

WHITE PAPER

January, 1997

Compaq Computer Corporation

Communications Products
Group

Networking Products Division

Compaq Netelligent Networking Controllers

Compaq markets its networking products under the brand name "Netelligent" - the smart choice for fast and simple networking. Compaq announces nine new FDDI controllers for dual and single attached networks using machines with either PCI or EISA bus architectures over fiber-optic or unshielded twisted pair cabling.

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- *Netelligent 100 FDDI PCI SAS Fiber-MIC Controller* (#287728-001)
- *Netelligent 100 FDDI PCI DAS Fiber-SC Controller* (#242509-001)
- *Netelligent 100 FDDI PCI SAS UTP Controller* (#242507-001)
- *Netelligent 100 FDDI PCI DAS UTP Controller* (#242511-001)
- *Netelligent 100 FDDI EISA SAS Fiber-MIC Controller* (#267413-001)
- *Netelligent 100 FDDI EISA DAS Fiber-MIC Controller* (#267415-001)
- *Netelligent 100 FDDI EISA SAS UTP Controller* (#267414-001)
- *Netelligent 100 FDDI EISA DAS UTP Controller* (#267416-001)

These controllers complement the growing line of Netelligent products, including a broad range of ISA, EISA, and PCI controllers for Ethernet, Token Ring, and 100Mb/s protocols, along with a broad range of repeaters, routers, and switches that are designed, developed, and tested for industry open standards networking environments.

COMPAQ

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Compaq Netelligent Networking Controllers

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COMPAQ NETELLIGENT NETWORKING CONTROLLERS (cont'd)

NETELLIGENT NETWORKING PRODUCTS

Compaq networking products are now marketed under the brand name "Netelligent." This coined word, obviously a blend of "Network" and "Intelligent" has been chosen to highlight the high performance, interoperability, and manageability of products from Compaq. Netelligent products are truly the smart choice in networking.

The Netelligent product family supports all the standards-based industry protocols, all the standard PC bus architectures, and virtually all the major network operating systems. Additionally, the Netelligent repeaters, routers, switches, and controllers support a wide variety of media, including coaxial, fiber-optic, shielded and unshielded twisted-pair cable. Netelligent products are standards-based, supporting IEEE 802.3 Ethernet, 802.3u Fast Ethernet, 802.5 Token Ring, IEEE 802.2. Logical Link Control, and ANSI X3T12 for FDDI.

All Netelligent products are designed, developed, tested, and validated to operate with the most popular PC platforms in industry open standards networking environments. These products meet the performance standards customers have come to expect from Compaq PCs and servers for years. They are easy to use and priced to bring leading-edge networking technology to a wide variety of users.

NEW 100 FDDI PRODUCTS

Compaq announces new controllers for the FDDI protocol as important additions to its family of Netelligent Networking Products. These nine new products are standards-based; all have undergone extensive testing in industry open standards networking environments; and all are backed by the Compaq limited warranty¹, service, and support.

100 FDDI PCI Controllers

100 FDDI PCI SAS Fiber-SC Controller	P/N 242505-001
100 FDDI PCI SAS Fiber-MIC Controller	P/N 287728-001
100 FDDI PCI SAS UTP Controller	P/N 242507-001
100 FDDI PCI DAS Fiber-SC Controller	P/N 242509-001
100 FDDI PCI DAS UTP Controller	P/N 242511-001

100 FDDI EISA Controllers

100 FDDI EISA SAS Fiber-MIC Controller	P/N 267413-001
100 FDDI EISA SAS UTP Controller	P/N 267414-001
100 FDDI EISA DAS Fiber-MIC Controller	P/N 267415-001
100 FDDI EISA DAS UTP Controller	P/N 267416-001

¹Certain restrictions and exclusions apply. Contact Compaq Networking Products Division Sales at 1-800-544-5255 or Compaq Networking Technical Support Center (post sales) at 1-800-386-2172 for details.

COMPAQ NETELLIGENT NETWORKING CONTROLLERS (cont'd)

FDDI is a mature, reliable technology often used for corporate servers, enterprise backbones and high-end workgroups due to its high throughput, distance capabilities, and immunity to EMI conditions. Appearing in the late 1980s, FDDI was the first standards-based, high-speed protocol and continues to enjoy widespread acceptance. Though the expense of FDDI led to its almost exclusive use in backbones, the introduction of the protocol's copper implementation has expanded its use to the desktop. These Netelligent 100 FDDI Controllers support both fiber and copper, both single and dual attach environments, and both PCI and EISA bus architectures, a total of nine different controllers. All Netelligent 100 FDDI Controllers ship with a common set of industry-leading features:

- Fully comply with their respective standards: IEEE802.2, ANSI X3T12 for fiber and ANSI TP-PMD Revision 2.1 (MLT-3) for copper. Netelligent 100 FDDI Controllers also comply with SMT v7.3
- 32-bit data transfer provides the fastest transfer method between network and PC
- Operate over fiber-optic cabling where long distance runs, security from outside monitoring, or immunity to noise are required. Support category 5 cabling where distance and noise immunity are not critical but cabling costs are of a major concern
- Fiber-optic versions support distances of 2000 meters between nodes, with a maximum overall network distance of 200 kilometers. The copper versions support distances of up to 100 meters between a node and a concentrator
- Dual attach controllers offer a direct connection into the FDDI ring or allow dual homing so that if cable is cut or accidentally disconnected, the ring reconfigures itself and network traffic continues uninterrupted. The unique design of the Netelligent 100 FDDI PCI Controller for dual attach rings takes only one PCI slot
- Ships with diagnostics utility that tests loopback, register, memory, onboard timer, and throughput functions at the user-specified settings
- Both asynchronous and synchronous FDDI support. Synchronous traffic has priority over asynchronous and can guarantee bandwidth. The bandwidth is allocated using the SBA (synchronous bandwidth allocator). Synchronous FDDI provides the capability to run services that require guaranteed bandwidth over FDDI, e.g. voice or video.
- Diagnostic LEDs indicate both driver and controller status
- Support industry standard SNMP management. Operate with most all network operating systems including NetWare, NetWare SFT III¹, Windows NT, Windows 95, SCO Unix¹.
- Connect into other Netelligent solutions through the family of Netelligent 5000 switches when an optional FDDI High-Speed Switch Port, thereby providing connectivity between 10Base-T workgroups/departments and high-speed FDDI networks.

¹Available in Q1 1997

COMPAQ NETELLIGENT NETWORKING CONTROLLERS *(cont'd)*

The following illustration shows an FDDI network with workstations, servers, and a concentrator attached to the dual ring. The FDDI workgroup connected to the concentrator are single attach stations.

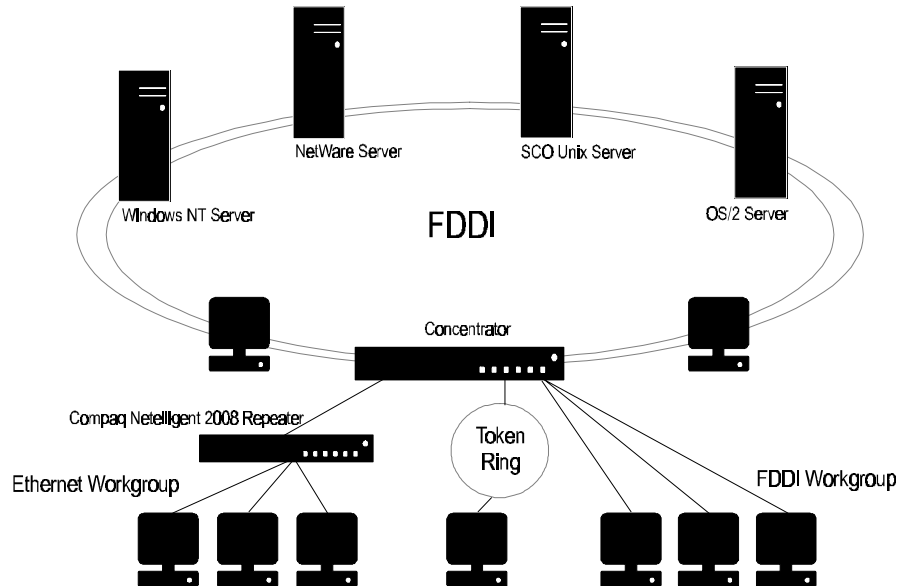
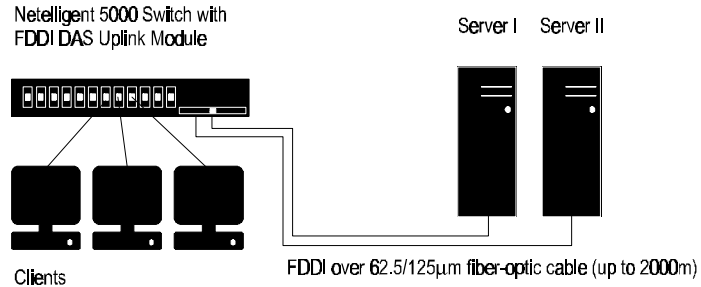


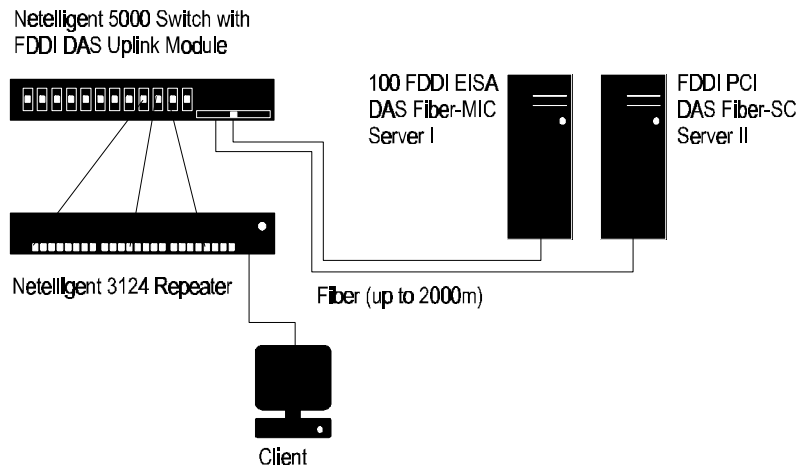
Figure 1: DAS devices attached to counter rotating dual ring

COMPAQ NETELLIGENT NETWORKING CONTROLLERS *(cont'd)*

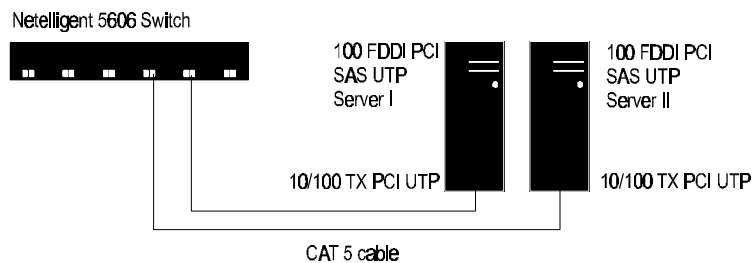
USAGE SCENARIOS USING NETELLIGENT 100 FDDI CONTROLLERS



Scenario I: Attach PCI server to FDDI switch over 150m



Scenario III: Attach servers to high-speed network containing switch and repeater



Scenario II: Fault tolerant Novell servers running SFT III

FAST ETHERNET PRODUCTS

Over the last three years there has been some market uncertainty about 100Base-TX on the one hand, and 100VG-AnyLAN on the other. Proponents of both standards have called their proposals "Fast Ethernet," and have claimed several benefits. These claims have led to much posturing in the trade press, and the result has been added confusion in a marketplace that doesn't like confusion. That uncertainty is now over; 100Base-T in its various media (100Base-TX, 100Base-T4, and 100Base-FX) has clearly won out with an installed base that is ten times that of 100VG-AnyLAN. 100Base-T is the *de facto* standard in our industry.

100Base-TX implementations operate using two cable pairs over Category 5 unshielded twisted-pair (UTP) cable, the same as 10Base-T. Because 100Base-TX uses the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) access scheme, it preserves the media access control (MAC) layer functions of 10Mb/s Ethernet. This allows users to draw from experience learned working with 10Base-T and maintain use of some existing network tools.

10/100 TX PCI UTP Controller

P/N 169845-001

P/N 242527-001 (6 pack)

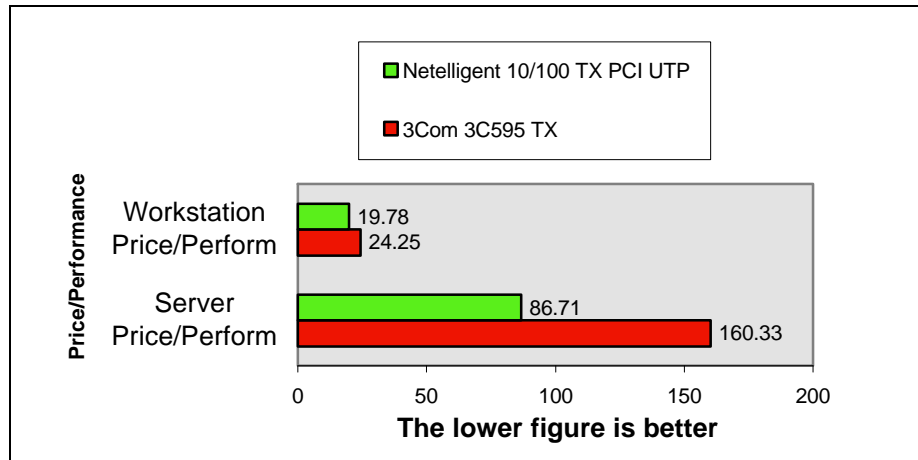
P/N 242528-001 (50 pack)

The Netelligent 10/100 TX PCI UTP Controller is a dual speed 32-bit bus-mastering controller, designed to take full advantage of the Peripheral Component Interconnect (PCI) bus architecture. It delivers excellent network throughput and low CPU utilization for both client and server connections. This controller operates in either 10Base-T or 100Base-TX networks making it an outstanding choice for all systems using a PCI-based bus architecture.

- Fully complies with IEEE 802.3 and 802.3u specifications to insure compatibility with all industry-standard 10Base-T and 100Base-TX devices
- 32-bit bus-mastering data transfer provides the highest level data transfer method between network and PC. Bus-mastering relieves the CPU of managing the controller, resulting in high-throughput with low CPU utilization
- PCI Plug and Play compliance allows the 10/100 TX PCI UTP Controller to automatically configure interrupt and memory addresses to conflict-free settings
- Operates over 10Base-T or 100Base-TX so customers can maintain their investment in current 10Mb/s Ethernet networking while also allowing easy migration to high-speed networks as the need arises
- Auto-negotiation support lets the 10/100 TX PCI UTP Controller automatically determine the proper network speed
- Full-duplex capable for increased bandwidth up to 20 or 200 Mb/s
- Diagnostic LEDs indicate network speed, link integrity, and network activity for "at-a-glance" troubleshooting
- Agents provide SNMP management support
- Operates with most all network operating systems including NetWare, Windows NT, Windows 95, Microsoft LAN Manager, IBM LAN Server and SCO UNIX

COMPAQ NETELLIGENT NETWORKING CONTROLLERS (cont'd)

The following graph illustrates the performance of the Compaq Netelligent 10/100 TX PCI UTP controller and the 3Com 3C595 TX adapter when they are used in an industry open standards networking environment. In accordance with standard reporting methods, the lower index figure of the Netelligent 10/100 TX PCI UTP controller indicates a better price:performance value over the other adapter.



NOTE: For server performance a Compaq 1500/R P/100 running NetWare 4.10 was used. For workstation performance a Dell Optiplex XMT P133 running NetWare 4.10 was used as the server. The six workstations were an AST Bravo 543W P75, an ATT Globalyst 600 P90, a Dell Omniplex P66, a Dell Optiplex P90, a Gateway 2000 P120, and an HP Vectra VL5 P133. The HP Vectra P133 workstation was used as the Perform3 collector for itself and the other five workstations. When testing the client performance, a 3Com 3C595 adapter was installed in the server. The Compaq Netelligent controller used the CPQNF3.COM driver; the 3Com adapter used the 3C59X.COM driver.

Throughput was determined by repeatedly transmitting blocks of 65535 bytes, 16384 bytes, 4096 bytes, 1024 bytes, and 64 bytes. The workstation performance index is the average throughput of transmitting data at these five block sizes. Server performance index is the average throughput of transmitting data at these five block sizes divided by server utilization. The Price/Performance Index is the controller price divided by the performance index.

100Base-TX allows maximum cable lengths of 100 meters from a concentrator to a network node, and only two Class II repeaters may be placed between any two nodes. These are rather restrictive cabling constraints compared to those we associate with 10Base-T networks. Compaq has developed a solution to help customers avoid costly re-cabling: the Compaq Smart Uplink™ Module. The Compaq Smart Uplink Module allows repeaters to be connected beyond the 100Base-TX distance limitations, thereby allowing duplication of 10Base-T wiring designs with 100Base-TX. Smart Uplink Modules can be connected to any available 100Base-TX or 100Base-FX repeater port. 100Base-TX repeaters are available in managed and unmanaged models, and they can be stacked up to five units high. Only one managed unit is needed to support the management of the complete stack.

Dual 10/100 TX PCI UTP Controller P/N 242559-001

The Netelligent Dual 10/100 TX PCI UTP Controller is a dual port 10/100 TX controller tuned specifically for Pentium Pro machines. It has been designed to meet the high transaction demands placed on mission-critical equipment. The Dual 10/100 TX PCI UTP Controller operates in any manufacturer's machine that meets the PCI specifications currently in place.

- Fully complies with IEEE 802.3 and 802.3u specifications to insure compatibility with all industry-standard 10Base-T and 100Base-TX devices
- 32-bit bus-mastering data transfer provides the highest level data transfer method between network and PC. Bus-mastering relieves the CPU of managing the controller, resulting in high-throughput with low CPU utilization
- PCI Plug and Play compliance allows the Dual 10/100 TX PCI UTP Controller to automatically configure interrupt and memory addresses to conflict-free settings
- Supports SNMP and Compaq Advanced Network Fault Detection and Correction feature; also works with Compaq Insight Manager
- Operates over 10Base-T or 100Base-TX so customers can maintain their investment in current 10Mb/s Ethernet networking while also allowing easy migration to high-speed networks as the need arises
- Auto-negotiation lets the Dual 10/100-TX PCI UTP Controller determine the proper network speed and automatically configure to the highest common speed with no changes to drivers or connectors
- Full-duplex capable for increased bandwidth up to 20 or 200 Mb/s per port
- Diagnostic LEDs indicate network speed, link integrity, and network activity for "at-a-glance" troubleshooting
- Operates with most all network operating systems including NetWare, Windows NT, Windows 95, Microsoft LAN Manager, IBM LAN Server and SCO UNIX

10MB/S ETHERNET PRODUCTS

While it has become an industry commonplace to claim that 10Mb/s Ethernet and traditional Token Ring network protocols have exhausted their usefulness, the reality is that few customers are throwing away their existing technology. Instead, what constitutes value to these customers has changed as the technology has shifted to commodity products. Now, customers wanting to protect their substantial investments in legacy technologies look more than ever for performance, compatibility, price, and reliability. These are qualities that they associate with Compaq computers, and these are the same qualities they can expect from the Netelligent family of products.

10 T PCI UTP Controller

P/N 242500-001

P/N 242529-001 (6 pack)

P/N 242530-001 (50 pack)

The Netelligent 10 T PCI UTP is a low-cost, high performance 32-bit bus-mastering 10Base-T controller, designed to take full advantage of the Peripheral Component Interconnect (PCI) bus architecture which delivers excellent network throughput and low CPU utilization.

- Fully complies with IEEE 802.3 specification to insure compatibility with 10Base-T devices from other vendors as well as from Compaq
- 32-bit bus-mastering data transfer provides the highest level data transfer method between network and PC. Bus-mastering relieves the CPU of managing the controller, resulting in high throughput with low CPU utilization
- PCI Plug and Play compliance allows the 10Base-T PCI UTP Controller to automatically configure its interrupt and memory address to conflict-free settings
- Full-duplex capable for increased bandwidth up to 20Mb/s
- Diagnostic LEDs indicate network speed, link integrity, and network activity for "at-a-glance" troubleshooting
- Agents provide SNMP management support
- Operates with most all network operating systems including NetWare, Windows NT, Windows 95, Microsoft LAN Manager, IBM LAN Server, Banyan VINES, and SCO UNIX

This controller allows users to protect their investment in 10Mb/s Ethernet while at the same time getting leading edge technology from Compaq. The 10 T PCI UTP Controller also uses the same drivers as the 10/100 TX PCI UTP Controller, thereby making a smooth migration path for users who now or in the future need to upgrade to a high-speed technology.

10 T ISA UTP Controller

10 T/2 ISA UTP/Coax Controller

For 10 T ISA UTP

P/N 265615-001

P/N 265615-002 (6 pack)

P/N 265615-003 (50 pack)

For 10 T/2 ISA UTP/Coax

P/N 265616-001

P/N 265616-002 (6 pack)

P/N 265616-003 (50 pack)

The Netelligent 10 T ISA UTP and 10 T/2 ISA UTP/Coax are low-cost, bus-mastering controllers optimized for clients attached to 10Mb/s Ethernet networks. These controllers are Plug and Play compliant, thereby allowing quick and easy installation. The combination of low-cost, high-performance, and ease-of-use that make them the best value in today's Ethernet market. These controllers have a feature set that includes:

- Bus-mastering for the highest level of data transfer while also lowering CPU utilization
- Plug and Play compliance allows the 10 T and 10 T/2 ISA Controller to automatically configure its interrupt and memory address to conflict-free settings
- Full-duplex support allows the controller to simultaneously transmit and receive data, thereby achieving an aggregate throughput of 20 Mb/s
- NE2100 compatible, thereby insuring operation with all the major operating systems running on 802.3 compliant machines. Compaq also ships drivers customized for use with these controllers.
- Bracket-mounted LEDs show link integrity and network activity for "at-a-glance" troubleshooting
- Full compliance with IEEE 802.3 specifications for compatibility with industry standard Ethernet machines from any vendor
- Boot ROM socket for remote booting. When remote booting is not needed, the controller can be left at its default "ROM Disabled" setting to save valuable memory for other uses

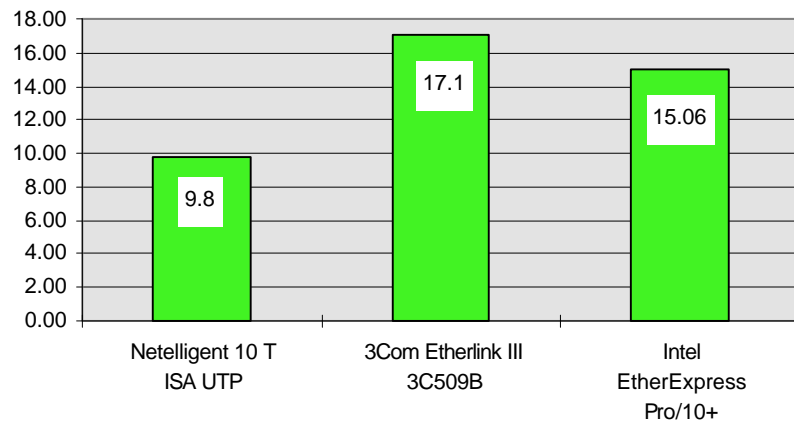
COMPAQ NETELLIGENT NETWORKING CONTROLLERS (cont'd)

ADVANTAGES OF NETELLIGENT 10 T ISA UTP OVER 3COM AND INTEL

	Compaq 10 T ISA UTP	3Com EtherLink III	Intel EtherExpress Pro/10+
Part No.	265625	3C509B-TPO	PCLA8220B (RJ45)
Estimated price, singles	\$71	\$125	\$110
Estimated multi-price	6 pack \$382 (\$64 ea)	5 pack \$530 (\$106 ea)	6 pack \$470 (\$94 ea)
Estimated multi-price	50 pack \$2786 (\$56 ea)	60 pack \$3950 (\$79 ea)	80 pack \$5860 (\$71 ea)
LAN Processor	AMD PCnetII	3Com Parallel Task	Intel 82595FX
Data Transfer Method	Bus-mastering	Programmed I/O	Programmed I/O
Onboard memory	Internal to chipset	None	32KB
Full-duplex capability	Yes	No	Yes
LEDs and functions	2 - link and activity	1 - link only	2 - link and activity

A price:performance comparison between these three controllers is particularly revealing because networking professionals usually base their buying decisions on these two factors...price and performance. For clients, price:performance is simply the estimated selling price divided by throughput. The following graph shows that the Compaq Netelligent 10 T ISA UTP Controller has the better price/performance ranking of the tested controllers, thereby giving users of the Netelligent product the best value for their networking dollar.

**Client Price/Performance
(Lower number is better)**



Connecting Ethernet Nodes through Netelligent Repeaters and Hubs

The Compaq Networking Products Division offers a wide range of repeaters, and switches, both unmanaged and managed, to connect the nodes together. The Netelligent family of networking products includes a wide range of IEEE compliant devices to connect even the largest of 100Mb/s and 10Mb/s networks.

- **Netelligent 1000 Repeaters** protect an investment in 10Base-T while also simplifying 10/100 connectivity. These repeaters come in 8, 16, or 24 port design, providing a low-cost, low-risk solution for upgrading from 10 to 100Mb/s as well as for bringing 100Mb/s to the desktop.
- **Netelligent 2000 Repeaters** are the perfect connectivity choice for departmental, remote site, and workgroup 10Mb/s Ethernet needs. They are stackable, support up to 160 nodes, are fully SNMP-manageable, and support UTP, coax, thick coax, and fiber cable.
- **Netelligent 3000 Repeaters** are designed for network segmentation. They are fully SNMP-manageable, and expandable to five-repeater stacks that support up to 120 ports of connectivity. Their unique architecture allows an entire stack to be managed by only one management repeater, thereby reducing network overhead on 10Mb/s networks.
- **Netelligent 5000 Switches** offer enterprise-wide switching functionality to optimize the performance of existing 10Base-T networks while providing a smooth migration to 100Mb/s Ethernet. The Netelligent 5000 Switches support SNMP management and over 8000 MAC addresses in configurations of 6 or 12 connections, with each having an optional modular high-speed uplink connector.

TOKEN RING

The reports of Token Ring's demise have been greatly exaggerated, and while it has become an industry commonplace to claim that legacy Token Ring network protocols have exhausted their usefulness, the reality is that few customers are throwing away their existing technology. Instead, what constitutes value to these customers has changed as the technology has shifted to commodity products. Now, customers wanting to protect their substantial investments in legacy Token Ring look more than ever for performance, compatibility, price, and reliability. These are qualities that they associate with Compaq computers, and these are the same qualities they can expect from the Netelligent family of Token Ring products.

4/16 TR PCI UTP/STP Controller

P/N 265407-001

P/N 265407-002 (6 pack)

P/N 265407-003 (50 pack)

The 4/16 TR PCI UTP/STP controller is a high-performance 32-bit product for the PCI bus architecture. The high throughput/low CPU utilization of the 4/16 TR PCI UTP/STP makes it particularly suitable for server environments where multiple rings can be supported without having the network controller become a network bottleneck. Its major features include the following:

- Bus-mastering data transfer maximizes throughput and minimizes CPU utilization
- Fully compliant with the v2.0 PCI local bus specification
- Automatic media detection for Type 1 STP or Type 3 UTP
- Exclusive Scalable Clock Architecture for adjusting onboard clock speed from 4MHz to 6MHz, which significantly increases packet processing rates
- Easy troubleshooting with TRTools, a Compaq exclusive diagnostic utility

ADVANTAGES OF COMPAQ OVER MADGE IN TOKEN RING PCI

	Compaq	Madge
Part No.	4/16 TR PCI UTP/STP	51-06
List Price	\$345	\$435
# LEDs/ function	2, insertion & activity	None
Connectors	DB9 & RJ-45	DB9 & RJ-45
Data Transfer	Bus-master	132Mb/s bursting
Onboard memory	128KB	512KB
RPL support	optional	none
SNMP Agent	yes	yes

4/16 TR PCI IBM UTP/STP Controller

P/N 199762-001

The Netelligent 4/16 Token Ring PCI IBM UTP/STP controller is a 32-bit bus-mastering PCI device that provides 100% IBM register-level compatibility with industry standard Token Ring devices and applications designed for IBM environments. This high-performance controller takes full advantage of the Peripheral Component Interconnect (PCI) bus architecture to deliver excellent network throughput and low CPU utilization for client and server connections. The controller automatically detects whether it should run at 4 or 16 Mb/s speed and adjusts itself to the proper speed.

- 100% IBM register level compatibility with IBM devices
- Fully conforms to IEEE 802.2 and 802.5 standards
- Full PCI Plug and Play compliance allows the 4/16 TR PCI IBM UTP/STP controller to automatically configure interrupt and memory addresses
- 32-bit bus-mastering data transfer provides the highest level data transfer method between network and PC. Bus-mastering relieves the CPU of managing controller throughput from memory to network for high-performance and low CPU utilization
- Auto Speed Sensing for easy migration from 4 to 16 Mb/s ring speeds. The 4/16 TR PCI IBM UTP/STP controller will automatically change to new speed
- Automatically moves the device driver and protocol stacks into extended memory (above 1MB). This reduces the amount of conventional and upper memory required by the controller, thereby freeing the space for other requirements
- Full-duplex support allows the controller to transmit and receive simultaneously, thus increasing effective bandwidth
- Single RJ-45 connector supports Type 1 STP or Type 3 UTP by including the cable converter for STP
- Diagnostic LEDs indicate ring insertion and network activity for “at-a-glance” troubleshooting
- Built-in RPL support allows diskless workstations to connect to the network for easy maintenance and increased security. No additional ROM necessary
- Extensive driver support guarantees that the controller will work with most all network operating systems, including NetWare, Windows NT, Windows 95, and SCO UNIX

COMPAQ NETELLIGENT NETWORKING CONTROLLERS (cont'd)

4/16 TR ISA UTP/STP Controller

P/N 265406-001

P/N 265406-002 (6 pack)

P/N 265406-003 (50 pack)

P/N 265406-004 (125 pack)

The 4/16 TR ISA UTP/STP was the industry's first Plug and Play ISA Token Ring controller. With Plug and Play technology users simply insert the controller into a Plug and Play enabled machine and the controller automatically identifies itself and the resources it requires. The system software automatically scans all installed controllers and devices to prevent potential resource conflicts and then sets up suitable configurations for each installed device.

- Plug and Play configuration means that there are no jumpers or switches to set
- Bus-mastering data transfer maximizes throughput and minimizes CPU utilization. Programmed I/O mode for non-bus-mastering machine with full 16-bit I/O operation
- Automatic media detection and configurations for STP or UTP cable
- Exclusive Scalable Clock Architecture for adjusting onboard clock speed from 4MHz to 6MHz, which significantly increases packet processing rates
- Socket for optional RPL ROM to support use in a diskless workstation

ADVANTAGES OF 4/16 TR ISA UTP/STP OVER IBM AND MADGE

	Compaq	IBM Auto16/4 TR ISA	Madge Smart 16 Client PnP
Part No.	4/16 TR ISA UTP/STP	92G7632	22-04
List Price	\$249	\$276	\$295
Interrupt Levels	2,3,5,6,7,9,10,11,12	2,3,10,11	2,3,7,10,11,15
DMA Support	0,1,5,6,7	None	None
I/O Addresses	8	2	12
# LEDs/ function	2, insertion & activity	2, insertion & activity	None
Connectors	DB9 & RJ-45	RJ-45	DB9 & RJ-45
Data Transfer	Bus-master & I/O	Shared Memory	Programmed I/O
Onboard memory	128KB	64KB	128KB

Users who need Token Ring support for EISA bus machines can look to the NetFlex-2 family of controllers, which are described on page 5 of this paper. All NetFlex-2 controllers are fully IEEE compliant and feature Packet Blaster technology for exceptional performance.

NetFlex-3 Controllers for Compaq Servers

Compaq customers have come to expect reliability, flexibility, and superior performance from Compaq servers and various options available for those servers. Many Compaq servers ship with a NetFlex controller pre-installed in the machine. For example, the NetFlex-3 controller is standard on the ProLiant 4500 5/166, 1500 5/166 and 5/133 servers, while the NetFlex-2 controller is standard on the ProLiant 1500 5/100 server. The NetFlex network controllers are now offered for use in Compaq servers and desktops.

All NetFlex-3 controllers have an auto-sensing capability to automatically determine the speed of the network. They are also full-duplex capable, doubling the throughput of both 10 and 100Mb/s controllers. The base NetFlex-3 controller comes in two versions:

NetFlex-3/E P/N 169800-001

This controller supports the 32-bit EISA bus architecture for machines connecting to 10Mb/s Ethernet networks running over unshielded twisted-pair or coaxial cable.

NetFlex-3/P P/N 169810-001

This controller supports the 32-bit PCI bus architecture for machines connecting to 10Mb/s Ethernet networks running over unshielded twisted-pair or coaxial cable.

Another significant advantage that the NetFlex-3 enjoys over other controllers is the performance-enhancing Adaptive Performance Optimization (APO) feature. APO automatically senses the bandwidth demands on the system I/O bus and adjusts the NetFlex-3 dynamic data buffer accordingly. For example, if the NetFlex-3 is one of four peripherals on the bus, APO increases the FIFO layer depth and transmits data packets on the PCI bus less frequently. On the other hand, if the NetFlex-3 is the only device on the bus, APO decreases the FIFO and transmits data on the PCI bus more frequently.

100Base-FX Module P/N 267657-001

The Netelligent 100Base-FX Module combines the protection and distance capabilities available only from fiber-optic cable with the 100Mb/s speed of Fast Ethernet. The 100Base-FX module is an upgrade kit for the Netelligent NetFlex-3 Controller used in Compaq ProLiant and ProSignia servers. Its features include the following:

- Full compliance with the IEEE 802.3u standard for Fast Ethernet
- Supports both the NetFlex 3/P and NetFlex 3/E controllers for either PCI or EISA bus architectures
- Provides connection up to 2000 meters when used in full duplex mode
- Ships with the latest NetFlex-3 drivers and a diagnostic utility
- Supports full-duplex mode
- Includes bracket-mounted LEDs showing link, network speed, and network activity
- Uses SC connectors for a guaranteed good connection to fiber cable

In addition to the 100Base-FX module, Compaq offers two other 100Mb/s upgrade kits:

10/100 Base-TX UTP module P/N 169804-001

COMPAQ NETELLIGENT NETWORKING CONTROLLERS *(cont'd)*

For Compaq customers wanting to upgrade to the popular Fast Ethernet protocol using Category 5 cable. One particular advantage of the 10/100 Base TX module is that it allows users to upgrade their NetFlex-3 controllers with the same Fast Ethernet protocol and wiring that they were using for 10Mb/s Ethernet.

100VG-AnyLAN UTP module
P/N 169802-001

For Compaq customers who need to upgrade their NetFlex-3 connections to 100Mb/s and also want the flexibility that comes from four pair operation over Category 3, 4, or 5 UTP cable. 100VG-AnyLAN uses "Demand Priority" to determine the order in which nodes share the network. It allows time-critical network applications more immediate access to the network.

NetFlex-2 Controllers for Compaq Servers

NetFlex-2 controllers all feature exceptional server performance, flexibility, and have been fully tested on a variety of Compaq servers. All NetFlex-2 controllers fully comply with the IEEE 802.3 and 802.5 standards. The NetFlex controllers are available in four versions:

NetFlex-2 ENET-TR Controller

P/N 142213-001

P/N 142015-001 DualSpeed Token Ring Module

This 32-bit EISA bus-mastering controller supports Ethernet environments as shipped, and Token Ring networks by adding the DualSpeed Token Ring module. The NetFlex-2 ENET-TR is full-duplex capable over 10Base-T, thereby doubling effective bandwidth for 10Mb/s Ethernet. With the optional AUI to BNC transceiver, this controller also supports 10Base-2 networks, and the Token Ring module can connect to either Type 1 UTP or Type 3 STP Token Ring networks.

NetFlex-2 DualPort ENET Controller

P/N 142131-001

The major attraction of the NetFlex-2 DualPort ENET controller is that it maximizes performance by combining two 32-bit controllers on one board, requiring only one EISA slot. This controller features exceptional performance through two channels by incorporating the Packet Blaster technology on each channel. The NetFlex-2 DualPort ENET controller is full-duplex capable, thereby doubling the effective bandwidth.

NetFlex-2 TR Controller

P/N 199520-0011

The NetFlex-2 TR controller delivers leading edge 32-bit performance by combining bus-mastering and Packet Blaster technology. This controller supports 4 and 16 Mb/s Token Rings, as well as Type 1 STP and Type 3 UTP media.

NetFlex-2 DualPort TR Controller

P/N 142132-001

This DualPort Token Ring controller combines two Token Ring interfaces on a single EISA board, thereby preserving EISA slots in the server. This controller features exceptional performance through two channels by incorporating the Packet Blaster technology on each channel. Like the single interface NetFlex-2, this controller supports 4 and 16 Mb/s Token Rings, as well as Type 1 STP and Type 3 UTP media.

STATEMENT OF DIRECTION

Although Compaq is well-known as the market leader in PCs, the company also has a strong but unappreciated position as a networking vendor. During 1995 alone, Compaq shipped over 450,000 controllers with its server products, along with an additional 1,800,000 for its desktop computing platforms. This tradition of designing and delivering high quality networking products form the foundation of the new Networking Products Division.

The goal of the Compaq Networking Products Division is to deliver "best-of-breed" networking products through partnerships and product innovation. "Best-of-breed" products exist when customers receive exceptional value for every dollar spent. Delivering on this commitment involves adding value in three ways:

- a) Providing cost benefits through volume manufacturing and distribution
- b) Making available complete solutions that are fully tested for industry open standards environments
- c) Pushing product innovation to create easy-to-use, better managed products that will drive down the level of expertise required to install, manage, and maintain an enterprise network

Customers can expect expanded offerings in the 100Mb/s protocols, particularly the standards-based high-speed technologies. The product offerings will range from new and improved controllers to shared media repeaters, switches, and newly designed sophisticated management tools. These products will address the needs of workgroup and departmental client/server applications.

Finally, over time, Compaq customers can expect a range of products that will provide an orderly migration from today's technologies to higher speed LAN technology as well as to WAN connectivity and remote access. As in other arenas, this will involve both partnering and product innovation.