TE100-S16*plus*
16-Port 10/100Mbps
NWay Fast Ethernet Switch

User's Guide

FCC Warning

This equipment has been tested and found to comply with the regulations 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.

注意
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害を引き起こすことがあります。この場合には使用者が適切な対策を講ずる
よう要求されることがあります。

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ABOUT THIS GUIDE

Congratulations on your purchase of the 16-port 10/100M NWay Fast Ethernet Switch. This device integrates 100Mbps Fast Ethernet and 10Mbps Ethernet network capabilities in a highly flexible package.

Purpose

This guide discusses how to install your 16-port 10/100Mbps NWay Fast Ethernet Switch.

Terms/Usage

In this guide, the term "**Switch**" (first letter upper case) refers to your 16-port 10/100M NWay Fast Ethernet Switch, and "**switch**" (first letter lower case) refers to other Ethernet switches.

Overview of this User's Guide

Introduction. Describes the Switch and its features.

Unpacking and Installation. Helps you get started with the basic installation of the Switch.

Identifying External Components. Describes the front panel, rear panel and LED indicators of the Switch.

Connecting the Switch. Tells how you can connect the Switch to your Ethernet network.

Technical Specifications. Lists the technical (general, physical and environmental, and performance) specifications of the Switch.

RJ-45 Pin Specification. Describes the RJ-45 receptacle/connector and the *straight through* and *crossover* cable connector.

INTRODUCTION

This chapter describes the features of the Switch and some background information about Ethernet/Fast Ethernet switching technology.

Fast Ethernet Technology

The growing importance of LANs and the increasing complexity of desktop computing applications are fueling the need for high performance networks. A number of high-speed LAN technologies have been proposed to provide greater bandwidth and improve client/server response times. Among them, 100BASE-TX (Fast Ethernet) provides a non-disruptive, smooth evolution from the current 10BASE-T technology. The non-disruptive and smooth evolution nature, and the dominating potential market base, virtually guarantee cost effective and high performance Fast Ethernet solutions in the years to come.

100Mbps Fast Ethernet is a new standard specified by the IEEE 802.3 LAN committee. It is an extension of the 10Mbps Ethernet standard with the ability to transmit and receive data at 100Mbps, while maintaining the CSMA/CD Ethernet protocol. Since the Switch is compatible with all 10Mbps Ethernet environments, it provides a straightforward upgrade and takes advantage of the existing investment in hardware, software, and personnel training.

Switching Technology

Another approach to pushing beyond the limits of Ethernet technology is the development of switching technology. A switch bridges and transmits Ethernet packets at the MAC address level of the Ethernet protocol, among connected Ethernet or Fast Ethernet LAN segments.

Switching is a cost-effective way of increasing the total network capacity available to users on a local area network. A switch increases capacity and decreases network loading by dividing a local area network into different *segments*. Each *segment* has its own bandwidth and it does not compete with others for network transmission capacity.

A switch acts as a high-speed selective *bridge* between the individual segments. The switch forwards traffic from origin segment to destination segment, without interfering with any other segments. By doing this, the total network capacity is multiplied, while still maintaining the same network cabling and adapter cards.

For Fast Ethernet networks, a switch is an effective way of eliminating problems of uplinking Fast Ethernet hubs beyond the "two-repeater limit". A switch can be used to split parts of the network into different collision domains, making it possible to expand your Fast Ethernet network beyond the 205-meter network diameter limit. The switch supports both traditional 10Mbps Ethernet and 100Mbps Fast Ethernet, which is also ideal for bridging between the existing 10Mbps networks and the new 100Mbps networks.

LAN Switching technology is a marked improvement over the previous generation of network bridges, which were criticized by their higher latencies. *Routers* have also been used to segment local area networks. But, the *router* expensive, difficult to setup, and

maintenance intensive, these make it relatively impractical for the network. Switch, on the other hand, is less expensive, easier to setup, and practically maintenance free, which make it an ideal solution to today's local area network congestion problems.

Features

This high performance Switch was designed for a network environment where traffic and the number of users increase continuously.

The Switch, with its standard rack-mount size, is perfect for middle to large workgroups. It provides immediate access to a rapidly growing network through a wide range of user-reliable functions.

The Switch is ideal for shared bandwidth 10Mbps or 100Mbps workgroups with multiple high-speed servers. With the highest bandwidth at 200Mbps (100Mbps full-duplex mode), each port can provide workstation with congestion-free data-pipe for simultaneous access to the server.

The Switch is expandable by cascading two or more switches together. As all ports support 200Mbps, the Switch can be cascaded from any port and to any number of switches.

The Switch is a perfect choice for 10Mbps network site that could be upgraded to Fast Ethernet in the future. Ethernet workgroups can connect to the Switch now, and change adapters and hubs anytime later without changing the Switch or reconfiguring the network.

The Switch combines dynamic memory allocation with store-and-forward switching method to ensure that the buffer is effectively allocated for each port. It also controls the data flow between transmit and receive nodes to guarantee against all possible packet loss.

This Switch is an unmanaged 10/100Mbps Fast Ethernet Switch that offers solutions to increase Ethernet workgroup bandwidth. Other key features are as followed:

- **Uplink/MDI-II (media dependent interface) port for uplink to another switch or hub.**
- **Store and forward switching scheme. As the result of complete frame checking and error frame filtering, this scheme prevents error packages from transmitting among segments.**
- **NWay Auto-negotiation for any port. This allows auto-sensing of speed (10/100Mbps) thereby providing you with automatic and flexible solutions for your network.**
- *IEEE 802.3x flow control* **for full-duplex mode operation.**
- *Back pressure flow control* **for half-duplex mode operation.**
- **Data Forwarding Rate (per port) at wire-speed for both 10Mbps and 100Mbps speed.**
- **Data Filtering Rate (per port) at wire-speed for both 10Mbps and 100Mbps speed; eliminates all error packets, runts, etc.**
- **16K active MAC address entry table with self-learning and table ageing.**
- **512KBytes RAM buffer per device.**
- **Broadcast storm protection.**
- **Three QoS levels; checked via IP header, 802.1Q VLAN Tag, and/or selected per port basis.**
- **Supports two trunking groups for cascading two or more Switches (same model).**

UNPACKING AND INSTALLATION

This chapter provides unpacking and setup information for the Switch.

Unpacking

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

One the 16-port 10/100M NWay Fast Ethernet Switch

One AC power cord; suitable for your area's electrical power connections

Four rubber feet to be used for shock cushioning

Screws and two mounting brackets

This User's Guide

If any item is found missing or damaged, please contact your local reseller for replacement.

Installation

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

- ?? Install the Switch in a fairly cool and dry place. See *Technical Specification* for the acceptable operating temperature and humidity ranges.
- ?? Install the Switch in a site free from strong electromagnetic source, vibration, dust, and direct sunlight.
- ?? Leave at least 10cm of space at the left and right hand side of the Switch for ventilation.

??? Install the Switch on a sturdy, level surface that can support its weight, or on a 19" EIA standard-size equipment rack. For information on rack installation, please see the next section, *Rack Mounting*.

??? When installing the Switch on a level surface, attach the rubber feet on the corners at the bottom of the Switch. The rubber feet cushion the Switch and protect the bottom of the Switch.

100Base-FX Module Installation

The installation procedure for each module is the same. Additional information about each module is provided in the module's package.

1. Power off the switch.
2. Locate the module slot at the switch's rear panel.
3. Using a screwdriver, undo the two screws and remove the dust cover on the module slot. *Note: reinstall the dusk cover when the slot is empty.*
4. Holding the module with the component-side up and connector-side going into the slot. Gently slide the module along the guides in the slot and firmly seat it in the internal connector.
5. Using a screwdriver, replace the two screws and tighten them until snug.

Note:

1. If the module is not present in the module bay, we recommend you install the dust cover over the module bay.

2. The port 16 and the 100BASE-FX port is really the same port.
Do not connect both Port 16 and the 100BASE-FX port at the same time.

Rack Mounting

The switch 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 switch's side panels (one on each side), and secure them with the provided screws.
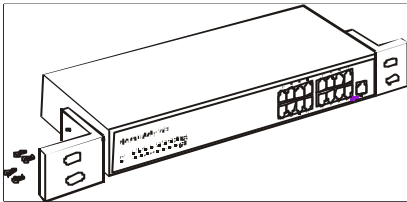
After that, use screws provided with the equipment rack to mount each switch in the rack.
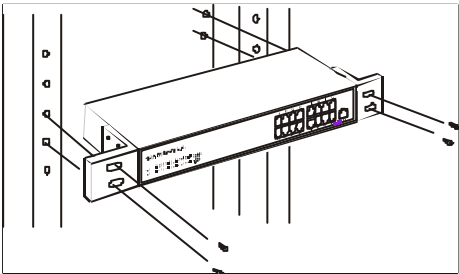
IDENTIFYING EXTERNAL COMPONENTS

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

Front Panel

The figure below shows the front panels of the switch.

16-port 10/100Mbps NWay Fast Ethernet Switch

LED Indicator Panel

Refer to the next chapter for detailed information about each LED indicator.

Twisted-Pair Ports

Use any of these ports to connect network devices (workstations, hubs, switches, etc.) to the Switch. These ports are MDI-X ports and you can use ordinary straight-through twisted-pair cables to connect PCs, workstations, and Servers to the Switch. If you need to connect these ports to devices with MDI-X ports, you need to use crossover cables, or connect using the Uplink port (described below).

Uplink Ports

The Uplink port is a MDI-II port, which means you can connect this port to another device's MDI-X port using an ordinary straight-through twisted-pair cable.

Port 8 and the Uplink port is really the same port, except that their pin-outs are different. ***Do not use both Port 8 and the Uplink port at the same time.***

Rear Panel
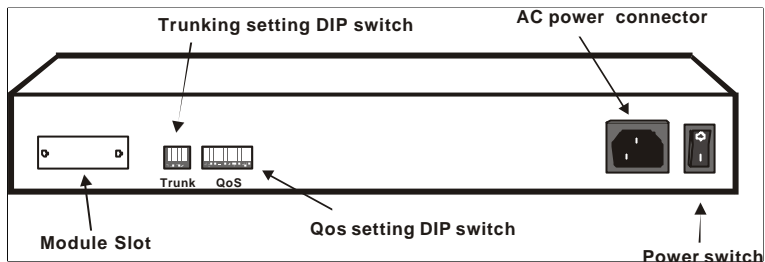
Module Slot:

For installing optional fiber module for 100BASE-FX connection.

Trunking setting DIP switch:

By using the trunking DIP switches, you can set the trunking function. For detail information on how to configure *trunking*, please refer to the *Trunking Setting* in the next section.

QoS setting DIP switch:

By using the QoS DIP switches, you can set the QoS function. For detail information on how to setup *QoS*, please refer to the *QoS Setting* in the next section.

AC Power Connector:

For the power cord.

LED Indicators

Power (Power Indicator)

This indicator lights green when the hub is receiving power. This LED is off indicating no power.

FX (100BASE-FX Module Indicator *(green))*

This LED lights green indicating a good link to the installed fiber module. It remains off when the module is not present.

10/100M FDX and 10/100M COL (10/100Mbps Full-Duplex and 10/100Mbps Collision Indicator)

This LED indicator lights green when the respective port is in full-duplex (FDX) mode. It remains off for half-duplex operation. This LED blinks green when collision occurs on the respective port.

Note: the full-duplex LED lights green when the connected device supports full-duplex operation.

10M Link/ACT and 100M Link/ACT (10Mbps Link/Activity *(amber)* **and 100Mbps Link/Activity** *(green) Indicator***)**

This indicator lights green when the port is connected to a 100Mbps device. It blinks green when transmitting or receiving data on the 100Mbps network.

This indicator lights amber when the port is connected to a 10Mbps device. It blinks amber when transmitting or receiving data on the 10Mbps network.

Trunking setting

This Switch supports trunking function. Trunking function increases backbone bandwidth and reduces network congestion; this is helpful when the traffic is heavy between the cascaded Switches.

You can cascade two Switches via one trunking group (max. of 4 ports) with bandwidth up to 800Mbps; or cascade three (or more) Switches via both trunking groups with 800Mbps bandwidth between the Switches. Please see the table and diagrams below for more information.

A0	A1	Trunking Group A
0	0	Disable
0	1	Port 1 & 9 (400Mbps)
1	0	Port 1, 2 & 9 (600Mbps)
1	1	Port 1, 2, 9 & 10 (800Mbps)
A2	A3	Trunking Group B
0	0	Disable
0	1	Port 8, 16 (400Mbps)
1	0	Port 8, 15 & 16 (600Mbps)
1	1	Port 7, 8, 15 & 16 (800Mbps)

You can select to trunk two Switches using 2, 3, or 4 ports with Trunk Group A or B. Please follow the instructions below to set the trunking dipswitches:

Note: You can only trunk same model Switches together.

1. Power off the Switch.
2. Follow the table above to select the trunk ports and set the dipswitches.
3. Repeat step 1 & 2 and configure another Switch.

4. Connect the trunk ports together using crossover CAT5 UTP/STP cables.
5. Power on the Switches.

Below are some trunking examples.

For switches without Trunking function, user usually link switches together using uplink port and straight through twisted pair cable. The bandwidth for this uplink between the two switches is only 200Mbps.

Trunking two Switches together using Trunk Group A with 4 crossover twisted pair cables. The backbone bandwidth of this trunk is 800Mbps.
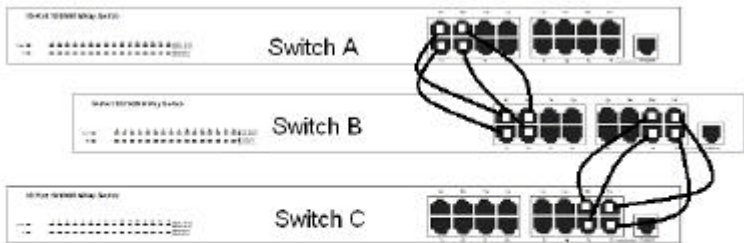
Trunking three Switches together using both Trunk Group A and Trunk Group B with 8 crossover twisted pair cables to create 800Mbps backbone bandwidth between Switch A & B and Switch B & C.

QoS (Quality of Service) setting

Quality of Service (QoS) is a networking term that specifies a guaranteed throughput level. When data packets with QoS priority information pass through QoS supported device, these packets will be handled with priority. Without certain level of QoS, multimedia applications such as Streaming Video and Network Conference can be sluggish or stopped due to network congestions.

This Switch supports leading edge QoS with three levels of priority settings. The priority can be checked via layer 2 (IEEE802.1Q VLAN Tagging) and/or layer 3 (IP Header TOS bits). *Port-Based Priority* is also provided for user to set traffic prioritization according to the port number. Port based priority ensures transmission with precedence for

all incoming packets to the selected port(s). This feature reduces transmission delay and allows effective video switching in multimedia applications and improves *voice-over-packet* application quality.
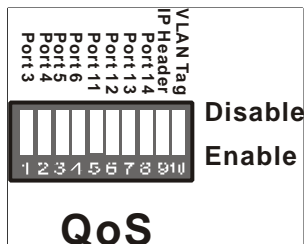
Note: Please power off the Switch before setting the QoS dipswitches.

Port-Based QoS:

There are eight ports on this Switch that can be set for *Port-Based QoS*. The QoS DIP Switches 1~8 represent port number 3~6 and 11~14. After setting the selected port's DIP Switch to "Enable", all incoming packets to these ports will be handled with priority.

IP Header QoS:

The QoS DIP Switch 9 enables/disables *IP header QoS* feature. When the DIP Switch is set at "Enable", the Switch will check each received data packet and handle the packet according to the TOS bit priority information.

VLAN Tag QoS:

DIP Switch 10 enables/disables 802.1Q VLAN Tag priority feature. When the DIP Switch is set at "Enable", the Switch will check each received data packet and handle the packet according to the VLAN tagging priority information.

Note: It is ok to enable all three QoS features, but the *Port-Based QoS* supersedes the *IP header* and *VLAN Tag* features.

CONNECTING THE SWITCH

This chapter describes how to connect the Switch to your Fast Ethernet network.

PC to Switch

A PC can be connected to the Switch via a two-pair Category 3, 4, 5 UTP/STP straight cables. The PC (equipped with a RJ-45 10/100Mbps phone jack) should be connected to any of the 16 ports (1x - 16x)

Note: Use CAT5 (or better) cable for 100Mbps connection.

After the connection is made, the port LED on the Switch will show the status of the connection. If LED indicator does not light after making a proper connection, check the PC LAN card, the cable, the Switch, and the Switch port.

The following are the possible LED indicator status for PC to Switch connection:

1. The "LINK/ACT" LED indicator lights green for 100Mbps connection or lights amber for 10Mbps connection.

2. The "FDX/COL LED" indicator lights green if the LAN adapter is in full-duplex mode. The LED remains off when

the adapter is in half-duplex mode.

Hub to Switch

A hub (10 or 100BASE-TX) can be connected to the Switch via a two-pair Category 3, 4, 5 UTP/STP straight cables. *Note: Use CAT5 (or better) cable for 100Mbps connection.* The connection is accomplished from the hub's uplink (MDI-II) port to any of the Switch's 1~16 (MDI-X) ports.

A. 10BASE-T Hub

For a 10BASE-T hub, the Switch LED indicators should light up as the following:

"FDX/COL" LED indicator is *OFF*.

"LINK/ACT" LED indicator lights amber.

B. 100BASE-TX Hub

When connecting to a 100BASE-TX hub, the Switch LED indicator should light up as the following:

"FDX/COL" LED indicator is *OFF*.

"LINK/ACT" LED indicator lights green.

Hub without Uplink (MDI-II) port

If a hub is not equipped with an uplink (MDI-II) port, connection can be made using either straight cable or crossover cable.

A. Using straight cable

When using straight cable, the connection can be made from Switch's

uplink (MDI-II) port to any port of the Hub.

B. Using crossover cable

When using crossover cable, the connection can be made from any regular ports of the Switch to any port of the Hub.

Switch to Switch (other devices)

The Switch can be connected to another switch or other devices (routers, bridges, etc.) via a two-pair Category 3, 4, 5 UTP/STP straight or crossover cable. *Note: Use CAT5 (or better) cable for 100Mbps connection.*

A. Using straight cable

When using straight cable, this is done from the Switch's uplink (MDI-II) port (Switch A) to any of the 10Mbps or 100Mbps (MDI-X) port of the other switch (switch B) or other device.

B. Using crossover cable

When using crossover cable, this is done from any (MDI-X) port of the Switch (Switch A) to any of the 10Mbps, 100Mbps (MDI-X) port of the other switch (switch B) or other device.

1. The "LINK/ACT" LED indicator lights green indicating 100Mbps connection or it lights amber indicating 10Mbps speed.

2. The "FDX/COL LED" indicator lights green if the connection is in full-duplex mode. The LED remains off when the connection is in half-duplex mode.

Port S peed & Duplex Mode

After a connection is made between the Switch and another Ethernet device, the system uses auto-negotiation to determine the transmission mode for this twisted-pair connection:

If the attached device does not support auto-negotiation or has auto-negotiation disabled, an auto-sensing process is initiated to select the speed and set the duplex mode to **half-duplex**.

TECHNICAL SPECIFICATIONS

General	
Standards	IEEE 802.3 10Base-T Ethernet
	IEEE 802.3u 100 Base-TX Fast Ethernet
	ANSI/IEEE 802.3 NWay auto-negotiation
	IEEE 802.3x flow control
Protocol	CSMA/CD
Data Transfer Rate	Ethernet: 10Mbps (half duplex), 20Mbps (full duplex)
	Fast Ethernet: 100Mbps (half duplex), 200Mbps (full duplex)
Topology	Star
Network Cables	10BASET: 2-pair UTP Cat. 3,4,5; EIA/TIA- 568 100-ohm STP
	100BASE-TX: 2-pair UTP Cat. 5; EIA/TIA-568 100-ohm STP
	100BASE-FX: 62.5/125 micron multimode fiber optic
Number of Ports	16 x 10/100Mbps NWay MDI-X ports
Uplink Port	1 x 10/100Mbps NWay MDI-II port, shared with port 8

| Physical and Environmental	
AC inputs	100 to 240 VAC, 50 or 60 Hz internal universal power supply
Power Consumption	20 watts. (Max.)
Temperature	Operating: 0? ~ 50? C, Storage: -10? ~ 70? C
Humidity	Operating: 10% ~ 90%, Storage: 5% ~ 90%
Dimensions	440 x 140 x 44 mm (W x H x D)
EMI:	FCC Class A, CE Mark Class A, VCCI Class A
Performance	
Transmits Method:	Store-and-forward
RAM Buffer:	512KBytes per device
Filtering Address Table:	16K entries per device
Packet Filtering/Forwarding Rate:	10Mbps Ethernet: 14,880/pps 100Mbps Fast Ethernet: 148,800/pps
MAC Address Learning:	Automatic update

RJ-45 PIN SPECIFICATION

When connecting your 16-port 10/100M NWay Ethernet Switch to another switch or other Ethernet device, a modified crossover cable maybe necessary. Please review your network products for matching cable pin assignment.

The following diagram and tables show the standard RJ-45 receptacle/connector and their pin assignments for the switch-to-network adapter card connection, and the straight / crossover cable for the Switch-to-switch / hub / bridge connection.
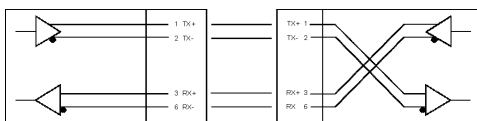
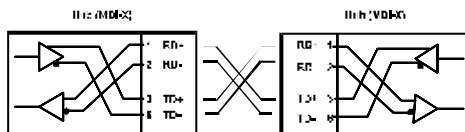| RJ-45 Connector pin assignment	
Contact	Media Direct Interface Signal
1	TX + (transmit)
2	TX - (transmit)
3	Rx + (receive)
4	Not used
5	Not used
6	Rx - (receive)
7	Not used
8	Not used

The standard cable, RJ-45 pin assignment
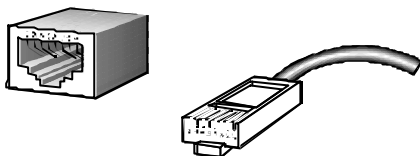
The standard RJ-45 receptacle and connector

The following shows straight cable and crossover cable connections:

MDI-II (uplink) port to MDI-X port connection using Straight Cable for connecting from Switch to switch or from Switch to other network device.

MDI-X port to MDI-X port connection using Straight Cable for connecting from Switch to switch or from Switch to other network device.