

TE100-S4PCI  
4-Port 10/100M  
NWay Ethernet  
Switch Card

User's Guide

## **FCC Warning**

This equipment has been tested and found to comply with the regulations for a Class B 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 B 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

この装置は、情報処理装置等電波障害自主規制協議会(VCCI)の基準に基づく第一種情報技術装置です。この装置を家庭環境で使用すると電波妨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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## ***Introduction***

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Thank you for choosing the 4-Port 10/100M NWay Ethernet Switch Card. This Introduction chapter will be useful if you are new to Fast Ethernet, Switch and other new technology featured by the 4-Port 10/100M NWay Ethernet Switch Card. Otherwise, skip ahead to the Installation chapter.

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## ***About Fast Ethernet***

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Fast Ethernet is a network technology specified by IEEE Standard 802.3u. It extends the traditional 10Mbps Ethernet technology to achieve 100Mbps transmission and reception, while retaining the same CSMA/CD Ethernet protocol. Thus while Fast Ethernet provides a tenfold increase in network capacity, it is wholly compatible with traditional 10Mbps Ethernet network facilities. This compatibility is the key to easy and efficient upgrades to 100Mbps in your network areas needing greater bandwidth. Upgrading selected areas to Fast Ethernet does not require hardware or software changes in network areas where traditional 10Mbps Ethernet is providing good service. For upgrading existing Ethernet installations to 100Mbps, and especially for selectively upgrading areas needing upgrade, Fast Ethernet is the clear choice in terms of cost-effectiveness, as well as convenience and smoothness in transition.

Fast Ethernet comprises two subtypes: 100Base-T4 and 100Base-TX. 100Base-T4 Fast Ethernet can utilize existing Category 3 or Category 4 UTP network cabling, but does not provide for full duplex operation. 100Base-TX requires Category 5 cabling, but does provide full duplex operation. Full duplex 100Base-TX operation allows simultaneous transmission and reception; both at 100Mbps, thus providing service potentially equal to 200Mbps full-duplex service.

The 4-Port 10/100M NWay Ethernet Switch Card does not support the 100Base-T4 subtype. To provide compatibility in traditional

10Mbps Ethernet environments, the 4-Port 10/100M NWay Ethernet Switch Card also supports traditional 10Mbps Ethernet operation, in full-duplex as well as half-duplex modes. Selection of the best operation mode in any given installation is automatically governed by auto-negotiation.

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### ***About Auto-negotiation***

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You have probably had the experience of making a dialup connection through a modem, and have heard the gravelly-sounding exchanges between your modem and the modem at the other end of the telephone line (these exchanges are ordinarily played out through a speaker in your local modem). As irritating as those few seconds of noise may be, they do let you know that your modem and the remote modem are on the job, preparing for your intended communication with the remote computer.

The preparatory work of the two modems during those few seconds before you see the “Connect” message is to *negotiate* the best data communication scheme which is supported by both modems, and which is suitable for the quality of the telephone line linkage between them. The parameters to be settled between the two modems include best baud rate, compression method, and error correction method. When the two modems have tested the phone-line quality and settled on the combination of shared options and parameters which will provide the best data communication over the connecting phone line, then you are given the “Connect” message which signals the end of the intermodem negotiation and the beginning of your intended communication with the remote computer.

Auto-negotiation between devices within an Ethernet LAN is similar in concept, but much briefer. The two devices involved in the auto-negotiation will be the 4-Port 10/100M NWay Ethernet Switch Card serving your station (*installed in your computer*), and the hub through which it is connected into the LAN. The options to be negotiated

between the 4-Port 10/100M NWay Ethernet Switch Card and its supporting hub include Ethernet type (100BASE-TX Fast Ethernet or 10BASE-T Ethernet) and duplex mode (half-duplex, being one-way-at-a-time, or full duplex, being simultaneous transmit-and-receive).

Startup communication between the two devices occurs when devices are power-on, the cable connection between them is good, and the Network Operating System software is running. As soon as those conditions are satisfied, the preparatory process of auto-negotiation between the 4-Port 10/100M NWay Ethernet Switch Card and its supporting hub proceeds automatically. If the hub has auto-negotiation functionality, then it and the 4-Port 10/100M NWay Ethernet Switch Card exchange a series of messages in which each device signals its capabilities and listens for corresponding information about the other. The auto-negotiation process requires only a few milliseconds, and the two devices select the best communication parameters supported by both devices.

If the hub does not have auto-negotiation functionality, then its monotone (single capability) message will be recognized by the 4-Port 10/100M NWay Ethernet Switch Card's auto-negotiation facility, and the 4-Port 10/100M NWay Ethernet Switch Card will simply switch to the one of its own capabilities which matches that of the hub.

When the preparatory procedure of auto-negotiation is completed, then the line is ready and will provide a data channel that is optimal for the two devices. The line will remain ready without further auto-negotiation action until the linkage is broken. Auto-negotiation then reoccurs at any time that the linkage is restored, again making the line ready for optimal data communications.

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## ***Switching Technology***

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Another approach to pushing beyond the limits of Ethernet technology is the development of switching technology. A switch bridges Ethernet packets at the MAC address level of the Ethernet protocol transmitting 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*, which don't compete with each other for network transmission capacity.

The switch acts as a high-speed selective bridge between the individual segments. The switch, without interfering with any other segments, automatically forwards traffic that needs to go from one segment to another. 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 chaining 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 for 100BASE-TX networks. Switches supporting both traditional 10Mbps Ethernet and 100Mbps Fast Ethernet are also ideal for bridging between the existing 10Mbps networks and the new 100Mbps networks.

Switching LAN technology is a marked improvement over the previous generation of network bridges, which were characterized by higher latencies. Routers have also been used to segment local area networks, but the cost of a router, the setup and maintenance required make routers relatively impractical. Today switches are an ideal solution to most kinds of local area network congestion problems.



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## ***Product Features***

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Designed for versatility and performance, the 4-Port 10/100Mbps Ethernet Switch Card provides the following features:

- PCI Bus Master memory access, for high throughput and low CPU demand.
- Complies with IEEE 802.3 10BASE-T, IEEE 802.3u 100BASE-TX standards.
- Complies with ANSI/IEEE 802.3 NWay Auto-negotiation.
- Plug and Play installation.
- 4 RJ-45 connectors for four network segment connections.
- 100Mbps Fast Ethernet or 10Mbps Ethernet data transfer, selected via auto-negotiation.
- Full duplex or half-duplex operation, selected by auto-negotiation.
- Data forwarding/filtering rate per port is at wire-speed for 10/100Mbps speed.
- 1K MAC address entry table with self-learning and table-aging
- 1 MB RAM buffer per device
- LED indicators for Link/Activity, 100Mbps and Collision/Full-duplex per each port.
- Drivers for all leading Network Operating Systems. Software drivers for:
  - *Workstation for DOS ODI Client*
  - *Server Driver for NetWare 3.12/4.x*
  - *Client 32 for Windows 95*
  - *Microsoft Network Client for DOS*

- *LAN Manager Workstation/Server*
- *Windows for Workgroups v3.11*
- *Windows NT 3.5x & 4.0*
- *Windows 95, 95/OSR2, 98, 2000*
- *SCO UNIX 3.X/5.X*
- *Packet Driver*
- *LANtastic 6.0 with NDIS drive*

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## ***Installation***

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Installation of the 4-Port 10/100Mbps Ethernet Switch Card requires hardware installation first, then software installation.

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## ***Unpack and Inspect***

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Open the shipping cartons and carefully remove all items. In addition to this User's Guide, ascertain that you have:

- One 4-Port 10/100Mbps NWay Ethernet Switch Card
- Software Diskette
- User's Manual

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## ***Install the Adapter***

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1. Shut down the computer, unplug its power cord, and remove the chassis cover.
2. If your order does not include the Boot ROM option, go ahead to Step 3. If your order includes the Boot ROM option, then install the Boot ROM Chip by plugging the chip into the Boot ROM Socket on the 4-Port 10/100Mbps NWay Ethernet Switch Card. The notched end of the Boot ROM Chip must be aligned with the notched end of the Boot ROM Socket (opposite alignment will cause destruction of the Boot ROM Chip).

3. Insert the contact edge of the 4-Port 10/100Mbps NWay Ethernet Switch Card into the connector of any available PCI Bus Master expansion slot. Press the card firmly into the connector and ascertain that the card's contacts are fully seated in the connector.
4. Install the bracket screw that secures the card to the computer chassis.
5. Replace the computer's chassis cover.
6. Reconnect the computer's power cord, and switch computer power on. If the BIOS section of your computer boot program is Plug and Play compliant, then at power-up the BIOS will automatically configure any newly installed 4-Port 10/100Mbps NWay Ethernet Switch Card.

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### ***LED Indicators***

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**Link/Activity (LINK/ACT):** This LED indicator lights **green** when there is a secure connection (or link) to a device at the port. The LED indicators blink **green** whenever there is reception or transmission of data occurring at a port.

**100Mbps Indicator (100Mbps):** This LED indicator lights **green** when a 100Mbps network is connected to this port. If a 10Mbps device is connected to this port, the LED indicator is OFF.

**Collision/Full-duplex (COL/FDX):** This LED indicator lights **green** when this port is in full duplex (FDX) mode. Otherwise, it is OFF for half duplex (HDX) operations. It blinks **green**, when collisions are occurring on this port.

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### ***Uplink button***

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One of the 4-Port 10/100Mbps NWay Ethernet Switch Cards is equipped with a Normal (MDI-X)/Uplink (MDI-II) push button that allows you to select normal (MDI-X) wiring or uplink (MDI-II) wiring. Port 4 is configured for normal wiring when the push button is in the out position. When the push button is pressed in, the port is configured for uplink wiring. Configuring the ports allows direct connection to a server or PC, or to another switch or a hub to form a network backbone.

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### ***Software Installation***

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On account of the great variety of network environments for which the 4-Port 10/100Mbps NWay Ethernet Switch Card may be used, and revisions of those network systems, the instructions for software installation are given as HELME.COM files on the 4-Port 10/100Mbps NWay Ethernet Switch Card Software Diskette. Run the root directory HELPME.COM for overview information, and for full installation details, run the INSTALL.EXE and referenced instruction files in the sub-directory appropriate to your network operating system.



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## *Specifications*

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### Network Type:

- Fast Ethernet 100Base-TX  
IEEE 802.3u standard for 100Mbps baseband CSMA/CD local area network
- Ethernet 10BASE-T  
IEEE 802.3 standard for 10Mbps baseband CSMA/CD local area network  
Jumperless Hardware  
Auto-negotiation functionality  
Media interface: RJ-45

### EMI Compatibility:

FCC Class B  
VCCI Class B  
CE Certification, Class B

Host interface: PCI 2.1 Bus (Bus Master)

Physical Dimensions: 154 x 104 mm (W x H)

### Environment:

Storage:  $-10^{\circ}$  to  $70^{\circ}$ C  
Operating:  $0^{\circ}$  to  $55^{\circ}$  C, ( $32^{\circ}$  to  $131^{\circ}$  F)  
Humidity: 10% to 90% non-condensing