



TEG-S4000

4-Slot Modular Switch

User's Guide

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Chapter 1 Introduction

The 4-Slot Modular Switch are multi-speed network devices combining Ethernet, Fast Ethernet and Gigabit Ethernet capabilities in a single compact, rack-mountable cabinet. Combining 10Mbps Ethernet, 100Mbps Fast Ethernet and Gigabit Ethernet interfaces in one unit allows these switches to unclog existing LANs and provide a path to efficient, high-speed networking.

The 4-Slot Modular Switch is a combination of a 4-slot host cabinet which accepts more than 15 different media modules. A maximum configuration of 32 x 10/100Base-TX switched ports can be achieved using 4 X 8 port 10/100Base-TX modules. In the same way, a maximum configuration of 32x10/100Base-TX or 8/16/32 x100Base-FX ports, or 4 x 1000Base-SX/LX/TX can be accommodated in the host cabling. Any of the above modules can be integrated to give up to many different configurations.

Package Contents

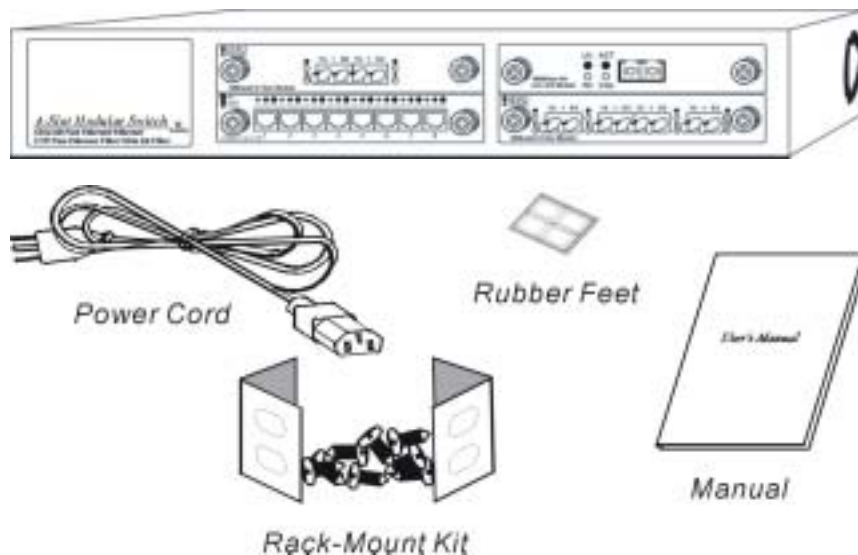


Figure 1-1. Package Contents

The 4-Slot Modular Switch package contains the following:

- ✓ 4-Slot Modular Switch
- ✓ AC power cord
- ✓ Rack mounting kit

- ✓ Four Rubber feet
- ✓ User manual

Device Description, Features and Capabilities

4-Slot Modular Switch Front and Rear Panels

This section describes the features on the front and rear panels of the 4-Slot Modular Switch unit.

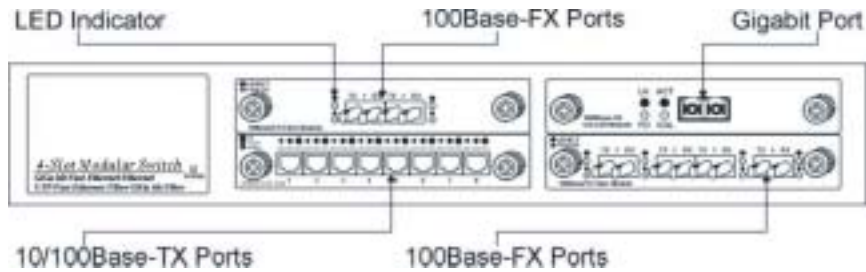


Figure 1-2. Front Panel



Figure 1-3. Rear Panel

All LED status indicators are located on the FRONT panel of the switches. They provide a real-time indication of system and operational status. The ports for connections to other devices and networks are also on the front panels, along with the crossover switches. The following sections provide descriptions of the LED indicators and ports.

LED Indicators	Explanation
Power	The red power indicator is illuminated when power is provided to the switch and the switch is turned in the ON position.
Link/Activity	Green Link/Activity indicators are illuminated when the switch detects a connection to that port. The indicator blinks when data is transmitted over the network connected to that port. When a port is not connected, the indicator is off.

Full Duplex/Col	Red Full Duplex/Col indicators are illuminated when that port is in full duplex mode. The indicator is off when that port is in half duplex mode. When a collision occurs on the network connected to a port, that Full Duplex/Col indicator blinks.
100Mbps	Green 100Mbps indicators are illuminated when the port is operating in 100Mbps mode. The indicator is off when the port is operating in 10Mbps mode.

✧ Power Port

The power port accepts the power plug.

✧ Power Switch

The power switch, located on the rear panel, controls the power supply

8 ports 10/100Base-TX Module

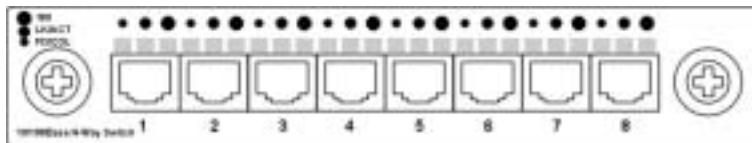


Figure 1-4. 8 port 10/100Base-TX Module

When installed into a 4-Slot Modular Switch, the 10/100Base-TX Module provides 8x 10/100Mbps Switch ports which can connect the 4-Slot Modular Switch to a 10Mbps or 100Mbps hub or end station.

8 Ports 10/100Base-TX Module Features

- ✧ 8x 10/100Base-TX N-Way Switch ports.
- ✧ Conforms to IEEE 802.3 10Base-T and IEEE 802.3u 100Base-TX and IEEE 802.3x Ethernet Standards
- ✧ Store and forward switch architecture for abnormal packet filtering
- ✧ Support for half and full duplex on all ports
- ✧ Back-plane up to 2.4Gbps
- ✧ 256K bytes Packet Buffer
- ✧ Automatic address learning with 4K address entry storage

✧ Filtering and forwarding rate of 14,880~148,800 packets per second

2 ports 100Base-FX Fiber Module

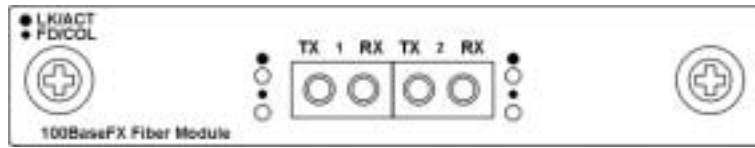


Figure 1-6. 2 port 100Base-FX Module Front View

When installed into a 4-Slot Modular Switch, this Module provides a 100Mbps Fast Ethernet fiber port which can be used to:

- Connect the Switch to the backbone of your network; that is, to a basement switch, hub or router
- Connect the Switch to a 100Mbps server or end-station

An ST (or SC) connector provides the link to the multi-mode fiber cabling and two indicators show the status of the Module at-a glance. A DIP-switch sets the operating mode to half duplex or full duplex (default).

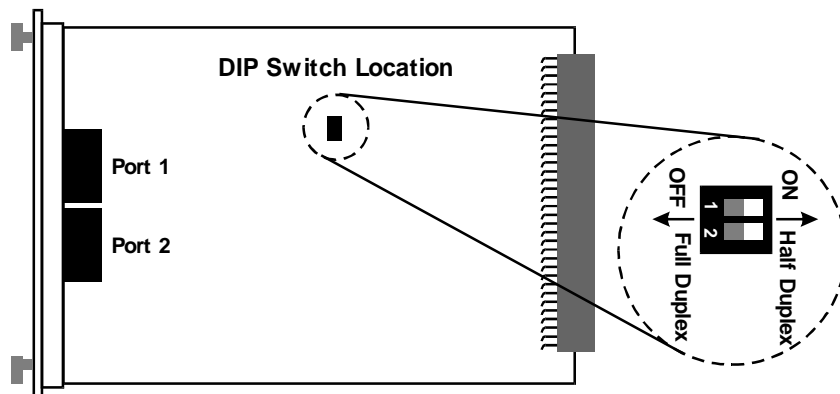


Figure 1-7. Dip switch location and mode settings

The following Table 1-2. lists the ports' operating modes based on the DIP switch position.

	PORT 1	PORT 2
SW	1	2
ON	Half-Duplex	Half-Duplex
OFF	Full-Duplex	Full-Duplex

Table 1-8. 2 ports 100Base-FX Fiber Module DIP switch functions

2 ports 100Base-FX Fiber Module Features

- ✧ Conforms to IEEE 802.3u Fast Ethernet standard
- ✧ Support for SC or ST fiber connectors (optional)
- ✧ Supports half and full duplex modes via DIP switches
- ✧ Store-and-forward switch architecture for abnormal packet filtering
- ✧ 2 switching 100Mbps Fiber Ethernet ports
- ✧ Back-plane up to 2.4Gbps
- ✧ 5 Mbytes Packet Buffer
- ✧ Automatic address learning with 12K address entry storage
- ✧ Filtering and forwarding rate of 148,800 packets per second
- ✧ 100Base-FX uses 62.5/125 micron multi-mode fiber or 8/125 micron single mode fiber for single mode type module.

4 Ports 100Base-FX Fiber Module

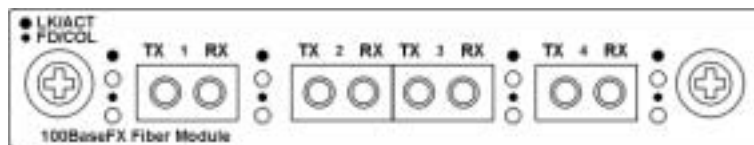


Figure 1-8. 4 port 100Base-FX Front View

When installed into a 4-Slot Modular Switch, this Module provides 4 x 100Mbps Fast Ethernet fiber ports which can be used to:

- Connect the Switch to the backbone of your network; that is, to a basement switch, hub or router.
- Connector the Switch to a 100Mbps server or end station.

An ST (or SC) connector provides the link to the multi-mode fiber cabling and three LEDs show five status of the Module at-a glance. A DIP-switch sets the operating mode to half duplex or full duplex (default).

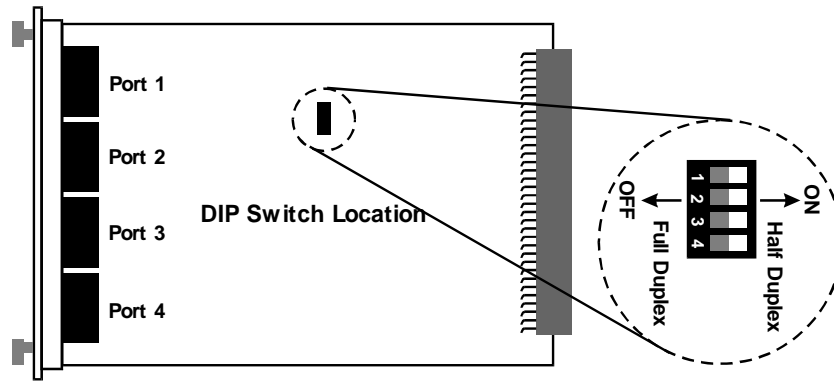


Figure 1-9. Location and setting duplex mode

The following Table 1-3. lists the ports operating modes based on the DIP switch position.

	PORT 1	PORT 2	PORT3	PORT4
SW	1	2	3	4
ON	Half-Duplex	Half-Duplex	Half-Duplex	Half-Duplex
OFF	Full-Duplex	Full-Duplex	Full-Duplex	Full-Duplex

Table 1-3. 4 ports 100Base-FX Fiber Module DIP switch functions

4 ports 100Base-FX Fiber Module Feature

- ✧ Conforms to IEEE 802.3u Fast Ethernet standard
- ✧ Support SC or ST fiber connector (optional)
- ✧ Support half and full duplex via DIP switches
- ✧ Store-and-forward switch architecture for abnormal packets filtering
- ✧ Back-plane up to 2.4Gbps
- ✧ 5 M bytes Packet Buffer
- ✧ Automatic address learning with 12K address entry storage
- ✧ Filtering and forwarding rate 148,800 packets per second for 100Mbps
- ✧ 100Base-FX uses 62.5/125um multi-mode fiber or 8/125 um single mode fiber for single mode type

module.

1000Base-SX/LX Fiber Module

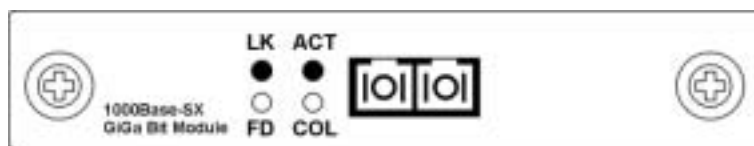


Figure 1-10. 1000Base-SX/LX Front View

When installed into a 4-Slot Modular Switch, the 1000Base-SX/LX Module provides 1 Gigabit Ethernet ports which can connect the 4-Slot Modular Switch to a Gigabit Backbone Switch or Server with Gigabit NIC.

1000Base-SX/LX Fiber Module Features

- ✧ Conforms to IEEE 802.3z draft 4.2 and 802.3x standard
- ✧ 1x1000Base-SX/LX Ethernet Port
- ✧ 128 KBytes packet buffer
- ✧ Automatic address learning with 4K address entry storage
- ✧ Standard auto-negotiation for speed, duplex mode and flow-control for MII and GMII PHYs
- ✧ Backpressure for half duplex

1000Base-T Module

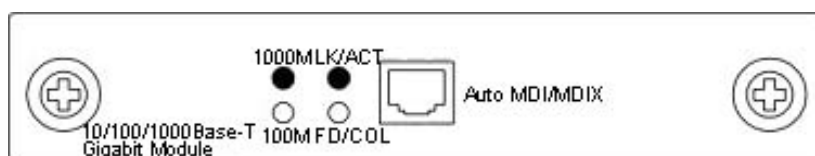


Figure 1-11. 1000Base-T Front View

When installed into a 4-Slot Modular Switch, the 1000Base-T Module provides 1 Gigabit Ethernet ports which can connect the 4-Slot Modular Switch to a Gigabit Backbone Switch or Server with Gigabit NIC.

1000Base-T Module Features

- ✧ Conforms to IEEE 802.3ab and 802.3x standard

- ✧ 1x1000Base-T Ethernet Port
- ✧ 128 KBytes packet buffer support
- ✧ Automatic address learning with 4K address entry storage
- ✧ Standard auto-negotiation for speed, duplex mode and flow-control for MII and GMII PHYs
- ✧ Backpressure for half duplex

Chapter 2 Planning your Network

Before you install your 4-Slot Modular Switch, you should review the guidelines for setting up Ethernet networks. Further, you should plan your network to take maximum advantage of its switching capabilities.

10Base-T Ethernet Network Guidelines

- The maximum length of a 10Base-T cable segment is 100 meters (328 feet).
- The maximum number of nodes on a 10Base-T segment is one (1) for regular 10Base-T.
- The recommended cable type is EIA/TIA Category 3 or higher.
- The maximum network diameter is 500 meters (1,640 feet) for Ethernet networks.
- The maximum number of segments between any two nodes in the network is five.
- The maximum number of hubs or repeaters between any two nodes in the network is four.

100Base-TX Fast Ethernet Network Guidelines

- The maximum length of a 100Base-TX cable segment is 100 meters (328 feet).
- The maximum number of hubs on a 100Base-TX segment is one if using Class I hubs and two if using Class II hubs.
- The recommended cable type is EIA/TIA Category 5 untwisted-pair.
- The maximum network diameter is 200 meters (656 feet) when using Class I hubs and 205 meters (672.5 feet) when using Class II hubs.

100Base-FX Fast Ethernet Network Guidelines

- In Multi-mode, the fiber optic segment cannot exceed 2 km (62.5/125 μ m), 2 km (50/125 μ m) in length.
- In Single-mode, the fiber optic segment cannot exceed 60km (9/125 μ m) in length.

1000BASE-SX /LX / TX Network Guideline

1000BASE-SX

- In Multi-mode, the fiber optic segment cannot exceed 220m (62.5/125 μ m) or 500m (50/125 μ m) in length.

1000BASE-LX

- In Multi-mode, the fiber optic segment cannot exceed 550m(62.5/125 μ m), 550m(50/125 μ m) in length.
- In single mode the fiber optic segment cannot exceed 10km(9/125 μ m).

1000BASE-TX

- The maximum length of a 1000Base-TX cable segment is 100 meters (328 feet).
- The recommended cable type is EIA/TIA Category 5 enhanced untwisted-pair with 4 pairs.

Network Planning

Using a switch, such as a 4-Slot Modular Switch, can expand network topologies and enhance network performance.

Each port on a switch connects to a separate network with its own collision domain. Separating networks with these switches allows you to expand 10Base-T networks past the four-hub limit and expand 100Base-TX networks past the one or two hub limit.

These switches also filter incoming traffic. On standard hubs and repeaters, any data received on a port is forwarded to all of the other ports. On switches, data received on one port is forwarded only to the port of the destination device, and if the traffic is local, the data is not forwarded at all. Also, switches can forward multiple data transaction at once.

To expand your network topology or enhance network performance, use the Max Switch II as collapsed backbone or to increase file server performance, to segment large networks, to interconnect 10Mbps networks with 100Mbps networks, or to overcome the limitations of 10Base-T and 100Base-TX networks.

Expanded Networks

You can expand your 10Base-T or 100Base-TX or 1000Base-SX/LX/T networks beyond its hub limit by adding a 4-Slot Modular Switch.

10Base-T Networks

10Base-T Networks are limited to four hubs between any two nodes. By adding your 4-Slot Modular Switch to a network, you can divide that network into segments with their own collision domains. In other words, you can connect one 10Base-T network with four hubs to your 4-Slot Modular Switch. Then you can connect another 10Base-T network with four hubs to your 4-Slot Modular Switch. You will then have one network with two collision domains, allowing four hubs on each port.

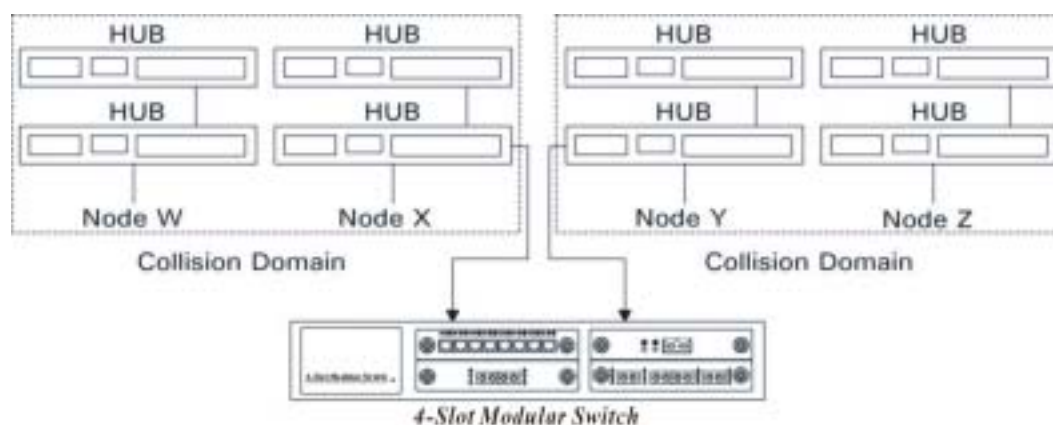


Figure 2-1. Expanding your 10Base-T Network

100Base-TX Networks

The hub limit of a 100Base-TX network depends on the class of the hub in the network. With a Class I hub, the network is limited to one hub. With a Class II hub, the network is limited to two hubs.

However, you can expand your 100Base-TX network that includes either class of hub by adding a 4-Slot Modular Switch. With the 4-Slot Modular Switch added to your 100Base-TX network, you can separate that network into individual segments with their own collision domains. In other words, you can connect one 100Base-T network with one or two hubs to the 4-Slot Modular Switch, and you can connect another 100Base-TX network with one or two hubs to the 4-Slot Modular Switch. You will then have one network with two collision domains.

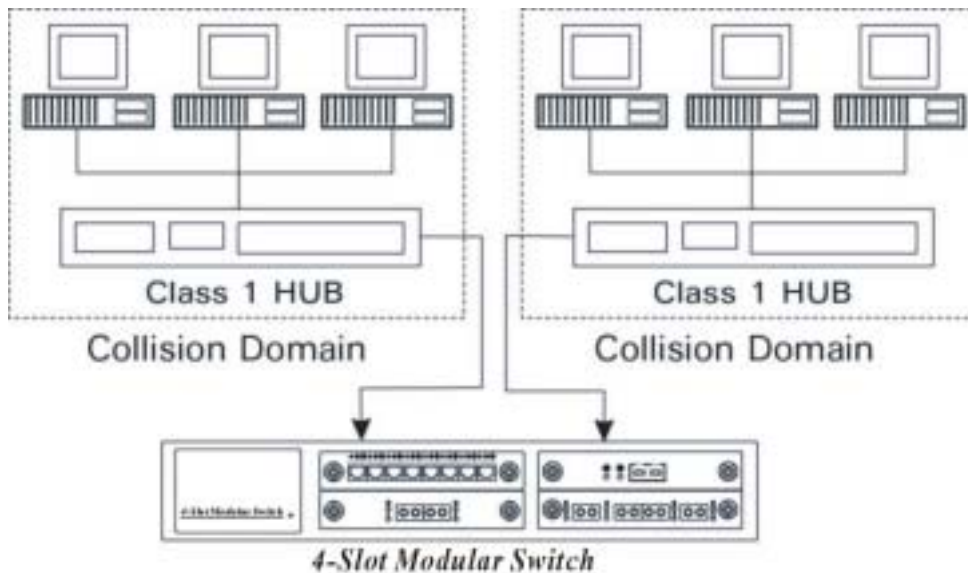


Figure 2-2. Expanding your 100Base-TX network (Class I)

Collapsed Backbone Link

Traditionally, bridges and routers have been used to link local area networks into one interconnected network. But these devices involve difficult management and long traffic delays.

The 4-Slot Modular Switch provides multiport bridges with short delays, easy setup and maintenance, making it ideal for backbone links. Also, the Built-in filtering on this hub decreases network traffic, while the multiple ports that communicate simultaneously increases network performance.

One or more of your hub's 100Mbps or 1000Mbps ports can be used as a high-speed backbone link to other hubs serving as collapsed backbones.

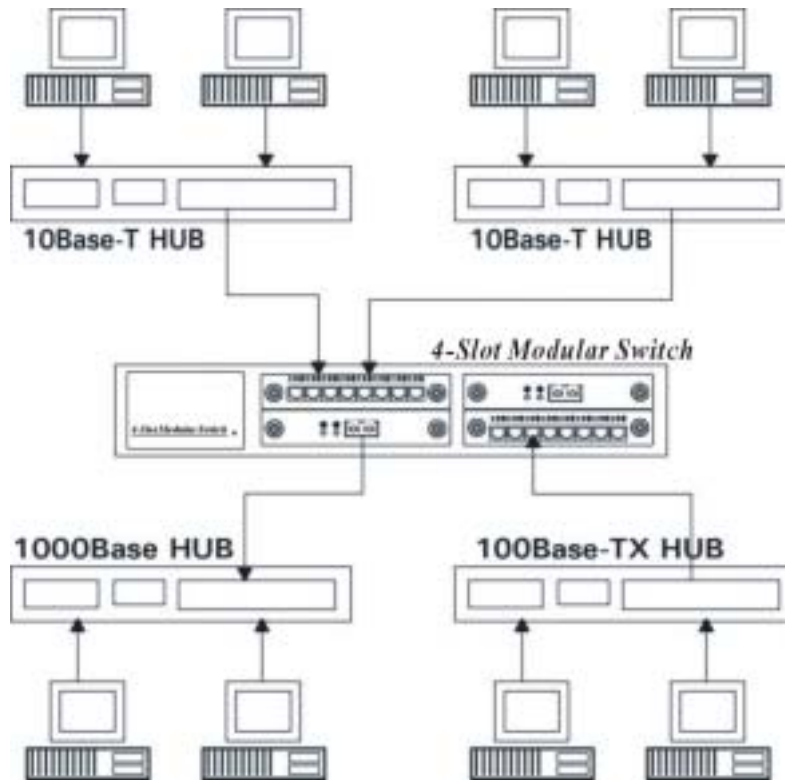


Figure 2-3. 4-Slot Modular Switch 100/1000 Hub in a collapsed backbone link

Fileserver Link

100Base Solution

With a fileserver link, you can increase file server performance by increasing the Hub's bandwidth between one or more file servers and the workgroups they serve.

If you connect 10Mbps workgroup hubs to the 10Mbps ports on the 4-Slot Modular Switch, traffic in one workgroup will not interfere with the performance of another workgroup.

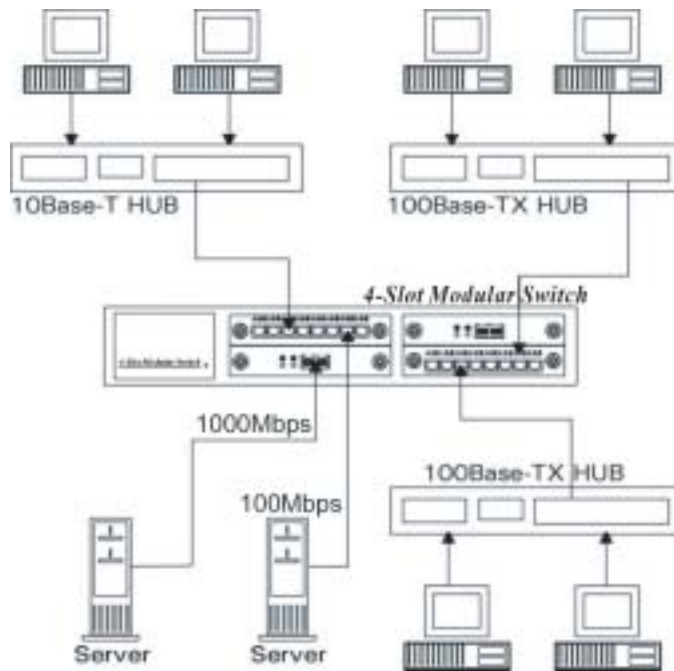


Figure 2-4. Fileserver Link

Connecting servers through 100Base-TX ports increases performance to the clients, even if the clients are on 10Base-T segments.

Because multiple 10Base-T devices can access the file server at the same time through a 100Base-TX connection, performance increases to beyond the performance of standard 10Base-T or 100Base-TX hubs. Operating the 4-Slot Modular Switch at full duplex further increases performance

1000Base Solution

You can upgrade your server with a Gigabit Ethernet NIC, and introduce a Gigabit backbone switch too. This contains several switch ports which provides much faster access to your server with minimum disruption. See Figure 2-4.

Multi-port Bridge with High-Bandwidth Backbone

With a 4-Slot Modular Switch, you can divide large network to ease congestion, and connect 10Base-T networks to 100Base-TX or 100Base to 1000Base networks for more flexibility. Adding your 4-Slot Modular Switch to a large network creates more segments in that network. The 4-Slot Modular Switch built-in filtering function separates a segment's local traffic from network traffic, reducing the amount of network traffic and easing congestion.

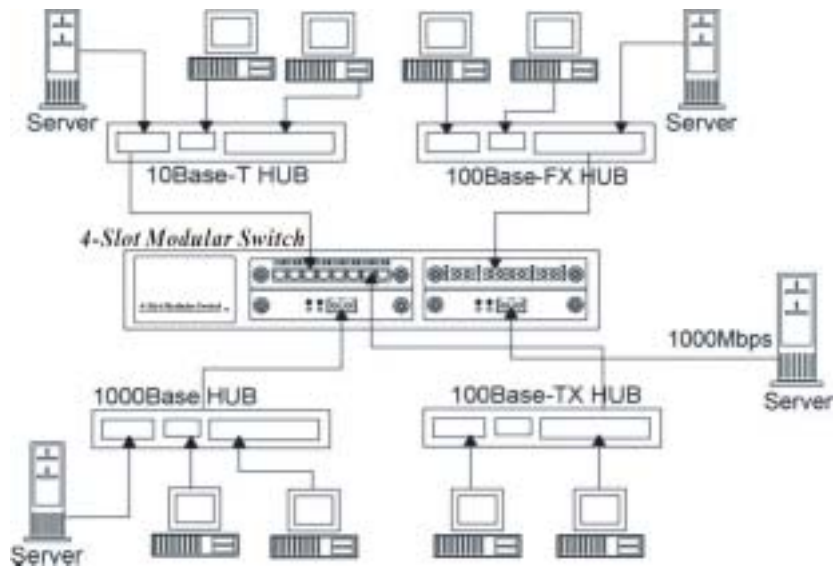


Figure 2-5. Used as a Multiport Bridge

Using your hub, you can also connect 10Base-T networks and 100Base-TX and 1000Base-SX/LX networks together for more flexibility in your network topology. As in the Figure 2-5 shown above, the 4-Slot Modular Switch can connect through one port to a 10Base-T network, and through another port, connect to a 100Base-TX port, creating one network. This switch can also connect to a 1000Base-LX, 1000Base-SX or 1000Base-T port.

Chapter 3 Installation

The Switch can be installed quickly and easily. However, for an installation with minimum impact on the existing network, please read this chapter carefully.

Installing a 4-Slot Modular Switch involves three steps:

1. Choosing a location
2. Supplying power
3. Connecting the switch

Choosing A Location

The location of the switch is based on the following criteria:

- ✧ Avoid dusty locations.
- ✧ Avoid electromagnetic noisy areas, such as locations close to power transformers or radio transmitters.
- ✧ Avoid temperatures below 32 Degrees Fahrenheit and over 122 Degrees Fahrenheit.
- ✧ Allow a clear view of the front panel LED indicators.
- ✧ Allow easy access to the front panel ports and the rear panel switches.

After choosing an appropriate location, you can install the switch on a desktop or in a rack.

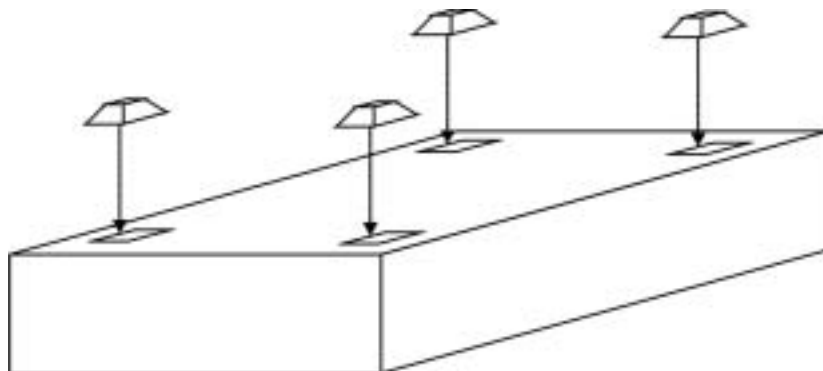


Figure 3-1. Attaching self-adhesive feet for desktop installation

Rack Installation

Your switch comes with two rack mounting brackets. you can use these brackets to mount the switch on an EIA standard 19" rack. Attach the brackets to the switch, using the screws provided.

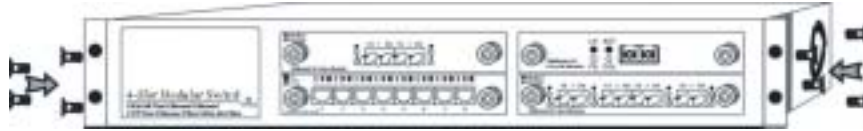


Figure 3-2. Attaching the mount brackets for rack installation

Next, install the switch in the rack using the screws provided to attach the brackets to the rack.

Supplying Power

The 4-Slot Modular Switch is equipped with a universal switching power supply that accepts AC input voltages from 100 to 240VAC and 50 to 60 Hz.

To supply power to your switch:

1. Plug the connector of the power cord into the power port on the rear panel of your switch.
2. Plug the other end of the power cord into an AC wall outlet.
3. Set the power switch to ON and verify that the Power LED is lit. If it is not, check the following:
 - ✧ The power switch is in the ON position.
 - ✧ The power cord is properly connected to the wall outlet and to the power connection on the switch.
 - ✧ The wall outlet is functional.

Note: Network cable segments can be connected or disconnected from the switch while the power is on, without interrupting the operation of the switch.

Connecting the Switch

You can connect your switch to network devices such as desktops and workgroups or to other hubs.

Before connecting your switch to a desktop or workgroup

make sure that:

- The 10Base-T twisted pair Ethernet cabling is Category 3 or above.
- The 100Base-TX Fast Ethernet cabling is tested Category 5.
- The 1000Base-T Gigabit Ethernet cabling is tested Category 5 enhanced.
- The 100Base-FX fiber cabling is 62.5/125 micron multimode fiber, or 9/125 micron single-mode fiber.
- The 1000Base-SX/LX fiber cabling is 50/125, 62.5/125 multi-mode or 9/125 micron single-mode fiber.

Chapter 4. Module Installation and Removal

WARNING

Before installing the Modules into the 4-Slot Modular Switch, you must disconnect the Switch from the main power supply.

Handling the Modules

The Module can be easily damaged by electrostatic discharge. To prevent damage, please observe the following:

- Do not remove Modules from their packaging until you are ready to install it into a Switch.
- Do not touch any of the pins, connections or components on the Modules.
- Handle the Modules only by its edges and front panel.
- Always wear an anti-static wristband connected to a suitable grounding point.
- Always store or transport Modules in appropriate anti-static packaging.

Module Setup and Installation

1. Ensure that the Switch is disconnected from the main power supply and that you are wearing an anti-static wrist-band connected to a suitable grounding point.
2. Place the Switch on a flat surface. Using a small cross-bladed screwdriver, remove the blanking plate

from the rear of the Switch. Do not remove any other screws from the rear of the Switch.

3. Keep the blanking plate and screws in a safe place. If you remove the Module at any time, you must replace the blanking plate to prevent dust and debris from entering the Switch and to aid the circulation of cooling air.
4. Hold the Module so that the text on the front panel is oriented correctly, and insert it into the Switch, ensuring the connectors are fully engaged. Tighten the two captive thumbscrews that secure the Module in place.



Figure 4-1. Insert the module

Installing the Modules

Installing 10/100Base-TX Modules

- a. Insert the RJ-45 connector on your cable into the socket of the Module.
- b. Connect the other end of the cable to an appropriate device with a 100Mbps Fast Ethernet or 10Mbps Ethernet twisted pair interface.
- c. Power up the Switch.

Installing 100Base-FX Modules

- a. Remove the protective plastic covers from the fiber connectors on the Module.
- b. Ensure that the Switch is powered up.
- c. Plug the ST (or SC) connector on the fiber cable into the fiber socket on the Module.
- d. Connect the other end of the fiber optic segment to an appropriate device fitted with a 100Mbps adapter.

Check the LED indicators on the front of the Switch to ensure that the Module is operating correctly.

Installing 1000Base-SX/LX Modules

- a. Remove the protective plastic covers from the fiber connectors on the Module.
- b. Ensure that the Switch is powered up.
- c. Plug the SC connector on the fiber cable into the fiber socket on the Module.
- d. Connect the other end of the fiber optic segment to an appropriate device fitted with a 1000Mbps adapter.

Check the LED indicators on the front of the Switch to ensure that the Module is operating correctly.

Installing 1000Base-T Modules

- a. Ensure that the Switch is powered up.
- b. Plug the RJ-45 connector on the UTP cable into the RJ-45 socket on the Module.
- c. Connect the other end of the UTP segment to an appropriate device fitted with a 1000Mbps adapter.
- d. Check the LED indicators on the front of the Switch to ensure that the Module is operating correctly.

Removing the Modules

- a. Ensure that the power supply and the backbone connection cables are disconnected from the Switch.
- b. Place the Switch on a flat surface. Undo the two captive thumbscrews securing the Module into the Switch. Do not remove any other screws from the rear of the Switch.
- c. If you are not installing another Module immediately, you must replace the blanking plate to ensure that dust and debris do not enter the Switch, as well as to aid circulation of cooling air.

Appendix A. Technical Specifications

Compatibility with Ethernet Standards:

The 4-Slot Modular Switch has been designed in accordance with IEEE Standard 802.3, 802.3u, 802.3z .

Power Input:

Voltage

Frequency

100V AC to 240V AC

50Hz to 60Hz

Environment:

Operating

Temperature 0 to 45

Humidity 10% to 90% RH

Storage

-40 to 70

10% to 90% RH

Dimensions:

440mm x 225mm x 66mm

EMI & Safety:

FCC Class A, CE, UL/CSA

Physical Characteristics:

Buffer Size

256 Kbytes shared buffer for 10/100Base-TX module,
and 1000T module

5 Mbytes shared buffer for 100Base-FX module.

128 Kbytes shared buffer for Gigabit module

Address Table

12K entry MAC Address table for 100FX module

4K entry MAC Address table for 10/100TX and Gigabit
module

Switching Architecture

Store and Forward

Forwarding Rate

14,880 pps/10Base-T port

148,800 pps/100Base-TX port

148,800 pps/100Base-FX port

1,488,000 pps/1000Base-SX/LX /TXport

Filtering Rate

14,880 pps/10Base-T port

148,800 pps/100Base-TX port

148,800 pps/100Base-FX port

1,488,000 pps/1000Base-SX/LX /TX port

LED Indicators

Link/Activity indicator per port

Collision/Full-Duplex indicator per port

100Mbps indicator for 10/100Mbps Module and 1000T
module

1000Mbps indicator for 1000T module

Power on/off indicator

Appendix B. Pin Assignments

RJ-45 station ports can be attached to any device which use a standard network interface (e.g., a workstation, server, bridge or router). RJ-45 daisy-chain ports can be cascaded to a station port on similar networking devices (e.g., another switch or hub). Use unshielded twisted-pair (UTP) for RJ-45 connections: 100 ohm Category 3,4 or 5 cable for 10Mbps connections or 100 ohm Category 5 cable for 100Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

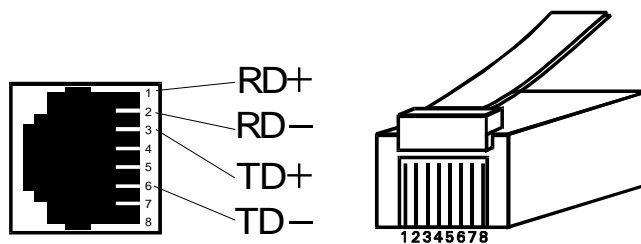
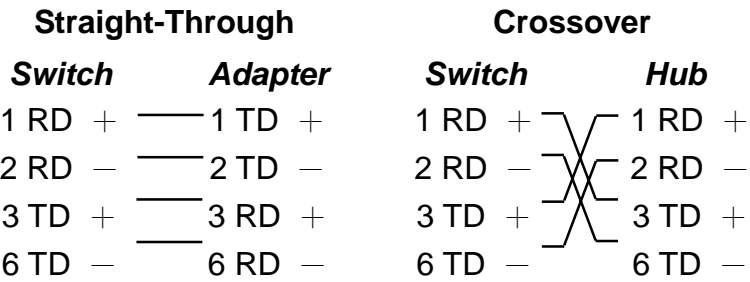


Figure B-1. RJ-45 Connector

Pin	Pin Station Ports 1 ~ 8	Cascade Ports
1	Receive Data +	Transmit Data +
2	Receive Data -	Transmit Data -
3	Transmit Data +	Receive Data +
6	Transmit Data -	Receive Data -
4,5,7,8	Not Used	Not Used

Table B-1. RJ-45 Pin Assignments

Schematics for both Straight-Through and Crossover twisted-pair cable are shown below.



Technical Support

TRENDware provides free technical support for customers worldwide for the duration of the product's warranty period.

Technical Support via Telephone: +1-310-891-1100

Fax: +1-310-891-1111

Technical Support via Internet: [Http://www.trendware.com](http://www.trendware.com)

E-mail: support@trendware.com

Technical Support Hours:

7:00AM ~ 6:00PM, Monday ~ Friday, Pacific Standard Time (except holidays)