

This chapter discusses how to make connections to the hub's twisted-pair, cascading hubs to create a stack, and linking with other hubs (or hub stacks).

## Hub Cascading/Building a Stack

You can stack up to four hubs using the daisy-chain ports to form one logical hub. In this configuration, the interconnected hubs constitute a single logical unit, providing a maximum of 128 twisted-pair ports.

Use the provided daisy-chain cable to connect the Daisy-Chain OUT port on the rear panel of one hub to the Daisy-Chain IN port on the hub below it, as shown in the figure below. Repeat this procedure for each hub to be included in the stack.




Hubs should not be added to the stack or removed from the stack while the power is on to any hub in the stack. **Always turn *on* power to the entire stack before adding or removing hubs.**

# Connectivity Rules

Ethernet (10Mbps) networks have the following connectivity rules:

- The maximum length of a twisted-pair cable segment is 100 meters. Cabling should be Category 3 or better.
- Between any two end-stations in a collision domain, there may be up to five cable segments and four intermediate repeaters (hubs, hub stacks, or other repeaters). **And be attention that you have to use 10Mbps Ethernet repeaters to connect in your network segments to avoid the limitation of Fast Ethernet. Because if you haven't use pure 10Mbps Ethernet repeaters in this**

**network segments then it would be under the rule of Fast Ethernet Standards in those Dual Speed Ethernet products that you used now.**

- If there is a path between any two end-stations containing five segments and four repeaters, then at least two of the cable segments must be point-to-point link segments (e.g., 10BASE-T or 10BASE-FL), while the remaining segments may be populated (mixing) segments (e.g., 10BASE-2 or 10BASE-5).

Fast Ethernet (100Mbps) networks have the following connectivity rules:

- The maximum length of a twisted-pair segment (that is, the distance between a port in the hub to a single-address network device such as a PC, server, or Ethernet switch) is 100 meters. Cabling and other wiring should be certified as Category 5 UTP or shielded twisted-pair (STP).

- The maximum diameter in a collision domain is about 205 meters using two Class II hubs (or hub stacks).

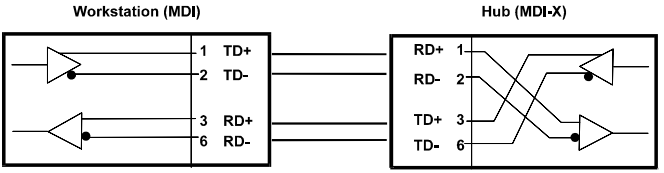
- Between any two end-stations in a collision domain, there may be up to three cable segments and two Class II hubs or hub stacks.

# Hub to End-Station Connection

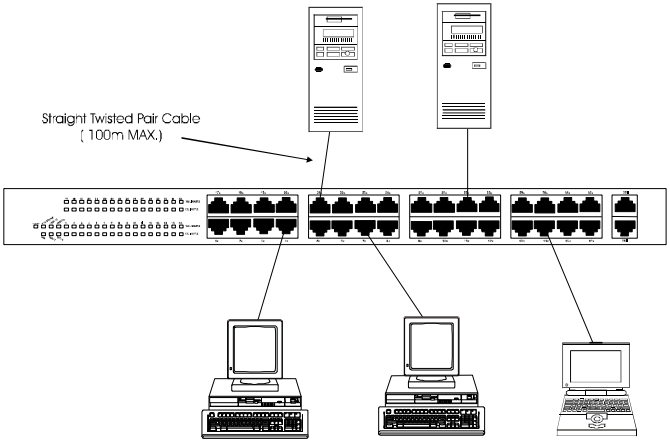
After installing the hub properly, it can support up to 32 ports, 24 ports or 16 ports end-station connections. Fast Ethernet connections require either a Category 5 UTP cable or a STP cable. These cables can be up to 100 meters long.

Each Ethernet connection requires a Category 3 or better UTP cable. It is recommended that you use Category 5 cabling for all connections, in order to make it easier to transition all stations to 100Mbps.

You can connect any combination of PCs, servers, and other single-address network devices to the twisted-pair ports using straight-through twisted-pair cables. These cables should not be crossed over. The following figure illustrates the pin assignments for a straight-through cable:




When connecting a PC or a server, the system being connected should have an Ethernet or Fast Ethernet network interface card with a twisted-pair port. The following figure shows a typical connection between the hub and end-stations:




# Hub-to-Hub Uplink

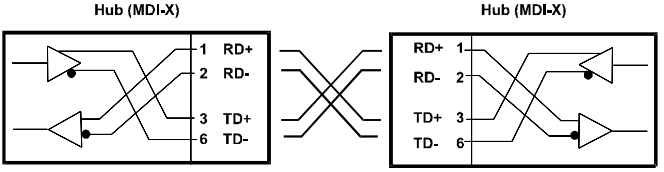
You can link two hubs or hub stacks to each other using any of the twisted-pair ports or the Uplink port. Linking hubs using ordinary twisted-pair ports requires crossover twisted-pair cables; linking using one ordinary twisted-pair port and the Uplink port requires an ordinary straight-through twisted-pair cable.

When connecting two hubs or hub stacks in this fashion, the maximum distance between any two end-stations in a collision domain is 205 meters. If each link between the hub and an end-station is 100 meters, then the hub-to-hub connection is limited to 5 meters. However, if the longest hub-to-end-station connection is less than 100 meters, then the hub-to-hub connection can be up to 100 meters long as long as the 205-meter total network diameter

rule is followed. The following table describes different methods of linking hubs (or hub stacks):

| H B PORT U ED | DEVICE | PORT TYPE | CABLE T ) USE |
|---|---|---|---|
| Normal | Switch or Hub | Non-Uplink | Crossover (X) |
| | | *Uplink* | Straight-Through (\|\|) |
| | Server (or PC) | | Straight-Through (\|\|) |
| *Uplink* | Switch or Hub | Non-Uplink | Straight-Through (\|\|) |
| | | *Uplink* | Crossover (X) |
| | Server (or PC) | | Crossover (X) |

A crossover cable is a straight-through twisted-pair cable in which the wires have been crossed. The figure below shows the pin assignments for an Ethernet or Fast Ethernet crossover cable:




There is 100BASE-FX optional module that may be added to any of the hubs in the series. Each of the modules offers a 100BASE-FX additional network interface that allows for greater flexibility in how these hubs may be used in a network.

## *100Base-FX Module Installation*

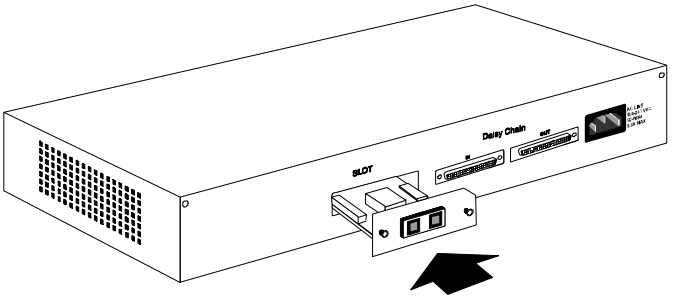
Please follow the instructions below to install the Fiber Module (SC type connector).

1. Locate the module slot in the hub's rear panel.

2. Using a screwdriver, undo the two screws and remove the dust cover on the module slot.

3. Holding the module component-side up and connector-side in, gently slide the module along the guides and seat it in the internal connector.

4. Using a screwdriver, replace the two screws and tighten until snug.



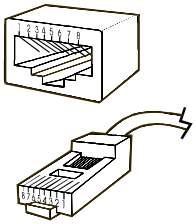
We recommend that you retain the dust cover in case you need to remove the module for an extended period sometime in the future.

# A

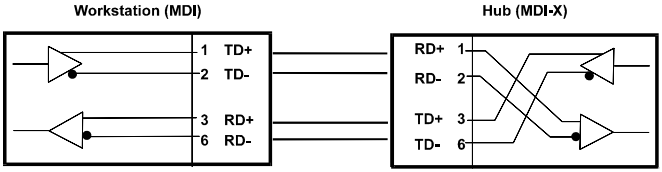
# CABLES AND CONNECTORS

## 100BASE-TX Ethernet Cable and Connectors

- Cable characteristics: 0.4 to 0.6 mm (22 to 26 AWG) 4-pair (only two pairs/four wires are used for 100BASE-TX); Category 5 unshielded twisted-pair or EIA/TIA-568 compliant, 100-ohm shielded twisted-pair
- Maximum segment length: 100 meters
- Maximum network diameter: 205 meters
- Connectors: RJ-45



| Straight Twisted-Pair Cable Pinouts | | |
|---|---|---|
| Contact | MDI-X Signal | MDI Signal |
| 1 | RD+ (receive) | TD+ (transmit) |
| 2 | RD- (receive) | TD- (transmit) |
| 3 | TD+ (transmit) | RD+ (receive) |
| 4 | Not used | Not used |
| 5 | Not used | Not used |
| 6 | TD- (transmit) | RD- (receive) |
| 7 | Not used | Not used |
| 8 | Not used | Not used |

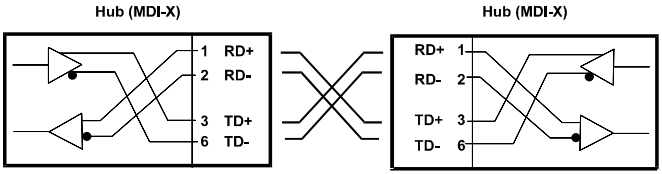



# Crossover Cables

When cascading or connecting the hub to another switch, bridge, or hub through the UTP port, a modified crossover cable is necessary. With a crossover cable, two pairs of wires are switched at one connector end. Carry out the following steps to create a customized, crossover twisted-pair cable:

**1.** Leave one end of the cable as is, with the RJ-45 connector intact. The wiring at just one end of the cable needs to be modified.

**2.** At the other end of the cable, connect wires 1 and 2 to contacts 3 and 6 respectively. Likewise, connect wires 3 and 6 to contacts 1 and 2. Refer to the following diagram:



# B

# SPECIFICATIONS

## General

**Standards**: IEEE 802.3 10BASE-T Ethernet repeater, IEEE 802.3u 100BASE-TX Fast Ethernet repeater (Class II); ANSI X3T9.5 Twisted-Pair Transceiver

**Topology**: Star

**Protocol**: CSMA/CD

**Network Data Transfer Rate**: Fast Ethernet, 100Mbps; Ethernet, 10Mbps

**Number of Ports**: 16 (16-port model), 24 (24-port model) or 32 (32-port model) 10BASE-T / 100BASE-TX ports

**Network Media**: Ethernet: Category 3 or better UTP cable, 100m maximum; Fast Ethernet: UTP/STP Cat 5, 100-ohm twisted-pair (100m maximum) for hub-to-station links; UTP Cat 5, 100-ohm UTP/STP (5m maximum) for hub-to-hub linking

# Hub-to-Hub Cascading

**Number of Daisy-Chained Hubs**: Maximum of 4 hubs per stack

**Daisy-Chain Port**: DB-25 connector × 2

**Daisy-Chain Cable**: DB-25 cable (supplied)

# LED Indicators

**Hub Status:** Power, FX Link/Rx, 100M Activity, 10M Activity, 10M Collision, 100M Collision, Switch Activity

**Port Status (per port):** 10M Link/Rx, 100M Link/Rx

# Environmental and Physical

**Power Supply**: 100 to 240 VAC, 50 or 60 Hz internal universal power supply

**Power Consumption**: 40W (max.)

**Dimensions**: 440mm × 200mm × 44mm, 19-inch rack-mountable

**Operating Temperature**: –10 to 40°C

**Storage Temperature**: –20 to 70°C

**Humidity**: 10% to 90% non-condensing

**Emissions**: FCC Class A, CE

**Safety**: cUL, CE Mark (EN60950)