

Networks and  
Communications  
Buyer's Guide

digital

1989 July-December

# Networks

## Map to the Guide

<b>Background Information</b> <i>Presents a general overview of networking and communications concepts and architecture.</i>	<b>Product Information</b> <i>Describes product features and capabilities.</i>	<b>Configuration Information</b> <i>Describes how products can be linked into networks.</i>	<b>Ordering Information</b> <i>Lists the codes required to purchase specific variations of a products.</i>
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1989 July-December

# Networks

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## Appendix B Environmental Specifications

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## Appendix D Related Documentation

## Index

**Surface-mount Wallbox**

As modular office cubicles increase, many facilities require surface-mounted faceplates rather than flush-mounted faceplates, which have wallboxes actually in the walls. The H3111-D Surface-mount Wallbox has mounting hardware that supports DECconnect Modular Faceplate H3111-C in surface-mount applications. ▲ Refer to "DECconnect Faceplate Products" in Section 2.

**DECconnect Daisy-chain Connector**

The DECconnect Daisy-chain Connector Tap (H3114-AA) assembly provides structured cabling support for serial connection of workstations or PCs, behind the wall. The Daisy-chain Connector allows workstations to be connected or disconnected from the LAN without disrupting the network or disconnecting downline nodes. ▲ Refer to "DECconnect Faceplate Products" in Section 2.

**Video Connector**

The H3115-AA Video Connector provides snap-in video connections for DECconnect Modular Faceplate H3111-C. Combined with the H3111-C, the new H3115-AA provides the same video capabilities as the H3111-A/B (non-modular) DECconnect faceplate, allowing flexibility for users who require video connectivity in a structured cabling environment. ▲ Refer to "DECconnect Faceplate Products" in Section 2.

**MUXserver 300/DECmux 300 Remote Terminal Server**

The MUXserver 300/DECmux 300 Remote Terminal Server connects up to 48 remote asynchronous terminals, serial printers, modems, and non-LAT hosts via a pair of modems and a leased phone line to an 802.3/Ethernet local area network. ▲ Refer to "802.3/Ethernet Communications Servers" in Section 2.

**802.3/Ethernet Adapters for IBM Shielded Twisted-pair Cabling**

The 802.3/Ethernet Adapters for IBM Shielded Twisted-pair Cabling connect workstations and personal computers over IBM Shielded Twisted-pair cabling to 10 Mb/s 802.3/Ethernet Local Area Network by adapting from a ThinWire 802.3/Ethernet port in a workstation or PC to IBM shielded twisted-pair cabling. ▲ Refer to "Ethernet Overview" in Section 2.

**DEC MicroServer-SP and DECrouter 100**

Offering similar functionality to the MicroVAX 2000 option, the DST32, the DEC MicroServer-SP provides synchronous communications for VAXstation 2000s, VAXstation 3100s, or a group of personal computers served by a MicroVAX 2000 or VAXserver 2000 running PCSA software.

The DECrouter 100, the server package offered for the DEC MicroServer-SP, includes a license and TK50 media for DECrouter 2000 V1.1 software. The DECrouter 100 is especially suited for networking small branch office networks. ▲ Refer to "802.3/Ethernet Communications Servers" in Section 2.

### **CXM04 (3270 Terminal Option Card)**

Pictured on the back cover, the CXM04, an option for DECserver 550 hardware, provides full-screen VT220 emulation to attached IBM 3270 Control Unit Terminal (CUT) displays and IBM PCs emulating 3270 CUT displays. Once connected, an IBM 3270 CUT display has access to VAX applications anywhere in the network. ▲ Refer to "802.3/Ethernet Communications Servers" in Section 2.

### **Fiber Optic Ethernet System**

This Fiber Optic Ethernet system provides the capability for distributing an Ethernet backbone over a structured fiber optic cabling system, eliminating the need for baseband coaxial cable.

Fiber Optic Ethernet products are manufactured by Chipcom Corporation, a Digital strategic partner, and available through Digital's Field Service Network and Site Services, as well as through authorized distributors such as Anixter Bros., Inc. ▲ Refer to Fiber Optic Ethernet Products in Section 2.

### **StrataCom IPX**

The IPX is a high-performance transmission resource management system (TRMS) that supports the corporate private network environment. It is used to build digital networks, integrating data, voice, image, and video applications for a variety of industries. The product of an ongoing relationship between Digital and StrataCom that includes joint development and marketing activities, the IPX provides a complementary capability to the DECrouter family of products. ▲ Refer to "Transmission Resource Management System" in Section 3.

### **DSH32 DEC MULTIcontroller 581**

The DSH32 (the DEC MULTIcontroller 581) is a dual-function communications controller specific to the MicroVAX 2000. The DSH32 consists of an eight-line asynchronous multiplexer and a single-line synchronous interface, and is supported by the VAX/VMS operating system, DECnet-VAX networking software, VAX P.S.I. communications software, and VMS/SNA communications software. ▲ Refer to "MicroVAX 2000 Asynchronous/Synchronous Communication Controllers" in Section 3.

### **DEC WANcontroller 220**

The DEC Wide Area Network Controller 220 (DEC WANcontroller 220), a two-line, synchronous communication controller designed specifically for VAXBI systems, provides host-based connectivity in VAXBI environments for establishing communication with X.25, DECnet and IBM networks by using Digital's standard layered network software. ▲ Refer to "VAXBI Controllers" in Section 3.

### Computer Integrated Telephony

Digital's Computer Integrated Telephony (CIT) enables customers to integrate the features and capabilities of the telephone and telephone switching network with the data-processing capabilities of computer equipment into a single application.

The VAX/VMS Computer Integrated Telephony PBX Server (CIT Server) is software that links the Digital computing environment with a PBX. CIT Server software supports communications between a VAX and the Northern Telecom Meridian SL-1 PBX Generic X.11 Release 12 available in North America.

The VAX/VMS Computer Integrated Telephony Applications Interface (CIT Applications Interface), a software package, provides programmers with an applications interface comprising a library of VMS routines that enable the programmer to initiate features and monitor the status of telephones connected to a PBX. CIT Applications Interface routines comply with the VMS Standard for Procedure Calling and Condition Handling, presenting a familiar interface to VMS applications programmers. ▲ Refer to "Business Communications" in Section 5.

Customers can use this guide to find the following kinds of information about Digital's networking and communications products:

- *Background Information* presents a general overview of networking and communications concepts and architecture.
- *Product Information* describes product features and capabilities.
- *Configuration Information* describes how products can be linked into networks.
- *Ordering Information* lists the Software Product Description and Unique Product Identifiers required to purchase specific variations of a product.

To locate information in this guide, find specific topics listed below and refer to the Contents for page numbers.

## Background Information

General background information about Digital networking and communications is presented in Section 1.

## Product Information

### ***Locating Products***

Products are listed in the Contents and alphabetically in the Index.

### ***New Products***

New products are highlighted under "What's New to the Networks and Communications Buyer's Guide."

### ***Descriptions of Software Products***

Descriptions of software products are located in Sections 4, 5, and 6. Each description is followed by the specific Software Product Description, Unique Product Identifier, and any prerequisite hardware and software.

Software required for 802.3/Ethernet Communications Servers is described in "802.3/Ethernet Communications Servers" in Section 2.

Full Software Product Descriptions (SPDs) are published separately. The SPD numbers for products in this guide are listed in the descriptions of products themselves and in Appendix C.

### ***Hardware Product Descriptions***

Hardware product descriptions are in Section 2, "Connectivity: 802.3/Ethernet Local Area Networks," and Section 3, "Connectivity: Hardware Communications Controllers." Each description is followed by specifications and order codes as well as any prerequisite hardware and software.

### ***Network Services Products***

Network Services Products are listed in Section 6, "Manageability."

### ***Product Comparisons***

Tables comparing the features and capabilities of products are located in the following subsections: "802.3/Ethernet Communications Servers," "Extended 802.3/Ethernet Local Area Networks," "DECnet Communications Software," "Digital/IBM Communications Software," "Asynchronous Communications Controllers," "Synchronous Communications Controllers," and "Modems."

## Suggestions for Using this Guide

### ***Product Performance Information***

Product performance information is discussed in Appendix A.

### ***Specifications***

Specifications for hardware products are listed in individual product descriptions and in summary tables.

### ***Prerequisite Products***

Any prerequisite hardware or software necessary to use a product is listed in the individual product description.

### **Configuration Information**

Overview configurations are described in Section 2, "Connectivity: 802.3/Ethernet Local Area Networks."

Detailed configuration information is located in Appendix A.

### **Ordering Information**

Order codes are listed in tables after each description of a hardware product. Software Product Description numbers and Unique Product Identifiers follow each description of a software product.

Order code formats are explained at the beginning of Section 4. To order network products in prepackaged configurations, contact the appropriate product marketing manager.

### **Comments and Suggestions**

Use the reply card at the end of this guide to make comments and suggestions.

*System Unit Space* in chassis for mounting prewired backplane(s) that accepts hex- or quad-sized modules.

*Double Slot Space* in a prewired backplane that accepts a 13.2 cm (5.22 in) high module.

*Quad Slot Space* in prewired backplane that accepts a 26.51 cm (10.44 in) high module.

*Hex Slot Space* in prewired backplane that accepts a 39.63 cm (15.6 in) high module.

*I/O Connection Panel Insert Openings* for mounting I/O Connection panel inserts in the I/O connection panel on the back of the CPU cabinet. These inserts provide the transition between internal cabling and external shielded cabling. There are two types of I/O connection panel inserts—one for UNIBUS systems and one for Q-bus systems.

I/O connection panel inserts for UNIBUS options vary in type and style depending on the amount and type of connectors required by the option. Each I/O connection panel accepts multiple inserts. Q-bus options have I/O connection panel insert sizes of A (2.54×10.1 cm or 1×4 in), B (6.6×8.1 cm or 2.6×3.2 in), or C (10.1×10.1 cm or 4×4 in).

*dc Amps Drawn* dc current (amps) drawn by the option at 5 V, 15 V, -15 V, 12 V.

*ac Watts Drawn* ac current (watts) drawn by the option at 120 V, 60 Hz or 240 V, 50 Hz.

*Bus loads* The number of bus loads drawn from the appropriate system bus.

*b/s* Bits per second.

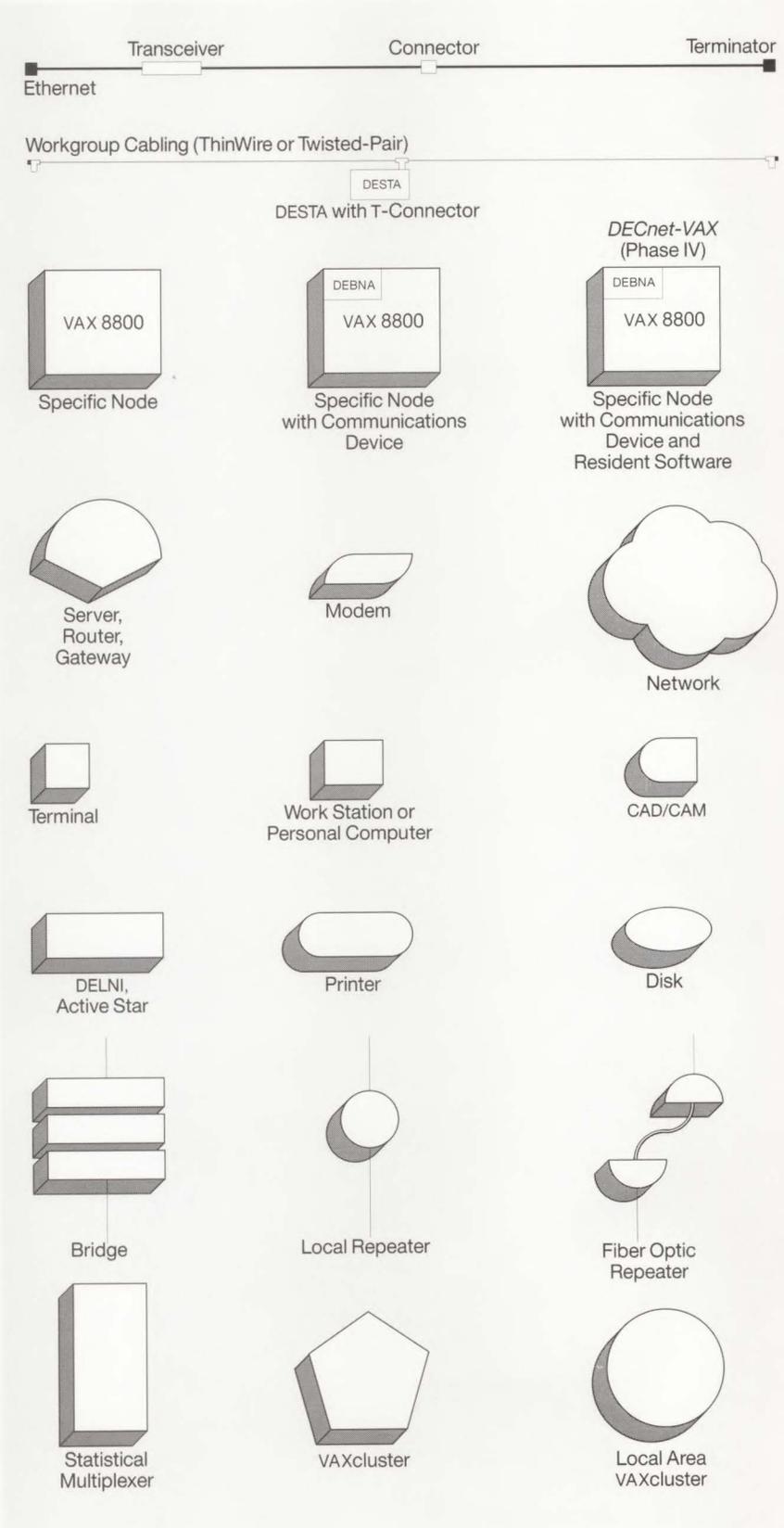
*Kb/s* Kilobits per second. (K = 1,000)

*KB/s* Kilobytes per second. (K = 1,024)

*MB/s* Megabytes per second. (M = 1,048,578)

*Mb/s* Megabits per second. (1 Mbit = 1,000,000 bits)

## Key to Symbols Used in This Guide



## Introduction

Digital Equipment Corporation is the leading producer of networking products, services, and capabilities that deliver computing power directly to an individual's work space. Our computing philosophy is based on the concept of distributed processing, which means locating powerful applications where users need them—in offices, laboratories, factory floors, or any work space that can benefit from sharing information or computing resources. Digital distributes computing power effectively through a broad range of products and services that allow computers to communicate via networking.

Organizations gain a number of benefits from arranging their computer systems into networks. Networks enable all computer users to take advantage of the organization's total computing capabilities through information exchange and sharing of resources. Small systems can access the resources and greater computing power of large systems, while large systems can off-load applications best handled by personal workstations.

Networks encourage the free flow of information throughout an enterprise by providing individuals (who have the proper security clearance) ready access to data, applications, and people. Any computing resource can become a resource to the entire organization simply by attaching it to the network.

Typically, computers are arranged into local area networks (LANs) when organizations need high-speed data transfer and communication within a building or a cluster of buildings—such as a campus or office complex. LANs may also be coupled to other nearby LANs to extend their distance or to improve performance; these are called extended LANs.

Network nodes can be distributed in different cities, or even to different countries. For transmitting data over long distances and across oceans, a network usually employs a combination of long-distance communication media including telephone lines, public data networks, satellite signals, and microwave. An organization with worldwide offices is likely to configure its computers into such a wide area network (WAN). Whether the network forms a LAN, an extended LAN, or a WAN, the user sees the network function as a single entity.

An important goal of any network should be to enable equipment manufactured by different vendors to work together. Communication between heterogeneous systems is possible only if the multiple vendors agree on a set of conventions or standards for information exchange. That is why Digital is committed to building products that comply with the Open Systems Interconnection (OSI) model recommended by the International Standards Organization (ISO).

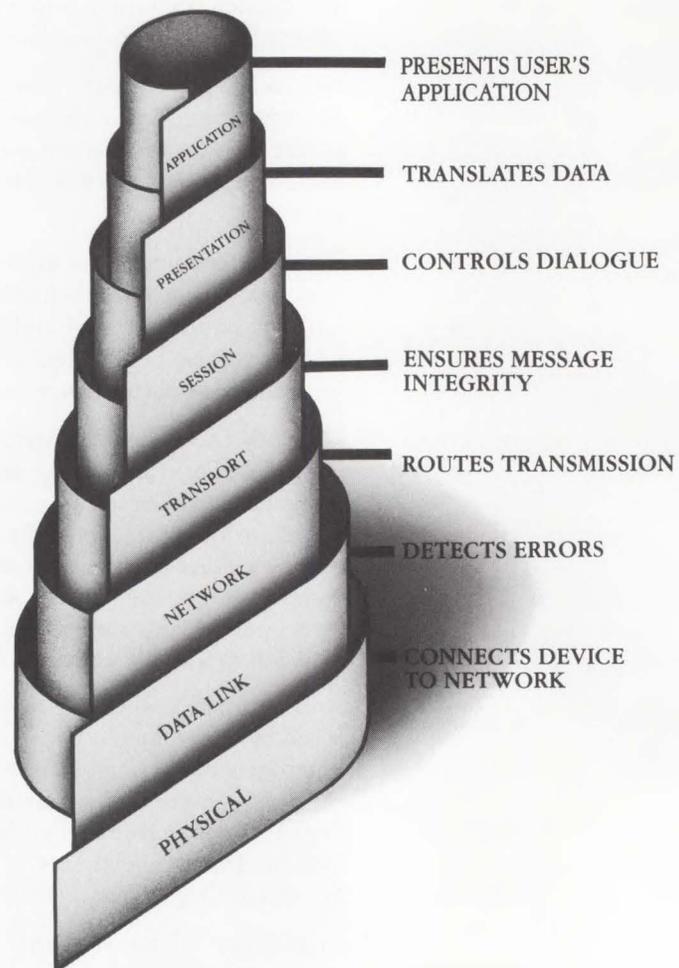
In addition, Digital supports multivendor networks by providing gateways to networks developed by other vendors, such as IBM's SNA networks and X.25-compliant systems. These gateways allow the functions of one vendor's network to be converted into functions recognizable by another vendor's network. In cases which Digital does not offer an off-the-shelf method for communicating with a different vendor's product, Digital's Computer Special Systems group can build customized hardware and software to create such a link.

### Digital Network Architecture

Digital's networking capabilities arise from the Digital Network Architecture (DNA). Digital has adhered to DNA since 1975; it serves as the blueprint for virtually all past, present, and future communications products. Historically, the DNA model, like the Open Systems Interconnection (OSI) reference model, is arranged in independent layers. Each layer can be changed without significantly affecting other layers. And in each layer the protocols govern communication with other layers.

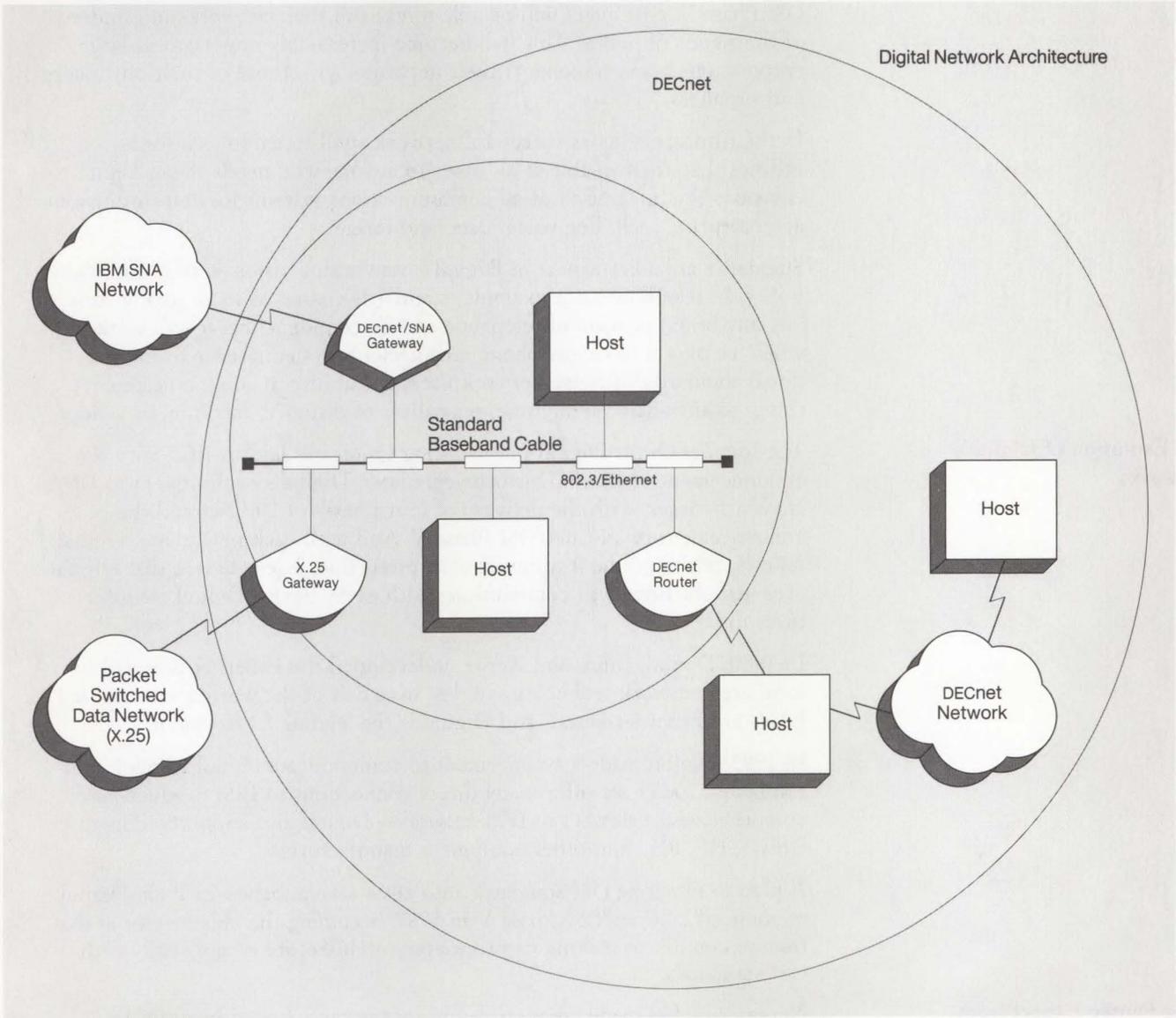
As DNA progresses to its next phase, it will comply with the OSI reference model.

#### *Open Systems Interconnection Model*



Digital's implementation of DNA is DECnet—a family of software and hardware products that link systems into a single network. DECnet software is layered on each of Digital's operating systems, allowing all Digital systems to communicate across the network with compatible functions.

DNA, DECnet, and 802.3/Ethernet Relationships



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DNA's layered structure has provided DECnet software with a unique adaptive quality. Since DECnet was first announced, it has progressed through four phases, with each phase providing increased capability. Now Digital has announced the next progression, DECnet/OSI Phase V, that promises compliance with international standards by merging DECnet and OSI. This will enable Digital customers to enjoy the benefits of multivendor communication without compromising system quality.

Digital offers freedom to users who wish to integrate computers from a variety of manufacturers into their networks through international standards. And users are assured that DECnet networks allow them to incorporate new technologies without the expense of rewriting existing applications or retraining staff.

## Introduction to Digital's Networks

DECnet also offers flexibility in planning. Networks can start with two nodes and expand to 64,000 nodes. And as Digital incorporates DECnet/OSI Phase V, customers will be able to expand their networks to hundreds of thousands of nodes. This will become increasingly important as large corporations begin to connect their networks with those of their customers and suppliers.

In the future, the most successful networks will function as information utilities that are available at all times to anyone who needs them. Digital envisions the integration of all communications systems located throughout an enterprise, including voice, data, and image.

Standards are a key aspect in Digital's networking vision as they are in any utility. In telephones, for example, standards enable us to go to any store, buy any brand or form of telephone and be confident that it will work when we plug it in to any phone receptacle. Strict adherence to international standards will give network users the ability to communicate anything, to anywhere, at anytime, regardless of distance, medium, or vendor.

The foundation for Digital's networking vision was laid in 1975 with the announcement of DNA. Thirteen years later, Digital's commitment to DNA is even stronger, with the delivery of four phases of DECnet and the announcement of DECnet/OSI Phase V. And with each new phase, Digital renews its commitment to investment protection. Every device that Digital ever manufactures will communicate with every device Digital manufactures today.

In 1980, Digital, Intel, and Xerox codeveloped the Ethernet protocol for local area network technology. Today, over half of the worldwide installed LANs are Ethernet-based, and Digital is the leading LAN vendor.

In 1983, Digital made a commitment to communicate in multivendor environments. Today, we offer many direct connections to IBM products and comprehensive gateways to IBM networks. Digital also supports links to Unisys, HP, ICL, and other equipment manufacturers.

A plan to integrate OSI standards into DNA was launched in 1985. Digital announced DECnet/OSI Phase V in 1987, becoming the only vendor at that time to commit to making its proprietary architecture comply fully with OSI standards.

Networking has made great strides in recent years fueled by dramatic changes in the marketplace. For example, the "globalization" of business has created a need to sell and service products worldwide. This has led to a dependence on technology and a rethinking of the whole idea of communication.

The ability to master technology has become an important factor in keeping a company competitive. Companies that invested heavily in computers to increase efficiency now realize that unconnected islands of computers can lead to information bottlenecks. Distributed computing can solve this problem by allowing for more decision making at the hands-on level. And networks can help companies respond more rapidly to the shifting demands of the marketplace by making more timely and accurate information available to decision makers.

### The Evolution of Digital's Networks

### What People Expect from Networks Today

At the same time that computers have proliferated, technological development has accelerated. Managers want to know what direction technology will take in order to incorporate constantly changing technology into their planning cycles. They want the freedom to purchase systems from multiple vendors. Furthermore, they need to match new technology with the corporation's past and present investments in hardware, software, and applications.

To accommodate these pressures, users and managers want networks that are easy to install, change, and operate. They want a lateral, open, and flexible flow of information to help managers cope with changes.

Digital's massive companywide network, EASYnet, is a good illustration of the functions people now expect from networks. Digital's network was established in 1978 with fewer than 10 nodes. Today EASYnet is the world's largest private data network, with users in 500 locations on three continents. It connects more than 32,000 computers worldwide, and is growing at the rate of 200 new nodes per week. EASYnet plays an important role in Digital's product development and testing, manufacturing, distribution and marketing. Digital employees use the electronic mail application to communicate with Digital facilities all over the world. And while network users exchange critical information, they need not be concerned about how data physically passes through the network because it is transparent.

Digital's Strategic Networking Vision for the future can be summed up as the ability to communicate anything, to anywhere, at anytime. In the future, companies will expect the functional integration of all communications systems throughout the enterprise.

The framework that organizes the technologies required to implement Digital's Strategic Networking Vision divides networking functions into four areas: Connectivity, Interoperability, Distributed Applications, and Manageability. This buyer's guide organizes Digital's products and services into categories that reflect these four functional areas. All of our past, present, and future products can be fit into this framework.

### **Connectivity**

Connectivity is the ability of the network to move any piece of information from Point A to Point B, regardless of the media or transmission technologies. Digital offers products to simplify the physical and logical connections in a network and enable every device to utilize the power of the entire network. Digital's connectivity solutions include

- 802.3/Ethernet LAN products.
- The DECconnect structured cabling system (which supports voice, data and video transmission).
- Links to public and private data networks using X.25 protocols.
- Specific interfaces to other vendors' equipment using gateways and routers.
- NETplan network planning service.

Products included in the Connectivity category enable networking devices to participate in an overall system and utilize the full power of a network.

### **Digital's Strategic Networking Vision for the Future**

## Introduction to Digital's Networks

### ***Interoperability***

Interoperability enables all system elements to exchange information between equipment from the same vendor, or from a collection of vendors who support the integrity of the network. Users need

- Bidirectional exchange of information and files.
- Support for major equipment vendors.
- Compliance with standards.

Digital products such as DECnet, IBM Interconnect, DECnet/OSI, and PC communications packages with DECnet-DOS allow users to operate in a multivendor environment. Products included in the Interoperability category give users the power of DECnet along with the advantages of industry standards.

### ***Distributed Applications***

Distributed Applications are the measure of the value and usefulness of the network and are a primary reason the network exists. Distributed applications can be accessed via a network as easily as if they were on a single system. People use Digital networks to access and utilize enterprise-wide applications such as

- Electronic mail.
- DECnet System Services.
- Computer Integrated Telephony (CIT).
- ALL-IN-1.
- Videotex/electronic conferencing.
- File transfer.

In the Distributed Applications category are the products and services that enable network managers to deliver high performance to users, regardless of network topology. These products also provide consistent interfaces for resources on the network. For example, electronic mail unites an enterprise by connecting disparate mail systems such as IBM/SNADS, IBM/DISOSS, X.400, and UNIX.

### ***Manageability***

Manageability provides the network capabilities as well as the product and service mix that

- Enables customers to design, implement, and control the performance of the entire network.
- Manages change in a responsive and flexible manner.

Manageability is inherent in Digital networks because the intelligence is built into the network architecture: The network handles day-to-day operations, automatically adjusting to changes in the system and circumventing failed components. In addition to the built-in capabilities, Digital network management solutions—including life-cycle management services, Remote System Manager, the DESNC Enhanced Ethernet Security system, DECnet Monitor, and LAN Traffic Monitor—help network managers better support the enterprise-wide network.

Products and services in the Manageability category provide information and capabilities to ensure high network availability, ease of use, security, and resource management.

### Future Directions

As Digital fulfills the Digital Strategic Networking Vision, the framework of Connectivity, Interoperability, Distributed Applications, and Manageability will extend to meet industry needs. Digital customers will continue to implement 802.3/Ethernet-based solutions over all standard media including baseband cable (standard, ThinWire, and unshielded twisted-pair), broadband cable, fiber optic cable, and microwave links. Digital's enterprise-wide networks will provide the functional integration of voice, data, and video across the entire network.

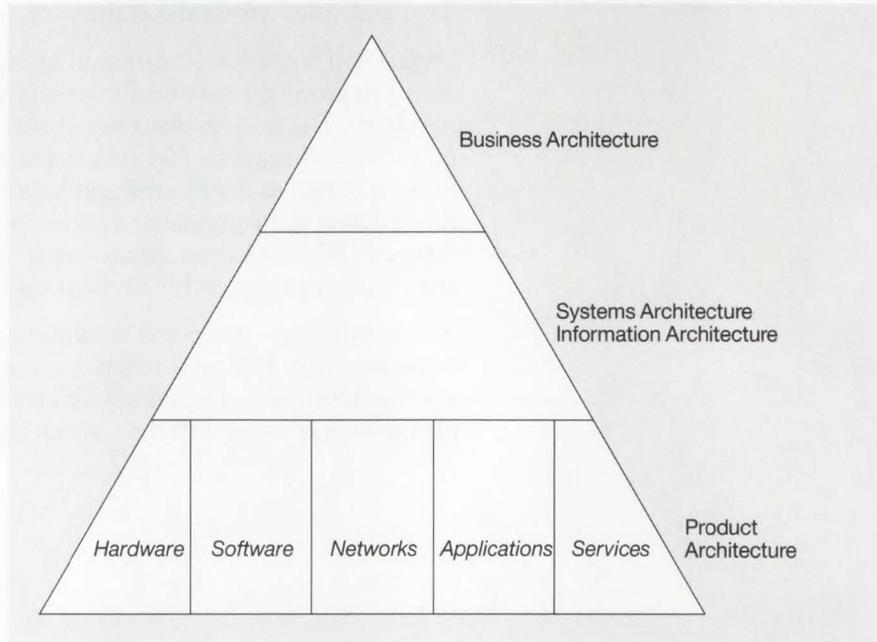
Digital will strive for unrestricted interoperability with multivendor computing devices and networks by continuing its commitment to integrate OSI standards. Digital also plans to enhance functional gateways to non-OSI networks and vendors. Network users will have consistent user interfaces for easy access to distributed applications such as DECnet System Services. And Digital will continue to provide comprehensive network management through OSI-based open management interfaces for multivendor support and through enhanced life-cycle network-management services.

An organization's success in networking directly affects its ability to respond to new business, redeploy resources, and aggressively seize competitive advantages. Digital has defined its vision today to help customers plan networks that fulfill their vision tomorrow.

### Analyzing an Enterprise's Needs

A network is the outgrowth of the way an enterprise conducts business, and is implemented to facilitate the productivity of the organization, the department, and the individual. To succeed, an enterprise must examine its business, information, and systems architectures; its product architecture must support successful information flow.

#### *Business Architecture*



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Within the product architecture are segments—hardware, software, networks, applications, and services—that support the information architecture. The network is part of the total solution. To get the most from any network implementation, you must satisfy current and future requirements at every level of the organization.

For instance, you must examine how and where information moves through an enterprise, and consider the present and future requirements of the people who communicate and share information, as well as those who access common resources that support the information architecture.

To plan and design a new network, or to integrate an existing network, you should examine

- The way you do business.
- Your future requirements.
- The way a data communications network can foster intra-organizational cooperation.

You must weigh the productivity of any networking solution against the cost of that solution, and you must consider the performance and reliability of alternatives. You should know the impact of each technology, now and in the future, and couple the decision to support a technology with a sensitivity for business and organizational issues. ▲ Refer to “Services for the Planning and Design Phase,” Section 6.

Because the network architecture supports the information architecture—which in turn supports the enterprise business architecture—you must select the technology that will succeed.

- What networking or communications standards fit your needs
- How fast each department requires data
- Which communications wiring scheme provides functional growth, flexibility, and cost efficiency

### Digital's Networking Products

Digital examines each business situation from the customer's point of view and provides a comprehensive solution—whether it's a specific product, a wiring scheme, connections to Digital and non-Digital hosts, or local or geographically dispersed networks.

Digital has the hardware, software, and service products to cover many environments (depicted in the topology at the end of this section). Digital ensures that our products are compatible—designed and tested to run together, applied in a consistent manner, managed with a consistent interface, and supported by consistent service and support. Because of this approach, the whole is greater than the sum of the parts.

The networking products described in this Buyer's Guide are compatible, have consistent interfaces, are well tested, readily adjust as the network grows, and provide one of the most flexible solutions in the industry.

#### **Product Testing**

Invisible to the user are Digital's very strict testing standards consisting of a multimonth—sometimes multiquarter—test sequence that places a product in many types of networks—starting on a small level, then growing in size, distance, and complexity.

For example, a terminal server is tested with all of Digital's products, in all sizes of networks, and with varied data loads, thus assuring customers that it meets their needs today and in the future. This is a key reason Digital's networking products meet the customers' long-term management and reliability goals.

#### **Product Solutions That Adjust to the Scale of the Network**

Because Digital's networking products perform within a consistent architecture, they scale well, that is, they adjust to communications requirements as the network grows and changes. This feature allows you to implement a network as little or large as your enterprise requires—even starting with a one- or two-computer terminal-server network. You can scale up, adding the incremental cost of just one piece of equipment and be assured that everything works properly. You don't have to add a half-million-dollar front-end processor to acquire the next terminal.

Matching your organization's growth with networking capabilities is a result of the product design and testing, and products that scale well. You can systematically add incremental equipment and implement a long-term strategy to build and expand your network, comfortable that all components will continue to work together.

Products that adapt well provide users with the flexibility to react quickly and easily to changes in an organization. If there's a sudden change in your strategic plan—your enterprise adds a department or division, or adds an entire building—the network adjusts to that change immediately.

## Building the Network

### An Example of a Network Solution Using Open Systems Interconnect

Digital's commitment to integrate Open Systems Interconnect (OSI) standards into the DECnet architecture provides a truly open architecture—another key benefit that protects an enterprise's investment and helps long-term planning. Digital's customers can build an enterprise-wide network that easily accommodates all OSI-compliant equipment—including equipment from other vendors.

As an example of Digital's enterprise network capabilities—which include OSI-based solutions—consider the hypothetical Baker Company, which uses the networking products depicted in the topology at the end of this section.

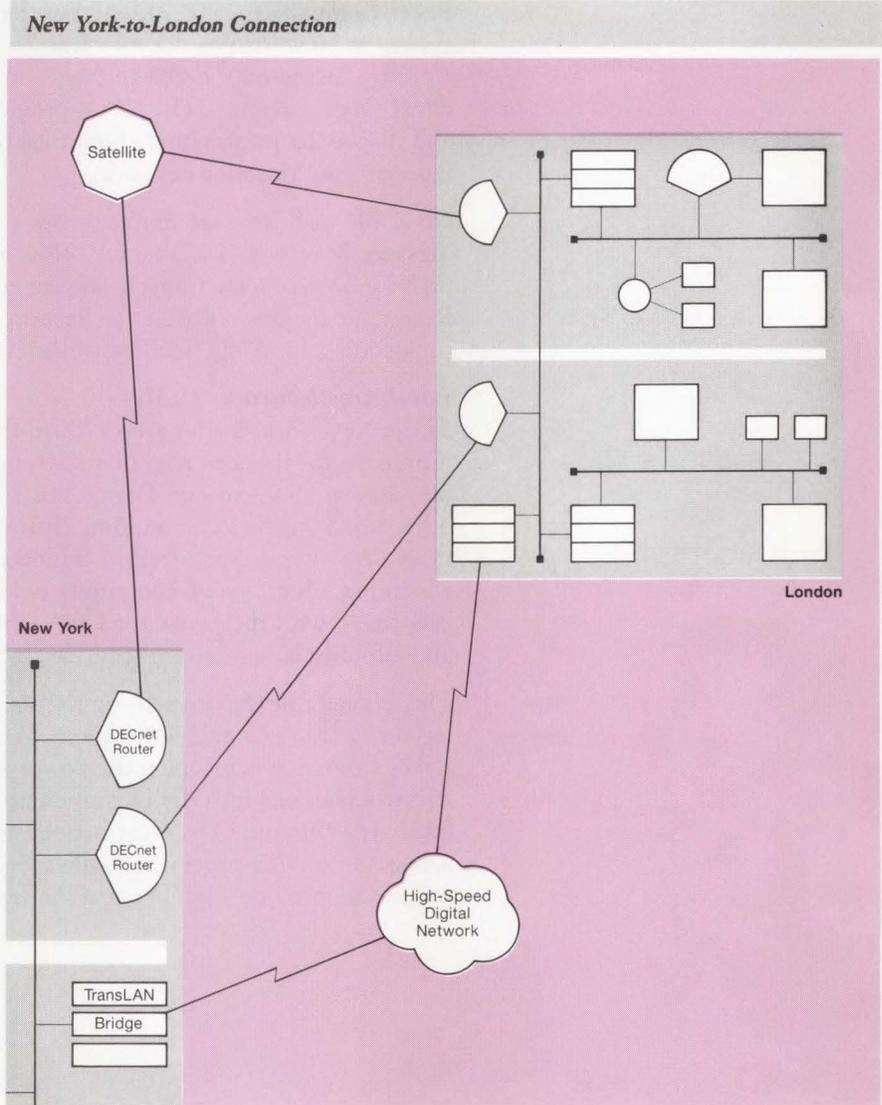
Baker Company operations have

- Centrally located headquarters in New York with another building located across the river in New Jersey.
- Many remote sales and distribution sites across the United States.
- A European headquarters in London.
- A Pacific Basin headquarters in Sydney, Australia.

A critical factor for Baker Company's success is to share data files and electronic mail among all sites.

Baker Company's London office has two non-Digital, OSI-based mainframes that communicate with departments in the New York headquarters to exchange files and mail.

## Building the Network



The data can be communicated through

- The DECnet routers using leased lines.
- Another pair of DECnet routers using an X.25 link.
- The TransLAN bridge involving a high-speed Digital network.

With this redundancy, Baker Company can choose the technology to best handle the required data volume or speed.

Because 802.3/Ethernet is part of the OSI network, the communications logical link can connect with any OSI device on the 802.3/Ethernet local area network (LAN). Baker Company knows that any two pieces of OSI-based equipment can interoperate because they are based on the same international standards, and they can readily communicate across the 802.3/Ethernet LAN.

## Building the Network

Baker Company transfers files from the London OSI mainframe to the VAX system in New York using File Transfer, Access, and Management (FTAM) software, based on the OSI reference model from the International Standards Organization (ISO). FTAM provides for copying and deleting files, and displaying information about files between ISO FTAM-compliant systems in a multivendor network.

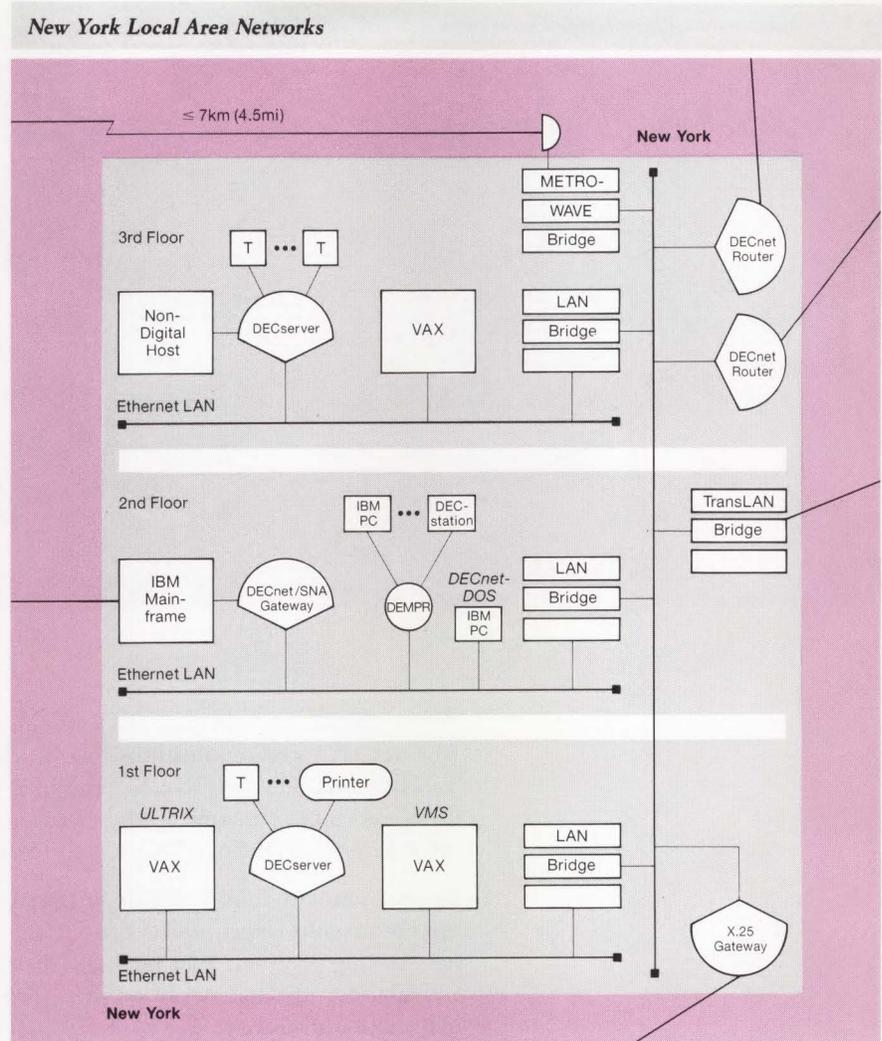
An X.400 mail message moves across a similar path utilizing the VAX Message Router X.400 Gateway MRX, a layered application that provides a path for any message transfer service conforming to the CCITT X.400 Recommendations. ▲ Refer to Section 4 for OSI and FTAM products, and to Section 5 for X.400 mail capabilities.

### ***Local Area Networks (LAN)***

In the New York headquarters (third floor), Baker Company has many terminals, for its sales administration department, that are used to share files among VAX and non-Digital hosts located on the same LAN, and with other LANs in the same building. Information is processed on the third-floor LAN, then transferred to engineering operations on the second floor, which has a high-speed computing environment. The data files are also exchanged with the first-floor LAN, which houses Baker Company's finance and administration department.

The engineering department on the second floor of the New York building has many IBM PCs and VAXstations. A tremendously important function for Baker Company is bringing the power and convenience of multivendor PCs and workstations into the Digital environment to share the benefits of the local area network. The clear benefit to the engineering department is the access to the VAX processors—file services and other applications the VAX processors provide—while using the installed PCs and workstations.

## Building the Network



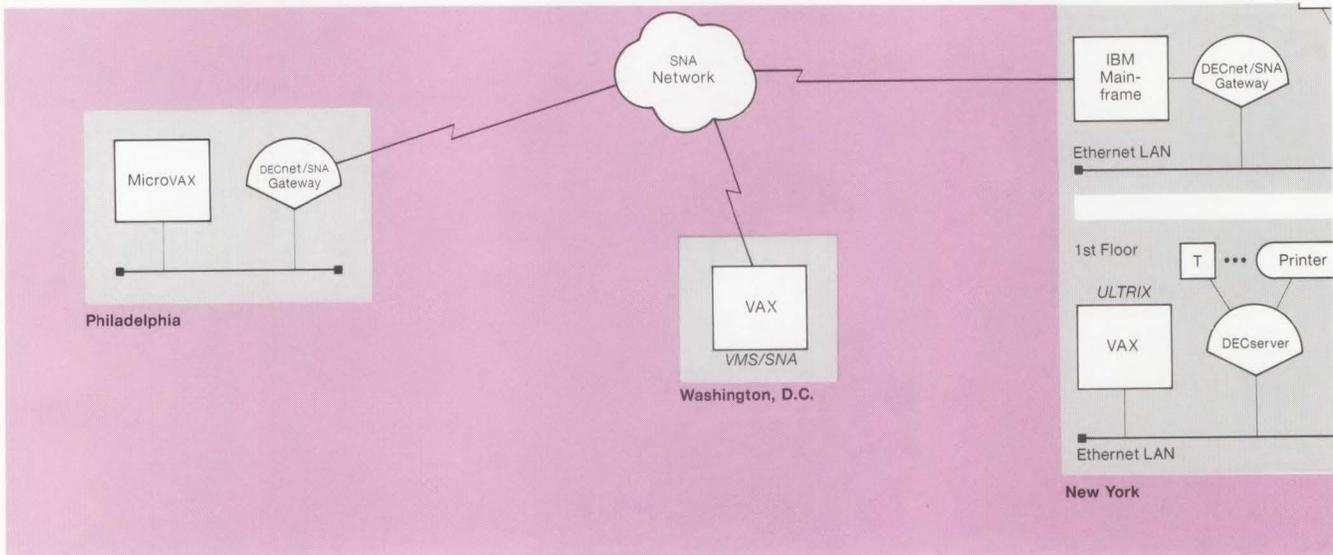
Baker Company has optimized its IBM/Digital connection by using its Digital desktop workstations to run application programs that reside on the IBM host, and by taking advantage of DECnet/SNA transport services.

For instance, VMS/SNA software allows the remote engineering site in Washington, D.C., which computes engineering data on a VAX, to communicate directly with the IBM mainframe on the second floor of the New York building.

Baker Company also found it could have a network-to-network connection (Digital's DECnet software to IBM's SNA environment) with high-volume output on existing equipment from the Philadelphia site using a DECnet/SNA Gateway (DECnet/SNA Gateway-ST).

## Building the Network

### New York–Washington–Philadelphia Connection



When volume and throughput warrants, Baker Company can upgrade the DECnet/SNA communications link on the second floor of the New York building to a DECnet/SNA Gateway for Channel Transport to handle more users and more sessions at higher throughput. ▲ Refer to Section 4 for information on DECnet/SNA capabilities.

Baker Company found that departments such as engineering enhanced its operations and improved its productivity by using DECnet System Services, networking products that facilitate distributed processing with consistent, transparent, network-wide services. From anywhere in the network users can share and manage network resources as if these resources were directly attached to the local system.

All the engineering department sites, for example, use engineering specifications updated nightly in a master file. Using DECnet System Services, once the master file is updated, the local engineering sites have access to current engineering specifications. DECnet System Services provides a seamless, transparent means of accessing printing, file-access, and software-management services for centralized or decentralized systems. ▲ Refer to Section 5 for information on DECnet System Services.

In the management of the multivendor networks, ETHERnim and LAN Traffic Monitor provide up-to-the-minute configuration, fault, and performance information in clear graphic formats.

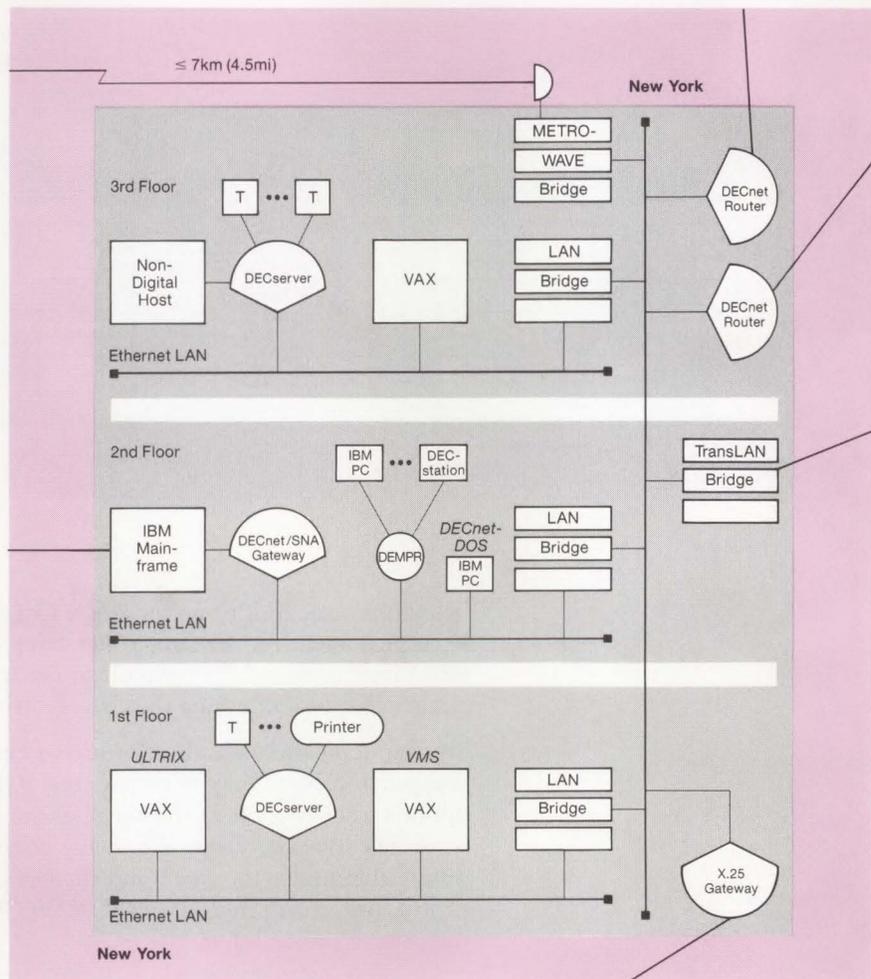
## Building the Network

### Extended LANs

Each floor of the New York building has its own LAN—a LAN Bridge connects each LAN segment to the vertical backbone. These departmental LANs connected by LAN Bridges, called Extended LANs, provide the same data-throughput benefits as a LAN, extend the geographic reach of the network, and provide performance benefits.

By connecting the departmental LANs in the New York building to the vertical backbone, Baker Company can direct its business and topological requirements throughout the network. The engineers on the second floor have high data flow within their departmental LAN, as well as to other LANs. The intelligence of the LAN Bridge allows it to act as a filter. Information destined for the same department stays within that LAN, while information destined for other departments is transmitted (forwarded) across the Extended LAN.

**New York Departmental Networks**

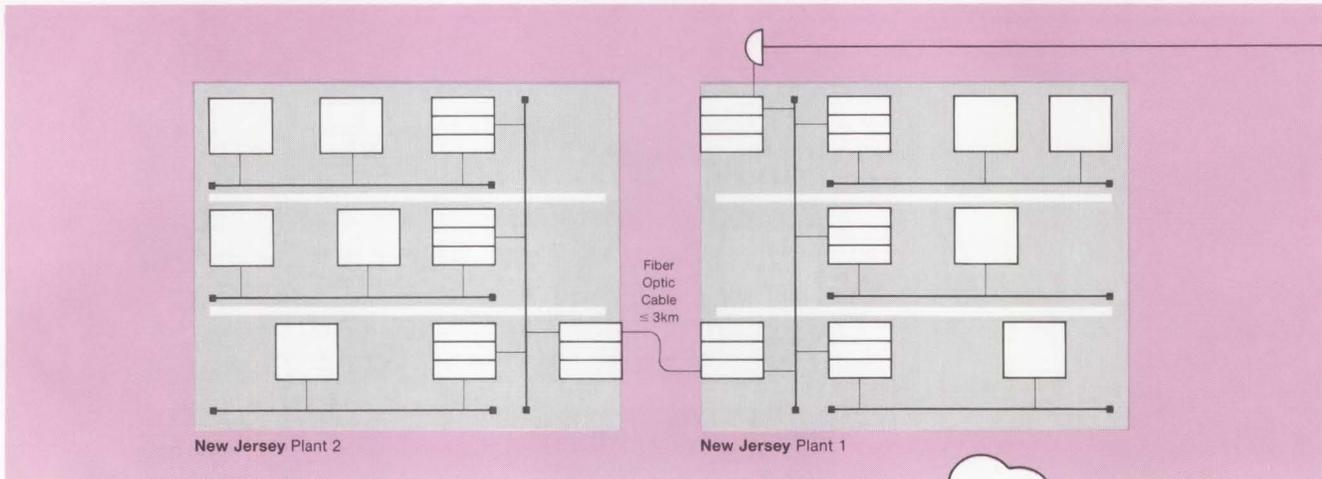


## Building the Network

The filtering of data traffic allows Baker Company to have very high network performance on each floor and within each departmental LAN. The company retains the high performance of a single LAN without impacting the other LANs on the backbone. Remote Bridge Management Software (RBMS) simplifies the configuration and fault management of this extended LAN.

Baker Company also has a research campus in New Jersey. Two of the campus buildings need to communicate with the same functionality and benefits as a single LAN within a single-management entity. These buildings are connected with fiber optic cable attached to LAN Bridges on either end. This allows Baker Company to connect two buildings up to 3,000 meters apart with the same high performance as any Ethernet LAN. The LAN Bridge provides traffic isolation between the buildings and Baker Company benefits from fully functional 802.3/Ethernet networking.

*New Jersey Buildings Connected via Fiber Optic LAN Bridges*

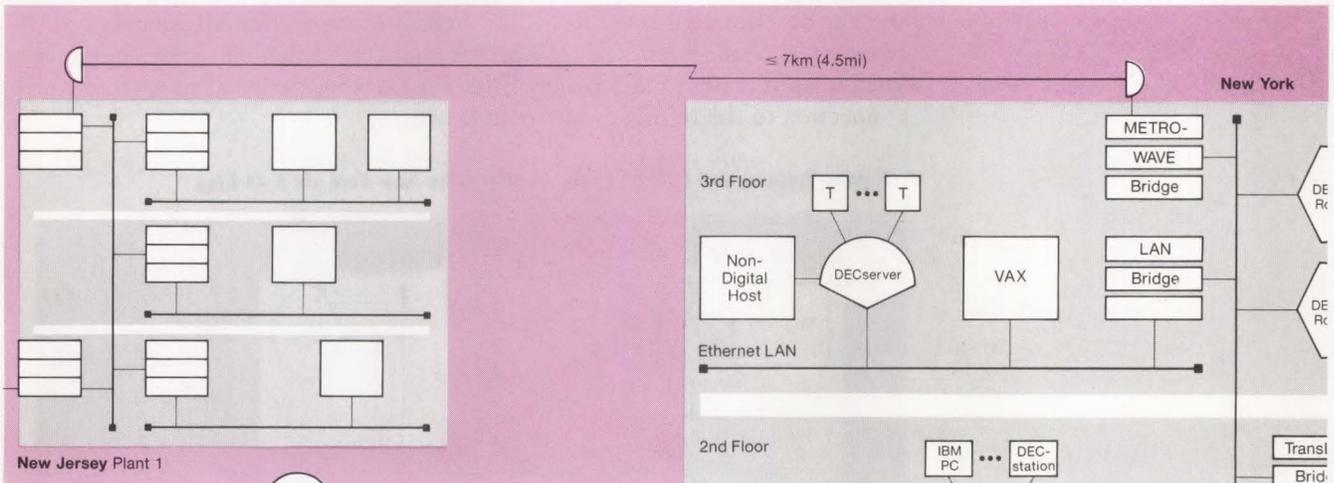


The fiber optic link provides Baker Company's research department with an environment impervious to lightning and electrical interference. Also, fiber optic cable is very difficult to tap into, it provides a secure environment—something that is very critical to the research department.

To communicate research information between its New Jersey research campus and New York headquarters, Baker Company had communications options to connect the building sites via leased lines, fiber optics, or microwave link. Because Baker Company could not obtain the rights to lay fiber optic cable under the river, and the use of leased lines might be cost-prohibitive, it selected a METROWAVE Bridge, that uses line-of-sight microwave transmission.

## Building the Network

### New York-to-New Jersey Connection



The METROWAVE Bridge provides a microwave connection in an Extended LAN environment, using the LAN Bridge 100 to deliver the same high performance, filtering capability, and reliability as other LAN Bridge products. ▲ Refer to "METROWAVE Bridge," Section 2.

#### **Wide Area Networks (WAN)**

Baker Company found, as many businesses have, that long-term success depends on wide area networking using a combination of data, voice, graphics, and image technology.

Digital provides an integrated set of Wide Area Network (WAN) products, several of which are depicted in the topology. One of the most frequently used connections is via a public PSDN (Packet Switched Data Network), which sends packets of information over leased telephone lines.

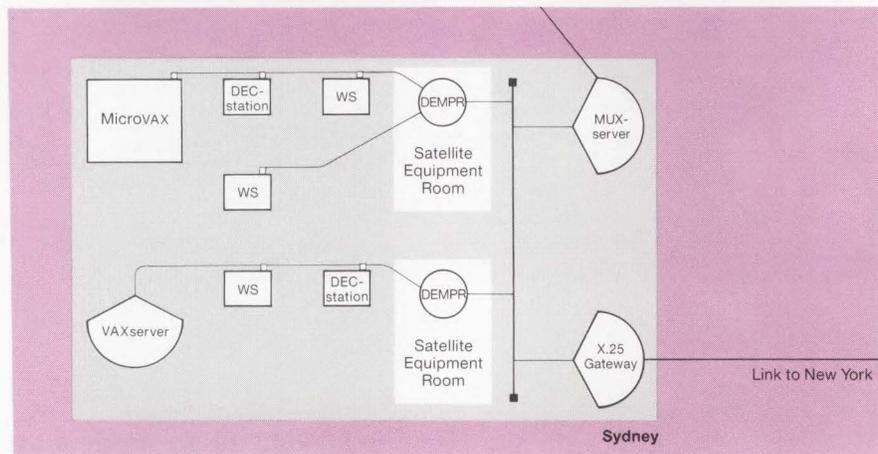
For example, when moving information from London to New York with OSI-based equipment, VAX P.S.I. (Packetnet System Interface) provides a means of returning packets to London across leased lines. The DECnet Router (DECrouter 2000)-to-satellite (or leased-line) connections, or TransLAN-Bridge-to-leased-line connection involves DECnet software and provides different value in flexibility, technology, and cost. ▲ Refer to Section 4 for information on Packetnet Communications.

When Baker Company expanded its business to the Far East, it established the Sydney headquarters for sales administration, promotions, and distribution administration. Baker essentially decentralized a heavy desktop/office automation environment to Sydney, and extended the use of computers to the Sydney workforce.

## Building the Network

Within the Sydney building, Baker Company installed the networking computers using satellite equipment rooms (SERs) that adhere to the DECconnect radial-wiring strategy. Baker Company's remote sales offices in the Far East are connected to Sydney headquarters via the MUXserver remote terminal server. The MUXserver connects to modems over leased lines, then directly to the Sydney Ethernet LAN for the most cost-effective connection to the terminal-only remote offices.

**Sydney Building and Remote Office Connected to New York via X.25 Link**



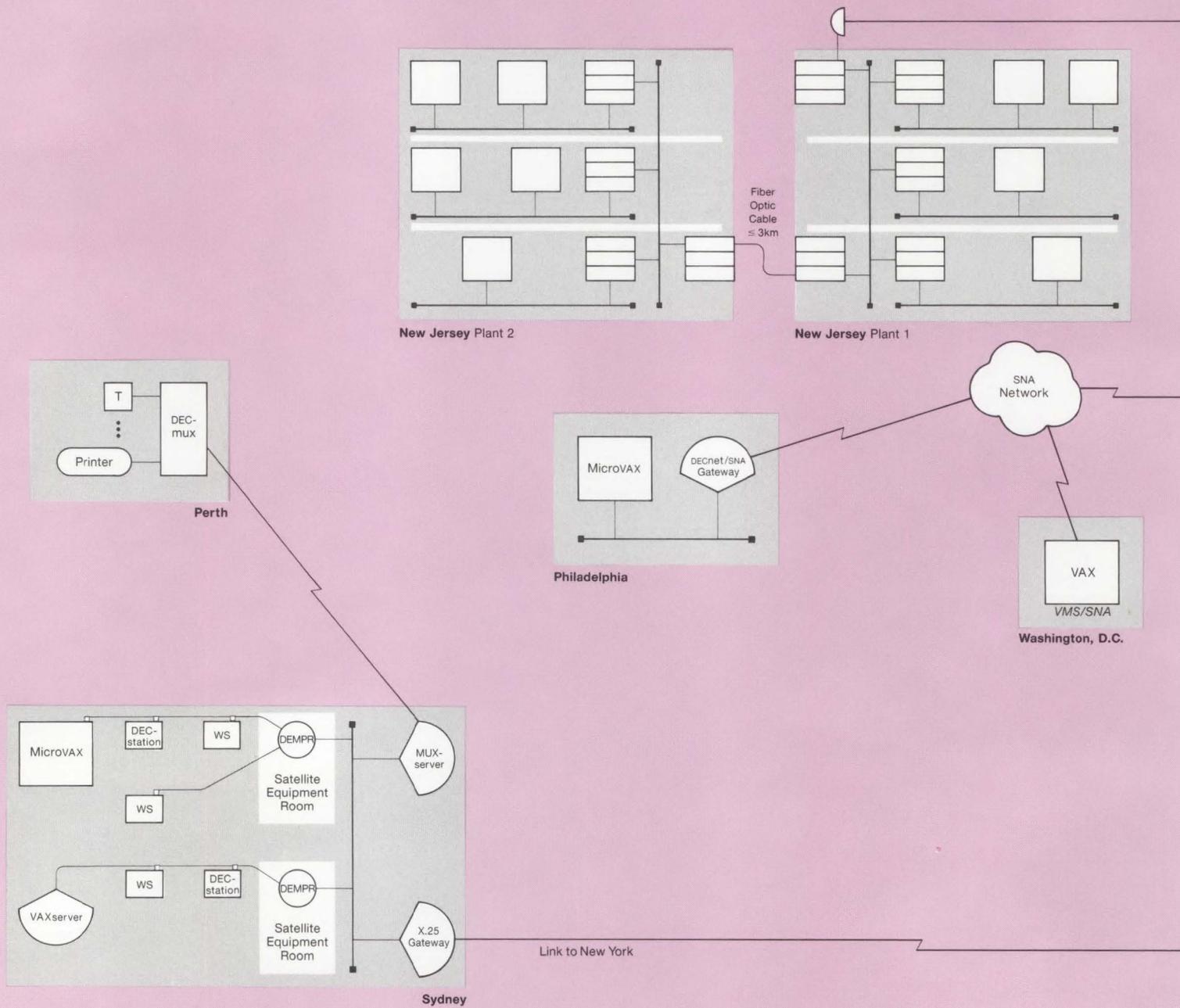
The Ethernet LAN in the Sydney building communicates with New York headquarters via an X.25 Gateway (X25router 2000) connected through the Packet Switched Data Network (PSDN). The X25router 2000 provides the optimum bandwidth-efficient solution with high-speed data communications based on the required data flow and volume.

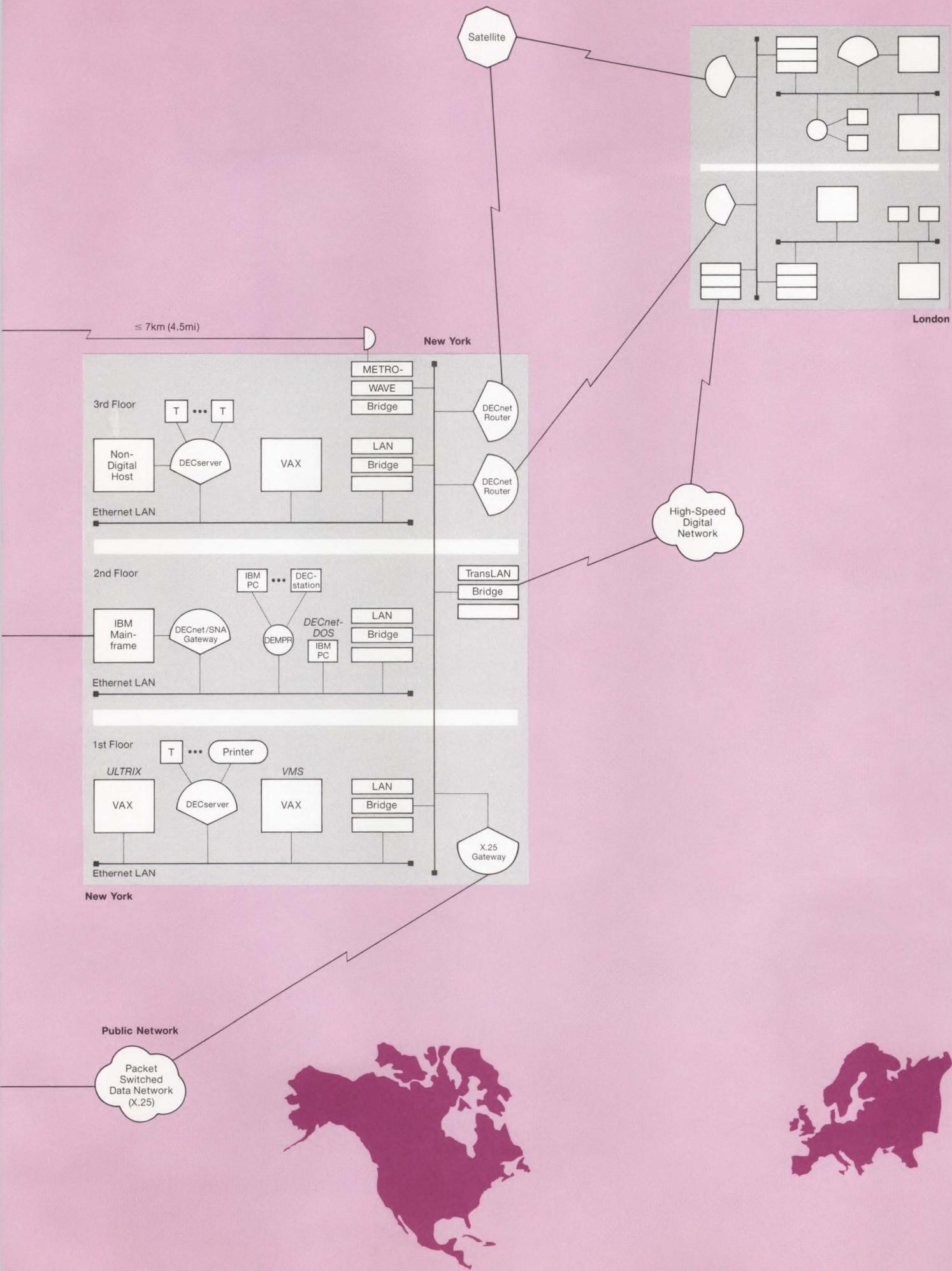
Digital provides a comprehensive product set that meets the needs of any enterprise, in any environment, using compatible hardware, software, and service products that have been tested to perform together within a consistent architecture, a consistent service strategy, and a consistent management interface.

## Building the Network

### Network Management

Digital provides DECnet software with network self-management capabilities, as well as network management tools, such as NMCC/DECnet Monitor, that perform network monitoring and complex management tasks. The combination of the inherent capabilities of DECnet software and the network management applications provide a very high level of up-time and network availability. ▲ Refer to Section 6 for information on Network Management Products and Services.





## Product Information

2 Connectivity: 802.3/Ethernet Local Area Networks

3 Connectivity: Communications Hardware

4 Interoperability: Communications Software

5 Distributed Applications

6 Manageability

## Section 2

### Connectivity: 802.3/ Ethernet Local Area Networks

This section contains the  
following topics...

802.3/Ethernet Overview

DECconnect Overview

Typical Baseband 802.3/Ethernet Applications

802.3/Ethernet Products

ThinWire 802.3/Ethernet Products

Unshielded Twisted-pair 802.3/Ethernet Products

DECconnect Products

Broadband 802.3/Ethernet Products

802.3/Ethernet Communication Controllers

Extended 802.3/Ethernet Local Area Network Products

802.3/Ethernet Communications Servers

## Connectivity: 802.3/ Ethernet Local Area Networks

A Local Area Network (LAN) is a privately owned data communications system that offers high-speed communications channels optimized for connecting information-processing equipment. A LAN usually serves a section of a building, an entire building, or a cluster of buildings.

Local area networks provide a fast, efficient means of exchanging information. They allow many varieties of information processing equipment to be easily connected and they provide resource sharing, which allows users to share expensive peripheral devices and databases. 802.3/Ethernet local area networks expand the possibilities for global resource sharing by offering standards for communication between equipment of different vendors and between local and remote networks.

Digital uses the IEEE 802.3/Ethernet standard for its local area network. 802.3/Ethernet networks provide full 10 Mb/s access to data with a high data-transfer rate that makes information and resource sharing practical.

IEEE 802.3/Ethernet LANs can be implemented on several media, including Thinwire coaxial cable, standard baseband coaxial cable, twisted-pair and fiber optic cable. Also supported is broadband coaxial cable, which offers customers the ability to put 802.3/Ethernet on the same network wiring system with video, voice, and other data communications.

Baseband and broadband 802.3/Ethernet LANs provide long-term savings in lower wiring costs and reduction of system downtime when reconfiguring or replacing equipment. Corporations are able to optimize their networks easily because additional capability can be added without disturbing network operation. Also, they can use scarce computing resources.

### IEEE 802.3 Compliance

All Digital second-generation LAN products are designed to comply with the IEEE 802.3 specification. In addition, Digital LAN products are backward compatible with first-generation Ethernet Version 2.0 products. This ensures connectivity between products and a smooth transition to 802.3-based LANs. The IEEE 802.3 standard has been adopted by the International Standards Organization (ISO), defining layers one and the MAC layer portion of layer two. Digital is committed to international standards, allowing customers the benefit of multivendor networking and flexibility in choosing networking products. Connectivity is the ability to move any piece of information from one point to another, regardless of media or transmission technologies.

### 802.3/Ethernet Advantages

The 10 Mb/s performance of 802.3/Ethernet can support LANs with as few as three nodes or as many as 8,000 in a single extended LAN. When more demanding applications require higher performance, Digital provides 100 Mb/s FDDI (Fiber Distributed Data Interface). Digital's FDDI strategy includes compatibility with 802.3/Ethernet network.

## 802.3/Ethernet Overview

### 802.3/Ethernet Channel Access

The technique used to access the baseband or broadband 802.3/Ethernet channel is called Carrier Sense Multiple Access with Collision Detection (CSMA/CD). CSMA/CD can be defined as follows:

- Carrier Sense (CS)—A device listens for a clear channel before transmitting. If the channel is in use (carrier sensed), the device delays transmission.
- Multiple Access (MA)—Many devices can be connected to one common wire, and when the channel is clear, all devices have equal access to it.
- Collision Detection (CD)—Two or more devices may sense a clear channel and simultaneously try to transmit. This results in data collision. The channel senses the collision condition, stops the transmission, and automatically retransmits the data after waiting a randomly selected amount of time.

### Ethernet Media Options

Digital's 802.3/Ethernet LANs can run on a variety of wiring or cabling media. Both shielded (IBM) and unshielded twisted pair is supported. Digital also supports fiber optic cables for Ethernet LANs, providing fiber links between bridges and repeaters. Thus, Digital 802.3/Ethernet LANs are virtually media independent. Through Chipcom, Digital also supports 802.3/Ethernet backbones.

### Baseband 802.3/Ethernet Cabling

Digital supports 802.3/Ethernet transmissions over two types of baseband cables:

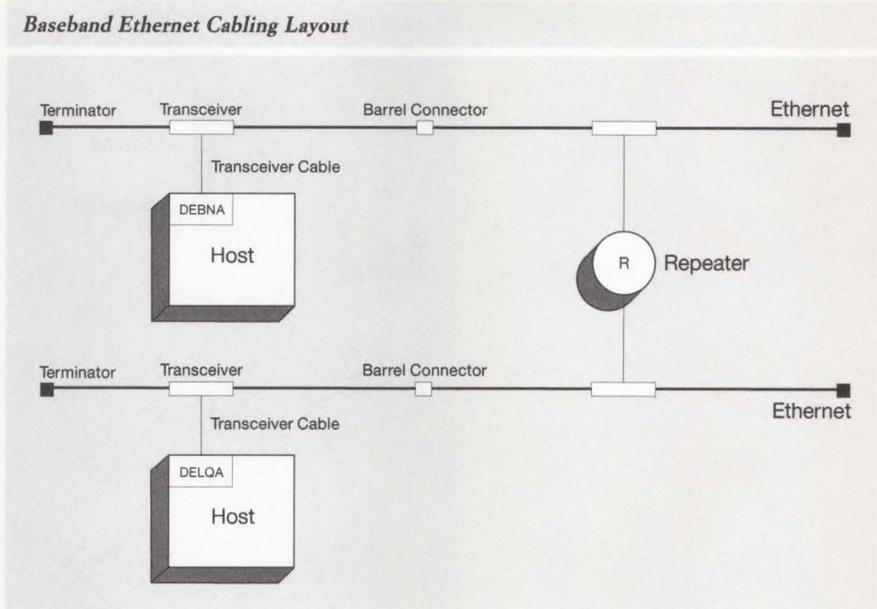
- Standard coaxial cable, recommended for communications between satellite equipment rooms and floors of a building. This cable is referred to as standard 802.3/Ethernet cable in this book, and is sometimes called the "backbone" cable.
- ThinWire, recommended for communications between workstations, personal computers, and low-end systems in local work areas on a floor.
- Alternatively, unshielded twisted-pair cable, recommended for those customers who have already installed telephone-type twisted-pair cabling, and who want to minimize the cost and network disruption of installing new network cable.

#### ***Standard Baseband 802.3/Ethernet Cabling***

Using standard baseband cabling, an 802.3/Ethernet communications controller in a network system connects to a transceiver using a specialized four-shielded, twisted-pair wire transceiver cable. The transceiver is clamped onto the standard baseband cable without cutting the cable or interrupting data transmissions.

A maximum of 100 transceivers can be used on a standard 802.3/Ethernet cable segment. A single cable segment can be up to 500 meters (1,640 feet) long. Multiple cable segments can be linked together with barrel connectors. Multiple segments of transceiver cable can be linked together by slide-latch connectors on the ends of standard transceiver cable.

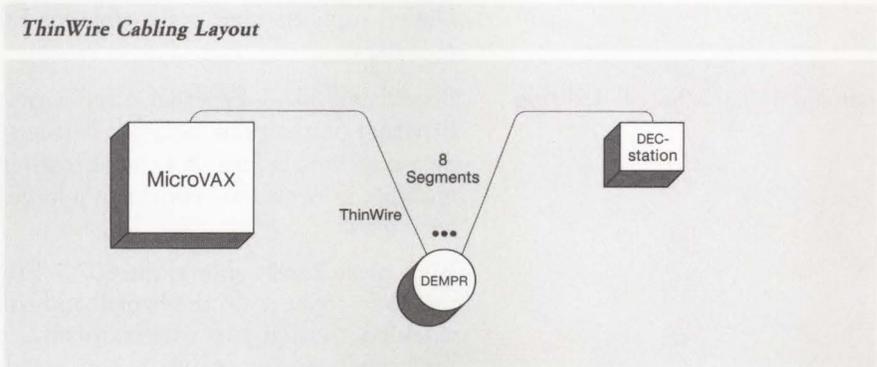
A repeater or bridge connects segments of standard baseband 802.3/Ethernet cable, creating a larger local area network.



NBG-120-00

**ThinWire 802.3/Ethernet Cabling**

ThinWire 802.3/Ethernet cabling, an inexpensive industry-standard coaxial cable with BNC connectors, enables the configuration of low-cost local area networks in the work area. ThinWire coaxial cable delivers 10-Mb/s 802.3/Ethernet performance, like standard baseband coaxial cable, and is specifically designed for horizontal wiring of a work area because of its ease of installation and lower cost. This provides full 10-Mb/s speed to the desktop for PCs and other intelligent workstations.

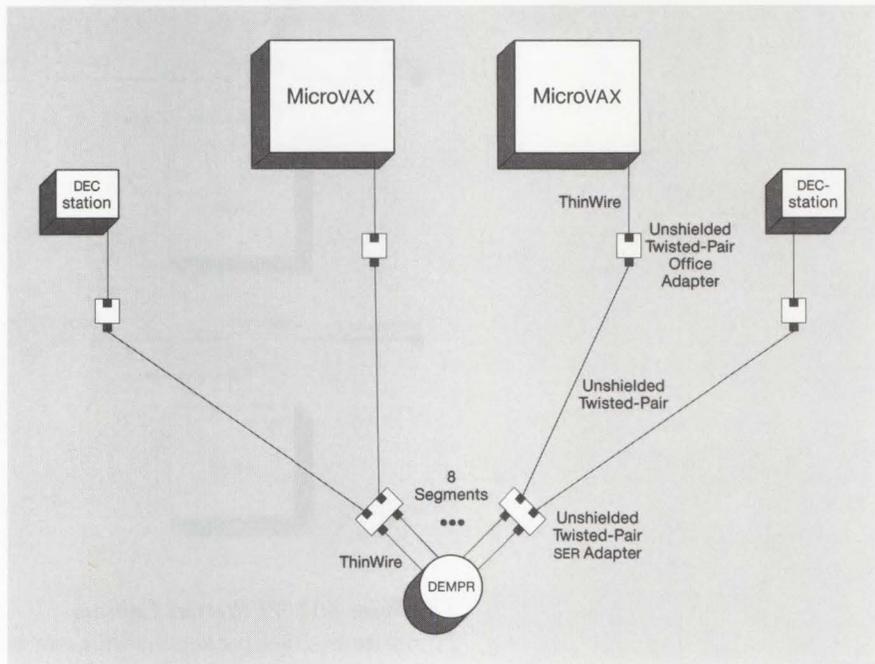


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**Unshielded Twisted-pair Cabling**

Unshielded twisted-pair cabling brings full 802.3/Ethernet capability to the desktop using unshielded twisted-pair adapters. These adapters, one located in the office and the other located in the Satellite Equipment Room (SER) (wiring closet), convert ThinWire communications to unshielded twisted-pair communications. The adapters supply all required electrical and physical translation from active ThinWire devices such as DEMPRs and VAXmates, providing a complete segment between the local area network and the office device via twisted-pair cabling. Unshielded twisted-pair 802.3/Ethernet adapters complement existing 802.3/Ethernet media options, and can be used with many leading structured cabling systems.

*Unshielded Twisted-pair Cabling Layout*



NBG-122-02

**Shielded Twisted-pair Cabling**

Both shielded twisted-pair (IBM) and unshielded twisted-pair are supported for Digital 802.3/Ethernet LANs, and standards are continually being developed.

**Fiber Optic Cable**

Digital supports fiber optic cable for Ethernet LANs between bridges and repeaters.

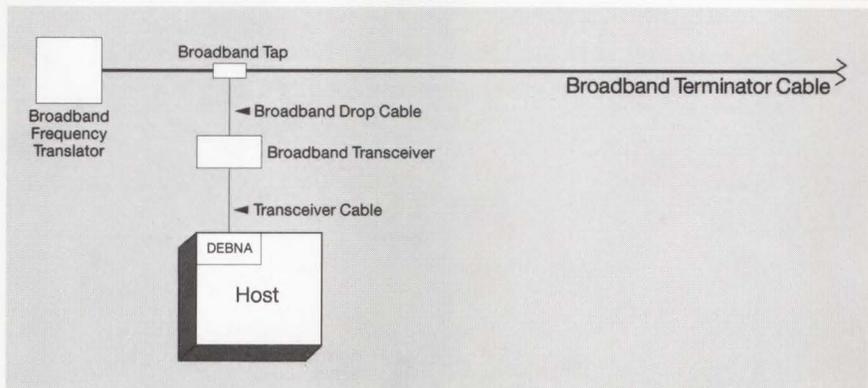
**Broadband 802.3/Ethernet Cabling**

Broadband 802.3/Ethernet offers customers the ability to put 802.3/Ethernet on the same network wiring system with video, voice, and other data communications. It is most feasible for customers who must distribute multiple information services to a large user population over an extensive local area.

With broadband cabling, the 802.3/Ethernet communications controller in the node connects to the broadband transceiver using the same four-shielded, twisted-pair wire transceiver cable as standard baseband. In turn, the broadband transceiver is connected to a tap in the broadband network cable via a broadband coaxial drop cable.

Design, installation, and maintenance of broadband cable networks are available as part of Digital Network Services. (For more information on broadband network services, refer to Section 6 or contact the local Digital sales or field service representative.)

**Broadband 802.3/Ethernet Cabling Layout**



NBG-123-00

**Standards and Distances**

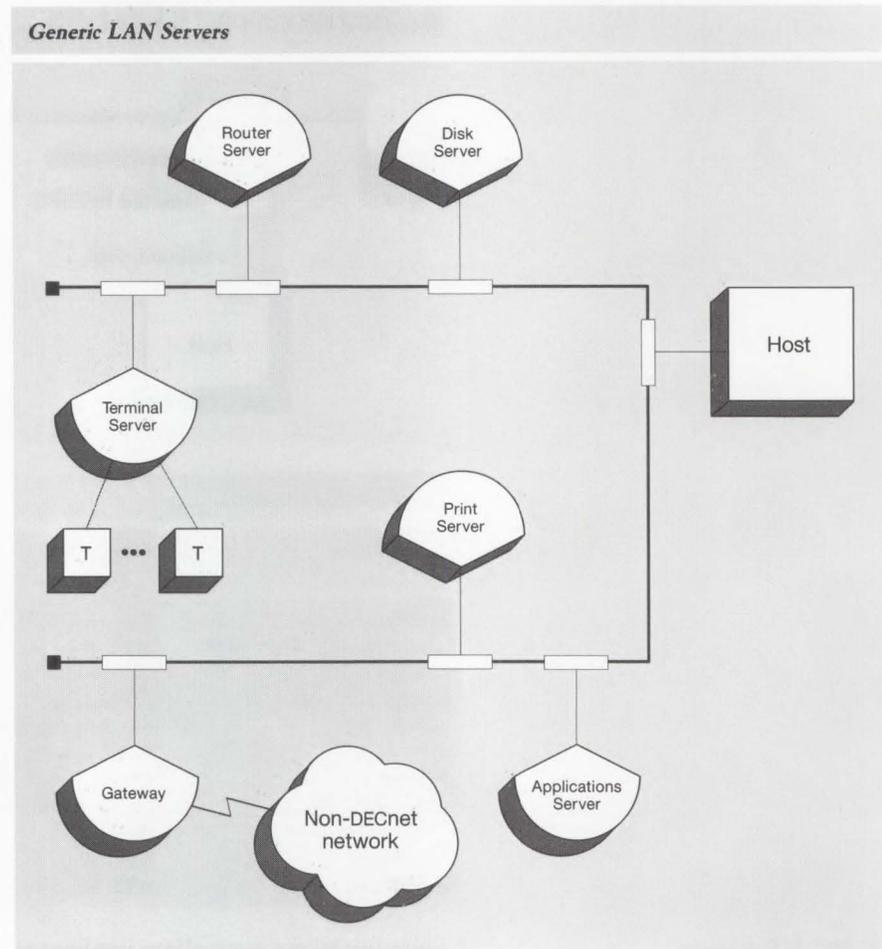
Media Name	Standard	Digital Distance/Segment Supported
Baseband coax	IEEE 802.3 10 Base 5	500 meters
Thin net coax (Thinwire)	IEEE 802.3 10 Base 2	185 meters
Unshielded Twisted-pair	IEEE 802.3 10 Base 1	70 meters
Shielded Twisted-pair (IBM)	No standard for IEEE 802.3 specified for IEEE 802.5	100 meters
Fiber optics	EIA (ANSI wiring standard) IEEE 802.3 fiber	3 km per link
Microwave	N/A	7.2 km per link
Broadband	IEEE 802.3 10 Base	3800 meters (1900 radius)

**IEEE 802.3/Ethernet Communications Controllers**

**Servers**

Communications controllers implement the Ethernet or IEEE 802.3 data link layer functions and CSMA/CD protocol to make electrical connections between 802.3/Ethernet systems. An 802.3/Ethernet communications controller must be installed in systems that connect to an 802.3/Ethernet local area network.

A server is any network node that provides a resource that can be shared by other nodes on the network. (A “node” is any intelligent device that can send and receive messages over the network.) Many different types of servers are available: terminal servers, compute servers, disk servers, application servers, router servers, gateway servers, and print servers. A computer in a LAN that offers these types of services, whether or not it is dedicated to that function, may be viewed as providing server functions. The following figure illustrates the various types of servers for baseband or broadband networks.



NBG-124-00

A node providing server functions can run other applications if its nonprocessing services do not justify total dedication. By adding servers to a network, other nodes on the network can be dedicated to applications processing.

Digital has a substantial amount of software available that can be used to provide server functions in the network. Print server, file server, terminal server, and database server capabilities are available by using existing Digital software on general purpose computers.

Users can build servers by providing their own application software. For example, a computer node providing typesetting services might be viewed as an application server. A VAX 8700 that is connected to a local area network and is running the VMS operating system might be viewed as a computer server, while a VAX 8250 with a laser printer might be viewed as a print server. The following table illustrates server software alternatives.

## 802.3/Ethernet Overview

### *Server Software Alternatives*

#### **General Purpose Servers**

Print Server/File Server (for example, VMS Host)

Database Access (for example, DATATRIEVE Host)

#### **Packaged/Special Purpose Servers**

Terminal Server

Router

Gateway

#### **Application Server**

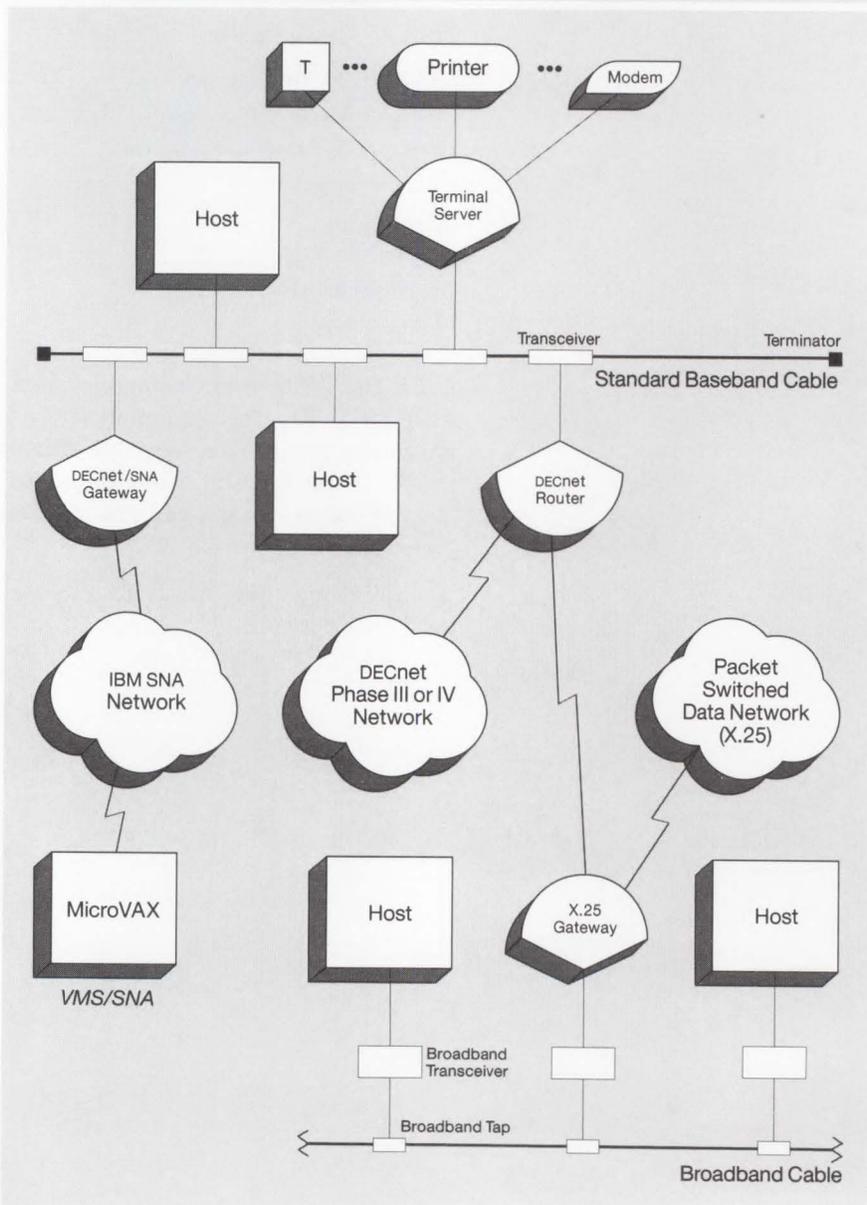
User developed

### ***IEEE 802.3/Ethernet Communications Servers***

IEEE 802.3/Ethernet communications servers are dedicated, special purpose units that provide resource sharing within a local area network (LAN). Three types of communications servers are available for use on an 802.3/Ethernet local area network: Terminal Servers, Router Servers, and Gateways.

The following figure illustrates the use of communications servers on a local area network.

*Baseband/Broadband 802.3/Ethernet LAN Configuration with Communications Servers*



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### Extended Local Area Networks

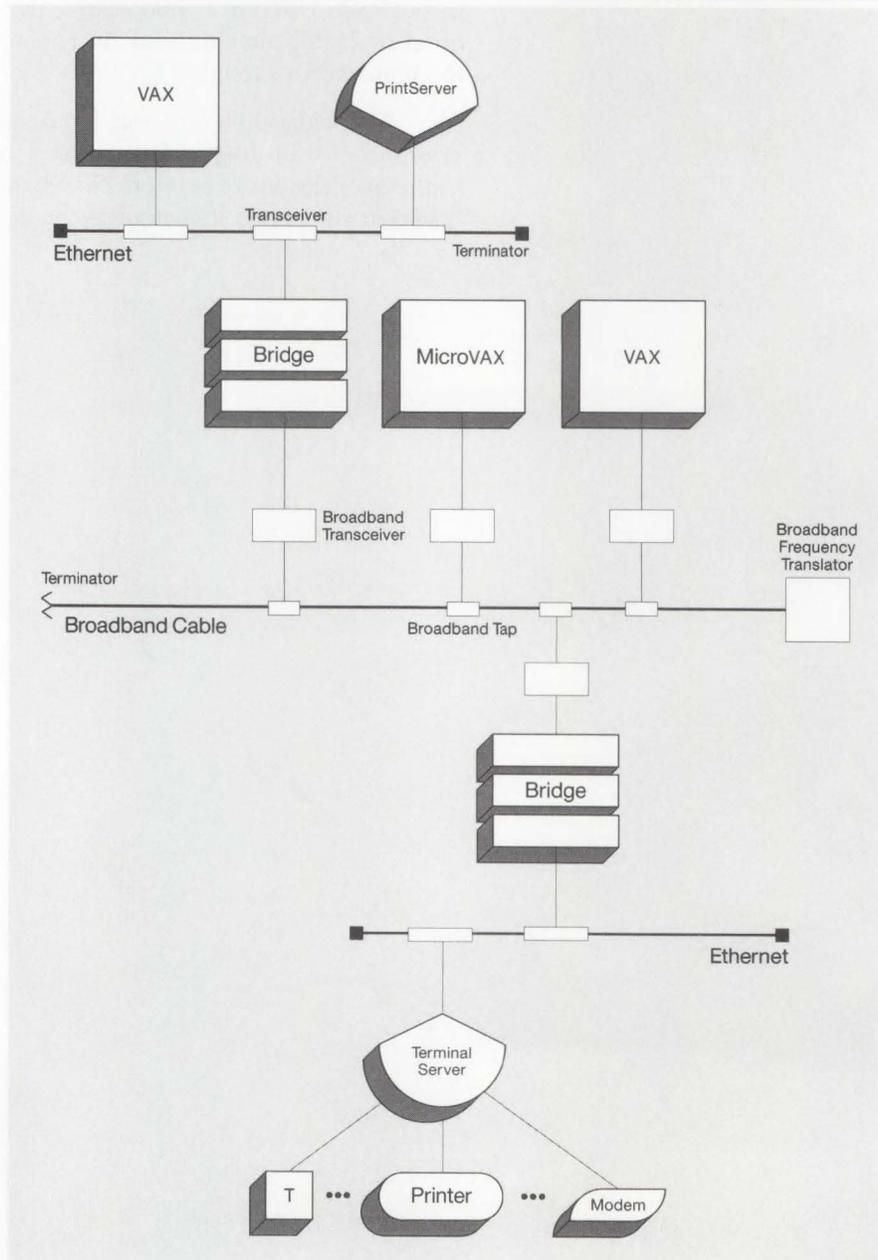
The LAN Bridge 100 connects IEEE 802.3/Ethernet networks using a variety of media to create an extended LAN. The maximum 802.3/Ethernet distance limit is 2,800 meters between any two nodes: An extended LAN lengthens this distance without degrading the 802.3/Ethernet 10-Mb/s throughput. Using fiber optic cable, the extended LAN can span distances of up to 23,000 meters; using microwave bridges, it can span distances up to 20 miles. An extended LAN may consist of up to 8,000 nodes.

The LAN Bridge 100 dynamically manages data traffic flow between LANs, selectively forwarding packets to keep local traffic local and to reduce traffic over the entire network. Baseband, broadband, and fiber nets can be linked in any network configurations possible using the bridge as a link.

### 802.3/Ethernet Overview

The following figure illustrates an extended LAN configuration using the LAN Bridge 100.

*Baseband/Broadband 802.3/Ethernet LAN Configuration with LAN Bridge*



NBG-126-02

### Network Security

Designed to protect network security, the Ethernet Enhanced Security System comprises two products integrated into standard 802.3/Ethernet environments:

- Digital's Ethernet Secure Network Controller (DESNK)
- VAX Key Distribution Center (KDC), a layered product

This security system selectively encrypts information across a network, without affecting other network nodes not requiring encryption.

▲ For more information, refer to "Network Security" in Section 6.

### 802.3/Ethernet Advantages

Digital's range of 802.3/Ethernet products has been developed to solve a number of problems typically encountered in business and industry.

- Simplified network design—802.3/Ethernet architecture and design rules are streamlined and uncomplicated because the cable, transceivers, and controllers meet the IEEE 802.3 and/or Ethernet specifications. (For specific design rules, refer to "802.3/Ethernet Configuration Guidelines" in Appendix A.)
- Simplified installation—802.3/Ethernet can be brought up one node at a time. A newly installed node can communicate immediately with all other active nodes on the network, without disrupting other nodes or networks.
- Simplified cabling—replaces multiple host to station cables.
- Flexibility for future growth—Additional devices and cable segments can be connected without shutting down the network.
- Reliability:
  - The absence of master/slave node relationships and the need for routing nodes eliminates most single points of failure.
  - Extensive diagnostics minimize the time needed to locate and to repair a failure.
  - The 802.3/Ethernet transceiver is designed with triple redundant circuitry to prevent a single failure from disabling the network.
  - 802.3/Ethernet is very reliable because of adherence to rigid standards on concentricity and passive nature.
- High-speed communications—802.3/Ethernet provides high-speed (10-Mb/s) links between all network nodes.
- Shared databases—The 802.3/Ethernet network coupled with DECnet software provides rapid access to large amounts of data in remote locations. Files and databases can be shared.
- Shared resources—802.3/Ethernet allows special purpose peripherals such as high-speed printers, very large disks, and high-resolution graphics packages to be shared by multiple users.
- Connection of diverse equipment—Digital Network Architecture (DNA) allows the exchange of data, files, commands, and diagnostic information among a large variety and range of Digital products. In addition, it is possible to connect to other vendor's equipment at the 802.3/Ethernet data link level or through X.25 and SNA Gateways.

The DECconnect communications system encompasses the full family of Digital connectivity products from 802.3/Ethernet-based active electronics to cabling and connectors. DECconnect provides access to corporate computer networks, telephone communications, and a video network. The modular nature of DECconnect allows mixing and matching components to meet user requirements.

DECconnect structured cabling offers a simple, cost-effective cabling system that brings both high-performance 802.3/Ethernet and enhanced EIA-423-A terminal connection (compatible with EIA-232) to offices and work areas. Through separate, industry-standard cabling runs that radiate from a centralized equipment/wiring area to an integrated faceplate in the work area, DECconnect cabling allows a customer to connect terminals, PCs, and workstations to an 802.3/Ethernet network as easily as plugging in a telephone or a lamp.

DECconnect combines separate communications technologies into one cohesive networking solution:

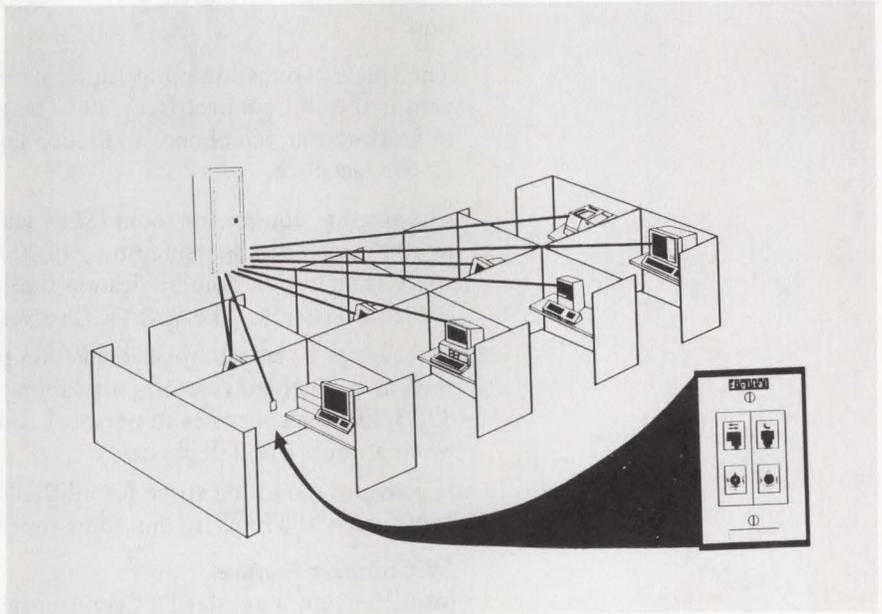
- ThinWire cable for 10-Mb/s 802.3/Ethernet communications to PCs, workstations, and departmental systems.
- Unshielded twisted-pair cable for terminal communications up to 19.2 Kb/s or for 10-Mb/s 802.3/Ethernet communications.
- Unshielded twisted-pair cable for telephone connections.
- Standard broadband cable for video connections.

Separate cables are used for low-speed data, high-speed data, telephone and, if desired, video communications, allowing implementation and configuration flexibility. These cables follow standard-industry wiring patterns and, typically, use radial topology from a central wiring closet to a faceplate in the local work area. (The voice communications feature of the DECconnect communications system does not apply in all European countries.)

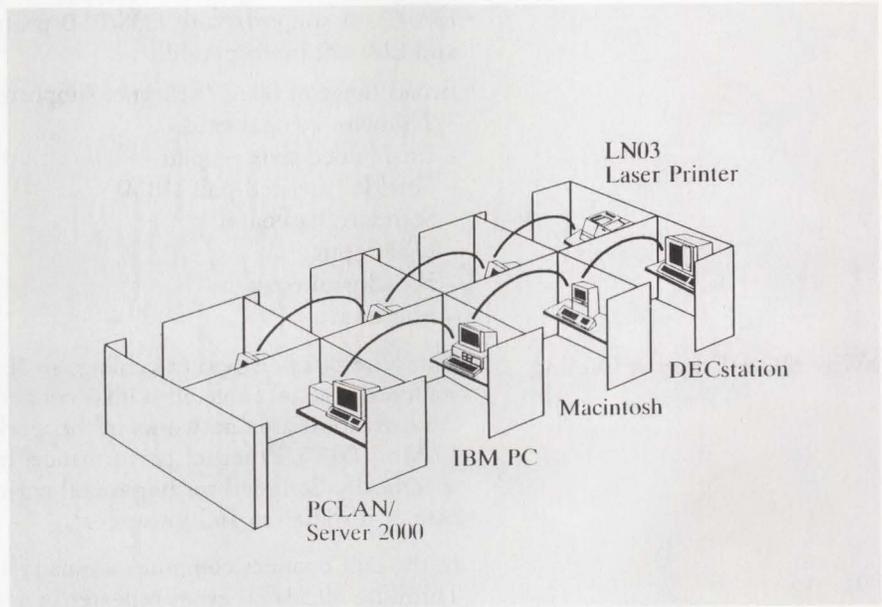
Cables are pulled in a radial topology between two easily accessible points: the faceplate is located in the work area/office and the wiring closet, also called the satellite equipment room (SER). A radial topology combines maximum office space coverage with ease of network management and maintenance. Maintenance performed at the central location can significantly reduce the cost of moves, adds and changes. The following figure illustrates the DECconnect radial topology.

# DECconnect Overview

*DECconnect Radial (Star) Topology*



*Workgroup PC LAN Daisy-Chain Configuration*



## DECconnect Overview

### DECconnect Daisy Chain Configurations

Alternatively, DECconnect structured cabling can be configured in a daisy chain. Initially, this alternative is less expensive but more difficult to maintain.

The single connection point for all network services in the office or work area is the DECconnect faceplate. The user's terminal, personal computer or workstation, telephone, and video equipment plug into the four outlets on the faceplate.

The satellite equipment room (SER) wiring closet rack can service as many as 128 users encompassing up to 15,000 to 20,000 square feet of floor space. The Office Communication Cabinet (OCC) offers a smaller but secure alternative. The SER/OCC serves two functions:

- It serves as a central cross-connection point for all radial office wiring, such as unshielded twisted-pair cabling for terminals, ThinWire cable for 802.3/Ethernet services to personal computer and office workstations, and when appropriate, telephones.
- It provides mounting space for all the active network hardware components, such as ThinWire multiport repeaters, terminal servers, and bridges.

#### **DECconnect Features**

- Multifunction, modular DECconnect faceplate
- Satellite equipment racks—cabinet racks and cable patching/cross-connect components
- EIA-423-A supports with EOS/ESD protection and EIA-232-D compatibility and EIA-422 interoperability
- Broad range of 802.3/Ethernet supported:
  - Thinwire coaxial cable
  - Unshielded twisted-pair
  - Shielded twisted-pair (IBM)
  - Standard baseband
  - Fiber optic
  - Broadband coax
  - Microwave

### ThinWire 802.3/Ethernet Cabling

ThinWire 802.3/Ethernet cabling, an IEEE 802.3 10 Base 2, industry-standard coaxial cable with BNC connectors, enables the configuration of low-cost local area networks in the work area. ThinWire cable delivers 10-Mb/s 802.3/Ethernet performance, like standard baseband cable, and is specifically designed for horizontal wiring of a work area because of its ease of installation and lower cost.

In the DECconnect communications system, ThinWire cable runs from a ThinWire 802.3/Ethernet repeater in a wiring closet or SER to DECconnect faceplates in a local work area. From the faceplates, desktop systems such as personal computers, workstations, and low-end systems are connected. Non-ThinWire (A.U.I. type) devices are connected to ThinWire cable using the ThinWire Ethernet Station Adapter (DESTA). Disk and print servers can also be connected to ThinWire cable.

### Unshielded Twisted-pair Cabling

Unshielded twisted-pair cabling brings full 802.3/Ethernet capability to the desktop using unshielded twisted-pair adapters. These adapters, one located in the office and the other in the satellite equipment room, convert ThinWire communications to unshielded twisted-pair communications and back again. The adapter products supply all required electrical and physical translation from active ThinWire devices such as DEMPRs and PC Ethernet controller boards, providing a complete segment between the 802.3/Ethernet network and the office device via twisted-pair cabling. Unshielded twisted-pair Ethernet adapters complement existing media options, and can be used with many leading structured cabling systems.

### Shielded Twisted Pair Cabling (IBM)

Similarly, Digital can support 802.3/Ethernet over the IBM cabling system's shielded twisted-pair cable. The topology is identified to that of unshielded twisted-pair.

### EIA-423 Signaling

Digital's implementation of EIA-423-A signaling is based on the EIA-423-A standard for low-speed terminal connection. This implementation provides all the improved signaling benefits of EIA-423-A connection and is compatible with EIA-232 and interoperable with EIA-422.

This implementation was chosen as the signaling standard because of its improved performance over the EIA-232 standard, and its backwards compatibility with existing EIA-232-D equipment.

By following the EIA-423-A standard, Digital supports terminal-to-CPU or terminal server-to-terminal distances of 1,000 feet, compared to the EIA-232-D standard of 50 feet. It is fully compatible with all existing EIA-232 installations, making major equipment changes unnecessary. Digital provides necessary mechanical adapters that enable EIA-232-D (25-pin) terminals to plug into EIA-423-A (six-pin) communications controllers.

Digital's implementation of EIA-423-A has the following features:

- Industry-standard EIA-423-A signaling benefits, including CPU-to-terminal distances of up to 1,000 feet at 38.4 Kb/s
- Complete electrical compatibility with EIA-232-D
- Smaller six-pin connector, which allows for increased line density at the back of the CPU and remote connection through the use of cable concentrators
- Simplified cabling requirements with all cables having male connectors on both ends and female connectors being designed into all EIA-423-A devices, such as terminals
- Improved cabling capabilities through the use of unshielded cables while still meeting full FCC certification

Digital asynchronous devices with EIA-423-A implementation signaling have the enhancement of integral electrical overstress/electrostatic discharge (EOS/ESD) protection. This improves equipment reliability and availability by protecting it from EOS damage caused by static discharge, lightning, or ac power surges, while still being 100 percent compliant with the EIA-423-A standard.

### Terminal Connections

The DECconnect communications system allows low-speed terminal users to migrate from EIA-232-D to EIA-423-A signaling, cables, connectors, and office products. Digital offers the adapters, connectors, and cables to migrate EIA-232-D devices to Digital's implementation of EIA-423-A.

These migration products allow customers to install the DECconnect communications system without having to replace most existing cabling or communications equipment. Digital supports the connection of new cabling to old products, new cabling to new products, and old cabling to new products.

Digital has also developed a standard connection cable and modified modular plug that can be used to connect terminals to the DECconnect faceplates. The standard cable is the Digital office cable (BC16E), an unshielded six-conductor flat cable that is flexible and easy to coil and terminate. The BC16E cable is designed primarily for office applications where flexibility, simplicity, and aesthetics are important.

All Digital second-generation Ethernet products support the IEEE 802.3 LAN standard. Digital is committed to international standards so that customers can enjoy the benefits of multivendor networking and have flexibility in the choice of equipment for their companies.

Digital's Standard Network Packages are currently undergoing restructuring and will be included in the January 1990 edition.

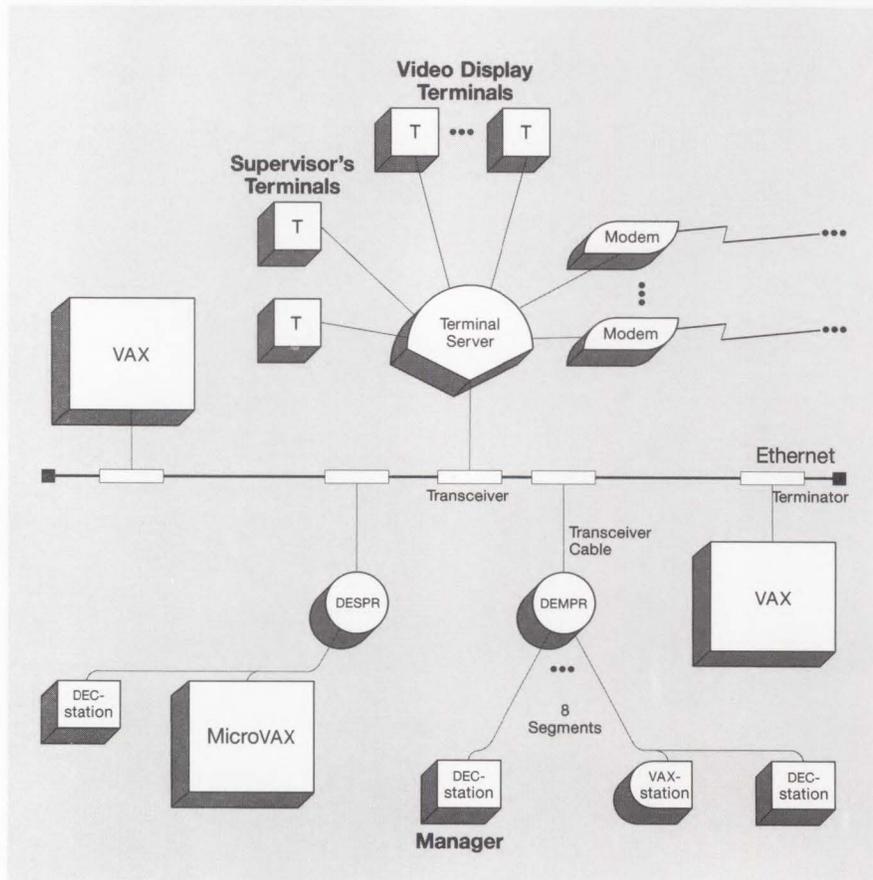
For information on currently available Standard Network Packages, contact the appropriate product marketing manager.

Office Applications

The following figure depicts a business office in which terminals are available for accounting, order taking, order processing, inventory control, word processing, and so on. Two supervisory stations have access to all data. A manager with a VAXmate can monitor accounts, display graphic data (pie charts, bar graphs, and so on), and issue instructions to any department. The VAXmate is connected to a segment of ThinWire cable that allows up to 29 additional devices to be added as the company grows.

Standard 802.3/Ethernet baseband cable extends from the office area to other major sources of information, including shipping, receiving, inventory, and the shop floor. Work can be monitored from the receipt of parts, through shipping, to receipt of payment. A bank of modems attached to a terminal server permits remote offices or sales representatives with small portable terminals to call in orders or check a particular account at any time.

Baseband 802.3/Ethernet Office Application

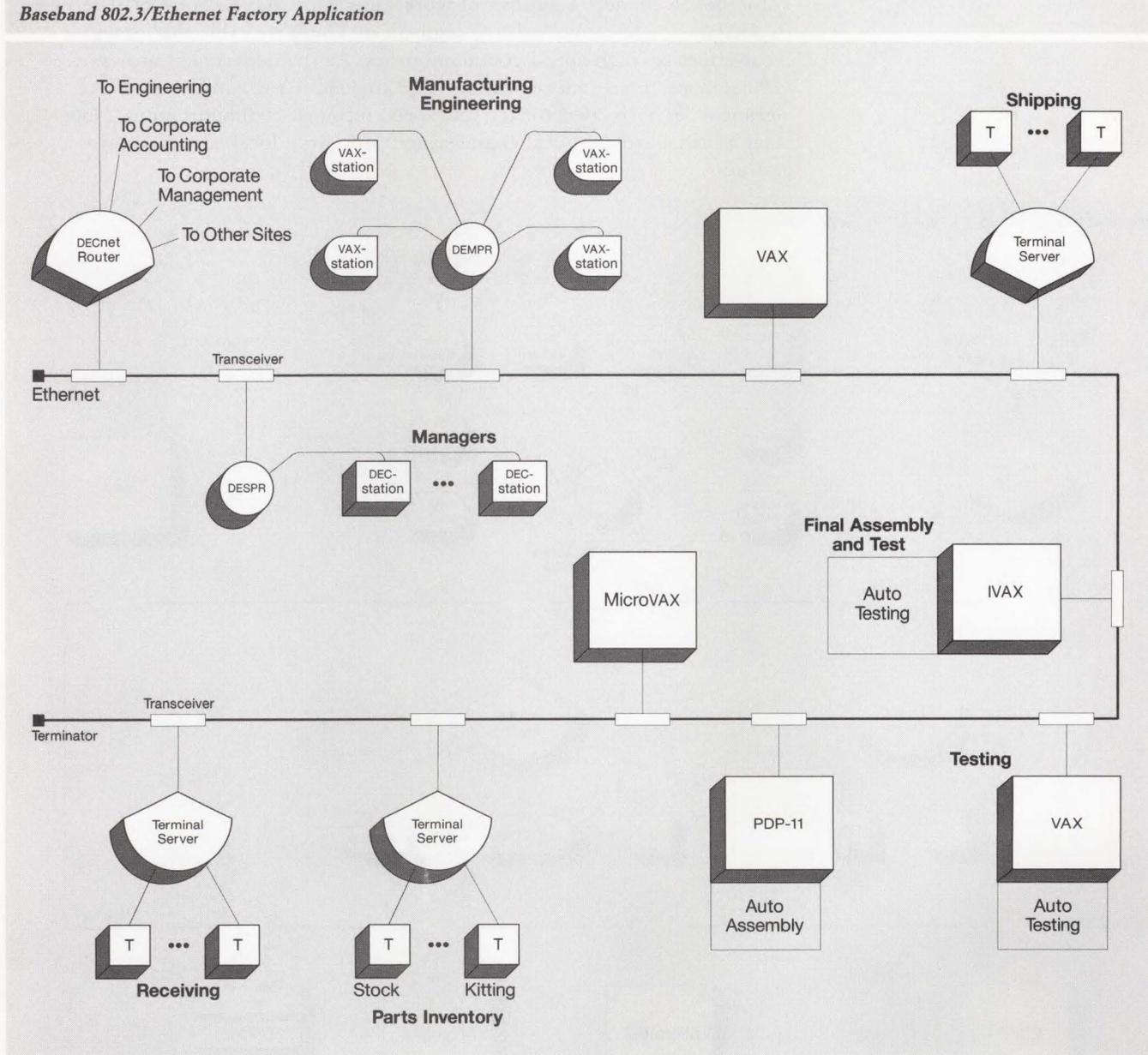


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## Typical 802.3/Ethernet Applications

### Factory Applications

The following figure illustrates a typical application in a factory, which controls automatic assembly/test devices. Data entry stations provide timely information on the entire manufacturing process. Exchange of data between the manufacturing site and the rest of the corporation is handled through a router server.



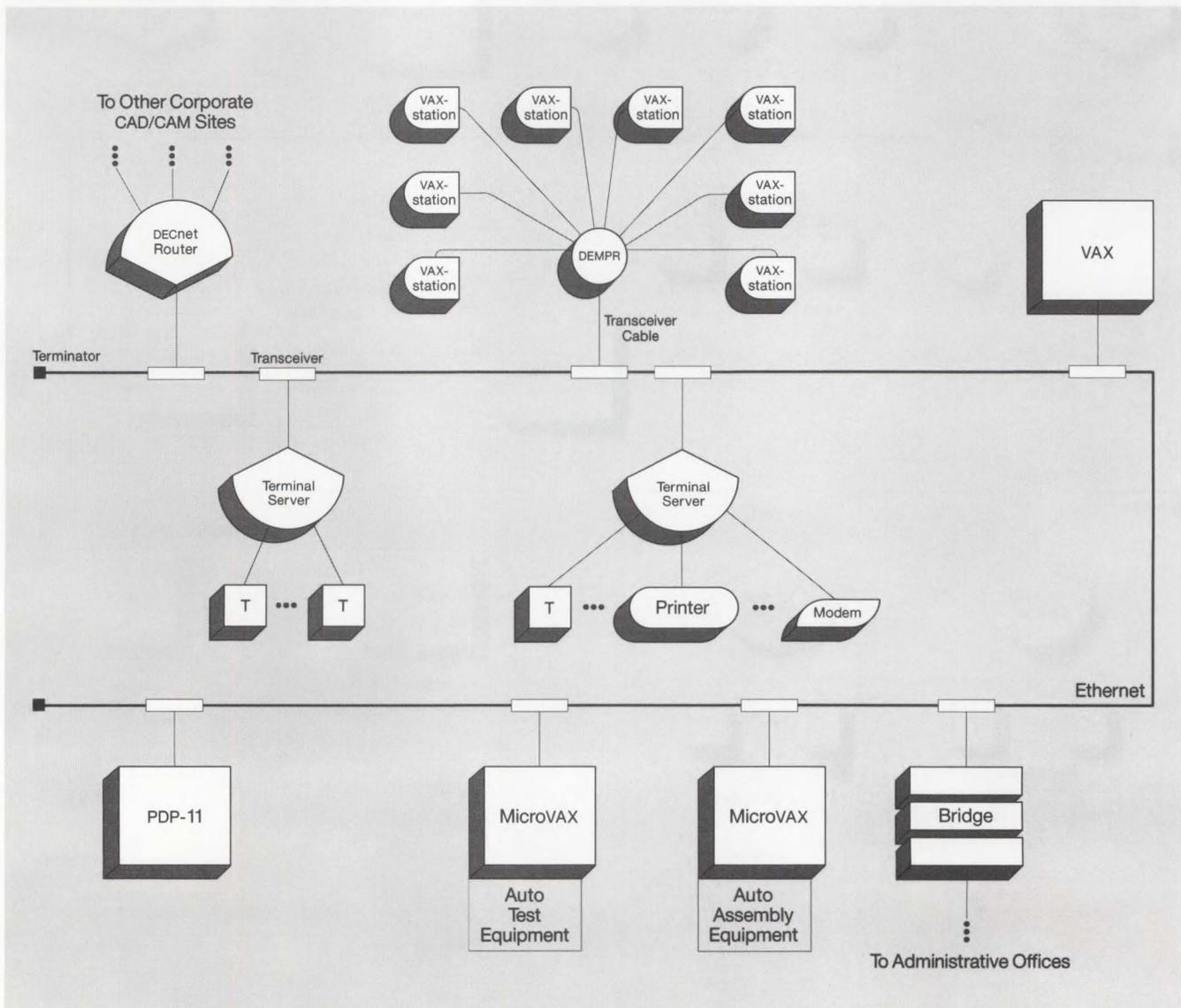
## Typical 802.3/Ethernet Applications

### CAD/CAM Applications

The 802.3/Ethernet 10-Mb/s throughput handles everything from word processing to bitmap graphics. A fully integrated 802.3/Ethernet design/manufacturing network permits smooth integration of design, automated manufacturing inventory, and business functions.

The following figure depicts an engineering department using 802.3/Ethernet to connect a number of workstations to CAD/CAM hosts. The workstations are connected to a segment of ThinWire cable that provides cost-effective, high-speed communications. As the department grows, over 200 stations can be added without changing this basic configuration. A terminal server is used for the low-speed terminal communications. Note that a bridge isolates local engineering traffic from local administrative traffic.

*Baseband 802.3/Ethernet CAD/CAM Application*



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## Typical 802.3/Ethernet Applications

### Hospital Applications

Connection of testing and laboratory computers to a hospital's central computer and to a number of remote monitoring stations requires a high-speed network. With the 802.3/Ethernet high data-transfer rate, even remote access to full-color bitmaps, such as CAT scans, is practical.

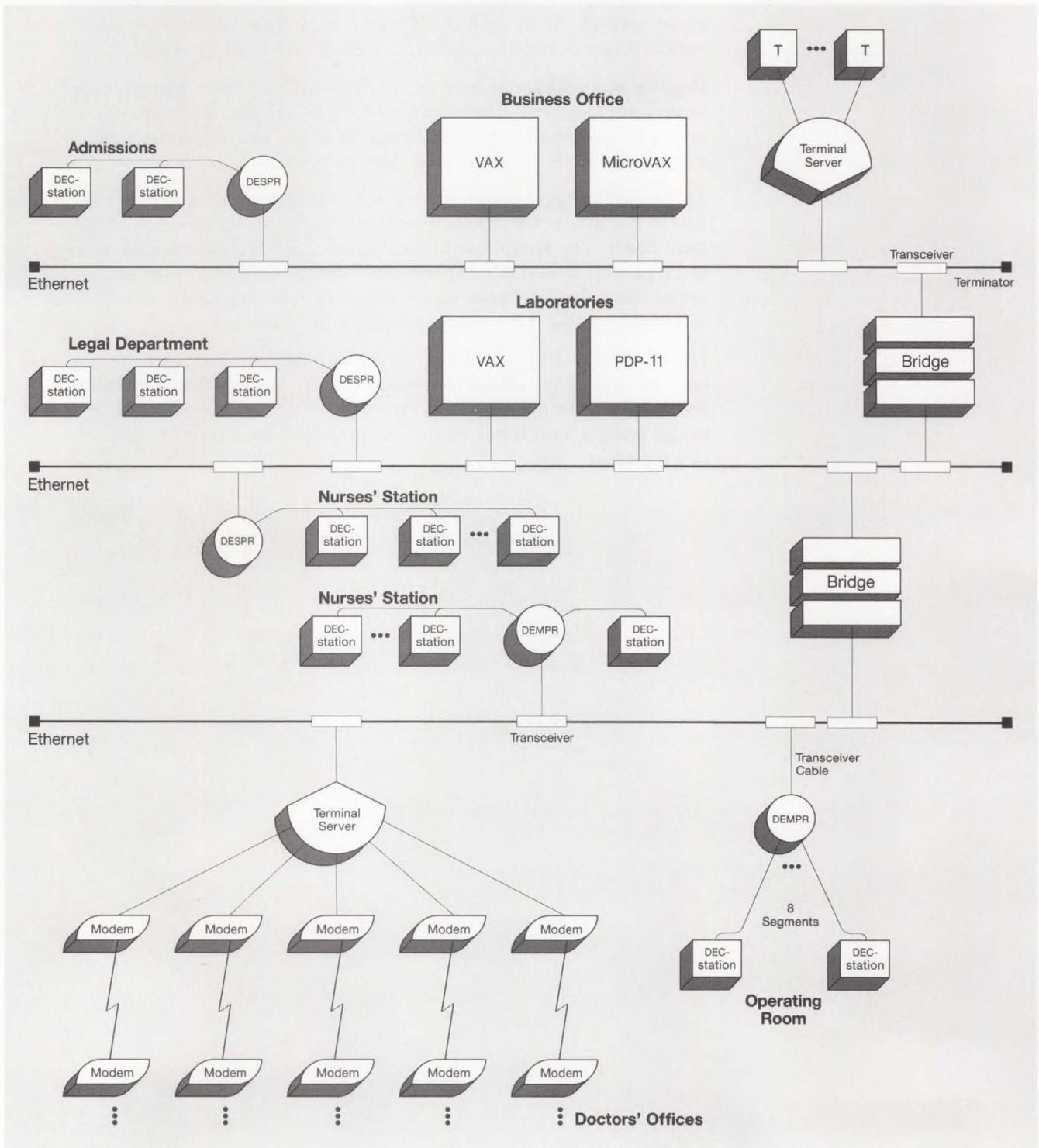
Hospital accounting and legal departments use automated patient records to perform their jobs. The local area network provides a fast, accurate means of accessing information critical to billing patient accounts and storing the details of patient treatment procedures.

The following figure depicts an 802.3/Ethernet network on which critical data is available at the nurses' station and in the offices of various department heads. The system can provide detailed medical information on any given patient, as well as comparisons to similar cases and to the accepted norms. Note that VAXmates on the operating room segment are connected to ThinWire cable that provides configuration flexibility.

The figure also shows a terminal server with modems and leased phone lines connecting the offices of resident doctors. A physician can monitor test results or the current conditions of patients from the office. Note that a bridge isolates local traffic on this segment from local traffic on the other two segments.

# Typical 802.3/Ethernet Applications

## Baseband 802.3/Ethernet Hospital Application



NBG-131-02

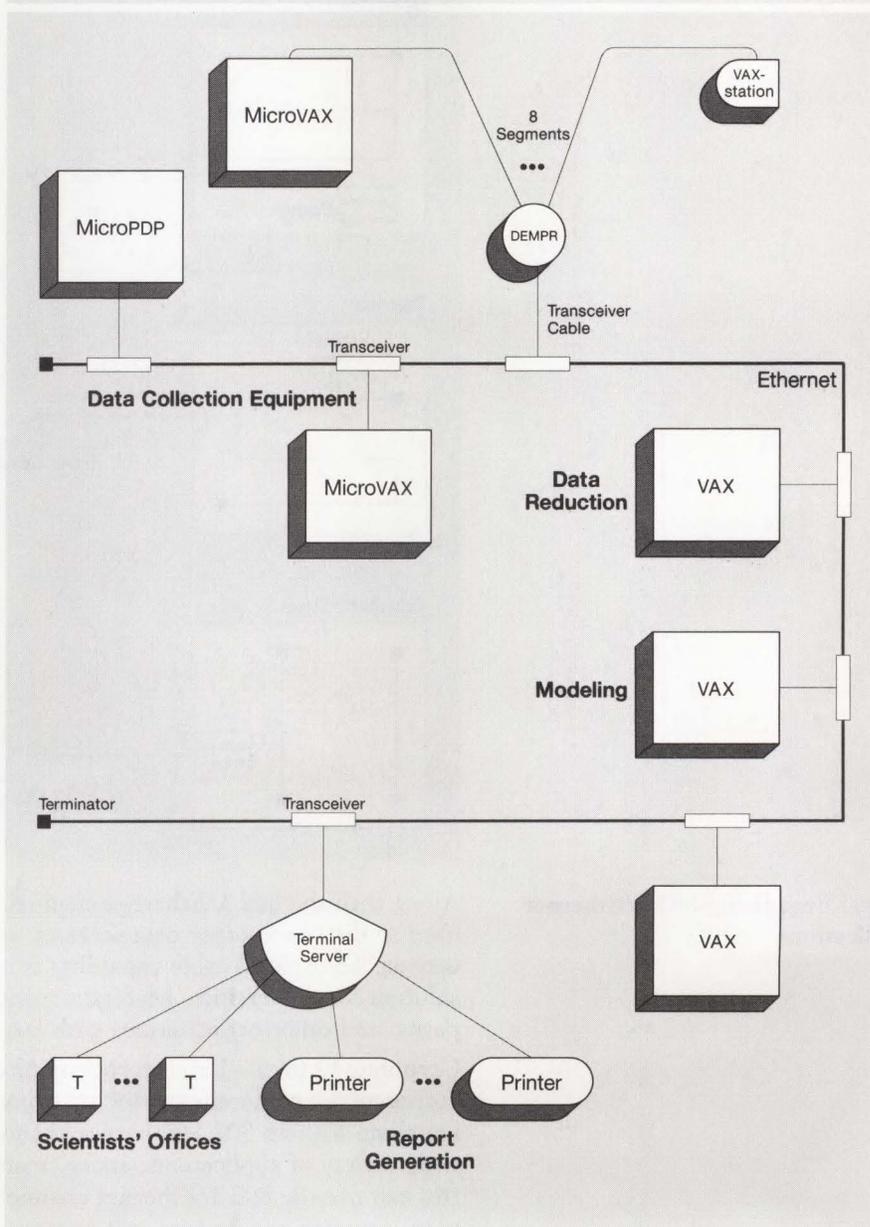
## Typical 802.3/Ethernet Applications

### Laboratory Applications

Within a laboratory environment, monitoring test conditions and results is extremely important. By networking a test control computer to a computer acting as a monitoring station and to a central database on another computer, current test conditions can be displayed along with previous or standard conditions. Deviations from the desired conditions become apparent and can be corrected before continuing with the test. Each MicroVAX computer is connected to a single segment of ThinWire cable, which provides a cost-effective link to the high-speed devices.

The following figure illustrates how various laboratory computers and other resources are typically connected by an 802.3/Ethernet local area network.

*Baseband 802.3/Ethernet Laboratory Application*



NBG-132-02

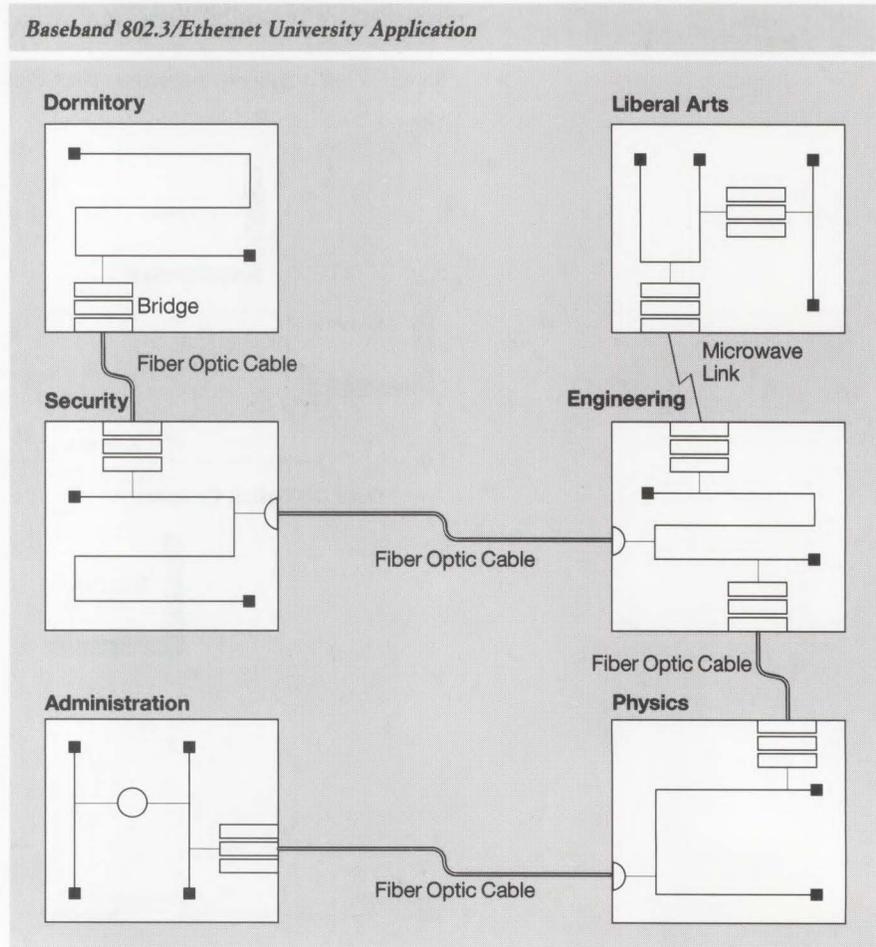
## Typical 802.3/Ethernet Applications

### University Applications

The application of computers in a university system can cover everything from maintaining student accounts and academic records to using computers as classroom tools.

The following figure illustrates an 802.3/Ethernet application used at a university. Note that bridges isolate local traffic throughout the university.

Fiber optic cable is recommended for connecting detached buildings. The METROWAVE Bridge (microwave-based) is used as an alternative for physical or economic reasons.



NBG-153-00

### Typical Broadband 802.3/Ethernet Applications

Along with the 802.3/Ethernet channel, the broadband network can be used to distribute other data services, as well as voice and video communications. The shared cable capability is often a cost-effective networking solution for universities, hospitals, manufacturing complexes, research parks, and other organizations with large, dispersed user populations.

- **Corporate Offices**—Large corporations can distribute services such as corporate teleconferencing, security monitoring, and employee video training along with an 802.3/Ethernet channel onto a broadband LAN. Among a wide variety of applications, energy management and building-access control can use the 802.3/Ethernet channel. Wiring systems in a skyscraper or plant complex can be kept to a minimum, and changes to the organization can easily be accommodated.

## Typical 802.3/Ethernet Applications

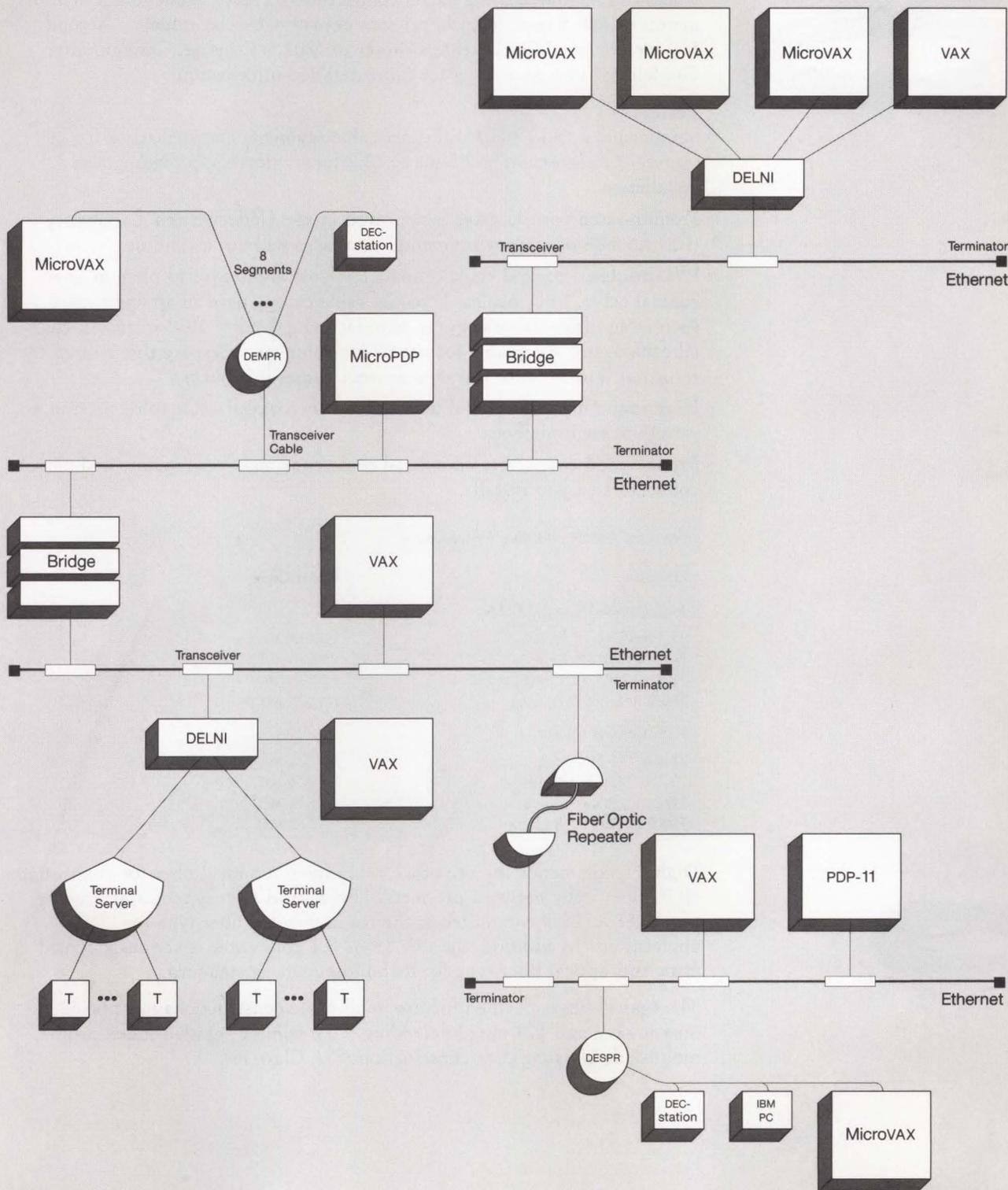
- **Plant Environment**—Industries, such as auto or aviation manufacturing, can use the broadband network to monitor a variety of data collection stations. The 802.3/Ethernet channel can be used for transmitting reports, energy management, and inventory distribution control, among a variety of other tasks. On the factory floor, broadband 802.3/Ethernet can coexist with MAP.
- **University Campus**—Broadband can be ideal for university use because it can support extensive communications needs. A single medium that can transmit television, data communication, and security is invaluable to an educational community. The broadband 802.3/Ethernet channel can provide access to important educational tools and a variety of databases while sharing the cable with applications such as video training seminars. In addition, by wiring classrooms and dormitories with broadband cable, universities can also connect the growing number of personal computers via the 802.3/Ethernet channel.
- **Hospitals**—Broadband networks are also invaluable to hospital communities. They allow medical staffs to maintain constant watch over patients via channels from a central location, while also having access to patient records and laboratory results on the 802.3/Ethernet channel. Meanwhile, patients can be viewing their favorite programs on another channel on the broadband LAN. For a hospital to have all of these functions requires only one broadband cable.

The incorporation of 802.3/Ethernet local area network technology into DECnet Phase IV demonstrates Digital's commitment to providing a complete set of products to address local area networking needs. 802.3/Ethernet networks have been developed specifically for the kinds of communications and resource sharing that take place in a local work environment.

Digital's local area network (LAN) connects Ethernet or IEEE 802.3-compatible devices in a small geographic area by way of high-speed standard ThinWire or unshielded twisted-pair cable. Every device attached to the cable has access to all network resources. The network becomes the system.

Hardware products combine to create a physical channel over which the DECnet and 802.3/Ethernet protocols are implemented. Baseband 802.3/Ethernet products currently available include ThinWire products, unshielded twisted-pair products, standard baseband cable, transceiver cable, connectors, terminators, Etherjack, the Local Network Interconnect (DELNI), transceivers, repeaters, communications controllers, LAN bridge products, and communications servers.

802.3/Ethernet Products



NBG-134-02

## 802.3/Ethernet Products

### Standard Baseband 802.3/Ethernet Cable



Standard baseband 802.3/Ethernet cable is the main transmission medium of a baseband network. The cable is available in four lengths (sections), which can be joined using barrel connectors to create segments up to 500 meters (1,640.5 feet) long. Local area networks can be extended beyond 500 meters by adding repeaters. Refer to "802.3/Ethernet Configuration Guidelines" in Appendix A for more detailed information.

#### Features

- Standard baseband 802.3/Ethernet cable segments are premarked for transceiver placement at 2.5-meter (8.2-foot) intervals, providing easy installation.
- Plenum-rated coaxial cable is approved by the Underwriters' Laboratory (UL) for safe use in environmental air spaces without a conduit.
- PVC-insulated coaxial cable offers a low-cost alternative to plenum-rated coaxial cable. PVC-insulated coaxial cable can be used in an open space, such as an office, laboratory, or manufacturing facility. PVC-insulated coaxial cable is not acceptable for use in environmental airspace that is used for return airflow because it produces toxic fumes if it burns.
- High immunity to electrical noise allows the coaxial cable to be used in a variety of environments.
- Pre-installed connectors on coaxial cable ends make terminators and barrel connectors easy to install.

#### Standard Baseband Cable Order Codes

Option	Order Code
<b>Plenum-rated Coaxial Cable:</b>	
23.4 m (76.8 ft) long	BNE2A-MA
70.2 m (230.3 ft) long	BNE2A-MB
117.0 m (383.9 ft) long	BNE2A-MC
500.0 m (1640.5 ft) long	BNE2A-ME
<b>PVC Coaxial Cable:</b>	
23.4 m (76.8 ft) long	BNE2B-MA
70.2 m (230.3 ft) long	BNE2B-MB
117.0 m (383.9 ft) long	BNE2B-MC
500.0 m (1640.5 ft) long	BNE2B-ME

### Fiber Optic Cable



Digital recommends the use of 62.5/125 micron optical fiber for connecting all its fiber optic network products. This optical-fiber type is approved by the ANSI X3T9.5 committee as the recommended fiber type for FDDI applications. In addition, the EIA TR-41.8.1 committee is seriously considering this optical-fiber type for its building wiring standard.

The optical fiber specified for use in all cable constructions must be 62.5 micron core and 125 micron cladding, dual-window, graded-index profile, multimode glass-on-glass construction (EIA Class 1a).

<i>Optical Characteristics</i>	
<b>Attenuation</b>	2.8 to 3.5 dB/km at 850 nm 0.8 to 1.5 dB/km at 1300 nm
<b>Bandwidth</b>	Greater than 160 Mhz-km at 850 nm Greater than 500 Mhz-km at 1300 nm
<b>Numeric Aperture</b>	0.275±0.015 at 850 nm
<b>Recommended Connector Type</b>	ST-style

The ST-style connector is generally a higher performing connector type than the traditional SMA-style. ST-to-SMA patch cable assembly is required when connecting current fiber optic LAN Bridges (DEBET) and fiber optic repeaters (DEREP) to ST-based cable plants. Future Digital fiber optic network products will utilize an ST-type connector.

Neither the cable nor the connectors are currently sold by Digital, but are readily available from leading fiber manufacturers, such as Sincor Corporation, American Telephone & Telegraph Company, or their authorized distributors.

### Transceiver Cable

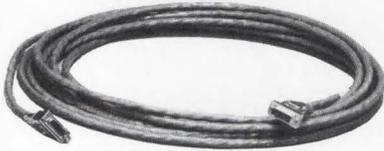
A transceiver cable connects an 802.3/Ethernet transceiver or a Local Network Interconnect (DELNI) to an 802.3/Ethernet communications controller, broadband transceiver, or LAN Bridge 100. The cable is compatible with Ethernet and IEEE 802.3 networking products and consists of four twisted-pair wires enclosed in a shield and jacket of either plenum-rated or PVC (polyvinyl chloride). Plenum-rated cable is more expensive than PVC-insulated cable, but it can be used in environmental airspaces without an expensive conduit. PVC-insulated cable can be used in an open space, such as an office, laboratory, or manufacturing facility. PVC-insulated cable is not acceptable for use in environmental airspace because it produces toxic fumes if it burns.

Transceiver cable is available in several lengths (sections). Sections can be connected with built-in slide latches to form a single continuous link up to 50 meters (164-feet) long. The connection point for a transceiver cable section can be secured to a wall and hidden with the use of an Etherjack. Each transceiver cable has either a straight or right-angled 15-pin connector on both ends.

For standard 802.3/Ethernet baseband networks, use BNE3H, K, L, or M series cable.

## 802.3/Ethernet Products

### Office Transceiver Cable



The office transceiver cable performs the same function as the transceiver cable but is smaller in diameter and more flexible. The office transceiver cable can be used in an open area (office, laboratory, or manufacturing area) instead of the heavier transceiver cable.

The office transceiver cable is available only with PVC insulation. It should not be connected to a standard baseband transceiver if the transceiver is located in environmental airspace. PVC-insulated cable is not acceptable in environmental airspace because it produces toxic fumes if it burns.

Office transceiver cable is available in two lengths (sections). Each office transceiver cable has either a straight or right-angled 15-pin connector on both ends. The connection of an office transceiver cable to a standard transceiver cable is simplified because both use the same connectors. The connection point can be secured to the wall base and hidden with the use of an Etherjack.

The office transceiver cable attenuation is greater than that of the PVC-insulated or plenum-rated transceiver cable by a factor of four (for example, 2 meters, or 6.6 feet, of office transceiver cable is electrically equivalent to 8 meters, or 26.2 feet, of standard transceiver cable). Because office transceiver cables are not as long as standard transceiver cables, the distance between devices connected by office transceiver cables is less than the distance between connected standard transceiver cables.

For standard 802.3/Ethernet baseband networks, use BNE4C- or D-series cable.

*Transceiver Cable and Office Transceiver Cable Order Codes*

Option	Order Code
<b>Transceiver Cable with PVC Insulation, Straight Connectors:</b>	
5.0 m (16.4 ft) long	BNE3H-05
10.0 m (32.8 ft) long	BNE3H-10
20.0 m (65.6 ft) long	BNE3H-20
40.0 m (131.2 ft) long	BNE3H-40
<b>Transceiver Cable with PVC Insulation, Right-angle Connectors:</b>	
5.0 m (16.4 ft) long	BNE3K-05
10.0 m (32.8 ft) long	BNE3K-10
20.0 m (65.6 ft) long	BNE3K-20
40.0 m (131.2 ft) long	BNE3K-40
<b>Transceiver Cable, Plenum-rated with Straight Connectors:</b>	
5.0 m (16.4 ft) long	BNE3L-05
10.0 m (32.8 ft) long	BNE3L-10
20.0 m (65.6 ft) long	BNE3L-20
40.0 m (131.2 ft) long	BNE3L-40
<b>Transceiver Cable, Plenum-rated with Right-angle Connectors:</b>	
5.0 m (16.4 ft) long	BNE3M-05
10.0 m (32.8 ft) long	BNE3M-10
20.0 m (65.6 ft) long	BNE3M-20
40.0 m (131.2 ft) long	BNE3M-40
<b>Office Transceiver Cable with PVC Insulation, Straight Connector:</b>	
2 m (6.6 ft) long	BNE4C-02
5 m (16.4 ft) long	BNE4C-05
<b>Office Transceiver Cable with PVC Insulation, Right-angle Connector:</b>	
2 m (6.6 ft) long	BNE4D-02
5 m (16.4 ft) long	BNE4D-05

**Standard 802.3/Ethernet Cable Connectors and Terminators**

Digital sells standard 802.3/Ethernet baseband cable with connectors at each end of the cable. Standard Ethernet cables can be ordered in bulk. End connectors can be purchased later.

End connectors cannot remain open. At each end connector, a barrel connector with another baseband cable or a terminator must be connected.

**Barrel Connectors**

Barrel connectors are used to directly join two sections of standard baseband cable. The barrel connector threads into the end connectors on the two cable sections.

**Terminators**

Terminators are used to electrically complete the ends of the standard baseband cable. A terminator must be installed at each end of a standard cable segment that is not connected to another standard cable segment.

**802.3/Ethernet Turnaround Connector**

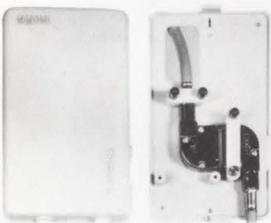
The 802.3/Ethernet turnaround connector is a testing device used to verify that a host controller at the user's station or a server controller and its transceiver cable are electrically operational.

The turnaround connector consists of a transceiver installed on a short length of coaxial cable. Both ends of the turnaround-connector coaxial cable are terminated. The turnaround connector is attached to the transceiver cable, which is connected to a host controller or to a server controller. The turnaround connector is used to verify host operation prior to the transceiver cable's actual installation on the baseband cable. The turnaround connector tests the controller and transceiver cable that connect it to the local area network.

The Etherjack (DEXJK) is a device for mounting cable connectors. Cables can be run either along a wallbase or within a wall.

The Etherjack can be used to secure the cable along the base of a wall, keeping the cable from the office floor area. The Etherjack also can be used to secure transceiver cables extending from transceivers so that they can be run down the inside of an office wall to the desired point of entry into the office area. A third use for the Etherjack is to cover unsightly connectors at the cable connection points within the office area.

**Etherjack (DEXJK)**



**Baseband Cable Connector and Terminator Product Order Codes**

Option	Order Code
Baseband cable barrel connector	12-19817-01
Baseband coaxial terminator	12-19816-01
Baseband ground clamp (available only from Digital Field Service)	12-21766-01
Baseband turnaround connector	H4080
Baseband transceiver cable straight connector kit	H4054-00
Baseband transceiver cable right-angle connector kit	H4055-00
Etherjack	DEXJK

**Baseband IEEE 802.3/Ethernet Transceiver (H4005)**



The H4005 is a nonintrusive tapping transceiver that provides a physical and electrical connection to a standard 802.3/Ethernet cable. The H4005 connects to the standard baseband cable via a removable tap assembly. This product complies with the IEEE 802.3 specification and can interface to both 802.3 and Ethernet station controllers. The H4005 contains the necessary electronics to send and receive signals at 10 Mb/s, detect the occurrence of collisions, and provide electrical isolation between the cable and the station.

**Compatibility**

The H4005 is compatible with all products except the DEREPE, which requires the H4000 transceiver to connect to the standard 802.3/Ethernet cable.

**Features**

- IEEE 802.3 and Ethernet compatibility allows for flexible network configuring.

## 802.3/Ethernet Products

- The transceiver clamps onto the standard baseband cable without cutting it, allowing the unit to be installed, repaired, or removed without interrupting network operation.
- Simple installation and replacement procedures allow quick and easy network reconfiguration. Network devices can be added to or removed from the network easily.
- Redundant protective circuitry, high noise immunity, and internal self-test make the H4005 a highly reliable physical channel, reducing maintenance cost.
- Heartbeat is enabled or disabled by a switch accessible from outside the unit.
- The continuous message loopback feature simplifies and speeds fault isolation, reducing maintenance time and cost.
- The UL-approved, rugged, insulated housing allows the H4005 to be installed in environmental airspace without conduits.

### ***Installation in Environmental Airspace***

Commercial buildings commonly have drop ceilings. The space between the drop ceiling and the floor above is called environmental airspace. Environmental airspace is often used for return air for heating and air conditioning systems (called return airspace) and to run wiring, such as coaxial cable. Equipment in return airspace can be a potential fire hazard because there is often no barrier to contain fire or smoke. Therefore, equipment that is not approved by UL must be placed in a conduit when installing it in return airspace.

Digital's plenum-rated cable and the H4005 are approved by the UL and National Electric Code (NEC) for use in environmental airspace without a conduit. (Canada, Europe, and GIA requirements may differ from those of NEC). However, local and state regulations always take precedence over UL approval.

### ***Specifications***

Physical Characteristics:

- Length: 8.7 cm (3 in)
- Width: 9.8 cm (4 in)
- Height: 3.7 cm (1.5 in)
- Weight: 10 oz

Power Requirements:

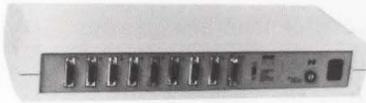
- Voltage required at transceiver: 15.75 V at maximum distribution impedance of less than 4 ohms
- Maximum current: 0.5 amps
- Environment class: C

### ***Ordering Information***

Installation of the H4005 transceiver by the customer requires the Transceiver Installation Tool Kit, which includes all the components necessary to install the H4005.

## 802.3/Ethernet Products

### Local Network Interconnect (DELNI)



#### *H4005 Order Codes*

Option	Order Code
802.3/Ethernet Transceiver	H4005
Transceiver Installation Tool Kit	12-24664-02

The Local Network Interconnect (DELNI) is a low-cost, tabletop device with its own power supply. It is a concentrator that allows up to eight Ethernet-compatible devices (not terminals) to be grouped together. Device performance remains constant whether a device is connected to the local area network through a transceiver or a DELNI.

The DELNI can be configured three ways: standalone, hierarchical standalone, and connected. A switch on the DELNI allows selection of either standalone or connected mode of operation.

The figure “DELNI Standalone Configuration” illustrates the standalone configuration that supports up to eight systems using standard transceiver cables.

The figure “DELNI Hierarchical Standalone Configuration” illustrates the hierarchical standalone configuration that supports a combination of DELNIs and devices using standard transceiver cables. Hierarchical standalone configurations are not connected to standard baseband cable.

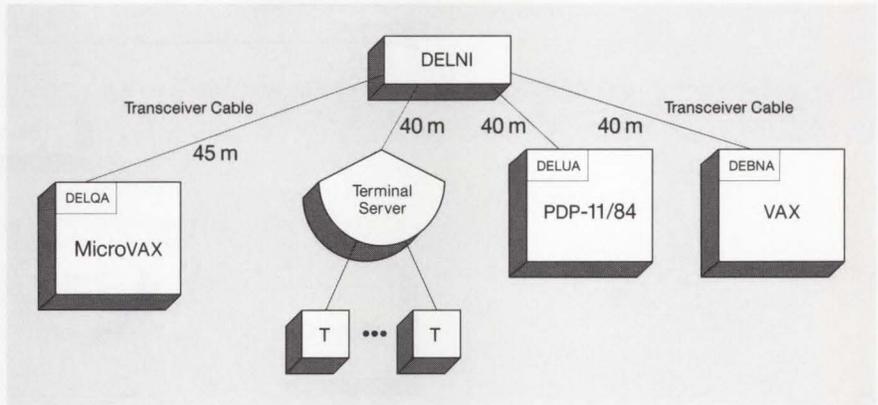
The figures “DELNI Connected Configuration” and “DELNI Hierarchical Connected Configuration” illustrate connected configurations that support up to eight devices using transceiver cable. These configurations are connected to standard baseband cable via transceivers and transceiver cable. For specific distance requirements, refer to “802.3/Ethernet Configuration Guidelines” in Appendix A.

The DELNI can also be used in ThinWire configurations to concentrate up to eight ThinWire repeaters. Refer to “ThinWire 802.3/Ethernet Products” in this section for more information.

#### **Features**

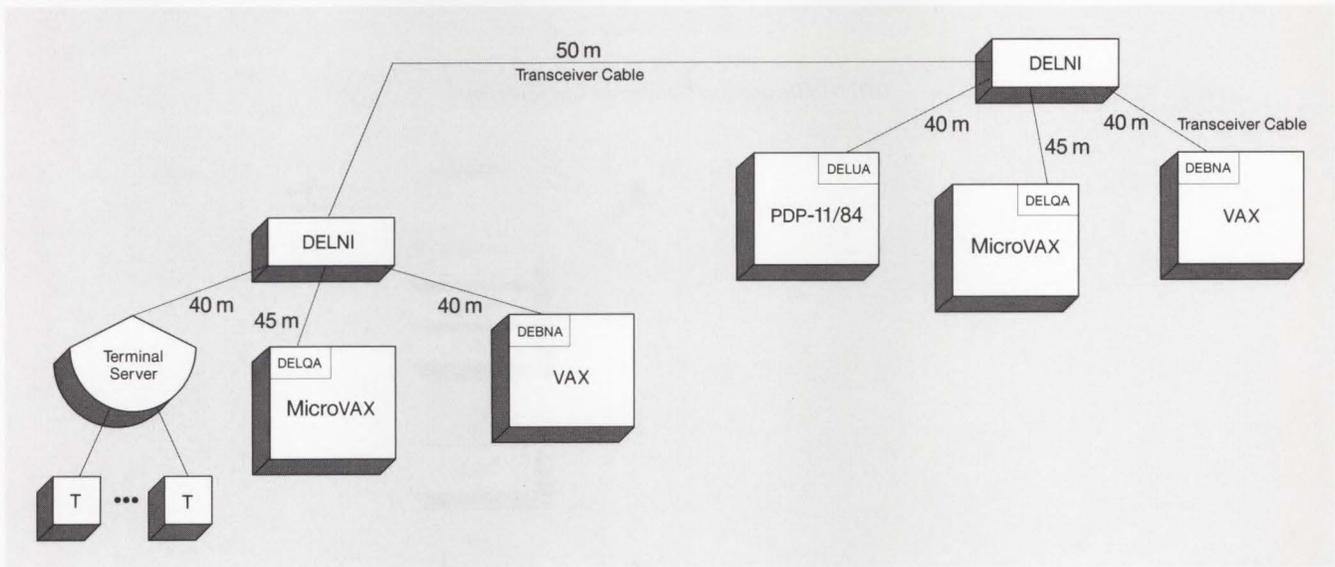
- A connected DELNI LAN reduces the cost of multiple connections to standard baseband cable. It also allows more than 100 devices to be connected to a single 500-meter coaxial cable segment.
- The standalone and hierarchical standalone DELNI LAN configurations eliminate the need for standard baseband cable and transceivers in very small networks.
- Transceiver cable wiring to a centrally located DELNI offers wiring configuration flexibility.
- The DELNI can be installed by customers, reducing installation cost.
- A standalone/connected mode switch allows a user to change from the connected configuration to the standalone configuration. This allows for the temporary isolation of traffic in the DELNI subnet for security or for performance testing.

*DELNI Standalone Configuration*



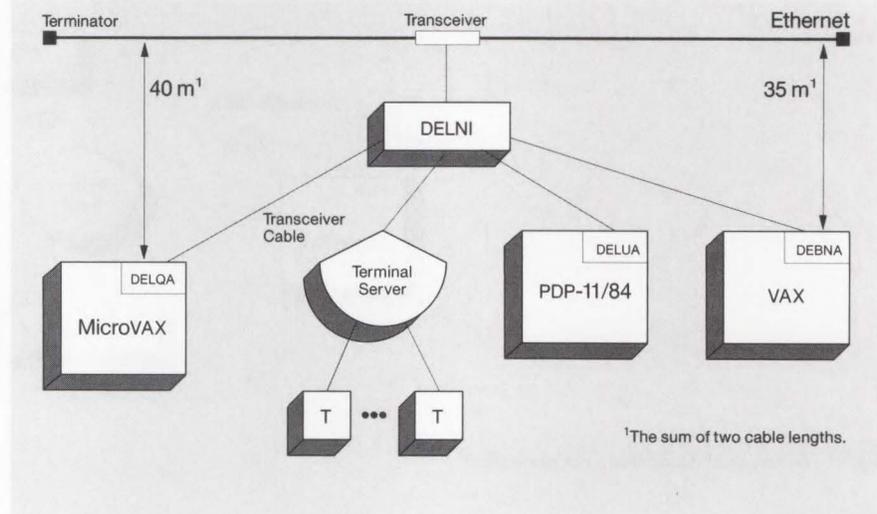
NBG-135-02

*DELNI Hierarchical Standalone Configuration*



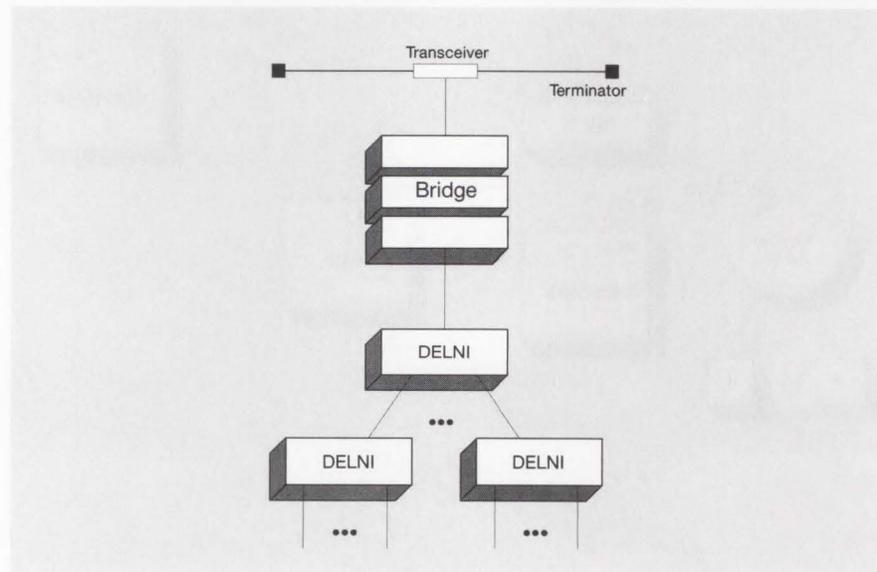
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*DELNI Connected Configuration*

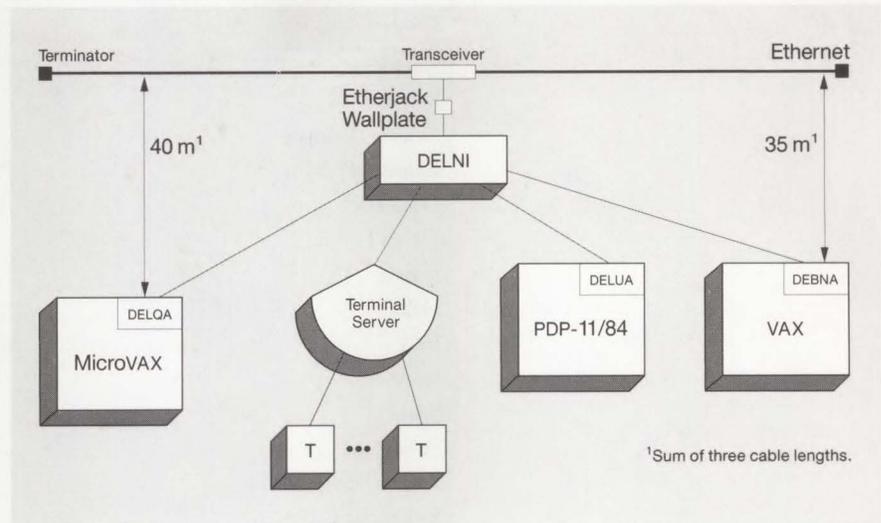


NBG-137-01

*DELNI Hierarchical Connected Configuration*



NBG-138-00

*DELNI Connected Configuration Using an Etherjack*

NBG-139-02

**Specifications****Physical Characteristics:**

- Length (rackmount): 44.5 cm (17.5 in)
- Length (with cover): 48.9 cm (19.25 in)
- Width (rackmount): 17.8 cm (7.0 in)
- Width (with cover): 19.7 cm (7.75 in)
- Height (rackmount): 6.4 cm (2.5 in)
- Height (with cover): 8.9 cm (3.5 in)
- Weight: 6.4 kg (14.0 lb)

**Power Requirements:**

- Switch-selectable: 120 V or 240 V, 47 to 63 Hz
- ac watts drawn: 26
- Inrush Currents: 1.0 amps at 120 V; 0.5 amps at 240 V
- Surge Currents: 2 amps for 5 cycles at 120 V; 1 amp for 5 cycles at 240 V

Environmental Class: C (Refer to Appendix B for details.)

**Ordering Information**

Order the DELNI and, if required, a country kit.

Each node connected to a DELNI requires an 802.3/Ethernet communications controller and transceiver cable. DELNI-connected configurations require a transceiver and transceiver cable.

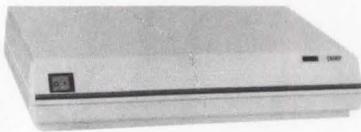
Non-U.S. versions of the DELNI require a country kit. (The U.S. version does not require a country kit.) Each kit contains installation instructions and a power cord. For countries not listed, select a country kit that uses the same plug configuration.

**DELNI Order Codes**

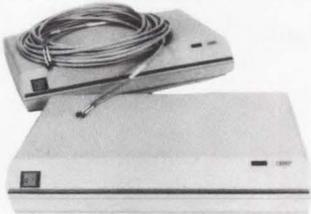
Option	Order Code
Local Network Interconnect (DELNI), allows up to eight network devices to be grouped together.	
Local Network Interconnect, 110–120 Vac	DELNI-BA
Local Network Interconnect, 220–240 Vac	DELNI-BB

*DELNI Country Kit Order Codes*

Country	Order Code
Australia	DELNK-AZ
Belgium	DELNK-AB
Canada (English)	DELNK-AQ
Canada (French)	DELNK-AC
Denmark	DELNK-AD
Finland	DELNK-AF
France	DELNK-AP
Holland	DELNK-AH
Italy	DELNK-AI
Norway	DELNK-AN
Spain	DELNK-AS
Sweden	DELNK-AM
Switzerland (German)	DELNK-AL
Switzerland (French)	DELNK-AK
United Kingdom	DELNK-AE
United States	Not required
West Germany	DELNK-AG

**Ethernet Repeaters (DEREP)**

*Local Ethernet Repeater  
(DEREP-AA)*



*Fiber Optic Ethernet Repeater  
(DEREP-RH)*

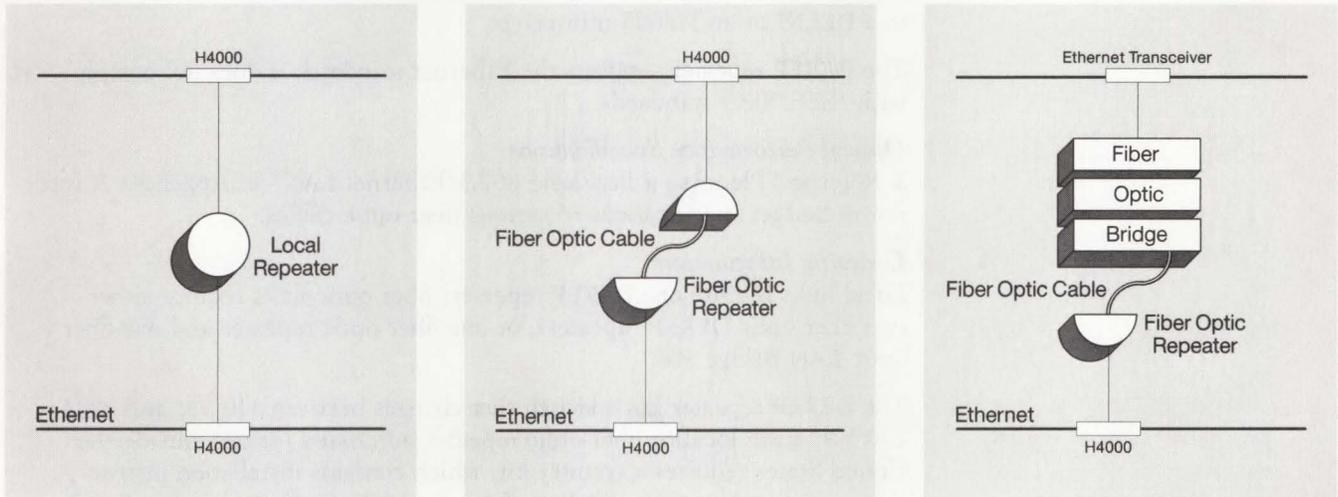
The standard baseband Ethernet repeater (DEREP) is a tabletop, standalone device that connects two segments of standard baseband Ethernet cable, extending an Ethernet LAN beyond the 500-meter (1,640-foot) single-cable segment. Each repeater can connect two segments of standard Ethernet cable, each up to 500 meters (1,640.5 feet) long with as many as 99 additional Ethernet transceivers installed. (The DEREP uses one transceiver space.) The repeater retimes, amplifies, and repeats all signals it receives from one cable segment and passes the signal to the next segment, creating one logical segment.

The DEREP repeater is offered in two versions, local and fiber optic. The local DEREP repeater connects two standard baseband Ethernet segments via transceiver cables and H4000 transceivers. (The DEREP cannot be attached to an Ethernet LAN via the H4005 transceiver.) A single local repeater can connect two standard baseband Ethernet segments which are separated by no more than 100 meters (328 feet). The fiber optic repeater connects one standard baseband Ethernet segment (via transceiver cable and H4000 transceiver) to a fiber optic cable segment. The other end of the fiber optic cable is linked to either another fiber optic repeater or a LAN Bridge 100. This flexibility allows the fiber optic repeater to extend the LAN beyond the 100-meter distance limitation of the fiber optic repeater in one of two ways:

- Repeater-to-repeater Application—Two fiber optic repeaters are joined by a fiber optic link. Each repeater is connected to a separate standard baseband Ethernet segment via transceiver cable and H4000 transceiver. Maximum length of fiber link for one pair of fiber optic repeaters is 1.0 kilometer (8497 feet). If two pairs of fiber optic repeaters are located in a series, the total length of fiber optic cable must be less than or equal to one kilometer.

- Repeater-to-bridge Application—One fiber optic repeater is joined to a fiber optic LAN Bridge 100 by a fiber optic link. The repeater and bridge are connected to separate standard Ethernet segments via transceiver cable and H4000 transceiver. Maximum length of fiber link between a single repeater-to-bridge application is 1.5 kilometers.

#### Local and Fiber Optic DEREPE Configurations



NBG-140-02

#### Features

- Connects segments of standard Ethernet cable, increasing the length of an Ethernet LAN and the number of devices supported.
- Can be installed and maintained by the customer, thus reducing cost.
- Contains an internal self-test feature that simplifies fault isolation, increases reliability, and reduces maintenance costs.
- The fiber optic repeater is not affected by electrical or electromagnetic interference and is protected from moisture, providing high performance and low error rates. The fiber optic repeater can be used between buildings, underground, and in harsh environments.
- When the repeater detects faulty signals, it automatically stops repeating them until good signals are detected again, at which point it resumes normal signal transmission. This greatly increases network reliability.
- Diagnostic light-emitting diodes (LEDs) on the back panel of both the local and fiber optic repeater assist in network troubleshooting.
- A second local repeater can be configured into the network providing automatic backup for any local repeater, increasing network availability.

#### Specifications

##### Physical Characteristics

Length	43.2 cm (17 in)
Width	30.5 cm (12 in)
Height	8.9 cm (3.5 in)

Power Requirements	120 Vac, 60 Hz or 240 Vac, 50 Hz (switch-selectable)
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Environmental Class	C (Refer to Appendix B for details.)
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### 802.3/Ethernet Products

#### **Qualifications**

A message transmitted on a local area network must pass through no more than two repeaters (DEREP, DEMPR, or DESPR) before either reaching its destination or passing through a LAN Bridge.

The DEREP repeater cannot be used in broadband Ethernet networks or between baseband and broadband Ethernet networks. It connects to standard baseband Ethernet cable via the H4000 transceiver; it cannot connect to a DELNI or an H4005 transceiver.

The DEREP repeater supports the Ethernet standard; it does not comply with IEEE 802.3 standards.

#### **Optical Performance Specifications**

▲ Refer to "Planning a Baseband 802.3/Ethernet LAN" in Appendix A for power budget specifications of various fiber optic cables.

#### **Ordering Information**

Local links require one DEREP repeater; fiber optic links require either two fiber optic DEREP repeaters, or one fiber optic repeater and one fiber optic LAN Bridge 100.

The DEREP repeater has a switch that changes between 110 Vac and 220/240 Vac. Each local or fiber optic repeater purchased for use outside the United States requires a country kit, which contains installation instructions and a power cord. (Versions for use within the United States do not require a country kit.) For countries not listed, select a kit that uses the same plug configuration.

Transceivers, transceiver cables, and fiber optic cable must be ordered separately. ▲ Also refer to "Communications Cables" in Section 3 for more information.

#### **DEREP Order Codes**

<b>Option</b>	<b>Order Codes</b>
Local repeater for United States. Includes installation instructions in English and 110-Vac power cord. Does not require a country kit.	DEREP-AA
Local repeater for non-U.S. countries. Requires a country kit.	DEREP-AB
Fiber optic repeater for United States. Includes installation instructions in English and a power cord. Does not require a country kit.	DEREP-RH
Fiber optic repeater for non-U.S. countries. Requires a country kit.	DEREP-RJ
Ethernet transceiver for use with DEREP Ethernet repeater.	H4000
Upgrade kit to convert older-model DEREP-RC/RD to DEREP-RH/RJ. Includes field service installation. One version for 110 and 220-240 Vac. (Does not convert DEREP-AA or DEREP-AB.)	FOAED-AA

## 802.3/Ethernet Products

### *DEREP Country Kit Order Codes*

Country	Local Repeater	Fiber Optic Repeater
Australia	DEREK-AZ	DEREK-RZ
Belgium	DEREK-AB	DEREK-RB
Canada (English)	DEREK-AQ	DEREK-RQ
Canada (French)	DEREK-AC	DEREK-RC
Denmark	DEREK-AD	DEREK-RD
Finland	DEREK-AF	DEREK-RF
France	DEREK-AP	DEREK-RP
Holland	DEREK-AH	DEREK-RH
Italy	DEREK-AI	DEREK-RI
Norway	DEREK-AN	DEREK-RN
Spain	DEREK-AS	DEREK-RS
Sweden	DEREK-AM	DEREK-RM
Switzerland (German)	DEREK-AL	DEREK-RL
Switzerland (French)	DEREK-AK	DEREK-RK
United Kingdom	DEREK-AE	DEREK-RE
United States	None required	None required
West Germany	DEREK-AG	DEREK-RG

**ThinWire 802.3/Ethernet Cable**

ThinWire 802.3/Ethernet cable delivers 10 Mb/s 802.3/Ethernet speed to the desk, work area, and local area systems for connecting PCs, workstations, and computing systems.

ThinWire cabling and connection products are designed to the IEEE 802.3 specification for Ethernet, which provides a simple, inexpensive and flexible means of attaching devices to the local area network by using industry-standard cable and BNC-type connectors.

ThinWire cable is a thin, flexible, and easy to install coaxial cable compatible with standard baseband cable. These qualities make it very suitable for horizontal connections of devices on a work area floor, and for connecting local work areas to satellite equipment rooms.

In comparison, standard baseband cabling is recommended for vertical or horizontal connection between satellite equipment rooms or work group areas because it can cover long distances (500 meters compared to 185 meters for ThinWire) and has superior EMI/RFI resistance. These qualities make standard baseband cabling very suitable for connecting satellite equipment rooms on facility floors and between floors.

**Features**

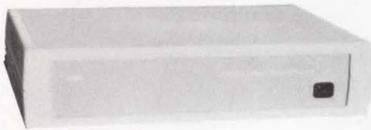
- ThinWire products are compatible with the IEEE 802.3 specification that allows users greater capability to participate in multivendor Ethernet networks.
- The maximum length of a ThinWire segment is 185 meters. A maximum of 30 devices can be connected to a single segment by daisy-chained connections. When a ThinWire Ethernet repeater is used, up to 29 stations can be connected to each segment of ThinWire cable.
- Non-ThinWire 802.3/Ethernet (A.U.I. type) devices are connected to ThinWire using a ThinWire Ethernet station adapter (DESTA), a compact inexpensive IEEE 802.3 transceiver.
- A ThinWire segment consists of sections linked together by BNC T-connectors or by behind-the-wall daisy-chain faceplates. The bottom of the "T" is inserted either into a DESTA, which is then connected to the station, or into an 802.3/Ethernet communications controller that supports a BNC connector. T-connectors must be a minimum of 0.5 meter apart.
- A maximum of eight ThinWire segments can be connected to a ThinWire Multiport Repeater (DEMPR) to form a network of up to 232 stations. A Local Network Interconnect (DELNI) can be used to concentrate up to eight DEMPRs. These configurations can either stand alone or connect to standard baseband cable using an H4005 (or H4000-BA) transceiver.
- The Ethernet limit of 1,023 devices can be configured in a single ThinWire 802.3/Ethernet network.

## ThinWire 802.3/Ethernet Products

### ThinWire 802.3/Ethernet Cable Order Codes

Option	Order Code
PVC cable with connectors and boots:	
6 feet	BC16M-06
15 feet	BC16M-15
30 feet	BC16M-30
ThinWire PVC cable (1,000 ft)	H8243-A
ThinWire plenum-rated cable (1,000 ft)	H8244-A
Male coaxial connectors and boots	H8222
T-connectors and boots	H8223
Barrel connectors and boots	H8224
Terminators and boots	H8225
Installation kit	H8242

### ThinWire Ethernet Multiport Repeater (DEMPR)



### ThinWire Ethernet Singleport Repeater (DESPR)

The ThinWire Ethernet multiport repeater (DEMPR) provides eight ports for connection of eight ThinWire 802.3/Ethernet segments, and one port for connection to standard baseband cable. It can be used as a standalone device, called a local DEMPR configuration, or connected to standard baseband cable, called a global DEMPR configuration. The DEMPR retimes, amplifies, and repeats signals between each of its nine ports. A DEMPR must be counted as a repeater when configuring a standard baseband 802.3/Ethernet network.

Each ThinWire segment can be up to 185 meters long (606 feet), and can accommodate connection of up to 29 stations, for a total of 232 stations per DEMPR.

Up to eight DEMPRs can be connected to a Local Network Interconnect (DELNI). This configuration provides up to 64 cable segments for connecting as many as 1,023 stations (Ethernet limit). This configuration, in turn, can be used in a standalone network or connected to standard baseband 802.3/Ethernet cable.

The ThinWire Ethernet singleport repeater (DESPR) connects a single ThinWire segment to a standard 802.3/Ethernet network. The ThinWire segment can be up to 185 meters long (606 feet), and can accommodate up to 29 stations.

The DESPR singleport repeater connects to standard baseband 802.3/Ethernet cable using a standard baseband transceiver, or via a DELNI. The DESPR must be counted as a repeater when configuring a standard baseband 802.3/Ethernet network.

#### Qualification

A message transmitted on a local area network must pass through no more than two repeaters (DEREP, DEMPR, or DESPR) before either reaching its destination or passing through a LAN Bridge.

## ThinWire 802.3/Ethernet Products

### *DEMPR/DESPR Specifications*

Physical Characteristics	-AA Models	-BA Models
Length	31.11 cm (12.25 in)	
Width	48.9 cm (19.25 in)	
Height	11.43 cm (4.5 in)	
<b>Power Requirements</b>		
Nominal Voltage	100 to 120 Vac 3-wire single phase	189 to 240 Vac 1 N-PE single phase
Frequency	47 to 63 Hz	47 to 63 Hz
Maximum current	0.83 A	0.42 A
Maximum power	40 W	40 W
<b>Operating Environment</b>	5 °C to 50 °C (41 °F to 122 °F)	
<b>Relative Humidity</b>	10% to 90% (noncondensing)	

### *DEMPR/DESPR Order Codes*

Option	Order Code
ThinWire Ethernet Multiport Repeater, 120 V. Includes power cord.	DEMPR-AA
ThinWire Ethernet Multiport Repeater, 240 V. Requires power cord.	DEMPR-AB
ThinWire Ethernet Singleport Repeater, 120 V. Includes power cord.	DESPR-AA
ThinWire Ethernet Singleport Repeater, 240 V. Requires power cord.	DESPR-AB

### *DEMPR/DESPR Power Cord Order Codes*

Country	Order Code
United Kingdom, Ireland	BN02A-2E
Austria, Belgium, Finland, France, Germany, Netherlands, Norway, Portugal, Spain, Sweden	BN03A-2E
Switzerland	BN04A-2E
Australia, New Zealand	BN05A-2E
Denmark	BN06A-2E
Italy	BN07A-2E

### ThinWire Ethernet Station Adapter (DESTA)



The ThinWire Ethernet Station Adapter (DESTA) converts a standard 15-pin A.U.I. station to ThinWire cabling. The station adapter can be attached to standard-cable Ethernet controllers, allowing UNIBUS, Q-bus, VAXBI, and other devices to connect to ThinWire. It also allows Digital's 802.3/Ethernet communications controllers and terminal servers to connect to ThinWire.

The DESTA has one 15-pin connector port that allows it to be mounted in or near the 802.3/Ethernet station, and a second port for connection to the ThinWire cable. It contains 802.3/Ethernet transceiver circuitry and provides transceiver functions. The DESTA is very compact, and is powered from the controller.

#### Specifications

##### Physical Characteristics:

- Length: 7.62 cm (3.0 in)
- Width: 8.38 cm (3.3 in)
- Height: 3.55 cm (1.4 in)

##### Power Requirements:

- Input voltage (from controller): 12 V
- Voltage required at transceiver: -9 V
- Maximum Current: 250 mA
- Typical Current: 200 to 250 mA

Environmental Class: C (Refer to Appendix B for details.)

#### DESTA Order Code

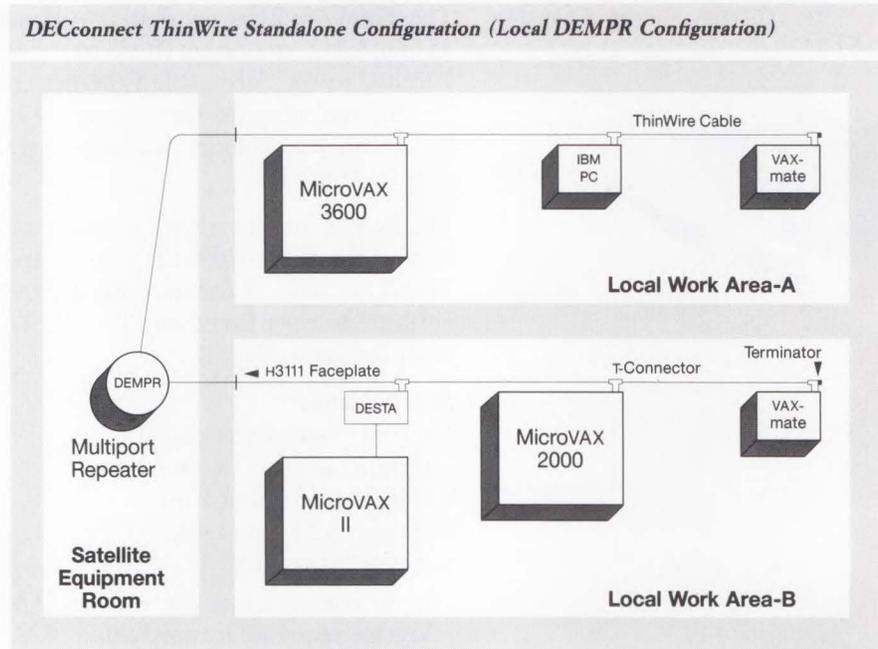
Option	Order Code
ThinWire Ethernet Station Adapter	DESTA-AA

### DECconnect ThinWire Configurations

The DECconnect communications system recommends an installation that includes ThinWire coaxial cable and two twisted-pair cables (one for DEC423 and one for the telephone) distributed in a radial topology from a local work area to a satellite equipment room. The ThinWire cable extends, without interruption, from a DEMPR in the satellite equipment room to an H3111 faceplate in the local work area, and then to PCs, workstations, or systems. Devices in the local work area can be daisy-chained on the ThinWire segment using T-connectors and DESTAs. The ThinWire cable attaches to the faceplate with a BNC connector. The total length of a ThinWire cable segment from DEMPR to farthest work area device is 185 meters.

#### Standalone (Local) Configuration

In standalone or local configurations, a multiport repeater (DEMPR) acts as a hub. Up to eight ThinWire segments run from the DEMPR to the local work areas without interruption. In the local work area, ThinWire cables connect to PCs, workstations, and low-end systems. The DEMPR connects devices from up to eight local work areas in this configuration. The DEMPR also isolates faults in a segment, keeping the rest of the segments in operation. The following figure illustrates a standalone configuration in local work areas.



A larger standalone network can be formed by connecting up to eight DEMPR hubs to a Local Network Interconnect (DELNI). This configuration can service up to 64 local work areas.

**Connected (Global) Configurations**

In connected or global configurations, multiple standalone configurations are connected to standard baseband 802.3/Ethernet cable. A DEMPR with up to eight ThinWire segments can be connected to the standard baseband cable using a standard baseband transceiver. This configuration provides standard baseband 802.3/Ethernet service for up to eight local work areas. (A single ThinWire segment with up to 29 stations may be connected to standard baseband cable using a DESPR.)

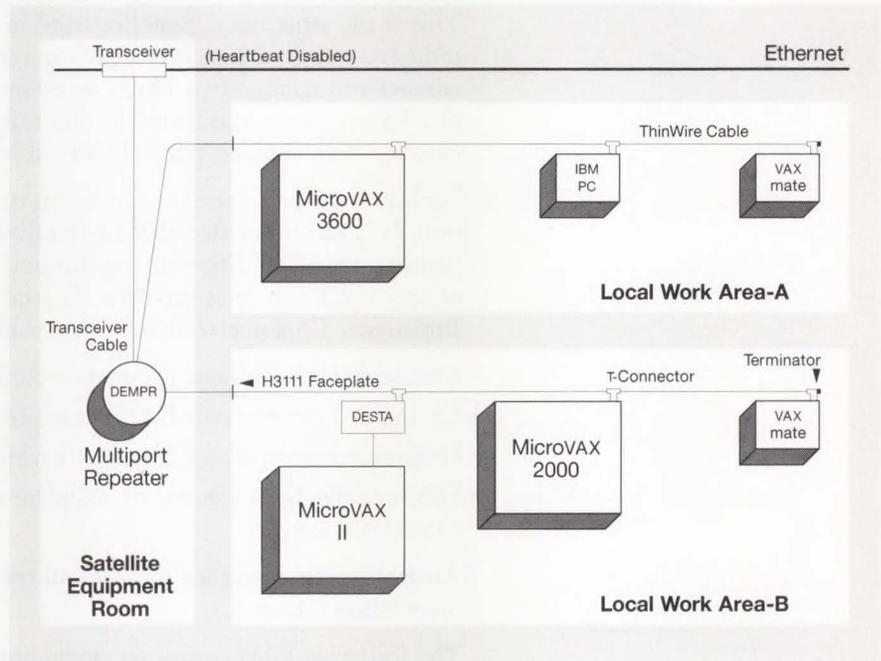
A DELNI with up to eight attached DEMPRs/DESPRs must be connected to standard baseband cable using an H4005 (or H4000-BA) transceiver. This configuration provides standard 802.3/Ethernet service for up to 64 local work areas.

When a DELNI/DEMPR combination is connected to a standard baseband cable segment, the following restrictions apply:

- The standard segment must be less than 300 meters.
- Connection to other standard segments must use a LAN Bridge (DEBET) only.

When connected to standard baseband cable, the DEMPR or DESPR counts as a repeater in the configuration. A message transmitted on a local area network must pass through no more than two repeaters (DEREP, DEMPR, or DESPR) before either reaching its destination or passing through a LAN Bridge.

DECconnect ThinWire Connected Configuration (Global DEMPR Configuration)



NBG-142-01

Unshielded twisted-pair 802.3/Ethernet products provide full 10 Mb/s Ethernet capability over telephone-type unshielded twisted-pair cabling. This is the same type of cabling used in DECconnect and many other industry-standard structured cabling systems. Through the use of passive adapter products, active ThinWire components, such as the DEMPR, DESPR or DESTA, can be connected to desktop computers and low-end systems over most unshielded twisted-pair cable.

Each twisted-pair segment can be up to 70 meters long from SER to station. It is recommended that all installed unshielded twisted-pair cabling planned for 802.3/Ethernet applications should be tested before installation of any 802.3/Ethernet products. Digital Field Service can provide Line Impedance Characterization Testing (LICT) on a custom quotation basis.

Unshielded twisted-pair products include

- Unshielded twisted-pair Ethernet office adapter.
- Unshielded twisted-pair Ethernet wiring closet/SER adapter.
- Office cables from adapter to wallplate and cables from DEMPR to wiring closet/SER adapter.

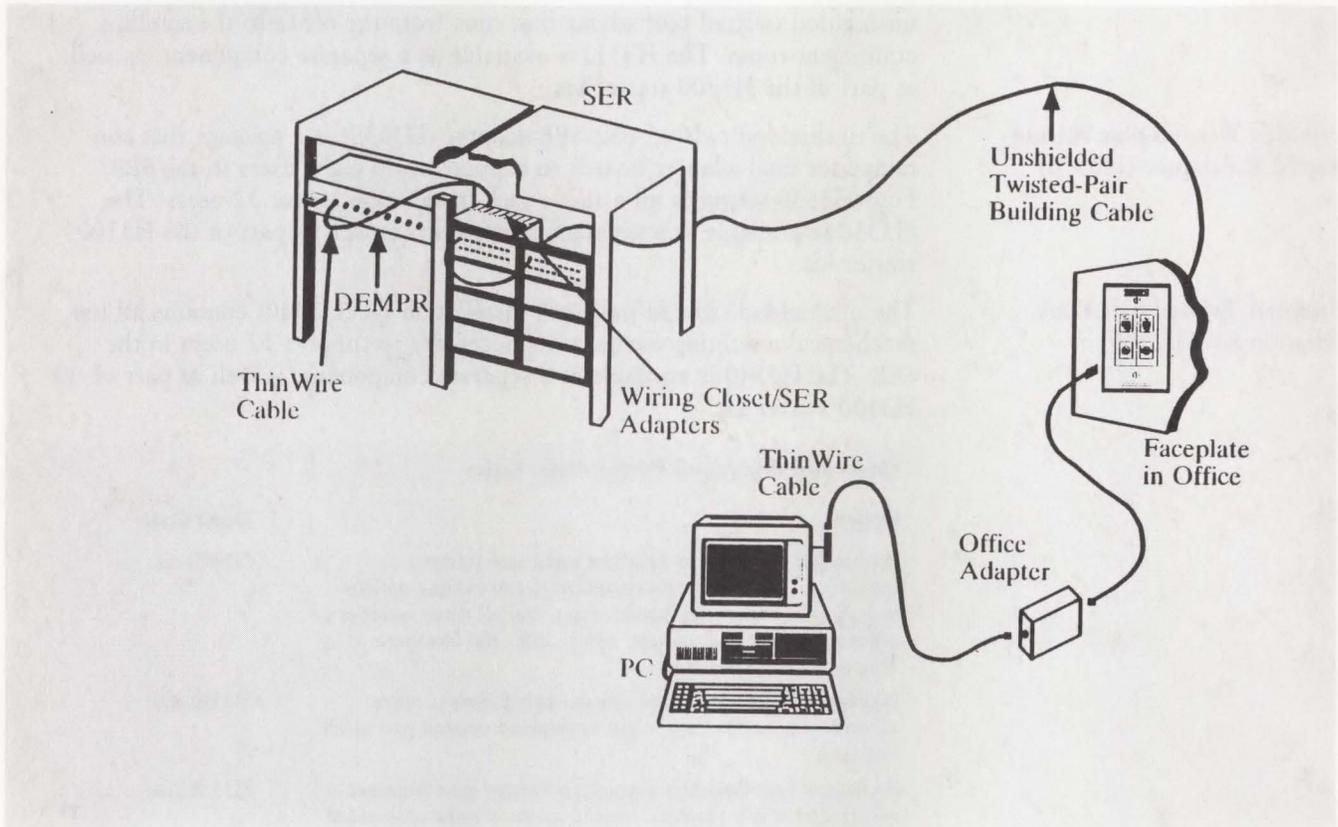
An eight-user starter kit includes all the components above plus a rack installation kit.

The following table compares media options for PC/Workstation connectivity.:

### *Media Options for PC/Workstation Connectivity*

<b>Thinwire</b>	<b>Unshielded Twisted-pair</b>
Shielded coax	De facto standard (telephone wire)
EMI-RFI protection	Can use cable already installed
Distances to 185 meters	Distances to 70 meters

*Unshielded Twisted-pair Configuration*



**Unshielded Twisted-pair Starter Kit (H3300)**

The unshielded twisted-pair starter kit (H3300) provides all the components required to connect eight offices to a DEMPR via unshielded twisted-pair cabling. These components include one H3310, one H3330, one H3340, and all necessary cabling.

## Unshielded Twisted-pair 802.3/Ethernet Products

### Unshielded Twisted-pair Ethernet Office Adapter (H3310)

The unshielded twisted-pair Ethernet office adapter (H3310) is a package of eight passive adapters that allow 802.3/Ethernet stations to connect to unshielded twisted-pair wiring that runs from the office to the satellite equipment room. The H3310 is available as a separate component, as well as part of the H3300 starter kit.

### Unshielded Twisted-pair Wiring Closet/SER Adapter (H3330)

The unshielded twisted-pair SER adapter (H3330) is a package that contains four dual adapter boards to support up to eight users in the SER. Four H3330 adapters fill a single rack installation kit for 32 users. The H3330 is available as a separate component, as well as part of the H3300 starter kit.

### Unshielded Twisted-pair Rack Installation Kit (H3340)

The unshielded twisted-pair rack installation kit (H3340) contains all the mechanical mounting components necessary to support 32 users in the SER. The H3340 is available as a separate component, as well as part of the H3300 starter kit.

#### *Unshielded Twisted-pair Product Order Codes*

<b>Option</b>	<b>Order Code</b>
Unshielded twisted-pair Ethernet eight-line starter kit. Includes all office and SER components and cabling options, including ThinWire SER patch cables, and all three varieties of office cables for DECconnect, AT&T, IBM, and Northern Telecom cabling systems.	H3300-AA
Package of eight unshielded twisted-pair Ethernet office adapters. (Accommodates eight unshielded twisted-pair office segments.)	H3310-AA
Package of four dual-line unshielded twisted-pair Ethernet wiring closet/SER adapters. (Accommodates eight unshielded twisted-pair office segments.)	H3330-AA
Unshielded twisted-pair Ethernet rack installation kit. Includes enclosure and mounting hardware for H3330 SER adapters.	H3340-AA
Package of 50 modified modular plug (MMP) connectors for terminating twisted-pair segments.	H8226
Package of eight DECconnect SER patching cables, 3-foot length for SER 6-pin MMP to 6-pin MMP.	BS16Q-03
Package of eight DECconnect office cables, 1-foot length for office 6-pin MMP to 6-pin MMP.	BS16R-02
Package of eight Northern Telecom office cables, 2-foot length for office 6-pin modular plug (MP) to 6-pin MMP	BS16S-02
Package of eight AT&T, IBM office cable, 2-foot length for office 8-pin MP to 6-pin MMP	BS16U-02
Package of eight ThinWire SER/OCC patch cables, 8-foot length.	BS16K-08

## Unshielded Twisted-pair 802.3/Ethernet Products

### 802.3/Ethernet Adapters for IBM Shielded Twisted-pair Cabling

The 802.3/Ethernet Adapters for IBM Shielded Twisted-pair Cabling connect workstations and personal computers over IBM Shielded Twisted-pair cabling to 10 Mb/s 802.3/Ethernet Local Area Network by adapting from a ThinWire 802.3/Ethernet port in a workstation or PC to IBM shielded twisted-pair cabling. A second adapter sends the signal from the IBM Cabling back again to connect to a Digital ThinWire single port repeater (DESPR) or multiport repeater (DEMPR). This takes advantage of the Digital 802.3/Ethernet technology, while protecting the investment in installed IBM cabling.

Components of the 802.3/Ethernet Adapters for IBM Shielded Twisted-pair Cabling are listed in the order code table. Refer to your local sales representative for applied configuration information.

#### *802.3/Ethernet Adapters for IBM Shielded Twisted-pair Cabling Order Codes*

<b>Option</b>	<b>Order Code</b>
802.3/Ethernet Adapters for IBM Shielded Twisted-pair cabling. Complete starter kit for 8 connections.	H3301-AA
Office adapters (8-pack).	H3311-AA
Conversion cable for IBM Shielded Twisted-pair to Digital ThinWire. One-meter length (8-pack).	BS10C-01
Conversion cable for IBM Shielded Twisted-pair to Digital ThinWire. Three-meter length (8-pack).	BS10D-03
ThinWire cables (8-pack).	BS16K-08

**DECconnect Modular Faceplate  
(H3111-C)**



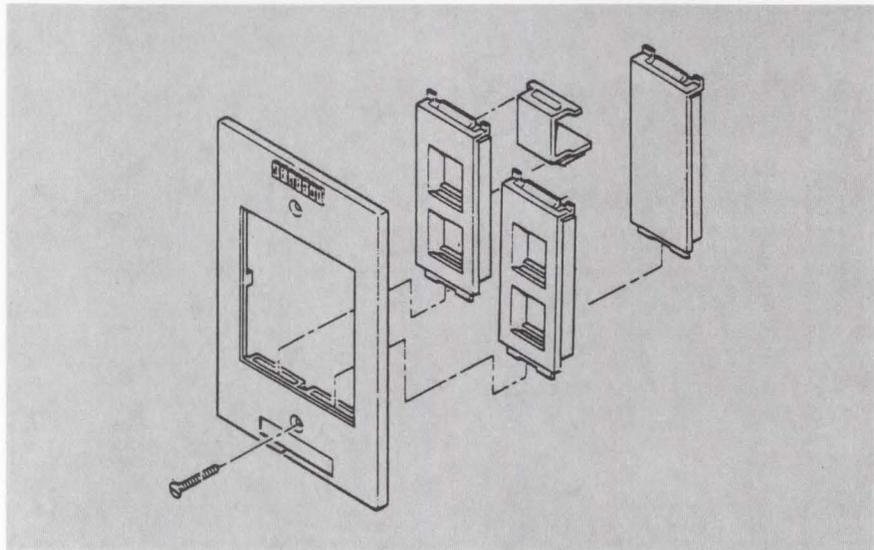
*Fully Configured Modular Faceplate*

DECconnect faceplate products can be used in new installations or as replacement products. The faceplates come with plugs to cover any unused openings; the desired connectors are chosen separately. The modular phone jack and modified modular data jack are the same size: A customer can use two telephones or two data connectors, rather than one of each.

The DECconnect modular faceplate (H3111-C) supports a choice of faceplate connectors by accommodating virtually any combination of low-speed data (terminals), 802.3/Ethernet (PCs/Workstations) and/or multiple voice connections, up to a total of four "snap-in" connectors per faceplate. This flexibility allows customers to support many combinations of data and voice applications to meet at a single faceplate.

The Modular Faceplate is a frame that accepts any combination of two types of inserts, blank or double opening. These inserts are then "snap-mounted" into the faceplate frame. The inserts in turn accept any of the traditional "snap-in" connectors including the modular jack (MJ) for telephones and modified modular jack (MMJ) for low-speed data transmissions. A snap-in BNC (ThinWire) connector is available for the faceplate. The faceplate provides total flexibility in that multiple voice and data connections can be supported from the same faceplate, and a single, flexible configuration of telephone, unshielded twisted-pair and ThinWire can be wired from every faceplate to accommodate the needs of a single office user.

**H3111-C Modular Faceplate**



**Features**

- Modular, snap-in design allows faceplate to meet individual requirements.
- Easy, installation simplifies moves, adds, and changes.
- The faceplate, designed to an industry-standard form factor, does not require custom wall boxes, and allows for the use of standard in-the-wall electrical boxes, single- or dual-gang and side-by-side mounting of multiple faceplates.

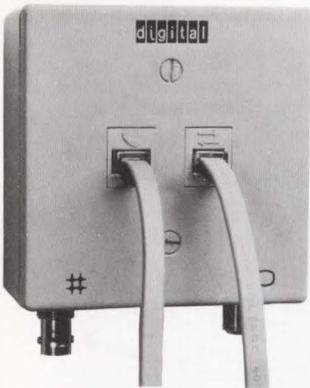
### Ordering Information

The modular faceplate is sold in kits of eight individually packaged faceplates. Each package contains the faceplate plus three inserts (one blank and two doubles) to allow any combination of one-to-four snap-in connectors. Connectors are purchased separately.

### Surface-mount Wallbox

The H3111-D Surface-mount Wallbox, with mounting hardware, supports DECconnect Modular Faceplate H3111-C in surface-mount applications. As modular office cubicles increase, many facilities require surface-mounted faceplates rather than flush-mounted faceplates, which have wallboxes actually in the walls. The H3111-D kit has mounting hardware that adapts to most common types of office furniture wall partitions, and is used with DECconnect Modular Faceplate H3111-C. This combination can be used instead of the fixed connector surface mount faceplates H3111-A.

### Surface-mount Faceplate



The H3111-A is a combination surface-mount box and faceplate, self-enclosed for mounting to the walls of modular furniture, concrete walls, or walls where internal cabling is prohibited. Its cables run to the box from a raceway or along the floor, depending on the type of furniture and panels installed. The cables enter the box from the top or bottom, rather than from behind, and the box is mounted to the wall or furniture with double-sided tape or magnets (included).

### Faceplate Installation Tool Kit

An H8242 faceplate installation tool kit is required to install the faceplate. The tool kit includes the following:

- A stripping tool to prepare the ThinWire before attaching the BNC connector
- A crimp tool to attach the ThinWire cable to the back of the BNC connector
- A punch-down tool to attach the twisted-pair cable to the back of the modified modular jacks (MMJ) and modular jacks (MJ)
- A socket wrench to attach the BNC connector and the F connector to the faceplate
- Loopback connectors for testing

At least one tool kit is required per facility, but it is recommended to have at least one tool kit for every 100-120 faceplates. (This figure is based on the size of the facility and the need for multiple installation resources: It is not based on the life expectancy of the tool.)

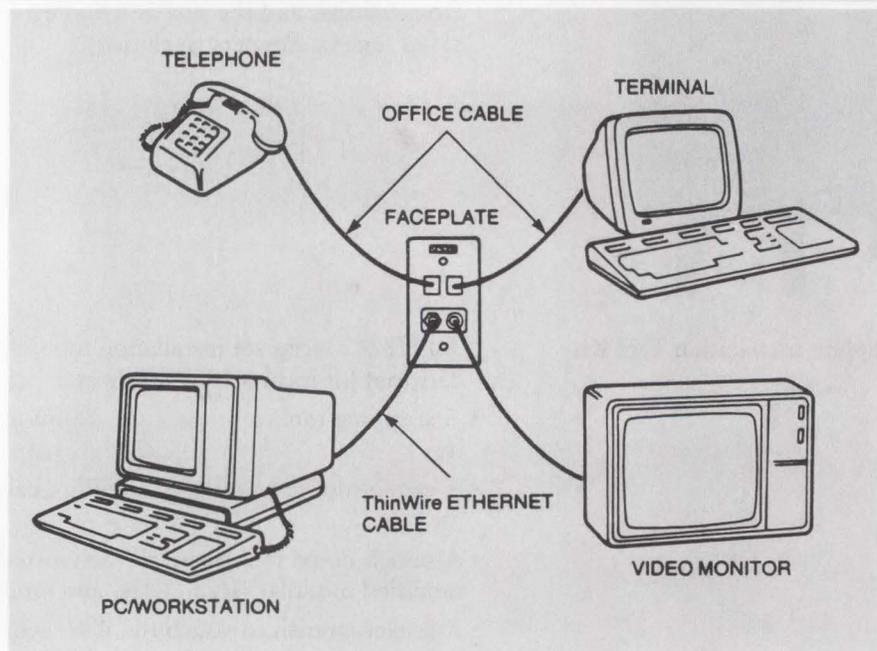
## DECconnect Faceplate Products

### Faceplate Jacks and Connectors

DECconnect jacks and connectors are used to customize the faceplate to provide essential network connections in office or other work areas. Jacks and connectors are available for four connections:

- High-speed data over ThinWire Ethernet using a BNC connector (H3114), for use with the H3111-A or H3111-C faceplates.
- Low-speed data with DEC423 (EIA-423-A) signaling using a modified modular jack (H3111-A) for use with H3111-A or H3111-C faceplates.
- Voice connection combined with the PBX vendor of choice using one of three modular jacks (H3112-A, H3112-B, or H3112-D) for use with the H3111-A or H3111-C faceplates. The H3112-A jack supports AT&T wiring, the H3112-B jack supports a Northern Telecom PBX or Rolm PBX, and the H3112-D is a universal 8-pin modular jack that accommodates other PBXs. They can be snapped into the faceplate along with the H3113 for the DEC423 wiring.
- Video connection using a standard F video connector (H3115) for use with H3111-A or H3111-C faceplates.

*Office Faceplate Configuration*



## DECconnect Faceplate Products

### Faceplate Product Order Codes

Option	Order Code
DECconnect surfacemount faceplates, package of eight	H3111-A
DECconnect modular faceplates, package of eight	H3111-C
Modular jacks for AT&T connection, package of eight	H3112-A
Modular jacks for Northern Telecom, Rolm PBX connections, package of eight	H3112-B
Modular jacks for universal telephone connections, package of eight	H3112-D
Modified modular jacks for EIA-423-A signaling, package of eight	H3113-A
Modified modular jacks for H3107-A only, package of eight	H3113-B
ThinWire Ethernet BNC bulkhead faceplate connectors, package of eight	H3114-AB
F-style video connector, package of eight	H3115
Faceplate installation tool kit	H8242

### DECconnect Daisy-Chain Connector

To order cables, refer to “Communications Cables” in Section 3.

The DECconnect Daisy-Chain Connector Tap (H3114-AA) assembly provides structured cabling support for serial connection of workstations behind the wall. Workstations or PCs are connected to the Daisy-Chain Connector Tap with Daisy-Chain Connector Cables BN24A-2E (8.2 ft.) or BN24A-3E (12 ft.) which comprise two separate ThinWire cables in a single sheath with single connectors. Up to eight workstations can be supported on a single segment of ThinWire coaxial cable. Designed specifically for use with DECconnect Modular Faceplate H3111-C, the tap uses the snap-in feature of the faceplate. Each Daisy-Chain Tap assembly uses two of the faceplate’s four connector positions.

The Daisy-Chain Connector allows workstations to be connected or disconnected from the LAN without disrupting the network or disconnecting downline nodes. Each daisy-chained segment must be terminated with a 50-ohm daisy chain terminator, installed after the final Daisy-Chain Tap assembly. Maximum distance for ThinWire behind the wall (excluding the Daisy-Chain Connector Cables) is 125 meters. T-Connectors are not used with Daisy-Chain Connectors.

Tap components are sold in packages of 8. Cables are sold individually.

The H3115-AA Video Connector provides snap-in video connections for DECconnect Modular Faceplate H3111-C. Combined with the H3111-C, the new H3115-AA provides the same video capabilities as the H3111-A/B (non-modular) DECconnect faceplate, allowing flexibility for users who require video connectivity in a structured cabling environment.

For applications such as teleconferencing, medical video networks, or security, DECconnect provides a structured cabling solution that includes integrated video connectivity, and the snap-in video connector allows users to choose the services they wish to include with video in a modular manner.

### Video Connector



H8571-A



H8571-B



H8572

DECconnect terminal-connection components are the cables, connectors, and adapters used to link terminals, terminal servers, and computer hosts within the DECconnect communications system. Low-speed terminal communication in the DECconnect system uses the DEC423 standard, a superset of the EIA-423-A signaling standard. The Digital DEC423-based products enhance the industry standard EIA-232-D performance by

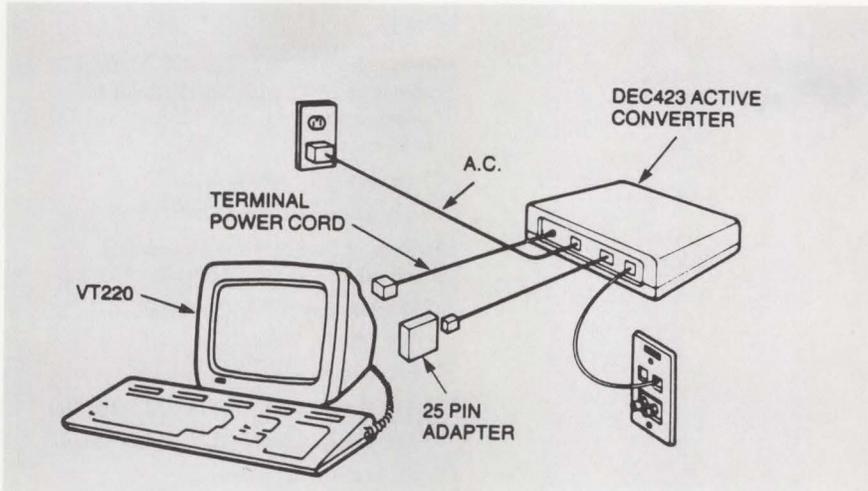
- Improving transmission speed.
- Increasing the distance that terminals can be located from host computers.
- Incorporating EOS/ESD protection.

Digital offers the following DEC423 products to connect devices using the EIA-423-A signaling standard and to adapt devices from EIA-232-D signaling to EIA-423-A signaling.

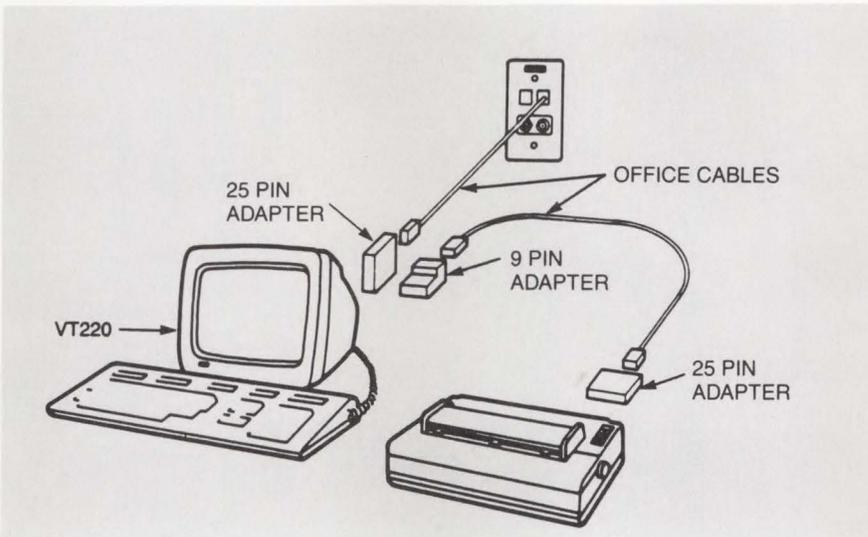
- Digital office cable—the DEC423 (EIA-423-A) standard office cable (BC16E), an unshielded six-conductor flat cable. The BC16E cable is terminated with a modified modular plug that has an offset key to prevent it from being accidentally plugged into the telephone jack.
- Modified modular plug (MMP)—the DEC423 standard connector. To connect MMPs into existing terminals and printers, passive physical adapters are required. Passive adapters allow both EIA-232 and EIA-423-A signaling to pass through. However, EIA-423-A devices, when connected to EIA-232-D wiring, are limited to EIA-232-D signaling parameters. Each passive adapter has a modified modular jack (MMJ) to receive the MMP.
- H8571-A adapter (25-pin D subminiature)—required for terminal connection.
- H8571-B adapter (9-pin D subminiature)—required for printer connection.
- H3105 active converter—allows customers to upgrade an EIA-232-D device to DEC423 and realize all the benefits of increased distance and EOS/ESD protection. As opposed to the passive adapters, which provide only a mechanical adaptation, the H3105 active converter transforms the electrical signal from an EIA-232-D interface to the signal for a DEC423 interface, thus allowing longer distances and better noise immunity.
- H8572 cable extender (6-conductor)—used to extend the length of two MMP preterminated cables.

## DECconnect Terminal-connection Components

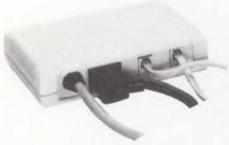
*Office Configuration with Passive Adapters*



*Office Configuration with Active Converter*



## DECconnect Terminal-connection Components



H3105

### *Terminal-connection Product Order Codes*

<b>Option</b>	<b>Order Code</b>
6-conductor DEC423 (EIA-423-A) office cable terminated with MMPs (Refer to "Communications Cables" in Section 3 for cable lengths.)	BC16E-xx
25-pin active converter (110 V)	H3105-A
25-pin active converter (220/240 V)	H3105-B
Package of 50 MMPs for 6-conductor office cable	H8220
1,000-foot spool of unterminated, 6-conductor, flat office cable	H8240
Crimp tool for 6-conductor cable	H8241
25-pin passive adapter (EIA-232-D female)	H8571-A
25-pin passive adapter (EIA-232-D male)	H8571-D
9-pin passive adapter	H8571-B
6-conductor cable extender	H8572

The DECconnect communications system offers the following network equipment mounting options.

- Satellite equipment room (SER) rack, H3120—designed to be used as a central hub servicing a large number of users (48-64) or up to 80 active connections by either direct connection or connection to smaller, remotely located equipment cabinets or patching panels. Because it is not enclosed with panels, doors, or other enclosures, it must be located within a secure room or wiring closet.
- Office communications cabinet (OCC), H9646-E—designed for customers who might not have or want a dedicated room to house an SER rack, or who prefer to use a standalone cabinet within an office area or computer room.
- Remote Wall Enclosure (RWE), H3131-A—designed to provide small, local work groups with a simple, easy-to-implement network connectivity solution for low-speed terminals via terminal servers (DECserver 200 or 500) and high-speed PC/Workstations via Ethernet multiport repeaters (DEMPRs) to an enterprise-wide 802.3/Ethernet backbone.

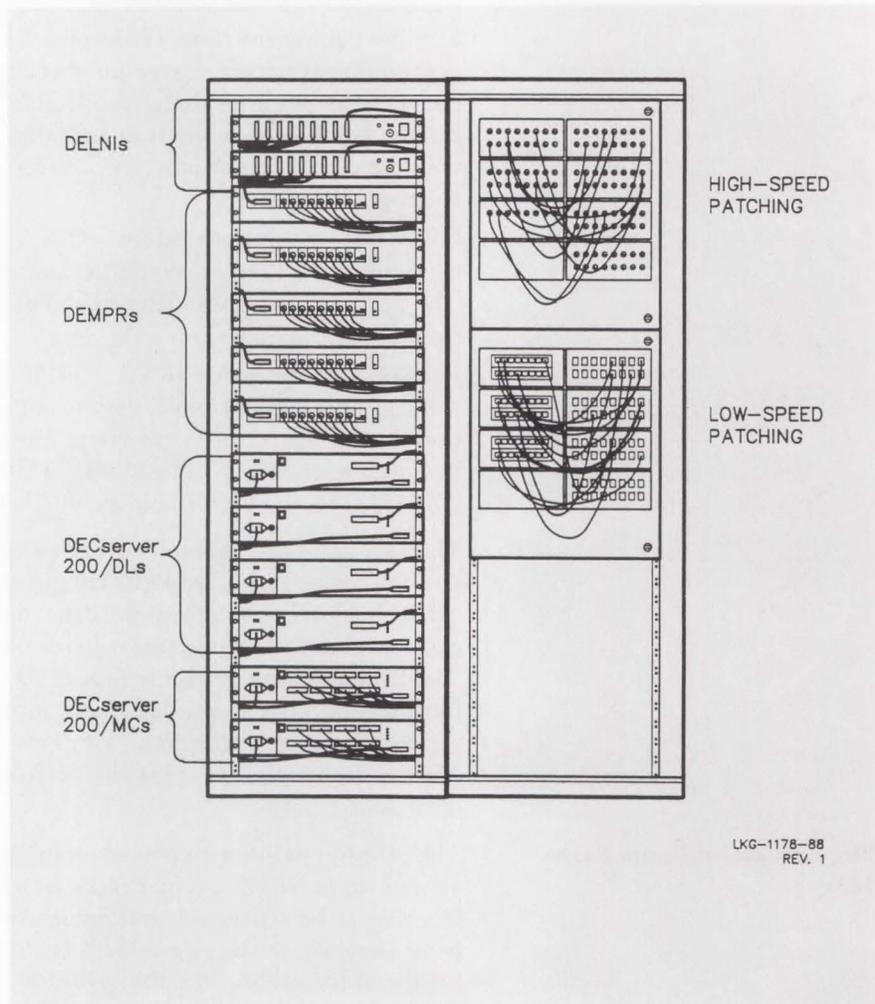
The SER and OCC cabinets utilize a common set of products known as building block kits. These kits comprise cable patching, termination panels, cables for low- and high-speed data applications, mounting hardware, and cable strain relief/management hardware. The building block kits offer the flexibility to easily configure SER racks and office communications cabinets for low- and high-speed data applications and office cable patching. They allow the network/telecommunications manager to meet the needs of current users, while keeping the flexibility to easily upgrade the cabinets to meet future needs.

### Satellite Equipment Room Rack (H3120)

The H3120 satellite equipment room rack comprises two industry-standard 19-inch-wide NEMA cabinet racks attached side by side. The rack on the left side is the active rack and houses the active network hardware component; the rack on the right side is the passive rack, the termination point for the office cabling and the mounting area for cable patching components that connect the office cabling to the active devices. This cabinet is designed to support up to 80 active connections.

## DECconnect Network Equipment Cabinet Products

### Satellite Equipment Room Configuration



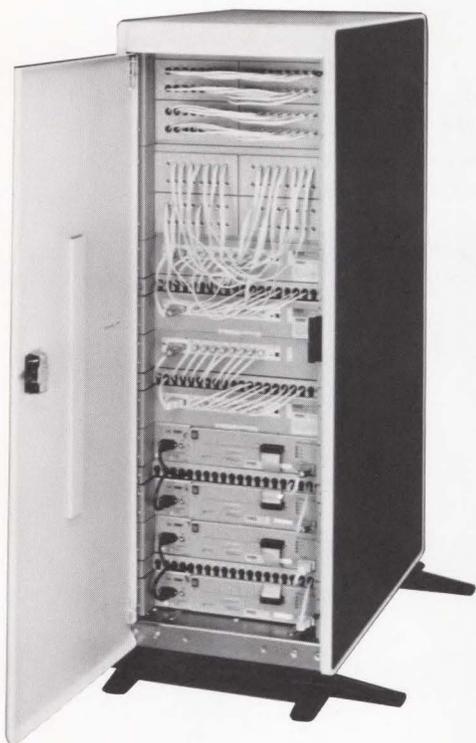
The H3120 includes two steel racks, power strip, cable managers, eight sets of rackmount brackets for DECservers or DEMPRs, one set of rackmount brackets for the DELNI, and two patch frame panels for mounting cable patch panels. Customers select patch panels, patch cords, and other accessories from the menu of building block kits to meet their application needs. ▲ Refer to "Cabinet Building Block Kits" in this section for more information.

The H3120 must be housed within a secure room or wiring closet. Each dual rack is 88 inches high, 46 inches wide, and 23 inches deep. The general room minimum requirements are 65 inches deep/wide and 96 inches long with a ceiling at least 96 inches high. These dimensions allow sufficient space for accommodating a telephone and/or video patching area.

The H3120 can accommodate a wide variety of Digital network hardware such as the DECserver 200 and 500, DEMPRs, DELNIs, and the LAN Bridge 100. Additionally, many 19-inch industry standard rackmountable products can be accommodated if they meet environmental and power considerations.

## DECconnect Network Equipment Cabinet Products

### Office Communications Cabinet (H9646-E)



#### *SER Rack Order Code*

Option	Order Code
SER starter racks, power strip, cable managers, cable trays, patching frames, and miscellaneous hardware, 110-120 Vac	H3120

The H9646-E DECconnect office communications cabinet (OCC) is a standalone cabinet, as opposed to the H3120 SER rack, which requires a secure room. The cabinet is attractive and takes little floor space, making it suitable for an office. This product is ideal for small departments that plan to expand and that need a secure environment for their networking products.

The H9646-E office communications cabinet, which complements the 64-user Satellite Equipment Room rack (H3120), can accommodate a variety of devices that mount in a 19-inch rack.

#### **Features**

- Enclosed cabinet with standard 19-inch frames
- Locks on both front and rear doors
- Power strip for up to nine devices
- Patch panels for cable management

The H9646-E cabinets have sufficient space to accommodate the cabinet building block kits, which allow customers to configure a cabinet to meet specific requirements for number of users and types of network applications (such as low- or high-speed connections.) ▲ Refer to “Cabinet Building Kits” in this section for more information.

#### **Preconfigured Office Communications Cabinet (H3130-A)**

The H3130-A office communications cabinet is a preconfigured version of the H9646-E cabinet. It includes enough passive components, cables (excluding transceiver cable), and hardware to accommodate one DELNI, four DECserver 200s, and four ThinWire multiport repeaters (DEMPRs), allowing a total of 32 high- and low-speed connections with full patching capability.

#### *Office Communications Cabinet Order Codes*

Option	Order Code
60-inch network equipment cabinet, includes side panels, top cover, front and rear locking doors and 120 Vac power strip. Does not include any other active or passive hardware components.	H9646-EA
Network equipment cabinet, same as H9646-EA except that it contains a 220/240 Vac power strip	H9646-EB
Office communications cabinet, includes enough patching components and cables to support 32 low- and high-speed users, 110/120 Vac	H3130-A2
Office communications cabinet, same as H3130-A2, except that it contains a 220/240 Vac power strip	H3130-A3

## DECconnect Network Equipment Cabinet Products

### Cabinet Building Block Kits

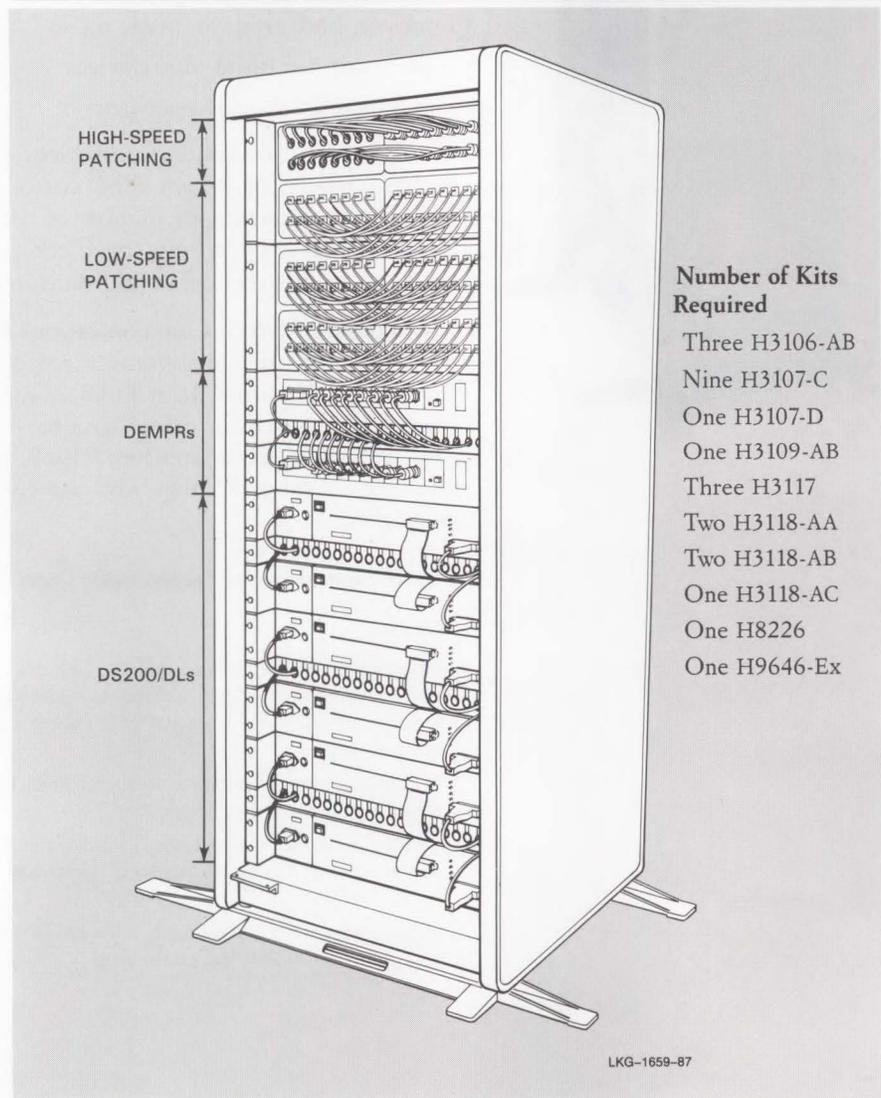
The cabinet building block kits consist of DECconnect patching and termination products, mounting brackets for rackmounting termination panels, recessed mounting brackets for DEMPRs, DECservers and DELNIs, and cables. These kits are used with either the H9646-E office communications cabinet or H3120 satellite equipment room rack. They allow customers to patch in current users, while offering the flexibility to configure future user support in 16-user increments.

All the components meet industry standards, allowing them to mount in any 19-inch wide rack.

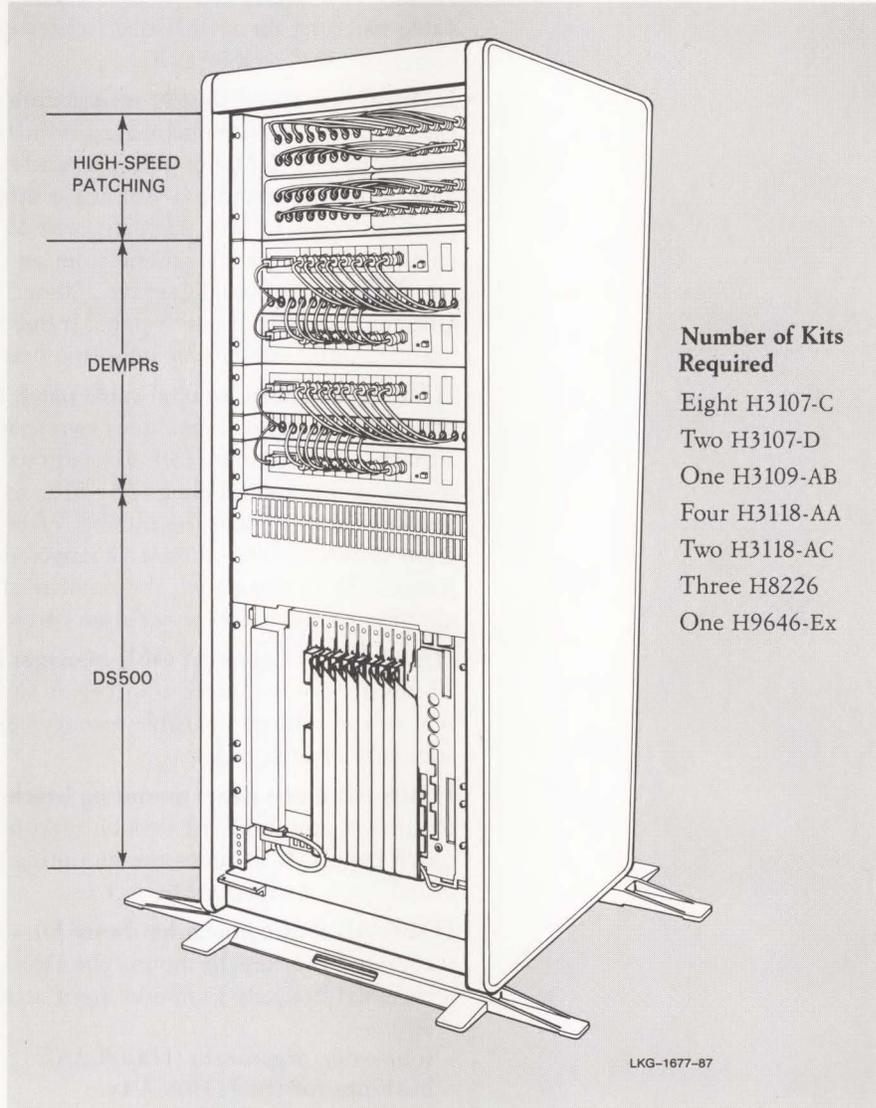
#### ***Building Block Ordering Examples***

The following two figures show examples of using the building block kits. The examples list all the components required for two Digital-supported configurations for the H9646-E series cabinet racks. The components are ordered separately from the Building Block Kit Order Code table.

#### ***H9646-E Cabinet Configuration for 48 Low-speed, 16 High-speed Connections with 100 Patching***



*H9646-E Cabinet Configuration for 128 Low-speed, 32 High-speed Connections with No Patching*



- Number of Kits Required**
- Eight H3107-C
  - Two H3107-D
  - One H3109-AB
  - Four H3118-AA
  - Two H3118-AC
  - Three H8226
  - One H9646-Ex

**Cabinet Kit Descriptions**

The following list describes several cabinet kits. ▲ For information regarding other building block components such as ThinWire patch cable kits and DECconnect patch-panel mounting brackets, refer to the Building Block Kit Order Code table.

- **H3106-AB flip adapters**—two flip adapters, attached to the 36-conductor ribbon cables, connect the H3107-C patch panels on the front of the H9646-E cabinet to the H3107-Cs mounted in the rear of the cabinet. The rear-mounted H3107-Cs are used as termination panels for building/office twisted-pair wiring. The H3106-AB provides a “flip” in the signal paths required when these two identical panels are used in this configuration.

## DECconnect Network Equipment Cabinet Products

- **H3107-A low-speed 16-user termination patch panel**—has 16 individual snap-in MMJ connectors, which allow for “punching down” unshielded twisted-pair cable. It is primarily used with the H3120 SER cabinet and for cable patching the unshielded twisted-pair 802.3/Ethernet product within either the SER rack or OCC.
- **H3107-C low-speed 16-user termination patch panel**—primarily used with the OCC and remote-enclosure products. Includes 16 PC-mount modified modular jacks (MMJ) on one side and two 36-pin connectors on the other. The building twisted-pair cabling is attached to the panels using modified modular plugs (MMP) (H8226). The MMPs, attached to building wiring, snap into these panels on one side; on the other side is a 36-pin connector for attaching to the DECserver 200 or 500. This panel fits into both the DECconnect hinged patch-panel frame (H3127) that comes with the H3120 and the DECconnect rackmounting bracket (H3108-AB).
- **H3107-D ThinWire coaxial cable patch block**—supports 16 high-speed office terminations. It includes two snap-in panels for ThinWire 802.3/Ethernet connections, 16 bulkhead coaxial connectors, bushings for cable management, and labeling. The BNC mounts into the plastic panels without bushings and reduces the number of BNC connections (because the office connections are now directly connected on the right side of the patch panels). With this panel, the number of ThinWire cables is reduced by eliminating the need for separate patch cables.
- **H3108-AA DECconnect cable-manager bracket**—provides strain relief for ThinWire, 36-conductor transceiver and cables, and guides the cable to the rear of the cabinet for cable management. This bracket mounts into any standard 19-inch rack.
- **H3108-AB Patch-panel mounting bracket**—has four cutout openings, mounts in any standard 19-inch rack, and is used with any the H3107-series patch panels. It includes the mounting bracket, two cable stress-relief rods, four U-nuts and mounting screws.
- **H3109-AB DECconnect hardware kit**—contains
  - recessed brackets to mount one DELNI.
  - recessed brackets to mount eight active devices, DEMPR or DECserver 200.
  - four cable organizers (H3108-AA).
  - bushings for the H3108-AAs.
  - various screws, tie wraps, and cable clips.
  - three patch-panel brackets (H3108-AB).
  - six strain-relief rods for providing cable strain relief (used with the H3108-AB panels).
- **H9646-E 60-inch network equipment cabinet**—fully enclosed, including side panels, top cover, front and rear locking doors, and rear-mounted cable-manager bracket. The cabinet includes a 12-amp power strip with 10 receptacle outlets and 15-amp circuit breaker. The power strip provides power to all the active hardware components, such as DECservers or DEMPRs.

## DECconnect Network Equipment Cabinet Products

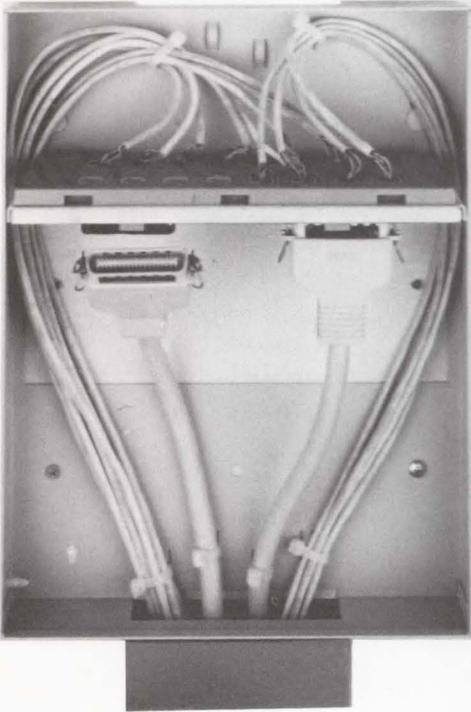
### *Building Block Kit Order Codes*

Flip adapter kit, containing two male 36-conductor flip adapters used with ribbon cables and H3107-C for patching DECserver 200/DL or DECserver 500/550 active connections	H3106-AB
16-user patch panel with 16 individual snap-in modified modular jacks for "punching down" unshielded twisted-pair cable in the H3120 SER rack	H3107-A
16-user patch panel with 16 PC-mounted modified modular jacks to patch building/office wiring for low-speed data to two DECserver 200 terminal servers in the H9646-E series OCC	H3107-C
16-user patch panel used to patch ThinWire cable to two ThinWire Ethernet multiport repeaters. It contains 16 female BNC bulkhead connectors for terminating the building/office ThinWire cable within the patch panel.	H3107-D
Cable-manager bracket kit	H3108-AA
Patch-panel mounting bracket kit	H3108-AB
DECconnect hardware kit	H3109-AB
Blank panel kit, containing eight blank panels for mounting in the patch panel brackets	H3116-AA
Package of 16 two-foot low-speed DEC423 (EIA-423-A) patch cords	H3117
Package of 16 two-foot high-speed ThinWire patch cords	H3118
Package of four 36-conductor ribbon cables, each eight feet long (connects servers to patch field)	H3118-AA
Package of four 36-conductor ribbon cables, each three feet long (connects H3107-C patch panels)	H3118-AB
ThinWire patch cable kit, containing 16 8-foot male-to-male patch cables for the H3107-D	H3118-AC
DEMPR/DECserver 200 recessed bracket rackmounting kit, containing all the necessary hardware to mount one DECserver 200 and/or one DEMPR in a 19-inch-wide cabinet	H3119-AA
DELNI mounting kit, containing two recessed brackets to mount one DELNI	H3126-AA
Package of 50 modified modular plugs/connectors for field termination of unshielded twisted-pair cable, solid wire only	H8226

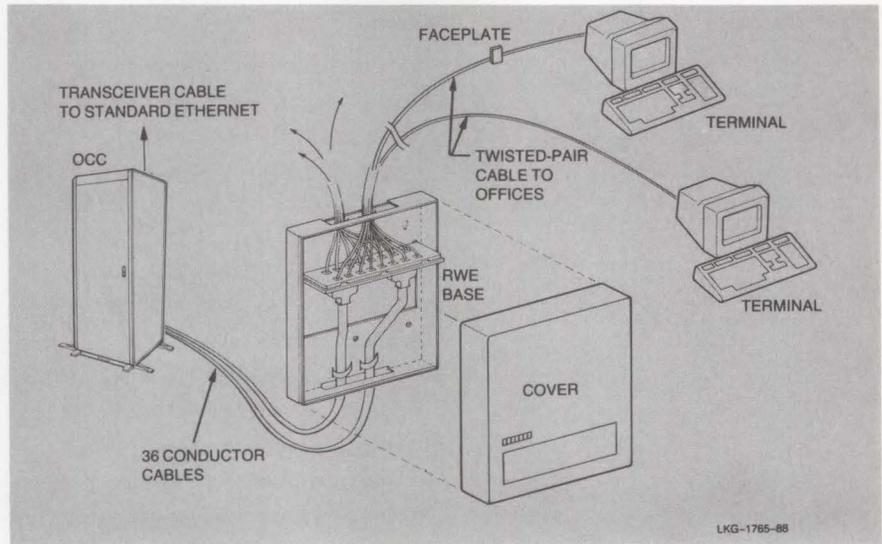
### **DECconnect Remote Wall Enclosure (H3131-A)**

The DECconnect Remote Wall Enclosure (RWE), H3131-A, is a wall-mounted metal enclosure that houses passive patching equipment to support a radial wiring topology for either 16 high- or 16 low-speed data lines running over unshielded twisted pair cabling. The RWE provides small, local work groups with a simple, easy-to-implement network connectivity solution for low-speed terminals via terminal servers (DECserver 200 or 500) and high-speed PC/Workstations via Ethernet multiport repeaters (DEMPR) to an enterprise-wide Ethernet backbone. The DECconnect Remote Wall Enclosure provides a cost-effective alternative to a Satellite Equipment Room (SER) or Office Communications Cabinet (OCC).





*RWE Configuration for Remote Terminal Server*



**Features**

- Compact wallmounted enclosure uses no floor space.
- Aesthetically acceptable for office applications.
- Local patching/cable termination simplifies moves, additions, and changes.

**Ordering Information**

For low-speed communications, the maximum length for a 36-conductor cable run between an RWE and a terminal server is 300 feet.

For high-speed communications,

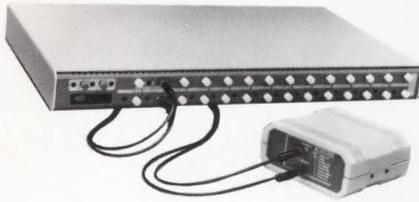
- The maximum length for a twisted-pair cable running 802.3/Ethernet communications is 230 feet.
- Twisted-pair cables terminate at twisted-pair Ethernet adapters, which in turn use a short section of ThinWire to connect to the respective devices. The total length of ThinWire cable—the cable leading from the RWE to the DEMPR plus the cable leading from the office adapter to the end user equipment—must not exceed 10 meters.

## DECconnect Network Equipment Cabinet Products

### *Remote Wall Enclosure Order Codes*

<b>Option</b>	<b>Order Code</b>
DECconnect remote wall enclosure	H3131-A
Unshielded twisted-pair card cage kit	H3131-B
Connector kit, 36-conductor cable	H8227-A
Tool kit, termination 36-conductor cable	H8101
36-conductor cable spool, PVC, 250 feet	H8247-A
36-conductor cable spool, PVC, 1000 feet	H8247-B
36-conductor cable spool, FEP, 250 feet	H8248-A
36-conductor cable spool, FEP, 1000 feet	H8248-B
Kit of 16 ThinWire cables	H3118-AC
Kit of eight unshielded twisted-pair office adapters	H3310-AA
Unshielded twisted-pair 802.3/Ethernet SER card	H3330-AA
Terminal patching "low-speed" panel	H3107-C
Wallmount kit, DECserver, DEMPR	H039
Super 8-pack unshielded twisted-pair office adapters	H3300-AA

### Fiber Optic Ethernet System



This Fiber Optic Ethernet system provides the capability for distributing an Ethernet backbone over a structured fiber optic cabling system, eliminating the need for baseband coaxial cable. Structured cabling for fiber often means that the network is distributed over a star or radial topology. Star topology differs from traditional Ethernet bus topology by allowing the Ethernet backbone to fan out from multiport, active network hub(s) to other hubs within a building, or to hubs located in other buildings which might be within a campus complex.

The fiber optic Ethernet system comprises two components: a fiber optic multiport star (hub) with Transceiver either eight or fourteen ports, and a fiber-to-copper transceiver. The products, manufactured by Chipcom Corp., a Digital strategic partner, are sold by Digital's Field Service organization under the Chipcom label.

These products operate over 62.5/125-micron fiber, using ST-type connectors (the same fiber and connector types endorsed by the both the ANSI FDDI and EIA Building Wiring committees). Digital recommends that customers install the "dual-window" version of this fiber, which is optimized for both Ethernet and FDDI applications. Other fiber types (i.e., 50/125) are not recommended because they restrict operating distances and the possibly future FDDI implementation..

A properly configured system, implemented on a structured fiber optic cabling system consisting of 62.5/125 fiber, supports maximum distances of 0.93 miles (1.5 km) between a star and a fiber transceiver.

Digital does not currently offer either the cable or connectors through traditional sales channels, such as DECdirect; however, all these products are available through Digital's Field Service Network and Site Services, as well as through authorized distributors such as Anixter Bros., Inc. ▲ Refer to "Fiber Optic Cables," elsewhere in this section, for cable specifications.

#### Features

- Connects to both IEEE 802.3 and Ethernet V2.0 copper-based products, ensuring backward compatibility of products and protection against obsolescence.
- 100 percent CSMA/CD (collision detection) performance guarantees maximum network efficiency data integrity.
- Extensive link and media level LEDs allow diagnosis of any local and/or remote media- and hardware-related problems from a single location.
- Products are optimized around EIA/ANSI committees' industry-endorsed, 62.5-micron fiber and ST-type connector standards, assuring Ethernet investment protection and a guaranteed growth path to FDDI.
- Architecture eliminates the requirement of using repeater devices for interconnection of active fiber stars. This simplifies the connection of a fiber backbone to many copper based LANs, which can already have the maximum number of allowable repeaters per network.
- Backup fan and optional power supply maximize network uptime.

## Fiber Optic Ethernet Products

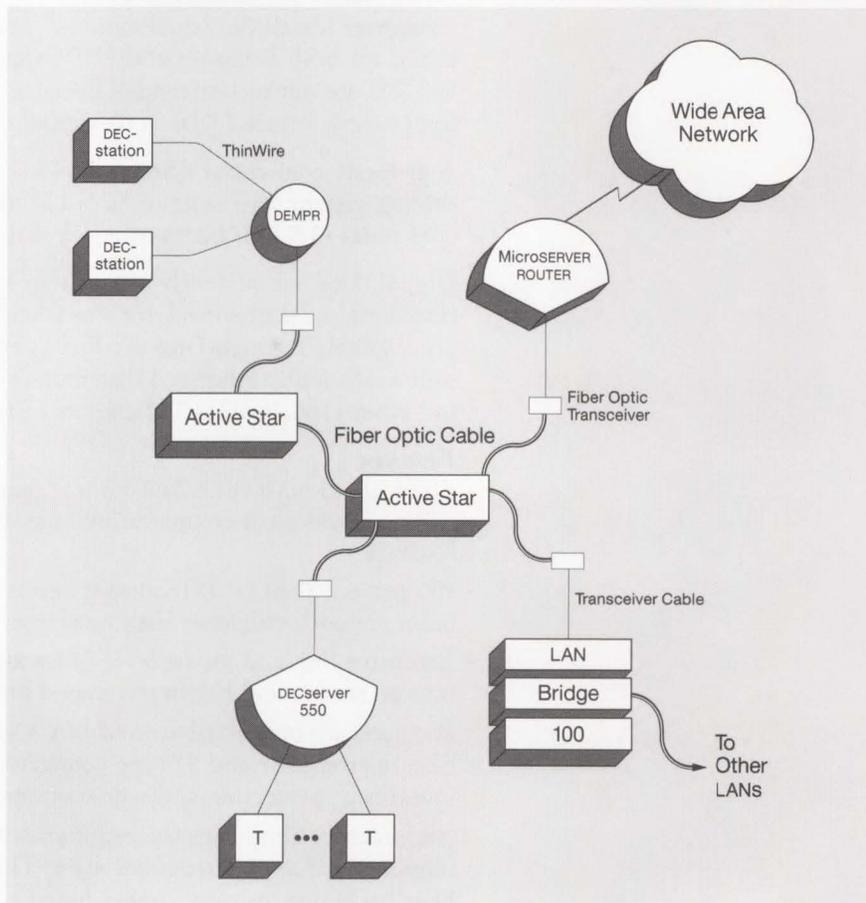
### Specifications

Physical Characteristics	Active Star	Fiber Optic Transceiver
Height	4.3 cm (1.7 in)	5.3 cm (2.1 in)
Width	43.9 cm (17.3 in)	9.6 cm (3.8 in)
Depth	25.4 cm (10.0 in)	10.2 cm (4.0 in)
Weight	3.63 kg (8 lb)	0.454 kg (1 lb)
<b>Power Requirements</b>	85–132 Vac or 187–265 Vac	12–15 Vdc ± 10%
Frequency Tolerance	47/63 Hz	N/A
Maximum AC watts drawn	36 W	N/A

### Ordering Information

Refer to your local Digital Field Service Network Site Services representative for these products and complete fiber optic network services.

### Fiber Optic Ethernet System



NBG-244-00

Broadband 802.3/Ethernet is most often selected by customers who have multiple services to distribute over large local areas. Broadband networks use frequency division multiplexing to carry many channels on one wiring system, enabling customers to transmit data, video, and voice over the same cable, simultaneously. The broadband cable and components are the same as those used for cable TV.

Digital Network Services can provide design, installation, and network maintenance, and can serve as the customer's single point of contact for the broadband network, Digital hardware and software products, and qualified vendor products.

Broadband 802.3/Ethernet is an extension of Digital's baseband 802.3/Ethernet. Baseband and broadband provide the same capabilities: a high-speed 10-Mb/s, peer-to-peer communications link between computers and other intelligent devices for transferring files and high-resolution graphics displays, and for transmitting text, electronic mail, and facsimile data. The broadband 802.3/Ethernet transceivers use the same controllers and DECnet Phase IV software as baseband. In addition, the broadband transceiver is used in conjunction the same bridges, routers, gateways, terminal servers, and communications servers as baseband networks. Also, the broadband transceiver cable is the same as for the baseband. The major difference between the two is the transceivers: the standard Ethernet transceiver for baseband, and Ethermodem for broadband.

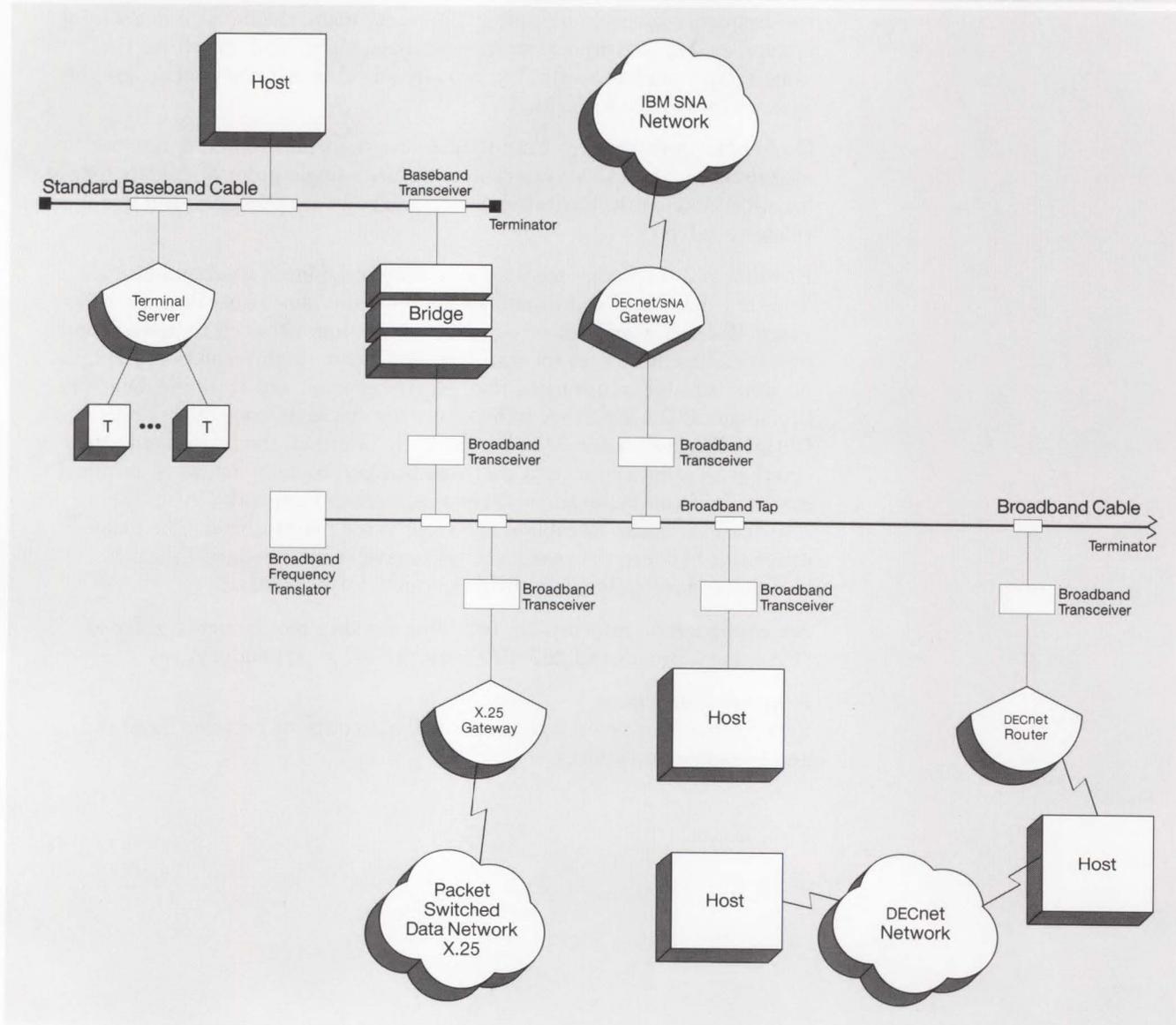
For configuration information, including distance requirements, refer to "Planning a Broadband 802.3/Ethernet LAN" in Appendix A.

### ***Repeater Restrictions***

Repeaters cannot be used in broadband networks, or between baseband and broadband networks.

# Broadband 802.3/Ethernet Products

*Broadband 802.3/Ethernet Configuration*



NBG-154-01

## Broadband 802.3/Ethernet Products

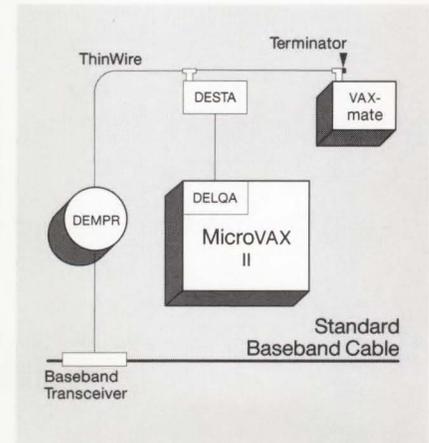
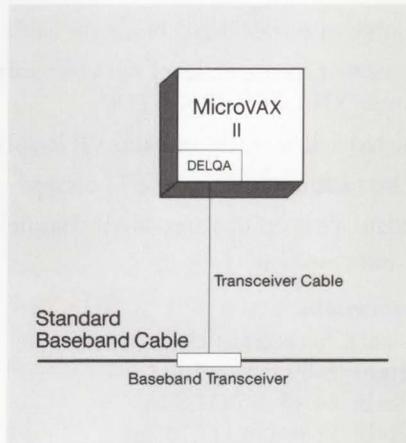
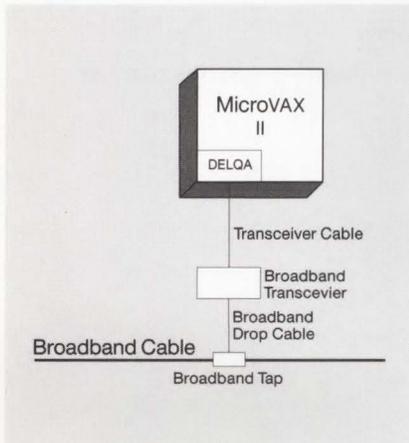
The following table compares the major characteristics of 802.3/Ethernet on broadband, baseband, and ThinWire cable.

**Comparison of Broadband, Baseband, and ThinWire**

Broadband	Baseband	ThinWire
Packets are transmitted by a broadband transceiver.	Packets are transmitted by a baseband transceiver.	Packets are transmitted by a built-in DESTA transceiver.
Broadband can share the cable with other independent channels, such as video, data, and voice.	Baseband is the only channel on the cable.	Baseband is the only channel on the cable.
Network cable is the same as for cable TV.	Network cable is designed to Ethernet or IEEE 802.3 specifications.	Network cable is designed to Ethernet or IEEE 802.3 specifications.
Tap and drop cable are the same as for cable TV.	Transceiver serves as the tap, and transceiver cable serves as the drop cable.	Transceiver serves as the tap, and transceiver cable serves as the drop cable to a ThinWire Ethernet Repeater. ThinWire cable connects devices to the ThinWire Ethernet Repeater.*

\*ThinWire is also available in standalone configurations. Refer to "802.3/Ethernet Configuration Guidelines" in Appendix A for more information.

### Broadband, Baseband, and ThinWire Cable Connection Comparison



NBG-155-01

Digital's broadband 802.3/Ethernet products implement an 802.3/Ethernet channel for both single- and dual-cable broadband LANs. Almost all Digital networking products used with baseband technology are compatible with broadband. These include

- DECnet Phase IV for VMS, RSX, RSTS/E, and P/OS operating systems.
- The 802.3/Ethernet communications controllers that connect to standard baseband cable.
- Communications servers (routers, terminal servers, and gateways).
- LAN Bridge 100.

## Broadband 802.3/Ethernet Products

### Chipcom Ethermodem Broadband Ethernet Transceiver



Digital's Third-party Program has qualified two products that incorporate multivendor services on broadband 802.3/Ethernet LANs. The products, the Ethermodem and the Frequency Translator, are available through Chipcom Corporation in the United States and in most European countries. Ethermodem is 802.3-compliant and coexists with Ethernet, MAP, IBM PC NET, or Sytek LocalNet 20.

The Chipcom two-port Ethermodem is a broadband transceiver that links baseband 802.3/Ethernet nodes to broadband networks. Ethermodems are fully IEEE 802.3-compliant and are available in either single or dual-cable configurations. Ethermodems are available in five frequencies providing 10-Mb/s performance and are transparent to higher level network software such as DECnet, TCP/IP, and XNS.

The DELNI, DEREPEP repeater, and ThinWire Ethernet repeaters should not be used with the Ethermodem as these are unsupported configurations. Chipcom and installed Digital broadband products (DECOM) can neither communicate nor coexist on the same broadband cable due to frequency conflicts. Single-cable Ethermodem installations require a Chipcom frequency translator.

#### **Features**

- IEEE 802.3 and Ethernet V2.0 compatible.
- 10-Mb/s CSMA/CD performance with full collision enforcement.
- Multiple frequency ranges to allow flexibility when configuring with MAP, IBM PC network, and SYTEK services.
- Functions in either mid-split or high-split single cable networks.
- 3,800-m station-to-station distance coverage.
- Available in either dual- or single-cable versions.
- Transparent to upper-level network software supporting systems that use DECnet, XNS, TCP/IP, or TOP.
- Onboard self-test, digital and RF loopback.
- Can be rackmounted or shelfmounted.
- Coexists with up to three MAP channels.
- Two-port modem.

#### **Specifications**

##### Physical Characteristics:

- Height: 8.89 cm (3.5 in)
- Width: 44.45 cm (17.5 in)
- Depth: 37.46 cm (14.75 in)
- Weight: 6.80 kg (15 lb)

##### Power Requirements:

- Power source: 115/220 Vac
- Frequency tolerance: 50/65 Hz  $\pm$  10%
- Maximum ac watts drawn: 40 W
- Power connector: IEC male
- Transmitted power: 50 dBmV  $\pm$  2 dBmV optional for dual cable-versions
- Receiver range: 20 dB minimum (–4 to +16 dBmV), 25 dB typical (–6 to +19 dBmV)

### Chipcom Ethermodem Frequency Translator



#### **Ordering Information**

Ethermodem is available in the U.S. and in some other countries via distributors. Contact a local marketing representative for country-specific information.

The Chipcom Ethermodem frequency translator, located at the network headend, is used with single-cable Ethermodems. The Ethermodem frequency translator receives low frequency signals from the reverse direction and translates them up in frequency by 192.25 MHz (IEEE recommended standard) to the transmit band. It amplifies, filters, and sends the signal to the user on the forward direction. The Ethermodem frequency translator minimizes interference with services in nearby frequencies by providing sharp, out-of-band filtering. It is available off-the-shelf in a range of standard frequencies. The Ethermodem frequency translator coexists with other broadband products (such as IBM PC Network, Sytek LocalNet 20, and MAP), video, and other common services. Contact your local Digital sales representative for ordering and service information.

#### **Specifications**

##### Physical Characteristics:

- Height: 8.89 cm (3.5 in)
- Width: 44.45 cm (17.5 in)
- Depth: 40.64 cm (16.0 in)
- Weight: 6.80 kg (15 lb)
- Mounting: 48.26 cm (19.0 in) standard rack

##### Power Requirements:

- Power source: 115/220 Vac
- Frequency tolerance: 50/60 Hz  $\pm$  10%
- Maximum ac watts drawn: 40 W
- Power connector: IEC male
- Power indicator: red LED

Translation frequency: 192.25 MHz  $\pm$  25 kHz

Nominal bandwidth: 18 MHz

Gain: 55  $\pm$  2 dB

802.3/Ethernet communications controllers are interfaces that connect systems to an 802.3/Ethernet local area network. Digital currently offers the following communications controllers:

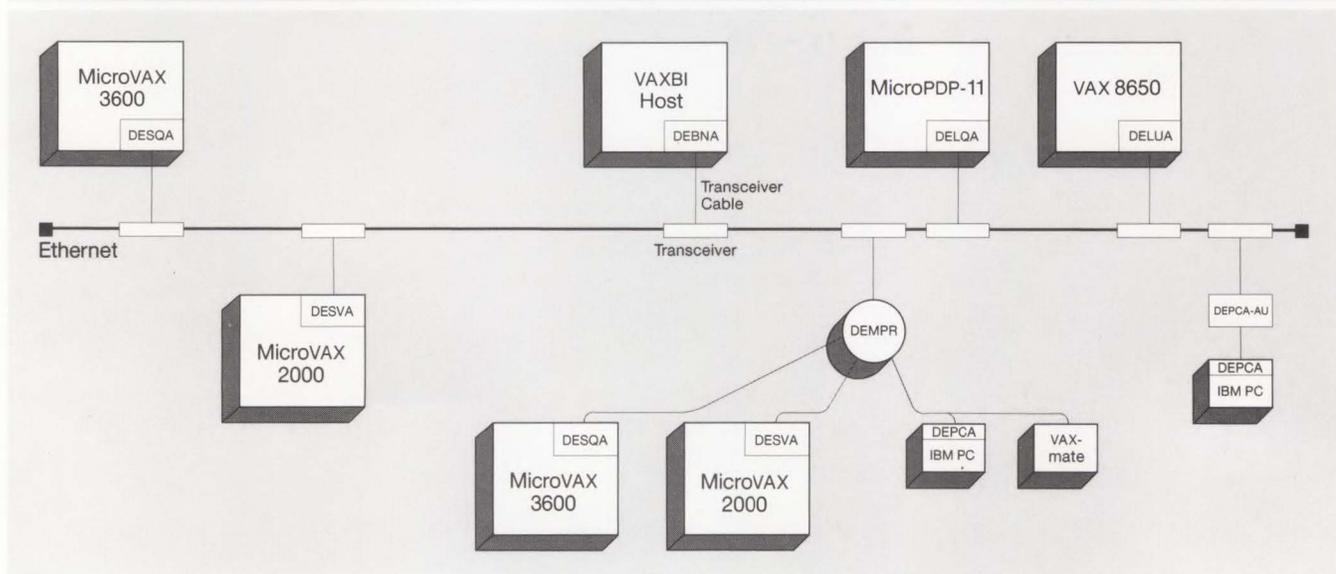
- The DEBNA, which connects VAXBI systems to standard baseband or broadband cable
- The DELQA, which connects Q-bus MicroVAX and MicroPDP-11 systems to standard baseband or broadband cable
- The DESQA, which connects Q-bus MicroVAX and MicroPDP-11 systems in BA200-series enclosures to standard baseband or ThinWire 802.3/Ethernet cable
- The DELUA, which connects UNIBUS VAX and PDP-11 systems to standard baseband or broadband cable
- The DESVA, which connects MicroVAX 2000 and VAXstation 2000 systems to ThinWire, standard baseband, or broadband cable
- The DEPCA, which connects the IBM PC, PC/XT, and Personal Computer AT to ThinWire Ethernet cable

In addition, the VAXmate has an integral Ethernet communications controller which connects to ThinWire Ethernet cable.

Controllers designed for standard baseband cable connect to the cable with a standard baseband 802.3/Ethernet transceiver or via a Local Network Interconnect (DELNI). They connect to broadband cable with a broadband transceiver. They can connect to ThinWire cable via a ThinWire Ethernet station adapter (DESTA).

Controllers designed for ThinWire 802.3/Ethernet cable connect to the cable via a BNC connector. They can connect to standard baseband cable via a ThinWire Ethernet Repeater, which then connects to standard baseband cable via an 802.3/Ethernet transceiver or DELNI.

### 802.3/Ethernet Communications Controllers



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## 802.3/Ethernet Communications Controllers

<i>802.3/Ethernet Communications Controllers</i>						
	<b>DEBNA</b>	<b>DELUA</b>	<b>DEPCA</b>	<b>DELQA</b>	<b>DESQA</b>	<b>DESVA</b>
<b>Bus</b>	VAXBI	UNIBUS	IBM PC-bus	Q-bus	Q-bus systems in BA200-series enclosures	MicroVAX 2000 and VAXstation 2000 bus
<b>Number of lines</b>	1	1	1	1	1	1
<b>DMA</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Maximum speed<sup>1</sup></b>	5 Mb/s	10 Mb/s	10 Mb/s	10 Mb/s	10 Mb/s	10 Mb/s
<b>Ethernet cable</b>	Standard	Standard	Standard <sup>4</sup> or ThinWire	Standard	Standard or ThinWire	Standard or ThinWire
<b>DECnet support</b>	DECnet-VAX, <sup>2</sup> DECnet-ULTRIX	DECnet-VAX, <sup>2</sup> DECnet-ULTRIX, DECnet-RSX, DECnet/E	DECnet-DOS, PCSA/PC Client <sup>3</sup>	DECnet-VAX, <sup>2</sup> DECnet-ULTRIX, DECnet-RSX, DECnet-Micro/ RSX, DECnet/E	DECnet-VAX, <sup>2</sup> DECnet-ULTRIX, DECnet-RSX, DECnet-Micro/ RSX, DECnet/E	DECnet-VAX, <sup>2</sup> DECnet-ULTRIX
<b>Operating system support</b>	VMS,	VMS, ULTRIX-32 ULTRIX-11, RSX-11, RSX-11M-PLUS, RSX-11S, RSTS/E	IBM PC DOS, ULTRIX-32, MS-DOS	VMS, COMPAQ, ULTRIX-11, RSX-11M, RSX-11M-PLUS, RSX-11S, Micro/RSX, RSTS/E, VAXELN	VMS, ULTRIX-32, ULTRIX-11, RSX-11M, RSX-11M-PLUS, RSX-11S, MICRO/RSX, RSTS/E, VAXELN	VMS, ULTRIX-32,

<sup>1</sup>Consult the appropriate DECnet Software Product Description for more information.

<sup>2</sup>DECnet-VAX allows multiple 802.3/Ethernet controllers per host within the limitations listed in the Load Unit Table in Software Product Description 25.03. When two or more 802.3/Ethernet controllers are used on a single CPU, they must be connected to different cables attached to separate local area networks. These cables must not be joined by a bridge or repeater, though they may be joined by a DECnet router.

<sup>3</sup>PCSA/PC Client software includes DECnet-DOS support.

<sup>4</sup>Converts to standard baseband cable with the optional DEPCA-AU.

### DEBNA

The DEBNA is an 802.3/Ethernet-to-VAXBI communications controller that connects VAXBI systems to an 802.3/Ethernet local area network. The DEBNA also allows a VAXBI system to be used as a boot member in a Local Area VAXcluster. (The number of satellite nodes that can be supported varies by system.) One DEBNA is a standard component of each VAXBI system.

The DEBNA is a single VAXBI module that supports the physical and data link communications layers. It operates at speeds up to 5-Mb/s peak hardware throughput. (Actual throughput depends on system configuration, packet sizes, and application.)

## 802.3/Ethernet Communications Controllers

Multiple DEBNA controllers can be added for control of multiple local area networks. Each DEBNA must be connected to a separate LAN, except when two controllers are connected to the same LAN with one on standby. The maximum number of DEBNA controllers allowed per system depends on available system DC power, available backplane space, and the following system limits:

- VAX 87xx/88xx systems may have a maximum of three DEBNA controllers per VAXBI channel and a maximum of four DEBNA controllers per system. Four DEBNA controllers on internal VAXBI channels may connect to the standard baseband cable with transceivers or a DELNI. DEBNA controllers on external VAXBI channels must connect through a DELNI.
- VAX 85xx systems may have a maximum of three DEBNA controllers per VAXBI channel and a maximum of four DEBNA controllers per system. No more than two DEBNA controllers on internal VAXBI channels may connect to the standard baseband cable through a transceiver. External VAXBI channels allow only one standard 802.3/Ethernet transceiver connection per channel. Additional connections must be through a DELNI.
- VAX 82xx/83xx Configuration 2 systems may have a maximum of two DEBNA controllers per system. Both DEBNA controllers may be connected to the standard baseband cable using the transceiver or DELNI.
- VAX 82xx/83xx Configuration 1 systems may have a maximum of two DEBNA controllers per system. The standard 802.3/Ethernet transceiver may be used to connect one controller to the standard baseband cable; the other connection must be made through a DELNI.

For VAXBI systems which include a UNIBUS, the maximum number of combined UNIBUS and VAXBI 802.3/Ethernet controllers per system cannot exceed the maximum numbers listed above.

### **Specifications**

Mounting Code: One VAXBI Slot

Power Requirements:

- dc amps drawn at 5 V: 6.72
- dc amps drawn at 12 V: 0.5 (CK-DEBNA-LJ)

I/O Panel Units: 1 for CK-DEBNA-LJ; 2 for -LM, -LN

### **DEBNA Order Codes**

Option	Order Code
VAXBI 802.3/Ethernet controller. Includes base module only.	DEBNA-M
For system installation, select one of the following cabinet kits, which includes an internal 802.3/Ethernet cable, an I/O connector panel, and a boot-enable jumper for 802.3/Ethernet:	
Cabinet kit for use with VAX 88xx, 87xx, 8550 internal VAXBI channels.	CK-DEBNA-LJ
Cabinet kit for use with VAX 88xx, 87xx, 8550 and 8350 external VAXBI channels.	CK-DEBNA-LN
Cabinet kit for use with VAX 8350 and 8250.	CK-DEBNA-LM

**DELUA**

The 802.3/Ethernet-to-UNIBUS high-performance synchronous communications controller (DELUA) connects UNIBUS systems (VAX and PDP) to both Ethernet V2.0 and IEEE 802.3 local area networks. It is M68000 microprocessor-based, operates at 10 Mb/s, and has 4-Mb/s throughput capability. (Actual device speed and throughput depend on operating system, system configuration, and application.) The 80-KB RAM is used primarily for buffering of data at the high bus rate. A separate DMA controller is used to access host memory locations.

The DELUA microcode implements data encapsulation and decapsulation, data link management, and all channel access functions to ensure maximum throughput with minimum processor intervention. It provides such network maintainability features as remote loopback of data from other stations, resident microdiagnostics, system identification, and the loading and remote booting of UNIBUS PDP-11 systems from other stations on the network.

The DELUA physically and electrically connects to the standard baseband cable via transceiver cable (BNE3X or BNE4X series) and either a baseband transceiver or Local Network Interconnect (DELNI). The DELUA also connects to a DESTA and ThinWire cable in ThinWire networks. Transceiver cable can be a maximum of 40 meters (131 feet) and must be ordered separately. Refer to "Communications Cables" in Section 3 for all order codes.

The DELUA-M option includes one hex module. A cabinet kit option, which must be ordered separately with the DELUA-M, contains a distribution panel and associated internal cabling.

**Specifications**

Mounting Code: 1 hex slot

Power Requirements:

- dc amps drawn at 5 V: 8.0 A
- dc amps drawn at -15 V: 1.0 (to power the transceiver)

Bus Loads: ac 4, dc 1

I/O Connection Panel Inserts: 2 panel units

Environmental Class: B (Refer to Appendix B for details.)

**DELUA Order Codes**

Option	Order Code
802.3/Ethernet UNIBUS single-line interface communications controller. Includes base module only.	DELUA-M
For system installation, select the appropriate external cables and one of the following cabinet kits:	
For use with VAX-11/725 shielded cabinets.	CK-DELUA-KL
For general purpose use with shielded cabinets.	CK-DELUA-KM
For use with unshielded cabinets.	CK-DELUA-K1

## 802.3/Ethernet Communications Controllers

### DELQA

The DELQA is an 802.3/Ethernet-to-Q-bus communications controller that connects Q-bus MicroPDP-11 and MicroVAX systems to an Ethernet V2.0 or IEEE 802.3 local area network.

The DELQA provides the firmware capability to support Maintenance Operation Protocol (MOP), which offers enhanced network management features, including remote circuit loopback, system identification messages, remote booting of diskless systems, maintenance of data link counters, and IEEE 802.2 XID and Test.

The DELQA physically and electrically connects to the standard baseband cable by means of a cabinet kit, transceiver cable (BNE3H, BNE3K, BNE3L, or BNE3M series), and baseband transceiver or Local Network Interconnect (DELNI). The DELQA also connects to ThinWire via a DESTA station adapter.

#### **Features**

- Dual size module saves on backplane space.
- Low power draw provides more available power for additional peripheral and communications options.
- Onboard self-test executes extensive testing of the DELQA circuitry at each power-up or reset.
- Onboard MOP provides the ability to decrease the demand on system software, thus reducing processor time required to support network management activities.

#### **Specifications**

Mounting Code: 1 dual slot

Power Requirements:

- dc amps drawn at 5 V: 2.5
- dc amps drawn at 12 V: 0.5

Bus Loads: ac 3.3, dc 0.5

I/O Connection Panel Insert: Size A

Operating Environment:

- Storage Temperature: 0°C–66°C (32°F–151°F)
- Operating Temperature: 5°C–60°C (41°F–140°F)
- Relative Humidity: 10%–95% noncondensing (Complies with DEC 102 standard, Class C.)

#### **DELQA Order Codes**

Option	Order Code
802.3/Ethernet-to-Q-bus communications controller. Requires one of the following cabinet kits.	DELQA-M
Cabinet kit for BA123 and BA11-M enclosure	CK-DELQA-YA
Cabinet kit for MicroPDP-11 BA23 enclosure	CK-DELQA-YB
Cabinet kit for H9642 cabinet	CK-DELQA-YF

**DESQA**

The DESQA is an 802.3/Ethernet-to-Q-bus communications controller that connects MicroPDP-11 and MicroVAX systems in BA200-series enclosures to an 802.3/Ethernet local area network. Based on the DELQA, the DESQA combines, on a quad-height module, the functions of the DELQA-M with a cabinet kit and ThinWire Ethernet station adapter (DESTA). A separate cabinet kit is not required because the bulkhead is integral to the module handle.

The DESQA can interface to either standard 802.3/Ethernet cable (15-pin D-connector) or to ThinWire (BNC connector). This allows the user to connect a system to the local area network using a standard 802.3/Ethernet transceiver cable or ThinWire cable.

**Specifications**

Mounting Code: 1 quad BA200 slot

Power Requirements:

- dc amps drawn at 5 V: 2.4
- dc amps drawn at 12 V: 0.22
- Maximum watts drawn: 14.64

Bus Loads: ac 3.3, dc 0.5

Operating Environment:

- Storage Temperature: 0°C–66°C (32°F–151°F)
- Operating Temperature: 5°C–60°C (41°F–140°F)
- Relative Humidity: 10%–95% noncondensing (Complies with DEC 102 standard, Class C.)

**Ordering Information**

Order the DESQA-SA for factory installation, and the DESQA-SF for field installation.

The DESQA physically and electrically connects to standard 802.3/Ethernet cable via BNE3K or BNE3M transceiver cable, directly to BC16M ThinWire, or to broadband cable via transceiver cable, broadband transceiver, and broadband drop cable. These components are not included with the DESQA.

The following accessories are supplied with the DESQA:

- One ThinWire BNC T-connector
- Two 50-ohm terminators

**DESQA Order Codes**

Factory-installed 802.3/Ethernet-to-Q-bus communications controller for BA200-series enclosures.	DESQA-SA
Field-installed 802.3/Ethernet-to-Q-bus communications controller for BA200-series enclosures.	DESQA-SF
DESQA Technical Manual	EK-DESQA-TM

## 802.3/Ethernet Communications Controllers

### DESVA

The DESVA is a synchronous 802.3/Ethernet communications controller that connects MicroVAX 2000 and VAXstation 2000 computers to ThinWire local area networks via ThinWire or standard Ethernet cable. The DESVA has FCC certification, is fully compatible with the IEEE 802.3 standard, and operates at 10 Mb/s.

The DESVA provides 802.3/Ethernet data link layer functions and a portion of the physical channel functions. Supported under DECnet Phase IV software, the DESVA is a standard component of the VAXstation 2000, and optional for the MicroVAX 2000.

#### **Ordering Information**

The DESVA-AA allows connection to ThinWire local area networks only. The DESVA-Bx options include a 15-pin standard Ethernet connector and a short transceiver cable, allowing users to connect to either standard Ethernet cable (15-pin) or to ThinWire Ethernet cable. DESVA-Bx options can be ordered only for MicroVAX 2000 systems built after March 18, 1988 (U.S. serial # WF8115880 and above). Earlier MicroVAX 2000 systems cannot be retrofitted because of FCC and UL regulations.

#### **DESVA Order Codes**

Option	Order Code
ThinWire 802.3/Ethernet communications controller option for MicroVAX 2000. Includes Networking Guide, T-connector, two terminators, and connector plus transceiver cable for connection to standard baseband cable.	DESVA-AA
Factory-integrated controller for ThinWire or standard Ethernet cable. Includes Networking Guide, T-connector, and two terminators.	DESVA-BA
Add-on (field-service installable) controller for ThinWire or standard Ethernet cable. Includes Networking Guide, T-connector, and two terminators.	DESVA-BF

### DEPCA

The DEPCA is an 802.3/Ethernet communications controller that connects the IBM PC, PC/XT, and Personal Computer AT to Ethernet and IEEE 802.3 local area networks. The DEPCA operates at 10 Mb/s.

The DEPCA implements data encapsulation and decapsulation, data link management, and all channel access functions to ensure maximum throughput. It provides network maintenance features including remote loopback, resident self-test diagnostics, and system identification. The DEPCA implements an asynchronous serial channel for connection to the VSXXX-AA mouse. This interface may be operated in an interrupt driven environment.

The DEPCA contains 48-KB RAM memory, used primarily for buffering network data at the high bus data rate. The Personal Computer's CPU is used to access the buffer memory, and to execute data link and self-test firmware (contained in a 16-KB ROM memory on the DEPCA module).

The DEPCA connects directly to the ThinWire cable, using integral transceiver (MAU) circuitry. With the addition of the DEPCA-AU connector option, the DEPCA can connect to standard baseband cable via a transceiver or Local Network Interconnect (DELNI).

## 802.3/Ethernet Communications Controllers

The DEPCA is offered as a module-only option or as a component of the Network Integration Packages. ▲ For more information, refer to “Integrated Personal Computing” in Section 5.

### **Specifications**

Mounting Code: One 8-bit PC-bus slot (2 when used with DEPCA-AU)

Power Requirements:

- dc amps drawn at 5 V: 2.0 (max.)
- dc amps drawn at 12V: 1.350 (max.) (1.0 to power the transceiver)
- dc amps drawn at –12 V: 0.050 (max.)

Bus Loads: 2 LSTTL

I/O Connection Panel Inserts: 1 slot (2 when used with DEPCA-AU)

Environmental Class: A (Refer to Appendix B for details.)

### **DEPCA Order Codes**

<b>Option</b>	<b>Order Code</b>
ThinWire 802.3/Ethernet communications controller for IBM PC, PC/XT, and Personal Computer AT. Includes a ThinWire assembly kit (T-connector, terminator, and 12-foot PVC BNC cable).	DEPCA-AA
15-pin 802.3/Ethernet transceiver adapter connects the DEPCA to standard baseband cable via a transceiver or DELNI.	DEPCA-AU

## Introduction

A standard IEEE 802.3/Ethernet local area network (LAN) has a limit of 2,800 meters between the farthest two nodes on the network. This limitation is the sum of

- Two 50-meter transceiver cables extending from the nodes.
- Three 500-meter coaxial cable segments that are connected by two pairs of DEREPE fiber optic repeaters.
- Four 50-meter transceiver cables connected to the fiber optic repeaters.
- A fiber optic link that is 1,000 meters long.

A Digital *extended* LAN uses the LAN Bridge 100, METROWAVE Bridge, and Vitalink Communications Corporation's TransLAN bridge to increase the distance between local area networks and to increase the number of nodes directly connected to 10-Mb/s 802.3/Ethernet links.

Variations of the LAN Bridge 100 are:

- The **standard LAN Bridge 100** (DEBET-Ax), which interfaces two transceiver drop cables.
- The **fiber optic LAN Bridge 100** (DEBET-Rx), which interfaces one transceiver cable and a fiber optic link. The fiber optic link must connect to either another fiber optic LAN Bridge 100 or to a fiber optic DEREPE repeater. Bridges and/or repeaters are required for sites that have more than 90 meters between two LANs, where a pair of 45-meter transceiver cables would be insufficient to span the distance. ▲ For more information on the fiber optic repeater, refer to "Baseband 802.3/Ethernet Products" in this section.
- The **METROWAVE Bridge** (DEMWB-\*A), which interfaces one transceiver drop cable at each end with a microwave link. The METROWAVE Bridge connects geographically separated LANs where cable is neither feasible nor economical, up to 7,240 meters (4.5 miles) bridge to bridge.
- In addition, Digital offers the Vitalink **TransLAN Bridge** through a third-party marketing agreement. This bridge is primarily intended to connect LANs across distances greater than a few miles, where coaxial, fiber optic, or microwave links are not available or feasible.

### **LAN Bridge 100, METROWAVE Bridge, and TransLAN Extended LANs**

Digital's IEEE 802.3/Ethernet bridges, the LAN Bridge 100 and the METROWAVE Bridge, are designed to transparently connect a series of up to eight 802.3/Ethernet segments, creating an extended LAN that could be 35 kilometers (22 miles) long. The LAN Bridge 100 and METROWAVE Bridge provide high-performance throughput across the network. Additionally, the low error rate of the connection is maintained from one end of the network to the other.

Many of the functions and capabilities of the Digital and Vitalink bridges are similar. Two exceptions, however, are Digital's implementations of

- Remote Bridge Management Software (RBMS), which allows a privileged user anywhere in the network to monitor and analyze the network.
- LAN Traffic Monitor (LTM) software, which allows a LAN Bridge 100 to be a dedicated network monitor.

## Extended 802.3/Ethernet Local Area Network Products

Vitalink's TransLAN Bridge is primarily intended to connect LANs across distances greater than a few miles where coaxial, fiber optic, or microwave links are not available or feasible. TransLAN provides industry-standard V.35 or EIA-232 connections and is capable of transmitting at a maximum rate of 2.048 Mb/s. This can be a constraint when the average traffic load is higher than the 2.048 Mb/s capability. Additionally, depending on the communications links (for example, terrestrial lines) delay may be apparent. Unlike the Remote Bridge Management Software, the TransLAN Bridge is managed from a bridge-management console attached to the TransLAN Bridge.

### **Comparison of Repeaters, Bridges, and Routers**

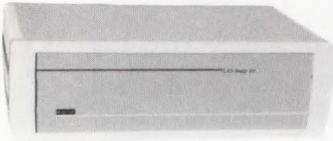
The following table compares the LAN extension features of the LAN Bridge 100 with the Ethernet Repeater and DECrouter 2000.

<i>Comparison of Extended LAN Devices</i>			
<b>Features</b>	<b>Repeater</b>	<b>Bridge</b>	<b>Router</b>
ISO layer	Physical	Data link	Network
Forwarding capability	Forwards bits	Forwards frames	Forwards messages
Addressing function	No address	MAC address <sup>1</sup>	Network address
Network extension	Yes	Yes	Yes
Packet filtering	No	Yes	Yes
Traffic management	No	Yes	Yes
Network management	No	Yes	Yes
Performance (throughput)	High	High	Medium
Cost	Low	Medium	Medium
Transparent to upper level protocols	Yes	Yes	No
Message segmentation	N/A	No	Yes
Load sharing	No	No	Yes
Mixed media <sup>2</sup>	Yes	Yes	Yes
Common carrier	No	No	Yes
Multivendor network	Yes	Yes	No
Auto backup <sup>3</sup>	Yes	Yes	Yes
Support for DECnet area routing	N/A	N/A	Yes

<sup>1</sup>Media Access Control (requires Ethernet or IEEE 802.3 packet format)  
<sup>2</sup>Refer to the product descriptions for media supported.  
<sup>3</sup>Ability to activate upon failure of a parallel device

## Extended 802.3/Ethernet Local Area Network Products

### LAN Bridge 100

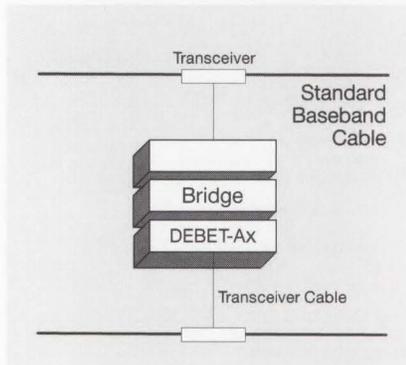


The LAN Bridge 100 (DEBET) connects two or more IEEE 802.3/Ethernet LANs, creating an *extended* local area network. The LAN Bridge 100 uses a store-and-forward technique to receive, regenerate, and transmit packets. This feature allows users to build extended LANs several times larger than Ethernet guidelines would otherwise allow.

The LAN Bridge 100 can connect baseband 802.3/Ethernet networks, broadband networks, or a combination of the two. It improves network performance by dynamically managing the data traffic flow. A user can increase bandwidth efficiency by isolating traffic on heavily loaded segments from the rest of the network. Traffic management is done automatically while still providing full network connectivity. Locally destined traffic remains local; remote traffic is forwarded to the appropriate destination.

The bridge operates at the data link level and is protocol-independent. Any protocols that run on IEEE 802.3/Ethernet, such as DECnet, LAT, XNS, or TCP/IP, can simultaneously take advantage of a LAN Bridge with no loss of performance.

#### Baseband-to-baseband LAN Bridge 100 Configuration



NBG-158-01

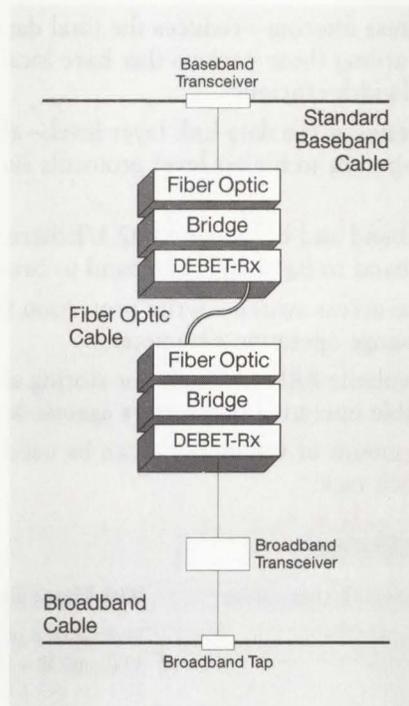
Changes in network configuration are automatically detected by the bridge within seconds and its memory is updated. Bridges may be used in any arbitrary topology, thereby allowing them to be used in parallel with other bridges to provide an auto-backup capability. Bridges causing loops in this situation automatically enter a backup state. A bridge that is in the backup state continues to monitor traffic on both LANs and, if the primary bridge fails, automatically takes over and forwards messages.

This auto-configuring feature of the bridge allows users to build a network that is immune to misconfiguration. Extended LANs can evolve without rigorous prior planning. They can be split or joined at any place or time. Customers do not need a network designer to plan changes ahead of time because the bridges automatically and completely adjust to configuration changes.

## Extended 802.3/Ethernet Local Area Network Products

Digital recommends configuring a maximum of seven bridges in a series to ensure adequate performance of time-critical protocols. No restrictions exist on the number of bridges when time-critical protocols are not an issue. Because it has an 8,000-node address buffer, an extended LAN can contain more than 8,000 node addresses with only minor degradation to network performance. An Extended LAN can span distances of up to 23,000 meters (7,010 feet) using fiber optic cable and up to 35,600 meters (10,850 feet) using microwave-based bridges.

### Baseband-to-broadband Fiber Optic LAN Bridge 100 Configuration



NBG-159-01

### Features

- High performance—filters traffic at 24,272 packets per second and forwards traffic at 13,404 packets per second.
- IEEE 802.3/Ethernet device—can be used in networks compliant with IEEE 802.3, standard Ethernet, or ThinWire.
- Light-emitting diodes (LEDs)—provide greater power and allow increased distances for interbridge fiber links.
- Fiber optic version—provides a fiber optic link up to 3,000 meters unaffected by electrical or electromagnetic interference and protected from moisture. The fiber optic bridge can be used between buildings, underground, and in harsh environments.
- Dynamic address learning—minimizes network congestion.
- Auto-configuration—automatically detects and adjusts to changes in network configuration using Digital's spanning-tree algorithm.
- Auto-backup (using redundant bridges)—increases availability and reliability of the network.
- No software required—does not require downline-loading or a Digital node on the network.

## Extended 802.3/Ethernet Local Area Network Products

- Remote Bridge Management Software (RBMS) available for enhanced management—by using a VAX/VMS system running RBMS, a user can observe and control any bridge in the extended LAN.
- Optional LAN Traffic Monitor (LTM) analyzes extended LAN utilization—a LAN Bridge 100 (minimum revision level E), downline-loaded with LTM software installed on any VAX in the extended LAN, provides multiple users with timely, accurate traffic-performance statistics operating at Ethernet speed (10 Mb/s).
- Store-and-forward capability—receives, regenerates, and transmits packets, enabling the configuration of Extended LANs.
- Address filtering—reduces the total data traffic on an extended LAN by not forwarding those packets that have local destination addresses. Increases bandwidth efficiency.
- Operates at the data link layer level—allows multivendor implementation transparent to higher-level protocols such as DECnet, LAT, TCP/IP, or XNS.
- Baseband and broadband 802.3/Ethernet compatible—connects LANs: baseband to baseband, baseband to broadband, broadband to broadband.
- Write-access switch—write protection feature controls the access necessary to change operating parameters.
- Nonvolatile RAM available for storing settable parameters—protects the settable operating parameters against loss resulting from power failures.
- Rackmount or wallmount—can be used in a wiring closet or mounted in a 19-inch rack.

### Specifications

Physical Characteristics	With Plastic End	Without Plastic End
Height	16.2 cm (6.4 in)	13.3 cm (5.3 in)
Width	49.4 cm (19.4 in)	43.6 cm (17.2 in)
Depth	31.3 cm (12.3 in)	29.8 cm (11.7 in)
Weight	9.5 kg (21 lb)	7.3 kg (16 lb)
Power Requirements		
Low-range line voltages	120: 93 to 128 V	120: 88 to 132 V
High-range line voltages	240: 207 to 253 V	240: 176 to 264 V
Frequency tolerance	47 to 63 Hz	47 to 63 Hz
Maximum ac watts drawn	150 W	160 W
Maximum Heat Dissipation	500 Btu/h	500 Btu/h
Performance	▲ Refer to "LAN Bridge 100 Performance Guidelines" in Appendix A for packet-processing rates of the LAN Bridge and for power budget specifications of fiber optic links.	

### **Required Hardware**

- For the standard LAN Bridge 100 (DEBET-Ax):
  - Baseband-to-baseband communications require two of the following in any combination: baseband transceiver or Local Network Interconnect (DELNI).
  - Broadband-to-broadband communications require two Chipcom Ethermodems. (Note that the Ethermodem cannot connect to a DELNI.)
  - Baseband-to-broadband communications require either a baseband transceiver or DELNI on the baseband side, and a broadband transceiver on the broadband side.
- For the fiber optic LAN Bridge 100 (DEBET-Rx): either another fiber optic bridge or a fiber optic repeater (DEREP-Rx), plus the required hardware listed for the standard LAN Bridge 100.

### **Optional Management Software**

**Remote Bridge Management Software (RBMS)** is an optional software package that allows users at a VAX or MicroVAX node to manage any bridge in an extended local area network. The network manager uses RBMS to control each bridge on the network, view error- and traffic-counters, operational parameters and the bridge's forwarding database. The manager also uses RBMS to change various operating parameters such as bridge state, link state, and address filtering characteristics.

**LAN Traffic Monitor (LTM)** is network monitoring software used in multivendor environments to analyze the utilization of an extended LAN. LTM allows multiple users at any location to access traffic information that is gathered from any device connected to the LAN. LTM displays data, which is based on nodes, addresses, and/or protocol types, in graphic or tabular format. The software is downline-loaded into a dedicated LAN Bridge 100 from a VAX node.

▲ For more information, refer to "Network and System Management Products" in Section 6.

▲ For additional information on the LAN Bridge 100, refer to "Digital's LAN Bridge 100: Industry Performance Leader" (ED-32966-42).

### **Ordering Information**

Local links require one DEBET bridge; fiber optic links require either two fiber optic DEBET bridges or one fiber optic bridge and one fiber optic DEREP repeater.

Each local or fiber optic bridge purchased for use outside the United States requires a country kit that contains a power cord. (Versions for use within the United States do not require a country kit.) For countries not listed in the order code table, select a kit that uses the same plug configuration.

Transceivers, transceiver cables, and fiber optic cable must be ordered separately. ▲ Refer to this section and to "Communications Cables" in Section 3 for more information.

## Extended 802.3/Ethernet Local Area Network Products

### *LAN Bridge 100 Order Codes*

<b>Option</b>	<b>Order Codes</b>
Local LAN Bridge 100 for United States. Includes 110-Vac power cord. Does not require a country kit.	DEBET-AA
Local LAN Bridge 100 for non-U.S. countries. Requires a country kit.	DEBET-AB
Fiber optic LAN Bridge 100 for United States. Includes a 110-Vac power cord. Does not require a country kit.	DEBET-RH
Fiber optic LAN Bridge 100 for non-U.S. countries. Requires a country kit.	DEBET-RJ
Upgrade kit to convert older-model DEBET-RC/RD to DEBET-RH/RJ. Includes field service installation. One version for 110 or 220-240 Vac. (Does not convert DEBET-AA or DEBET-AB.)	FOAED-AA

### *LAN Bridge 100 Country Kit Order Codes*

<b>Country</b>	<b>Order Code</b>
Austria, Belgium, Finland, France, West Germany, Netherlands, Norway, Portugal, Spain, Sweden	BN03A-2E
Australia, New Zealand	BN05A-2E
Denmark	BN06A-2E
Ireland, United Kingdom	BN02A-2E
Italy	BN07A-2E
Switzerland	BN04A-2E

## **METROWAVE Bridge**

The METROWAVE Bridge connects geographically separated 802.3/Ethernet LANs within a metropolitan or campus environment in which cable is neither feasible nor economical. The METROWAVE Bridge consists of two LAN Bridge 100s connected by microwave transmission medium, thus adding microwave technology to the LAN Bridge 100's traditional coaxial and fiber optic transmission media.

The METROWAVE Bridge is a high-performance 802.3/Ethernet device that connects two or more LANs separated by such obstacles as streets, highways, and waterways. Transparent to the user, the bridge provides high-speed transmission via a 23-gigahertz (GHz) wideband, duplex, frequency-modulated microwave link. The METROWAVE Bridge spans single-link line-of-sight distances up to 4.5 miles, bridge to bridge. (Active and passive repeater solutions are also available.) Multiple METROWAVE Bridges can be connected to reach greater distances, provided they adhere to 802.3/Ethernet configuration rules.

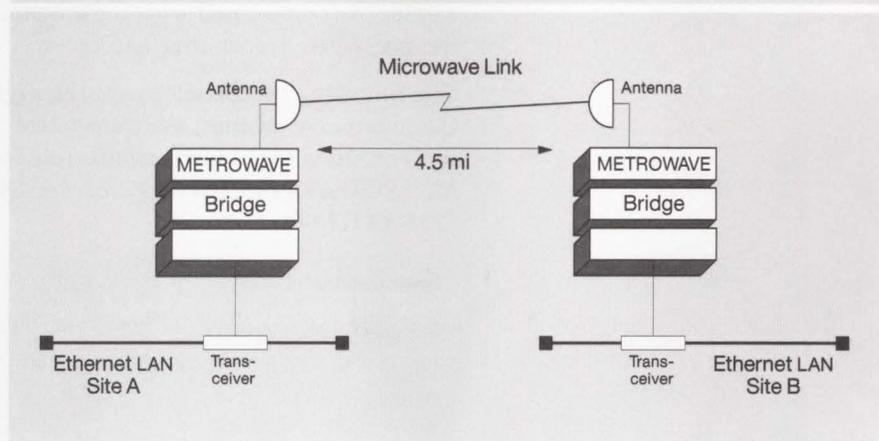
The METROWAVE Bridge provides a microwave connection that delivers the same high performance and store-and-forward filtering capability as the standard and fiber optic LAN Bridge 100s. The METROWAVE Bridge can simultaneously handle any protocols that run on 802.3/Ethernet, accommodating totally Digital, multivendor, or totally non-Digital networks.

## Extended 802.3/Ethernet Local Area Network Products

The microwave equipment for this product is manufactured by a joint marketing partner, M/A-COM, Inc. The microwave radios, modified specifically for the METROWAVE Bridge, are based on widely proven 23-GHz technology. Digital's microwave adapter converts microwave equipment signal levels to standard 802.3/Ethernet signal levels. It also notifies the LAN Bridge 100 of a collision when both link stations attempt simultaneous transmission over the microwave link.

A complete METROWAVE Bridge system comprises two microwave link stations as shown in the following figure.

**METROWAVE Bridge Configuration**



NBG-160-00

### Features

- The microwave link, transparent to the user, allows connection when cable is too expensive or not feasible.
- 802.3/Ethernet 10 Mb/s bandwidth provides high-speed transmission.
- Protocol independence and Ethernet Version 2.0 compliance accommodates multivendor environments.
- Easily installed for quick availability.
- T-carrier and video-system solutions can be combined with the METROWAVE Bridge to increase flexibility and reduce overall costs.
- 802.3/Ethernet permits use in networks that are 802.3, standard Ethernet, or ThinWire-compliant.

▲ Refer to the LAN Bridge 100 product description for additional features that the METROWAVE Bridge shares with the LAN Bridge 100.

### Availability

This product is available in the United States, Canada, Sweden, and Australia. Availability of private-use licenses for 23-GHz microwave equipment also exists in some other countries where M/A-COM equipment is distributed and supported. Please call the Digital Computer Special Systems group at 1-800-832-6277 for details, or Digital Ancey in Europe.

**Implementing the Link**

The customer is responsible for such activities as path survey, site analysis, and compliance with FCC licensing regulations. Assistance in performing these activities is available from Digital and authorized M/A-COM dealers. Additional information on implementing the link is listed in a separate Digital publication, *METROWAVE Bridge Links Ethernet LANs with Microwave Technology* (YM-AA114-00), or is available by calling 1-800-832-6277.

**Specifications**

The LAN Bridge 100 and the microwave adapter operate at 10 Mb/s using the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) technique. The radio frequency (RF) unit generates a 23-GHz microwave carrier. It is collocated with the antenna and is powered by a cable from the microwave transmitter and receiver controllers.

The following specifications are the aggregate totals for the LAN Bridge, the microwave adapter, the transmitter controller, and the receiver controller. For individual specifications, refer to a separate Digital publication, *METROWAVE Bridge Links Ethernet LANs with Microwave Technology* (YM-AA114-00).

<b>Specifications</b>	
<b>Physical Characteristics</b>	
Height	31.50 in
Depth	31.25 in
Width	21.35 in
Weight	190 lb
<b>Power Requirements</b>	
Voltage tolerance	93 to 128 Vac
Line frequency	60 Hz
Maximum current	3.95 A (120 Vac)
Power consumption	326 W (Maximum)
<b>Environmental Class</b>	B ▲ Refer to Appendix B for details.

**Prerequisite Software**

No special software is required for operation of the METROWAVE Bridge because the bridge control functions are resident in the LAN Bridge 100 component.

**Optional Management Software**

Remote Bridge Management Software (RBMS) is recommended for enhanced control and monitoring of the microwave link for Digital LANs. ▲ Refer to "Network and System Management Products" in Section 6 for more information.

### *METROWAVE Bridge Order Codes for Digital Components*

Option	Order Code
A METROWAVE Bridge includes two each: LAN Bridge 100, standard Ethernet transceiver, microwave adapter, BNE3M-20, BNE4D-02, and cable adapter. The METROWAVE Bridge is available premounted in 31.5 inch cabinets, or in non-cabinet configurations suitable for rackmounting in Satellite Equipment Room (SER) racks.	
METROWAVE Bridge in two-cabinet configuration package	DEMWB-AA
METROWAVE Bridge in two-SER-compatible configuration package	DEMWB-BA

### **Ordering M/A-COM Components**

The M/A-COM LAN radio components, designated MA-23 LAN, include the following:

- Two transmitter controllers
- Two receiver controllers
- Two 23 GHz RF units
- Two 4-foot coaxial cables
- Two 2- or 4-foot microwave antennas

The MA-23 LAN and its installation are purchased separately through an authorized M/A-COM dealer. Contact the Digital Computer Special Systems group at 1-800-832-6277 for the name, address, and telephone number of the nearest authorized M/A-COM dealer.

The Vitalink TransLAN bridge, included in Digital's bridge family, is the product of an ongoing relationship between Digital and Vitalink that includes joint development and marketing activities.

This bridge offers Digital-supported solutions for long-distance communication needs by allowing users to access services on their 802.3/Ethernet local area network. TransLAN bridges are available from and serviced by Digital under Digital's standard terms and conditions. When purchased from Digital, the Vitalink TransLAN bridge is fully Digital-supported with installation, warranty, and service.

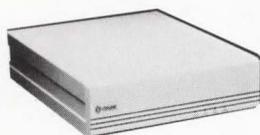
TransLAN uses high-speed synchronous lines up to 2.048 Mb/s to connect multiple, geographically dispersed LANs. Several bridges can interoperate to combine multivendor 802.3/Ethernet LANs into one integrated, multiprotocol extended LAN. With sophisticated link-level forwarding and a filtering rate up to 14,880 packets-per-second, TransLAN handles long-distance traffic between high-speed 802.3/Ethernet LANs.

The TransLAN bridge transparently extends a LAN over thousands of miles, and all traffic from any station on a connected LAN appears as local, including both host-to-host and terminal traffic. The user has simple, direct access to any compatible resource in the extended network. The TransLAN bridge filters locally addressed data frames and forwards only remote traffic.

### **Features**

- Connects 802.3/Ethernet LANs for long-distance communications with protocol transparency and simple user access.

### **TransLAN Bridge**



## Extended 802.3/Ethernet Local Area Network Products

- Uses high-speed synchronous lines—one T1 link or up to eight lower-speed parallel links. Supports transmission speeds ranging from 56 Kb/s to 2.048 Mb/s (T1).
- Operates with Digital LAN Bridge 100 and METROWAVE Bridge in an extended LAN environment.
- Provides automatic activation of backup links if the primary link fails.
- Provides Class-of-Service priority, protocol filtering, and other traffic-filtering options.
- Provides enhanced performance support for Digital's terminal servers.
- Includes Vitalink Management Services for network planning and diagnostics. This service can be centralized at one site or distributed throughout the network. Capabilities include comprehensive bridge, link, and network statistics.
- Automatically learns the addresses of network stations, allowing easy installation and automatic reconfiguration when devices are moved or added.
- Provides a consistently high network service level through Distributed Load Sharing (DLS), which allows the use of backup paths during operation.
- Supports AT&T's ACCUNET Switched 56 dial-service for added bandwidth at peak traffic periods for emergency backup or for occasional-user access. Autodial, manual, and time-of-day setup are available.

### Specifications

<b>LAN Interfaces</b>	Ethernet Version 2.0 or IEEE 802.3
<b>Ports</b>	
TransLAN III	1, 4, or 8
TransLAN IV	1
<b>Serial Line Interfaces</b>	
V.35	1, 4, or 8 ports
RS449/422	4 or 8 ports
<b>Line Speed Support</b>	48 Kb/s–2.048 Mb/s
<b>Maximum Filtering Rate (All models)</b>	14,880 packets-per-second (pps)
<b>Maximum Forwarding Rate</b>	
TransLAN III	2,000 pps
TransLAN IV	3,000 pps
<b>Physical Dimensions</b>	
Height	5.1 in (12.8 cm)
Width	17.25 in (43.1 cm)
Depth	23.0 in (57.5 cm)
Weight	32 lbs (14.5 kg)
<b>Mounting Options</b>	Rack or tabletop
<b>Power Requirements</b>	100–120 Vac, or 200–240 Vac 200 Watts max. 47–63 Hz
<b>Operating Environment</b>	
Temperature	41–40°F (5–40°C)
Humidity	10–90% (without condensation)
<b>Network Management</b>	Vitalink Management Services

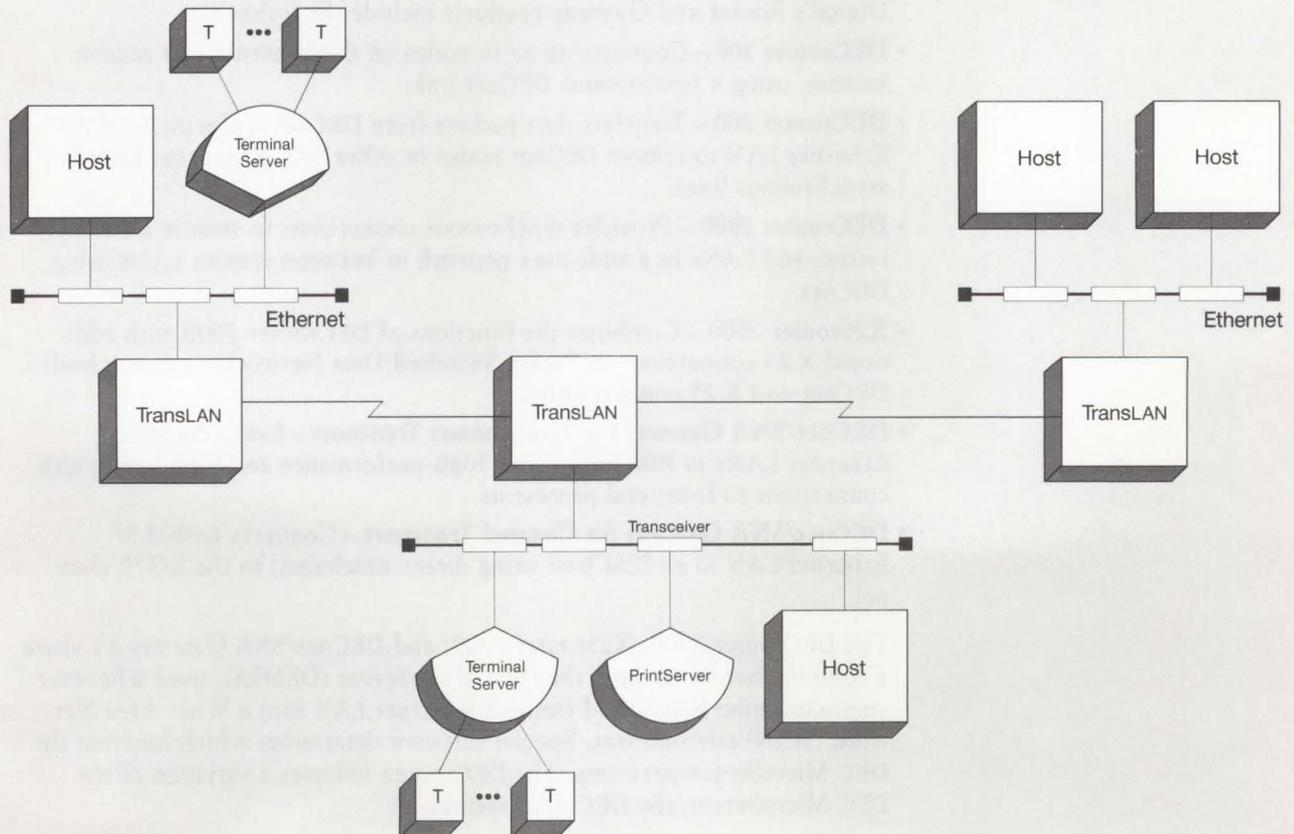
**Ordering Information**

▲ Refer to the order codes below for specific hardware available. For more information regarding the TransLAN Bridge, contact your local Digital sales representative.

**TransLAN Hardware Order Codes**

Bridge	Specification	Bridge	Specification
<b>TransLAN III/IV</b>		<b>TransLAN 350</b>	
DETLB-AA	1-Line, V.35, 110 V	DETLB-BA	1-Line, V.35, 110 V
DETLB-AB	1-Line, V.35, 220 V	DETLB-BB	1-Line, V.35, 220 V
DETLB-AC	4-Line, V.35, 110 V	DETLB-BC	4-Line, V.35, 110 V
DETLB-AD	4-Line, V.35, 220 V	DETLB-BD	4-Line, V.35, 220 V
DETLB-AE	8-Line, V.35, 110 V	DETLB-BE	8-Line, V.35, 110 V
DETLB-AF	8-Line, V.35, 220 V	DETLB-BF	8-Line, V.35, 220 V
DETLB-AG	4-Line, RS449, 110 V	DETLB-BG	4-Line, RS449, 110 V
DETLB-AH	4-Line, RS449, 220 V	DETLB-BH	4-Line, RS449, 220 V
DETLB-AI	8-Line, RS449, 110 V	DETLB-BI	8-Line, RS449, 110 V
DETLB-AJ	8-Line, RS449, 220 V	DETLB-BJ	8-Line, RS449, 220 V
DETLB-AK	1-Line, DS1, 110 V	DETLB-BK	1-Line, DS1, 110 V
DETLB-AL	1-Line, DS1, 220 V	DETLB-BL	1-Line, DS1, 220 V
		DETLB-BM	2-Line, DS1, 110 V
		DETLB-BN	2-Line, DS1, 220 V

**Network Configuration Using TransLAN**



NBG-161-02

802.3/Ethernet communications servers are divided into Terminal Servers, Print Servers, Routers and Gateways. Terminal and Print Servers are dedicated, special purpose systems that provide resource sharing across nodes within a local area network (LAN). Router and gateway servers provide connection to nodes off the local area network via synchronous or asynchronous communication lines.

#### ***Terminal and Print Servers***

Digital's Terminal and Print Server products include the following:

- **DECserver 200**—Connects up to eight terminals, serial printers, or modems to one or more hosts on an 802.3/Ethernet LAN.
- **DECserver 550**—Connects from eight to 128 terminals, serial printers, modems, or four to 64 IBM 3270 Control Unit Terminal (CUT) displays to one or more hosts on the 802.3/Ethernet LAN.
- **MUXserver 100/DECmux II Remote Terminal Server**—Connects up to 16 terminals, or serial printers at remote sites to one or more hosts on an 802.3/Ethernet LAN.
- **MUXserver 300/DECmux 300 Remote Terminal Server**—Connects up to 48 terminals, serial printers, and modems at remote sites to one or more hosts on an 802.3/Ethernet LAN.
- **PrintServer 40**—Provides high-volume laser printing via a dedicated data print controller to client nodes in a local area network.

#### ***Routers and Gateways***

Digital's Router and Gateway products include the following:

- **DECrouter 100**—Connects up to 16 nodes on the Ethernet to a remote location using a synchronous DECnet link.
- **DECrouter 200**—Transfers data packets from DECnet nodes on an 802.3/Ethernet LAN to remote DECnet nodes or other 802.3/Ethernet LANs via asynchronous lines.
- **DECrouter 2000**—Provides synchronous connections to remote a DECnet system and LANs in a wide area network or between remote LANs using DECnet.
- **X25router 2000**—Combines the functions of DECrouter 2000 with additional X.25 connections to Packet Switched Data Networks (can run both DECnet and X.25 concurrently).
- **DECnet/SNA Gateway for Synchronous Transport**—Connects 802.3/Ethernet LANs to IBM hosts using high-performance and high-bandwidth connections to front-end processors.
- **DECnet/SNA Gateway for Channel Transport**—Connects an 802.3/Ethernet LAN to an IBM host using direct attachment to the S/370 channel.

The DECrouter 2000, X25router 2000, and DECnet/SNA Gateway-ST share a common hardware base, the DEC MicroServer (DEMSA), used whenever communication is required from an Ethernet LAN into a Wide Area Network (WAN) environment. Special software determines which function the DEC MicroServer performs. The DECrouter 100 uses a variation of the DEC MicroServer, the DEC MicroServer-SP.

## 802.3/Ethernet Communications Servers

### Features

- Provides resource sharing across multihost systems within an 802.3/Ethernet LAN.
- Performs a dedicated function whose cost can be spread over many users.
- Increases 802.3/Ethernet LAN configuration flexibility.
- Offloads communications processing from 802.3/Ethernet nodes, reducing CPU overhead.
- Automatic diagnosis on startup checks communications-server operation, increasing network reliability.

### Summary of 802.3/Ethernet Terminal Servers

Product	DECserver 200	DECserver 550	DECserver 550/ CXM04	MUXserver 100/ DECmux II	MUXserver 300/ DECmux 300
Hardware Type	DSRVB	DSRVS	DSRVS	DSRZA/ DFMZA	DERZC/DM3xx
Number of Lines/ Maximum Throughput	Eight @ 19.2 Kb/s	Up to 128 (160,000 char/s output, 14,000 char/s input —application-dependent)	Comparable input/output to DSRVS with asynchronous cards.	16 @ 19.2 Kb/s	48 @ 19.2 Kb/s
MultiCPU Access	Yes	Yes	Yes	Yes	Yes
Modem Control	MC version—Yes; DL version—No	CXY08—Yes; CXA16—No CXB16—No	N/A	No	Yes
Protocols	Asynchronous	Asynchronous	IBM Coax-A	Asynchronous	Asynchronous
Downline-load Host Support <sup>1</sup>	DECnet-VAX, DECnet-11M-PLUS, DECnet-Micro/RSX, DECnet-ULTRIX	DECnet-VAX, DECnet-11M-PLUS, DECnet-Micro/RXS	DECnet-VAX	DECnet-VAX, DECnet-11M-PLUS, DECnet-Micro/RXS, DECnet-ULTRIX	DECnet-VAX DECnet-ULTRIX
Operational Host Support <sup>1</sup>	VMS, RSX-11M-PLUS, MicroRSX, ULTRIX-32 <sup>2</sup>	VMS, RSX-11M-PLUS, MicroRSX	VMS, RSX-11M-PLUS, MicroRSX	VMS, RSX-11M-PLUS, MicroRSX, ULTRIX-32	VMS, RSX-11M-PLUS, MicroRSX, ULTRIX-32
Primary Buying Reason	Connect to non-LAT hosts; modem control; DEC423 (EIA-423-A) connection	Modular growth; high-density with small footprint; decreased cost-per-port as users increase	Multivendor terminal network; IBM 3270 CUT displays require VAX application access in addition to native IBM access	Efficient remote terminal connection; low price per line	Efficient remote connections include modems or non-LAT hosts, DEC 423 option

<sup>1</sup>The terminal servers support only DECnet Phase IV implementations.

<sup>2</sup>LAT support.

## 802.3/Ethernet Communications Servers

### Summary of 802.3/Ethernet Routers and Gateways

Product	DECrouter 100	DECrouter 200	DECrouter 2000	X25router 2000	DECnet/SNA Gateway-ST	DECnet/SNA Gateway-CT
Hardware Type	DEM5B	DSRVC	DEM5A	DEM5A	DEM5A	DESNA
Number of Lines/ Maximum Throughput	16 @ 19.2 Kb/s	8 @ 19.2 Kb/s	2 @ 256 Kb/s 4 @ 64 Kb/s	2 @ 256 Kb/s 4 @ 64 Kb/s	1 @ 256 Kb/s 2 @ 128 Kb/s 4 @ 64 Kb/s	1 @ channel speed
MultiCPU Access	Yes	Yes	Yes	Yes	Yes	Yes
Modem Control	Full	Full	Full	Full	Full	Full
Protocols	Synchronous SDLC	Asynchronous DDCMP	DDCMP	DDCMP, X.25 (LAPB)	Synchronous SDLC	Channel
Downline-load Host Support <sup>1</sup>	DECnet-VAX DECnet-ULTRIX	DECnet-VAX, DECnet-ULTRIX	DECnet-VAX DECnet-ULTRIX	DECnet-VAX,	DECnet-VAX	DECnet-VAX
Operational Host Support <sup>1</sup>	ULTRIX-32	Any Phase IV DECnet node	Any Phase III or Phase IV DECnet	VMS	VMS, ULTRIX-32, MS-DOS	VMS, ULTRIX-32, MS-DOS
Primary Buying Reason	Cost-effective connection for small, branch-office networks	Cost-effective PC-to-LAN connection	Connects Phase III nodes and wide area nodes to LAN; offloads nodes from communications processing	MultiCPU access to PSDNs; price and performance advantages over VAX CPUs acting as dedicated gateways	Connects an 802.3/Ethernet LAN to as many as four IBM SNA networks over synchronous communications lines	High-end DECnet/SNA transport provides channel connection for communications

<sup>1</sup>The DECnet/SNA Gateway products support only DECnet Phase IV implementations, while the DECrouter 2000 and X25router 2000 support any Phase III or Phase IV implementation.

### Terminal Server Overview

Terminal servers provide a cost-effective, flexible way to connect terminals to hosts in an 802.3/Ethernet LAN. Each terminal connected to a terminal server can access services running on service nodes connected to the same LAN (refer to Prerequisite Software for supported hosts). Terminal servers connect asynchronous terminals at speeds up to 19.2 Kb/s to local nodes that implement the Local Area Transport (LAT) protocol.

Digital offers the following terminal server products:

- **DECserver 200**—an eight-line server that includes software that is downline loaded into DSRVB hardware. The DECserver 200 has a version with modem control (MC), and a DEC423 (EIA-423-A) version for data-only leads with no modem control.
- **DECserver 550**—a four-to-128-line server that includes software that is downline loaded into DSRVS hardware. The DECserver 550 can accommodate three types of line controllers: one for full modem control, one for DEC423 (EIA-423-A) connections with no modem control, and one for EIA-422 connections with no modem control.
- **MUXserver 100/DECmux II**—a 16-line remote server that includes MUXserver 100 software downline loaded into DSRZA hardware, and a remote multiplexer, the DFMZA.
- **MUXserver 300/DECmux 300**—a 48-line remote server that includes MUXserver 300 software downline loaded into DSRZC hardware, and a remote multiplexer, the DM3xx.

## 802.3/Ethernet Communications Servers

Server software, including diagnostics, is downline-loaded into the server from a load host. In the event of hardware or software malfunction, the unit attempts to upline-dump the memory image (for later analysis), and automatically reloads the software.

The function performed by these terminal servers is similar to that offered by traditional terminal data switches (for example, Gandalf or Micom). The difference is that the terminal servers handle terminal communications over a communications line, while a traditional switch requires multiple terminal line connections. This results in a significant reduction in cost-per-line when using terminal servers, especially when cabling, host power, and packaging expenses are factored into the overall cost of network terminal connection.

In a VAXcluster environment, terminal servers add significantly in maintaining high-availability to the cluster. Features such as log-in load balancing, automatic login failover, and multisession terminal connections provide greater user productivity.

Terminal servers support VT, LN, LA, and LQ series terminal devices as well as Digital devices that run in VT100 compatibility mode. In addition, the DECserver 550 can support IBM 3270 Control Unit Terminal (CUT) displays, or IBM PCs emulating 3270 CUT displays connected to the CXM04 option. ▲ (For more information on 3270 display models supported, refer to the DECserver 550 information elsewhere in this section.)

Terminals connected to terminal servers can access remote DECnet nodes through DECnet Phase IV routing nodes on the same LAN. They can also connect to VMS nodes running Access software to access a X25router 2000 or DECnet/SNA Gateway. Note that a system on the LAN does not have to be running DECnet to communicate with the terminal servers. However, DECnet must be running on at least one node on the LAN in order to downline-load the terminal server.

### **Printer Support**

A terminal server used for printer applications provides a cost-effective way to distribute a printer or a collection of printers in an 802.3/Ethernet LAN. Each printer connected to a server can be shared between multiple VMS nodes connected to the same LAN. A terminal server can connect asynchronous printers at speeds up to 19.2 Kb/s to local nodes that implement the LAT protocol. ▲ Refer to the appropriate terminal-server Software Product Description for a list of printers supported.

### **Features**

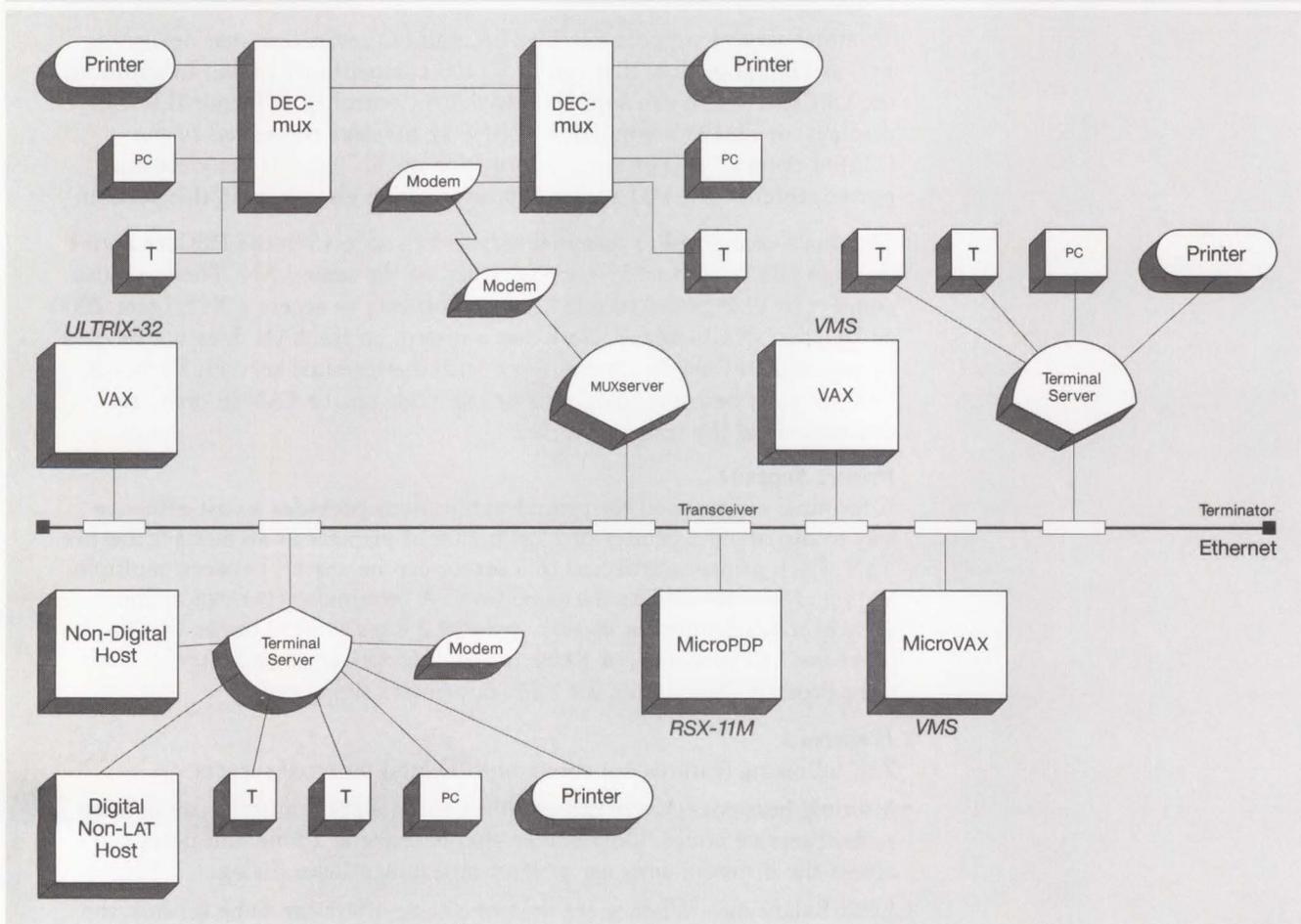
The following features are common to Digital terminal servers:

- **Multiple Sessions**—Users can establish and maintain multiple sessions to several service nodes. Only one session is active at a time and users can access the different sessions without repeating a login dialog.
- **Load Balancing**—When more than one node offers the same service, the server connects to the node with the highest rating for the service desired. This rating is based on the current loading on the nodes that offer the service.
- **Automatic Sessions Failover**—The server provides increased reliability and redundancy by allowing terminals logically connected to a failed host to access other hosts on the LAN.

### 802.3/Ethernet Communications Servers

- Terminal Request Management—The server eliminates terminal “blocking” (a limitation of data switches) by managing multiple terminal requests logically instead of physically. The LAT software allows the terminal server to effectively “multiplex” many terminal access requests over a single physical line.
- Terminal Connection Management—Users can establish a logical connection (session) to any local service node that implements the LAT protocol. Users connect to the services offered rather than the node itself. All the standard system utilities and applications supported by the node are available to the user.
- Security—The server provides multiple levels of security for terminal access to network hosts, preventing unauthorized users from accessing network resources.
- PC File Transfer—poly-XFR File Transfer for IBM Personal Computers.

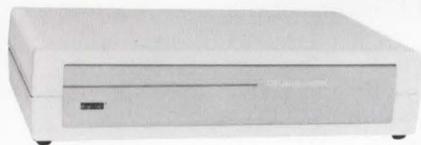
LAN Configuration Using Terminal Servers



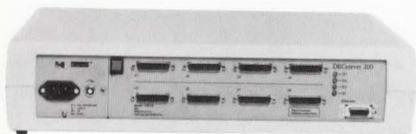
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## 802.3/Ethernet Communications Servers

### DECserver 200



*DECserver 200*



*DECserver 200/MC*



*DECserver 200/DL*

The DECserver 200 is a network terminal switch for 802.3/Ethernet local area networks. It supports the simultaneous operation of up to eight terminals at speeds up to 19.2 Kb/s full duplex. Two versions of the DECserver 200 are available: DECserver 200/MC and DECserver 200/DL.

The following capabilities are supported by the DECserver 200/MC (Modem Control):

- EIA-232-D line interface
- Modem Control—The DECserver 200 provides modem support for asynchronous modems (Digital's modems or BELL 103, 212, and 2400 baud modems)
- LED enhanced visual communication monitors
- Connection to Non-LAT Hosts—The DECserver 200/MC provides transparent logical terminal connections to hosts that do not implement the LAT protocol. In this type of configuration, the DECserver 200 becomes the 802.3/Ethernet connection and protocol support for these hosts. Users can access LAT and non-LAT hosts directly via a DECserver 200. A host that supports XON/XOFF, ASCII standards, and EIA-232-D interfaces can be connected to the DECserver 200.

The DECserver 200/DL (Data Leads) has a single 36-pin connector capable of supporting eight DECconnect ports (DEC423). A special cable is required to connect the DECserver 200/DL to equipment that can interface to DEC423 signals. DECserver 200/DL does not support modems or applications with devices that require modem control signals. The DECserver 200/DL is intended for applications requiring only data leads to serial terminals or printers. Refer to "DECconnect" in this section for more information.

### **Features**

- Terminal Device/Session Management Protocol (TD/SMP) supports these functions on VT330 and VT340 terminals:
  - Two terminal sessions can be active simultaneously, regardless of which session is displayed on the screen.
  - Users can concurrently display the interaction with two sessions on a divided screen.
  - While the user is interacting with one session, the other session can continue processing.

Refer to Terminal Server Overview in this section for other DECserver 200 features.

### **Specifications**

Physical Characteristics:

- Height: 11.75 cm (4.63 in)
- Width: 48.90 cm (19.25 in)
- Depth: 32.07 cm (12.63 in)
- Weight: 5.44 kg (12 lb)
- Environmental Class: C (Refer to Appendix B for details.)

### **Prerequisite Hardware**

- All 802.3/Ethernet physical channel hardware.
- Either an 802.3/Ethernet transceiver, a DELNI, or any properly configured ThinWire tap/segment.

## 802.3/Ethernet Communications Servers

### **Prerequisite Software**

- DECserver 200 software must be downline loaded from one of the following load hosts: DECnet-VAX, DECnet-11M, DECnet-11M-PLUS, DECnet-Micro/RXS, and ULTRIX-32.
- For service node support, one of the following operating systems is required: VMS, MicroVMS, RSX-11M-PLUS with DECnet-11M-PLUS, Micro/RXS with DECnet Micro/RXS, ULTRIX-32.

▲ Refer to the Software Product Description for the version number requirements.

### **Terminal Server Manager Optional Software**

The Terminal Server Manager/VMS is a software tool that allows a user at a VAX host to remotely observe and control Digital terminal servers anywhere in an extended local area network. For more information, refer to "Terminal Server Manager" in this section.

### **Ordering Information**

Order the DECserver 200 hardware, a country kit for 240-V versions, and at least one copy of the software. Cables to connect terminals and modems must be ordered separately.

The DECserver 200 hardware includes the license to run DECserver 200 software. Software on the appropriate distribution medium must be purchased for the host that downline-loads the DECserver 200.

The DECserver 200 country kit includes a power cord, hardware manual, and rackmounting brackets. The 240-V versions of the DECserver 200 require a country kit; the 120-V versions include the country kit. A 120-V country kit for the U.S. and Canada is listed to retrofit models originally ordered for 240 V.

### **DECserver 200 Hardware Order Codes**

<b>Option</b>	<b>Order Code</b>
8-line DECserver 200, 120 V, supports 8 EIA-232-D physical terminal connections. Includes country kit.	DSRVB-AA
8-line DECserver 200, 120 V, supports DEC423 data-only terminal connections. Includes SER adapter kit and country kit.	DSRVB-BA
8-line DECserver 200, 240 V, supports 8 EIA-232-D physical terminal connections. Requires country kit.	DSRVB-AB
8-line DECserver 200, 240 V, supports 8 DEC423 data-only terminal connections. Includes SER adapter kit; requires country kit.	DSRVB-BB

*DECserver 200 Power Cord Order Codes*

Country	Order Code
Australia, New Zealand	DSRVB-KZ
Belgium, Finland, France, Holland, Norway, Spain, Sweden	DSRVB-LA
Canada (English and French), United States	DSRVB-KA
Denmark	DSRVB-KD
Italy	DSRVB-KI
India	DSRVB-LJ
Israel	DSRVB-KT
Japan	DSRVB-KJ
Switzerland (French and German)	DSRVB-LB
United Kingdom	DSRVB-KE
West Germany	DSRVB-KG

▲ Refer to the following for further information on supported processor and services.

- VMS
  - Software Product Description 27.53
  - Unique Product Identifier VCB
- ULTRIX-32
  - Software Product Description 27.54
  - Unique Product Identifier VDE
- Micro/R SX and RSX-11M-PLUS
  - Software Product Description 15.72
  - Unique Product Identifier Z06

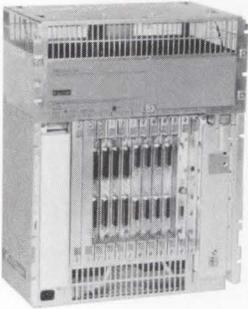
**Terminal Cables**

To connect terminals to the DECserver 200/MC, order the following cables. (When ordering cables refer to “Communications Cables” in Section 3 for cable options and be sure to specify length, for example, BC22F-25.)

- BC22E—Full modem 16-wire cable for modem connections.
- BC22F—Full modem 25-wire cable for modem connections.
- BC22R—Recommended null modem cable for host systems and other devices, including those that utilize CTS/RTS flow control.
- BC17D—Null modem cable for host systems and other devices that do not utilize CTS/RTS flow control.

## 802.3/Ethernet Communications Servers

### DECserver 550



The DECserver 550 terminal server is a terminal switch capable of connecting large concentrations of VT and/or IBM 3270 CUT terminals, serial printers, and modems to one or many hosts on an 802.3/Ethernet local area network. It can also be used to connect other vendors' processors to the local area network, allowing access to terminal-server users. It is the high-end companion to the DECserver 200 terminal server.

The DECserver 550 high-density compact packaging supports up to 128 terminal connections via eight integral card slots that support terminal interface options:

- The CXY08 with modem control provides eight EIA-232-D 25-pin connections.
- The CXA16 provides 16 EIA-423-A modular-jack local connections for local terminals or serial printers.
- The CXB16 provides 16 EIA-422 modular-jack connections to terminals in harsh environments located at distances up to 4,000 feet.
- The CXM04 provides eight BNC connections for IBM 3270 CUT displays and IBM 3270 Cluster Control Unit connections via RG62A/U coax, or shielded/unshielded twisted-pair (through user-supplied TP baluns).

▲ For more information on the CXY, CXA, and CXB modules, refer to "Q-bus Communications Controllers" in Section 3, and to the CXM04 description elsewhere in this section.

A fully populated DECserver 550 with EIA-423-A or EIA-422 interface options supports a maximum of 128 terminal devices. A fully populated DECserver 550 with EIA-232-D or CXM04 interface options supports a maximum of 64 devices. Or, any combination of interface options, up to eight total, can be mixed within the same enclosure.

The DECserver 550 with CXY08 EIA-232-D interface provides a non-LAT 802.3/Ethernet interface that connects non-Digital equipment, including processors, modems, protocol converters, Data PBXs, and virtually any device with a serial port that supports asynchronous EIA-232-D connections with modem control.

The DECserver 550 in many ways performs like a Data PBX. It can coexist with or replace existing Data PBXs as part of a migration path to 802.3/Ethernet local area networks.

The DECserver 550 is available in two versions: one for rackmounting into a Digital Satellite Equipment Room (SER) or 19-inch utility cabinets, and one with cabinet enclosures for the office floor.

## 802.3/Ethernet Communications Servers

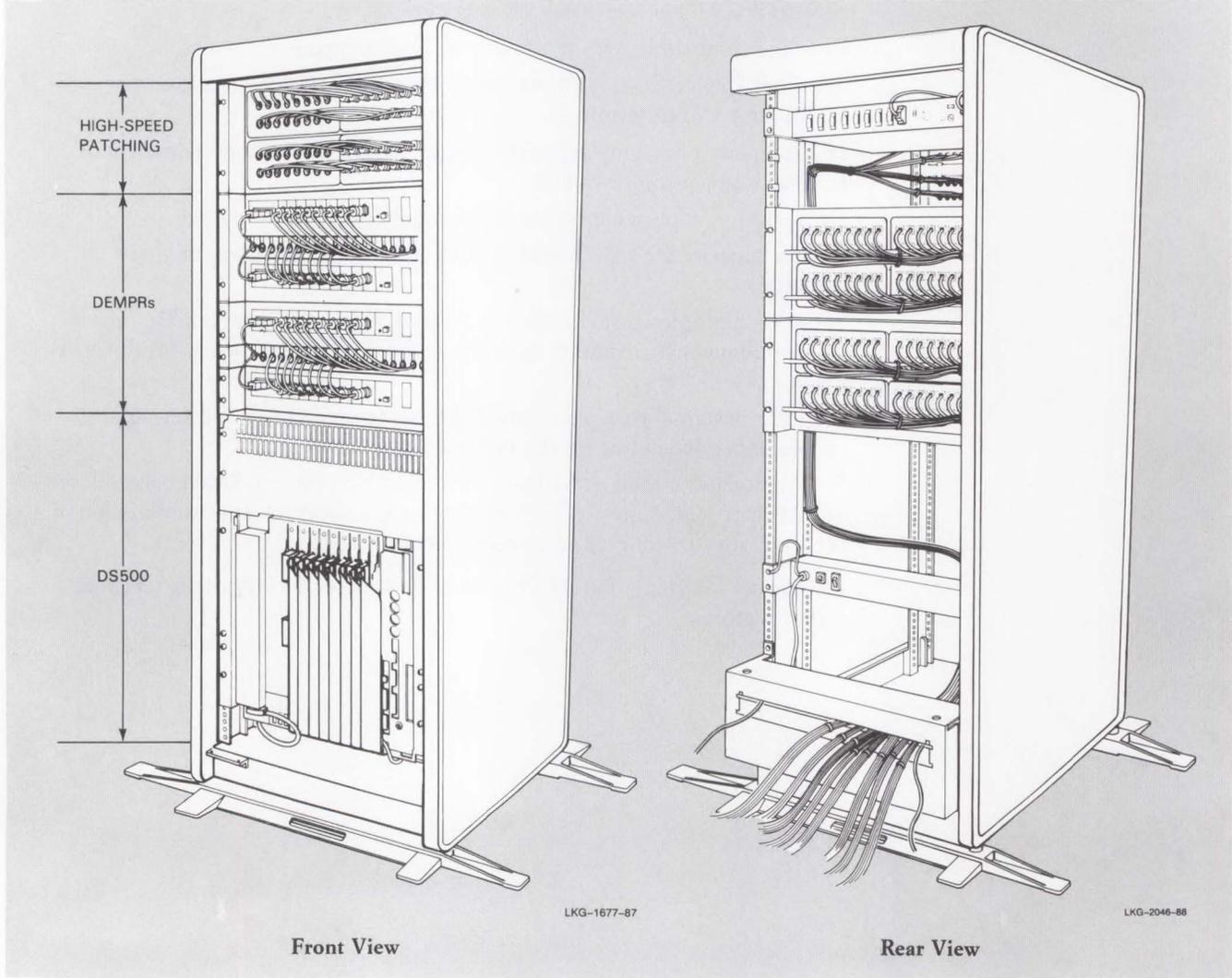
### *Features*

- Ideally suited for connecting large concentrations of terminal devices to 802.3/Ethernet local area networks.
  - Can co-exist with or replace traditional Data PBX switches as a migration path to 802.3/Ethernet local area networks.
  - Protocol compatible with the family of Digital terminal servers.
  - Terminal Device/Session Management Protocol (TD/SMP) support for VT330 and VT340 terminals.
  - High-density packaging supports a large number of terminal connections from a compact footprint size.
  - Decreased cost-per-connection as the number of users increase.
  - Printer support for VAX and MicroVAX systems allows users to share printers.
  - Supports multiple sessions, up to a total of 512 per DECserver 550. Users can simultaneously maintain multiple sessions to several hosts, resulting in greater productivity.
  - Modular design allows incremental growth from eight to 128 terminal connections, depending on the interface modules selected.
  - Accommodates a total of 64 lines with eight CXY08 or CXM04 controllers, or 128 lines with eight CXA16 or CXB16 controllers, or any combination of the four (up to a total of eight controllers).
- ▲ Refer to “Terminal Server Overview” in this section for other terminal server features.

### 802.3/Ethernet Communications Servers

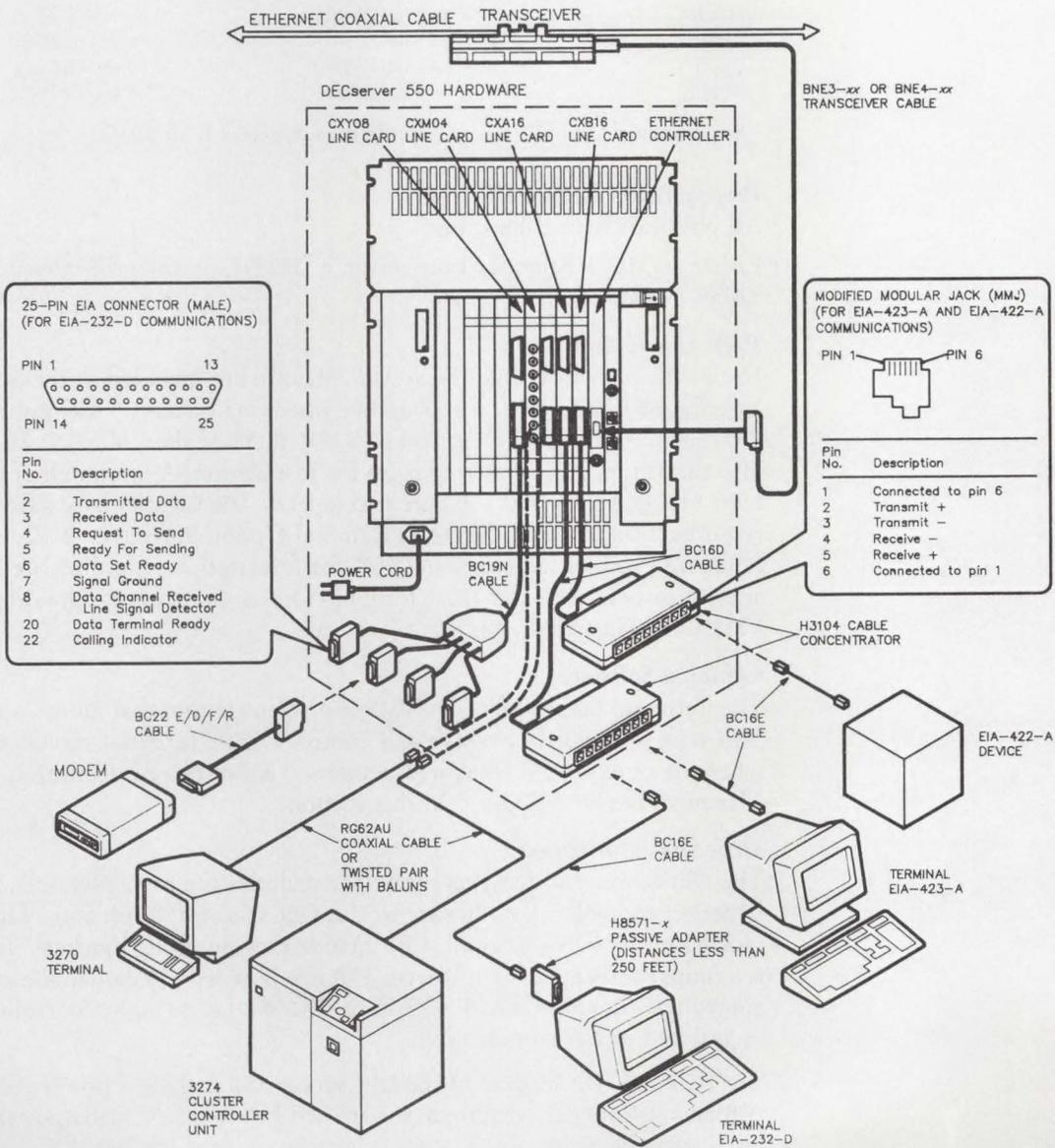
The following figures show how the DECserver 550 with CXA16 (no modem control) can be configured for the Office Communications Cabinet.

*DECserver 500 Rackmounted in an H9646-E Office Communications Cabinet*



# 802.3/Ethernet Communications Servers

## DECserver 550 Nonrackmounted, Standalone Configuration



NOTES: Components inside the dashed outline are shipped with the server in this example. The other components are customer supplied.

H8571-x and H3105-x adapters are not used to connect to EIA-423-A devices.

LKG-2859-89A

## 802.3/Ethernet Communications Servers

<i>Specifications</i>		
<b>Physical Characteristics</b>	<b>Office Model</b>	<b>Rackmount Model</b>
Height	0.69 m (27 in)	0.66 m (26.25 in)
Width	0.53 m (21 in)	0.46 m (18.28 in)
Depth	0.45 m (17.8 in)	0.29 m (11.5 in)
Weight	39.5 kg (85 lb)	28.3 kg (61 lb)
<b>Environmental Class</b>	C ▲ (Refer to Appendix B for details.)	

### ***Prerequisite Hardware***

- All physical channel hardware.
- Either an 802.3/Ethernet transceiver, a DELNI, or any properly configured ThinWire tap/segment.

### ***Prerequisite Software***

Instructions for installing the server software are included in the Software Installation Guide for the appropriate operating systems. ▲ Consult the RSX Software Product Description (SPD) 18.53 or the VMS SPD 26.97 for information regarding prerequisites for installation. A minimum of one copy of DECserver 500 software is required. The CXM04 hardware also requires installation of the 3270 Terminal Option Software. ▲ Refer to Software Product Description 25.G5 for information regarding prerequisites of installation. The 3270 Terminal Option Software is supported for VMS Load Hosts only.

### ***Optional Software***

The Terminal Server Manager/VMS is a software tool that allows a user at a VAX host to remotely observe and control Digital terminal servers anywhere in an extended local area network. ▲ For more information, refer to "Terminal Server Manager" in this section.

### ***Ordering Information***

The DECserver 550 hardware (DSRVS) includes the processor, 802.3/Ethernet controller, and license to run DECserver 550 software. The rackmount models (-CA and -CB) include rackmounting brackets. To act as a terminal server, each DECserver 550 needs at least one communications controller: CXY08, CXA16, CXB16 or CXM04. Up to eight controllers may be ordered in any combination.

The -CA and -DA models of the DECserver 550 include a power cord. The -CB and -DB models require a power cord kit. A U.S./Canada power cord kit is available to retrofit models originally ordered for 240 V.

DECserver 550 hardware includes the license to run DECserver 550 software. The software on the appropriate distribution medium must be purchased for the node that will downline load the DECserver 550. The CXM04 hardware includes the license to run the 3270 Terminal Option Software. The software on the appropriate distribution medium must be purchased for the VMS node that will downline-load the DECserver 550 where the CXM04 is installed.

## 802.3/Ethernet Communications Servers

### *DECserver 550 Hardware Order Codes*

Option	Order Code
DECserver 550 rackmount model, 120 V. Includes power-cord kit.	DSRVS-CA
DECserver 550 rackmount model, 240 V. Requires power-cord kit.	DSRVS-CB
DECserver 550 floor model, 120 V. Includes power-cord kit.	DSRVS-DA
DECserver 550 floor model, 240 V. Requires power-cord kit.	DSRVS-DB
To act as a terminal server, each DECserver 550 needs at least one of the following communications controllers:	
Factory-installed 16-line asynchronous communications controller for DEC423 (EIA-423-A) signaling standard.	CXA16-AA
Factory-installed 16-line asynchronous communications for EIA-422 signaling standard.	CXB16-AA
Factory-installed 8-line asynchronous communications controller for EIA-232-D signaling standard.	CXY08-AA
Factory-installed 3270 Terminal Option Card to connect 4 or 8 displays (see CXM04 description for configuration details).	CXM04-AA
Field-installed 16-line asynchronous communications controller for DEC423 (EIA-423-A) signaling standard.	CXA16-AF
Field-installed 16-line asynchronous communications controller for EIA-422 signaling standard.	CXB16-AF
Field-installed 8-line asynchronous communications controller for EIA-232-D signaling standard.	CXY08-AF
Field-installed 3270 Terminal Option Card to connect 4 or 8 displays (see CXM04 description for configuration details).	CXM04-AF

### *Upgrade for DECserver 500*

Option	Order Code
To upgrade the DECserver 500 to DECserver 550	DSRVS-UA

### *DECserver 550 Power-Cord Order Codes*

Option	Order Code
United States, Canada	BN20A-2E
Japan	BN20B-2E
Australia, New Zealand	BN20C-2E
Belgium, Finland, France, West Germany, Holland, Norway, Spain, Sweden	BN20D-2E
Ireland, United Kingdom	BN20E-2E
Switzerland	BN20F-2E
Denmark	BN20H-2E
Italy	BN20J-2E
India, South Africa	BN20K-2E
Israel	BN20L-2E

## 802.3/Ethernet Communications Servers

### *DECserver 550/CXM04 Configured 3270 Hardware Packages*

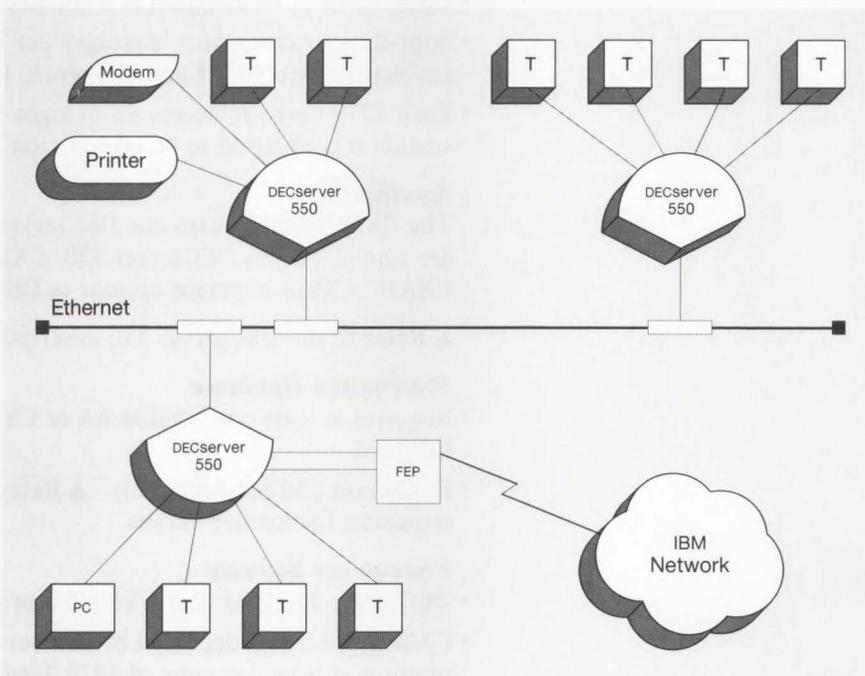
<b>Option</b>	<b>Order Code</b>
One DECserver 550 (model number DSRVS-CA 120 V) with eight (8) CXM04-AA option cards. Provides connectivity for thirty-two (32) 3270 displays to operate with dual Digital/IBM access. Includes power-cord kit.	DSRVM-AA
One DECserver 550 (model number DSRVS-CB 240 V) with eight (8) CXM04-AA option cards. Provides connectivity for thirty-two (32) 3270 displays to operate with dual Digital/IBM access. Requires power-cord kit.	DSRVM-AB
Four DECserver 550s (model number DSRVS-CA 120 V) with thirty-two (32) CXM04-AA option cards. Provides connectivity for 128 3270 displays to operate with dual Digital/IBM access. Includes four power-cord kits.	DSRVM-BA
Four DECserver 550s (model number DSRVS-CB 240 V) with thirty-two (32) CXM04-AA option cards. Provides connectivity for 128 3270 displays to operate with dual Digital/IBM access. Requires four power-cord kits.	DSRVM-BB
Eight DECserver 550s (model number DSRVS-CA 120 V) with sixty-four (64) CXM04-AA option cards. Provides connectivity for 256 3270 displays to operate with dual Digital/IBM access. Includes eight power-cord kits.	DSRVM-CA
Eight DECserver 550s (model number DSRVS-CB 240 V) with sixty-four (64) CXM04-AA option cards. Provides connectivity for 256 3270 displays to operate with dual Digital/IBM access. Requires eight power-cord kits.	DSRVM-CB

**Note:** The DECserver 550/CXM04 packages contain rackmount model DECserver 550 hardware and factory installed CXM04-AA cards. Appropriate software licenses are included with the hardware. ▲ Refer to the following Software Product Description (SPD) and Unique Product Identifiers (UPI) for further information.

- VMS
  - SPD 26.97
  - UPI 03K
- RSX and MicroRSX
  - SPD 18.53
  - UPI Z46
- 3270 Terminal Option Software
  - SPD 25.G5
  - UPI VVQ

### CXM04 (3270 Terminal Option Card)

DECserver 550 with CXM04 Configurations ;endla;



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The CXM04, an option for DECserver 550 hardware, provides full-screen VT220 emulation to attached IBM 3270 Control Unit Terminal (CUT) displays and IBM PCs emulating 3270 CUT displays at scroll rates selectable up to 19.2 Kb/s. Once connected, an IBM 3270 CUT display has access to VAX applications anywhere in the network. The CXM04 provides maximum Ethernet flexibility for connected displays. The CXM04 is transparent to the IBM network and IBM software. CXM04 installation requires no reconfiguration of the IBM network.

Full VT220 emulation is supported within the constraints of the 3270 hardware. Certain VT220 characteristics, such as double-height, double-width characters are not reproducible on 3270 displays. Comprehensive keyboard maps for 87, 102, 104 and 122 IBM keyboards are included with the associated 3270 Terminal Option Software. Also, a Keyboard Mapping Utility is supplied as part of the DECserver Terminal Server Configurator Utility (TSC) to customize these standard keyboard maps for further flexibility. The Keyboard Mapping Utility is also supported under the optional Terminal Server Manager (TSM) software package.

#### Features

- VT220 emulation, including VT220 SETUP capabilities.
- IBM session maintained while 3270 display is in VT mode.
- Screen is repainted with latest IBM response when user returns to IBM mode.
- Custom keyboard configuration through use of TSC and/or TSM (native and emulation mode keyboards supported).
- Fail safe protection of IBM connectivity. User always has IBM access during a DECserver power down.
- Automatic fail over to VT mode during an IBM line outage.

## 802.3/Ethernet Communications Servers

- Server image is downline-loaded.
- Coax-A status information is accessible from 3270 Control Screen.
- Support four coresident languages per DECserver 550) and their associated keyboard maps. (US, English, French, German supported.)
- Each 3270 user can access up to eight VT sessions (in addition to an IBM session if configured in “dual-function” mode).

### **Specifications**

The CXM04 option uses one DECserver 550 slot. Up to eight CXM04 cards are supported in a DECserver 550. CXM04 can also be mixed with CXY08, CXA16, CXB16 interface options in DECserver 550 hardware.

▲ Refer to the DECserver 550 description for further information.

### **Prerequisite Hardware**

- Requires at least one CXM04-AA or CXM04-AF. (Software license is included.)
- DECserver 550 hardware only. ▲ Refer to DECserver 550 hardware prerequisites for further details.

### **Prerequisite Software**

- DECserver 550 load host—VMS 5.0 or greater.
- CXM04 option is supported by DECserver 500 Version 2.0 software; requires at least one copy of 3270 Terminal Option Software Version 1.0. ▲ Refer to SPD 25.G5 for details.
- The CXM04 is supported by Terminal Server Manager Version 1.3 software (optional).

### **Supported IBM 3270 Hardware**

IBM 3270 CUT Displays include

- IBM 3278-2, 3, 4, and 5.
- IBM 3279-S2A, S2B, S3G, 2X, and 3X.
- IBM 3178-C2, C3, and C4.
- IBM 3179-1.
- IBM 3180-1.
- IBM 3191-A10, B10, A20, B20, A30, and B30.
- IBM 3192-C series, D series.
- IBM PCs using DCA IRMA-1, DCA-IRMA-2, or IBM 3270 Terminal Emulator Adapter (PCA and MCA).

**Note:** 87, 102, 104, 122 keyboards are supported in native and emulation mode. **Note:** Display attached devices such as printers, card readers and light pens are supported in IBM “pass-through” mode only. Input to or from such devices is not recognized when the associated display is in VT-mode. **Note:** Displays connected via IBM 3299 terminal multiplexers can be attached on the display side of the multiplexer only to a CXM04. The CXM04 does not interpret 3299 datastream directly at this time. IBM Cluster Control Units include

- IBM 3274-21A, B, C, and D.
- IBM 3274-31A, B, C, and D.
- IBM 3274-41A, B, C, D.

## MUXserver 100/DECmux II Remote Terminal Server

- IBM 3274-51C.
- IBM 3274-61C.
- IBM 3174-01L, 01R, 02R, 03R, 51R, 53R, 81R, and 82R.

### Ordering Information

The CXM04 can be ordered only for the DECserver 550. For ordering information refer to the DECserver 550 product description.

The MUXserver 100/DECmux II Remote Terminal Server connects up to 16 remote asynchronous terminals, personal computers, and printers via a pair of modems and a leased phone line to an 802.3/Ethernet local area network. The MUXserver 100 connects to the LAN and functions as a terminal server for remote devices. The DECmux II connects devices at the remote site and functions with the MUXserver 100 as a statistical multiplexer to send data to the LAN.

### Features

The MUXserver 100/DECmux II reduces monthly phone charges by concentrating data over one leased phone line, and it offers an efficient and low-cost method for multiplexing remote devices over one leased phone line.

▲ Refer to "Terminal Server Overview" in this section for other MUXserver 100 features.

<i>Specifications</i>		
<b>Physical Characteristics</b>	<b>MUXserver 100 (DSRZA)</b>	<b>DECmux II (DFMZA)</b>
Height	9.52 cm (3.75 in)	11.43 cm (4.5 in)
Width	45.7 cm (18 in)	35.29 cm (13.5 in)
Depth	30.48 cm (12 in)	22.35 cm (8.8 in)
Weight	6.8 kg (15 lb)	2.95 kg (6.5 lb)
<b>Power Requirements</b>		
Low-range line voltage	100 Vac to 120 Vac (-BA versions)	
High-range line voltage	200 Vac to 240 Vac (-BB versions)	
Frequency tolerance	50/60 ±3 Hz	50/60 ±3 Hz
Maximum ac watts drawn	50	33
Maximum heat dissipation	393 Btu/h	210 Btu/h
<b>Environmental Class</b>	C (See Appendix B for details.)	

### Configurations

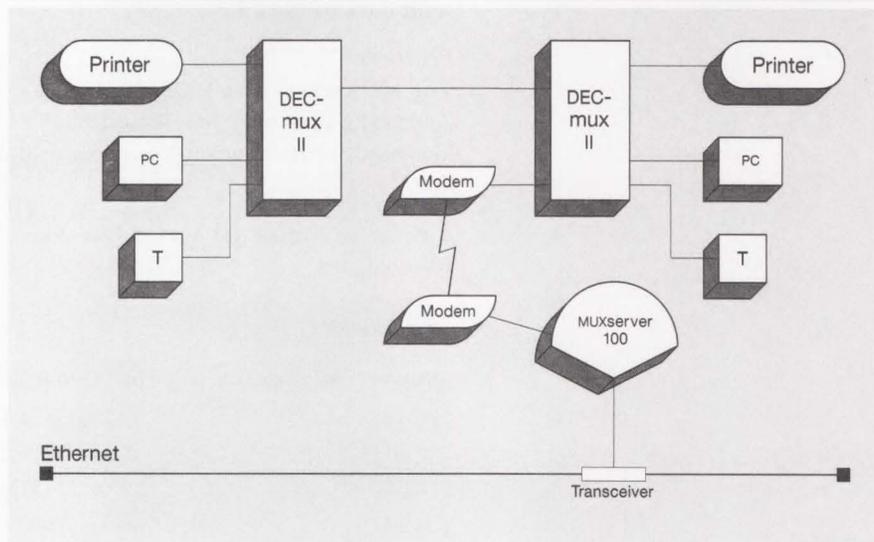
Each DECmux II can connect up to eight remote devices. Because each MUXserver 100 can accept up to 16 channels, two DECmux IIs can be linked to one MUXserver 100. Also, each MUXserver 100 can accept up to two composite links. A MUXserver 100 is linked to a DECmux II through a leased phone line and two external modems operating at a maximum speed of 19.2 Kb/s. Configurations include

- Sixteen users at one site: Two DECmux IIs can be linked at the same remote site with an EIA-232-D cable (maximum distance: 50 feet) or an EIA-422 cable (maximum distance: 4,000 feet) to accommodate up to 16 users.

## 802.3/Ethernet Communications Servers

- 16 users at two sites: Each site can have up to eight users connected to a DECmux II. Each site connects through a phone link to one MUXserver 100.
- Two sites with route-through: If there are two separate remote sites that are located close to each other, one site can be routed through the second site by linking two DECmux IIs with two modems and a leased phone line. Each site can have a maximum of eight users.
- One local site and one remote site: If only eight remote devices need 802.3/Ethernet connection, eight local devices can also be linked to the MUXserver 100 through a DECmux II. The MUXserver 100 is locally linked to a DECmux II with an EIA-422 cable.

*MUXserver 100/DECmux II Configuration (daisy-chained)*



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### **Prerequisite Hardware**

- One MUXserver 100 with one or two DECmux IIs plus user port cables.
- One 3002 or equivalent leased phone line and one pair of external modems and cables, where needed.
- All 802.3/Ethernet physical channel hardware.
- An 802.3/Ethernet transceiver, DESTA, or DELNI and transceiver drop cable.

### **Prerequisite Software**

- To downline-load MUXserver 100 software, one or more load hosts on the LAN must run one of the following:
  - DECnet-VAX
  - DECnet-11M-PLUS
  - DECnet-Micro/R SX
  - DECnet-ULTRIX

▲ See the Software Product Description for the version number requirements.

## 802.3/Ethernet Communications Servers

- Service node support is available on the following operating systems:
  - VMS
  - RSX-11M-PLUS
  - Micro/RSX
  - ULTRIX-32

Remote printer support is available only for VMS and ULTRIX operating systems.

▲ See the Software Product Description for the software version number requirements.

### **Optional Software**

The Terminal Server Manager/VMS (TSM) is a software tool that allows a user at a VAX host to remotely observe and control Digital terminal servers anywhere in an extended local area network. For more information, refer to Terminal Server Manager in this section.

#### **MUXserver 100/DECmux II Hardware Order Codes**

Option	Order Code
MUXserver 100, 120 V (supports 16 remote devices connected to DECmux II ports.) Includes U.S. country kit.	DSRZA-BA
DECmux II, 120 V (supports 8 EIA-232-D Terminal, PC, or printer connections). Includes U.S. country kit.	DFMZA-BA
MUXserver 100, 240 V (supports 16 remote devices connected to DECmux II ports.) Requires country kit.	DSRZA-BB
DECmux II, 240 V (supports 8 EIA-232-D Terminal, PC, or printer connections). Requires country kit.	DFMZA-BB

▲ Refer to the following Software Product Description (SPD) and Unique Product Identifiers (UPI) for further information.

- VMS/MicroVMS
  - SPD 28.45
  - UPI VE4
- ULTRIX-32/32M
  - SPD 28.46
  - UPI ZAW
- Micro/RSX and RSX-11M-PLUS
  - SPD 15.27
  - UPI DAW

### **Required Cables**

To configure the MUXserver 100/DECmux II, order the following cables. When ordering cables refer to Communications Cables in Section 3 for cable options and be sure to specify the length, for example, BC22F-25.

#### **MUXserver 100/DECmux II Cables**

Cable	Order Code
Modem cable to connect external modem to MUXserver 100 or DECmux II.	BC22F
Null modem cable to connect two DECmux IIs.	BC17D
Null modem cable to connect terminals, personal computers, or printers to DECmux II user ports.	BC22D

## 802.3/Ethernet Communications Servers

Note that EIA-422 cables are not sold as a Digital standard product. However, documentation is provided so that customers can make their own cables or Digital Field Service can custom-make them for an additional charge.

### ***MUXserver 100/DECmux II Country Kits***

The U.S. MUXserver 100/DECmux II (DSRZA-BA/DFMZA-BA) includes a U.S./Canada country kit. The non-U.S. MUXserver 100/DECmux II (DSRZA-BB/DFMZA-BB) requires a country kit. Each country kit includes a power cord, hardware documentation, and country-specific items. Be sure to order the appropriate country kit as a separate line item for each MUXserver and each DECmux II.

#### ***MUXserver 100/DECmux II Country Kit Order Codes***

<b>Country</b>	<b>MUXserver 100 Order Code</b>	<b>DECmux II Order Code</b>
Australia	DSRZA-KZ	DFMZA-KZ
Belgium	DSRZA-LA	DFMZA-LA
Canada (English and French)	DSRZA-KA	DFMZA-KA
Denmark	DSRZA-KD	DFMZA-KD
Finland	DSRZA-LA	DFMZA-LA
France	DSRZA-LA	DFMZA-LA
Holland	DSRZA-LA	DFMZA-LA
Italy	DSRZA-KI	DFMZA-KI
India	DSRZA-LJ	DFMZA-LJ
Israel	DSRZA-KT	DFMZA-KT
Japan	DSRZA-KJ	DFMZA-KJ
New Zealand	DSRZA-KZ	DFMZA-KZ
Norway	DSRZA-LA	DFMZA-LA
Spain	DSRZA-LA	DFMZA-LA
Sweden	DSRZA-LA	DFMZA-LA
Switzerland (French and German)	DSRZA-LB	DFMZA-LB
United Kingdom	DSRZA-KE	DFMZA-KE
United States*	DSRZA-KA	DFMZA-KA
West Germany	DSRZA-KG	DFMZA-KG

\*The U.S. version of the MUXserver 100 (DSRZA-BA) includes a country kit. A U.S. country kit is also available as a separate line item.

### **MUXserver 300/DECmux 300 Remote Terminal Server**

The MUXserver 300/DECmux 300 Remote Terminal Server connects up to 48 remote asynchronous terminals, serial printers, modems, and non-LAT hosts via a pair of modems and a leased phone line to an 802.3/Ethernet local area network. The MUXserver 300 connects to the LAN and functions as a terminal server for remote devices. The DECmux 300 connects devices at the remote site and functions with the MUXserver 300 as a statistical multiplexer to send data to the LAN.

**Features**

The MUXserver 300/DECmux 300 minimizes phone costs by concentrating data from multiple devices over one leased phone line. DECmux 300 versions with EIA-232-D user ports provide modem control and non-LAT connectivity. DECmux 300 versions with EIA-423-A ports provide DECconnect wiring for devices that do not need modem control, such as terminals and printers, but do not provide modem control.

▲ Refer to “Terminal Server Overview” in this section for MUXserver 300 features.

**Specifications**

Physical Characteristics	MUXserver 300 (DSRZC)	DECmux 300 (DM3xx)
Height	16.1 cm (6.35 in)	16.1 cm (6.35 in)
Width	49.3 cm (19.4 in)	49.3 cm (19.4 in)
Depth	31.2 cm (12.3 in)	31.2 cm (12.3 in)
Weight	6.0 kg (13.2 lb)	7.4 kg (16.3)
<b>Power Requirements</b>		
Low-range line voltage	100 Vac to 120 Vac (-*A versions)	
High range line voltage	200 Vac to 240 Vac (-*B versions)	
Frequency tolerance	50-60 Hz	50-60 Hz
Maximum ac watts drawn	110	180
Maximum heat dissipation	375 BTU/hr	614 BTU/hr
Environmental Class	C (See Appendix B for details.)	

**Configurations**

A single MUXserver 300 can

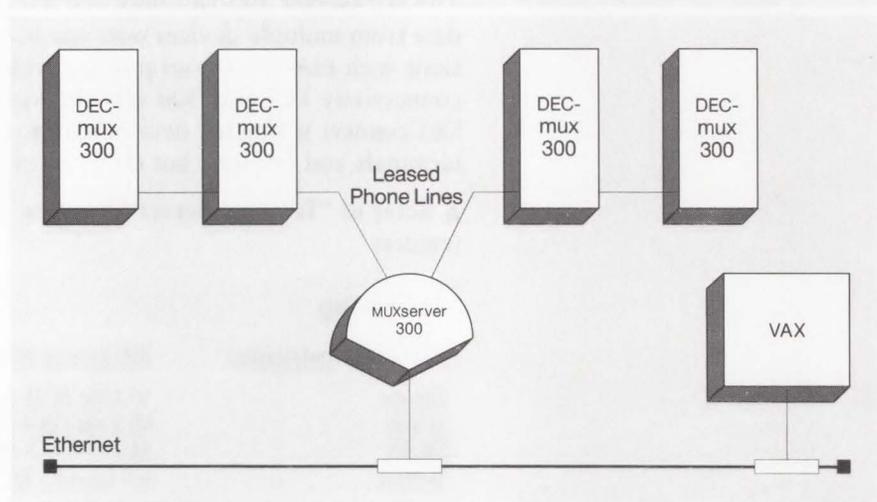
- Link up to 48 devices actively to the Ethernet LAN.
- Accept up to two phone line links, each at up to 64 Kb/s.
- Connect up to six DECmux 300s, with up to three DECmux 300s daisy-chained on each phone line link.

A single DECmux 300 can

- Connect up to eight, 16, 24, or 32 remote devices.
- Be daisy-chained to a second and third DECmux 300.
- Connect dial-up modems through EIA-232-D user ports.
- Support connections to non-LAT hosts through EIA-232-D user ports.
- Provide DECconnect wiring on EIA-423-A user ports.

DECmux 300s can be daisy-chained together through a cable or a leased phone line. Although six 32-channel DECmux 300s can physically connect 192 devices to one MUXserver 300, only 48 ports can have logical connections at one time.

*MUXserver 300/DECmux 300 Configuration*



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***Prerequisite Hardware***

- One MUXserver 300 with up to six DECmux 300s plus users port cables.
- One 3002 or equivalent leased phone line and one pair of external modems and cables, where needed.
- All 802.3/Ethernet physical channel hardware.
- An 802.3/Ethernet transceiver, DESTA, or DELNI and transceiver drop cable.

***Prerequisite Software***

- MUXserver 300 software must be downline loaded from either a DECnet-VAX or ULTRIX-32 load host.
- For service node support, one of the following operating systems is required: VMS, MicroVMS, RSX-11M-PLUS with DECnet-11M-PLUS, MicroRSX with DECnet Micro/RSX, or ULTRIX-32.

***Ordering Information***

- Refer to Software Product Description 25.E9 (UPI VT7) for VMS load host version number requirements and software ordering information. For ULTRIX load host MUXserver 300 software, refer to SPD 25.F1.xx (UPI VZH).
- Terminal Server Manager optional software supports the MUXserver 300. For more information, refer to Terminal Server Manager in this section.
- The eight-channel and 16-channel expansion boards for DM308-Ax and DM316-Bx variations are used to create 24-channel versions for DECmux 300 or to upgrade existing installations.
- Order the appropriate country kit for any 240 V version only.

## 802.3/Ethernet Communications Servers

### *MUXserver 300/DECmux 300 Hardware Order Codes*

<b>Option</b>	<b>Order Code</b>
MUXserver 300, 120 V. Includes country kit and license.	DSRZC-AA
Eight-channel EIA-232-D DECmux 300, 120 V. Includes country kit.	DM308-AA
16-channel EIA-232-D DECmux 300, 120 V. Includes country kit.	DM316-AA
16-channel EIA-423-A DECmux 300, 120 V. Includes country kit. Order 2 H3104-B kits separately.	DM316-BA
32-channel EIA-423-A DECmux 300, 240 V. Includes country kit. Order 4 H3104-B kits separately.	DM332-BA
MUXserver 300, 240 V. Includes license. Order country kit separately.	DSRZC-AB
Eight-channel EIA-232-D DECmux 300, 240 V. Order country kit separately.	DM308-AB
16-channel EIA-232-D DECmux 300, 240 V. Order country kit separately.	DM316-AB
16-channel EIA-423-A DECmux 300, 240 V. Order country kit and 2 H3104-B kits separately.	DM316-BB
32-channel EIA-423-A DECmux 300, 240 V. Order country kit and 4 H3104-B kits separately.	DM332-BB
Eight-channel EIA-232-D expansion board for DM308-Ax and DM316-Bx.	CK-DM308-A7
16-channel EIA-423-A expansion board for DM308-Ax and DM316-Bx. Order 2 H3104-B kits separately.	CK-DM316-W7
<b>Country Kit (240 V versions only)</b>	<b>Order Code</b>
Australia, New Zealand	DSRZC-KZ
Belgium, Finland, France, Holland, Norway, Spain, Sweden	DSRZC-MA
Denmark	DSRZC-KD
Germany	DSRZC-KG
India	DSRZC-LJ
Israel	DSRZC-KT
Italy	DSRZC-KI
Japan	DSRZC-KJ
Switzerland	DSRZC-MB
United Kingdom	DSRZC-KE

**Required Cables**

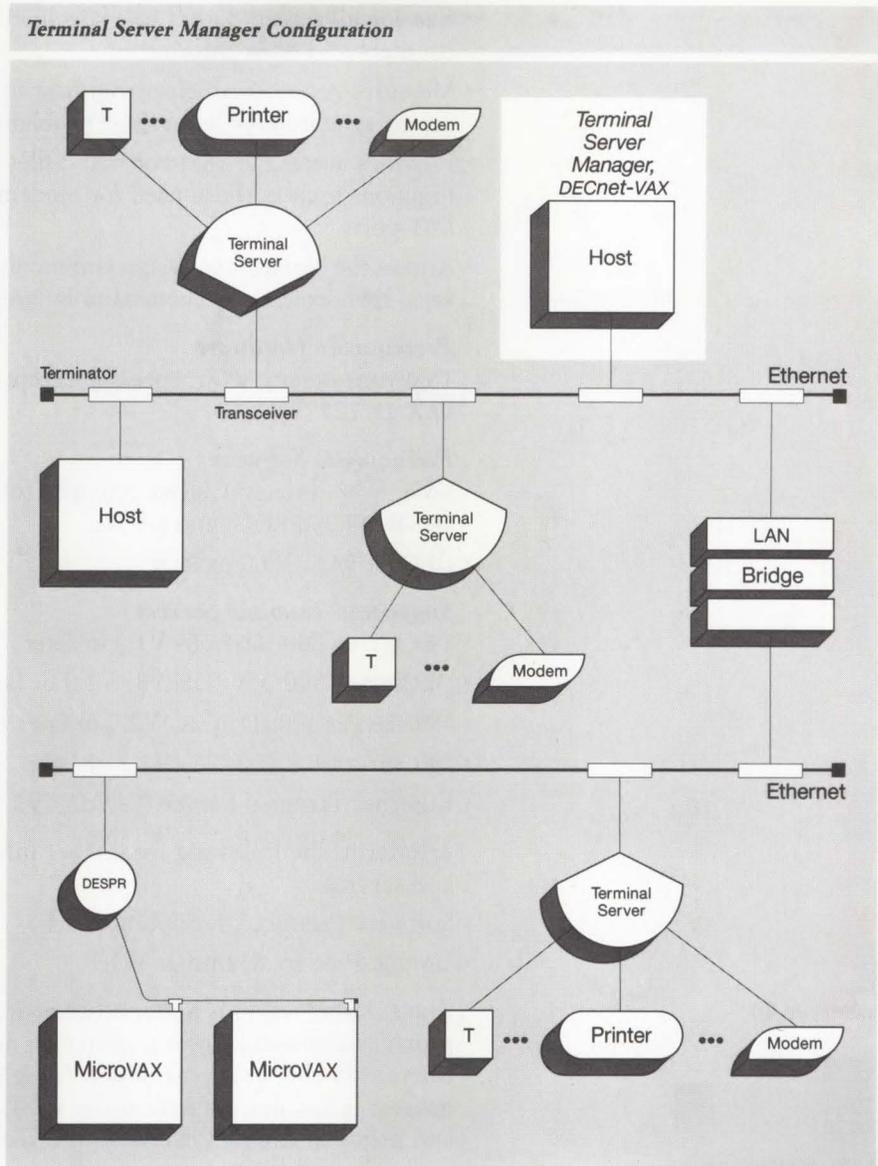
To configure the MUXserver 300/DECmux 300, order the following cables as needed:

Cable	Order Code
EIA-423-A cable concentrator kit. Order 2 for DM316-B* or CK-DM316-W7; order 4 for DM332-B.	H3104-B
EIA-423-A cable to connect terminal or printer to cable concentrator on DECmux 300 EIA-423-A versions.	BC16E
Connects terminal or printer to DECmux 300 EIA-232-D user port.	BC22D
Full modem 16-wire cable connects modem to DECmux 300 EIA-232-D user port.	BC22E
Full modem 25-wire cable connects modem to DECmux 300 EIA-232-D user port.	BC22F
Connects host systems and devices using CTS/RTS flow control to DECmux 300 EIA-232-D user port.	BC22R
Connects host systems and devices that do NOT use CTS/RTS flow control to DECmux 300 EIA-232-D user port.	BC17D
EIA-232-D cable connects MUXserver 300 to modem OR connects DECmux 300 to modem for analog leased phone line link.	BC19D-02
V.35 cable connects MUXserver 300 to data communications equipment OR connects DECmux 300 to data communications equipment (for example, for digital leased phone line link).	BC19F-02
EIA-422 cable connects MUXserver 300 to DECmux 300, OR connects two DECmux 300s together.	BC19Y-10

**Terminal Server Manager**

The Terminal Server Manager/VMS (TSM) software allows a network manager at a VAX/VMS host to control and observe terminal servers anywhere in an extended local area network. TSM allows the manager to configure, monitor, and control Digital's family of terminal servers including the DECserver 100, 200 and 500/550, MUXserver 100, and Ethernet Terminal Server.

TSM integrates the functions of NCP TSC and DSVCONFIG in a product that allows the use of command files to help automate terminal server management. TSM exceeds the capabilities of NCP CONNECT in both configuration and fault management.



NBG-168-02

### Features

- Allows a manager to group terminal servers based on server type, floor location, or department. Commands can be executed on a portion or on all servers, saving time.
- Automatically updates the DECnet database with information about each terminal server on the network, allowing easy access to all servers by name rather than LAN address.
- Allows generic command files to operate on single, group, or all servers in the network, saving time and providing flexibility.
- Tests LAT printers that are set up with LATCP and informs the manager of any printer queue setup problems or printer hardware problems.
- Automatically produces a command file configuration template containing parameters from a selected terminal server on the network.

### 802.3/Ethernet Communications Servers

- Can log all screen output to a specified file for review, useful for saving counters and error information.
- Measures round-trip delay from host to server or servers, useful in diagnosing synchronous line bridge problems.
- Provides automatic TSM command files to perform common server setup functions such as those used for modem ports, printer ports, and reverse-LAT ports.
- Allows the manager to assign commonly used TSM commands to keyboard keys, then execute the command by pressing the key.

#### ***Prerequisite Hardware***

TSM runs on any VAX processor except the MicroVAX I, VAXstation I, or VAX-11/725.

#### ***Prerequisite Software***

- VMS, V5.0 or later. Classes required for fully functional product are Base, DRVR, NET, PROG, and UTIL.
- DECnet-VAX, V5.0 or later

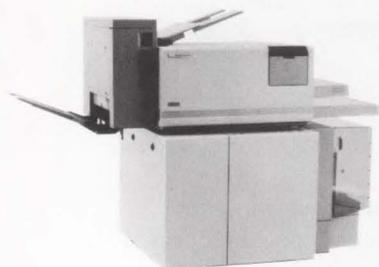
#### ***Supported Terminal Servers***

- DECserver 200 (DSRVB) V1.0 or later
- DECserver 500/550 (DSRVS) V1.0 or later
- MUXserver 100 (DSRZA) V2.0 or later
- DECserver 100 (DSRVA) V1.2 or later
- Ethernet Terminal Server (DECSA) V2.1 or later

▲ Refer to the following for further information on supported processors and services.

- Software Product Description 27.64
- Unique Product Identifier VDH

#### **PrintServer 40**



The PrintServer 40 is a monochromatic, high-speed laser printer that provides a shared printer resource on an 802.3/Ethernet LAN to VMS or MicroVMS client systems. It offers high-quality text, graphics, and scanned images. It handles multiple paper sizes, uses multiple fonts and point sizes, and prints directly on overhead transparencies or labels.

The PrintServer 40 employs PostScript, the industry standard from Adobe Systems Inc., as its page description language. PostScript enables the PrintServer 40 to produce highly professional, complex documents with image rotation, rotated type, textures, patterns, halftones, and images scalable to any size and shape. Because not all application software currently supports PostScript, three VMS translators are included. These translators convert data syntaxes of ANSI (ASCII and Sixels), ReGIS, and Tektronix 4010/4014 to PostScript, which is then sent to the PrintServer 40.

The PrintServer 40 is downline-loaded and managed from a VMS or MicroVMS system running the VAX PrintServer 40 Support Host software. The PrintServer 40 is accessed by suitably configured VMS or MicroVMS systems running the VAX PrintServer 40 Client software. ▲ For more information on the VAX PrintServer 40 Support Host software, refer to Software Product Description (SPD) 27.68. For more information on the VAX PrintServer 40 Client software, refer to SPD 27.67.

### **Features**

- Electrophotographic printing of up to 40 pages per minute on plain paper and transparencies, using dry toner, heat and pressure fusing.
- In network applications, the number of users ranges from 20 to 200, with a mean of 60.
- High-speed 802.3/Ethernet connection for VAX and MicroVAX systems to support distributed processing.
- High-duty cycle—typically up to 100,000 pages per month.
- Accommodates multiple paper sizes, cut sheet paper, transparencies, and predrilled paper.
- Three paper input trays provide capacity of up to 2500 sheets of various media combinations.
- Employs PostScript as its standard page description language. (Information on PostScript training is available by contacting Adobe Systems, Inc.)
- Multiple fonts with 29 resident PostScript typefaces, including the symbol/math set.
- Resolution of 300 by 300 dots per inch for text, graphics, and scanned images.
- Translates ANSI/sixels, ReGIS, and Tektronix 4010/4014 protocols.
- Accounting functions can record page-usage and system-performance data, useful to a system manager.
- “Layup” functions permit multiple images on a single sheet of paper.

### **Prerequisite Software**

- VMS operating system V5.0
- DECnet-VAX V5.0

### **Ordering Information**

Order PrintServer 40 hardware, cables, and software.

The PrintServer 40 hardware includes the licenses to use the Client and Support Host software. Customers must order one copy each of the Client and Support Host software on the appropriate distribution medium.

For H4005/DELNI connection, right-angle cables must be ordered. The last two digits of the order code specify the length of the cable, measured in feet.

## 802.3/Ethernet Communications Servers

<i>PrintServer 40 Hardware Order Codes</i>	
<b>Option</b>	<b>Order Code</b>
U.S. model: PrintServer 40, 40-ppm 802.3/Ethernet printer, 220/240 V, 60 Hz, attached power cord. Client and Support Host licenses are included.	LPS40-AA
International model: PrintServer 40, 40-ppm 802.3/Ethernet printer, 200/208/220/240 V, 50 Hz, detached power cord. Client and Support Host licenses are included.	LPS40-A3
<b>Cables</b>	
IEEE 802.3/Ethernet PVC-jacketed right angle male-to-female transceiver cable	BNE3K-10
	BNE3K-20
	BNE3K-40
IEEE 802.3/Ethernet plenum-rated right angle male-to-female transceiver cable	BNE3M-10
	BNE3M-20
	BNE3M-40
<b>Consumable Parts</b>	
Toner cartridges, package of 6 for approximately 60,000 pages total	LPS4X-AA
Developer and replaceable parts for approximately 100,000 pages	LPS4X-AB
Silicon oil, package of 4 for approximately 60,000 pages total	LPS4X-AC
▲ Refer to the following for further information on supported processor and services.	

- PrintServer 40 Client Software
  - Software Product Description 27.67
  - Unique Product Identifier 797
- PrintServer 40 Supporting Host Software
  - Software Product Description 27.68
  - Unique Product Identifier 798

### DECrouter 100

The DECrouter 100 can connect a group of up to 16 nodes on the Ethernet to a remote location using a synchronous DECnet link. The remote end of the link must be part of the same DECnet area (area routing is not supported). It supports a maximum line speed of 19.2 Kb/s, requires a VMS system on the Ethernet to load and manage the router, and offers ULTRIX load host support as an option.

The hardware base for the DECrouter 100 is the DEC MicroServer-SP, which provides synchronous communications for VAXstation 2000s, VAXstation 3100s, or a group of personal computers served by a MicroVAX 2000 or VAXserver 2000 running PCSA software.

▲ For more information refer to the product description of the DEC MicroServer-SP, under “802.3/Ethernet Communications Servers” in this section.

### DECrouter 200

The DECrouter 200 provides communications between systems running DECnet software and systems on an 802.3/Ethernet local area network. Systems that can connect to the DECrouter 200 include the IBM PC, IBM PC AT, or any system running asynchronous DECnet-VAX or DECnet-RSX.

The DECrouter 200 handles up to eight local and remote connections at line speeds up to 19.2 Kb/s. It has a maximum throughput rate of 175 packets per second when all eight lines are running at maximum speed. ▲ For more information on performance, refer to Appendix A.

The DECrouter 200 communications server software runs on a dedicated hardware base (the DSRVC) to provide the routing functions for up to eight DECnet Phase IV end nodes. It performs the routing functions on the LAN to allow Phase IV end nodes not directly connected to the LAN to communicate with directly connected Phase IV nodes. The DECrouter 200 can also be the designated router on the LAN, allowing end nodes to communicate with nodes off the LAN.

The DECrouter 200 implements Phase IV DECnet asynchronous DDCMP routing and network management. It can be used to connect to Phase III nodes to provide Phase III networks with connectivity to Phase IV nodes.

The DECrouter 200 supports intra-area (Level 1) routing for transporting messages between nodes; it does not support inter-area (Level 2) routing. The DECrouter 200 transports messages between Phase III or Phase IV routing end nodes in the same area. End nodes connected directly to the LAN must use the DECrouter 200 or Phase IV host-routing nodes on the same LAN for message routing off that LAN.

#### **Features**

- Eight asynchronous lines with dial-in capability.
- Supports standard EIA-232-D connections and standard Ethernet AUI connections. ThinWire connects to the network via the DESTA Ethernet Station Adapter.
- Supports Phase IV enhancements (path-splitting, out-of-order packet caching).
- Provides full network management.
- Includes a monitor that shows such useful data as line utilization and speeds, other nodes on the network, and the designated router.

#### **Installation and Host System Configurations**

The DECrouter 200 can be downline-loaded from a DECnet-VAX or DECnet-ULTRIX system. ▲ (Note that ULTRIX and DECnet-ULTRIX do not support the VAX-11/782 configuration.)

#### **Prerequisite Hardware**

A valid 802.3/Ethernet configuration is required to downline-load the DECrouter 200. The load host for the DECrouter 200 must be a DECnet Phase IV node with 802.3/Ethernet controller, and must be connected to the same LAN segment as the DECrouter 200.

The load host must have one of the following devices to read the distribution medium: 1600-bpi magnetic tape, floppy diskette (VAX host RX33, DOS host RX33, RX24 or RX31), or TK50 tape cartridge.

## 802.3/Ethernet Communications Servers

### **Prerequisite Software**

The software must be downline loaded by one of the following systems:

- VMS with DECnet-VAX, V4.2 or later
- ULTRIX-32, V1.2 or later, and DECnet-ULTRIX, V1.1 or later
- ULTRIX-32m, V1.2 or later, and DECnet-ULTRIX V1.1 or later
- DECnet-DOS V2.1

▲ For more information, refer to Software Product Description 27.72.

### **DECrouter 200 Hardware Order Codes**

Description	Order Code
DECrouter 200, EIA-232-D version, 120 V	DSRVC-AA
DECrouter 200, EIA-232-D version, 240 V	DSRVC-AB

### **Cable Requirements**

One of the following cables must be used to connect to the DECrouter 200 asynchronous port:

- BC22D—EIA-232-D/CCITT V.24 null modem cable used to connect directly to locally situated nodes that do not require modem control signals.
- BC17D—EIA-232-D/CCITT V.24 null modem cable used to connect directly to locally situated nodes that require modem control signals.
- BC22E—EIA-232-D/CCITT V.24 cable used to connect to modems and modem-type devices.

The DECrouter 200 hardware (DSRVC) requires a transceiver cable to connect the integral 802.3/Ethernet port to the transceiver. The DSRVC may be connected to

- Standard baseband or broadband 802.3/Ethernet transceivers—requires a BNE3(H,K,L, or M) up to 50 meters, or a BNE4(C or D) up to 12.5 meters.
- DELNI Local Network Interconnect—requires a BNE3(H,K,L, or M) up to 50 meters, or a BNE4(C or D) up to 12.5 meters.
- DESTA ThinWire Ethernet Station Adapter—requires a BNE (H, K, L, or M) up to 50 meters, or a BNE4(C or D) up to 12.5 meters.

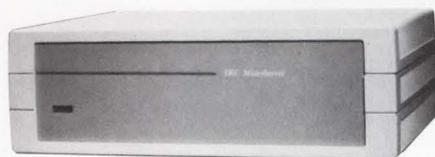
### **DECrouter 200 Country Kits**

Description	Order Code
DECrouter 200 Country Kit	DSRVC-K*
	DSRVC-L*

\*Refer to the Price List for more information.

▲ Refer to the following for further information on supported processors and services.

- Software Product Description 27.72
- Unique Product Identifier VDJ (VMS) and VDK (ULTRIX)

**DEC MicroServer**

The DEC MicroServer is the hardware base for the DECrouter 2000, the X25router 2000, and the DECnet/SNA Gateway-ST, providing connection whenever communication is required from an 802.3/Ethernet LAN into a wide area network (WAN). Network users can access destinations across a worldwide geography via either a DECnet network, a Packet Switched Data Network (X.25), or an IBM SNA network, by connecting the appropriate version of the DEC MicroServer to the 802.3/Ethernet network.

The DEC MicroServer allows DECnet backbone networks to use leased lines or X.25 public data networks. It can also provide a network-to-network connection from DECnet to SNA.

The DEC MicroServer is packaged in a LAN Bridge 100-type enclosure that can be placed on a desktop or mounted in a standard 19-inch rack. The hardware, a single-board communications engine, comprises a MicroVAX II chip set, two Mbytes of onboard memory, one Ethernet interface port (IEEE 802.3 compatible), power supply, and four synchronous communications ports.

**Features**

- With high line-speed support, users benefit from cost-effective tariffs for higher-speed telecommunications services and X.25 public data networks.
- Compatibility with CCITT X.25 PSDNs allows users to build global networks, utilizing the most competitive worldwide public networks.
- Efficient use of bandwidth improves price/performance and lowers cost of network ownership.

**Specifications**

Physical Characteristics	With Plastic	Without Plastic
Height	16.2 cm (6.4 in)	13.3 cm (5.3 in)
Width	49.4 cm (19.4 in)	43.6 cm (17.2 in)
Depth	31.3 cm (12.3 in)	29.8 cm (11.7 in)
Weight	8.1 kg (18 lb)	6.9 kg (13 lb)
<b>Power Requirements</b>		
Low-range line voltage	120–87 to 132 V	120–87 to 132 V
High-range line voltage	240–174 to 264 V	240–174 to 264 V
Frequency tolerance	47 to 63 Hz	47 to 63 Hz
Maximum ac watts drawn	150 W	150 W
Maximum heat dissipation	500 BTU/h	500 BTU/h
<b>Environmental Class</b>		
	A (See Appendix B for details.)	

**Ordering Information**

The DEC MicroServer is packaged with the DECrouter 2000, X25router 2000, and DECnet/SNA Gateway-ST. ▲ Refer to the appropriate product description for ordering information.

Refer to the order codes below only when ordering spare hardware for any of these packages. Note that the options below do not include cables, licenses, media, or documentation.

*DEC MicroServer Spare Hardware Order Codes*

Option	Order Code
DEC MicroServer configured for 120 Vac	DEMSA-AA
DEC MicroServer configured for 240 Vac	DEMSA-AB

**DEC MicroServer-SP**

The DEC MicroServer-SP offers similar functionality to the MicroVAX 2000 option, the DST32, as described in Section 3. The DEC MicroServer can provide synchronous communications for VAXstation 2000s, VAXstation 3100s, or a group of personal computers served by a MicroVAX 2000 or VAXserver 2000 running PCSA software.

The DEC MicroServer-SP is a free-standing box that can also be rackmounted in a DECconnect 19-inch rack, using the kit provided. Connections on the rear of the unit are provided for power, Ethernet, and single synchronous communications.

**DECrouter 100**

The DECrouter 100, the server package offered for the DEC MicroServer-SP, includes a license and TK50 media for DECrouter 2000 V1.1 software. The DECrouter 100 is especially suited for networking small branch office networks.

The DECrouter 100 can connect a group of up to 16 nodes on the Ethernet to a remote location using a synchronous DECnet link. The remote end of the link must be part of the same DECnet area (area routing is not supported). It supports a maximum line speed of 19.2 Kb/s, requires a VMS system on the Ethernet to load and manage the router, and offers ULTRIX load host support as an option.

Where possible, the DECrouter 100 should be used to integrate workstations or personal computers into a larger DECnet network.

**Features**

- DEC MicroServer-SP supports any personal computer or workstation with an Ethernet interface and DECnet.
- DECrouter 100 provides wide area network connections for VMS workstations and PCLAN Servers.
- A single part number includes all the hardware and software components for remote connections.

**Specifications**

Physical Characteristics	With Plastic	Without Plastic
Height	16.2 cm (6.4 in)	13.3 cm (5.3 in)
Width	49.4 cm (19.4 in)	43.6 cm (17.2 in)
Depth	31.3 cm (12.3 in)	29.8 cm (11.7 in)
Weight	8.1 kg (18 lb)	6.9 kg (13 lb)
<b>Power Requirements</b>		
Nominal Range	120 Vac, 60 Hz 87 V to 132 V, 47 to 63 Hz 150 W	
Consumption Heat dissipation	maximum 500 BTU/hr maximum	

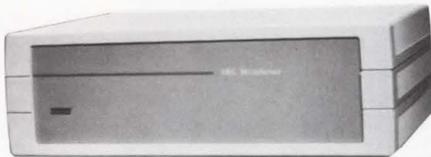
**Ordering Information**

Refer to the following for information on the DECrouter 2000 (also refer to the DECrouter 2000 product description in this topic):

- Software Product Description 28.85.xx
- Unique Product Identifier VI8

**DEMSB Order Codes**

Option	Order Code
DEC MicroServer with DECrouter 100, including basic hardware, ThinWire Ethernet adapter, 2-meter standard Ethernet cable, rack mounting kit, EIA-232-A adapter cable, software license, TK50 software media for VMS, and hardware and software documentation.	DEMSB-DA

**DECrouter 2000**

The DECrouter 2000, a combination hardware/software product that runs on the DEC MicroServer (DEMSA) hardware unit, is a dedicated routing system that supports both intra-area (Level 1) and inter-area (Level 2) routing for Phase IV nodes on the LAN, or Phase III or Phase IV remote nodes connected to one of the four synchronous lines. The DECrouter 2000 is compatible with Phase V implementations.

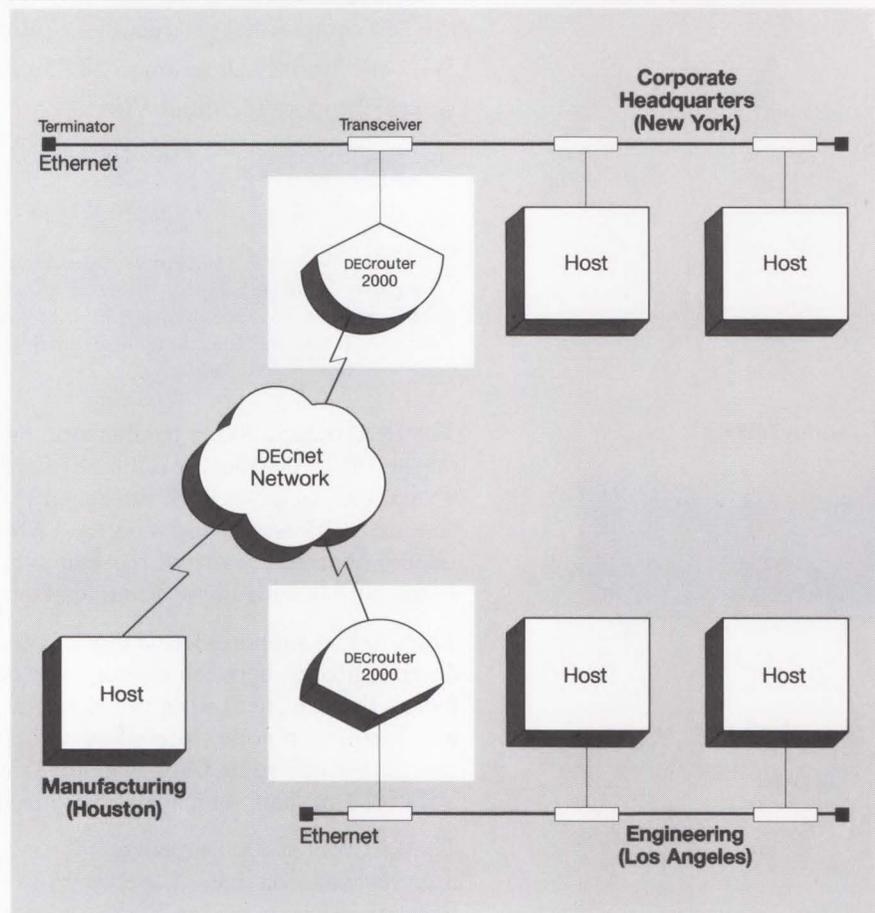
The product supports DDCMP point-to-point and multipoint links and “path splitting” between two or more equal-cost paths. Path splitting means that DECnet traffic can share two equal-cost routes between source and destination nodes, providing higher-performance as well as an alternative path if one route fails. Note that the destination end node must be VMS V4.1 or later, which supports reordering of out-of-order packets.

The DECrouter 2000 supports full- or half-duplex communications over four synchronous lines at speeds up to 64 Kb/s, or over two synchronous lines at speeds up to 256 Kb/s. Adapter cables provide the necessary interchange circuits for each synchronous line.

▲ Refer to Software Product Description (SPD) 28.85 for further information.

**DEC MicroServer (DEMSA)**

The DEC MicroServer provides the hardware base for the DECrouter 2000, for interconnect whenever communication is required from an Ethernet LAN into a Wide Area Network (WAN). ▲ For further information regarding the DEC MicroServer, refer to its product description in this section.

*LAN Configuration Using a DECrouter 2000*

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**Features**

- Provides synchronous connections to remote DECnet system and LANs in a wide area network or between remote LANs using DECnet.
- Operates at speeds up to 256 Kb/s for two lines, or 64 Kb/s for four lines.
- Can communicate with remote Phase III nodes in the same DECnet area.

**Prerequisite Hardware**

Any VAX processor specified in the order code table. Every load host on which the DECrouter 2000 software is installed must contain:

- A valid DECnet-VAX or DECnet-ULTRIX system configuration ▲ Refer to the DECnet and appropriate operating system SPDs.
- A supported connection on the same LAN as the DECrouter 2000.
- An appropriate device available to read the software during installation. ▲ Refer to the Software Product Description for supported devices.

**Prerequisite Software**

For each VAX system acting as a load host/dump receiver, one of the following is required:

- VMS Operating System V4.4 to V5.0
- MicroVMS Operating System V4.4 to V4.7

- ULTRIX-32 Operating System V1.2
- DECnet-VAX V4.4 to V5.0
- DECnet-ULTRIX V1.2 (either end node or full-function)

For VMS V5.0 systems, the following VMS classes are required to be fully functional:

- VMS Required Saveset
- Network Support

▲ For more information on VMS classes and tailoring, refer to SPD 25.01.

### Ordering Information

Order the hardware base for the DECrouter 2000, which includes the license for the DECrouter 2000 software. Also order at least one copy of the distribution and documentation kit.

#### DECrouter 2000 Hardware Order Codes

Option	Order Code
DECrouter 2000 Server Package includes DEC MicroServer hardware (120 V), two V.35 and two EIA-232-D adapter cables, power cord, and DECrouter 2000 license with warranty.	DEMSA-D*
DECrouter 2000 Server Package for Ireland. Includes components listed above.	DEMSA-EE

\*Replace the \* with one of the following codes: A (United States, Mexico), D (Denmark), E (United Kingdom), G (West Germany), I (Italy), K (Switzerland), P (France), T (Israel), X (Austria, Belgium, Finland, Netherlands, Norway, Sweden, Portugal, Spain)

▲ Refer to the following for further information on supported processor and services.:

- Software Product Description 28.85
- Unique Product Identifier VI8 (VMS) and VI9 (ULTRIX-32)

The X25router 2000, a combination hardware/software product that runs on the DEC MicroServer (DEMSA) dedicated hardware unit, acts as an X.25 gateway for an 802.3/Ethernet local area network. This product provides access to one or more PSDNs for any system on the LAN that runs VAX P.S.I. Access software. It also provides access to any DECnet system that uses the PSDN to carry DECnet traffic to remote Digital systems, as well as providing one end of a point-to-point connection using standard ISO protocols, which conform to both Telegraph and Telephone Consultative Committee (CCITT) and ISO standards.

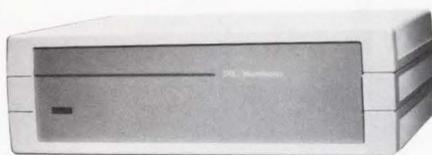
As with the DECrouter 2000, the X25router 2000 supports both Level 1 and Level 2 area routing. Adapter cables provide the necessary interchange circuits for each synchronous line. Performance is approximately 170 packets per second for DECnet circuits over X.25.

▲ Refer to Software Product Description 28.86 for further information.

### DEC MicroServer (DEMSA)

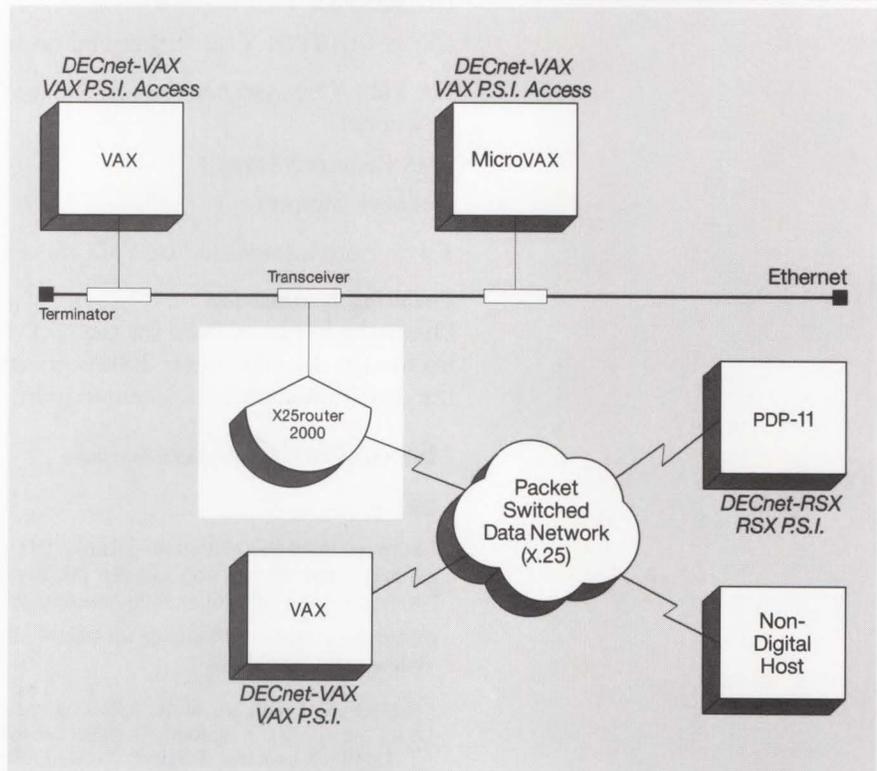
The DEC MicroServer provides the hardware base for the X25router 2000, for interconnect whenever communication is required from an Ethernet LAN into a wide area network (WAN). ▲ For further information on the DEC MicroServer, refer to its product description in this section.

X25router 2000



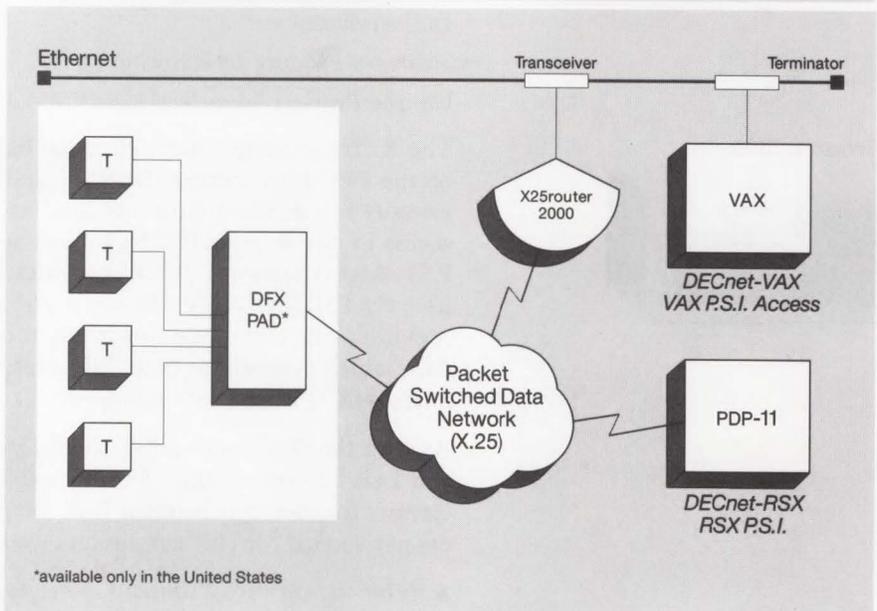
802.3/Ethernet Communications Servers

*X25router 2000 Configuration (Digital-to-non-Digital Host)*



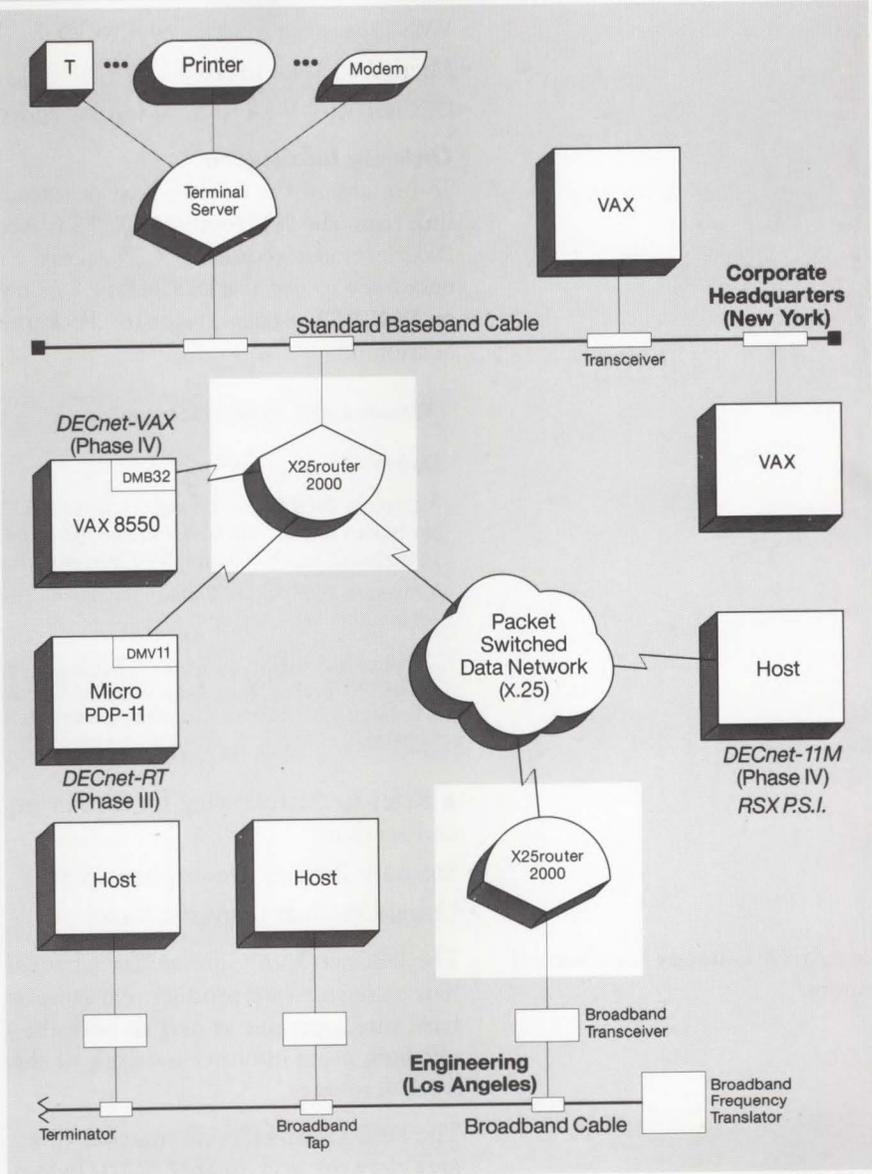
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*X.25/X.29 Terminal Access Configuration*



\*available only in the United States

NBG-110-01

*X25router 2000 Configuration (DECnet-to-DECnet)***Features**

- Performs all the functions of the DECrouter 2000 plus connects systems on the LAN to X.25 PSDNs.
- Can run both DECnet and X.25 protocols concurrently.
- Allows DECnet to be connected to up to four X.25 PSDNs simultaneously.

**Prerequisite Hardware**

Any VAX or MicroVAX system, as specified in the X25router Software Product Description 28.86.

**Prerequisite Software**

For each VAX system acting as a load host or dump receiver:

- VMS Operating System V4.4 to V5.0
- MicroVMS V4.4 to V4.7
- DECnet-VAX V4.4 to V5.0 (either end node or full-function)

**Ordering Information**

To use any of the host-to-host or terminal-to-host capabilities of an X.25 link from the X25router, VAX P.S.I. Access software must be installed on DECnet nodes requiring X.25 access. The P.S.I. Access software is not necessary to use the DDCMP or DECnet DLM circuits. ▲ For information on VAX P.S.I. Access, refer to "Packetnet Communications Software" in Section 4.

**X25router 2000 Hardware Order Codes**

Option	Order Code
X25router 2000 Server Package includes DEC MicroServer hardware (120 V), two V.35 and two EIA-232-D adapter cables, power cord, and X25router 2000 license with warranty.	DEMSEA-X*
X25router 2000 Server Package for Ireland. Includes components listed above.	DEMSEA-YE
*Replace the * with one of the following codes: A (United States, Mexico), D (Denmark), E (United Kingdom), G (West Germany), I (Italy), K (Switzerland), P (France), T (Israel), X (Austria, Belgium, Finland, Netherlands, Norway, Sweden, Portugal, Spain)	

▲ Refer to the following for further information on supported processors and services.

- Software Product Description 28.86
- Unique Product Identifier V1A

**DECnet/SNA Gateway for Channel Transport**

The DECnet/SNA Gateway for Channel Transport, a combination hardware/software product that runs on DEC ChannelServer dedicated hardware, operates as part of both the DECnet and IBM SNA networks, allowing users in either network to share systems, applications, and network resources.

The DEC ChannelServer attaches directly to both the 802.3/Ethernet local area network and an IBM S/370 byte multiplexer, block multiplexer, or selector channel.

▲ Refer to "Digital/IBM Communications Software" in Section 4 for more information.

**DECnet/SNA Gateway for Synchronous Transport**

The DECnet/SNA Gateway for Synchronous Transport, a combination hardware/software product that runs on DEC MicroServer dedicated hardware, connects a DECnet 802.3/Ethernet local area network to as many as four remote SNA networks over synchronous communications lines.

▲ Refer to "Digital/IBM Communications Software" in Section 4 for more information.

## Section 3

### Connectivity: Communications Hardware

This section contains the following topics...

Ordering Information

VAXBI Communications Controllers

Q-bus Communications Controllers

MicroVAX 2000 Communications Controllers

UNIBUS Communications Controllers

Communications Processors

Modems

Statistical Multiplexers

Communications Cables

## Connectivity: Communications Hardware

Asynchronous and synchronous communications hardware is used in both Digital-to-Digital and Digital-to-non-Digital environments to transmit data between computers, or from terminals to computers. Transmission methods, or protocols, used for asynchronous connections differ from those used for synchronous connections.

Asynchronous transmission, a character-oriented protocol, is used primarily in terminal-to-host communications. Asynchronous transmission is uniquely suited to the low-speed, intermittent data transmission from terminals to hosts. Synchronous transmission, on the other hand, is a more efficient block-oriented protocol that transmits an entire block of characters at one time. Synchronous transmission is used primarily for high-speed communications between computers. (Although Digital's terminal-to-computer connections are asynchronous, IBM and many other vendors use synchronous terminal-to-computer connections.)

When data is sent across most telephone lines, the digital computer signals must be translated into the analog signals used with telephone equipment. This is accomplished through modems. Computer devices are connected to modems through standard interfaces. EIA-232-C/CCITT V.28, EIA-422/CCITT V.11, EIA-423-A/CCITT V.10, and CCITT V.35 are examples of such interface standards. All Digital communications interfaces that include an industry-standard interface can be used to connect Digital systems to a Private Branch Exchange (PBX) via a modem.

A network is a flexible configuration of interconnected terminals, computers, and other intelligent devices (nodes). Nodes can be either close together (local) or far apart (remote). Some devices, because of their high speed, operate only in a local area. Because low-speed devices can be connected across phone lines, they can be used in remote applications as well as locally.

This section includes product descriptions and configuring and ordering information for Digital's asynchronous and synchronous hardware communications products, modems, statistical multiplexers, and cables. ▲ For information on Digital's 802.3/Ethernet products, refer to Section 2.

Note: Synchronous products do not support the use of internal clocking.

**Modules and Cabinet Kits**

To order a communications device, order both the base option module and, if required, the cabinet kit needed to install the module on your system. A cabinet kit includes such things as the appropriate cabling, filter assembly, distribution panel, and brackets. Several cabinet kits are available for each module because cables lengths, distribution panels, or mounting brackets vary for different system cabinets and different electrical transmission standards.

**External Cables**

The order codes for external cables required by the communications devices are listed in "Communications Cables" at the end of this section.

The following table summarizes the features of Digital's asynchronous and synchronous VAXBI communications controllers.

<i>VAXBI Communications Controllers</i>				
	<b>DMB32</b>		<b>DHB32</b>	<b>DSB32</b>
<b>Type</b>	Asynchronous	Synchronous	Asynchronous	Synchronous
<b>Number of lines</b>	8	1	16	2
<b>Direct Memory Access (DMA)<sup>1</sup></b>	Yes	Yes	Yes	Yes
<b>Maximum speed (Consult SPD)<sup>2</sup></b>	38.4 Kb/s	64 Kb/s for HDLC, SDLC; 19.2 Kb/s for DDCMP; 9.6 Kb/s for others	38.4 Kb/s simultaneously on four channels with custom driver; 19.2 Kb/s simultaneously on two channels with VMS	64 Kb/s for DDCMP; 19.2 Kb/s (one-line-only) SDLC/HDLC
<b>Software support</b>	DECnet-VAX	DECnet-VAX; VAX Wide Area Network device driver (prerequisite); VAX P.S.I. <sup>5</sup>	DECnet-VAX	DECnet-VAX VAX P.S.I. <sup>5</sup> DSB32 SYNC device driver (Prerequisite)
<b>Operating system support</b>	VMS	VMS	VMS	VMS
<b>MultiCPU access<sup>3</sup></b>	No	No	No	Yes
<b>Modem control<sup>4</sup></b>	Full	Full	Yes (with EIA-232 Cabinet Kit)	Full
<b>Primary buying reason</b>	Interface to VAXBI systems, eight asynchronous lines, one synchronous line, one printer port		Direct connection to VAXBI for asynchronous devices	Direct connection to VAXBI/ or Synchronous Communication

<sup>1</sup>DMA (Direct Memory Access) is the ability to move multicharacter messages between a communication line and CPU memory without interrupting the CPU. This capability yields higher performance.

<sup>2</sup>Actual device speed and throughput depend on current Digital operating system, system configuration, and applications.

<sup>3</sup>MultiCPU access is the ability to send a message directly to two or more CPUs without routing the message through another CPU.

<sup>4</sup>Modem control refers to the number of signals available to control modem functions on U.S. and European modems. Full modem control includes nine to eleven signals. Limited modem control is five signals. No modem control means only send and receive signals are present for each line.

<sup>5</sup>Can be integrated with DECnet: P.S.I. must be present.

**DHB32**

The DHB32 is an asynchronous communications controller that enables up to 16 terminals, modems, or serial printers to communicate directly with a VAXBI processor. The DHB32 emulates the asynchronous portion of Digital's DMB32 communications controller by using similar architecture and the same software driver. The functions offered by the eight asynchronous channels on the DMB32 are extended to 16 channels on the DHB32. Unlike the DMB32, the DHB32 has neither a synchronous communications line nor a parallel printer channel.

The DHB32 is available in an EIA-232-D or EIA-423-A version. The EIA-232 version has a distribution panel for 16 asynchronous channels with modem control. The EIA-423-A version has 14 DECconnect channels for connection to terminals, plus two channels that can be switched to EIA-423-A for terminals or EIA-232 for modem control.

Using the standard VMS driver, the DHB32 can operate 16 channels simultaneously at the following maximum throughput speed: 19.2 Kb/s for two channels, and 9.6 Kb/s for 14 channels. Using a custom-developed driver, it can operate four channels simultaneously at maximum throughput speed of 38.4 Kb/s.

**Features**

- Allows maximum of 16 terminals, modems, or serial printers to communicate directly with a VAXBI processor.
- Provides full modem control with full-duplex, autoanswer, dialup operation.
- Has programmable split-speed operation with automatic flow control of transmitted and received data.
- Includes a full range of diagnostics compatible with the DMB32.
- Provides DECconnect terminal connection with EIA-423-A version.

**Prerequisite Software**

The DHB32 uses the asynchronous portion of the DMB32 device driver, which is included with VMS Operating System V4.6 or later.

<i>Specifications</i>	
<b>Mounting Code</b>	One VAXBI slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	5.56 A
dc amps drawn at 12 Vdc	0.42 A
dc amps drawn at -12 Vdc	0.42 A
<b>VAXBI Nodes</b>	One
<b>I/O Panel Units</b>	Eight for EIA-232, four for EIA-423-A

**Ordering Information**

Order the DHB32-M controller and the appropriate cabinet kit. Cabinet kits include the distribution panel, a loopback connector for diagnostic testing, six adapter cables to connect the module to the distribution panel, and a user guide.

External device cables for the DHB32 must be ordered separately. The EIA-423-A version requires the H3104-B cable and cable concentrator.

## VAXBI Communications Controllers

### *DHB32 Order Codes*

Option	Order Code
<b>Controller</b>	
16-line asynchronous communications controller for VAXBI processors.	DHB32-M
<b>Cabinet Kits</b>	
For EIA-232-D system installation, select one of the following cabinet kits:	
EIA-232-D cabinet kit for VAX 82xx/83xx.	CK-DHB32-AM
EIA-232-D cabinet kit for VAX 85xx/87xx/88xx	CK-DHB32-AJ
EIA-232-D cabinet kit for VAX 85xx/87xx/88xx external VAXBI channels.	CK-DHB32-AN
For EIA-423-A system installation, select one of the following cabinet kits:	
EIA-423-A cabinet kit for VAX 82xx/83xx.	CK-DHB32-LM
EIA-423-A cabinet kit for VAX 85xx/87xx/88xx internal VAXBI channels, and VAX 62xx internal and external channels.	CK-DHB32-LJ
EIA-423-A cabinet kit for VAX 85xx/87xx/88xx VAXBI external channel	CK-DHB-LN
<b>Cables</b> ▲ Refer to "Communications Cables" at the end of this section for available lengths.	
Connects EIA-232-D-compatible terminals and printers.	BC22D-xx
Connects EIA-232-D-compatible asynchronous modems.	BC22E-xx
EIA-423-A cable and cable concentrator for eight devices. (Order two kits for connecting up to 16 EIA-423-A devices.)	H3104-B
Connects EIA-423-A terminals or printers to cable concentrator with modified modular jack connectors.	BC16E-xx

### DMB32

The DMB32 is a high-performance DMA intelligent communications controller for the VAXBI family of computer systems. It provides ten communication lines—eight asynchronous terminal or modem lines, one synchronous line, and one parallel printer line, all supported from a single VAXBI backplane slot.

The eight asynchronous lines can transmit at speeds up to 38.4 Kb/s a line under specified conditions. (Actual line speed and throughput depends on the operating system and user applications.) All lines provide DMA output, full modem control, and split-receive/transmit speed capability.

The one synchronous line supports message framing, and CRC generation and verification with full modem control for the HDLC, SDLC, BISYNC, DDCMP, and GEN BYTE protocols. It is capable of operating at speeds up to 64 Kb/s for HDLC and SDLC protocols, and 19.2 Kb/s for DDCMP. Other protocols are supported at 9.6 Kb/s speeds. (The actual throughput depends on the operating system and application.)

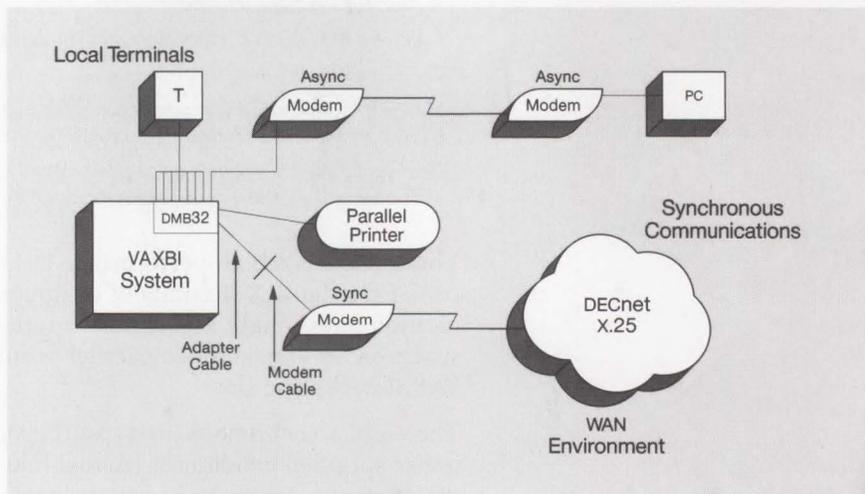
The one parallel printer line supports LP32 generic printer specifications, including the LP25, LP26, LP27, LXY12, LXY22, and LG01 parallel printers.

## VAXBI Communications Controllers

### Features

- Asynchronous communications:
  - Eight communication lines, EIA-232-D compatibility
  - Line speeds up to 38.4 Kb/s (application-dependent)
  - DMA output optimizes terminal I/O performance
  - Split-receive/transmit speeds on a per-line basis
  - Full modem control supports full- and half-duplex point-to-point modems
- Synchronous communications:
  - One communication line with EIA-232-D, EIA-422-A, EIA-423-A, and V.35 compatibility
  - Line speeds up to 64.0 Kb/s (application-dependent)
  - DMA input and output
  - Full modem control supports full- and half-duplex point-to-point modems
- Parallel printer line supports a wide range of Digital parallel printers, including LP25, LP26, LP27, LP32, LXY12, LXY22 and LG01.
- Comprehensive self-test through ROM-based diagnostics performs extensive functional tests of the DMB32 circuitry at each power-up or reset.

### DMB32 Typical Configuration



NBG-186-00

### Adapter Cables

The appropriate two-foot adapter cable must be ordered to connect the DMB32 50-pin D-subminiature connector to the selected synchronous communication device. ▲ Refer to the DMB32 Hardware Order Code Table for ordering information. The adapter cable can be ordered through the *DECdirect Plus* catalog.

### Distribution Panel

The distribution panel is four panels wide, does not require power, and attaches to the back of the computer system cabinet containing the module. The panel contains eight 25-pin D-subminiature connectors for asynchronous lines, one 50-pin D-subminiature connector for the synchronous line, and one 37-pin D-subminiature connector for the printer port.

## VAXBI Communications Controllers

### Specifications

<b>Mounting Code</b>	One VAXBI slot One distribution panel (H3033), four-panel width
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	6.75 A
dc amps drawn at 12 Vdc	300 mA
dc amps drawn at -12 Vdc	425 mA
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

### Required Software

- VMS V5.0 or later
- VAX Wide Area Network Device Driver, required to use the synchronous line with VMS

### Required Hardware

- A VAXBI system configuration (▲ Refer to Software Product Description 27.35, for a list of supported processors.)
- Adapter cable for synchronous line

### Ordering Information

The VAX Wide Area Network device driver for the synchronous line must be ordered separately to support point-to-point communications with VMS.

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.35
- Unique Product Identifier Z03

### DMB32 Hardware Order Codes

Option	Order Code
Includes base module only. For system installation, select the appropriate cabinet kit and external cables.	DMB32-M
<b>Cabinet Kits</b>	
For use with VAX 8840, 8830, 8820, 8810, 8800, 8700, 8550, and 8530 internal VAXBI channels; H9657 external VAXBI channels; and VAX 6200 series internal and external channels	CK-DMB32-LJ
For use with VAX 8250 and 8350	CK-DMB32-LM
For use with VAX 8810, 8800, 8700, 8550, and 8530 external (H9652) VAXBI channels	CK-DMB32-LN
<b>Synchronous line adapter cables</b>	
For use with CCITT V.35	BC19F-02
For use with EIA-232-D/CCITT V.24	BS19D-02
For use with EIA-422	BC19B-02
For use with EIA-423-A	BC19E-02

## VAXBI Communications Controllers

### DEC WANcontroller 220

The DEC Wide Area Network Controller 220 (DEC WANcontroller 220) is a two-line, synchronous communication controller designed specifically for VAXBI systems. It provides host-based connectivity in VAXBI environments for establishing communication with X.25, DECnet and IBM networks by using Digital's standard layered network software.

The DEC WANcontroller 220 supports DDCMP, HDLC, and SDLC protocols at speeds up to 64 Kb/s per line for two-line operation, and 19.2 Kb/s for one-line-only operations running HDLC and SDCL protocols. (Actual throughput is application-dependent.)

The two lines of the DEC WANcontroller 220 are independently managed and operated. This permits concurrent communication using Digital's layered network software products (DECnet-VAX, VAX P.S.I.). Any combination of these software products can share the DEC WANcontroller 220.

#### **Features**

- Optimizes single host connection for VAXBI systems.
- Runs standard Digital layered network software (DECnet, VAX P.S.I.).
- Line speeds up to 192 Kb/s (application-dependent).
- Direct Memory Access input and output.
- Allows concurrent communication using different protocols.
- Compliant with standard, physical line interfaces.
- EIA 232-D (V.24), EIA 422-A (V.36, V.11), EIA 423-A (V.10) and V.35.

#### **Prerequisite Software**

VMS V5.0 or higher operating system for support of the Wide Area Device Driver Kit, which includes the DEC WANcontroller 220 Driver.

#### **Specifications**

<b>Mounting Code</b>	One VAXBI slot
----------------------	----------------

#### **Power Requirements**

dc amps drawn at 5 Vdc	4.5 A
dc amps drawn at 15 Vdc	0.08 A
dc amps drawn at -15 Vdc	0.08 A

<b>I/O Panel Units</b>	Two
------------------------	-----

<b>VAXBI Nodes</b>	One
--------------------	-----

**Ordering Information**

Order one DSB32-M module with one appropriate cabinet kit.

Order adapter cables and extension cables separately based on the interface standard required.

**DEC WANcontroller 220 Order Codes**

Option	Order Code
Two-line synchronous communications controller for VAXBI processor	DSB32-M
<b>Cabinet Kits</b>	
Cabinet kit for VAX 62xx/63xx/85xx/87xx/88xx	CK-DSB32-UJ
Cabinet kit for VAX 82xx/83xx	CK-DSB32-UM
Cabinet kit for VAX 62xx/63xx/85xx/87xx/88xx Expansion	CK-DSB32-UN
<b>Adapter and Extension Cables</b>	
EIA 422-A adapter cable	BC19B-02
EIA 232-D adapter cable	BS19D-02
EIA 423-A adapter cable	BC19E-02
V.35 adapter cable	BC19F-02
Extension cable for BC19B and BC19E	BC55D-xx
Extension cable for BS19D	BC22F-xx
Extension cable for BC19F	BC19L-xx

## Q-bus Communications Controllers

The following table summarizes the features of Digital's asynchronous and synchronous Q-bus communications controllers.

<i>Q-bus Communications Controllers</i>					
Device	CXA16	CXB16	CXY08	DHF11 <sup>8</sup>	DHQ11
Type	Asynchronous <sup>1</sup>	Asynchronous <sup>1</sup>	Asynchronous <sup>1</sup>	Asynchronous	Asynchronous
Number of lines	16	16	8	16 or 32	8
DMA <sup>2</sup>	Yes	Yes	Yes	Yes	Yes
Maximum speed (consult SPD) <sup>3</sup>	38.4 Kb/s	38.4 Kb/s	38.4 Kb/s	38.4 Kb/s	38.4 Kb/s
Software support	DECnet-11M-PLUS, DECnet-Micro/RSX	DECnet-11M-PLUS, DECnet-Micro/RSX	DECnet-11M-PLUS, DECnet-Micro/RSX, DECnet-VAX	DECnet-RSX, DECnet-Micro/RSX, MicroPower/Pascal	DECnet-VAX, DECnet-RSX, DECnet-Micro/RSX, MicroPower/Pascal
Operating system support	RSX-11M-PLUS, Micro/RSX, VMS	RSX-11M-PLUS, Micro/RSX, VMS	RSX-11M-PLUS, Micro/RSX, VMS	VMS, RSX-11M-PLUS, Micro/RSX, RSTS/E, VAXELN, ULTRIX-32	VMS, RSX-11M-PLUS, Micro/RSX, ULTRIX-32, RSTS/E, VAXELN
MultiCPU access <sup>4</sup>	No	No	No	No	No
Modem control <sup>5</sup>	No	No	Full	No	Full
Primary buying reason	EIA-423-A asynchronous communications (data only)	EIA-422 asynchronous communications (data only)	EIA-232-D asynchronous communications; full modem control	Fiber optic link up to one kilometer; environments that prevent the use of copper connections	High-performance; low power consumption; dual height module with full modem control

<sup>1</sup>Used only on Q-bus systems with BA200 series enclosures.

<sup>2</sup>DMA (Direct Memory Access) is the ability to move multicharacter messages between a communication line and CPU memory without interrupting the CPU. This capability yields higher performance.

<sup>3</sup>Actual device speed and throughput depend on current Digital operating system, system configuration, and applications.

<sup>4</sup>MultiCPU access is the ability to send a message directly to two or more CPUs without routing the message through another CPU.

<sup>5</sup>Modem control refers to the number of signals available to control modem functions on U.S. and European modems. Full modem control includes nine to eleven signals. Limited modem control is five signals. No modem control means only send and receive signals are present for each line.

<sup>6</sup>Can be integrated with DECnet: P.S.I. must be present.

<sup>7</sup>Limited to 19.2 Kb/s with VAX P.S.I. or RSX P.S.I.

<sup>8</sup>DECnet-VAX does not currently support this device.

## Q-bus Communications Controllers

<i>Q-bus Communications Controllers (Continued)</i>						
Device	DLVJ11	DMV11	DPV11	DSV11	DZQ11	KMV1A
Type	Asynchronous	Synchronous	Synchronous	Synchronous	Asynchronous	Asynchronous or Synchronous
Number of lines	4	1	1	2	4	1
DMA <sup>2</sup>	No	Yes	No	Yes	No	Yes
Maximum speed (consult SPD) <sup>3</sup>	One line @ 38.4 Kb/s, two lines @ 19.2 Kb/s, four lines @ 9.6 Kb/s	56 or 19.2 Kb/s (Depends on the version)	56 Kb/s, 9.6 Kb/s for IBM interconnect	Two lines @ 64 Kb/s, one line @ 256 Kb/s; SNA limited to one line @ 64 Kb/s	9.6 Kb/s	64 Kb/s <sup>7</sup>
Software support	DECnet-RT, DECnet-RSX, DECnet-Micro/RX	DECnet-RT, DECnet-RSX, DECnet/E, DECnet-Micro/RX, DECnet-VAX	DECnet-RT, DECnet-RSX, RSX P.S.I., <sup>6</sup> DECnet-Micro/RX, VAX P.S.I., <sup>6</sup> VMS/SNA	VAX Wide Area Network device driver (prerequisite) DECnet-VAX, VAX P.S.I., VMS/SNA	DECnet-RSX, DECnet-VAX, DECnet-Micro/RX	RSX-11M-PLUS Software Tools, MicroVMS Software Tools, HDLC framing, X.25 Link Level Products, VAX P.S.I., <sup>6</sup> RSX P.S.I. <sup>6</sup>
Operating system support	RSX-11M-PLUS	RSX-11M, VMS	VMS, RSX-11S, RSX-11M, RSX-11M-PLUS, Micro/RX-11S, Micro/RX-11M, Micro/RX-11M-PLUS	VMS	RSX-11M-PLUS, Micro/RX, VMS, ULTRIX-32, Micro/RSTS, RSTS/E	VMS, RSX-11S, RSX-11M, RSX-11M-PLUS, Micro/RX
MultiCPU access <sup>4</sup>	No	Yes	No	No	No	No
Modem control <sup>5</sup>	Limited	Full	Full	Full	Limited	Full
Primary buying reason	Lowest price; FDX configurations	DECnet point-to-point configurations across phone lines	Low cost	High-performance; multiprotocol support	Dual-height module with limited modem control; FDX	High-performance for bit-stuff protocols; programmable for synchronous or asynchronous communications

## Q-bus Communications Controllers

### CX Communications Controllers

The CX communications controllers provide asynchronous communications for Q-bus systems that use the BA200 series system enclosures. These communications controllers—the CXY08, the CXA16, and the CXB16—operate at speeds up to 38.4 Kb/s per line, and transmit data using either Direct Memory Access (DMA) or programmed output.

#### **CXY08**

The CXY08 provides eight EIA-232-D communications lines to terminals, modems, or serial printers. All lines support full modem control, which permits point-to-point dialup or leased line operation.

#### **CXA16**

The CXA16 provides 16 EIA-423-A lines for data-only connections (no modem control) using the DECconnect modular plug connectors.

Digital's implementation of EIA-423-A supports local EIA-232-D terminal-to-host communications at 9.6 Kb/s up to distances of 200 feet with the H8571-A passive adapter. EIA-232 terminals using the H8571-A and H3105-A active adapters can take advantage of Digital's Electrical Overstress and Electrostatic Discharge (EOS/ESD) protection, as well as increased distances up to 1,000 feet at 9.6 Kb/s.

VT300 series terminals provide integral EIA-423-A compatibility, which allows connection to the CXA16 at operating distances of 1,000 feet at 9.6 Kb/s, without the need of a passive or active adapter.

#### **CXB16**

The CXB16 provides 16 EIA-422 communications lines for data-only connections (no modem control).

The EIA-422 standard offers a high immunity to line noise, important in harsh factory, industrial, and military applications. It allows for line lengths up to 4,000 feet at all supported line speeds. (The CXB16 is used only with EIA-422-compatible terminal equipment; connection to standard VT100/200/300 series terminals is not supported.)

#### **Features**

- High throughput allows transmissions at selectable speeds up to 38.4 Kb/s per line (operating system and user application dependent). CXY08 total throughput is 50,000 char/s; CXA16 and CXB16 total throughput is 100,000 char/s (10-bit characters: 8 data, 1 stop, no parity).
- Automatic XON/XOFF flow control manages receive and transmit data flow on a per-line basis without program intervention.
- 256-character receive FIFO buffer ensures top system performance during periods of data-intensive input.
- Comprehensive self-test using onboard sequencer performs an extensive test at each system or device reset.
- No cabinet kit is necessary because the bulkhead distribution panel is integral to the CX module handle.
- DMA or programmed output with CXA16 or CXB16 allows the software device driver to dynamically select appropriate transmit mode, either DMA or 64-character FIFO output, depending on user application. This helps to optimize I/O system performance.

## Q-bus Communications Controllers

### Software Support

The CX options are supported by the following operating systems: RSX-11M-PLUS V3.0, Micro/RSX V3.1, and VMS V4.6.

### Specifications

	CXY08	CXA16	CXB16
Number of lines	8	16	16
Electrical interface standards	EIA-232	EIA-423-A	EIA-422
Direct Memory Access	Yes	Yes	Yes
Modem control	Full	No	No
Mounting space	Quad slot	Quad slot	Quad slot
Asynchronous formats	5-, 6-, 7- or 8-bit characters; Odd, even, or no parity; 1, 1.5, or 2 stop bits		
Power requirements			
dc amps drawn at 5 Vdc	1.5	1.4	1.6
dc amps drawn at +12 Vdc	0.22	0.11	0.0
dc loads	1.5	1.5	1.5
ac loads	3.0	3.0	3.0

### Ordering Information

The CX communications controllers in the Q-bus systems, use the BA200 series system enclosure (for example, the MicroVAX 3000). Order the -AA options with the purchase of a system; order the -AF options for field-installed add-ons.

The CXA16 and CXB16 include two 25-foot extension cables (BC16D-25), each leading to a 16-connection harmonica. The CXY08 includes two 12-foot cables (BC19N-12), each providing an 8-foot run to a molded box with four EIA-232-D connections.

### CX Order Codes

Option	Order Code
Factory-installed eight-line EIA-232-D asynchronous controller with modem control	CXY08-AA
Field-installed eight-line EIA-232-D asynchronous controller with modem control	CXY08-AF
Factory-installed 16-line EIA-423-A asynchronous controller (data only)	CXA16-AA
Field-installed 16-line EIA-423-A asynchronous controller (data only)	CXA16-AF
Factory-installed 16-line EIA-422 asynchronous controller (data only)	CXB16-AA
Field-installed 16-line EIA-422 asynchronous controller (data only)	CXB16-AF

### DHF11

The DHF11 is a fiber optic terminal interface that provides a maximum of 32 full-duplex, asynchronous, EIA-423-A serial data channels on Q-bus systems. The DHF11, based on LSI technology, multiplexes and demultiplexes 16 data lines onto one fiber optic cable.

The fiber optic terminal interface provides asynchronous connections to Digital's Q-bus products where the environment prevents copper connections between the devices and the host system. The DHF11 also provides the ability to connect remote (up to one kilometer) clusters of terminals to a Q-bus host where an 802.3/Ethernet connection is not available. Therefore, the DHF11 can be used in many applications, including data concentration, near or remote terminal interfacing, factory floor cell control, and terminal cluster control. Because the fiber optic terminal Q-bus controller is fully compatible with existing software drivers, new system software drivers are not required.

The DHF11 is a quad-height module that supports one or two 16-line ports. Each 16-line port connects via a dual fiber optic cable to an active terminal concentrator (H3132) that handles 16 full-duplex, asynchronous EIA-423-A serial data lines.

#### **Features**

- The remote-powered terminal concentrator with an EIA-423-A interface economically connects data terminals to remote processing equipment when an 802.3/Ethernet LAN is not installed.
- Full-duplex 38.4 Kb/s asynchronous point-to-point terminal connections over fiber optic cables up to 1-kilometer long provide higher bandwidth and longer distances than available with copper connections. (Operating system driver limits speed to 19.2 Kb/s for most applications.)
- The DHF11 uses high-volume 62.5/125 micron fiber optic (industry-standard) cable.
- The host-transparent, programmable split-speed reception and transmission by the terminal user allows support of split-speed terminals with host intervention.
- Because the DHF11 is Q-bus compatible, it can be used with any 16-, 18-, and 22-bit address system (not supported on Q-bus processors that use the BA200 series enclosure).
- Visual indicator for terminal concentrator status allows quick check for proper operation, and self-test and background monitor diagnostics provide realtime notification of hardware failure.
- Remote maintenance mode allows line tests to be invoked from the terminal side.
- The DHF11 isolates the system from lightning (EOS) and static (ESD), making it ideal for campus and industrial installations.
- The high terminal-to-cable density reduces cable congestion at the host.
- Self-test and background monitor diagnostics provide realtime notification of hardware failure.

## Q-bus Communications Controllers

### Operating System Support

- MicroVMS V4.6 or later (MicroVMS has been integrated into VMS as of V5.0)
- RSX-11M-PLUS V4.0
- Micro/RSX V4.0
- RSTS/E V9.5
- VAXELN V3.1
- ULTRIX-32 V2.2 or later
- MicroPower/Pascal—MicroRSX V2.4

### Specifications

<b>Mounting Code</b>	One quad slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	5 A
dc amps drawn at 12 Vdc	0 A
dc amps drawn at -12 Vdc	0 A
<b>Bus Loads</b>	3.7 ac, 1.0 dc
<b>I/O Connection Panel Inserts</b>	One size A

### Ordering Information

The DHF11 includes a 10-meter fiber optic cable for each 16-line terminal concentrator, and is compatible with Digital's BN25J standard fiber optic cables. ▲ Refer to "Communications Cables" at the end of this section for specific cable lengths.

Power cords are supplied with 120 Vac products. For 240 Vac products, a power cord must be ordered for each 16-line terminal concentrator.

### DHF11 Order Codes

Option	Order Code
16-line fiber optic terminal controller, 120 Vac. Includes power cord for use in the U.S., Canada, Mexico, and Japan.	DHF11-AA
32-line fiber optic terminal controller, 120 Vac. Includes power cords for use in the U.S., Canada, Mexico, and Japan.	DHF11-BA
16-line terminal concentrator upgrade for DHF11-AA, 120 Vac. Includes power cord for use in the U.S., Canada, Mexico, and Japan.	H3123-B2
16-line fiber optic terminal controller, 240 Vac. Requires power cord.	DHF11-AB
32-line fiber optic terminal controller, 240 Vac. Requires power cord.	DHF11-BB
16-line terminal concentrator upgrade for DHF11-AB, 240 Vac. Requires power cord.	H3123-B3

## Q-bus Communications Controllers

### *DHF11 Power Cord Order Codes*

Country	Order Code
Australia	BN19H-2E
Central Europe	BN19C-2E
Denmark	BN19K-2E
Italy	BN19M-2E
India	BN19S-2E
Israel	BN19U-2E
Switzerland	BN19E-2E
United Kingdom	BN19A-2E
U.S./Canada (not required)	BN19P-1K

### DHQ11

The DHQ11 is a Q-bus communications controller that supplies eight asynchronous communications lines on a dual-size module. The DHQ11 operates in either Direct Memory Access (DMA) or programmed-output mode.

The DHQ11 provides EIA-232-D or EIA-232/EIA-423 signaling to externally connected terminal devices through a choice of distribution panels, called cabinet kits. EIA-232 cabinet kits supply eight 25-pin connectors to support full modem control; Digital's implementation of EIA-423-A cabinet kits supply eight DECconnect modular plug connectors, without modem control, for local terminal connections.

The DHQ11 is the logical choice for connecting local terminals, modems, and serial printers to MicroVAX II and MicroPDP-11 computer systems.

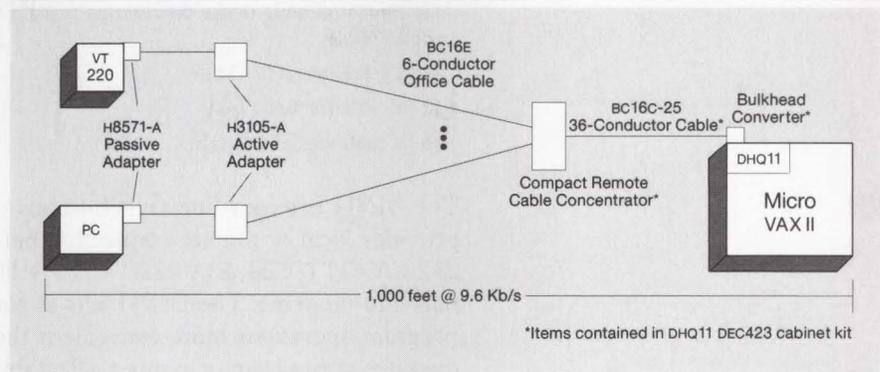
#### **Features**

- High throughput on all eight asynchronous communications lines allows transmission at selectable speeds up to 38.4 Kb/s per line, full-duplex (operating system—and user application—dependent), for a total throughput of 60,000 char/ (10-bit characters: 8 data, 1 stop, no parity), ideal for graphics and videotex applications.
- Compact, dual-size module leaves more backplane space available for additional communications devices.
- Low power consumption with EIA-232 cabinet kit requires only 1.4 amps from the CPU 5 V-power supply; EIA-423-A cabinet kit requires only 2.0 amps, leaving more power available for connecting additional peripheral devices to the backplane.
- Receive FIFO buffer of 256 characters is shared by the eight lines. This ensures top system performance during periods of data-intensive input.
- DMA or programmed-output 64-character FIFO transmit buffer optimizes I/O performance by transmitting data from memory to communications channel with minimum CPU interruptions.

## Q-bus Communications Controllers

- Automatic XON/XOFF flow control manages data flow in either direction on a per-line basis without program intervention.
- Modem control with EIA-232 cabinet kit provides full modem control for full- and half-duplex, point-to-point communications.
- EIA-423-A cabinet kit with Electrical Overstress/Electrostatic Discharge (EOS/ESD) supports local EIA-232-compatible terminals at 9.6 Kb/s. The terminals may be placed up to 200 feet from the CPU with the H8571-A passive adapter, and up to 1,000 feet from the CPU with the H3105-A active and H8571-A passive adapters. (▲ Refer to the following figure and to Section 2 for more information.)
- Onboard self-test executes an extensive test of DHQ11 circuitry each power-on or device reset. Also, a background monitor program continually tests the DHQ11 when it is not engaged in other tasks.

**DHQ11 Configuration with EIA-423-A Cabinet Kit**



NBG-185-00

### CPU and Software Support

The DHQ11 is supported by the MicroVAX II, MicroPDP-11/23, MicroPDP-11/53, MicroPDP-11/73, and MicroPDP-11/83.

The DHQ11 is supported by the following operating systems: RSX, MicroRSX, RSTS/E, Micro/RSTS, VMS, ULTRIX-32, and VAXELN. It is also supported by MicroPower/Pascal. For specific applications, consult your sales representative.

### Specifications

<b>Mounting Code</b>	One dual slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	1.4 A with EIA-232 cabinet kit; 2.0 A with EIA-423-A cabinet kit
dc amps drawn at 12 Vdc	0.23 A
<b>Bus Loads</b>	ac 3.2, dc 0.5 with EIA-232 cabinet kit; ac 2.9, dc 0.5 with EIA-423-A cabinet kit
<b>I/O Connection Panel Inserts</b>	Two Size B (EIA-232) One Size B (EIA-423-A)
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

## Q-bus Communications Controllers

### *DHQ11 Order Codes*

Option	Order Code
Asynchronous Q-bus communication controller. Includes base module only.	DHQ11-M
For system installation, order one of the following cabinet kits: Cabinet Kits for EIA-232 connection: contain two B-size slot bulkhead distribution panels with 25-pin male connectors and associated cabling to connect the module to the distribution panels. Data cables are not included.	
21-in cable for BA123 box	CK-DHQ11-AA
12-in cable for BA23 box	CK-DHQ11-AB
36-in cable for H9642 cabinet	CK-DHQ11-AF
Cabinet kits for EIA-423-A connection: contain B-size slot bulkhead distribution panel with a 36-conductor cable, compact remote terminal concentrator and associated cabling to connect the control module to the distribution panel. Data cables are not included.	
21-in cable for BA123 box	CK-DHQ11-WA
12-in cable for BA23 box	CK-DHQ11-WB
36-in cable for H9642 cab	CK-DHQ11-WF

### DLVJ1

The DLVJ1 is a four-line asynchronous communications controller that provides local or remote connection between Q-bus systems and EIA-232-C/CCITT V.28, EIA-422/CCITT V.11, and EIA-423-A/CCITT V.10 terminals and modems. The DLVJ1 acts as four separate devices, making program operations more convenient than with a multiplexer. The DLVJ1 operates at program or jumper-selectable speeds from 150 to 38,400 bits per second at full-duplex (one line at 38.4 Kb/s, two lines at 19.2 Kb/s, or four lines at 9.6 Kb/s). Split-speed transmit and receive rates are supported on each line, reducing the software demand for the receive line.

The DLVJ1 is compatible with Digital's family of modems and with Bell 100 and 200 series modems and their equivalents. The DLVJ1 is not supported by MicroVMS or VMS.

#### **Features**

- Four asynchronous communications lines from a dual-size board.
- Single line speed up to 38.4 Kb/s, two lines at 19.2 Kb/s each, or four lines at 9.6 Kb/s each.
- Limited modem control on all lines supports full-duplex, point-to-point modems.
- Character interrupt input/output.
- Split-receive/transmit speeds on a per-line basis.
- Compatible with EIA-232-C, EIA-422-A and EIA-423-A.

## Q-bus Communications Controllers

### Specifications

<b>Mounting Code</b>	One double slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	1.0 A
dc amps drawn at 12 Vdc	0.15 A
<b>Bus Loads</b>	ac 1, dc 1
<b>I/O Connection Panel Insert</b>	Size B
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

### DLVJ1 Order Codes

Options	Order Code
EIA-232-C/CCITT V.28 interface. Includes base module only. For system installation select external cables and one of the following cabinet kits:	DLVJ1-M
For use with BA123 (MicroVAX II) and BA11-MA(MB) (PDP-11/23-S) boxes.	CK-DLVJ1-LA
For use with BA23 box (MicroPDP-11, MicroVAX). For use with dual cabinet (PDP-11/83, MicroVAX II).	CK-DLVJ1-LB CK-DLVJ1-LF
EIA-442/CCITT V.11 interface. Includes base module only. For system installation select external cables and one of the following cabinet kits:	DLVJ1-M
For use with BA123 (MicroVAX II) and BA11-MA(MB) (PDP-11/23-S)boxes.	CK-DLVJ1-EA
For use with BA23 box (MicroPDP-11). For use with dual cabinet (PDP-11/83, MicroVAX II).	CK-DLVJ1-EB CK-DLVJ1-EF

## DMV11

The DMV11 is a microprocessor-controlled, single-line synchronous communications controller that provides local or remote connection between Q-bus systems and other computer systems with EIA-232-C/CCITT V.28, CCITT V.35, or EIA-423-A/EIA-449 interfaces. The DMV11 implements DDCMP in hardware and supports direct memory access data transfers, DECnet point-to-point configurations, and full modem control. It operates at speeds up to 56 Kb/s (depending on the version selected) at half- or full-duplex. Note: The maximum speed for EIA-232-C connection is 19.2 Kb/s.

Depending on the operating system and layered software, the DMV11 can support up to 12 tributaries. In point-to-point configurations, the DMV11 can communicate with DMC11, DUP11, DPV11, DMR11, DMP11, or other DMV11 controllers.

The DMV11 is compatible with Digital's family of modems and with Bell 200 series modems and their equivalents.

## Q-bus Communications Controllers

### **Features**

- Single-line synchronous communications from a dual-size board.
- Line speeds up to 56 Kb/s (application-dependent).
- DMA input/output optimizes communication throughput.
- Full modem control supports full- or half-duplex communications.
- EIA-232-C, EIA-423-A/EIA-449, or V.35-compatible depending on version selected.

### **Specifications**

<b>Mounting Code</b>	One quad slot (all versions)
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	3.4 A (DMV11-A, -B, -F), 3.4 A (DMV11-C)
dc amps drawn at 12 Vdc	0.38 A (DMV11-A; -B, -F), 0.26 A (DMV11-C)
<b>Bus Loads</b>	ac 2, dc 1 (all versions)
<b>I/O Connection Panel Inserts</b>	Size B (DMV11-A, -F) Size A (DMV11-B, -C)
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

## Q-bus Communications Controllers

### DMV11 Order Codes

Option	Order Code
Synchronous Q-bus controller for EIA-232-C/CCITT V.28, EIA-423-A/EIA-449, or CCITT V.35 interfaces. Includes base module only. Requires a cabinet kit.	DMV11-M
Synchronous Q-bus controller for integral modem. Includes base module only. Requires a cabinet kit.	DMV11-N
<b>EIA-232-C/CCITT V.28 Cabinet Kits</b>	
For use with BA123 (MicroVAX II, MicroPDP-11) and BA11-MA(MB) (PDP-11/23-S) boxes.	CK-DMV11-AA
For use with BA23 box (MicroPDP-11).	CK-DMV11-AB
For use with H9642 Micro cabinet (MicroVAX II, MicroPDP-11).	CK-DMV11-AF
For use with CPUs that do not have an I/O connection panel. Kit contains a 10-ft cable that connects the DMV11-M module to an external device.	CK-DMV11-A2
<b>EIA-423-A/EIA-449 Cabinet Kits</b>	
For use with BA123 (MicroVAX II, MicroPDP-11) and BA11-MA(MB) (PDP-11/23-S) boxes.	CK-DMV11-FA
For use with BA23 box (MicroPDP-11).	CK-DMV11-FB
For use with H9642 Micro cabinet (MicroVAX II, MicroPDP-11).	CK-DMV11-FF
For use with CPUs that do not have I/O panel. Kit contains a 10-ft cable that connects the DMV11-M module to an external device.	CK-DMV11-F3
<b>CCITT V.35 Cabinet Kits</b>	
For use with BA123 (MicroVAX II, MicroPDP-11) and BA11-MA(MB) (PDP-11/23-S) boxes. Includes a BC17E cable for connection to modem.	CK-DMV11-BA
For use with BA23 box (Micro/PDP-11). Includes a BC17E cable for connection to modem.	CK-DMV11-BB
For use with H9642 Micro cabinet (MicroVAX II, MicroPDP-11).	CK-DMV11-BF
For use with CPUs that do not have an I/O connection panel. Kit contains a 25-ft cable that connects the DMV11-M module to an external device.	CK-DMV11-B3
<b>Integral Modem Cabinet Kits</b>	
For use with BA123 (MicroVAX II, MicroPDP-11) and BA11-MA(MB) (PDP-11/23-S) boxes.	CK-DMV11-CA
For use with BA23 box (MicroPDP-11).	CK-DMV11-CB
For use with H9642 Micro cabinet (MicroVAX II, MicroPDP-11).	CK-DMV11-CF
For use with CPUs that do not have an I/O connection panel. Kit contains a 25-ft cable that connects the DMV11-N module to an external device.	CK-DMV11-C3

## Q-bus Communications Controllers

### DPV11

The DPV11 is a low-cost, single-line synchronous programmable interface that provides local or remote connection between Q-bus systems and other computer systems with EIA-232-C/CCITT V.28 or EIA-232-C/CCITT V.11 interfaces. Operating at speeds up to 56 Kb/s at half- or full-duplex with full modem control (DDCMP/BISYNC at 56 Kb/s, HDLC/SDLC at 9.6 Kb/s), the DPV11 is programmable for either byte-oriented protocols (DDCMP or BISYNC) or bit-oriented protocols (SDLC or HDLC). The DPV11 is suited for interfacing to medium-speed synchronous lines for remote batch and remote job-entry applications and is compatible with Digital's family of modems and with the Bell 200 series modems and their equivalents.

#### Features

- Single-line synchronous communications from a dual size board.
- Line speeds up to 56 Kb/s (application-dependent).
- Full modem control supports full- and half-duplex communications.
- Character interrupt input/output.
- EIA-232-C-compatible.

#### Specifications

<b>Mounting Code</b>	One double slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	1.2 A
dc amps drawn at 12 Vdc	0.3 A
<b>Bus Loads</b>	ac 1, dc 1
<b>I/O Connection Panel Insert</b>	Size A
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

#### DPV11 Order Codes

Option	Order Code
Single-line synchronous Q-bus communications controller. Includes base module only; requires cabinet kit.	DPV11-M
Factory-installed controller for BA200 series enclosures. No cabinet kit required.	DPV11-SA
Field-installed controller for BA200 series enclosures. No cabinet kit required.	DPV11-SF
For system installation of the DPV11-M, select one of the following cabinet kits:	
For use with BA123 (MicroVAX II, MicroPDP-11) and BA11-MA(MB) (PDP-11/23-S) boxes.	CK-DPV11-AA
For use with BA23 box (Micro/PDP-11).	CK-DPV11-AB
For use with H9642 Micro cab (MicroVAX II, MicroPDP-11).	CK-DPV11-AF
For use with CPUs that do not have an I/O connection panel. Kit contains a 25-ft cable that connects the DPV11-M module to an external device.	CK-DPV11-A3

## DSV11

The DSV11 module supports synchronous communications at speeds up to 256 Kb/s for standalone MicroVAX Q-bus systems. It is the preferred MicroVAX option for host-based wide area communications, with the flexibility to support two lines running different applications.

The DSV11 supports the DDCMP, HDLC, and SDLC protocols at speeds up to 256 Kb/s for one-line-only operation, and speeds up to 64 Kb/s per line for two-line operation. The bisync protocol is also supported at speeds up to 9.6 Kb/s per line, regardless of whether one or two lines are in operation.

Up to five DSV11 modules may be included in a system box (available slots, power, and bus load permitting), except for the BA23 box where the limit is two DSV11 modules.

DECnet-VAX, VAX P.S.I., and VMS/SNA software products support the DSV11 module. Combinations of these software products can share the DSV11, with one product controlling both lines, or one product controlling one line while another product controls the second line.

The following table lists the software combinations that can control the DSV11 and the maximum line speeds they support.

Communications Application	One-line Operation (speed)	Two-line Operation (speed/line)		
		DECnet-VAX	VMS/SNA	VAX P.S.I.
DECnet-VAX	256 Kb/s	64 Kb/s	64 Kb/s	64 Kb/s
VMS/SNA	64 Kb/s	64 Kb/s	N/S*	64 Kb/s
VAX P.S.I.	64 Kb/s	64 Kb/s	64 Kb/s	64 Kb/s

\*VMS/SNA does not support two DSV11 lines.

**Features**

- High performance.
- Multiprotocol capability supports different applications.
- Configurable communications ports support different line interfaces with one option.

**Prerequisite Software**

VMS V5.0 operating system for support of the Wide Area Device Driver included with the DSV11.

A synchronous device driver is available for DSV11 support under VMS V4.7 operating system. ▲ Refer to Software Product Description 28.49 for more information.

## Q-bus Communications Controllers

### Specifications

<b>Mounting Code</b>	One quad slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	5.43 A
dc amps drawn at 12 Vdc	0.62 A
<b>Bus Loads</b>	3.9 ac, 1.0 dc
<b>I/O Connection Panel Inserts</b>	One size B (BA23/BA123/H9642 only)

### Ordering Information

The DSV11 is available in versions using a cabinet kit for BA23/BA123 enclosures or with integral distribution panel for BA200-series enclosures. The DSV11 includes the Wide Area Network Device Driver software for support under the VMS V5.0 operating system—license, distribution on TK50 media, and documentation are included.

For multiple DSV11 modules on one system, order one DSV11-SA/-SF/-AA plus additional DSV11-SB/-SG/-AB options as required.

### DSV11 Order Codes

Option	Order Code
First DSV11 controller for BA200-series enclosures, factory installed. Includes software, one EIA-232 adapter cable, one V.35 adapter cable, and documentation.	DSV11-SA
Extra DSV11 modules for the same system, factory installed. Includes adapter cables only; no software or documentation.	DSV11-SB
First DSV11 controller for BA200-series enclosures, field installed. Includes software, one EIA-232 adapter cable, one V.35 adapter cable, and documentation.	DSV11-SF
Extra DSV11 modules for the same system, field installed. Includes adapter cables only; no software or documentation.	DSV11-SG
First DSV11 module for BA23/BA123/H9642 enclosures. Includes software, one EIA 232 adapter cable, one V.35 adapter cable, and documentation.	DSV11-AA
Extra DSV11 modules for the same system. Includes adapter cables only; no software or documentation.	DSV11-AB

### Cabinet Kits

For system installation of the DSV11-AA and DSV11-AB, order one of the following cabinet kits.

Cabinet kit for BA123	CK-DSV11-UA
Cabinet kit for BA23	CK-DSV11-UB
Cabinet kit for BA123	CK-DSV11-UF

### Adapter Cables

EIA-422 adapter cable	BC19B-02
EIA-232/V.24 adapter cable	BS19D-02
EIA-423 adapter cable	BC19E-02
V.35 adapter cable	BC19F-02

**DZQ11**

The DZQ11 is a four-line asynchronous communications controller that provides local or remote connection between PDP-11 and VAX Q-bus systems and EIA-232-C/CCITT V.28 and EIA-423-A/CCITT V.10 terminals, modems, or other systems. The DZQ11 operates at program-selectable speeds up to 9.6 Kb/s at full-duplex with limited modem control on each line.

The DZQ11 is compatible with Digital's family of modems and with Bell 100 and 200 series modems and their equivalents.

**Features**

- Four asynchronous communication lines from a dual-size module.
- Line speeds up to 9.6 Kb/s.
- Limited modem control on all lines supports full-duplex, point-to-point, modems.
- Character interrupt input/output.
- Compatible with EIA-232-C and EIA-423-A.

**Specifications**

<b>Mounting Code</b>	One dual slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	1.0 A
dc amps drawn at 12 Vdc	0.36 A
<b>Bus Loads</b>	ac 1.4, dc 0.5
<b>I/O Connection Panel Insert</b>	Size B
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

**DZQ11 Order Codes**

Option	Order Code
Four-line asynchronous Q-bus controller. Includes base module only; requires cabinet kit.	DZQ11-M
Factory-installed controller for BA200 series enclosures. Includes base module only; no cabinet kit required.	DZQ11-SA
Field-installed controller for BA200 series enclosures. Includes base module only; no cabinet kit required.	DZQ11-SF
For system installation of DZQ11-M, select the appropriate external cables and one of the following cabinet kits:	
For use with BA123 (MicroVAX II, MicroPDP-11) and BA11-MA(MB) (PDP-11/23-S) boxes.	CK-DZQ11-DA
For use with BA23 box (Micro/PDP-11, MicroVAX).	CK-DZQ11-DB
For use with H9642 Micro cabinet (MicroVAX II, MicroPDP-11).	CK-DZQ11-DF
For use with CPUs that do not have an I/O connection panel. Kit contains a 25-ft cable that connects the DZQ11-M module to eight EIA-232 or EIA-423-A devices. (Non-FCC compliant)	CK-DZQ11-D3

## Q-bus Communications Controllers

### KMV1A

The KMV1A is a high-performance Direct Memory Access, single-line programmable communications controller that provides connection between Q-bus systems with EIA-232-C/CCITT V.28, EIA-422/CCITT V.11, and EIA-423-A/CCITT V.10 interfaces. It is capable of communications speeds up to 64 Kb/s. Used on the PDP-11/23, PDP-11/23-PLUS, MicroVAX II, MicroVAX 3500, MicroVAX 3600, and MicroPDP-11 systems, it utilizes the Micro/T11 Processor to perform user-defined communications functions, thereby freeing the host to do more application computations.

The KMV1A can be programmed in synchronous or asynchronous modes. It also provides full modem support for Digital's family of modems, the Bell 200 Series or equivalent, and European PTT-approved modems.

Software Development Tools, X.25 Link Level, and HDLC Framing package are available for use under RSX-11M and RSX-11M-PLUS systems. Software support is available for VAX P.S.I. (at speeds up to 19.2 Kb/s), X.25 Link Level, and Development Tools on a MicroVAX.

#### *Specifications*

<b>Mounting Code</b>	One quad slot
<b>Power Requirements</b>	
dc amps drawn at 5 V	2.6 A
dc amps drawn at 12 V	0.2 A
<b>Bus Loads</b>	ac 3, dc 1
<b>I/O Connection Panel Insert</b> (Compatible connections for MicroVAX 3500/3600)	Size B (PDP-11/23, MicroPDP-11, MicroVAX II) Size C (PDP-11/23-PLUS)
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

## Q-bus Communications Controllers

### *KMV1A Order Codes*

Option	Order Code
<b>Controllers</b>	
Field-installed EIA-232-C KMV controller for BA200 series enclosure. No cabinet kit required.	KMV1A-SF
Field-installed EIA-422 KMV controller for BA200 series enclosure. No cabinet kit required.	KMV1A-SG
Field-installed EIA-423-A KMV controller for BA200 series enclosure. No cabinet kit required.	KMV1A-SH
KMV controller for MicroVAX II and MicroPDP-11 systems. Includes module only. Requires cabinet kit.	KMV1A-M
<b>Cabinet Kits</b>	
For KMV1A-M system installation, select one of the following cabinet kits.	
EIA-232-C for PDP-11/23 and BA123.	CK-KMV1A-AA
EIA-232-C for BA23.	CK-KMV1A-AB
EIA-232-C for PDP-11/23-PLUS.	CK-KMV1A-AC
EIA-232-C for MicroVAX II System 5 (in H9642 cabinets).	CK-KMV1A-AF
EIA-422 for PDP-11/23 and BA123.	CK-KMV1A-EA
EIA-422 for BA23.	CK-KMV1A-EB
EIA-422 for PDP-11/23-PLUS.	CK-KMV1A-EC
EIA-422 for MicroVAX II System 5 (in H9642 cabinets).	CK-KMV1A-EF
EIA-423-A for PDP-11/23s and BA123.	CK-KMV1A-FA
EIA-423-A for BA23.	CK-KMV1A-FB
EIA-423-A for PDP-11/23-PLUS.	CK-KMV1A-FC
EIA-423-A for MicroVAX II System 5 (in H9642 cabinets).	CK-KMV1A-FF
<b>Cables for Modem Connection</b>	
Connects KMV1A-S controllers to EIA-232-compatible modems.	BC22U-xx
Connects KMV1A-S controllers to EIA-422 or EIA-423-A compatible modems.	BC22W-xx

## Q-bus Communications Controllers

▲ Refer to the Software Product Description (SPD) and Unique Product Identifier (UPI) regarding any of the optional software listed below.

- KMV1A RSX and Micro/RSX Development Tools
  - SPD 13.41
  - UPI S98
- KMV1A RSX X.25 Link Level
  - SPD 13.43
  - UPI S97
- KMV1A RSX and Micro/RSX HDLC Framing
  - SPD 14.22
  - UPI S39
- KMV1A MicroVAX Driver
  - SPD 28.23
  - UPI VCP
- KMV1A MicroVMS Development Tools
  - SPD 28.24
  - UPI Z36
- KMV1A MicroVMS X.25 Link Level
  - SPD 28.25
  - UPI Z37
- KMV1A MicroVAX Driver and Development Tools
  - SPD 28.26
  - UPI VCR
- KMV1A MicroVAX Driver and X.25 Link Level
  - SPD 28.27
  - UPI VCQ
- VAXELN KMV1A Tool Kit
  - SPD 29.17
  - UPI ZNA
- RSX-11 Packetnet System Interface
  - SPD 10.42
  - UPI D91
- RSX-11 Packetnet System Interface/M-Plus
  - SPD 10.43
  - UPI D92
- VAX Packetnet System Interface
  - SPD 25.40
  - UPI 071

The following table summarizes the features of Digital's MicroVAX 2000 communications controllers.

<i>MicroVAX 2000 Communications Controllers</i>				
	DHT32	DST32	DSH32*	
Type	Asynchronous	Synchronous	Asynchronous	Synchronous
Number of lines	8	1	8	1
Direct Memory Access (DMA) <sup>1</sup>	No	No	No	No
Maximum speed (consult SPD) <sup>2</sup>	38.4 Kb/s	19.2 Kb/s	38.4 Kb/s	19.2 Kb/s
Software support	DECnet-VAX, <sup>5</sup> DECnet- ULTRIX	DECnet-VAX, <sup>5</sup> VAX P.S.I., VMS/SNA	DECnet- ULTRIX DECnet-VAX	VAX P.S.I. VMS/SNA DECnet-VAX
Operating system support	VMS, ULTRIX-32	VMS	VMS, ULTRIX 32	VMS
MultiCPU access <sup>3</sup>	No	No	No	No
Modem control <sup>4</sup>	No	Full	No	Full
Primary buying reason	EIA-423-A asynchronous communications; adds eight more lines to MicroVAX 2000 system's standard four.	Low-cost connection to Wide Area Network	Adds eight lines and a low-cost connection to Wide Area Network.	

<sup>1</sup>DMA (Direct Memory Access) is the ability to move multicharacter messages between a communication line and CPU memory without interrupting the CPU. This capability yields higher performance.

<sup>2</sup>Actual device speed and throughput depend on Digital operating system, system configuration, and applications.

<sup>3</sup>MultiCPU access is the ability to send a message directly to two or more CPUs without routing the message through another CPU.

<sup>4</sup>Modem control refers to the number of signals available to control modem functions on U.S. and European modems. Full modem control includes nine to eleven signals. Limited modem control is five signals. No modem control means only send and receive signals are present on each line.

<sup>5</sup>DECnet-VAX currently supports these devices with certain line and speed configuration restrictions. ▲ Refer to SPD 25.03 for more information.

\*DEC Multicontroller 581

## MicroVAX 2000 Communications Controllers

### DHT32

The DHT32 is an eight-line asynchronous multiplexer for the MicroVAX 2000, application compatible with the DHQ11. It provides data-only transmission at speeds up to 38.4 Kb/s, and allows eight additional terminals or peripheral devices to connect to the MicroVAX 2000 system. With the three nonmodem lines and one modem line available on the MicroVAX 2000, a total of 12 asynchronous lines can be connected to the MicroVAX 2000 system. (A "network" solution, including DECserver 200 via 802.3/Ethernet, is appropriate if more asynchronous lines are required.)

The DHT32 supports the EIA-423-A standard. Terminals requiring EIA-232 connections can use an adapter. Cables that connect directly to terminals or printers are not provided as part of this option.

Note: The DST32 and the DHT32 (eight-line asynchronous communications option) are mutually exclusive, and only one can be installed in a system. If more than four asynchronous lines are required, customers can add terminals using Digital terminal servers. For synchronous communication to an IBM host, an alternate method is to use a DECnet/SNA Gateway.

#### Features

- Eight-line, asynchronous, terminal-expansion option gives MicroVAX 2000 a total capacity of 12 asynchronous lines.
- Performance approximates the MicroVAX II systems with DHV11/DHQ11 asynchronous controller.

#### Software Support

VMS and ULTRIX-32 operating systems.

#### Specifications

<b>Mounting Space</b>	Daughter-boarded to the system module; driver/receiver board located in the expansion adapter.
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	1.50 A
dc amps drawn at 12 Vdc	0.70 A
dc amps drawn at -12 Vdc	0.12 A
<b>Bus Loads</b>	Private bus architecture (one F-type logic board)
<b>I/O Connection Panel Inserts</b>	Located in opening C in the expansion adapter
<b>Environmental Class</b>	B with modified relative humidity (operating) of 10-90% (no diskette system), and 20-80% (diskette in use).

#### DHT32 Order Codes

Option	Order Code
Eight-line asynchronous controller includes serial line logic module, serial line driver/receiver module, 34-way internal ribbon cable, external 25-foot data cable, and eight-line data cable concentrator (H3104).	DHT32-AA

**DST32**

The DST32, a single-line synchronous communications controller for the MicroVAX 2000, is a full-duplexed line option with bit- or character-oriented protocol. The DST32 supports HDLC and SDLC at speeds up to 19.2 Kb/s, and DDCMP at up to 9.6 Kb/s.

The DST32 option includes the DST32 device driver license and software. Customers can use the DST32 either for VMS/SNA connection or for VAX P.S.I.

Note: The DST32 and the DHT32 (eight-line asynchronous communications option) are mutually exclusive, and only one can be installed in a system. If more than four asynchronous lines are required, customers can add terminals using Digital terminal servers. For synchronous communication to an IBM host, an alternate method is to use a DECnet/SNA Gateway.

**Features**

- Provides cost-effective, Wide Area Network connection for applications supporting geographically dispersed MicroVAX 2000 systems.
- Supports SNA or X.25 (P.S.I.) networks, or synchronous DECnet (DDCMP).

**Prerequisite Software**

VMS/SNA or VAX P.S.I. V4.1 using the VMS operating system.

<b>Hardware Specifications</b>	
<b>Mounting Space</b>	Daughter-boarded to the system module; driver/receiver board located in the expansion adapter
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	2.0 A
dc amps drawn at 12 Vdc	0.07 A
dc amps drawn at -12 Vdc	0.115 A
<b>Bus Loads</b>	Private bus architecture (one F-type logic board)
<b>I/O Connection Panel Inserts</b>	Located in opening C in the expansion adapter
<b>Environmental Class</b>	B with modified relative humidity (operating) of 10-90% (no diskette system), and 20-80% (diskette in use).

**Ordering Information**

DST32 hardware comprises a controller module, a driver/receiver module, an internal ribbon cable, and an external modem adapter cable. The appropriate modem cable must be ordered separately for a specific application: BC22F-xx for DST32-AA, and BC55D-xx for DST32-AB and DST32-AC, where xx is the cable length. ▲ Refer to “Communications Cables” in this section for available cable lengths.

Also included are the device driver in both tape and diskette media, and software license.

## MicroVAX 2000 Communications Controllers

### *DST32 Order Codes*

Option	Order Code
Single-line synchronous communications controller for MicroVAX 2000. Includes EIA-232/V.24 modem cable with EIA-232-C adapter (supported by VMS/SNA).	DST32-AA
Single-line synchronous communications controller for MicroVAX 2000. Includes EIA-423/V.10 modem cable.	DST32-AB
Single-line synchronous communications controller for MicroVAX 2000. Includes EIA-422/V.36 modem cable.	DST32-AC

### DSH32

The DSH32 (or DEC MULTIcontroller 581) is a dual-function communications controller specific to the MicroVAX 2000. The DSH32 consists of an eight-line asynchronous multiplexer and a single-line synchronous interface, and is supported by the VAX/VMS operating system, DECnet-VAX networking software, VAX P.S.I. communications software, and VMS/SNA communications software. (ULTRIX supports only the eight asynchronous lines.)

The single-line synchronous interface allows operation at software-set speeds up to 19.2 Kb/s (9.6 Kb/s maximum for DDCMP) in non-DMA mode, with full modem control and support for bit- and byte-oriented protocols. The synchronous line is compatible with Digital's family of modems and with Bell 200-series modems and their equivalents.

The eight-line asynchronous multiplexer can be set for speeds up to 38.4 Kb/s with operating software limitation of 19.2 Kb/s. These lines do not have modem control. They will support connection of any EIA-423-A-supported device.

The DSH32 consists of three modules—a controller board, a synchronous driver/receiver board, and an asynchronous driver/receiver board. This option can be shipped preconfigured or as “add-on” installed by field service.

### **Features**

- Provides cost-effective connection to Wide Area Network.
- Combines the functionality of the one synchronous line of the DST32 and the eight synchronous lines of the DHT32. (Note that only one of these three options can be installed in the same MicroVAX 2000 system.)

### *Specifications*

<b>Mounting Code</b>	Daughter-boarded to the system module; driver/receiver boards located in the expansion adapter
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	3.44 A max.
dc amps drawn at 15 Vdc	494 mA max.
dc amps drawn at -15 Vdc	240 mA max.
<b>Bus Loads</b>	Private bus architecture (one F-type logic board)
<b>I/O Connection Panel Inserts</b>	Located in openings C and D

### Ordering Information

All MicroVAX 2000 systems ordered before March 6, 1989, need the BA40A-BA expansion adapter to use the DSH32 option.

The following external cables are required for connection to modems (xx refers to the cable length in feet):

- BC22F-xx—For connecting DSH32-AA to EIA-232-A-compatible modems
- BC55D-xx—For connecting DSH32-AB or DST32-AC to EIA-422/V.36 or EIA-423/V.10-compatible modems

#### *DSH32 Order Codes*

Option	Order Code
Eight asynchronous lines (EIA-423-A), one synchronous line for EIA-232/V.24 communications (and BC19V-02 cable and EIA-232-C adapter connector)	DSH32-AA
Eight asynchronous lines (EIA-423-A), one synchronous line for EIA-423/V.10 communications (and BC19W-02 cable)	DSH32-AB
Eight asynchronous lines (EIA-423-A), one synchronous line for EIA-422/V.36 communications (and BC19U-02 cable)	DSH32-AB

The following table summarizes the features of Digital's asynchronous and synchronous UNIBUS communications controllers.

<i>UNIBUS Communications Controllers</i>					
Device	DHU11	DMF32		DMR11	DMZ32
Type	Asynchronous	Synchronous <sup>7</sup>	Asynchronous <sup>7</sup>	Synchronous	Asynchronous <sup>7</sup>
Number of lines	16	1	8	1	24
DMA <sup>1</sup>	Yes	Yes	Yes	Yes	Yes
Maximum speed (consult SPD) <sup>2</sup>	38.4 Kb/s	19.2 Kb/s	19.2 Kb/s	1 Mb/s	19.2 Kb/s
Software support	DECnet-VAX	DECnet-VAX, VAX P.S.I. <sup>5</sup>	DECnet-VAX	DECnet-RT, DECnet-20, DECnet-10, DECnet/E, DECnet-VAX, DECnet-RSX	DECnet-VAX
Operating system support	VMS, RSX-11M, RSX-11M-PLUS, ULTRIX-32, RSTS/E	VMS	VMS	VMS, RSX-11S, RSX-11M, RSX-11M-PLUS, RSTS/E	VMS, ULTRIX-32
MultiCPU access <sup>3</sup>	No	No	No	No	No
Modem control <sup>4</sup>	Full	Yes	Full on two lines; none on six lines	Full	Full (optional)
Primary buying reason	DMA performance with full modem control; lowest price per line	Low cost; DMA performance; one synchronous line; eight asynchronous lines; one printer port		DECnet interface across phone lines	DMA performance with full modem control; remote distribution panel

<sup>1</sup>DMA (Direct Memory Access) is the ability to move multicharacter messages between a communication line and CPU memory without interrupting the CPU. This capability yields higher performance.

<sup>2</sup>Actual device speed and throughput depend on Digital operating system, system configuration, and applications.

<sup>3</sup>MultiCPU Access refers to the ability to send a message directly to two or more CPUs without routing the message through another CPU.

<sup>4</sup>Modem Control refers to the number of signals available to control modem functions on U.S. and European modems. Full modem control includes nine to eleven signals. Limited modem control is five signals. No modem control means only send and receive signals are present for each line.

<sup>5</sup>Can be integrated with DECnet—P.S.I. must be present.

<sup>6</sup>▲ For more information, refer to "Digital/IBM Communications Software" in Section 4.

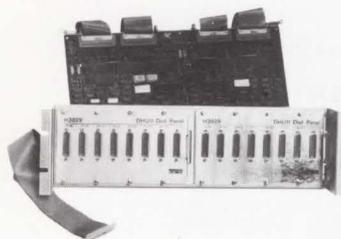
<sup>7</sup>VAX systems only.

<sup>8</sup>Limited to 19.2 Kb/s with VAX P.S.I. and RSX P.S.I.

## UNIBUS Communications Controllers

<i>UNIBUS Communications Controllers (Continued)</i>				
Device	DUP11	KCT32	KMS11	KMS1P
Type	Synchronous	Asynchronous or Synchronous <sup>7</sup>	Synchronous	Synchronous
Number of lines	1	2	8	1
DMA <sup>1</sup>	No	Yes	Yes	Yes
Maximum speed (consult SPD) <sup>2</sup>	9.6 Kb/s <sup>4</sup>	Two lines @ 64 Kb/s, One line @ 160 Kb/s	Four lines @ 56 Kb/s, Eight lines @ 19.2 Kb/s <sup>8</sup>	64 or 19.2 Kb/s (depends on the version)
Software support	IBM Internet, <sup>6</sup> RSX P.S.I., VAX P.S.I., <sup>5</sup> DECnet-RT, DECnet-RSX	VAX-11 KCT32 Software Tools	VAX X.25 Link Level, RSX X.25 Link Level, VAX HDLC/BSC Framing, VAX P.S.I., <sup>5</sup> RSX P.S.I. <sup>5</sup>	VAX P.S.I., <sup>5</sup> RSX X.25 Link Level, RSX P.S.I. <sup>5</sup>
Operating system support	RSX-11M, RSX-11M-PLUS, RSX-11S, VMS (for VAX P.S.I.)	VMS	VMS, RSX-11M, RSX-11M-PLUS, RSX-11S	VMS, RSX-11M, RSX-11M-PLUS
MultiCPU access <sup>3</sup>	No	No	No	No
Modem control <sup>4</sup>	Full	Full	Full	Full
Primary buying reason	Low cost; host-programmable protocols	Low cost for custom applications; programmable (sync or async) on VAX systems	Multiple line X.25 support, high-performance	Single line X.25 support, high-performance

### DHU11



The DHU11 is a 16-line asynchronous communications controller with direct memory access (DMA) that provides local and remote connection between UNIBUS PDP-11 or VAX systems and EIA-232-C/CCITT V.28 or EIA-423-A/CCITT V.10 terminals, modems, serial printers, and data switches. The DHU11 supports operating speeds up to 38.4 Kb/s. Actual communications speed and throughput is dependent on current Digital operating systems and system configuration. Full modem control is available on all 16 lines.

## UNIBUS Communications Controllers

### Features

- Sixteen asynchronous communications lines from a hex size board.
- Line speeds up to 38.4 Kb/s (application-dependent).
- DMA output optimizes communications throughput compared to character interrupt devices.
- Full modem control on all lines supports full- and half-duplex, point-to-point modems.
- Automatic XON/XOFF flow control allows the management of data flow in either direction on a per-line basis without program intervention.
- Split-receive/transmit speeds on a per-line basis.
- Comprehensive self-test through ROM-based diagnostics provides testing of DHU11 circuitry at each power-on or reset.
- EIA-232-D and EIA-423-A compatibility.

### Software Support

The DHU11 is supported by VMS, ULTRIX-32, RSX-11M, RSX-11M PLUS, RSTS/E, and ULTRIX-11.

### Specifications

<b>Mounting Code</b>	One hex slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	6.0 A
dc amps drawn at 15 Vdc	0.4 A
dc amps drawn at -15 Vdc	0.4 A
<b>Bus Loads</b>	ac 2.2, dc 1.0
<b>I/O Connection Panel Inserts</b>	Eight for -AD; two for -VD
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

### DHU11 Order Codes

Option	Order Code
EIA-232-C/CCITT V.28 and EIA-423-A/CCITT V.10 interface with full modem control and DMA. Includes base module only.	DHU11-M
For system installation, select the appropriate external cables and one of the following cabinet kits:	
For general-purpose expander cabinet used with the VAX-11/780, PDP-11/44, and the expander cabinet for the VAX-11/750.	CK-DHU11-AD
Remote distribution cabinet kit requires only two I/O distribution panels for shielded connection to two 8-connector distribution panels. Each distribution panel has full international modem control signals for four of the eight serial lines. Internal cable length is 10 feet.	CK-DHU11-VD
For kernel cabinet of VAX-11/750, and PDP-11/84.	CK-DHU11-AE
For use with PDP-11/84 rackmount variations.	CK-DHU11-AF
For use with unshielded cabinet models. Adapter bracket included.	CK-DHU11-A1

DMF32

The DMF32, a multifunction communications controller, provides connection between modems or terminals and UNIBUS VAX systems. The DMF32 consists of an eight-line asynchronous multiplexer, a single-line synchronous interface, and a general purpose parallel interface. It is supported by the VMS operating system, DECnet-VAX networking software, and VAX P.S.I. communications software.

The eight-line asynchronous multiplexer operates at speeds up to 19.2 Kb/s at full-duplex in either DMA mode or FIFO (first-in, first-out) mode. Two lines have full modem control and split-speed capability; the other six lines have no modem control and are for connecting local terminals only. The single-line synchronous interface operates at speeds up to 19.2 Kb/s in DMA mode with full modem control and supports both bit- and byte-oriented protocols. The general purpose parallel interface operates with either a lineprinter (in DMA mode) or a user-specific device (DMA mode or FIFO mode).

The DMF32 is compatible with Digital's family of modems and with Bell 200 series modems and their equivalents.

**Features**

- Asynchronous communications:
  - Eight asynchronous communications lines
  - DMA output optimizes communications throughput compared to character interrupt devices
  - Line speeds up to 19.2 Kb/s (application-dependent)
  - Full modem control on two lines supports full- and half-duplex, point-to-point modems
  - EIA-232-C-compatible
- Synchronous communications:
  - One synchronous communications line with line speeds up to 19.2 Kb/s
  - DMA input/output optimizes communications throughput
  - Full modem control point-to-point
  - EIA-232-C compatible
- Parallel printer line supports LP27 generic specifications
- Comprehensive self-test
- Software support for VMS and ULTRIX-32

<i>Specifications</i>	
<b>Mounting Code</b>	One hex slot
<b>Power Requirements</b>	
dc amps drawn at +5 Vdc	8.0 A
dc amps drawn at +15 Vdc	0.5 A
dc amps drawn at -15 Vdc	0.5 A
<b>Bus Loads</b>	ac 6, dc 1
<b>I/O Connection Panel Inserts</b>	Four panel units
<b>Environmental Class</b>	B (▲ Refer to Appendix B for details.)

## UNIBUS Communications Controllers

### DMF32 Order Codes

Option	Order Code
Includes base module only.	DMF32-M
For system installation, select the appropriate external cables and one of the following cabinet kits:	
For use with shielded cabinets (VAX-11/780).	CK-DMF32-LD
For use with shielded cabinets (VAX-11/750).	CK-DMF32-LE
For use with cabinets without I/O connection panels. Adapter brackets included. (Non-FCC-compliant)	CK-DMF32-L1

### DMR11

The DMR11 is a high-performance microprocessor-controlled single-line synchronous communications controller that provides local or remote connection between PDP-11 or VAX UNIBUS systems and other computer systems with EIA-232-C/CCITT V.28, CCITT V.35, EIA-423-A/EIA-449, or EIA-422/EIA-449 interface. The DMR11 implements DDCMP in hardware and supports Direct Memory Access data transfers, DECnet point-to-point configurations, and full modem control. It operates at speeds up to 1 Mb/s at half- or full-duplex. The DMR11 can communicate with another DMR11, DMV11, or any other synchronous interface that implements DDCMP Versions 3.1 or 4.0.

The DMR11 is compatible, depending on the version selected, with Digital's family of modems and with Bell 200 series and Bell 500a 11/5 modems and their equivalents.

### Specifications

<b>Mounting Code</b>	Two hex slots (all versions)
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	12.0 A (all versions)
dc amps drawn at 15 Vdc	0.08 A (DMR11-A, -C), 0.11 A (DMR11-B, -E, -F)
dc amps drawn at -15 Vdc	0.19 A (DMR11-A, -C), 0.20 A (DMR11-B, -E, -F)
<b>Bus Loads</b>	ac 1 (all versions), dc 1 (all versions)
<b>I/O Connection Panel Inserts</b>	One panel unit (DMR11-A, -B, -C, -E) Two panel units (DMR11-F)
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

## UNIBUS Communications Controllers

### DMR11 Order Codes

Option	Order Code
Includes base module only.	DMR11-M
For installation, select the appropriate external cable and one of the following cabinet kits:	
EIA-232-C cabinet kit. For use with shielded cabinets.	CK-DMR11-AD
For use with shielded cabinets.	CK-DMR11-AL
For use with unshielded cabinets. Adapter bracket included.	CK-DMR11-A1
V.35 cabinet kit. For use with shielded cabinets.	CK-DMR11-BD
For use with shielded cabinets.	CK-DMR11-BL
For use with unshielded cabinets. Adapter bracket included.	CK-DMR11-B1
Includes integral modem for local connection. This option must be ordered with the system.*	
Integral modem cabinet kit. For use with shielded cabinets.	CK-DMR11-CD
For use with shielded cabinets.	CK-DMR11-CL
For use with unshielded cabinets. Adapter bracket included.	CK-DMR11-C1
AS/422/EIA-449 cabinet kit. For use with shielded cabinets.	CK-DMR11-ED
For use with shielded cabinets.	CK-DMR11-EL
For use with unshielded cabinets. Adapter bracket included.	CK-DMR11-E1
EIA-423-A/EIA-449 cabinet kit. For use with shielded cabinets.	CK-DMR11-FD
For use with shielded cabinets.	CK-DMR11-FL
For use with unshielded cabinets. Adapter bracket included.	CK-DMR11-F1

\*Supports switch-selectable speeds over the distances noted in the following table.

Frequency	Maximum Distance	Cable
1 Mb	6,000 ft (1,830 m)	BC55S
500 Kb	7,000 ft (2,135 m)	BC55S
250 Kb	8,000 ft (2,440 m)	BC55S
56 Kb	16,000 ft (4,800 m)	BC55T

### DMZ32



The DMZ32 is a 24-line asynchronous terminal interface for UNIBUS VAX computers running VMS or ULTRIX-32 operating system. It provides EIA-232-C compatibility and offers Direct Memory Access (DMA) output on all lines to optimize terminal to CPU I/O performance. The DMZ32 operates at speeds up to 19.2 Kb/s and features a distribution panel that can be located locally or remotely.

The DMZ32 distribution panel can be located locally or remotely up to 5,000 feet from the VAX computer system. Terminals can be located where needed, up to 5,000 feet from the VAX computer, without affecting the EIA-232-C specified speed/distance limitations.

In the local configuration, the DMZ32 can be mounted in the H9642-FC/FD and H9652-MF/MH UNIBUS expander cabinets or any existing 19-inch cabinet. The H9642-FC/FD can support one DMZ32 panel. The H9652-MF/MH can support one DMZ32 panel with two BA11-K boxes installed, and two panels with one BA11-K box installed.

## UNIBUS Communications Controllers

In remote configurations, the distribution panel can be mounted in any standard 19-inch cabinet or the H9646 communications cabinet. This reduces the requirements for costly UNIBUS expander cabinets because the DMZ32 distribution panel has a self-contained power supply and fan assembly. (The distribution panel plugs into a standard 120 Vac electrical outlet.)

A single high-performance twisted-pair T1 cable connects the DMZ32 interface module to the remote distribution panel. The remote distribution panel then connects separate EIA-232 data cables to the individual VT100/200/300 or compatible terminals.

### ***Cabinet Kits***

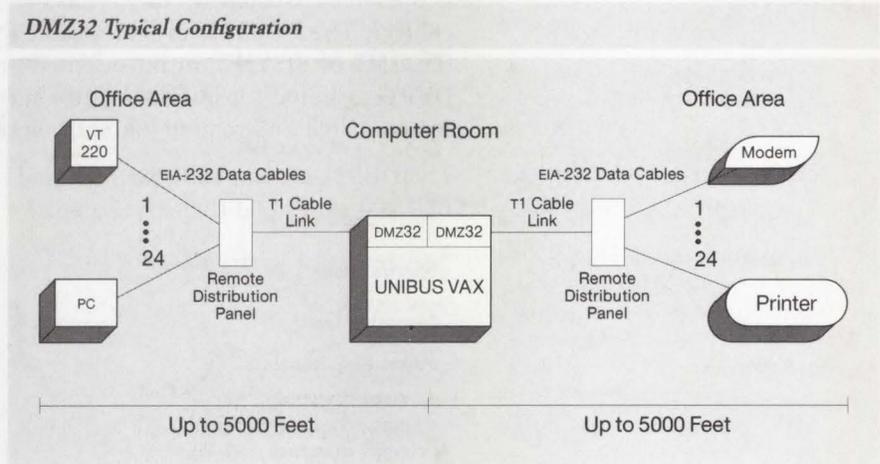
The DMZ32 can be purchased with or without modem control by selecting the appropriate cabinet kit. The cabinet kit includes 15 feet of T1 cable with optional 1,000-foot lengths available. ▲ Refer to the DMZ32 order code table for information.

### ***Features***

- 24 asynchronous communication lines from a hex-size board.
- Line speeds up to 19.2 Kb/s (application-dependent).
- Automatic XON/XOFF flow control allows the management of data flow in either direction on a per-line basis without program interruption.
- Full modem control with full- and half-duplex communications available on all lines with the CK-DMZ32-AY cabinet kit.
- Split-receive/transmit speeds on a per-line basis optimizes CPU performance by reducing software demand on input.
- Software-programmable line parameters such as speed and character length.
- Remote distribution panel lets you locate terminals up to 5,000 feet from the computer system.
- Comprehensive self-test through ROM-based diagnostics provides complete checkout of the DMZ32 circuits on each power-on or reset.

## UNIBUS Communications Controllers

The following diagram illustrates a DMZ32 configuration where terminals, personal computers, modems, and serial printers are connected to a local UNIBUS VAX computer system:



### Specifications

**Mounting Code** One hex slot

#### Power Requirements

##### Module

dc amps drawn at 5 Vdc 9.0 A  
dc amps drawn at 15 Vdc 0.1 A

##### Distribution Panel

ac amps drawn at 120 Vac 1.1 A  
ac amps drawn at 220-240 Vac 0.6 A

**Bus Loads** ac 6.0, dc 1.5

#### I/O Distribution Panel Insert

Eight panel units (when mounted in the cabinet mentioned above)  
One additional panel unit for bulkhead cable connector  
One panel unit (if remote, for bulkhead cable connector)

**Environmental Class** B (▲ Refer to Appendix B for details.)

### DMZ32 Order Codes

Option	Order Code
24-line DMA terminal interface	DMZ32-M
Cabinet kits include 15 feet of cable and the remote distribution panel containing 24 DB25-pin connectors.	
Cabinet Kit with modem control	CK-DMZ32-AY
Cabinet Kit without modem control	CK-DMZ32-DY
Modem control upgrade for CK-DMZ32-DY cabinet kit	DMZ32-N
1,000-ft PVC T1 cable	BC18L-LO
1,000-ft plenum-rated T1 cable	BC18M-LO

## UNIBUS Communications Controllers

### DUP11

The DUP11 is a single-line, synchronous programmable communications controller that provides remote connection between PDP-11 or VAX UNIBUS systems and other systems with EIA-232-C/CCITT V.28 interface. It operates at speeds up to 9.6 Kb/s at half- or full-duplex with full modem control. The DUP11 is programmable for either byte-oriented protocols (DDCMP or BISYNC) or bit-oriented protocols (SDLC or HDLC). The DUP11 is suited for interfacing to a medium-speed synchronous line for remote batch and remote job entry applications.

The DUP11 is compatible with Digital's family of modems and with the Bell 200 series and their equivalents.

#### Specifications

<b>Mounting Code</b>	One hex slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	3.6 A
dc amps drawn at 15 Vdc	0.08 A
dc amps drawn at -15 Vdc	0.08 A
<b>Bus Loads</b>	ac 1, dc 1
<b>I/O Connection Panel Insert</b>	One panel unit
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

#### DUP11 Order Codes

Option	Order Code
Includes base module only.	DUP11-M
For system installation, select one of the following cabinet kits:	
For use with (PDP-11/24) shielded cabinets.	CK-DUP11-AD
For use with (PDP-11/84) shielded cabinets.	CK-DUP11-AF
For use with unshielded cabinet models. Adapter bracket included.	CK-DUP11-A1

### KCT32

The KCT32 is a programmable communications interface based on the Digital DCT11 chip. Its two lines provide low-cost asynchronous or synchronous communication between VAX systems and other devices with EIA-232-C/CCITT V.28, EIA-422/CCITT V.11, or EIA-423-A/CCITT V.10 and V.35 interfaces for networking or custom communications applications. The KCT32 operates at speeds up to 64 Kb/s for two lines, and 160 Kb/s for one line in bit synchronous mode. The KCT32 supports Direct Memory Access with full modem control on each line. It has 56 Kbytes of user-programmable memory for implementation of custom communications functions.

#### Specifications

<b>Mounting Code</b>	One hex slot
<b>Power Requirements</b>	
dc amps drawn at +5 Vdc	6.0 A
<b>Bus Loads</b>	ac 4.5, dc 1
<b>I/O Connection Panel Insert</b>	One panel unit
<b>Environmental Class</b>	B (▲ Refer to Appendix B for details.)

**KCT32 Order Codes**

Option	Order Code
Two lines provide asynchronous or synchronous communications between VAX systems and other devices with CCITT V.35. Includes CCITT V.35 interface quad board, CCITT V.35 interface panel and test connector.	KCT32-AB
EIA-422/CCITT V.11 with basic system unit, EIA-422/CCITT V.11 interface panel, and test connector.	KCT32-AE
EIA-232-C/CCITT V.28 version with basic system unit, EIA-232-C/CCITT V.28 interface panel, and connector modem test.	KCT32-FA
EIA-423-A/EIA-449 version with basic system unit, EIA-423-A/EIA-449 interface panel, and EIA-423-A/EIA-449 test connector.	KCT32-FF

**Optional Software**

Refer to following Software Product Description (SPD) and Unique Product Identifier (UPI) for information regarding optional software.

VAX KCT32 software tools:

- SPD 26.04
- UPI 128

**KMS11**

The KMS11 is an eight-line synchronous intelligent front end that provides up to eight lines of connection between UNIBUS PDP-11 or VAX systems and other devices with EIA-232-C/CCITT V.28 or CCITT V.35 (with optional hardware module) interfaces. The KMS11 operates at speeds up to 56.0 Kb/s in half- and full-duplex with full modem control. (V.35 is required for 56.0 Kb/s.) The KMS11 supports Direct Memory Access data transfers, X.25 Link Level, and HDLC/BSC Framing Software.

Maximum line speed depends on the software application. The X.25 Link Level Software is currently warranted for four lines at 56.0 Kb/s (using V.35) or eight lines at 19.2 Kb/s.

VAX P.S.I. or RSX P.S.I. is limited to 19.2 Kb/s with some restrictions on the number of lines used. ▲ Refer to the VAX P.S.I. Software Product Description 25.40 for further restrictions concerning multiple network support and DTE/DCE modes.

**Specifications**

<b>Mounting Code</b>	Two SU (KMS11-BD), one hex slots (KMS11-BE)
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	12.5 A
dc amps drawn at 15 Vdc	1.5 A
dc amps drawn at -15 Vdc	0.5 A
<b>Bus Loads</b>	ac 7, dc 2
<b>I/O Connection Panel Inserts</b>	Eight panel units
<b>Environmental Class</b>	B (▲ Refer to Appendix B for details.)

## UNIBUS Communications Controllers

### *KMS11 Hardware Order Codes*

Option	Order Code
Eight-line communications multiplexer including a KMC11-B auxiliary processor unit, line terminator, modem control unit, I/O connection panel, double system unit, and internal cables.	KMS11-BD
Same as KMS11-BD without the double system unit.	KMS11-BE

▲ Refer to the appropriate Software Product Description (SPD) and Unique Product Identifier for a list of supported processors.

- VAX KMS11-BD/BE X.25 Link Level
  - SPD 25.80
  - UPI 757
- VAX KMS11-BD/BE HDLC/BSC Framing
  - SPD 26.55
  - UPI 920
- VAX P.S.I. Access (SSA-B)
  - SPD 25.40
  - UPI 071
- KMS11 RSX X.25 LAPB Link Level
  - SPD 13.42
  - UPI 770
- RSX-11 P.S.I./M
  - SPD 10.42
  - UPI D91
- RSX-11 P.S.I./M-PLUS
  - SPD 10.43
  - UPI D92

### **KMS1P**



The KMS1P is a one-line intelligent synchronous communications controller that provides connection between PDP-11 or VAX UNIBUS systems and EIA-232-C/CCITT V.28, EIA-423-A/CCITT V.10, CCITT V.35, or EIA-422-A/CCITT V.11 interfaces. The microprocessor-based device operates at speeds up to 19.2 Kb/s (V.28 option) or 64 Kb/s (V.35 option) in half- or full-duplex and full modem control. The KMS1P supports Direct Memory Access data transfers, the VAX P.S.I. and RSX P.S.I. software packages, and RSX X.25 Link Level software.

### *Specifications*

<b>Mounting Code</b>	Two hex slots
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	10.5 A
dc amps drawn at 15 Vdc	0.15 A
dc amps drawn at -15 Vdc	0.20 A
<b>Bus Loads</b>	ac 5, dc 1
<b>I/O Connection Panel Insert</b>	One panel unit
<b>Environmental Class</b>	B (▲ Refer to Appendix B for details.)

## UNIBUS Communications Controllers

### *KMS1P Order Codes*

<b>Option</b>	<b>Order Codes</b>
Single-line programmable synchronous intelligent communications controller. Includes microprocessor and line unit modules.	KMS1P-M
For system installation, select one of the following cabinet kits:	
Cabinet kit for X.25, EIA-232-C/CCITT V.28 interface	CK-KMS1P-AD
Cabinet kit for X.25, CCITT V.35 interface	CK-KMS1P-BD
Cabinet kit for X.25, EIA-422/CCITT V.11 interface	CK-KMS1P-ED
Cabinet kit for X.25, EIA-423-A/CCITT V.10 interface	CK-KMS1P-FD

▲ Refer to following Software Product Descriptions (SPD) and Unique Product Identifiers (UPI) for information regarding optional software:

- VAX KMS11-BD/BE X.25 Link Level
  - SPD 25.80
  - UPI 757
- VAX P.S.I. Access (SSA-B)
  - SPD 25.40
  - UPI 071
- KMS11 RSX X.25 LAPB Link Level
  - SPD 13.42
  - UPI 770
- RSX-11 P.S.I./M
  - SPD 10.42
  - UPI D91
- RSX-11 P.S.I./M-PLUS
  - SPD 10.43
  - UPI D92

**KXT11-AB**

The KXT11-AB is PDP-11 (T11) 16-bit, single-board computer suitable for communications applications running in ROM or RAM. The processor can support up to 32 Kbytes of RAM, 32 Kbytes of ROM, two asynchronous serial line units, 24 parallel lines, a realtime clock, and Q-bus expansion.

The KXT11-AB is supported by RT-11, V5.1 or later, MicroPower/Pascal, and MACRO-11.

<i>Specifications</i>	
<b>Mounting Code</b>	One double slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	2.8 A maximum
dc amps drawn at 12 Vdc	1.1 mA maximum
<b>Bus Loads</b>	ac 2.7 unit loads; dc 0.5 unit load
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

**KXT11-AB Order Code**

<b>Option</b>	<b>Order Code</b>
SBC-11/21 single-board, 16-bit processor with 16 Kbytes static RAM.	KXT11-AB

**KXJ11-CA**

The KXJ11-CA is a PDP-11 (J11) 16-bit, single-board processor that can act as a realtime processor, coprocessor, or communications processor. As a communications processor, the KXJ11-CA can offload the main processor by handling low and intermediate levels of communications protocol.

Applications for the KXJ11-CA may be written in either MicroPower/Pascal (V2.3 or later) or MACRO-11. Peripheral Processor Tool Kits are used by the host to communicate with the application on the KXJ11-CA. The tool kits support use of the KXJ11-CA as a slave processor in PDP-11 Q-bus system that run RT-11, RSX-11M, or Micro/RSX, and in MicroVAX II systems that run MicroVMS.

▲ For more information on the Peripheral Processor Tool Kits, refer to the applicable Software Product Descriptions: SPD 12.70 for RT-11, SPD 13.25 for RSX, SPD 18.48 for Micro/RSX, and SPD 28.29 for MicroVMS.

**Features**

- PDP-11 (J-11) processor with Q-bus compatibility
- 512 Kbytes of RAM that can be programmed as shared memory on the Q-bus
- Expansion of basic ROM up to 64 Kbytes
- Two channels for Direct Memory Access
- Two fully programmable synchronous/asynchronous lines
- One asynchronous serial console port
- Three 16-bit programmable timers
- 20-bit programmable parallel port (four control lines and 16 data lines)

<i>Specifications</i>	
<b>Mounting Code</b>	One quad slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	6.0 A maximum
dc amps drawn at 12 Vdc	2.0 A maximum
<b>Bus Loads</b>	ac 3.0 unit loads; dc 0.5 unit load
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

<i>KXJ11-CA Order Codes</i>	
<b>Option</b>	<b>Order Codes</b>
Single-board PDP-11 (J-11) 16-bit processor.	KXJ11-CA
KXJ11-CA User's Guide.	EK-KXJCA-UG

**KXT11-CA**

The KXT11-CA is a PDP-11 (J-11) 16-bit, single-board processor that can operate as a standalone processor or a peripheral processor.

Applications for the KXT11-CA can be written in either MicroPower/Pascal or MACRO-11. Peripheral Processor Tool Kits are used by the host to communicate with the application on the KXT11-CA. The tool kits support use of the KXT11-CA as a slave processor in PDP-11 Q-bus systems that run RT-11, RSX-11M, or Micro/RSX, and in MicroVAX II systems that run MicroVMS.

▲ For more information on the Peripheral Processor Tool Kits, refer to the applicable Software Product Descriptions: SPD 12.70 for RT-11, SPD 13.25 for RSX, SPD 18.48 for Micro/RSX, and SPD 28.29 for MicroVMS.

**Features**

- PDP-11 (T-11) processor with Q-bus compatibility
- 32 Kbytes RAM with battery-backup support
- Expansion of basic ROM up to 32 Kbytes
- Two channels for Direct Memory Access
- Two fully programmable synchronous/asynchronous lines
- One asynchronous console port
- Three 16-bit programmable timers
- 20-bit programmable parallel port (four control lines and 16 data lines)

## Communications Processors

### *Specifications*

<b>Mounting Code</b>	One quad slot
<b>Power Requirements</b>	
dc amps drawn at 5 Vdc	4.0 A maximum
dc amps drawn at 12 Vdc	0.4 A maximum
Battery backup at 5 Vdc	20 mA maximum
<b>Bus Loads</b>	ac 2.0 unit loads; dc 1.0 unit load
<b>Environmental Class</b>	C (▲ Refer to Appendix B for details.)

### *KXT11-CA Order Code*

<b>Option</b>	<b>Order Code</b>
Single-board PDP-11 (T11) 16-bit processor.	KXT11-CA

**Stratacom IPX**

Digital offers the IPX Product Family through a third-party marketing agreement with StrataCom.

The IPX is a high-performance transmission resource management system (TRMS) that supports the corporate private network environment. It is used to build digital networks, integrating data, voice, image, and video applications for a variety of industries. The product of an ongoing relationship between Digital and StrataCom that includes joint development and marketing activities, the IPX provides a complementary capability to the DECrouter family of products.

The IPX product family switches and transmits information using FastPacket technology, the communications technology for Broadband ISDN. FastPacket switching instantaneously allocates bandwidth on demand.

All members of the IPX product family use identical hardware and software modules; they differ only in the number of digital trunk interfaces supported.

**Features**

- High reliability—100 percent automatic equipment redundancy (no network outages caused by equipment failures).
- Low network cost—Adaptive voice compression provides high-speed modems and fax machines with 4:1 voice compression.
- FastPacket technology—Instantaneous bandwidth allocation accommodates LANs and frame relay terminals.

**Specifications**

<b>Processors</b>	One or two processor cards; Two EIA-232-A network management ports
<b>Voice Ports</b>	A maximum of 960 voice connections; Integral voice activity detection; Optional ADPCM compression
<b>Data Ports</b>	EIA-232-C/D, V.35 and EIA-422/449 interfaces; A maximum of 500 data connections; Synchronous data up to 1.344 Mb/s; Isochronous clocking up to 128 Kb/s; Optional data frame multiplexing up to 64 Kb/s
<b>Digital Trunk Interfaces</b>	A maximum of 96 T1 superframe interfaces; Internal clock source at 1.544 MHz $\pm$ 50 ppm
<b>Power Supplies</b>	A maximum of four power supplies
<b>Environmental</b>	0–50 °C; Up to 95% relative humidity; Non-condensing; FCC Part 68 and Part 15 for Class B computing devices
<b>Dimensions</b>	Consult sales representative for dimensions of the available models.

**Ordering Information**

For more information regarding the IPX family of products from StrataCom, consult your local Digital sales representative.

This product set is available in the United States and Canada.

**Ordering Information**

▲ To order modems, refer to the Dialup-line Modem Charts and the Private/leased-line Modem Charts. Then turn to the specific product description for ordering information.

The DF100 series modems are available in desktop and rackmount options. The 200 series modems are available only in desktop models.

For more information, call the Computer Special Systems Support Team at 1-800-832-6277.

*Dialup-line Modem Charts*

Asynchronous Communications	Full Duplex				Half Duplex
<b>Data Rate</b>	2400 b/s (1200 b/s) (300 b/s)	2400 b/s (1200 b/s) (300 b/s)	2400 b/s (1200 b/s) (300 b/s)	1200 b/s (600 b/s) (300 b/s)	2400 b/s (1200 b/s)
<b>Functional Compatibility</b>	CCITT V.22/ V.22 bis BELL 212A/103J	CCITT V.22/ V.22 bis BELL 212A/103J	CCITT V.22/ V.22 bis BELL 212A/103J	CCITT V.22 BELL 212A/103J	DF126 (CCITT V.26)
<b>Digital Modem</b>	DF242*	DF224*	DF124	DF212*	DF126

Synchronous Communications	Full Duplex				Half Duplex
<b>Data Rate</b>	2400 b/s (1200 b/s)	1200 b/s (600 b/s)	2400 b/s (1200 b/s)	2400 b/s (1200 b/s)	2400 b/s (1200 b/s)
<b>Functional Compatibility</b>	CCITT V.22/ V.22 bis BELL 212A	CCITT V.22 BELL 212A	CCITT V.22/ V.22 bis BELL 212A	CCITT V.22/ V.22 bis BELL 212A	DF126 (CCITT V.26) BELL 201B/C
<b>Digital Modem</b>	DF242*	DF212*	DF124	DF224*	DF126

\*Desktop only

*Private/Leased-line Modem Chart*

Asynchronous Communications	Full Duplex	
<b>Data Rate</b>	2400 b/s (1200 b/s)	2400 b/s (1200 b/s)
<b>Functional Compatibility</b>	CCITT V.22/ V.22 bis BELL 212A/103J	DF126 (CCITT V.26)
<b>Digital Modem</b>	DF124	DF126

Synchronous Communications	Full Duplex				Half Duplex
<b>Data Rate</b>	9600 b/s (7200 b/s) (4800 b/s)	4800 b/s (2400 b/s)	2400 b/s (1200 b/s)	2400 b/s (1200 b/s)	4800 b/s (2400 b/s)
<b>Functional Compatibility</b>	CCITT V.29	CCITT V.27	CCITT V.26 BELL 201B	CCITT V.22 bis BELL 212A	CCITT V.27
<b>Digital Modem</b>	DF129	DF127	DF126	DF124	DF127

## Modems

### DF100 Series

The DF100 series of modems provides remote connection between Digital systems and operate in either asynchronous or synchronous mode at half- or full-duplex at speeds ranging from 300 b/s to 9.6 Kb/s, depending on the version selected. They support standard EIA-232-C and EIA-423-A interfaces and are compatible with Bell 103/212A, 201 B/C, and CCITT V.22 bis/V.27/V.29 modems. DF100 series modems are FCC-approved for direct connection to telephone lines on all Public Switched Telephone Networks (PSTN) and Private/Lease Telephone Networks (P/LTN) in the U.S. and Canada.

The DF100 series of modems was designed to utilize three standard enclosures: one for standalone desktop modem applications (DF100-DT), one for multiple modem (rackmount) applications (DF100-RM), and one for the DFM series of statistical multiplexers.

The DF124 is a 1.2- or 2.4-Kb/s, full-duplex asynchronous and synchronous modem for dialup and leased line telephone networks. It has an integral autodialer and is designed to support desktop, multiple (rack) modem, and DFM statistical multiplexer configurations.

The DF124 modems have all the features of the Scholar Plus modems (▲ refer to “Scholar Plus Modems”), including access and dial-in security, industry-standard Hayes “AT” command language, and MNP and X.PC error correction. When used in a leased line application, the DF124 detects faltering line conditions and drops back to a preset dialup line. The DF124 is compatible in operation to CCITT V.22 bis, CCITT V.22, Bell 212A, and Bell 103 modems.

The **DF126** is a 2.4-Kb/s synchronous/asynchronous half-duplex dialup line and full-duplex leased line modem. It can also be used in leased line multipoint communication environments. It includes an asynchronous integral autodialer that can also be used for synchronous communications when a BC22Y-01 adapter cable and customer-written software are used. The modem is designed for use in desktop, multiple modem (rack), and DFM statistical multiplexer configurations. The DF126 is compatible in operation to Bell 201 B/C CCITT V.26 modems.

The **DF127** is a 4.8-Kb/s synchronous, half-duplex, full-duplex, leased line modem that is CCITT V.27-compatible. It is designed for use in desktop, multiple modem (rack), and DFM statistical multiplexer configurations.

The **DF129** is a 9.6-Kb/s synchronous, full-duplex, leased line modem that is CCITT V.29-compatible. It is capable of fallback speeds of 7200 and 4800 b/s. The DF129 is designed for use in desktop, multiple modem (rack), and DFM statistical multiplexer configurations.

### Specifications

Physical Characteristics for DF124-CA, DF126-AA, DF127-AA, DF129-AA:

- Height: 74 mm (2.91 in)
- Width: 217 mm (8.56 in)
- Depth: 292 mm (11.5 in)
- Weight: 2.62 kg (5 lb, 13 oz)

Physical Characteristics for DF124-CM, DF126-AM, DF127-AM, DF129-AM:

- Height: 25.4 mm (1 in)
- Width: 203 mm (8 in)
- Depth: 264 mm (10.4 in)
- Weight: 0.55 kg (1 lb, 4 oz)

## Modems

### Power Requirements

Product	dc amps drawn		
	5 V	12 V	-12 V
DF124-CM	0.70	0.20	0.15
DF126-AM	0.40	0.15	0.10
DF127-AM	1.00	0.18	0.18
DF129-AM	1.00	0.18	0.18
<b>Environmental Class</b>	B (▲ Refer to Appendix B for details.)		

### DF100 Series Order Codes

Option	Order Code
DF124 desktop modem for U.S./Canada	DF124-CA
DF124 modem module for U.S./Canada	DF124-CM
DF126 desktop modem for U.S./Canada	DF126-AA
DF126 modem module for U.S./Canada	DF126-AM
DF127 desktop modem for U.S./Canada	DF127-AA
DF127 modem module for U.S./Canada	DF127-AM
DF129 desktop modem for U.S./Canada	DF129-AA
DF129 modem module for U.S./Canada	DF129-AM

## DF200 Scholar Series

The DF224 Scholar is a low-profile desktop modem with external wall-mount power supply. It operates at 2400, 1200, and 300 b/s full-duplex over dialup (PSTN) lines. The DF224 asynchronous integral autodialer stores up to 15 telephone numbers, which may also be identified by an ID name of six characters or less. Phone number linking capabilities are also provided. The DF224 is designed for supporting Digital and non-Digital, asynchronous or synchronous terminals, personal computers and workstation applications in the U.S. and Canada. The DF224-AA is compatible in operation to CCITT V.22 bis, CCITT V.22, and Bell 103/212A modems.

### Scholar Plus

The DF242 and DF212 are enhanced versions of the desktop DF224 Scholar modem. As full-duplex, dialup (PSTN), desktop modems, these Scholar Plus modems offer the industry-standard Microcom Networking Protocol (MNP) error correction and X.PC error correction (used when accessing the TYMNET value-added network). Compatibility with the industry-standard Hayes "AT" command language acclimates the experienced modem user in minimal time. In addition, the Scholar Plus modems offer the simplified Digital Modem Command Language (DMCL) with VMS-like commands to set parameters.

DMCL features a unique security system to prevent unauthorized access to proprietary databases. One of four levels of security can be set:

- Passthrough via password
- Callback to predefined phone number with password
- Callback to predefined number with password and phone number validation
- Callback to predefined or user-defined phone number with password for those who call in from different sites, local or long distance

## Modems

For complete security, an audit trail records dial attempts. Parameter settings are also secured by password to avoid unattended modem modifications.

The autodialer includes mixed dialing of up to 30 linked phone numbers, local or long distance. In the event of a busy or no-answer signal, the next linked number is dialed. The embedded speaker allows audible monitoring of call progress.

Cables may be ordered separately from the *DECdirect* catalog.

Call the Computer Special Systems Sales Support Team at 800-832-6277 for more information.

### Specifications

#### Physical Size for DF224-AA, DF242-CA, DF212-CA

Height	30.3 mm (1.19 in)
Width	152.4 mm (6.00 in)
Depth	219.0 mm (8.62 in)
Weight	0.539 kg (1.19 lbs) including power supply

#### Power Requirements

dc amps drawn at 5 Vdc	0.80 A
dc amps drawn at 12 Vdc	0.10 A
dc amps drawn at -12 Vdc	0.10 A

<b>Environmental Class</b>	B (▲ Refer to Appendix B for details.)
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### DF200 Series Order Codes

Option	Order Code
2400/1200/300 FDX desktop modem Scholar for U.S./Canada	DF224-AA
2400/1200/300 FDX desktop modem Scholar Plus for U.S./Canada	DF242-CA
1200/600/300 FDX desktop modem Scholar Plus for U.S./Canada	DF212-CA

### Multiple Modem (Rackmount) Enclosure



The multiple modem (rackmount) enclosure provides online computer services to distributed remote terminal users. The enclosure can house up to 12 combination DF100 modem modules. Modules can be added or changed from the front of the enclosure without disconnecting ac power or disrupting other online users. The enclosure connects to either dialup or leased telephone lines. For dialup communications, RJ21X telephone service is required, and for leased line communications, either two- or four-wire telephone service is required. All enclosures have a self-contained power supply that provides power to all modem modules within the enclosure. The enclosure is available with a 6-amp integral power supply.

### Multiple Modem Enclosure Order Code

Option	Order Code
6-amp multiple modem enclosure for U.S./Canada	DF100-RM

### DFM Series



The DFM Series of Intelligent Communication Processors (ICP) are free-standing units that utilize statistical time-division multiplexing techniques for concentrating four to 16 EIA-232-C data channels over a single high-speed communication link. These data channels interface to terminals, personal computers, printers, modems, and computer ports.

The DFM Series has been designed with multimicroprocessor architecture utilizing internal DMA data transfer for high efficiency. The DFM uses a total modular design concept. This allows users to easily expand and upgrade the units from four to 16 channels with and without integral 4.8- and 9.6-Kb/s modems.

Channel switching and contention features provide the flexibility required in the rapidly changing data communication environments. Any switched channel end can be connected to any other authorized switched channel in the network. The contention feature allows a DFM at one end of the network to be connected to a DFM with fewer channels at the host end of the network. Users at one end may contend for connections on a first-come/first-served basis.

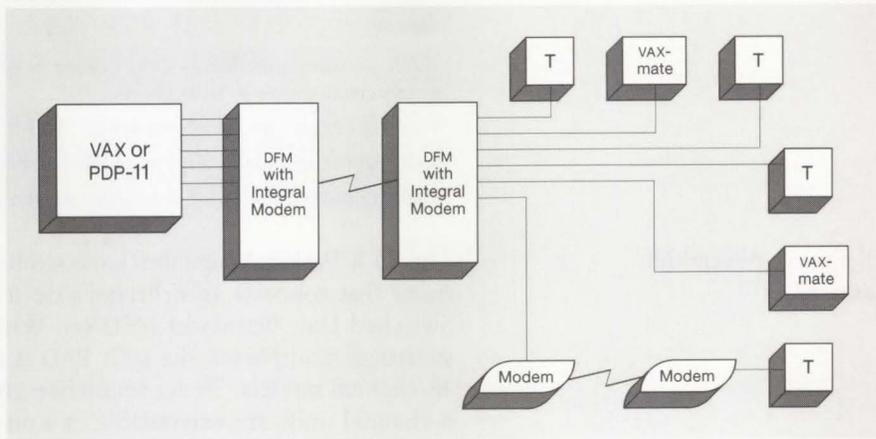
DFM-concentrated link configurations include telephone lines or satellite links. Digital's DDCMP protocol is supported on synchronous channels. The DFM handles synchronous data traffic on up to one-half of its channels. Each of these channels can be configured to support various data speeds and block sizes. Call the CSS Sales Support Team at 800-832-6277 for further information. Cables may be purchased separately from the *DECdirect* catalog.

#### **Features**

- Asynchronous and synchronous data channels
- Network control and management
- Channel switching
- Port contention with queuing
- Modem control, all channels
- Network diagnostics
- Optional 4.8/9.6-Kb/s integral modems
- Automatic speed detection
- Speed conversion
- Flow control conversion
- Local and remote echo
- Easy expansion from four lines to 16 lines

## Statistical Multiplexers

**DFM Statistical Multiplexer Configuration**



NBG-187-00

### Specifications

#### Physical Size:

- Height: 32 cm (12.5 in)
- Width: 32 cm (12.5 in)
- Length: 23 cm (9.0 in)

#### Power Requirements:

- 120 V, 60 Hz: 92 W
- 240 V, 50 Hz: 92 W

Environmental Class: B (▲ Refer to Appendix B for details.)

### DFM Series Order Codes

Option	Order Code
4-channel DFM with no modem	DFM04-AA
4-channel DFM with 4.8 Kb/s integral modem	DFM04-AB
4-channel DFM with 9.6 Kb/s integral modem	DFM04-AC
8-channel DFM with no modem	DFM08-AA
8-channel DFM with 4.8-Kb/s integral modem	DFM08-AB
8-channel DFM with 9.6 Kb/s integral modem	DFM08-AC
12-channel DFM with no modem	DFM12-AA
12-channel DFM with 4.8 Kb/s integral modem	DFM12-AB
12-channel DFM with 9.6 Kb/s integral modem	DFM12-AC
16-channel DFM with no modem	DFM16-AA
16-channel DFM with 4.8 Kb/s integral modem	DFM16-AB
16-channel DFM with 9.6 Kb/s integral modem	DFM16-AC
4-channel expansion line card for DFM08 option	DFMXX-4E
8-channel expansion line card for DFM08 option	DFMXX-8E
2.4 Kb/s integral modem for all DFM models	DF126-AM
4.8 Kb/s integral modem for all DFM models	DF127-AM
9.6 Kb/s integral modem for all DFM models	DF129-AM

Cables for the DFM must be ordered separately. When ordering cables, supply the length of the cable. ▲ Refer to "Communications Cables" in this section for available cable lengths.

## Statistical Multiplexers

### *DFM Cable Order Codes*

Option	Order Code
Cable to connect modem to DFM link, or to connect synchronous device to DFM channel	BC22F-xx
Cable to connect asynchronous device to DFM channel	BC22E-xx
Cable to connect dialup modem to DFM channel	BC22M-xx
Cable to connect two DFMs together for pre-installation test	BC22L-xx

### **DFX Packet Assembler/ Disassembler**

The DFX Packet Assembler/Disassembler (PAD) is a freestanding concentrator that connects asynchronous devices to X.25 Public and Private Packet Switched Data Networks (PSDNs). With the same enclosure as the DFM statistical multiplexer, the DFX PAD is available in basic units of 4-, 8- and 16-channel models. To accommodate growing networks, the basic 4- and 8-channel units are expandable to a maximum of 16 channels. When the number of terminals or computer ports to be networked increases, the DFX PAD channel expansion cards (DFMXX-xE) are available for field-upgrade expansion in increments of four and eight channels.

The DFX PAD concentrates the asynchronous data from 4, 8, 12, or 16 terminals or host computer ports onto a single high-speed synchronous X.25 leased access line. The DFX PAD is compatible with the 1980 X.25 industry standards recommended by the international standards committee (CCITT). Video terminals and personal computers connected to the local DFX PAD can use it as a data switch to access and share local computer ports, printers, or modems. This combines comprehensive local communication with access to remote hosts, such as Digital systems running Packetnet products, via the PSDN. (▲ Refer to Section 4 for more information on Packetnet products.)

The DFX PAD supports a single synchronous access line to the PSDN at speeds ranging from 2.4 Kb/s to 64 Kb/s. Most public applications will provide, as part of the basic service, the pair of leased line modems and the leased telephone line to access the X.25 network. However, in private applications, or where permitted by a public PSDN, Digital's two optional integral modems may be used to access the X.25 network: The DF127-AM operates at 4.8 Kb/s and the DF129-AM operates at 9.6 Kb/s.

The DFX PAD may also be used, given suitable modems or modem eliminators, to connect directly to VAX P.S.I. over a local or long-distance leased or private synchronous line. In such a configuration, VAX P.S.I. is configured as a DCE to the ISO 8208 specification, and the DFX PAD acts as the DTE. (▲ For more information on VAX P.S.I., refer to Section 4.)

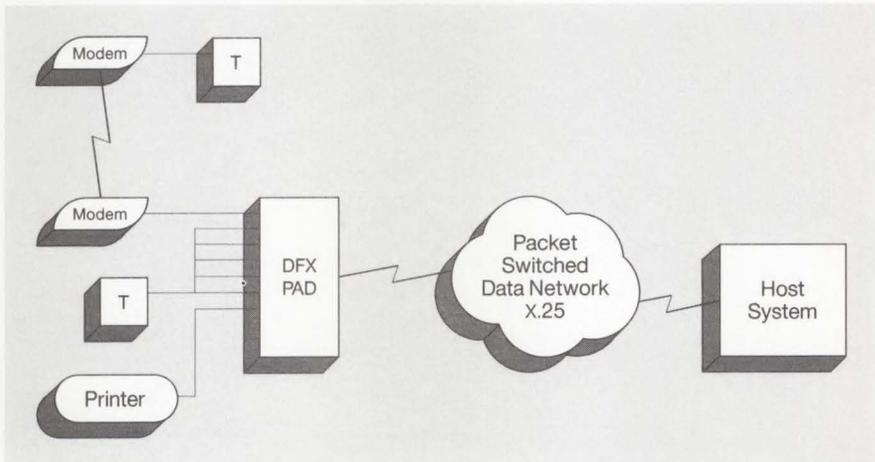
The DFX PAD is certified for connection to TYMNET and TELENET networks in the United States and the DATAPAC networks in Canada.

## Statistical Multiplexers

### Features

- Fully compatible with the 1980 CCITT recommendation X.3, X.28, X.29 and X.25.
- Certified for use on TYMNET and TELENET in the U.S. and Canada's (1980) DATAPAC X.25 Public Networks.
- Enhanced terminal interface parameters in addition to standard X.3 settings provide customized support for a wide variety of applications.
- Local port switching and contention combines local resource sharing with access to remote hosts on the X.25 networks.
- Easy field-upgrade channel expansion up to 16 channels with 4- and 8-channel expansion modules.
- Easy-to-use calling features such as AUTOCALL and ABBREVIATED-CALL allow users to save time and eliminate the occurrence of wrong numbers when connecting to the remote X.25 destination.
- Composite link supports speeds of up to 64 Kb/s.
- Dedicated supervisory channel and user-friendly self-prompting software commands allow independent configuring of system, channel, and link parameters in nonvolatile memory.

### DFX PAD Terminal-to-host Application



NBG-188-00

### Specifications

#### Physical Characteristics:

- Height: 32 cm (12.5 in)
- Width: 32 cm (12.5 in)
- Length: 23 cm (9.0 in)

#### Power Requirements:

- 120 V, 60 Hz: 92 W
- 240 V, 50 Hz: 92 W

Environmental Class: B (▲ Refer to Appendix B for details.)

## Statistical Multiplexers

### *DFX PAD Order Codes*

<b>Option</b>	<b>Order Code</b>
4-channel X.25 PAD	DFX04-AA
8-channel X.25 PAD	DFX08-AA
16-channel X.25 PAD	DFX16-AA
Optional X.25 control module to upgrade existing DFM Statistical Multiplexer to an X.25 PAD	DFX25-CM
<b>Channel Expansion Modules:</b>	
4-channel expansion module for DFX04 and DFX08	DFMXX-4E
8-channel expansion module for DFX04 and DFX08	DFMXX-8E
<b>Integral Modems:</b>	
4800 b/s synchronous modem	DF127-AM
9600 b/s synchronous modem	DF129-AM

The following table lists the order codes and available lengths for cables required by the networking and communications products described in this catalog. For information about custom cables and longer-length cables, contact Digital's Accessories & Supplies Group.

<i>Communications Cable Order Codes</i>			
Order Code	Description	Where Used	Length
BC16C-10 BC16C-25	36-position, straight-to-right angle, male-to-male, shielded, 18 twisted-pair assembly	DECconnect, EIA-423-A Q-bus products	3.05 m (10 ft) 7.62 m (25 ft)
BC16D-10 BC16D-25 BC16D-50 BC16D-A5	36-position, right-angle, male-to-male, shielded, 18 twisted-pair extension cable	DECconnect, EIA-423-A Q-bus products	3.05 m (10 ft) 7.62 m (25 ft) 15.24 m (50 ft) 45.7 m (150 ft)
BC16E-02 BC16E-10 BC16E-25 BC16E-50	Terminated six-conductor cable for terminal connection (Digital office cable)	DECconnect standard terminal connection cable	0.6 m (2 ft) 3.1 m (10 ft) 7.6 m (25 ft) 15.2 m (50 ft)
BC16K-10	ThinWire patch cord	Patches ThinWire patch panel to DEMPR	3.05 m (10 ft)
BC16M-06 BC16M-15 BC16M-30	ThinWire 802.3/Ethernet PVC cable with connectors and boots	ThinWire 802.3/Ethernet Products	1.8 m (6 ft) 4.6 m (15 ft) 9.2 m (30 ft)
BC17C-10 BC17C-25 BC17C-35 BC17C-50 BC17C-75 BC17C-A0 BC17C-B0 BC17C-B5	Full EIA-232-C/CCITT V.28 modem cable, round, 25-wire, fully shielded, male-to-female molded connectors	802.3/Ethernet Communications Servers (DCSAX-LA line cards)	3.1 m (10 ft) 7.6 m (25 ft) 10.7 m (35 ft) 15.2 m (50 ft) 22.9 m (75 ft) 30.5 m (100 ft) 61.0 m (200 ft) 76.2 m (250 ft)
BC17D-02 BC17D-10 BC17D-25 BC17D-50 BC17D-A0	EIA-232-C/CCITT V.28, fully shielded, null modem, 10-wire, female-to-female molded connectors	802.3/Ethernet Communications Servers (DCSAX-LB line cards)	0.6 m (2 ft) 3.1 m (10 ft) 7.6 m (25 ft) 15.2 m (50 ft) 30.5 m (100 ft)
BC17E-25 BC17E-50 BC17E-A0 BC17E-A5 BC17E-B0 BC17E-B5	CCITT V.35, fully shielded, modem cable (Note: This cable has a EIA-449 connector on the CPU end, and a V.35 connector on the modem end.)	802.3/Ethernet Communications Servers (DCSAX-LB line cards), DMR	7.6 m (25 ft) 15.2 m (50 ft) 30.5 m (100 ft) 45.7 m (150 ft) 61.0 m (200 ft) 76.2 m (250 ft)
BC17L-04	EIA-232-C/CCITT V.28, 25-wire, fully shielded, male-to-female connectors adapter cable	802.3/Ethernet Communications Servers (DCSAX-LA or DCSAX-LC line cards)	1.22 m (4 ft)
BC22D-10 BC22D-25 BC22D-35 BC22D-50 BC22D-75 BC22D-A0 BC22D-A5 BC22D-B0 BC22D-B5	Null modem cable, round, 6-wire, fully shielded, EIA-232-C/CCITT V.28, female-to-female molded connectors	Local connection of asynchronous terminals	3.1 m (10 ft) 7.6 m (25 ft) 10.7 m (35 ft) 15.2 m (50 ft) 22.9 m (75 ft) 30.5 m (100 ft) 45.7 m (150 ft) 61.0 m (200 ft) 76.2 m (250 ft)

## Communications Cables

### Communications Cable Order Codes (Continued)

Order Code	Description	Where Used	Length
BC22E-10 BC22E-25 BC22E-35 BC22E-50 BC22E-75 BC22E-A0 BC22E-A5 BC22E-B0 BC22E-B5	Modem cable, round, 16-wire, fully shielded, EIA-232-C/CCITT V.28, male-to-female molded connectors	Connection of asynchronous modems	3.1 m (10 ft) 7.6 m (25 ft) 10.7 m (35 ft) 15.2 m (50 ft) 22.9 m (75 ft) 30.5 m (100 ft) 45.7 m (150 ft) 61.0 m (200 ft) 76.2 m (250 ft)
BC22F-10 BC22F-25 BC22F-35 BC22F-50 BC22F-75 BC22F-A0 BC22F-A5 BC22F-B0 BC22F-B5	Full, EIA-232-C/CCITT V.28 modem cable, round, 25-wire, fully shielded, male-to-female molded connectors	Connections of synchronous modems	3.1 m (10 ft) 7.6 m (25 ft) 10.7 m (35 ft) 15.2 m (50 ft) 22.9 m (75 ft) 30.5 m (100 ft) 45.7 m (150 ft) 61.0 m (200 ft) 76.2 m (250 ft)
BC22U-10 BC22U-25 BC22U-50	Full, EIA-232-C/CCITT V.28 modem cable, D-subminiature connector, fully shielded, male-to-female molded connectors	KMV1A configuration in BA200 enclosure	3.1 m (10 ft) 7.6 m (25 ft) 15.2 m (50 ft)
BC22W-10 BC22W-25 BC22W-50	EIA-422/423 communications cable, 37-conductor, D-subminiature connector, fully shielded, molded connectors	KMV1A configuration in BA200 enclosure	3.1 m (10 ft) 7.6 m (25 ft) 15.2 m (50 ft)
BC55D-10 BC55D-25 BC55D-50	EIA-423-A/EIA-449 interface connectors	Connection of DMR, DMP, DMV options	3.1 m (10 ft) 7.6 m (25 ft) 15.2 m (50 ft)
BC55S-25 BC55S-50 BC55S-75 BC55S-A0 BC55S-B5 BC55S-E0 BC55S-L0 BC55S-YA	Integral modem, triaxial with BNC connectors	Connects fully shielded DMR, DMP, DMV options	7.6 m (25 ft) 15.2 m (50 ft) 22.9 m (75 ft) 30.5 m (100 ft) 76.2 m (250 ft) 152.4 m (500 ft) 304.9 m (1000 ft) 1,067 m (3500 ft)
BC55T-25 BC55T-50 BC55T-75 BC55T-A0 BC55T-B5 BC55T-E0 BC55T-L0 BC55T-YA	Integral modem, twinaxial cable with BNC connectors	Connects fully shielded DMR, DMP, DMV options	7.6 m (25 ft) 15.2 m (50 ft) 22.9 m (75 ft) 30.5 m (100 ft) 76.2 m (250 ft) 152.4 m (500 ft) 304.9 m (1000 ft) 1,067 m (3500 ft)
BC56A-02	Male-to-male BC55S-to-BC55M adapter cable	Connects fully shielded DMR, DMP, DMV options to old options using CPC plastic connectors	0.6 m (2 ft)
BC56B-02	Male-to-female BC55S-to-BC55M adapter cable	Connects fully shielded DMR, DMP, DMV options to old options using CPC plastic connectors	0.6 m (2 ft)

## Communications Cables

<i>Communications Cable Order Codes (Continued)</i>			
Order Code	Description	Where Used	Length
BC56D-02	Male-to-male BC55T-to-BC55N adapter cable	Connects fully shielded, DMR, DMP, DMV options to old options using CPC plastic connectors	0.6 m (2 ft)
BC56E-02	Male-to-female BC55T-to-BC55N adapter cable	Connects current, fully shielded DMR, DMP, DMV options to old options using CPC plastic connectors	0.6 m (2 ft)
BN25J-10 BN25J-20 BN25J-50 BN25J-A0 BN25J-B5 BN25J-E0	VCS FOSHA-AC/AD fiber optic cable	Connects DHF11 remote terminal concentrator to DHF11 controller	10 m (32.8 ft) 20 m (65.6 ft) 50 m (98.4 ft) 100 m (131.2 ft) 250 m (820 ft) 500 m (1,640)
BNE2A-MA BNE2A-MB BNE2A-MC BNE2A-ME	Plenum-rated coaxial cable	Standard 802.3/Ethernet cable (backbone)	23.4 m (76.8 ft) 70.2 m (230.3 ft) 117 m (383.9 ft) 500 m (1640.4 ft)
BNE2B-MA BNE2B-MB BNE2B-MC BNE2B-ME	PVC-insulated coaxial cable	Ethernet	23.4 m (76.8 ft) 70.2 m (230.3 ft) 117 m (383.9 ft) 500 m (1640.4 ft)
H8243-A	PVC-insulated ThinWire cable spool	ThinWire 802.3/Ethernet Products	300 m (1000 ft)
H8244-A	Plenum-rated ThinWire cable spool	ThinWire 802.3/Ethernet Products	300 m (1000 ft)
BNE3A-05 BNE3A-10 BNE3A-20 BNE3A-40	PVC-insulated transceiver cable with straight connector	Ethernet	5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft) 40 m (131.2 ft)
BNE3B-05 BNE3B-10 BNE3B-20 BNE3B-40	PVC-insulated transceiver cable with right-angle connector	Ethernet	5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft) 40 m (131.2 ft)
BNE3H-05 BNE3H-10 BNE3H-20 BNE3H-40	PVC-insulated transceiver cable with straight connector	IEEE 802.3	5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft) 40 m (131.2 ft)
BNE3K-05 BNE3K-10 BNE3K-20 BNE3K-40	PVC-insulated transceiver cable with right-angle connector	IEEE 802.3	5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft) 40 m (131.2 ft)
BNE3L-05 BNE3L-10 BNE3L-20 BNE3L-40	Plenum-rated transceiver cable with straight connector	IEEE 802.3	5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft) 40 m (131.2 ft)
BNE3M-05 BNE3M-10 BNE3M-20 BNE3M-40	Plenum-rated transceiver cable with right-angle connector	IEEE 802.3	5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft) 40 m (131.2 ft)
BNE4C-02 BNE4C-05	Office transceiver cable with PVC insulation, straight connector	IEEE 802.3	2 m (6.6 ft) 5 m (16.4 ft)
BNE4D-02 BNE4D-05	Office transceiver cable with PVC insulation, right-angle connector	IEEE 802.3	2 m (6.6 ft) 5 m (16.4 ft)

## Section 4

### **Interoperability: Communications Software**

This section contains the following topics...

**Ordering Information**

**DECnet Communications Software**

**Internet Communications Software**

**Digital/IBM Communications Software**

**Digital/UNIX Communications Software**

**Packetnet Communications Software**

**Opens Systems Interconnect (OSI) Products**

**File Transfer and Terminal Emulation Products**

## Interoperability: Communications Software

Interoperability is the ability to exchange information between systems from the same vendor or from a collection of vendors.

Digital's customers may choose DECnet, OSI, and Packetnet products to exchange information and files, support multivendor equipment, and comply with industry standards. Also, Digital provides bidirectional communication with IBM databases and equipment.

The following Digital communications products, described in this section, facilitate interoperability.

- DECnet communications software
- Internet communications software including
  - Digital/IBM
  - Digital/UNIX
- Packetnet communications software
- Open Systems Interconnection (OSI) products
- File transfer and terminal emulation products

## Software Ordering Information

The following software order code template provides information needed to order the major components of a software product: the licenses, distribution and documentation, and installation service.

For a given software product, the template is completed by providing the following codes:

- The Unique Product Identifier (UPI), a three-digit number assigned to each software product. The UPI replaces the "xxx" in the order code template, and can be found in this catalog at the end of each product description.
- The processor on which the software will run, as listed in the footnotes below the template. The processor code replaces the "\*" in the order code template.
- The medium on which the software will be delivered, as listed in the footnotes below the template. The media code replaces the "#" in the order code template.

Note that a software product may not support all processors or all distribution media. Also, certain limitations might accompany each option; for example, a VAXcluster license might not be available for certain processors. The Software Product Description (SPD), available for each product, defines the capabilities and specific ordering information. The SPD number for each product is found in this catalog at the end of each product description. A list of all SPDs for products in this catalog is located in Appendix C.

## Introduction

### Software Order Code Template

Option	Order Code
<b>Licenses</b> (A license is required for each CPU.)	
Single-use or first license for VAXcluster	QL-xxxA*-AA
Cluster member	QL-xxxA*-AB
Initial license, primary and cluster	QL-xxxA*-CA
Monthly rental, single-use	QL-xxxA*-DA
Monthly rental, cluster	QL-xxxA*-DB
Software revision right-to-copy	QL-xxxA*-HZ
<b>Materials and Installation</b>	
Distribution and documentation	QA-xxxAA-H#
Documentation only	QA-xxxAA-GZ
Installation service	QT-xxxA*-I#

\*Supported processors (\*): MicroVAX II (N), MicroVAX 2000 (P), MicroVAX 3300/3400 (J), MicroVAX 3500/3600 (B), VAXstation II (Q), VAXstation 2000 (R), VAXstation 3100/3200/3500/3520/3540 (C), VAXserver 3500/3600/3602/3300/3400 (C), VAXserver 6210/6310 (H), VAXserver 6220/6320 (G), VAX-11/750 (L), VAX-11/780/782/785 (K), VAX 6210/6310 (2), VAX 6220/6320 (3), VAX 6230/6330 (4), VAX 6240/6340/6350 (D), VAX 6360 (U), VAX 8200/8250 (J), VAX 8300/8350 (H), VAX 8500/8530 (G), VAX 8550 (E), VAX 8600/8650 (F), VAX 8700 (E), VAX 8800 (D), VAX 8810 (E), VAX 8820 (D), VAX 8830 (U), VAX 8840/8842/8974 (V), VAX 8978 (5), PC Software (includes VAXmate) (W), PDP cross product generic (X), RISC processor tier neutral and RISC cross product generic (8), Processor tier neutral and VAX cross product generic (9)

#Supported Media (#): RX18 floppy diskette (2), RX50 floppy diskette (3), RC25 disk cartridge (4), TK50 streaming tape cartridge (5), TK25 cartridge (6), RX33 floppy diskette (7), RD50 optical disk (8), Magtape, 6250 b/in 9-track (A), RX24 3.5 inch floppy diskette (B), Magtape, 9-track 800 b/in (NRZI) (D), TU58 DECTape II cartridge (G), RL02 disk cartridge (H), RX31 floppy diskette (I), RA60 disk cartridge (J), RP04 disk pack (K), 9-track 1600 b/in magtape (PE) (M), TU60 cassette (N), RL01 disk cartridge (Q), RK06 disk cartridge (T), RK07 disk cartridge (V), RX02 double-density diskette (X), RX01 floppy diskette (Y)

For example, to order a DECnet-ULTRIX single-use license for the VAX 8350, replace the "xxx" in the template with the Unique Product Identifier (716), and the "\*" with the VAX 8350 processor code (H). The order code is therefore QL-716AH-AA. To order the software distributed on magtape, specify order code QA-716AH-IM, where "M" designates magtape.

## Introduction

Digital Network Architecture (DNA) is implemented in phases. The current phases are III and IV.

Four network capabilities were introduced in DNA Phase III:

- Adaptive routing (255 nodes)
- Network management
- Network command terminal software
- Multipoint line support

The maximum number of nodes in a Phase III network is 255. Network management was enhanced to provide the software tools for identifying and isolating problems for remotely testing network integrity.

Phase IV DECnet products give network owners significantly more flexibility in developing larger and more cost-effective computer networks and extending their current networks as their needs evolve. Phase IV capabilities include

- Area routing with 63 areas, 1,023 nodes per area.
- Communications server support.
- Network virtual terminals.
- 802.3/Ethernet support.

Digital offers two packages, full-function and end-node, for Phase IV DECnet products. The full-function package includes routing capability. The end-node package offers full DECnet capability with the exception of the routing function; that is, this DECnet package offers only single-line access to a network.

Using an end-node package, data can originate and terminate at this node, but data destined for other nodes cannot transit this node. End nodes access DECnet routers, X.25 gateways, or full-function nodes to send messages beyond the local area network. An end node reduces overhead needed for routing, thus increasing application performance.

Customers who have never used DECnet are strongly advised to purchase DECnet with the full service offerings including installation service.

The following table shows which DECnet products support full-function and end-node Phase IV packages and which continue to support Phase III.

## DECnet Communications Software

<i>DECnet Packaging Support</i>		
	Phase IV Packaging Support	Phase III Packaging Support
	Full-function Package	End-node Package
DECnet-VAX	•	•
DECnet-ULTRIX		•
DECnet-DOS		•
DECnet-VAXmate		•
DECnet-11M	•	•
DECnet-11M-PLUS	•	•
DECnet-Micro/ RSX		•
DECnet-11S	•	•
DECnet-RT (end- node only)		•
DECnet/E	•	

### DECnet Product Capabilities

Each DECnet software product offers a particular set of capabilities that are summarized in the following table. These capabilities are divided into two categories:

- **DECnet Functions**—those capabilities inherent in the DECnet product
- **DECnet Services**—those capabilities provided by software beyond DECnet.

#### *Definitions of DECnet Functions*

- **Program-to-program communication** means that cooperating programs, including those running under different operating systems and written in different languages, can exchange data.
- **Network command terminal** capability allows users on a host system to log onto like (homogeneous) systems in the network as though their terminals were directly connected to the other system.
- **File transfer** is the ability to exchange files among systems in a network.
- **Command/batch file submission and execution** means that a user at a source node can request a destination node to execute a command file. The command file can already be at the destination node, or the source node can send it along with the request.
- **Remote resource access** allows the sharing of such resources as expensive peripheral devices and massive database files for reasons of economy and convenience. This capability is sometimes referred to as “remote file access,” when programs access file-structured devices remotely. DECnet offers both remote file and remote record access.
- **Downline system loading** is the ability to store initial memory images for a DECnet-11S system on a host. These images can then be loaded on request into adjacent DECnet-11S systems on the network.

## DECnet Communications Software

- **Downline task loading** is the ability of a host to store programs that are to be executed on another system or server. These programs are then loaded on request into adjacent systems or servers on the network, under the joint control at both ends of the logical link.
- **Upline dumping** is the capability of a system or server to automatically send a system-image dump to an adjacent node if the system or server fails.

### Definitions of DECnet Services

- **SNA Access** is the ability to access an IBM SNA network.
- **CCITT X.25 Access** is the ability to access an X.25 service.
- **Bisync Access** is the ability to support the IBM binary synchronous communications protocol between Digital and IBM systems.

<i>DECnet Product Capabilities</i>								
Capability	DECnetProducts							
	-RT	Micro/RSX, -11S -11M, -11M-PLUS	/E	-VAX	-ULTRIX	-VAXmate	-DOS	
<b>DECnet Functions</b>								
Program-to-program Communications	•	•	•	•	•	•	•	•
Network Command Terminal	• <sup>3</sup>	• <sup>4</sup>	• <sup>1</sup>	• <sup>3</sup>	• <sup>4</sup>	• <sup>4</sup>	•	• <sup>4,5</sup>
File Transfer	•	•	•	•	•	•	•	•
Command/Batch File Submission and Execution	• <sup>1</sup>	•	•	•	• <sup>2</sup>	•	• <sup>1</sup>	• <sup>1</sup>
Remote Resource Access	•	•	• <sup>1,6</sup>	•	•	•	•	•
Downline System Loading		•			•	• <sup>2</sup>		
Downline Task Loading		•			•			
Upline Dumping		•	•		•	• <sup>2</sup>		
<b>DECnet Services<sup>8</sup></b>								
SNA Access					•	•	•	•
CCITT X.25 Access		• <sup>7</sup>			•			
Bisync Access		•			•			
<sup>1</sup> Requester-only function. DECnet-11S does not support connection from remote command terminals. <sup>2</sup> Command file must reside on remote node. <sup>3</sup> Supports homogeneous network virtual terminal. <sup>4</sup> Supports CTERM, heterogeneous network virtual terminal. <sup>5</sup> Supports outgoing requests only. <sup>6</sup> Local system supports unit-record equipment only. <sup>7</sup> Support for RSX-11M and RSX-11M-PLUS. <sup>8</sup> Requires additional software beyond DECnet.								

## DECnet Communications Software

### DECnet Product Support

CPU	DECnet -RT	/E	-RSX	-Micro/ RSX	-VAX <sup>1</sup>	-ULTRIX	-DOS	-VAXmate
VAX CPUs					•	•		
PDP-11 CPUs	•	•	•	•				
IBM PCs <sup>4</sup>							•	
VAXmate Ethernet Controllers <sup>2</sup>								• <sup>5</sup>
DEBNA					•	•		
DELUA		•	•		•	•		
DEPCA							• <sup>3</sup>	
DELQA		•	•	•	•	•		
DESQA		•	•	•	•	•		
DESPA Communications Controllers <sup>2</sup>					•	•		
CXA16			•	•				
CXB16			•	•				
CXY08			•	•	•			
DHB32					•			
DHF11			•	•				
DHQ11			•	•	•			
DHT32						•		
DHU11			•		•			
DLVJ1	•							
DMB32					• <sup>1</sup>			
DMF32					•			
DMR11	•	•	•		•	•		
DMV11	•	•	•	•	•	•		
DMZ32					•			
DSB32					•			
DSH32						• <sup>6</sup>		
DPV11	•		•	•				
DSV11					•			
DUP11	•		•					
DZQ11			•	•	•			

<sup>1</sup>Any synchronous communications device on VMS requires the Wide Area Device Drivers Kit in addition to DECnet-VAX software.

<sup>2</sup>Refer to the appropriate Software Product Description for support of retired products.

<sup>3</sup>Also supports some third-party products.

<sup>4</sup>Refer to the DECnet-DOS product description for supported processors and controllers.

<sup>5</sup>Uses an integral 802.3/Ethernet controller for connection to a local area network.

<sup>6</sup>Refer to the product description for limitations.

### DECnet-VAX

DECnet-VAX allows a suitably configured VMS system to participate as a full-function (routing) or end node in DECnet computer networks. With proper network planning, DECnet-VAX networks can contain up to 1,023 nodes per network area, and up to 63 areas per network. DECnet-VAX interfaces are standard components of the VMS operating system for use on a local, standalone system.

The DECnet-VAX end-node and full-function products are licensed separately for VMS. The DECnet-VAX License Product Authorization Key (PAK), when registered on a VMS system, enables communication between different networked systems that use the same protocols.

DECnet-VAX is a Phase IV network product that is warranted for use only with Phase III and Phase IV products supplied by Digital.

DECnet-VAX offers task-to-task communications, file management, downline system and task loading, network command terminals, and network resource-sharing capabilities using the Digital Network Architecture (DNA) protocols. DECnet-VAX communicates with adjacent and non-adjacent Phase III and Phase IV nodes. (Adjacent nodes are connected by a single communications line.)

VMS programs written in VAX MACRO and native-mode high-level languages can use DECnet-VAX capabilities; programs executing in PDP-11 compatibility mode cannot use DECnet-VAX.

Network functions available to DECnet-VAX users depend in part on the network configuration. Networks consisting entirely of DECnet-VAX Phase IV nodes provide all the functions described in the DECnet-VAX Software Product Description.

Networks that combine different DECnet implementations may limit the functions available to the DECnet-VAX user on non-DECnet-VAX nodes (because other DECnet implementations may not implement the functions). Conversely, a user of another DECnet implementation may not be able to access all DECnet-VAX functions. Functions available on mixed networks can be determined by comparing the Software Product Descriptions for the appropriate DECnet products.

DECnet-VAX allows multiple 802.3/Ethernet controllers per host within the limitations listed in the Load Unit Table in Software Product Description 25.03. When two or more 802.3/Ethernet controllers are used on a single CPU, each controller must be connected to a different 802.3/Ethernet cable. These cables must not be joined by a bridge or repeater, though they can be joined by a DECnet router.

DECnet-VAX licenses include a license to run VAX/VMS Services for MS-DOS, allowing the DECnet-VAX host to act as a file, disk, and print server to VAXmate and other PC clients. Software media and services must be purchased separately. ▲ Refer to "VAX/VMS Services for MS-DOS" in Section 5 for more information.

#### **Ordering Information**

Order the license for either the end-node or full-function version. A license is also available to upgrade an end node to a full-function node.

## DECnet Communications Software

As of DECnet-VAX Version 5.0, no media kit is required. DECnet-VAX is fully integrated into VMS V5.0 and is included in the VMS V5.0 Media and Documentation kit. A DECnet-VAX license PAK must be installed on each node.

As of Version 5.0 of DECnet-VAX, the VAX-11/782 is no longer supported.

▲ Refer to the following for information on prerequisite hardware and software:

- Software Product Description 25.03
- Unique Product Identifier D04

### DECnet-ULTRIX

DECnet-ULTRIX is a Phase IV end-node implementation of the Digital Network Architecture (DNA) for the ULTRIX-32 operating system. It allows Digital ULTRIX systems to communicate with other Digital operating systems that use the DNA Phase III or Phase IV protocols, as well as with non-Digital operating systems that support the Internet (TCP/IP-based) protocols.

DECnet-ULTRIX functions include a semi-transparent, bidirectional gateway that acts as a bridge between DECnet networks and Internet (TCP/IP-based) networks. This function allows DECnet and Internet users to communicate through file transfers, remote logins, and mail correspondence. The gateway function does not require special software on systems that use its service, nor does it require accounts for remote users on the gateway system.

#### **Features**

DECnet-ULTRIX offers these networking capabilities:

- Semi-transparent, bidirectional software gateway between DECnet networks and Internet (TCP/IP-based) networks
- Task-to-task communications
- Network virtual terminal
- Remote file transfer
- Electronic mail
- Network management

#### **Prerequisite Hardware**

One of the following:

- Any valid VAX system configuration running ULTRIX-32 with the following communications devices: DEUNA or DELUA Ethernet controller, or VAXBI 802.3/Ethernet controller, or DMR11 synchronous controller interface.
- Any valid MicroVAX or VAXstation system configuration running ULTRIX-32 with the following communication devices: DELQA, DESQA or DESVA 802.3/Ethernet controller, or DSV11 synchronous controller

#### **Prerequisite Software**

ULTRIX-32 operating system V3.0

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.83
- Unique Product Identifier 716

### DECnet-RSX

DECnet-RSX allows a suitably configured PDP-11 running the RSX operating system to participate as a Phase IV node in a DECnet network. The functions available to a user partially depend on the configuration of the rest of the network. DECnet-Micro/RSX functions as an end node only.

Features of DECnet-RSX include network terminal, file transfer, remote resource access, downline loading, and upline dumping.

#### **Ordering Information**

▲ For prerequisite hardware and software, consult the following Software Product Description (SPD) and Unique Product Identifier (UPI) under each particular software package:

- DECnet-11M
  - SPD 10.75
  - UPI 765
- DECnet-11S
  - SPD 10.74
  - UPI 763
- DECnet-11M-PLUS
  - SPD 10.66
  - UPI 767
- DECnet-Micro/RSX
  - SPD 18.27
  - UPI 766

### DECnet-DOS

DECnet-DOS allows IBM PCs, PC/XTs, Personal Computer ATs, and PS/2 models to participate as nonrouting (end) nodes in DECnet local area and wide area networks. In addition, some IBM compatibles are supported.

DECnet-DOS supports the following 802.3/Ethernet communications controllers:

- Digital: DEPCA multibuffered 802.3/Ethernet controller and DEMCA multibuffered 802.3/Ethernet communications controller for PCs with MicroChannel bus
- MICOM/INTERLAN: NI5010-1 and NI5010-2 IBM PC Ethernet/IEEE 802.3 controllers
- 3Com: Etherlink/IBM PC, Etherlink II, and Etherlink/MC Ethernet Network Interfaces

DECnet-DOS nodes that use the DEPCA 802.3/Ethernet controller are supported in a broadband environment using the Chipcom Ethermodems.

#### **Features**

- Supports task-to-task communications, remote file access, utilities for network file operations, and network resource sharing using DNA protocols.
- Provides NETBIOS session-level interface, which allows NETBIOS applications to be layered on DECnet-DOS. These applications can communicate with other DECnet applications or with other PCs running DECnet and the NETBIOS application.
- Supports virtual command terminals (VT220 emulation) and a scripting language.

## DECnet Communications Software

- Allows access to full DECnet-DOS functions for MS-DOS user programs written in Macro Assembler or the C language.
- Provides SETHOST 132-column support for Digital national character sets and Digital multinational character sets.
- Supports IBM enhanced keyboards for IBM PC/XT and IBM Personal Computer AT, and Digital LK250.
- Allows for remote network monitoring of DECnet-DOS nodes.

### **Prerequisite Hardware**

▲ Refer to Software Product Description 50.15 for configuration details.

### **Prerequisite Software**

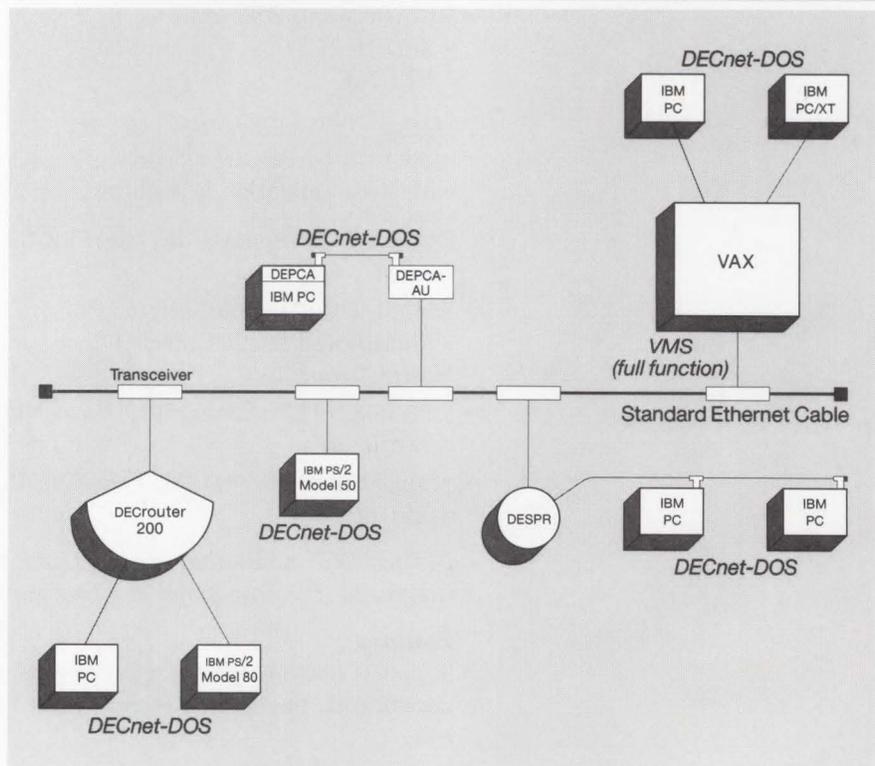
IBM PC Disk Operating System or vendor's variant of MS-DOS.

### **Ordering Information**

▲ Refer to the following for specifics on supported systems and configurations:

- Software Product Description 50.15
- Unique Product Identifier VA0

### **DECnet-DOS Configuration**



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**DECnet-VAXmate**

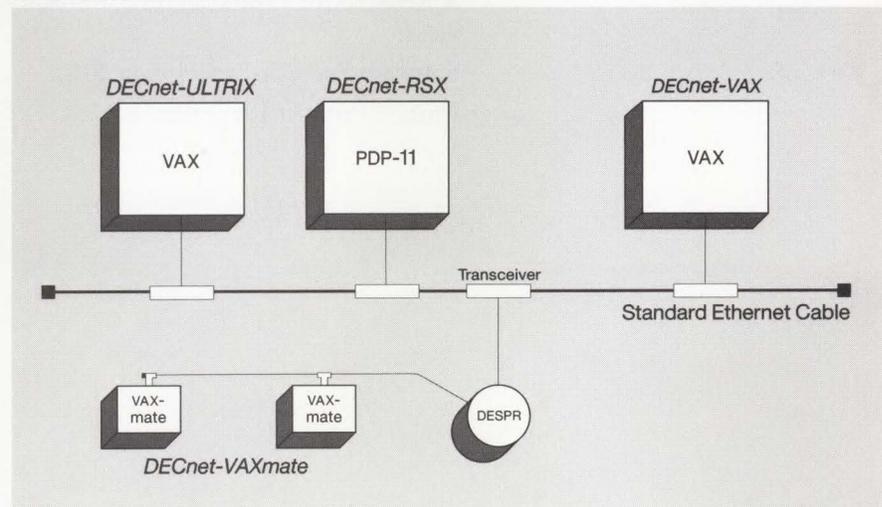
DECnet-VAXmate allows Digital's VAXmate personal computer/workstations to participate as nonrouting (end) nodes in both local and wide area DECnet networks. This software is one of the DECnet-DOS family of products for personal computer systems running Microsoft Corporation's MS-DOS operating system, and specific variants of that product. DECnet-VAXmate is a DECnet Phase IV network product and is warranted for use only with supported Phase IV products supplied by Digital.

**Features**

- Supports task-to-task communications, remote file access, utilities for network file operations, network command terminals, and network resource sharing using DNA protocols.
- Provides NETBIOS session-level interface, which allows NETBIOS applications to be layered on DECnet-DOS. These applications can communicate with other DECnet applications or with other PCs running DECnet and the NETBIOS application.
- Allows access to full DECnet-DOS functions for MS-DOS user programs written in Macro Assembler or the C language.
- Provides SETHOST 132-column support for Digital national character sets and Digital multinational character sets.
- Allows multiple CTERM and LAT terminal emulation sessions.
- Allows for remote network monitoring of DECnet-VAXmate nodes.

▲ Refer to Software Product Description 50.05 for more information about DECnet-VAXmate.

**DECnet-VAXmate Configuration**



NBG-102-01

**Minimum Hardware Required**

▲ Refer to Software Product Description 50.05 for supported configurations.

Note: Operation of the 802.3/Ethernet interface with broadband modems is not supported.

**Prerequisite Software**

VAXmate Standalone Software V1.1 or V2.0

## DECnet Communications Software

### ***Ordering Information***

▲ Refer to the following for specifics on supported systems and configurations:

- Software Product Description 50.05
- Unique Product Identifier 600

### **DECnet/E**

DECnet/E software allows a suitably configured RSTS/E system to participate as a routing or nonrouting node in DECnet computer networks. DECnet/E can connect to an Ethernet and supports all Phase IV capabilities except area routing.

DECnet/E is a Phase IV network product and is warranted for use with supported Phase III and Phase IV DECnet products.

### ***Ordering Information***

▲ Refer to the following for information on prerequisite hardware and software:

- Software Product Description 10.73
- Unique Product Identifier 692

### **DECnet-RT**

DECnet-RT software allows a suitably configured RT-11 Foreground/Background (FB) system to participate as an end node in DECnet computer networks. The backward compatibility of Phase IV allows DECnet-RT to connect to Ethernet through any Phase IV routing node.

DECnet-RT is a Phase III network product and is warranted for use with supported Phase III and Phase IV DECnet products supplied by Digital.

### ***Ordering Information***

▲ Refer to the following for information on supported processor and services:

- Software Product Description 10.72
- Unique Product Identifier 687

Digital's Internet family of products supports the connection of Digital's computers and Digital's networks to systems built by other manufacturers. Internet products are tools for distributed data processing in a multivendor environment. As parts of the powerful DNA, the Internet products allow transparent, bidirectional communication with the equipment of other vendors and, at the same time, provide the flexibility required by local networks and office systems. They support many programming languages and the wide range of computing power provided by Digital.

Internet Communications Software includes

- **Digital/IBM.**
- **Digital/UNIX.**
- **Packetnet.**
- **Open Systems Interconnection (OSI).**

Digital/IBM communications products range from single-function, point-to-point protocol emulation to multifunction network-to-network communication via an IBM channel.

Digital offers three transport products that provide DECnet connection to the SNA environment. All three products support MVS (both /SP and /XA), VM/SP, and VSE/SP operating systems. The products fit into three price/performance tiers.

- **VMS/SNA** is a software product, layered on the VMS operating system, that provides a system-to-network connection over a synchronous communications line. It is suitable for low-volume applications that run on a single system and require a single, direct link to the SNA environment.
- **DECnet/SNA Gateway for Synchronous Transport** is software that runs on the DEC MicroServer, dedicated server hardware that provides network-to-network communications. It connects a DECnet 802.3/Ethernet local area network to as many as four remote SNA networks over synchronous communications lines. This product is suitable for medium traffic over a DECnet network to one or more IBM SNA systems.
- **DECnet/SNA Gateway for Channel Transport** is software that runs on the DEC ChannelServer, dedicated server hardware that connects 802.3/Ethernet local area networks to an SNA network via an IBM S/370 channel. Its high throughput and dedication to one high-speed IBM channel make it suitable for applications with heavy traffic between the DECnet and SNA environment.

The DECnet/SNA Gateway products and VMS/SNA software require installation of the appropriate **DECnet/SNA Access Routines and Programming Interfaces**. These products provide such functions as terminal and printer emulation, bidirectional data transfer, mail exchange, and remote job entry. ▲ Refer to "DECnet/SNA Access Routines and Programming Interfaces" in this section for more information.

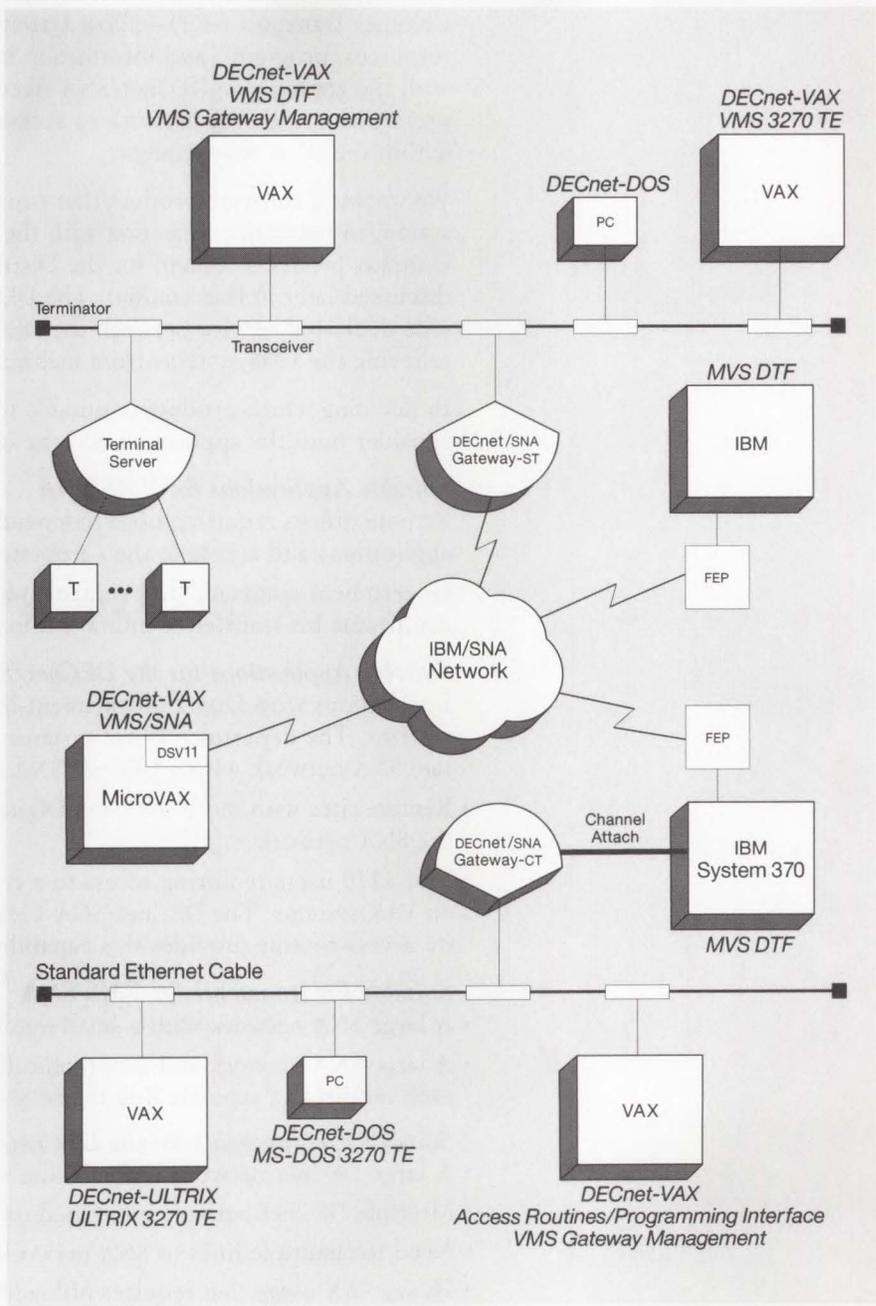
Digital's **Binary Synchronous Communications (BSC) Protocol Emulator** products provide point-to-point emulation between Digital and IBM systems and are designed to satisfy single-function Digital/IBM communication requirements. If the amount of communication between Digital systems and IBM mainframes is relatively low, BSC may be the appropriate connection method. Digital offers two types of IBM Internet products using the BSC technology—**3271** and **2780/3780** protocol emulation software.

**DECnet-DOS** and **DECnet/PCSA Client** software products allow the IBM PC, PC/XT, Personal Computer AT systems (from PS/2 models), and selected compatibles to participate as nonrouting (end) nodes in DECnet and 802.3/Ethernet computer networks. ▲ Refer to "DECnet Communications Software" in this section for more information.

Other products are available for Digital/IBM communications:

- **VIDA** allows integration of data from IDMS on IBM mainframes with VAX databases.
- **WPS-PLUS/PC** provides Digital-style word processing for IBM PC users.

*DECnet/SNA Environment*



NBG-127-00

### Comparison of VMS/SNA and DECnet/SNA Gateway Products

The three DECnet/SNA transport products—VMS/SNA, DECnet/SNA Gateway for Synchronous Transport (-ST), and DECnet/SNA Gateway for Channel Transport (-CT)—allow systems in a DECnet network to access resources, programs, and information in an SNA network. In cooperation with the appropriate DECnet/SNA Access Routines, they allow 3270 display users within the SNA network to access DECnet-based system resources within the DNA environment.

VMS/SNA, a software product that runs on a VAX/VMS system, provides system-to-network connection with the same functions as the DECnet/SNA Gateway products (except for the Distributed Host Command Facility, discussed later in this section). The DECnet/SNA Gateway products provide dedicated service between the DECnet network and the SNA network, relieving the VMS systems from managing this task.

In deciding which product is suitable for a customer site, it is helpful to consider both the application and the operating environment.

#### ***Suitable Applications for VMS/SNA***

- Remote offices requiring both independent computing resources for office applications and access to the corporate database on the IBM mainframe.
- Government command and control systems requiring a link to the IBM mainframe for transfer of military information from mobile units.

#### ***Suitable Applications for the DECnet/SNA Gateway Products***

- Installations with Digital department-level systems and IBM corporate systems. The department-level systems are linked via DECnet to the corporate SNA network with a DECnet/SNA Gateway.
- Remote sites with more than one Digital computer that require access to the SNA network.
- IBM 3270 users requiring access to a corporate mail system implemented on VAX systems. The DECnet/SNA VMS Distributed Host Command Facility access routine provides this capability.

#### ***Suitable Environments for VMS/SNA***

- A large SNA network with a small number of VAX systems
- A large SNA network and geographically dispersed single VAX systems, each requiring a separate link to the SNA network

#### ***Suitable Environments for the DECnet/SNA Gateway Products***

- A large DECnet network and medium-to-heavy interface to SNA network
- Multiple DECnet networks and medium interface to SNA network
- Need for multiple lines to SNA network
- Heavy VAX usage that requires offloading network capabilities to a communications server

## Digital/IBM Transport Products

*Comparison of VMS/SNA and DECnet/SNA Gateway Capabilities*

VMS/SNA	DECnet/SNA Gateway-ST	DECnet/SNA Gateway-CT
System-to-network connection	Network-to-network connection	Network-to-IBM-channel connection
Single line at speeds up to 64 Kb/s	One line at speeds up to 256 Kb/s; Two lines at speeds up to 128 Kb/s; Four lines at speeds up to 64 Kb/s.	Direct channel speed (typically 3 to 4 Mb/s)
Supports 16 concurrent sessions	Supports 128 concurrent sessions	Supports 255 concurrent sessions
Supports all VAX processors except VAX UNIBUS processors	802.3/Ethernet-based, supports all VAX systems	802.3/Ethernet-based, supports all VAX systems
No Distributed Host Command Facility	Supports Distributed Host Command Facility	Supports Distributed Host Command Facility
Node management internal	Gateway management uses DECnet tools	Gateway management uses DECnet tools

### DEC ChannelServer

The DEC ChannelServer represents the high-end of the DECnet/SNA Gateway product family and provides the hardware base for the DECnet/SNA Gateway for Channel Transport (DECnet/SNA Gateway-CT). The DEC ChannelServer attaches directly to both the Ethernet Local Area Network and an IBM S/370 Byte Multiplexer, Block Multiplexer, or Selector Channel.

The DEC ChannelServer is defined to the I/O subsystem as either a 3174-1L or 3790 communications controller and is also defined to VTAM as a Physical Unit Type 2.0. It supports a single pair of Bus and Tag connectors and is capable of accessing information on any mainframe defined to the SNA network regardless of its location. By using the SNA network, a single DEC ChannelServer can access applications, files, and documents simultaneously on multiple mainframes in either central or distributed locations.

The DEC ChannelServer consists of a MicroVAX II CPU with 4 Mb/s of additional memory enclosed in an H9642 OEM cabinet. It connects to the Ethernet LAN through a DELQA controller and connects to the S/370 through a three-card Q-bus option with driver/receiver panel. An RX33 diskette controller and a video port are also included for diagnostic use.

▲ For more information, refer to "DECnet/SNA Gateway-CT" in this section.

## Digital/IBM Transport Products

### Specifications

#### Physical Characteristics

Height	41.7 inches	105.918 cm
Width	23.0 inches	58.42 cm
Depth	36.0 inches	91.44 cm
Weight	200 pounds	90.72 kg

#### Power Requirements

	120 Vac	240 Vac
Low-range line voltage	88 to 128 Vac	176 to 256 Vac
High-range line voltage	Single	Single
Frequency tolerance	47 to 63 Hz	47 to 63 Hz
Frequency	60 Hz	50 Hz
Steady state current (typ)	4.4 A	2.2 A
Steady state current (max)	6.0 A	3.0 A
Power consumption (max)	345 W	345 W

#### Environmental Class

A ▲ Refer to Appendix B for details.

### Prerequisite Hardware

- Any VAX, MicroVAX, or VAXstation configuration as specified in the order code table can act as the load host.
- S/370 Bus and Tag cables (terminators if appropriate) for connection into the X/370 system.
- VT1xx, VT2xx, or VT3xx series terminal for diagnostic use.

Note: The DEC ChannelServer has a built-in Ethernet communications controller. It needs a suitable connection to the user's Ethernet LAN and transceiver cables.

### Prerequisite Software

- VMS V4.6 to V5.0 or MicroVMS V4.6 to V4.7
- DECnet-VAX V4.6 to V5.0

### Ordering Information

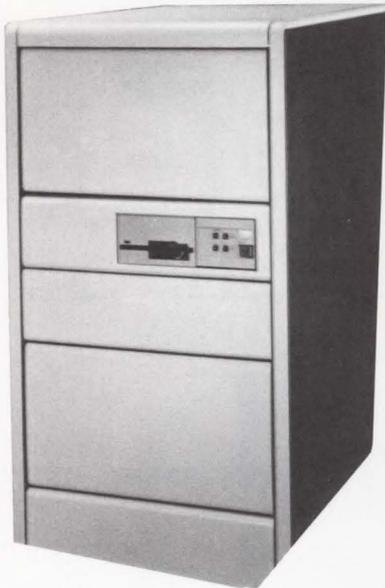
The DEC ChannelServer is packaged and ordered as a complete DECnet/SNA Gateway-CT system. ▲ Refer to the DECnet/SNA Gateway-CT product description to order the package.

Refer to the order codes below only when ordering spare hardware. Note that the options listed below do not include cables, licenses, or documentation.

#### DEC ChannelServer Spare Hardware Order Codes

DEC ChannelServer configured for 120 Vac	DESNA-AA
DEC ChannelServer configured for 240 Vac	DESNA-A3

### DECnet/SNA Gateway for Channel Transport



DECnet/SNA Gateway for Channel Transport (DECnet/SNA Gateway-CT), the high-end member of the DECnet/SNA Transport family, is software that runs on the DEC ChannelServer dedicated server hardware. The DECnet/SNA Gateway-CT operates as part of both the DECnet and SNA networks, allowing users anywhere in either the SNA or DECnet network to share systems, applications, and network resources.

DECnet/SNA Gateway-CT is defined to VTAM as a Physical Unit Type 2.0 and can be configured to the Physical Unit Type 2 maximum of 255 logical units. Also, it supports a maximum of 255 simultaneous sessions. Compatible with IBM MVS, VSE/SP, and VMS operating systems, DECnet/SNA Gateway-CT also supports all existing DECnet/SNA Access Routines for VMS, ULTRIX, and MS-DOS systems.

DECnet/SNA Gateway-CT software is downline loaded across an Ethernet network into the DEC ChannelServer from a suitably configured VAX/VMS load host system. The DECnet/SNA Gateway-CT product is configured and managed by the load host using DECnet/SNA VMS Gateway Management V2.0 (required for each load host). DECnet/SNA VMS Gateway Management software can be used to manage both DECnet/SNA Gateway-CT and DECnet/SNA Gateway-ST products. ▲ For more information on the DECnet/SNA VMS Gateway Management software, refer to "DECnet/SNA Access Routines and Programming Interfaces" in this section.

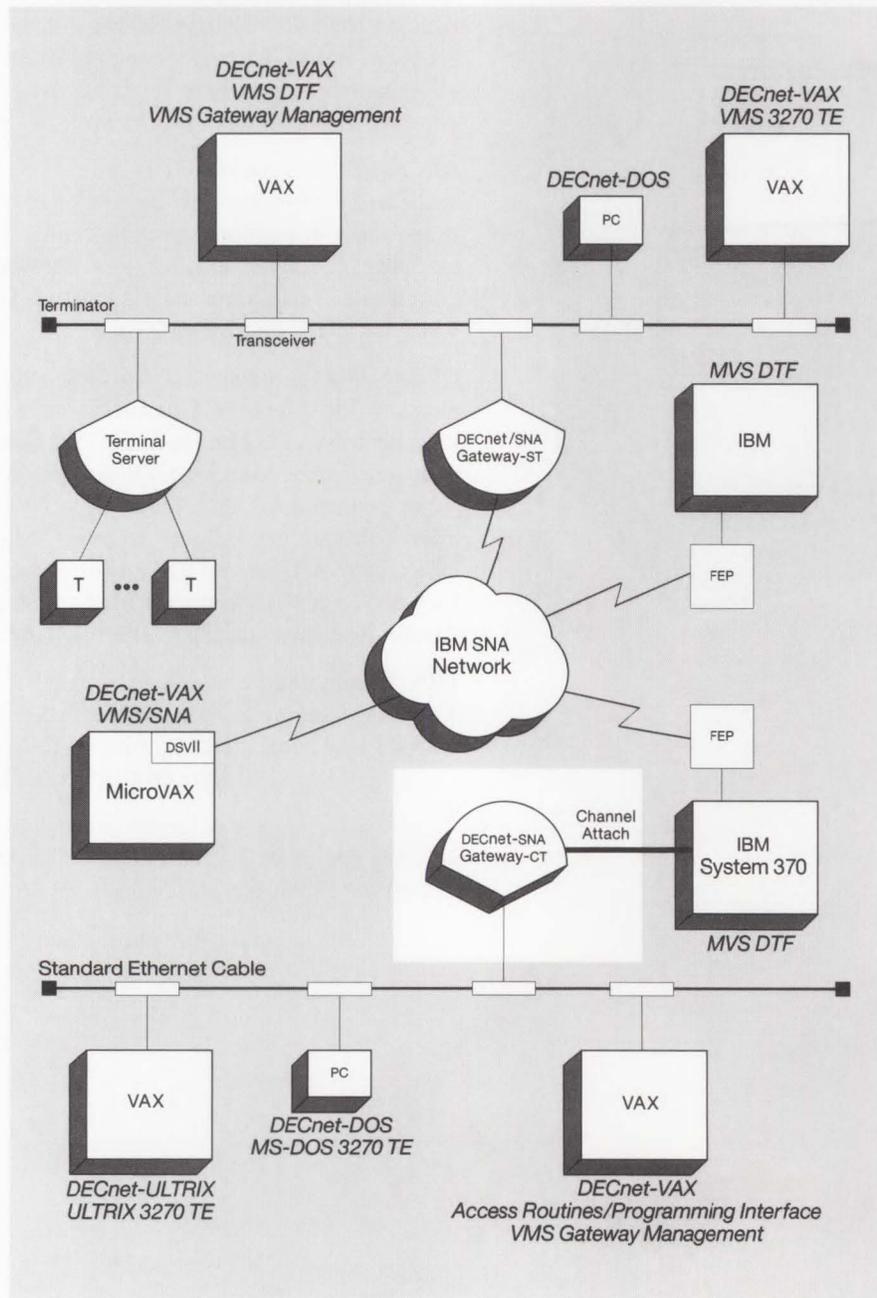
#### ***DEC ChannelServer***

The DEC ChannelServer provides the hardware base for the DECnet/SNA Gateway-CT, and attaches directly to both the Ethernet local area network and an IBM S/3270 Byte Multiplexer, Block Multiplexer, or Selector Channel.

▲ Refer to the DEC ChannelServer product description in this section and to Software Product Description 29.76 for further information.

# Digital/IBM Transport Products

## DECnet/SNA Gateway-CT Configuration



NBG-147-00

## Digital/IBM Transport Products

### **Features**

- Up to 255 concurrent sessions allow many users and applications to be supported through a single DECnet/SNA Gateway-CT.
- High performance DECnet/SNA Gateway-CT supports greater concurrent sessions and provides higher throughput than any other DECnet/SNA Transport product.
- Direct S/370 channel attachment bypasses front-end processors and wide area networks.
- Compatibility with DECnet/SNA Access Routines and Programming Interfaces eases migration from other transport products to DECnet/SNA Gateway-CT.

### **Prerequisite Hardware**

- Any VAX, MicroVAX, or VAXstation configuration as specified in the order code table
- S/370 Bus and Tag cables (terminators if appropriate) for connection into the X/370 system
- VTxxx terminal for DEC ChannelServer diagnostic use
- The DEC ChannelServer has a built-in Ethernet communications controller that needs transceiver cable and a suitable connection to the 802.3/ Ethernet LAN.

### **Prerequisite Software**

For the load host that will downline load the DECnet/SNA Gateway-CT software:

- VMS V4.6 to V5.0 or MicroVMS V4.6 to V4.7
- DECnet-VAX V4.6 to V5.0

### **Ordering Information**

Order the DEC ChannelServer hardware base for the DECnet/SNA Gateway-CT (DESNA), which includes a power cord, diagnostic package, and software licenses for DECnet/SNA Gateway-CT and DECnet/SNA VMS Gateway Management software V2.0. First-time purchasers of a DEC Channel/Server system require distribution and documentation kits for the DECnet/SNA Gateway-CT software and the DECnet/SNA VMS Gateway Management software V2.0. ▲ For information on ordering the DECnet/SNA VMS Gateway Management V2.0 software, refer to "DECnet/SNA Access Routines and Programming Interfaces" in this section.

The DECnet systems that access the SNA environment through the DECnet/SNA Gateway-CT must be configured with the appropriate Access Routines or Programming Interfaces. ▲ For more information, refer to "DECnet/SNA Access Routines and Programming Interfaces" in this section.

Bus and Tag cables are the responsibility of the customer and are not available from Digital!

## Digital/IBM Transport Products

### DECnet/SNA Gateway-CT Hardware Order Codes

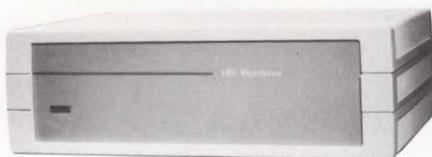
Option	Order Code
DECnet/SNA Gateway-CT package includes DEC ChannelServer hardware, power cord, diagnostics, DECnet/SNA Gateway-CT License, DECnet/SNA VMS Gateway V2.0 license.	DESNA-S*
DECnet/SNA Gateway-CT package for Ireland. Includes components listed above.	DESNA-TE

\*Fill in one of the following codes for the appropriate country: A (United States, Mexico), D (Denmark), E (United Kingdom), G (West Germany), I (Italy), K (Switzerland), P (France), T (Israel), X (Austria, Belgium, Finland, Netherlands, Norway, Sweden, Portugal, Spain)

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 29.76
- Unique Product Identifier VC9

### DECnet/SNA Gateway for Synchronous Transport



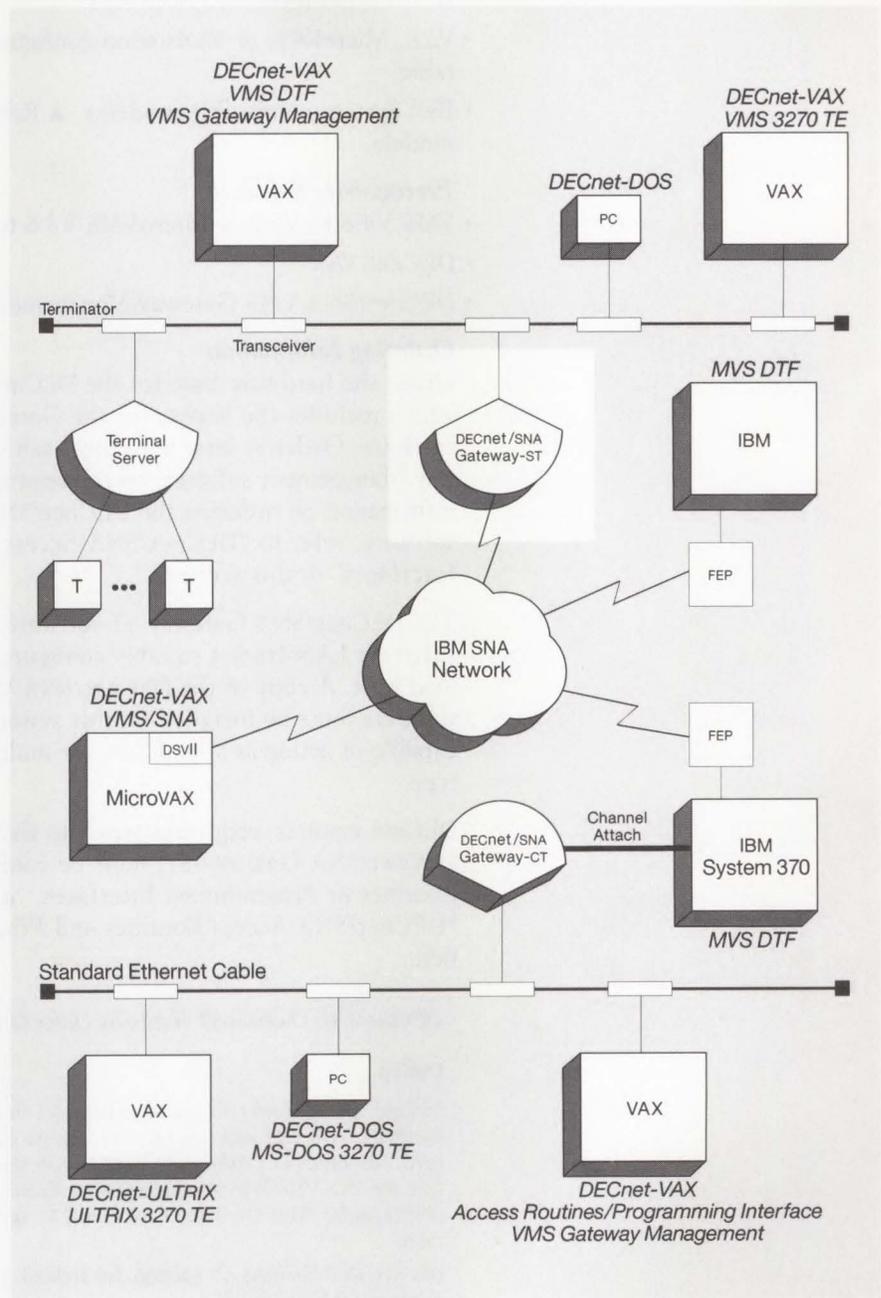
DECnet/SNA Gateway for Synchronous Transport (DECnet/SNA Gateway-ST) is software that runs on the DEC MicroServer, dedicated server hardware that provides network-to-network communications. It connects a DECnet 802.3/Ethernet local area network to as many as four remote SNA networks over synchronous communications lines. This product is suitable for medium traffic over a DECnet network to one or more IBM SNA systems.

The DECnet/SNA Gateway-ST, the midrange member of the DECnet/SNA Transport family, connects Digital and IBM networks using a wide variety of Digital Access Routines running under VMS, MS-DOS, and ULTRIX operating environments. DECnet/SNA Gateway-ST is defined to Virtual Telecommunications Access Method (VTAM) as a Physical Unit Type 2.0 and can be configured with up to four Physical Unit Type 2 definitions supporting up to 128 concurrent sessions.

DECnet/SNA Gateway-ST software is downline loaded across an Ethernet network into the DEC MicroServer from a suitably configured VMS load host system. The DECnet/SNA Gateway-ST is configured and managed by the load host using the DECnet/SNA VMS Gateway Management V2.0 (required for each load host), which can be used to manage both DECnet/SNA Gateway-ST and DECnet/SNA Gateway-CT systems.

▲ For more information on the DEC MicroServer, refer to "802.3/Ethernet Communications Servers" in Section 2. For more information on the DECnet/SNA Gateway-ST, refer to Software Product Description 25.C6.

*DECnet/SNA Gateway-ST Configuration*



NBG-103-01

**Features**

- Supports up to 128 concurrent sessions and up to four synchronous connections.
- Operates at speeds up to 256 Kb/s for one line, 128 Kb/s for two lines, or 64 Kb/s for four lines.
- Supports all DECnet/SNA Access Routines and Programming Interfaces.
- Uses the same user interface as the DECSA DECnet/SNA Gateway, eliminating retraining.

## Digital/IBM Transport Products

### **Prerequisite Hardware**

In Ethernet local area networks:

- VAX, MicroVAX, or VAXstation configuration as specified in the order code table
- Bell System-compatible modems ▲ Refer to SPD 25.C6 for approved models.

### **Prerequisite Software**

- VMS V4.6 to V5.0 or MicroVMS V4.6 to V4.7
- DECnet-VAX
- DECnet/SNA VMS Gateway Management V2.0 for each VAX/VMS load host

### **Ordering Information**

Order the hardware base for the DECnet/SNA Gateway-ST (DEMSA), which includes the license for the Gateway and Gateway Management software. Order at least one copy each of the Gateway software and Gateway Management software on the appropriate distribution medium. ▲ For information on ordering the DECnet/SNA VMS Gateway Management V2.0 software, refer to “DECnet/SNA Access Routines and Programming Interfaces” in this section.

The DECnet/SNA Gateway-ST software is downline loaded across the Ethernet LAN from a suitably configured VAX/VMS system which acts as a load host. A copy of the DECnet/SNA VMS Gateway Management V2.0 software must be installed on this system. A single VAX/VMS system is capable of acting as a load host for multiple DECnet/SNA Gateways of any type.

DECnet systems, requiring access to the SNA environment through the DECnet/SNA Gateway-ST, must be configured with the appropriate Access Routines or Programming Interfaces. ▲ For more information, refer to “DECnet/SNA Access Routines and Programming Interfaces” in this section.

#### **DECnet/SNA Gateway-ST Hardware Order Codes**

<b>Option</b>	<b>Order Code</b>
DECnet/SNA Gateway-ST package. Includes DEC MicroServer hardware, two V.35 and two EIA-232 adapter cables, power cord, DECnet/SNA Gateway-ST license with warranty, and DECnet/SNA VMS Gateway Management license with warranty. (Packages for West Germany have two X.21 and two EIA-232 cables.)	DEMSA-S*
DECnet/SNA Gateway-ST package for Ireland. Includes components listed above.	DEMSA-TE

\*Fill in one of the following codes for the appropriate country: A (United States, Mexico), D (Denmark), E (United Kingdom), G (West Germany), I (Italy), K (Switzerland), P (France), T (Israel), X (Austria, Belgium, Finland, Netherlands, Norway, Sweden, Portugal, Spain)

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 25.C6
- Unique Product Identifier S01

### VMS/SNA

VMS/SNA is a software product, layered on the VMS operating system, that provides a system-to-network connection over a synchronous communications line. It is suitable for low-volume applications that run on a single VAX/VMS system and require a single, direct link to the SNA environment.

Architecturally, a VAX system running VMS/SNA appears to the SNA network as a remote Physical Unit Type 2 node, and is attached to the SNA network through a synchronous communications controller to an IBM 37x5 Communications Controller.

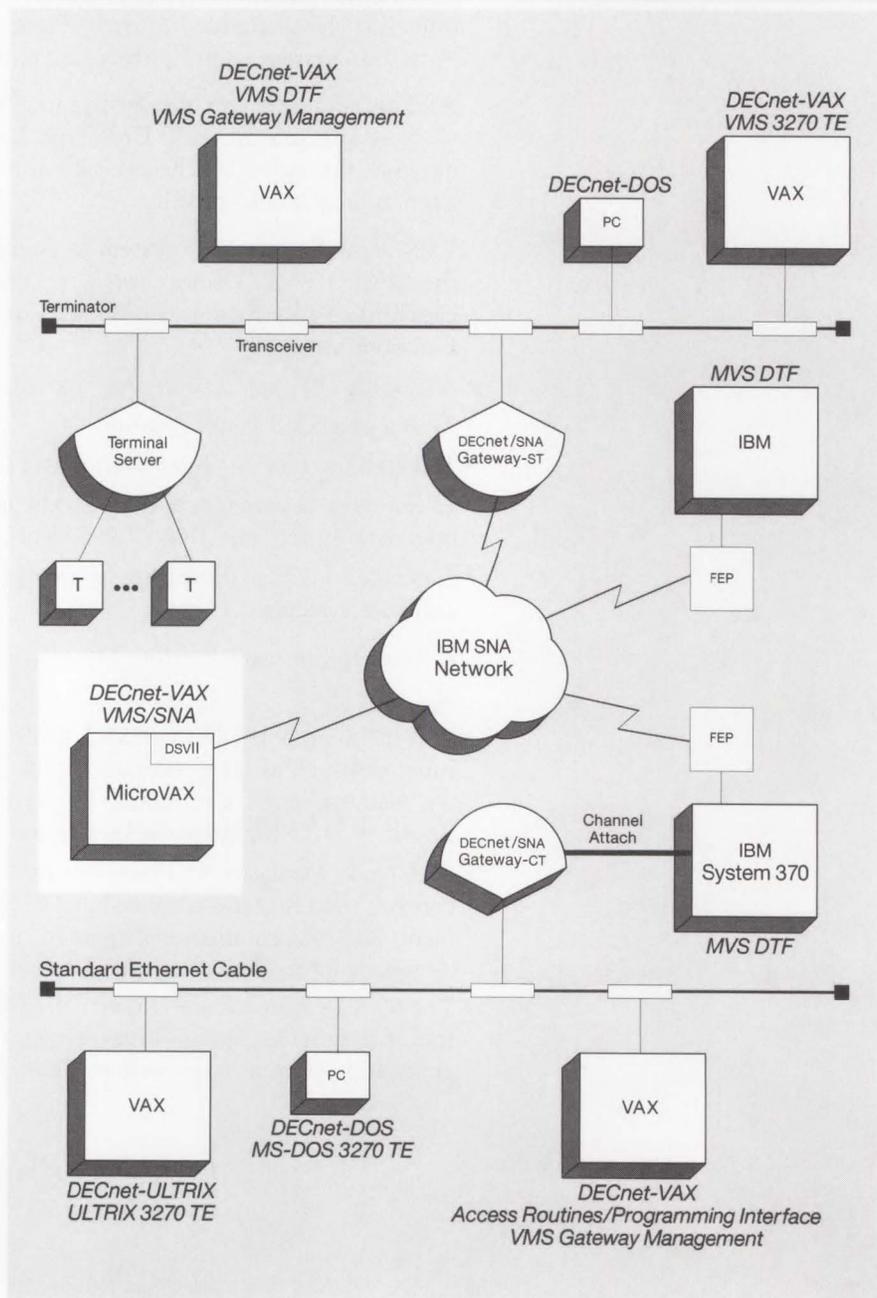
VMS/SNA allows a VMS system to connect to SNA at lower entry cost than the DECnet/SNA Gateway products. VMS/SNA provides the high-level capabilities of a system-to-network link, allowing users to perform such functions as

- Accessing IBM application programs or other system resources.
  - Acting as a 3270 display station.
  - Transferring files between Digital and IBM environments.
  - Exchanging documents and electronic mail messages between the VMS operating system and IBM's DISOSS or PROFS.
  - Implementing distributed application programs that run between the VMS and IBM systems.
- ▲ Refer to Software Product Description 27.01 for more information.

#### *Features*

- VMS/SNA supports DECnet/SNA VMS Access Routines that provide SNA functions such as terminal and printer emulation, bidirectional data transfer, mail exchange, and remote job entry. ▲ Refer to "DECnet/SNA Access Routines and Programming Interfaces" in this section for more information.
- SNA Node Management (SNANM) provides a node-management facility to control, monitor, and troubleshoot VMS/SNA and the IBM/SNA environment. SNANM commands display information about the circuit status, circuit counters, line status, and access names.
- The SNA Protocol Trace Utility (SNATRACE) is a problem-determination tool that provides frame-level tracing of a circuit to help in debugging application programs, as well as identifying system problems.

VMS/SNA Configuration



NBG-104-00

### ***Prerequisite Hardware***

VMS/SNA supports various synchronous communications controllers for supported processors. ▲ Refer to Software Product Description 27.01 for a list of devices and their maximum line speeds.

### ***Prerequisite Software***

- VMS V5.0 or later.
- At least one of the DECnet/SNA Access Routines or Programming Interfaces. (VMS/SNA does not support the Distributed Host Command Facility.) ▲ For more information, refer to “DECnet/SNA Access Routines and Programming Interfaces” in this section.
- The synchronous communications controller may require a software device driver. ▲ Refer to Software Product Description 27.01 for more information.

### ***Ordering Information***

Order the license and at least one copy of the distribution media and documentation kit. ▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.01
- Unique Product Identifier 362

DECnet/SNA Access Routines and Programming Interfaces allow users to perform specific functions on IBM host systems connected to the SNA network. Access Routine software packages are required for either the DECnet/SNA Gateway products or VMS/SNA software.

The following products, which are ordered separately, are available:

- Message Router/S Gateway (for IBM SNADS)
- Message Router/P Gateway (for IBM PROFS)
- DECnet/SNA VMS Gateway Management
- DECnet/SNA VMS 3270 Terminal Emulator (VMS 3270 TE)
- DECnet/SNA ULTRIX 3270 Terminal Emulator (ULTRIX 3270 TE)
- DECnet/SNA MS-DOS 3270 Terminal Emulator (MS-DOS 3270 TE)
- Remote Job Entry (RJE)
- DECnet/SNA Data Transfer Facility (DTF)
- DISOSS Document Exchange Facility (DDXF)
- EDE with IBM DISOSS
- Distributed Host Command Facility (DHCF)
- Printer Emulator (PrE)
- Advanced Program-to-Program Communication/LU6.2 Programming Interface (APPC)
- DECnet/SNA VMS 3270 Data Stream Programming Interface (3270 DS)
- DECnet/SNA VMS Application Programming Interface (API)

The following table lists the IBM operating systems supported by each of the access routines.

## DECnet/SNA Access Routines and Programming Interfaces

### IBM Software Supported by Access Routines

DECnet/SNA Access Routine	IBM Software Supported		
	MVS	VM/SP	VSE/SP
DECnet/SNA VMS 3270 Terminal Emulator V1.4	CICS, ISPF, Netview, PS/370, TSO	CMS, PROFS, Netview	CICS, ISPF, NCCF, PS/370
DECnet/SNA ULTRIX 3270 Terminal Emulator, V1.0	CICS, ISPF, Netview, PS/370, TSO	CMS, PROFS, Netview	CICS, ISPF, NCCF, PS/370
DECnet/SNA MS-DOS 3270 Terminal Emulator, V1.0	CICS, ISPF, Netview, PS/370, TSO	CMS, PROFS, Netview	CICS, ISPF, NCCF, PS/370
DECnet/SNA VMS RJE V1.3	JES2, JES3	N/A	VSE/Power
DECnet/SNA VMS API V2.2	CICS, VTAM, IMS, TSO	VTAM, CMS, RSCS	CICS, VTAM
DECnet/SNA VMS 3270 Data Stream Programming Interface V1.3	CICS, IMS, TSO, VTAM	CMS	CICS, VTAM
DECnet/SNA VMS APPC/LU6.2 Programming Interface V2.0	CICS	N/A	CICS
DECnet/SNA VMS PrE V1.1	DSPRINT, CICS, JES 328X	RSCS	CICS, VSE/Power
DECnet/SNA VMS DHCF V1.1	HCF	N/A	N/S
DECnet/SNA VMS DDXF V1.3	DISOSS	N/A	N/S
EDE with IBM DISOSS V2.1	DISOSS	N/A	N/S
DECnet/SNA DTF V2.0	MVS/DTF	N/A	N/A
VAX Message Router/S Gateway V1.0	DISOSS	N/A	N/S
VAX Message Router/P Gateway V1.0	N/A	PROFS, CMS Notes	N/A

N/A means not applicable.

N/S means the product has not been certified and is not supported.

### Message Router/S Gateway (for IBM SNADS)

Message Router/S Gateway is a layered VMS application that allows transparent exchange of messages between Digital and IBM Office Networks. ▲ For more information, refer to "MAILbus Electronic Mail Interchange" in Section 5.

### Message Router/P Gateway (for IBM PROFS)

Message Router/P Gateway is a layered VMS application that allows transparent exchange of messages between Digital and IBM PROFS and CMS systems. ▲ For more information, refer to "MAILbus Electronic Mail Interchange" in Section 5.

### DECnet/SNA VMS Gateway Management

DECnet/SNA VMS Gateway Management provides configuration and management functions for the DECnet/SNA Gateway for Synchronous Transport (DECnet/SNA Gateway-ST) and DECnet/SNA Gateway for Channel Transport (DECnet/SNA Gateway-CT). ▲ Refer to the appropriate descriptions in this section for information on both products.

DECnet/SNA VMS Gateway Management allows the gateway administrator to configure the software executing in the DECnet/SNA Gateway-ST or DECnet/SNA Gateway-CT system. Also, it allows the administrator to establish parameters relating to lines, circuits, physical units, logical units, and other variables necessary for network-to-network communications between the DECnet and SNA networks. Additionally, DECnet/SNA VMS Gateway Management allows the administrator to manage and to diagnose problems related to the DECnet/SNA Gateway.

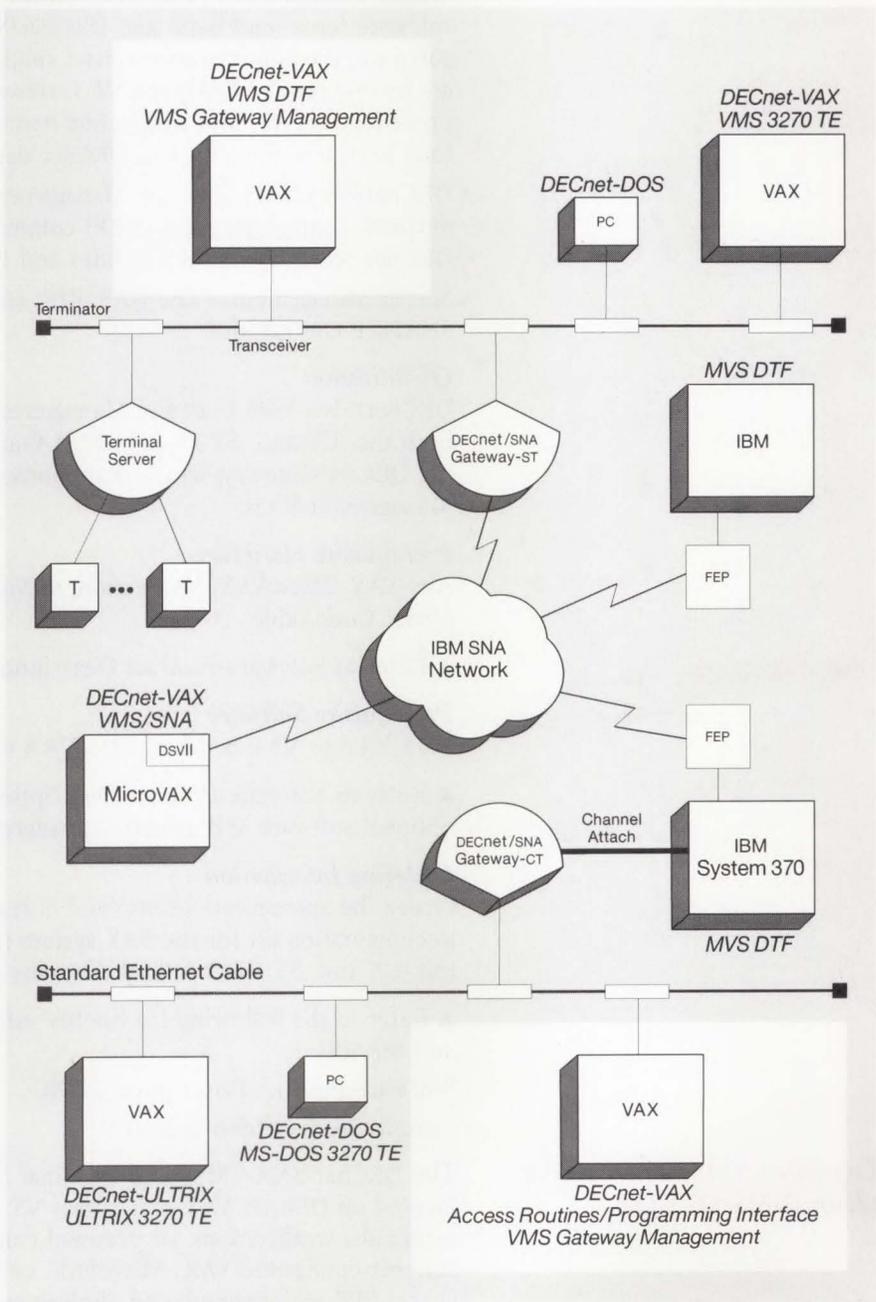
DECnet/SNA VMS Gateway Management includes the following fault isolation tools:

- A trace capability for use with the DECnet/SNA Gateway(s) helps debug application programs and assists in identifying system problems. An operator can run a trace at the line/circuit, physical unit (PU), or session level, then format the data on a specified Digital system. This trace feature helps determine an error for remedial action.
- A “snapshot” monitoring utility displays on a Digital host-controlled terminal the status of the Gateway’s buffer availability, the number of SNA session currently in progress, and other information pertinent to both the DECnet and the SNA network.
- If an irrecoverable error occurs during operation of the DECnet/SNA Gateway system, a memory image may be dumped to a designated Ethernet-attached VAX host.

▲ For further information, refer to Software Product Description 29.70.

## DECnet/SNA Access Routines and Programming Interfaces

*DECnet/SNA VMS Gateway Management Configuration*



NBG-105-01

### **Qualifications**

Note that only DECnet/SNA VMS Gateway Management V1.x supports DECnet/SNA V1.x (DECSA-FA/DX24).

## DECnet/SNA Access Routines and Programming Interfaces

### **Features**

- Simple configuration procedure—After installing DECnet/SNA Gateway software (on a load host) and DECnet/SNA VMS Gateway Management software, the administrator runs a single configuration procedure appropriate for the type of DECnet/SNA Gateway to be used. This configuration procedure creates files that define items for the DECnet database on the load host, and the SNA and DECnet databases on the Gateway.
- DECnet/SNA VMS Gateway Management utility—The Gateway supports network control program (NCP) commands to manage the Gateway-to-DECnet components such as lines and circuits.
- Server management—The GAS, RJE, and DHCF servers are managed with SNANCP commands.

### **Qualification**

DECnet/SNA VMS Gateway Management V2.0 can configure and monitor both the -CT and -ST DECnet/SNA Gateway products. It does not support the DECSA Gateway, which is supported by DECnet/SNA VMS Gateway Management V1.0.

### **Prerequisite Hardware**

Any VAX, MicroVAX, VAXstation, or VAXserver system specified in the Order Code table.

▲ Refer to Software Product Description 29.70 for other requirements.

### **Prerequisite Software**

VMS V4.6 to V5.0 or MicroVMS V4.6 to V4.7

▲ Refer to Software Product Description 29.70 for information regarding optional software and growth considerations.

### **Ordering Information**

Order the appropriate license and at least one copy of the distribution and documentation kit for the VAX system that will downline-load and monitor the -CT and -ST DECnet/SNA Gateway products.

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 29.70
- Unique Product Identifier VCK

### **DECnet/SNA VMS 3270 Terminal Emulator (VMS 3270 TE)**

The DECnet/SNA VMS 3270 Terminal Emulator (VMS 3270 TE) is software layered on DECnet-VAX that allows VT users (or users of other Digital terminals, workstations, or personal computers in VT emulation mode) on suitably configured VAX, MicroVAX, or VAXstation systems to interactively access IBM mainframe-based applications. The applications for use by the VMS 3270 TE are those originally developed for IBM 3270 display stations in a Systems Network Architecture (SNA) networking environment.

The VMS 3270 Terminal Emulator gains access to the SNA environment via a DECnet/SNA Gateway product or VMS/SNA software.

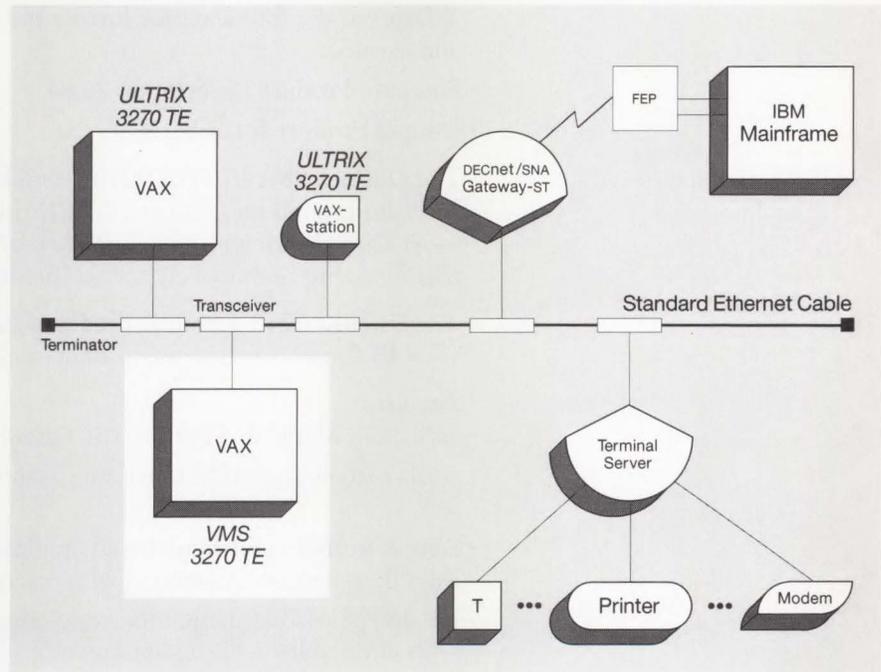
### **Features**

- IBM 3x78 Models 2, 3, 4, or 5 Terminal Emulation.
- Support for multiple IBM Operating System environments (MVS, VM, VSE/SP).

## DECnet/SNA Access Routines and Programming Interfaces

- Support for SSCP-LU sessions—Supports USS screen (also called Message 10) and by use of the SYS REQ key allows users to switch easily between SSCP-LU and LU-LU sessions.
- Support for SPAWN/ATTACH commands—Allows users to create subprocesses and easily switch between VMS processes using SPAWN/ATTACH commands.
- Support for RECORD/PLAYBACK—Allows users to save frequently used key sequences and associate them with particular PF keys. The key sequences saved (recorded) can then be executed by pressing the desired PF key. Up to 127 keystrokes can be saved on each PF key.
- Support for Numeric Lock Override—Allows users to enter nonnumeric characters in numeric fields. The numeric lock override feature is enabled/disabled by the NUM OVR key.

### VMS 3270 Terminal Emulator Configuration



NBG-148-00

### ***Prerequisite Hardware***

The VMS 3270 TE is supported on any valid VAX, MicroVAX, or VAXstation running VMS and DECnet-VAX. (The order code table lists the supported processors.) ▲ For more specific communications configuration information, refer to Software Product Description 26.84.

Access via a DECnet/SNA Gateway requires a VMS-based load host.

▲ Refer to the appropriate DECnet/SNA Gateway product in this section for more information.

### ***Prerequisite Software***

- VMS Operating System V4.6–V5.0 or MicroVMS Operating System V4.6–V4.7
  - DECnet-VAX V4.6–V5.0
  - DECnet/SNA Gateway and Gateway Management Software V1.4 (for DECnet/SNA Gateway configurations), or VMS/SNA V1.2
- ▲ Refer to the following for further information on supported processor and services:
- Software Product Description 26.84
  - Unique Product Identifier 454

### **DECnet/SNA ULTRIX 3270 Terminal Emulator (ULTRIX 3270 TE)**

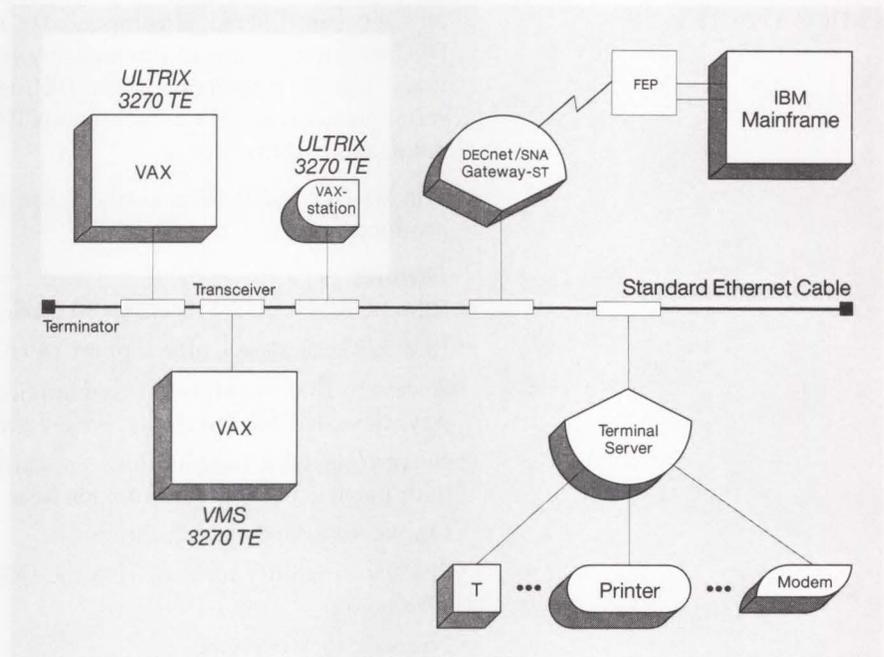
The DECnet/SNA ULTRIX 3270 Terminal Emulator (ULTRIX 3270 TE) is software layered on DECnet-ULTRIX that allows VT users (or users of other Digital terminals, workstations, or personal computers in VT emulation mode) to interactively access IBM mainframe-based applications.

The ULTRIX 3270 Terminal Emulator gains access to the SNA environment via a DECnet/SNA Gateway product only.

### ***Features***

- IBM 3x78 Model 2, 3180 (24×80 mode) Terminal Emulation
- Access to multiple IBM Operating System environments (MVS, VM, VSE/SP)
- Access to IBM mainframe-based applications (via the DECnet/SNA Gateway) designed for interaction with a screen size of 1920 (24×80) characters
- Record/playback function for associating frequently used key sequences with particular PF (Program Function) keys
- Online keyboard customization
- Online help facility
- Numeric lock override
- Local/logical print functions

*ULTRIX 3270 Terminal Emulator Configuration*



NBG-191-01

**Prerequisite Hardware**

The ULTRIX 3270 TE is supported on any valid VAX, MicroVAX, or VAXstation running ULTRIX-32 and DECnet-ULTRIX. (The order code lists the supported processors). ▲ For more specific communications configuration information, refer to Software Product Description 26.40.

IBM Access is via a DECnet/SNA Gateway, which requires a VMS-based load host. ▲ For more information, refer to the appropriate DECnet/SNA Gateway product description in this section.

**Prerequisite Software**

- ULTRIX-32 Operating System V2.2 or later, or ULTRIX Worksystem Software V1.1 (for VAXstation 3200/3500 systems) or later
  - DECnet-ULTRIX V2.2 or later
- ▲ Refer to the following for further information on supported processor and services:
- Software Product Description 26.40
  - Unique Product Identifier VCW

### DECnet/SNA MS-DOS 3270 Terminal Emulator (MS-DOS 3270 TE)

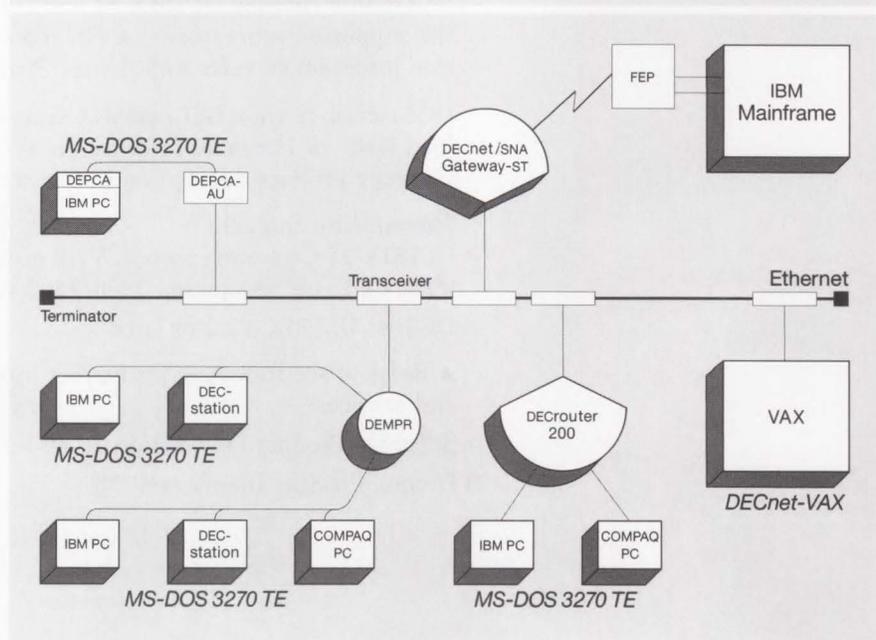
The DECnet/SNA MS-DOS 3270 Terminal Emulator (MS-DOS 3270 TE) is software layered on DECnet-DOS or DECnet-VAXmate, which allows an MS-DOS-based personal computer (PC), connected as an end node in a DECnet environment to interactively access IBM mainframe-based applications. The PC connection to the DECnet environment can be via either a serial port driver with asynchronous DDCMP, or an 802.3/Ethernet communications controller.

The MS-DOS 3270 TE is available for use with the DECnet/SNA Gateway products only.

#### Features

- IBM 3x78 Model 2, 3180 (24x80 mode) Terminal Emulation
- IBM 3279 2A Base Color support (4 colors)
- Access to IBM mainframe-based applications (via the DECnet/SNA Gateway) designed for interaction with a screen size of 1920 (24x80) characters
- Record/playback function for associating frequently used key sequences with particular Program Function keys
- Online keyboard customization
- SPAWN capability for accessing the DOS command environment from the TE session
- Numeric lock override
- Local/logical print functions

*MS-DOS 3270 Terminal Emulator Configuration*



NBG-192-02

## DECnet/SNA Access Routines and Programming Interfaces

### **Prerequisite Hardware**

The following systems are supported:

- DECstation 210
- DECstation 316
- DECstation 320
- Digital VAXmate personal computer
- IBM 5150 Personal Computer
- IBM 5160 Personal Computer XT
- IBM 5162 Personal Computer XT Model 286
- IBM 5170 Personal Computer AT
- IBM 8525 Personal System/2 Model 30
- IBM 8525 Personal System/2 Model 50
- IBM 8525 Personal System/2 Model 60
- IBM 8525 Personal System/2 Model 80
- COMPAQ DESKPRO 286 Personal Computer Model 40
- COMPAQ DESKPRO Model 2

Standard keyboards supplied with the PCs above are supported. The Digital LK250 is also supported on the IBM PC, IBM PC/XT and IBM PC/AT.

The following video adapters are supported:

- MDA (IBM Monochrome Display Adapter)
- CGA (IBM Color Graphics Adapter)
- EGA (IBM Enhanced Graphics Adapter)
- MCGA (IBM PS/2 Model 30 video hardware)
- VGA (IBM PS/2 Model 50, 60, 80 video hardware)

IBM Access requires a DECnet/SNA Gateway, which requires a VMS-based load host. ▲ Refer to Software Product Description 30.15 for DECnet/SNA Gateway configuration details.

### **Prerequisite Software**

Operating system—one of the following depending on PC model:

- VAXmate Standalone Software V2.2
- IBM PC Disk Operating System
- COMPAQ MS-DOS

Digital layered products—one of the following:

- DECnet-DOS or DECnet/PCSA Client
- DECnet-VAXmate

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 30.63
- Unique Product Identifier VVF

### DECnet/SNA VMS Remote Job Entry (RJE)

The DECnet/SNA VMS Remote Job Entry (RJE) access routine allows suitably configured VAX or MicroVAX systems to function as SNA/RJE workstations that can submit batch jobs to an IBM host and receive job output. The RJE access routine must reside on each VAX or MicroVAX system supporting RJE transmission. Note that access routines are not required for DECnet nodes that transmit files to a DECnet system for subsequent RJE processing, nor are they required for any routing nodes between the requesting VAX or MicroVAX system and the DECnet/SNA Gateway. The RJE access routine is available for use with both VMS/SNA and the DECnet/SNA Gateway products.

▲ Refer to Software Product Description 26.85 for further information.

### DECnet/SNA Data Transfer Facility (DTF)

DECnet/SNA Data Transfer Facility (DTF) is a software product that provides bidirectional data transfer capabilities, initiated by either environment, between an IBM MVS system in a Systems Network Architecture (SNA) environment and one or more Digital nodes in a DECnet network. Digital nodes include VMS systems running DECnet-VAX, ULTRIX-32 systems running DECnet-ULTRIX, and MS-DOS systems running DECnet-DOS. Access between the cooperating Digital and IBM environments is via a DECnet/SNA Gateway or VMS/SNA software.

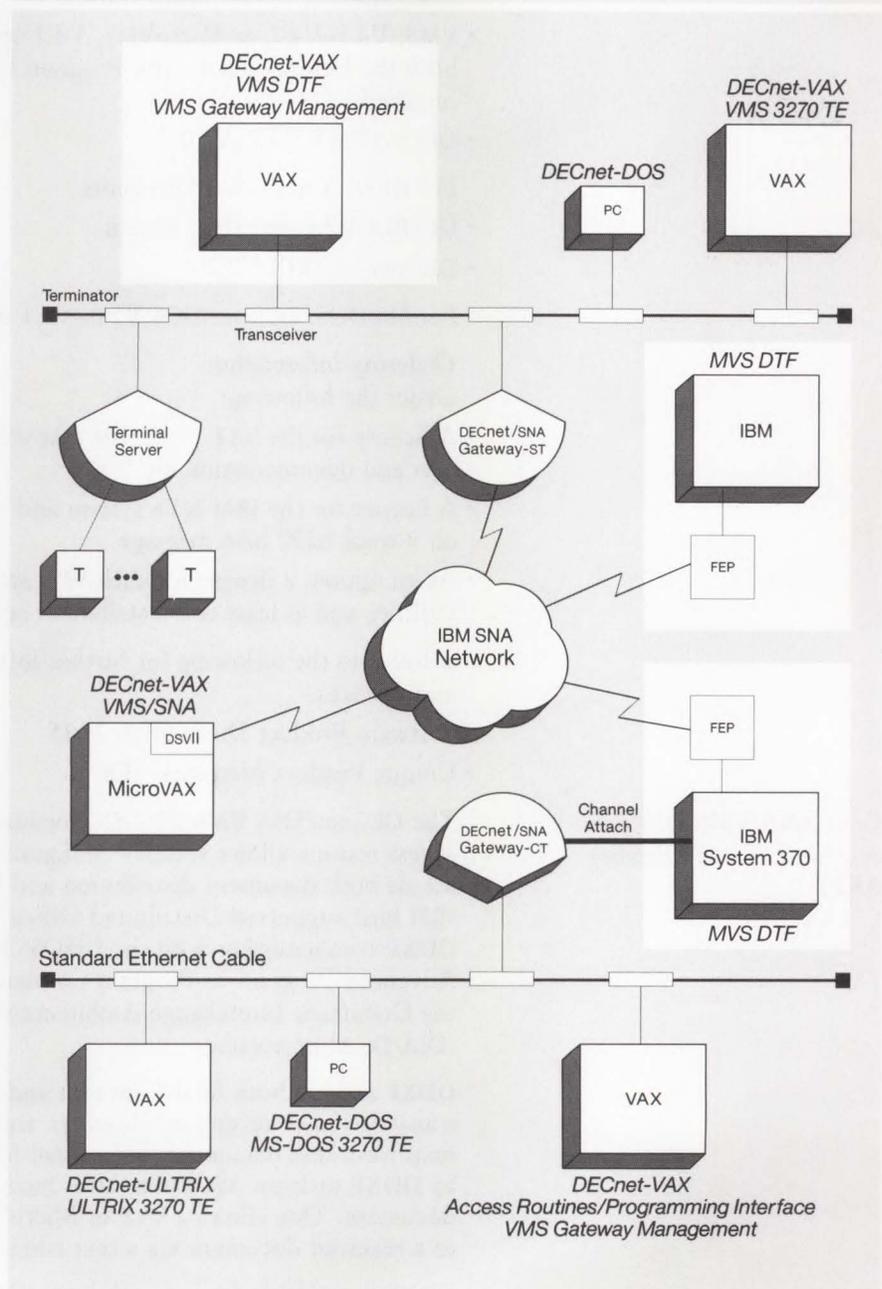
The DTF software comprises these components:

- DECnet/SNA DTF Server software that runs on a DECnet-VAX system to communicate between the DECnet nodes and the MVS/DTF system.
- DECnet/SNA MVS DTF software that runs on the IBM MVS system. MVS/DTF includes a VTAM application program to control the communications with the VMS/DTF Server nodes, a TSO command processor, and an ISPF dialog to initiate transfers from the IBM system.
- Optional DECnet/SNA VMS DTF Utilities software that runs on any DECnet-VAX node that is not a DTF server and that needs to initiate recoverable file transfers.

#### **Features**

- Allows record-level access from VMS systems to MVS data sets via DATATRIEVE, RMS applications, or DCL commands.
- Provides create, read, and write facilities for IBM VSAM and non-VSAM data sets.
- Uses the VMS/DTF Server software via DECnet for all VMS, MS-DOS, and ULTRIX systems.
- Allows MS-DOS, ULTRIX, and VMS systems to initiate nonrecoverable, bidirectional file transfers. Optional VMS Utilities software provides recovery and management capabilities for other networked VMS systems.
- Provides recoverable file transfer for non-VSAM file types between the IBM MVS system and a VMS system.
- Customers maintain control over their corporate data.
- Provides password security through a proxy database on the VMS/DTF Server node for both Digital and IBM users.
- Supports standard user interfaces in Digital and IBM environments.

**DTF Configuration**



NBG-106-01

**Prerequisite Hardware**

A suitably configured VAX/VMS system that will act as the DTF server. ▲ Refer to Software Product Description 27.85 for Server and Utilities block-space requirements.

MVS/DTF is installed on an IBM System 370 class machine (including 43xx and 30xx). ▲ Refer to Software Product Description 27.85 for more information.

## DECnet/SNA Access Routines and Programming Interfaces

### **Prerequisite Software**

For VMS/DTF Server and Utilities,

- VMS, V4.5–V4.7, or MicroVMS, V4.7 operating system. (For MicroVMS, both the Extended Base and Program Development components are required.)
- DECnet/VAX V4.7–V5.0

For ULTRIX and MS-DOS clients,

- ULTRIX V2.2 operating system
- DECnet-ULTRIX V2.2

For MS-DOS, DECnet-DOS V2.0–V2.1 operating system

### **Ordering Information**

Order the following:

- A license for the VAX processor that will act as the server and a distribution and documentation kit
- A license for the IBM MVS system and a software distribution kit delivered on 9-track 6250 b/in magtape
- As an option, a license for each VAX system that requires the VMS/DTF Utilities and at least one distribution and documentation kit

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.85
- Unique Product Identifier VEB

### **DECnet/SNA VMS DISOSS Document Exchange Facility (DDXF)**

The DECnet/SNA VMS DISOSS Document Exchange Facility (DDXF) access routine allows suitably configured VAX or MicroVAX systems to access both document distribution and library services provided by the IBM host supported Distributed Office Support System/370 (DISOSS/370). DDXF communicates with the DISOSS host system using the SNA Advanced Program-to-Program Communication (APPC/LU6.2) facility and the Document Interchange Architecture/Document Content Architecture (DIA/DCA) protocols.

DDXF accepts both final-form-text and revisable-form-text documents for transmission or reception. However, transform routines are provided for final-form-text documents only. Final-form-text documents are translated by DDXF to/from ASCII text after reception or prior to transmission of a document. This allows a VAX or MicroVAX user to perform minor revisions to a received document via a text editor such as EDT.

DDXF is available for use with both VMS/SNA and the DECnet/SNA Gateway products.

### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.72
- Unique Product Identifier 042

### EDE with IBM DISOSS

The EDE with IBM DISOSS product provides VAX or MicroVAX users of ALL-IN-1 Office Menu software or DECdx/VMS access to the Document Library Services and Distribution Services of the IBM DISOSS/370 product running in an SNA environment. Both final-form-text and revisable-form-text are supported/transformed. Operation of EDE with IBM DISOSS is initiated through a simple menu interface, which can be added to the ALL-IN-1 Office Menu or invoked from the DCL system prompt when used with DECdx/VMS. Note: The DISOSS Document Exchange Facility (DDXF) access routine is a prerequisite product.

EDE with IBM DISOSS is available for use with both VMS/SNA and the DECnet/SNA Gateway products.

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.72
- Unique Product Identifier 761

### DECnet/SNA VMS Distributed Host Command Facility (DHCF)

The DECnet/SNA VMS Distributed Host Command Facility (DHCF) access routine allows IBM 3270-class displays connected to an IBM host running the HCF (Host Command Facility) program product in an SNA network to access VAX/VMS systems. The IBM system gains access to VAX/VMS systems through a DECnet/SNA Gateway product. This allows the IBM network manager to control both the IBM and Digital networks from an IBM display terminal. It allows IBM users to access Digital computers and perform VAX functions such as executing VMS commands, reading VAX mail, editing files, and monitoring and controlling VMS processors.

DHCF is available for use with the DECnet/SNA Gateway products only.

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.71
- Unique Product Identifier 043

### DECnet/SNA VMS Printer Emulator (PrE)

The DECnet/SNA VMS Printer Emulator (PrE) access routine allows suitably configured VAX or MicroVAX systems to receive printable data from IBM host-based applications. These applications were originally developed to produce output for an IBM 3287 printer in system mode that is connected to an IBM 3274 cluster controller. Using PrE, either an IBM or Digital terminal user (in 3270 terminal emulation mode) can have a document printed at a Digital printer attached to a local VAX or MicroVAX system.

PrE is available for use with both VMS/SNA and the DECnet/SNA Gateway products.

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.70
- Unique Product Identifier 044

### DECnet/SNA VMS Application Programming Interface (API)

The DECnet/SNA VMS Application Programming Interface (API) supports many different types of sessions between VMS or MicroVMS applications and applications running in an IBM host through its support of Logical Unit Type 0 (LU0) sessions. This product can implement the path control, transmission control, and the data flow control layers of SNA for the VMS user. The API also provides extensive parameter checking, state machine management, and other high-level services.

The DECnet/SNA VMS Application Programming Interface can be used in either basic or extended mode. Two sets of subroutines are provided with the product: the set for the basic mode supports VMS or MicroVMS application programs written with the V1.x product; the set for the extended mode provides users with an easier-to-use interface than earlier versions of the product.

API is available for use with both VMS/SNA and the DECnet/SNA Gateway products.

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.86
- Unique Product Identifier 455

### DECnet/SNA VMS Advanced Program-to-Program Communication/LU6.2 Programming Interface (APPC)

The DECnet/SNA VMS Advanced Program-to-Program Communication/LU6.2 Programming Interface (APPC) allows program-to-program communications between transaction programs on an IBM host and those on a suitably configured VAX or MicroVAX system. The APPC product is a set of subroutines called by VMS programs acting as Logical Unit 6.2 (LU6.2) transaction application programs. Any of the VMS programming languages conforming to the VMS Calling Standard can be used to write VMS or MicroVMS programs that communicate with IBM applications running under IBM's CICS transaction subsystem. APPC implements both the basic and mapped conversation verb set of LU6.2, using additional parameters to implement the mapped verbs.

APPC is available for use with both VMS/SNA and the DECnet/SNA Gateway products.

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.88
- Unique Product Identifier 022

### DECnet/SNA FLASH/IMS Programming Interface (FPI)

The DECnet/SNA FLASH/IMS Programming Interface (FPI) is a layered software package that enables high-level, task-to-task message exchange between cooperating VMS and IMS applications.

FPI facilitates creation of distributed applications where one component of the application runs on an IBM IMS system and another component runs on a VMS system. It is suitable for developing high-performance, realtime, and inquiry-response applications.

Layered on the DECnet/SNA VMS Application Programming Interface (API) software, the FPI software exists on the VMS system as a shareable subroutine library.

#### **Features**

- Provides mechanisms for applications to perform session level recovery in the event of communications failure, ensuring data integrity across sessions and prevents loss or duplication of messages.
- Supports asynchronous and synchronous calls as well as inbound/outbound session activation and multiple SNA sessions per user process.
- Has high-level callable interface that conforms to VMS calling standard.
- Implements SLU-Type P protocol.
- Performs default translation between ASCII and EBCDIC.
- Allows user-definable translation tables.

#### **Availability**

This product is available in the United States only.

#### **Prerequisite Hardware**

- Any valid VAX or MicroVAX system configuration.
- Access between the cooperating Digital and IBM applications is via a DECnet/SNA Gateway or VMS/SNA software.

#### **Prerequisite Software**

- VMS V4.6–V5.0 or MicroVMS Operating System V4.6, V4.7 and DECnet/SNA VMS Application Programming Interface
- For IBM software, any valid IBM system that supports Digital's DECnet/SNA VMS Application Programming Interface

#### **Ordering Information**

For ordering information contact the local Digital sales office.

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.86
- Unique Product Identifier TAM

### DECnet/SNA VMS 3270 Data Stream Programming Interface (3270 DS)

The DECnet/SNA VMS 3270 Data Stream Programming Interface (3270 DS) allows users to develop programs that use Logical Unit Type 2 (LU2) sessions to communicate with IBM application programs. This product can be used in either of two modes—Data Stream Mode or Field Mode. Data Stream Mode programs send and receive uninterpreted 3270 data streams, as defined by IBM. The VMS program interprets the incoming 3270 data stream and builds the data stream that returns to IBM applications. Field Mode programs interpret the incoming 3270 data stream to build a screen image, and produce the 3270 data screen to return to the IBM application from the updated image provided by the VMS application.

3270 DS is available for use with VMS/SNA and the DECnet/SNA Gateways.

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 26.87
- Unique Product Identifier 363

### VAX/IBM Data Access (VIDA)

VAX/IBM Data Access (VIDA) is VMS-layered software that allows integration of data from IBM mainframe databases with VAX databases. VIDA conforms to a read-only subset of the Digital Standard Relational Interface (DSRI) architecture. VIDA users can access IBM data through products such as DATATRIEVE, the Rdb/VMS utilities and embedded Data Manipulation Language (DML), and other layered products that access data through DSRI.

VIDA uses Digital's VMS/SNA Gateway products to communicate with software from Cullinet Software, Inc., running on the IBM mainframe. The Cullinet software accesses the data from the IBM mainframe database, and sends it across a VMS/SNA Gateway to the VAX user's application software. The accessed data can also be stored in a VAX database or file.

#### **Required Hardware**

Digital hardware: Any valid VAX or MicroVAX system configuration and 802.3/Ethernet-based VMS/SNA Gateway.

IBM hardware: Any valid IBM system that supports the required Cullinet Software and Digital's DECnet/SNA VMS 3270 Data Stream Programming Interface. ▲ Refer to Software Product Description 26.87.

### ***Prerequisite Software***

Digital software: VMS V4.5–V5.0 or MicroVMS Operating Systems V4.5–V4.7 and DECnet/SNA VMS 3270 Data Stream Programming Interface V1.1 or later.

IBM software: Any valid IBM system which supports the required Cullinet software and Digital's DECnet/SNA VMS 3270 Data Stream Programming Interface. ▲ Refer to Software Product Description 26.87.

Cullinet software: IDMS-DC/UCF, ICMS Version 10.0 and IDMS/R Version 10.0 with Information Database (IDB).

### ***Ordering Information***

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.25
- Unique Product Identifier B12

The communications used in this group of products is a subset of IBM's Binary Synchronous Communications (BSC) protocol. Access to an IBM host system can be either via batch or interactive methods. Horizontal format control records can be received and processed. A subset of vertical format control escape sequences is supported, specifically single, double, and triple space, form feed, and space suppress. In most cases, any block-addressable storage device supported by the Digital system can be used as a source of transmission files with fixed length (80-character card image), variable length transmitted as either EBCDIC (automatically translated from ASCII), or binary data (no translation). BSC control characters are automatically added to the data before transmission and stripped upon reception.

▲ Refer to Software Product Description 25.07 for more information.

### VAX 2780/3780 Protocol Emulator

The VAX 2780/3780 Protocol Emulator supports the synchronous line protocol used by an IBM 2780 or 3780 Remote Batch Terminal. The emulator provides the VMS user with a mechanism for transferring data between the VMS operation system and another system equipped to handle 2780 or 3780 communications protocols.

The following IBM remote batch terminal features are supported:

- 2780 Extended and Multiple Record Option
- Variable Horizontal Forms Control
- BSC Transparency
- 3780 Space Compression

The VAX 2780/3780 Protocol Emulator can run up to four physical lines concurrently, each with a different set of attributes. For example, some lines may connect to 2780 terminals, others to 3780 terminals, at speeds up to 9.6 Kb/s per line (4.8 Kb/s for MicroVAX II).

#### **Features**

- Can be invoked interactively or by a VMS command procedure.
- Command set designed to facilitate sharing a communication line among several users to reduce network costs.
- With the appropriate modem options, the emulator can automatically answer incoming calls.
- Using a combination of command procedures, the emulator can operate unattended and is capable of
  - detecting an incoming call.
  - establishing the connection.
  - transmitting and receiving files.
  - recovering from transmission failures.

#### **Prerequisite Hardware**

One of the following:

- A MicroVAX or VAXstation system with DPV11 communications interface.
- A VAX-11/700 system (except VAX-11/725) with a DUP11 or DMF32 communications interface; or a VAX-11/725 with a DMF32 communications interface. The VAX-11/730 requires an R80/RL02 configuration.
- A VAX 8000 series system with a DUP11, DMF32, or DMB32 communications interface.

## Binary Synchronous Communications Protocol Emulators

### *Optional Hardware*

- For MicroVAX or VAXstation, up to two additional DPV11 communications interfaces
- For VAX-11/780, VAX-11/782, VAX-11/785, VAX 8600, or VAX 8650, up to three additional DUP11 or DMF32 communications interfaces
- For VAX-11/750, one additional DUP11 or DMF32 communications interface
- For VAX 8200 or VAX 8300, one additional DMF32 or DMB32 communications interface
- For VAX 8530, VAX 8550, VAX 8700, or VAX 8800, up to three additional DUP11, DMF32, or DMB32 communications interfaces

### *Prerequisite Software*

- For MicroVAX and VAXstation systems, MicroVMS with Extended Base component and Program Development component
- For VAX systems, VMS and, if using the DMB32, the DMB32 Synchronous Device Driver

### *Ordering Information*

- ▲ Refer to the following for further information on supported processor and services:
- Software Product Description 25.07
- Unique Product Identifier 111

### VAX 3271 Protocol Emulator

VAX 3271 Protocol Emulator enables VT100 users (or users with Digital terminals or personal computers that emulate the VT100) on a VMS system to communicate interactively with application programs running on an IBM System 370 class host. The 3271 Protocol Emulator can run with IMS/VS, CICS/VS, or TSO, and allows users to implement applications performing remote, online access to IBM databases for data entry, retrieval and update. This capability is an especially efficient migration tool in the transition phase for users who are implementing distributed processing by moving applications from centralized mainframes to VAX distributed processors. The application program interface provides a base for distributed applications where one component of the application runs on an IBM system and the other on a VAX. This type of application is useful in situations such as on line access and update of a mainframe database in response to an event in the VAX system. ▲ Refer to Software Product Description 25.21 for detailed information.

### *Features*

- Manages the modems and line protocols and provides an easy-to-use interface.
- The application program support interface provides on-line access to a mainframe database.
- Executes the WRITE, GENERAL POLL, and SPECIFIC POLL command sequences.
- Allows the system manager to control and monitor the activity of the emulator.

## Binary Synchronous Communications Protocol Emulators

- The 3270 Terminal Emulation utility causes a screen display transmitted from the IBM system to be displayed on the Digital terminal in a fashion similar to the display on a 3270, and maps the Digital terminal keyboard to simulate the 3270 keyboard.

### ***Prerequisite Hardware***

One of the following:

- A MicroVAX or VAXstation system with DPV11 communications interface.
- A VAX-11/700 system (except VAX-11/725) with a DUP11 or DMF32 communications interface, or a VAX-11/725 with a DMF32 communications interface. The VAX-11/730 requires an R80/RL02 configuration.
- A VAX 8000 series system with a DUP11 or DMF32 communications interface.

### ***Optional Hardware***

- For MicroVAX or VAXstation, up to two additional DPV11 communications interfaces
- For VAX-11/780, VAX-11/782, VAX-11/785, VAX 8600, or VAX 8650, up to three additional DUP11 or DMF32 communications interfaces
- For VAX-11/750, one additional DUP11 or DMF32 communications interface
- For VAX 82xx or VAX 83xx, one additional DMF32 communications interface
- For VAX 8530, VAX 8550, VAX 87xx, or VAX 88xx, up to three additional DUP11 or DMF32 communications interfaces

### ***Prerequisite Software***

- For MicroVAX I, MicroVAX II, and VAXstation II systems, MicroVMS with Extended Base component and Program Development component
- For VAX systems, VMS operating system

### ***Ordering Information***

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 25.21
- Unique Product Identifier 112

## **RSX-11 2780/3780 Emulator**

The RSX-11 2780/3780 software emulates the communications protocol of an IBM 2780 or 3780 data communications terminal while running as a user task on a suitably configured RSX-11M or RSX-11M-PLUS system. This product is not designed to run on RSX-11S systems.

The RSX-11 2780/3780 Emulator appears as an IBM 2780 or 3780 data transmission terminal on point-to-point switched or nonswitched communications line operating with standard 2780/3780 protocol.

This product can transmit and receive data and job control files with an IBM System/370 class host system running batch subsystems such as POWER, HASP, RES, JES2, or JES3. RSX-11 2780/3780 software will transmit files from or store received files on any file-structured device accessible through the RSX-11M or RSX-11M-PLUS File Control Services (FCS) except DECTape or TU58.

## Binary Synchronous Communications Protocol Emulators

On a mapped system the RSX-11 2780/3780 Emulator also supports a spooling feature that allows users to queue one or more files for subsequent transmission or printing.

Users running the RSX-11 2780/3780 Emulator on an unmapped system are limited to one-line support, 2780 emulation, and attended mode.

▲ Refer to Software Product Description 10.01 for further information.

### **Features**

- Transmission from disk storage devices.
- Capable of queuing transmission request in unattended operation.
- Maximum transmit and receive block size of 400 characters in 2780 mode, 512 characters in 3780 mode.
- Maximum transmit and receive record size of 144 characters.
- Handles up to seven records per block in 2780 mode and up to 256 records per block in 3780 mode.
- Supports vertical and horizontal print format control.
- Supports binary or EBCDIC transmission.
- Selectable EBCDIC-to-ASCII conversion on Receive.
- Space Compression/Expansion in 3780 mode.
- Concurrent operation with application programs.
- Automatic retry of unattended mode transmissions.
- Error log recording and loopback facilities.
- Supports up to four lines concurrently.
- Supports line speeds up to 9,600 b/s half duplex, although CPU utilization on small RSX-11M systems will make support of more than two lines running at 9,600 b/s.

### **Prerequisite Hardware**

RSX-11M or RSX-11M-PLUS system configuration with

- At least an additional 16 Kwords of memory available for this product (10 Kwords for unmapped systems). Requirements vary with option and configuration; see product documentation for exact requirements.
- One DU11, DUP11, DUV11, or DPV11 synchronous line interface per line.

### **Prerequisite Software**

One of the following operating systems:

- RSX-11M operating system
- RSX-11M-PLUS operating system

### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 10.01
- Unique Product Identifier D82

## Binary Synchronous Communications Protocol Emulators

### Micro/R SX 2780/3780 Emulator

The Micro/R SX 2780/3780 Emulator is a layered software product that extends the ability to communicate with IBM systems using Binary Synchronous Communications (BSC) protocols in both a batch and interactive manner.

Micro/R SX 2780/3780 emulates the communications protocol of an IBM 2780 or 3780 remote batch terminal. Data may be transferred between the Micro/R SX system and the IBM system that supports the IBM 2780 or 3780 protocol.

#### **Prerequisite Hardware**

- Any system with 512 Kbytes of memory
- One DPV11 synchronous communications device (Note: Maximum line speed is between 2400 and 4800 b/s.)

#### **Prerequisite Software**

Micro/R SX V3.0

Follow the guidelines described in the Software Product Description regarding prerequisite support and customer responsibility for installing this product.

#### **Ordering Information**

- ▲ Refer to the following for further information on supported processor and services:
- Software Product Description 18.32
- Unique Product Identifier D82

### RSX-11/3271 Protocol Emulator

RSX-11/3271 Protocol Emulator (PE) enables VT100 or VT200 users on an RSX-11M or RSX-11M-PLUS system to communicate interactively with application programs running on an IBM System 370 class host. The 3271 PE can run with IMS/VS, CICS/VS, or TSO. The protocol emulator makes it possible to implement applications performing remote, online access to IBM databases for data entry, retrieval and update.

This capability is an especially efficient migration tool in the transition phase for users who are implementing distributed processing by moving applications from centralized mainframes to PDP-11 distributed processors. The RSX-11/3271 PE allows users to access the applications that remain on mainframes through their local PDP-11 systems.

The application program interface provides a base for distributed applications where one component of the application runs on an IBM system and the other a PDP-11. This type of application is useful in situations such as online access and update of a mainframe database in response to an event in the PDP-11, or where it is inappropriate to present a 3270-style formatted screen to a user who is accustomed to RSX-11-style screens.

- ▲ Refer to Software Product Description 10.88 for further information.

## Binary Synchronous Communications Protocol Emulators

### **Prerequisite Hardware**

RSX-11M or RSX-11M-PLUS system configuration with

- Synchronous interface: either a DV11, a DUP11, or a DUV11.
- Additional memory available for the RSX-11/3271 Protocol Emulator Application Interface:
  - 16 Kbytes for the first or only 3270 controller emulated by the application interface (i.e., for the first or only synchronous line).
  - 2 Kbytes for each synchronous line after the first.
  - 1.2 Kbytes of pool for the protocol emulator and approximately 60 bytes of pool for each application task supported.
- Installation requires approximately 4,800 blocks of disk space; approximately 2,800 are required for generation.

### **Prerequisite Software**

RSX-11M or an RSX-11M-PLUS operating system

### **Features**

- Manages the modems and line protocols and provides an easy-to-use interface so that the application programmer does not have to be knowledgeable about communications.
- The application program support interface provides online access to a mainframe database.
- Executes the WRITE, GENERAL POLL, and SPECIFIC POLL command sequences.
- Allows the system manager to control and monitor the activity of the emulator.
- The 3270 Terminal Emulation utility causes a screen display transmitted from the IBM system to be displayed on the VT100 in a fashion similar to the display on a 3270, and maps the VT100 keyboard to simulate the 3270 keyboard.
- The hardware is microprocessor-driven providing Direct Memory Access (DMA) for the DUP11 synchronous line adapter on PDP-11 UNIBUS configurations. The DMA ability reduces the CPU overhead associated with the transmission and reception of messages compared to a character interrupt method that interrupts the CPU for each character as it is received.

The terminal emulator portion of the RSX-11/3271 Protocol Emulator supports the following features of the 3277 Model 2 terminal:

- 1,920-character screen
- Upper/lowercase, numeric, and special symbol characters
- Field attribute characters, protected and unprotected fields
- Tab stop
- Overstrike and insert mode
- Reverse video and intensified display (both requiring the VT100 Advanced Video Option), display or nondisplay characters

### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 10.88
- Unique Product Identifier D76 (RSX-11M), D84 (RSX-11M-PLUS)

## Binary Synchronous Communications Protocol Emulators

### Micro/R SX 3271 Protocol Emulator

The Micro/R SX 3271 PE is a layered software product that enables supported Digital terminals and application programs to interact with IBM system application programs and system services that use the Binary Synchronous Communications (BSC) line discipline. Digital terminal users access the 3270 Terminal Emulator which is part of the Micro/R SX 3271 PE distribution; application programmers use an application program interface (API) provided as part of the Micro/R SX 3271 PE product.

#### **Prerequisite Hardware**

- Any system with 512 Kbytes of memory
- One DPV11 synchronous communications device.

Note: Maximum line speed supported is between 2400 and 4800 b/s.

#### **Prerequisite Software**

Micro/R SX V3.0

Follow the guidelines described in the Software Product Description regarding prerequisite support and the customer's responsibility for installation of this product.

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 18.33
- Unique Product Identifier D84

### RSX-11M/RSX-11M-PLUS RJE/HASP Emulator

The RSX-11M/RSX-11M-PLUS RJE/HASP Emulator is a software package that performs the standard functions of an IBM HASP Remote Job Entry Workstation. It operates as a set of tasks under the RSX-11M-PLUS operating system.

The emulator provides multileaved (pseudosimultaneous, bidirectional) communication of up to seven input and seven output data streams. The number of input and output streams accommodated by the emulator is fixed at assembly time. The operator can assign operating supported devices to data streams on a per-file or temporarily dedicated basis.

#### **Features**

- Data compression of repeated sequential characters including blanks
- Full EBCDIC transparency
- Multileaving
- Printer vertical forms control skip to channel 1 (top of form) is supported (No other vertical forms control is supported.)

## Binary Synchronous Communications Protocol Emulators

### ***Prerequisite Hardware***

- PDP-11/44 or PDP-11/70 with at least 128 K words of memory configured to support RSX-11M-PLUS
- A KG11-A communications arithmetic unit
- A tape drive capable of reading the distribution media
- At least 14 Kwords of memory allocated for RSX-11M-PLUS RJE/HASP operation with one input and two output streams
- 600 words of memory required for each additional stream with File Control Services (FCS)
- One of the following synchronous communications line controllers: DP11, DU11, or DUP11 for line speeds up to 4,800 b/s
- One of the following Bell System modems or a modem that is exactly equivalent:
  - 201A 2.0 Kb/s dialup
  - 201B 2.4 Kb/s private line
  - 201C 2.4 Kb/s dialup
  - 208A 4.8 Kb/s private line
  - 208B 4.8 Kb/s dialup
  - 209A 9.6 Kb/s private line
  - 19.2 Kb/s current Bell

▲ For host system compatibility, consult Software Product Description 10.48.

### ***Prerequisite Software***

RSX-11-PLUS operating system

### ***Ordering Information***

- ▲ Refer to the following for further information on supported processor and services:
- Software Product Description 10.48
- Unique Product Identifier 563

**VMS/ULTRIX Connection**

Digital/UNIX Communications software is part of the Internet software family supporting the NFS V2.0 protocol specifications and the networking protocols of the Defense Data Network RFCs.

The VMS/ULTRIX Connection, a VMS layered software product, provides a bridge between VMS servers and ULTRIX clients without modifying the syntax or semantics of either operating system. The VMS/ULTRIX Connection supports Internet networking protocols and a network file system (NFS) server on VMS. The protocols are

- Transmission Control Protocol (TCP).
- Internet Protocol (IP).
- User Datagram Protocol (UDP).
- Internet Control Message Protocol (ICMP).
- Address Resolution Protocol (ARP).
- File Transfer Protocol (FTP).

The VMS/ULTRIX Connection also provides a QIO (Queued Input/Output) programming interface so VMS users can write applications to access the lower-level protocols. Users can write networking applications in any VAX language using the standard ASSIGN, DASSGN, and QIO system services.

The Network File System (NFS) server provides UNIX-based clients with transparent access to remote file systems. The NFS server promotes data sharing between clients by providing a central data storage facility for VMS and UNIX file systems.

**Features**

- Customers can connect VMS and ULTRIX systems with UNIX-based systems from other vendors using industry-standard protocols for communication.
- Users can write network applications that access the Internet Networking Protocols using standard VMS services.
- UNIX-based clients can access VMS and UNIX-compatible files stored on a remote VMS-based system or VAXcluster system.
- VMS system managers can manage Internet communications and the FS server without a detailed knowledge of UNIX networking.

**Hardware Requirements**

Refer to the Software Product Description for processor support. At least one Ethernet controller is required.

Note: The VMS/ULTRIX Connection can share the same Ethernet interface with other Digital protocols such as DECnet-VAX.

**Software Requirements**

For the VMS server, VMS V4.7 or later, or MicroVMS V4.7

For UNIX-based clients, any UNIX-based system which supports NFS V2.0 protocol specifications and the networking protocols specified by the Defense Data Network RFCs.

**Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 25.A4
- Unique Product Identifier VHR

**FUSION TCP/IP**

FUSION TCP/IP, developed by Network Research Corporation and distributed by Digital through the Digital Distributed Software (DDS) program, is a communications package that provides full VMS communications services to other vendors' systems that support the Transmission Control Protocol/Internet Protocol (TCP/IP) suite.

**Features**

- Supports TCP/IP communications services over any Digital 802.3/Ethernet communications controllers. The shared version can share an 802.3/Ethernet communications controller simultaneously with DECnet.
- Provides three standard application-level utility services for VMS users:
  - File Transfer: The File Transfer Protocol (FTP) permits the transfer of both text and binary files between network hosts.
  - Electronic Mail: The Simple Mail Transfer Protocol (SMTP) allows users to send and receive mail over the network.
  - Virtual Terminal: The TELNET protocol allows a user to log into a remote system and utilize the resources of the remote host.
- Supports the following protocols: IP, TCP, UDP, ICMP, ARP, and TFTP.

**Availability**

This product is available worldwide.

**Prerequisite Hardware**

Any valid VAX system with a Digital 802.3/Ethernet communications controller

**Prerequisite Software**

VMS, V4.3 or later

**Ordering Information**

Special pricing is available for qualified educational institutions.

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 29.81
- Unique Product Identifier ZDN, ZDQ (shared)

**WIN/TCP and WIN/TCP-DDN**

WIN/TCP and WIN/TCP-DDN, developed by the Wollongong Group and distributed by Digital through the Digital Distributed Software (DDS) program, allow VMS systems to fully communicate with systems that support the Transmission Control Protocol/Internet Protocol (TCP/IP).

**Features**

- WIN/TCP supports TCP/IP communications services over any Digital 802.3/Ethernet communications controller. WIN/TCP-DDN supports connection to the various Defense Data Networks, ARPANET, MILNET, or DISNET through X.25 communications interfaces supplied by Advanced Computer Communications.

## Digital/UNIX Communications Software

- WIN/TCP is based on the most recent specifications for TCP/IP and is compatible with BSD 4.3 UNIX.
- Provides three standard application-level utility services for VMS users:
  - File Transfer: The File Transfer Protocol (FTP) permits the transfer of both text and binary files between network hosts
  - Electronic Mail: The Simple Mail Transfer Protocol (SMTP) allows users to send and receive mail over the network using standard VMS mail facilities.
  - Virtual Terminal: The TELNET protocol allows a user to log into a remote system and utilize the resources of the remote host.
- WIN/TCP and WIN/TCP-DDN support the following protocols: IP, TCP, UDP, ICMP, EGP, an ARP.

### ***Availability***

This product is available in North America only.

### ***Prerequisite Hardware***

For WIN/TCP, any valid VAX system with a valid 802.3/Ethernet communications controller.

For WIN/TCP-DDN, any valid VAX system with a DDN X.25 interface from Advanced Computer Communications.

### ***Prerequisite Software***

VMS, V4.3 or later

### ***Optional Software***

WIN/TCP-DDN Ethernet option adds support for 802.3/Ethernet communications to WIN/TCP-DDN.

WIN/TCP DDN option adds support for DDN X.25 interfaces to WIN/TCP.

### ***Ordering Information***

Special pricing is available for qualified educational institutions.

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 29.80
- Unique Product Identifier ZNJ, ZNM, ZNH, ZNL

## TCP/IP

TCP/IP is a software communications product developed by the Wollongong Group and available through Digital's Distributed Software (DDS) program. TCP/IP software under VMS or MicroVMS contains the network protocols required in exchanging messages between various systems connected to a TCP/IP network. The package supports various hardware interfaces to the following networks: Arpanet, 802.3/Ethernet, MILNET, Defense Data Network (DDN), Point-to-Point Networks, custom-designed networks. The DEUNA and DEQNA Ethernet controllers are supported and can be shared by the TCP/IP package, DECnet, and LAT (terminal server protocols). The DMC/DMR-11 is also supported.

### ***DECnet-ULTRIX as an Alternative Solution***

TCP/IP is a suitable solution for a single VMS node in a large UNIX environment. However, DECnet-ULTRIX communicates between the VMS and ULTRIX environments using DECnet instead of the TCP/IP protocols. DECnet-ULTRIX bridges both environments by supporting the coexistence of the DECnet and TCP/IP protocols. Coexistence means that DECnet and TCP/IP can run together simultaneously (DECnet-ULTRIX systems use DECnet to communicate with other Phase III/IV systems in DECnet networks and TCP/IP is used to communicate with non-Digital systems in Internet networks). DECnet and TCP/IP can also share the same system resources such as the DEUNA and DEQNA Ethernet interfaces, and programs can be written in such a way that either of the lower-level protocols, NSP or TCP, can be used. In general, existing programs running over TCP/IP can be easily modified to run with DECnet. DECnet programs can run over TCP/IP, but only if they do not make use of operations that are specific to DECnet. This feature of coexistence allows a DECnet-ULTRIX system to act as a gateway between DECnet networks and Internet networks. ▲ Refer to “DECnet Communications Software” in this section for a description of DECnet-ULTRIX.

### ***Features***

The following application-level protocols are included in the TCP/IP package:

- SMTP—Simple Mail Transfer Protocol, which allows users to send and receive electronic mail
- FTP—File Transfer Protocol, which allows a user to transfer files between hosts
- TELNET—A protocol which allows a user to log on to a remote system over the network (virtual terminal)
- UDP—User Datagram Protocol, which allows an application program to send messages to other programs via the network (task-to-task communications)
- ICMP—Internet Control Message Protocol, which provides a method of sending messages concerning unusual network events

### ***Availability***

This product is currently not available in Europe.

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 21.34
- Unique Product Identifier 090

## Overview

The fundamental technology used in data networks is called **packet switching**. With it, user data and the accompanying control information needed to ensure delivery are formed in discrete entities called **packets**. The network dynamically interweaves the packets of many users over shared transmission facilities and routes the packets to their destinations.

**Packet Switched Data Networks (PSDNs)** can be public or private. A **public PSDN** is the computer's analogy to the telephone: Once connected to the PSDN, calls can connect to any other number on that network, or to any number on another public PSDN that is cross-connected to it (for example, for international data communication). Calls can be normally or reverse-charged, and the customer pays a tariff related to time-of-day, number called, and duration and amount of data. The tariff structures vary considerably between public PSDNs, but the data charges are generally more significant than either time or distance factors.

**Private PSDNs** are owned and operated by one company or group of companies, for inter- rather than intra-company communications. Otherwise, they offer the same general features as their public counterparts.

Digital's Packetnet System Interface (P.S.I.) products extend the high-level DECnet functions of Digital's Network Architecture to computer systems communicating across PSDNs. The currently available products are

- **X25router 2000.**
- **VAX P.S.I. and VAX P.S.I. Access.**
- **RSX-11 P.S.I./M.**
- **RSX-11 P.S.I./M-PLUS.**

These interfaces allow suitably configured Digital systems to connect to packet switched data networks that conform to the CCITT Recommendation X.25. (CCITT is the International Telephony and Telegraphy Consultative Committee, an advisory committee established under the United Nations to recommend worldwide standards.) VAX P.S.I. also supports International Standards 7776 and 8208, which standardize the protocols described in the CCITT recommendations.

### **Features**

Packet-switching networks offer a number of benefits to a customer looking for low-to-medium data communications rate to a reasonable number of remote locations, and in particular when the remote locations tend to be undefined. These benefits can include

- Reduced complexity of wiring—only one physical line can handle multiple calls simultaneously, to the same or different remote locations.
- The same network can handle computer-to-computer and terminal-to-computer traffic.
- The tariff is less than leased lines if the data rate to the remote site is relatively low.
- Because it is an internationally recognized protocol, X.25 can be used as a common carrier for multiple protocols, avoiding duplication of networks.
- A level of multivendor operation, especially when used to carry Open System Interconnection (OSI) protocols above the basic X.25 protocols.
- Simpler network management as a result of reduced proliferation of lines and protocols.

**Applications**

Applications where packet-switching communications technology is particularly suitable include

- Dial-in access to or from the general public.
- Any OSI applications such as electronic mail to customers or other third parties.

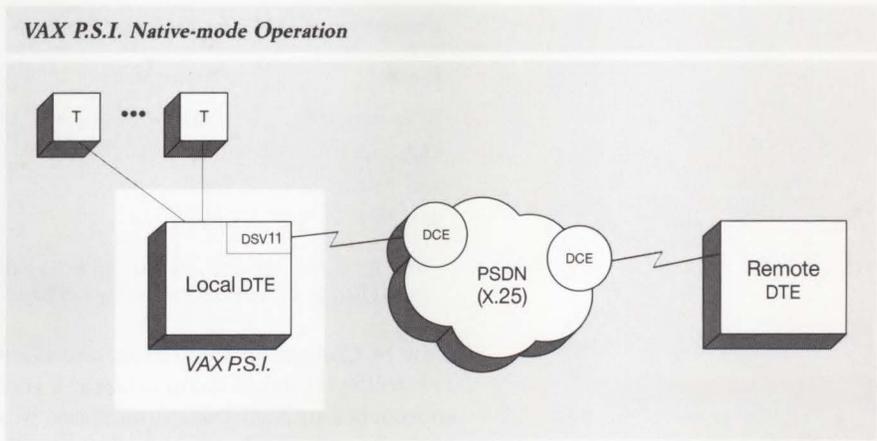
▲ For an introduction to packet switching networks and the user benefits associated with their use, refer to *Introduction to VAX P.S.I.* (AA-LO67D-TE) or *Introduction to RSX P.S.I.* (AA-M369B-TC) in the product documentation sets.

For connections to private networks other than those conforming to the ISO 7776/8208 standards, Digital requires that its P.S.I. software be specifically configured. Consult the local Digital sales representative for details.

**Native, Access, and Connector Modes**

Digital's Packetnet products can act in three ways, each giving different configuration benefits. These ways are referred to as native mode, access mode, and connector mode.

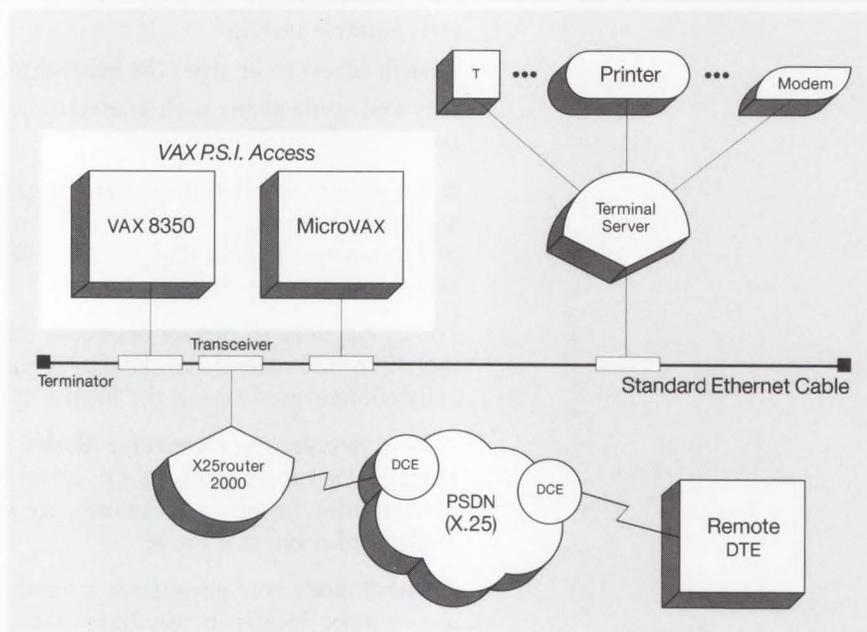
A **native-mode** configuration is a standalone CPU with direct connection to one or more PSDNs. It may have other DECnet connections, but the essential point is that all communications to or from any PSDN originate or terminate in that same CPU. The following figure shows VAX P.S.I. in native mode.



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**Access mode** allows communications to take place to or from a PSDN that is not directly connected to that CPU. The PSDN is connected to another node, called a **connector node**, and the connector node communicates with the access node by DECnet (usually, but not necessarily, over an 802.3/Ethernet local area network). The following figure shows VAX P.S.I. Access in such a configuration.

**VAX P.S.I. Access with Connector Mode of Operation**



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The following table indicates the mode of the various Digital Packetnet products:

**Comparison of Modes for Packetnet Products**

Product	Native Mode	Access Mode	Connector Mode
X25router 2000	No	No	Yes
VAX P.S.I.	Yes	No*	Yes
VAX P.S.I. Access	No*	Yes	No*
RSX P.S.I.	Yes	No	No

\*VAX P.S.I. and VAX P.S.I. Access can be installed in the same system to provide combined native, connector, and access facilities.

**How to Choose between Host and Gateway X.25 Connections**

The following table summarizes the trade-offs and benefits of the two approaches to X.25 communications in an 802.3/Ethernet environment: direct connection between a PSDN and the system that needs to access it; and indirect connection using access and connector modes.

*Comparison of Direct and Connector Packetnet Connection*

	<b>Direct Connection</b>	<b>Connector Connection</b>
Cost of connections	One per system	One shared between all systems on 802.3/Ethernet LAN
Cost of devices	One set per system; may be limited in speed as a result of cost factors	Shared devices on the connector node(s); possible to use fewer, higher-speed lines
Technology Considerations	Specific to each system concerned; may need to change if processor types change	Specific to the connector node only; no change needed if other processors change
DECnet communication	Requires a DECnet full-function license per system	Handled entirely in one connector node; only end-node licenses needed elsewhere
X.25 or X.29 communication	Uses VAX or RSX P.S.I. on all connected nodes	Uses P.S.I. Access on all other nodes
	No user differences in X.25/X.29 application interfaces/code; applications are portable between (VAX) P.S.I. and P.S.I Access nodes	
CPU overhead: routing DECnet (DLM) data traffic	Can be significant on the directly connected nodes	Handled entirely in the connector node
CPU overhead: X.25 task-to-task and X.29 terminal traffic	Optimal when using direct memory access (DMA) devices	Sometimes higher on access nodes as a result of DECnet overhead

The benefits of using the gateway or connector increase when a high portion of the PSDN traffic is DECnet; the benefits of using direct connection increase when a high portion of the PSDN traffic is task-to-task X.25 or X.29 terminal traffic. A combination of direct connections and connector nodes may sometimes be best.

If an access/connector solution is indicated, the following table shows the benefits of choosing between different connector nodes, that is, VAX P.S.I. in multihost mode and the X25router 2000.

*Comparison of Host and X.25 Gateway Connections*

	VAX P.S.I. Multihost	X25router 2000
Type of solution	Existing VMS system may be used	Dedicated server on the 802.3/Ethernet
Technology	General purpose system	Specific hardware
Public PSDNs supported	Many	Many
Number of lines and line speeds	Not limited, but depends on system used	Four lines at 64 Kb/s or two lines at 256 Kb/s
DECnet communication	Requires DECnet full-function license	Handled entirely in the Gateway node
	Supports Level 1 (local) or Level 2 (area) routing	Supports Level 1 (local) or Level 2 (area) routing
	DDCMP lines require extra devices	Supports up to four DDCMP lines
CPU overhead in the access nodes	No difference between the two solutions.	
CPU overhead in the gateway node	Can be significant, depending on the VAX system	Puts the CPU load on the Gateway rather than on a VAX system
Load host	Not required	Must be a VAX/VMS system

**Multivendor Aspects**

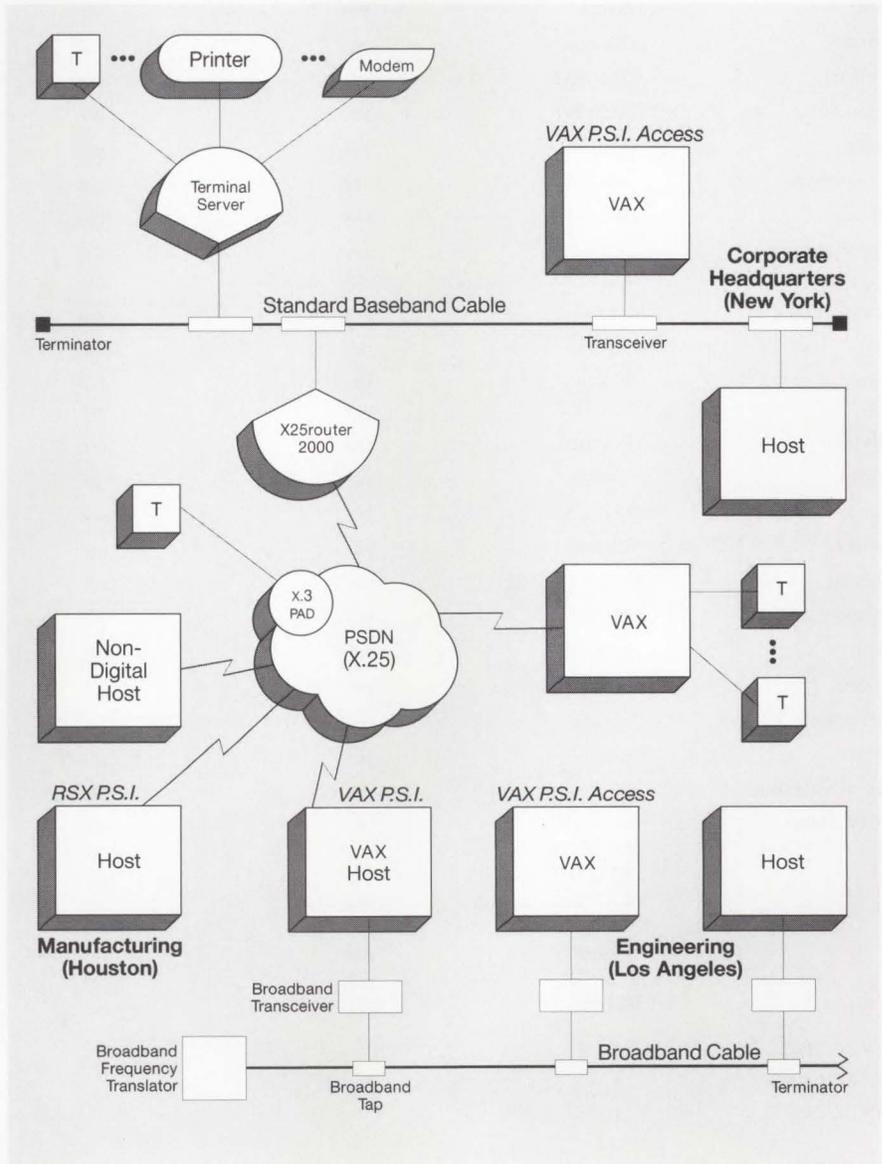
Because many networks contain non-Digital systems, Digital fully supports the concept of cooperative computing via the Packetnet family of products. These products provide extended X.25 capabilities including communications with non-Digital hosts and asynchronous terminals connected to the X.25 network. Note that when X.25 is used as the data link protocol between Digital systems and non-Digital systems, all upper-level software (such as file transfer protocols) must be written by the user, or purchased separately (for example, the VOTS product from Digital for OSI multivendor communications).

The configuration shown in the following figure enables the following communications:

- Digital-to-Digital communications using DECnet between the X25router 2000 at New York, the Houston PDP-11 running RSX P.S.I. and DECnet-RSX, and the Los Angeles VAX P.S.I. node. DECnet routing on the two 802.3/Ethernet local area networks means that the use of the X.25 PSDN is transparent to users on other 802.3/Ethernet nodes at New York and Los Angeles.
- Customers can write applications to communicate between a VAX P.S.I. Access node on the two local area networks and any Digital or non-Digital node connected to the PSDN. The same is true for OSI applications, subject to support of such in all nodes concerned.
- Terminals connected to VAX hosts on the 802.3/Ethernet local area networks, or the RSX P.S.I. node at Houston, can make outgoing calls to log into any Digital or non-Digital node on the PSDN, or any VAX P.S.I. Access node on the local area network.

- Remote terminals on the PSDN can use Packet Assemblers/Disassemblers (PADs) to place calls into any Digital or non-Digital node connected to the PSDN, including the RSX P.S.I. node at Houston. These calls can access any VAX P.S.I. Access node on either of the two 802.3/Ethernet local area networks. The PADs may be "public" PADs provided as a part of the PSDN service, accessible through dedicated or dialup telephone connections or, depending on PSDN policies, a customer-owned "private" PAD such as the DFX product connected to the PSDN by a synchronous leased line. ▲ Refer to Section 3 for more information on Assemblers/Disassemblers.

*Packetnet Communications Including Non-Digital Computers*



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## Packetnet Communications Software

### Currently Supported PSDNs

The following table lists the currently supported public PSDNs by country and product. ▲ Consult the local Digital sales office for the latest additions to this table.

#### Supported Public PSDNs

Country	Public PSDN	VAX P.S.I.	RSX P.S.I.	X25router 2000
Australia	Austpac	yes	no	yes
Austria	Datex-P	yes	yes	yes
Belgium	DCS	yes	no	yes
Brazil	Renpac	yes	no	yes
Canada	Datapak	yes <sup>1,3</sup>	yes <sup>1</sup>	yes <sup>1</sup>
Denmark	DATAPAK	yes	no	yes
Finland	DATAPAK	yes	no	yes
France	Transpac	yes	yes	yes
W. Germany	Datex-P	yes	yes	yes
Holland	Datanet-1	yes	yes	yes
Hong Kong	INTELPAC DATAPAK	yes yes	yes no	yes yes
Ireland (Eire)	Eirpac	yes	yes	yes
Italy	ITAPAC	yes	no	yes
Japan	DDX-P VENUS-P	yes <sup>1,3</sup> yes <sup>3</sup>	no no	yes yes
Malaysia	Maypac	yes	no	yes
Mexico	Telepac	yes	no	yes
Norway	DATAPAK	yes	no	yes
Portugal	Telepac	yes	no	yes
S. Korea	DATAKOM-NET	yes	no	yes
Singapore	Telepac	yes	no	yes
Spain	IBERPAK	yes	no	yes
Sweden	DATAPAK	yes	no	yes
Switzerland	Telepac	yes <sup>2,3</sup>	yes <sup>2</sup>	yes <sup>2</sup>
Taiwan	Pacnet	yes	yes	yes
United Kingdom	PSS	yes	yes	yes
United States	ACCUNET AUTONET INFONET Mark*net Extended PTN-1 Telenet TYMNET Worldnet	yes yes yes yes yes yes yes yes	no no no no no yes yes no	yes yes yes yes yes yes yes yes

<sup>1</sup>CCITT 1976

<sup>2</sup>CCITT 1978

<sup>3</sup>CCITT 1980

**X25router 2000**

The X25router 2000 is a combination hardware/software product that provides access to one or more PSDNs for any system on the LAN that runs a supported VAX P.S.I. Access product. It also provides access to any DECnet system that uses the PSDN to carry DECnet traffic to remote Digital systems.

The X25router is the preferred method for accessing a PSDN. ▲ For more information on the X25router 2000, refer to “802.3/Ethernet Communications Servers” in Section 2.

**VAX P.S.I. and VAX P.S.I. Access**

The VAX P.S.I. products allow suitably configured VMS systems to connect to, and/or access, Packet Switching Data Networks (PSDNs). The product set consists of two options: full-function VAX P.S.I. and a subset of that product, VAX P.S.I. Access. VAX P.S.I. allows connection to PSDNs conforming to CCITT recommendations X.25 (1978, 1980, or 1984) or to Full or Draft International Standards (ISO or DIS) 7776 and 8208.

Both options enable process-to-process and terminal communications between a VAX and remote Data Terminal Equipment (DTE) in a PSDN supporting the X.25 interface protocol. VAX P.S.I. also enables direct connection to equipment acting as either Data Circuit Terminating Equipment (DCE) or DTE using the ISO 7776/8208 protocols.

**VAX P.S.I.**

VAX P.S.I. allows a standard VMS system to use X.25 connections to any number or combination of the following:

- One or more DTEs (lines) connecting to X.25 PSDN(s) conforming to the CCITT X.25 recommendations (1978, 1980, or 1984)
- Point-to-point connections to one other DTE or DCE conforming to the ISO 7776/8208 protocols

Most facilities and options of the CCITT recommendations can be supported with VAX P.S.I. Consult the Software Product Description for details.

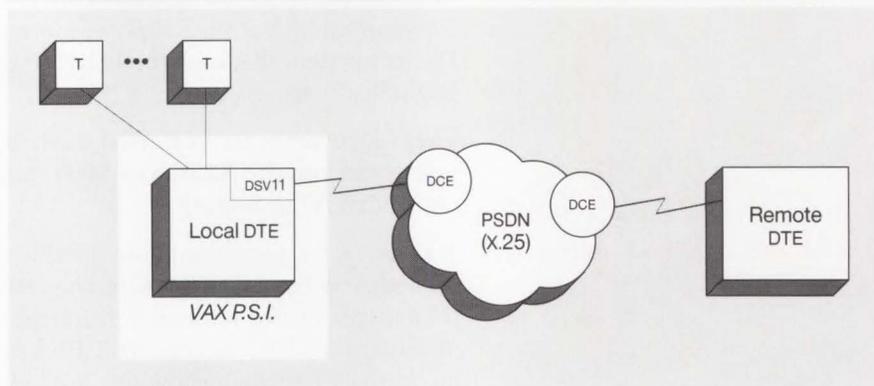
VAX P.S.I. can be configured for either multihost or native mode operations. When installed in native mode, VAX P.S.I. supports access to the PSDN or DTE only from processes in the VAX processor on which it is installed. When installed in multihost mode in a DECnet-VAX node, VAX P.S.I. acts as a connector node to the PSDN or DTE, supporting access to the network by other properly configured local or remote VAX hosts. These additional hosts must be DECnet-VAX systems on which the VAX P.S.I. Access software has been installed.

VAX P.S.I. is a layered VMS product and may be used in the following ways:

- Process-to-process (X.25) communication
- Process-to-terminal communication (remote terminal)
- Terminal-to-process communication (remote CPU)
- Full DECnet communication (Digital remote hosts only)
- As part of an OSI multivendor communications environment (when used with Digital's VOTS product and OSI applications)

For all the uses above, VAX P.S.I. provides accounting, security, and P.S.I. Mail.

**VAX P.S.I. Native Mode of Operation**



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**VAX P.S.I. Access**

VAX P.S.I. Access allows a properly configured DECnet-VAX system in a DECnet environment to make logical connections to PSDNs by way of one or more other P.S.I. connector nodes. VAX P.S.I. Access, with the connector node providing physical connections to a PSDN, enables process-to-process and terminal communications between the accessing VAX and remote DTE. The P.S.I. connector node may be one of the following:

- VAX P.S.I. installed in multihost mode. The corresponding version of VAX P.S.I. and VAX P.S.I. Access is required for full functionality, though basic communication will take place with earlier versions of VAX P.S.I.
- An X25router 2000. ▲ Refer to Software Product Description 28.86.

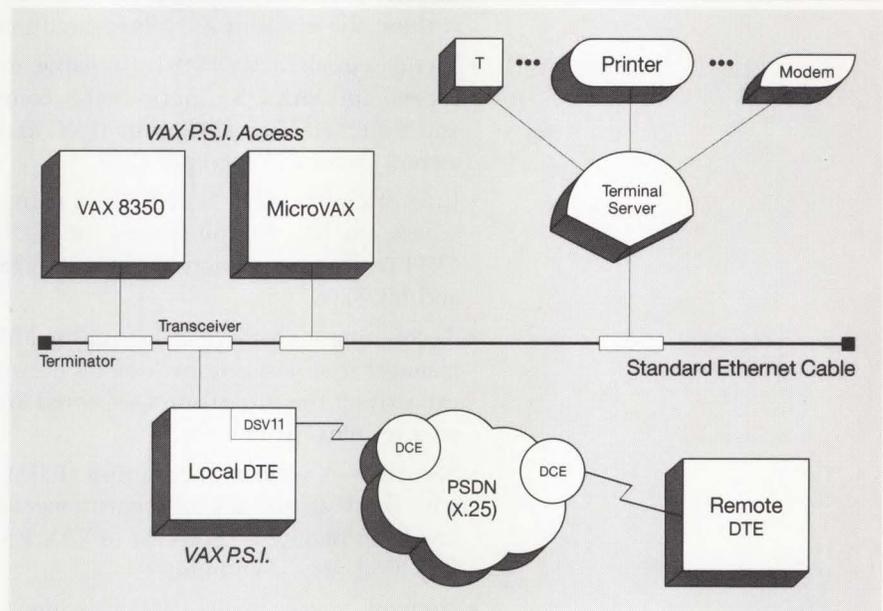
DECnet logical links are established by VMS to connect the VAX P.S.I. Access host to the connector node. These links may use any supported DECnet communications path between the VAX P.S.I. Access node and the connector node, provided they do not themselves use an X.25 connection. VAX P.S.I. Access uses these links to transmit X.25/X.29 messages between the connector node and the VAX P.S.I. Access host.

A single VAX P.S.I. Access host can logically connect to one or more connector nodes concurrently and hence access all PSDNs accessible from those connector nodes. During installation of VAX P.S.I. Access, one of these connector nodes/PSDN combinations is established as the default DTE/DCE connection that outgoing calls will normally use.

VAX P.S.I. Access provides all of the user interfaces of the full-function VAX P.S.I. product, with the ability to utilize these interfaces from a DECnet-VAX node not directly connected to the PSDN. If such connection to a packet switched data network is necessary, the full-function VAX P.S.I. product is required. Applications that work correctly on VAX P.S.I. may be used with VAX P.S.I. Access, and vice versa, if the application is not sensitive to the differences in timing or throughput involved in the transfer.

▲ Refer to Software Product Description 27.78 for more information.

**VAX P.S.I. Multihost Mode of Operation**



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**Features (VAX P.S.I. and VAX P.S.I. Access)**

- Support for multiple networks—A VAX P.S.I. node (native or multihost mode) may be connected to more than one network. This is useful for connection to both a public and private network, or (in those countries where applicable) to several public ones.
- Support for DCE mode of operation—The VAX P.S.I. product may be used to configure individual lines as either a DTE or DCE. Two VAX P.S.I. nodes may be connected “back-to-back,” with one as a DTE and the other as a DCE. Point-to-point configurations are valid only where both ends fully conform to ISO standards 7776/8208.
- Support for CCITT 1984 networks—VAX P.S.I. has the capability to connect to networks conforming to the CCITT 1984 revision of the X.25 family of protocol recommendations.
- Coresidency of P.S.I. and P.S.I. Access—Both VAX P.S.I. and VAX P.S.I. Access can be installed in the same node, granting local users/processes the ability to access a network or networks connected to another P.S.I. multihost node.
- Process-to-process communication—VAX P.S.I. and VAX P.S.I. Access allow application programs to access the packet level of the protocol as defined by the X.25 recommendation. This interface enables an application program using VMS System Services to communicate with complementary software on other systems (Digital or non-Digital DTEs) accessible via the X.25 connection.
- Terminal communications—VAX P.S.I. and VAX P.S.I. Access support terminal communications according to CCITT recommendations X.3, X.28, and X.29. Remote terminals may access the VAX, and local terminals on the VAX may access remote CPUs.

## Packetnet Communications Software

- PSImail—Users of the VMSmail utility may exchange electronic mail directly between VAX P.S.I. (or VAX P.S.I. Access) nodes over a PSDN, without the need for a DECnet circuit connection between the nodes.
- Virtual circuits—VAX P.S.I. (in native mode, or configured for multihost access) and VAX P.S.I. Access offer communication over both Permanent and Switched Virtual Circuits (PVC and SVC), and support up to 512 virtual circuits in total per CPU.
- Line discipline—For VAX P.S.I. in native mode, or configured for multihost access, the line discipline used for PSDN communications complies with CCITT recommendation X.25 (1978, 1980 or 1984) and/or with DIS7776 and ISO8208.
- Accounting—The accounting utility, PSIAccounting, enables the system manager to obtain information on network usage. The Accounting utility can extract the information collected and display the information directly on a terminal or to a file.
- Security—A security mechanism (PSIAuthorize), which is consistent with the VMS access and security mechanisms, offers the means of controlling both remote DTE access to VAX P.S.I. and access to the network by the VAX P.S.I. user community.
- Network management—VMS provides a Network Control Program (NCP) for managing DECnet-VAX, the VAX P.S.I. products, and other Digital communications software. In addition, extensive event-logging and tracing capabilities are available. Trace data may be stored on a file, or displayed “live” on a local terminal.
- Communications—For the best performance, Digital recommends using a DMA device. ▲ Refer to Software Product Description 25.40 for a list of devices VAX P.S.I. supports, and for any restrictions in line speed or function.

### ***Prerequisite Hardware and Software***

DECnet-VAX for VAX P.S.I. multihost operation, VAX P.S.I. Access, or DECnet (DLM) communications across the PSDN.

The KMS/KMV link-level software and drivers are *not* required when these devices are to be used only with VAX P.S.I. The DMB32 synchronous driver is required for use with VAX P.S.I.

### ***Ordering Information***

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 25.40 (VAX P.S.I.), 27.78 (VAX P.S.I. Access)
- Unique Product Identifier 071 (VAX P.S.I.), 061 (VAX P.S.I. Access)

### RSX-11 P.S.I./M and RSX-11 P.S.I./M-PLUS

RSX-11 P.S.I./M and RSX-11 P.S.I./M-PLUS allow suitably configured RSX-11M and RSX-11M-PLUS systems to connect to a single Packet Switched Data Network (PSDN) conforming to the CCITT recommendation X.25 (June 1980). Access to the RSX-11 P.S.I. products is supported for user programs written in MACRO-11, FORTRAN IV/RXS, and PDP-11 FORTRAN/RXS. RSX-11 P.S.I. products support task-to-task and incoming or outgoing remote terminal communications via the network.

The RSX-11 P.S.I. products can coexist with or operate as a layered product under DECnet-11M or DECnet-11M-PLUS to allow use of DECnet facilities over PSDNs, as well as point-to-point connectors, such as private leased lines or switched telephone networks.

The communications discipline used is the CCITT recommendation X.25. Specifically, the product supports EIA-232-D/CCITT V.28 at the hardware level, the symmetric LAPB variant of the X.25 frame-level protocol, and the X.25 packet-level protocol over point-to-point, four-wire, synchronous, full-duplex lines.

#### **Features**

- Supports access from remote terminals according to the CCITT recommendations X.3, X.28, and X.29 (1978 and 1980). Terminals are supported in "Remote X.29 Terminal" mode in which code conversions between ASCII and the actual code used by the terminal are performed by the network.
- Includes a host PAD to permit outgoing X.29 calls from a local terminal connected to the PDP-11 to a remote DTE.
- For intertask communication, application programs use RSX-11M or RSX-11M-PLUS executive calls to set up and break connections with the network, to send and receive data, and to issue control and synchronization requests.
- Offers communications over both Permanent and Switched Virtual Circuits (PVCs and SVCs).
- Manages virtual-circuit calls on behalf of DECnet by using user-data fields as well as subaddressing.
- A Network Control Program and Configuration File Editor are provided for the control of the operation of the X.25 software. This includes loading and unloading.

#### **Prerequisite Hardware**

- Supports all current PDP-11s and MicroPDP-11s.
- Requires at least one of the following communications controllers for each processor:
  - For the PDP-11/23/53/73/83: a DPV11-DA or KMV1A-A
  - For the PDP-11/24/44/70/84: a DUP11-DA, KMS11-BD/BE, or KMS11-PX/PY

## Packetnet Communications Software

### ***Prerequisite Software***

- RSX-11 operating system for RSX-11 P.S.I./M
- RSX-11M-PLUS operating system for RSX-11 P.S.I./M-PLUS

### ***Ordering Information***

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 10.42 (RSX-11 P.S.I./M), 10.43 (RSX-11 P.S.I./M-PLUS)
- Unique Product Identifier D91 (RSX-11 P.S.I./M), D92 (RSX-11 P.S.I./M-PLUS)

Open Systems Interconnection (OSI) is a set of developing standards produced by the International Organization for Standardization (ISO). OSI has been developed by ISO to allow computers made by various manufacturers to communicate with each other using internationally accepted protocols. Users are thus enabled to explore networking in an open environment. OSI is based on an architectural reference model that defines a layered protocol structure for systems communications. The Digital Network Architecture (DNA) is based on the OSI Reference Model.

The OSI model has seven layers with well-defined functions. Each layer builds upon the functionality offered by lower layers. Used with other Digital products, six of the seven layers can be provided. VAX P.S.I. and 802.3/Ethernet products provide services at the Physical, Data Link, and Network Layers of the OSI model. VAX DEC/MAP provides network services for the manufacturing environment at the network, transport, session, and application layers. VOTS provides services at the Transport Layer and OSAK provides services at the Session Layer. Message Router X.400 Gateway, combined with Digital's other MAILbus products, provides mail, messaging, and document interchange services at the Application layer. ▲ Refer to "MAILbus Electronic Mail Interchange" in Section 5 for more information.

Digital's OSI Products

Layer Number	Network Management		Digital OSI Products
	OSI Layers	DNA Layers	
7	Application	User	(Customer written application) Message Router/X.400 Gateway VAX FTAM VAX DEC/MAP
6	Presentation	Network application	
5	Session	Session control	OSAK VOTS
4	Transport	Transport	
3	Network	Routing	VAX P.S.I. or VAX P.S.I. ACCESS IEEE 802.3 Products IEEE 802.4 Products*
2	Data Link	Data Link	
1	Physical Link	Physical Link	

\*Available from Concord Communication, Inc. for UNIBUS or VAXBI processors only.

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The following Open Systems Interconnection products are available:

- VAX FTAM
- VAX DEC/MAP
- Message Router X.400 Gateway
- VAX OSI Applications Kernel (OSAK), which includes VAX OSI Transport Service (VOTS)
- VAX P.S.I. ▲ For more information, refer to "Packetnet Communications Software" in this section.

## Open Systems Interconnection (OSI) Products

### VAX FTAM Open Systems Multivendor File Transfer

VAX FTAM (File Transfer, Access, and Management), a layered product on VMS V5.0, allows VMS systems to use the international standard protocol ISO 8571 to transfer files between other ISO-FTAM-compliant systems in a multivendor network. VAX FTAM copies files, deletes files, and displays information about files between open systems.

An open computer system implements the standards for each of the seven layers of the Open Systems Interconnection (OSI) Basic Reference Model for communications as defined by the International Organization for Standardization. An FTAM system is any open system containing an FTAM implementation that conforms to the FTAM standard and includes the implementations of the necessary underlying OSI services.

VAX FTAM contains components that together include the protocols and services of layers 3 through 7 of the OSI Basic Reference Model, described earlier in this section: the File Transfer, Access, and Management service element; the Association Control Service Element (ACSE) of the Application layer; the Presentation layer; the Session layer; the Transport and Network layers.

VAX FTAM conforms to ISO 8571 and supports transfer of the following document (file) types: FTAM 1—unstructured files containing ASCII data and having stream record formats, FTAM 2—sequential text files with variable record formats and carriage-return attributes, and FTAM 3—unstructured files containing binary data and having stream record formats.

#### ***Features***

- Effortless file transfer among multivendor systems
- Based on ISO standards
- DCL-level access to user facilities
- Flexible and transparent access to local files
- Support for RMS-style format for file specifications
- Support for various file types
- Support for any file-naming convention
- Management tools

#### ***Prerequisite Hardware***

When used in a Local Area Network Environment, VAX FTAM requires that an Ethernet Communications Controller be installed on the VAX system. ▲ Refer to “Ethernet Communications Controllers” in Section 2 and to Software Product Description 29.86 for more information.

Also, a transceiver cable is needed to connect the Ethernet controller to a tap on the local area network. ▲ Refer to “Baseband 802.3/Ethernet IEEE Products” in Section 2 for appropriate order numbers.

▲ For optional hardware requirements for X.25 packet-switched networks, refer to VAX P.S.I. (Software Product Description 25.40) or VAX P.S.I. Access (Software Product Description 27.78).

## Open Systems Interconnection (OSI) Products

### **Prerequisite Software**

VMS V5.0

The required software depends on the physical medium of the open systems network. The network can be an ISO 8802-3 (IEEE 802.3) LAN, or an X.25 packet-switched network. To support the ISO 8802-3 data link, VAX FTAM uses standard VMS LAN drivers.

For an X.25 wide area network, the VAX P.S.I. (Software Product Description 25.40) or VAX P.S.I. Access software (Software Product Description 27.78) is required.

### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 29.86
- Unique Product Identifier VFW

## VAX DEC/MAP

VAX DEC/MAP is a multivendor, broadband, plant-floor device interconnect for the manufacturing environment, which adheres to the Manufacturing Automation Protocol (MAP) specification Version 2.1. The MAP Version 2.1 specification is based on the seven-layer, International Standards Organization/Open Systems Interconnection (ISO/OSI) network reference model.

This product, comprising both software and hardware, is called DTQWA.

Designed for the Q-bus, it includes the DTQNA MAP controller, firmware, appropriate cables, and software layered on the VMS operating system. The DTQNA has a frequency agile modem with an internal or external (NEMA 12 enclosure) modem option.

The MAP network architecture specifies the protocols and services for the Physical, Data Link, Network, Transport, Session, Presentation and Application Layers—Layers 1–7, respectively. The software (VAX DEC/MAP) for the DTQNA implements the Session Layer to the Application Layer (Layers 5–7), the Physical through the Transport Layers (Layers 1–4) are implemented in hardware (DTQNA). The Presentation Layer is NULL as specified by MAP V2.1. The network media is 75-ohm broadband CATV cable.

The VAX DEC/MAP software provides the user interface to the communication services that consist of File Transfer, Access, and Management (FTAM), Common Application Service Elements (CASE), Manufacturing Messaging Format Standard (MMFS).

VAX DEC/MAP Network Management includes the MAP Control Program (MAPCP). MAPCP enables a network manager to read and modify local and remote parameters, isolate faults through event logging and loopback testing, perform system verification, and maintain the local directory cache. MAPCP commands are similar to DECnet NCP commands. Also included is the Directory Service/Client Services Agent (CSA) which provides name-to-address resolution.

## Open Systems Interconnection (OSI) Products

### *Specifications and Standards used for VAX DEC/MAP*

DEC/MAP Component	Specifications and Standards	OSI Layer
Network Management	Network Management Agent (NMA) only defined in the MAP V2.1 Spec. Network	Manager
Application		Application
<ul style="list-style-type: none"> <li>• NBS Phase I FTAM</li> <li>• MAP CASE V2.1</li> <li>• MAP V2.1 MMFS</li> <li>• Directory Service/CSA</li> </ul>	Based on ISO FTAM DP2 ISO based and defined in Service Definition and Protocol Spec. (7/85) Conformance class 0 MAP V2.1	
Presentation	Undefined in MAP V2.1, therefore NULL layer	Presentation
Session	ISO Session Standard (ISO/IS 8326, 8327) Only Kernel and full-duplex is implemented as required in MAP V2.1	Session
Transport	ISO Transport, Class 4 Service as specified in ISO/IS 8072, ISO/IS 8073.	Transport
Network	ISO Internet (ISO/IS 8473)	Internet
Data Link	IEEE 802.2 Class 1, Logic Link Control; IEEE 802.4 Token Bus, Media Access Control	Data Link
Physical	IEEE 802.4 Broadband	Physical

### ***Interoperability***

Digital guarantees the operation of the VAX DEC/MAP product between Digital nodes *only*, with the prerequisite hardware supplied by Concord Communication, Inc. The DTQNA product has successfully completed conformance testing at ITI (Industrial Technological Institute), an independent testing facility for MAP V2.1 products.

### ***Required Hardware***

VAX DEC/MAP software is a layered product, supported on the VMS operating system. This product requires 7,500 blocks (3.84 MB) of system disk space for installation and 6,500 blocks (3.33 MB) of system disk space for permanent use.

This product is part of a packaged system: The customer cannot purchase software separately from hardware.

Minimum hardware:

- MicroVAX II (BA23,BA123,BA2\*\*, H9642 only), MicroVAX 3500/3600 (BA213)
- Broadband cableplant
- CCI headend remodulator, 10 Mb/s (part number L5-R051-2100)

### ***Prerequisite Software***

VMS V5.0 or later

### ***Ordering Information***

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.66
- Unique Product Identifier VFZ

### VAX OSI Applications Kernel (OSAK)

The VAX OSI Applications Kernel is a layered product on VMS that provides an OSI-conformant base on which to develop products. The product consists of interfaces to the Session and Transport layers of the OSI Basic reference model for communications, as defined by the ISO and discussed earlier in this section.

The product conforms to the following protocol standards:

- ISO 8327: 1987—Basic Connection Oriented Session Protocol Specification
- ISO 8073: 1986—Basic Connection Oriented Transport Protocol Specification
- ISO 8473—Protocol for providing Connectionless Mode Network Services

#### **Features**

- The VAX OSI Applications Kernel combines both the VAX OSI Transport Service (VOTS) and the VAX OSI Applications Kernel into a single package, simplifying both migration to Phase V DECnet for current users and the ordering of OSI products.
- The VAX OSI Transport Service provides and supports many of the options stated in International Standard ISO 8073. An end system, VOTS is implemented according to International Standard ISO 8473, and supports many of the options listed in the specification.
- The VAX OSI Applications Kernel software is a privileged shareable image, which can be linked with VMS users' programs. It provides the higher-level services that allow interprocess communications over an OSI network to one or more remote systems. The VAX OSI Applications Kernel is layered on VAX OSI Transport Service.

#### **Prerequisite Hardware**

Any valid VAX/VMS configuration as specified in Software Product Description 27.47.

#### **Prerequisite Software**

VMS Operating System V5.0

The software may be used over either an ISO 8802-3 (IEEE 802.3) local area network or an X.25 packet-switched network. To support the ISO 8802-3 data link, VAX OSAK uses standard VMS drivers. For an X.25 wide area network, the VAX P.S.I. V4.2 or VAX P.S.I. Access V4.2 software (SPD 25.40 and SPD 27.78) is required.

#### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.47
- Unique Product Identifier VD9

## VAX Public Access Communications (VAXPAC)

VAX Public Access Communications (VAXPAC) lets VMS or MicroVMS users connect to a remote system using asynchronous lines. VAXPAC allows users to access database services that provide information such as investment reports, credit verification, or international news.

The remote system may be any system that accepts and displays data using an asynchronous interface compatible with EIA-232-D, EIA-422, or EIA-423-A.

VAXPAC users can operate as if the terminal were directly connected to the remote system, can capture data from the remote system in a file for later printing or editing, or transfer a file (with error checking) to or from a system with cooperating software.

### **Features**

- Provides access to all facilities through menu selections and extensive online help.
- Includes KERMIT error-correction file-transfer software; provides an interface that allows other file-transfer software to be invoked instead of KERMIT.
- Offers predefined connections that can be specified for either general use or designated individuals.
- Supports direct or telephone connections with autodial, dial from keyboard, or dial from handset for applicable modems.
- Includes maintenance facilities that let users customize VAXPAC operation.

### **Prerequisite Hardware**

One of the following:

- Any valid MicroVAX II with 3-MB internal memory, TK50 or dual RX50 drive, one DZQ11 or DHV11, one RD52, and a VT100- or VT200-series terminal, or any MicroVAX 2000 or VAXstation 2000, plus one or more modems if using telephone connections: DF224 (Scholar), DF03-compatible, or Hayes Instruction Set-compatible.
- Any valid MicroVAX 3500/3600 system with 3-MB memory, TK70, one RA70, CXY08 or DFA01, and VT100- or VT200-series terminal.

### **Prerequisite Software**

One of the following:

- All components of MicroVMS, V4.4 or later
- VMS, V4.4 or later

### **Ordering Information**

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 28.51
- Unique Product Identifier ZB1

## File Transfer and Terminal Emulation Products

### **VTERM II, poly-COM 220, and poly-COM 240 for the IBM PC/XT/AT**

This product set is not currently available in Europe.

The Digital Distributed Software Program offers three products that run on the IBM PC/XT/AT to emulate Digital terminals. These products perform ASCII and binary file transfers between an IBM PC and a Digital host system. VTERM II allows the PC/XT/AT to emulate a VT52 or VT100 terminal, poly-COM 220 allows the PC/XT/AT to emulate a VT52, VT102, and VT220 terminal, and poly-COM 240 allows the PC/XT/AT to emulate a VT240 terminal.

#### ***VTERM II***

VTERM II is an asynchronous communication package for the IBM PC developed by Coefficient Systems Corporation. VTERM II allows direct connection to a host computer at speeds up to 9600 baud. With a Digital mini or mainframe computer, users can run full screen, keypad oriented software such as EDT, TECT, WORD11, and EMACS transferring text and binary files between the PC and the host.

#### ***VTERM II Features***

- Compatible with VT100
- Full VT100 keyboard and video emulation
- 20 user definable keys
- Full VT100 and VT52 escape-sequence recognition
- Status display line on screen
- 80 column display — 132 with adapter board available from Coefficient Systems Corporation
- DOS-VTERM toggle key allows switching between the DOS screen and the host screen without losing the communications link
- Setup mode key
- Printer support for VT1XX-AC and VT102 ports using any IBM PC- compatible printer

#### ***poly-COM 220 and 240***

poly-COM 220 is the successor to poly-COM and allows the use of an IBM PC/XT/AT computer as any one of the Digital VT52, VT102, and VT220 terminals for file transfer. The program supports all Digital full screen editors, including EDT, and all programs that use advanced terminal features such as Digital's ALL-IN-1. poly-COM 220 provides an instant horizontal shift key that allows the user to view and work on text up to 132 columns wide. poly-COM 240 adds Digital VT240 emulation to poly-COM 220 and provides full Digital color graphics terminal emulation.

## File Transfer and Terminal Emulation Products

### ***poly-COM 220 Features***

- Compatible with VT100 series and VT220
- Full VT100 and VT200 keyboard and video emulation
- 8-bit international character support with compose key
- 21 soft function keys "user definable"
- VT100 escape sequence recognition and VT220 8-bit terminal control
- Status display line on screen
- Instantaneous horizontal shift for 132-character display
- DOS-VTERM toggle key allows switching between the DOS screen and the host screen without losing the communication link
- Setup mode key
- Printer support for VT1xx-AC and VT102 ports using any IBM PC- compatible printer
- Host control functions allows the host to control the IBM PC through poly-COM 220
- Screen Save function which blanks the PC screen after an inactive time period that is user definable.

### ***poly-COM 240 Features***

- Compatible with VT100 series and VT220
- Full VT100 and VT220 keyboard and video emulation
- 8-bit international character support with compose key
- 21 soft function keys "user definable"
- VT100 escape sequence recognition and VT200 8-bit terminal control
- Status display line on screen
- Instantaneous horizontal shift for 132-character display
- Setup mode key
- Printer support for VT1XX-AC and VT102 ports using any IBM PC compatible printer
- VT240 and VT125 device ID
- ReGIS graphics supported
- Full support for IBM PC and Epson graphics printers

### ***Required Hardware***

For the Digital host, the same hardware used for asynchronous terminal ports accommodates the IBM PC.

For the PC, a serial communications port is required for direct cable connection to the Digital host or to a modem.

### ***Ordering Information***

▲ Consult your local Sales Representative for specific software configurations.

**WPS-PLUS/PC**

WPS-PLUS/PC is a document-processing software system that provides Gold Key style word processing for users of IBM PCs and IBM PC/XTs running IBM PC-DOS Version 2.10, 3.0, or 3.10. ▲ Refer to Software Product Description 30.75 for more information.

**Features**

WPS-PLUS/PC allows PC-DOS users to

- Create, edit, and print documents, as well as retrieve documents by document name, number, or keyword.
- Produce form letters and maintain mailing lists.
- Convert a WPS-PLUS document to and from a DX file format and ASCII file format.
- Communicate through user-developed scripts.
- Create and modify printer attribute and character print tables.
- Transfer documents with Digital hosts running WPS-PLUS/VMS or WPS-PLUS/ALL-IN-1.
- Include technical characters and scientific equations in a document.
- Run WPS-PLUS/VMS on the VAX in VT100 emulation mode, which also supports the Digital Multinational and Technical Character Sets.
- Include diagrams, matrices and VT100 character set equations, and composite and multinational characters in a document.
- Transfer documents between the IBM PC and IBM PC/XT and any Digital host running the poly-XFR for PC-DOS/IBM Personal Computers Communications package, where the host does not have WPS-PLUS/VMS or WPS-PLUS/ALL-IN-1.

**Required Hardware**

Any valid IBM PC or IBM PC/XT personal computer configuration with

- At least 384 Kbytes of memory.
- A minimum of two 5.25-inch, 362-KB floppy drives, or one 5.25 inch, 362-KB floppy drive and a hard disk.
- IBM PC/XT keyboard.

**Prerequisite Software**

PC-DOS Operating System, Versions 2.10, 3.0, or 3.10

## Additional Software Products

### **Ordering Information**

▲ Consult your local Sales Representative for specific software configurations. The following table lists specific Unique Product Identifiers:

**WPS-PLUS/PC Unique Product Identifiers (UPI)**

Option	UPI
Single-use license, binaries, documentation, warranty	
Quantities 1-9	A72
Quantities 10-24	A73
Quantities 25-99	A74
Quantities 100 plus	A75
Installation service	A72
Basic service	A72
Single product update service	A72

## Software Development Tools

Digital's Software Development Tools facilitate the development of layered telecommunications protocols for Digital's family of direct memory access (DMA) intelligent communications processors.

The development tools are especially useful to OEMs and end users who write their own communications packages. Well-defined programming standards and methodology help reduce project development costs.

Digital-supplied firmware routines build an executive that acts as the communication processor's operating system. With the development tools, system programmers can easily implement private protocols for custom networking applications.

Digital offers Development Tools for the following intelligent communications processors.

- KMV1A-M Direct Memory Access Intelligent Communications Processor
- KCT32 Direct Memory Access Intelligent Communications Processor

### **Features**

- Facilitates custom network applications
- Extensive documentation
- Reduced development costs
- Linker and loader
- Single-step, start, stop, and breakpoint program debugger

## Additional Software Products

### Ordering Information

▲ Consult your local Sales Representative for specific software configurations. The following table lists Unique Product Identifiers:

<i>Software Development Tools Unique Product Identifiers (UPI)</i>	
Option	UPI
<b>VMS</b>	
KCT32 development tools*	128
<b>RSX-11S, RSX-11M, RSX-11M PLUS</b>	
KMV1A-M development tools	S98
<b>MicroVMS</b>	
KMV1A-M development tools*	Z36
KMV1A-M MicroVMS driver	Z35
*VAX-11 RSX (Q*382) is required for VMS and MicroVMS development.	

### HDLC Framing Software

Digital offers HDLC framing software for the KMS11-BD/BE and the KMV1A-M. These software packages provide a basic HDLC frame; they do not provide the addressing and sequencing that must be supplied by the user for some applications. The framing software packages are particularly useful in multivendor environments and in applications requiring proprietary protocols. The KMS11-BD/BE Framing Software can also be configured for Bisync (BSC) Framing.

### Ordering Information

▲ Consult your local Sales Representative for specific software configurations. The following table lists Unique Product Identifiers:

<i>HDLC/BSC Framing Software Unique Product Identifiers (UPIs)</i>	
Option	UPI
<b>VMS</b>	
KMS11-BD HDLC/BSC framing software	920
<b>RSX-11S, RSX-11M</b>	
KMV1A HDLC framing software	S32
<b>RSX-11M PLUS</b>	
KMV1A-M HDLC framing software	S39

### X.25 Link Level Software

Digital offers X.25 Link Level software for the KMS11-BD/BE, KMS1P-M, and KMV1A-M. These packages provide point-to-point communications between host processors, making them particularly useful in a multivendor environment. The packages operate in full-duplex mode, and implement the CCITT 1980 recommendations for X.25 LAPB Link Level Protocol.

These packages are not required when the devices are used by Packetnet software, discussed elsewhere in this section.

## Additional Software Products

### **Ordering Information**

▲ Consult your local Sales Representative for specific software configurations. The following table lists Unique Product Identifiers (UPIs):

<i>X.25 Link Level Software Unique Product Identifiers (UPIs)</i>	
<b>Option</b>	<b>UPI</b>
<b>VMS</b>	
KMS11-BD/BE	757
<b>MicroVMS</b>	
KMV1A-M MicroVMS driver	Z35
KMV1A-M MicroVMS X.25 link level	Z37
<b>RSX-11S, RSX-11M</b>	
KMS11-BD/BE, KMS1P-M	757
KMV1A-M	S97
<b>RSX-11M-PLUS</b>	
KMS11-BD/BE, KMS1P-M	770
KMV1A-M	S97

## Section 5

### Distributed Applications

This section contains the following topics...

Integrated Personal Computing

DECnet System Services

Business Communications

MAILbus Electronic Mail Interchange

## Distributed Applications

Distributed applications support large network environments, allowing network resources to be accessed as readily as if they were on a single system.

This section describes the following distributed applications, that enhance the value and usefulness a network delivers:

- **Integrated Personal Computing**—These applications allow personal computers to participate in a DECnet network and to share network resources such as printers and disks. PC users can share data with other DECnet users, and connect their PCs as terminals to DECnet nodes.
- **DECnet System Services**—These services simplify network use and allow a user to access network resources as if those resources were on the user's system. They also allow a system manager to manage many remote VMS and ULTRIX systems in the network efficiently.
- **Business Communications**—These applications allow users to exchange mail in a multivendor environment, to participate in online conferencing, and to share videotex information-retrieval services.
- **MAILbus Electronic Mail Interchange**—Electronic mail and messaging services allow users and application programs to exchange mail or messages in a multivendor environment. These services are based on the CCITT X.400 standard for message handling.

Because customers must access and retrieve information easily, they require high performance regardless of network topology and a consistent interface for distributed resources. Digital's distributed applications provide efficient access to information in Digital and multivendor networking environments.

Digital's Integrated Personal Computing combines the advantages of MS-DOS personal computing with the power of VMS to provide comprehensive desktop solutions in a multivendor, enterprise-wide networked environment. Integrated Personal Computing solutions create an environment that gives customers more features, functions, and growth potential than a PC local area network, with competitive performance and price.

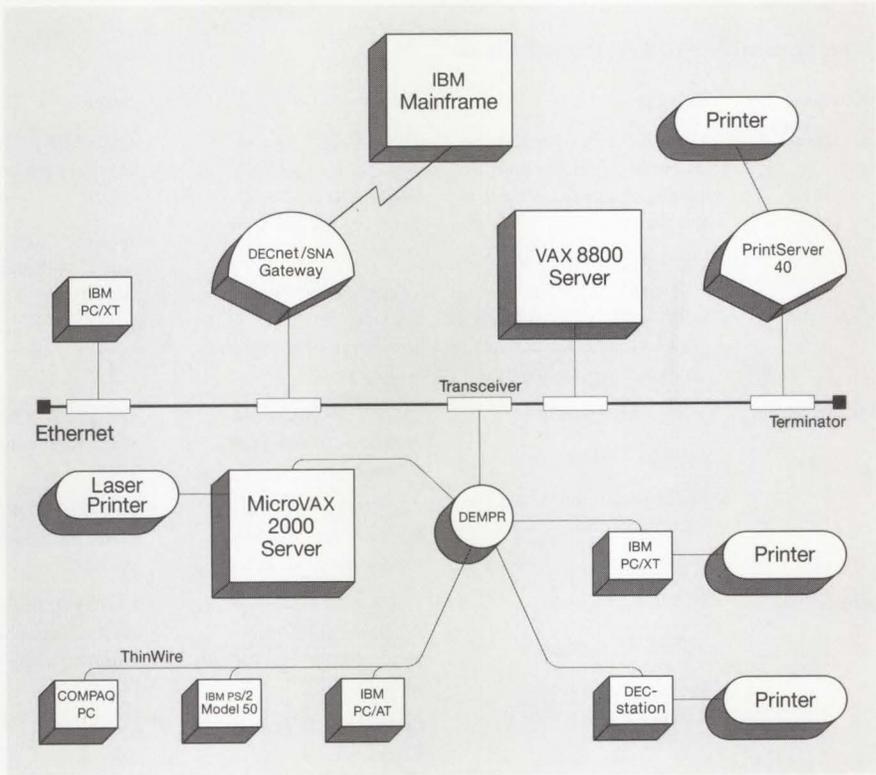
Digital's PC integration products are based on international and industry standards such as OSI, MS-Net, MS-DOS, and NETBIOS. They implement Digital's Personal Computing Systems Architecture (PCSA) to extend the MS-DOS desktop environment to the DECnet/VMS environment. PCSA transparently integrates the personal, departmental, and enterprise computing environments to offer

- Shared files, data, and applications.
- Centralized, simplified management of PC resources.
- Flexible, incremental growth.
- Multivendor support.

The integrated personal computing solution, which combines VAX/VMS systems and personal computers in a server/client relationship, includes

- VAX and MicroVAX server computers running VAX/VMS Services for MS-DOS and DECnet-VAX software.
- Networked personal computers running DECnet/PCSA Client software, which includes DECnet-DOS.

*Integrated Personal Computing Environment*



NBG-197-01

VAX/VMS Services for MS-DOS, which runs on a VAX or MicroVAX server, acts like an extension to the local MS-DOS system, making facilities such as VMS files, VMS directories, or VAX printers appear as MS-DOS equivalents. This capability allows simple interchange of data between PC and VAX-based applications. MS-DOS applications adhering to the NETBIOS programming interface standard can be used without software modification.

The license for VAX/VMS services for MS-DOS is included with the DECnet-VAX license at no additional charge. Customers can purchase the DECnet/PCSA Client license, which allows personal computers to run software that communicates with VAX/VMS Services for MS-DOS, in the following ways:

- As DECnet/PCSA Client software-only option.
- As part of the PC Network Packages, that include appropriate PC network hardware for running the DECnet/PCSA Client software.
- As part of the PC Integration Packages for MicroVAX II or 2000, which combine the server license, three client licenses, and appropriate network hardware.
- As part of the PCLAN/Server 2000.

## Integrated Personal Computing

The following table summarizes the products available for PCSA servers and clients.

### Product Summary of PCSA Servers and Clients

Processor	Hardware	Software	Service	Options
VAX/MicroVAX Server	DEPCA-RA Starter Kit for MicroVAX 2000 Server, or DESVA-AA 802.3/Ethernet controller  DEPCA-SA Starter Kit for MicroVAX II Server, or DESTA-AA for adapting a standard 802.3/Ethernet controller to ThinWire	DECnet-VAX license (included in DEPCA-RA/SA): includes VAX/VMS Services for MS-DOS license  Q*A93-H VAX/VMS Services for MS-DOS media/documentation	QS938-SZ PCSA DECstart (first server installation only)  Q*A93-*** DECsupport, Basic, Self-maintenance Service	Not applicable
VAXmate Server	PC500-BA (green) PC500-CA (amber)  RCD3x-FC expansion box with hard disk	Q6A93-UZ VAXmate Services for MS-DOS license  Q6A93-H7 VAXmate Services for MS-DOS media/documentation	QS939-SZ PCSA DECstart (first server installation only)  Q6A93-*7 DECsupport, Basic, or Self-maintenance service	FP287 Math Coprocessor  PC50X-MA 2-MB RAM
VAXmate Client	PC500-BA (green) PC500-CA (amber)  Includes DECnet/PCSA Client VAXmate license	Q6ZP3-UZ DECnet/PCSA Client license (one required per PC; included with PC500)  Q6ZP3-H* DECnet/PCSA Client media/documentation (one copy per network)	Q6ZP3-3*/3Z Self-maintenance Service/Right-to-copy	PC50X-AA 2-MB RAM FP287 Math Coprocessor PC50X-MA Modem RCD3x-FC expansion box with hard disk
IBM PC/XT/AT, PS/2 Model 30, and Selected Compatible Clients	DEPCA-KA/DEPCB-V* IBM PC Network Integration Pkg <sup>1</sup> or DEPCA-BA/DEPCB-B* PC network Services Pkg <sup>2</sup> (Both include QBZP3-UZ DECnet/PCSA Client PC license), or a supported third-party Ethernet controller <sup>1</sup>	QBZP3-U* DECnet/PCSA Client PC license <sup>2</sup> (one required per PC; included in DEPCA-KA/BA)  QBZP3-H* DECnet/PCSA Client media/documentation (one copy per network)	QBZP3-3*/3Z Self-maintenance Service/Right-to-copy	DEPCA-AU for direct connection to standard 802.3/Ethernet cable);  VSXXX-AA mouse
PS/2 Models 50/60/80 Client	Asynchronous support only	QBZP3-UZ DECnet/PCSA Client license (one required per client)  QBZP3-H* DECnet/PCSA Client media/documentation (one copy per network)	QBZP3-3*/3Z Self-maintenance Service/Right-to-copy	
Standalone VAXmate	PC500-BA (green) PC500-CA (amber)  RCD3x-FC expansion box with hard disk	Q6005-A7 license, media, and documentation for standalone use	Q6005-*7 DECsupport, Basic, or Self-maintenance Service	PC50X-AA 2-MB RAM FP287 Math Coprocessor PC50X-MA Modem

\*▲ Refer to the Software Product Description for complete ordering information.

<sup>1</sup>▲ Refer to Software Product Description 55.07 for supported configurations.

<sup>2</sup>Quantity pricing available.

### VAX/VMS Services for MS-DOS and DECnet/PCSA Client

VAX/VMS Services for MS-DOS allows the VAXmate, IBM PC, IBM PC/XT, IBM Personal Computer AT, IBM PS/2, and selected PC compatibles to act as clients to VAX or MicroVAX servers in a local area network. The PC clients use selected facilities and services of the server system, and can access information and services on other types of systems in DECnet networks.

VAX/VMS Services for MS-DOS consists of networking and server software. VAX/VMS Services for MS-DOS implements Digital's Personal Computing Systems Architecture (PCSA), which integrates industry-standard personal computing into larger-scale multiuser computing environments. The network software is based on an adaptation of MS-NET, which allows it to be used in a DECnet-based network.

VAX/VMS Services for MS-DOS provides file services, disk services, print services, file transfer, and network management and control. It also offers remote boot capability for VAXmates and for PCs equipped with Digital's DEPCA 802.3/Ethernet controller.

DECnet/PCSA Client software includes DECnet-DOS (or DECnet-VAXmate) and MS-NET networking software, NETBIOS interface support, VT200-series terminal emulation, Microsoft's MS-Windows, DOS operating system enhancements, and an Online User Information System. MS-DOS is included for VAXmate; PC-DOS or MS-DOS is a prerequisite for other PCs.

With DECnet/PCSA Client software, VAXmate and PC systems function as clients in the integrated personal computing (PCSA) environment, utilizing the services provided by a VAX or MicroVAX configured as a server.

DOS applications adhering to the NETBIOS programming interface standard can be used without modification with DECnet/PCSA Client and VAX/VMS Services for MS-DOS software. In the PCSA environment, the same NETBIOS applications can run on local area and wide area DECnet networks, and can communicate with other DECnet applications.

#### **Features**

- 802.3/Ethernet-based communications for high-speed data exchange.
- Asynchronous communication for lower-speed remote data access.
- Access to VAX-based server systems to provide centralized application and data storage, file and record sharing, centralized system management, and the ability to share resources such as laser printers and disk storage.
- Full compatibility with Digital's DECnet family of networking products.
- Industry-standard compatibility for running off-the-shelf MS-DOS applications software.

#### **Prerequisite Hardware**

- Server systems: Any valid VAX or MicroVAX system connected to the same local area network as the PC clients.
- Client systems: Several IBM personal computers, selected PC compatibles, and selected third-party Ethernet controllers are supported.

▲ Refer to Software Product Description (SPD) 30.50 for more information on VAX/VMS Services for MS-DOS, SPD 55.09 for more information on VAXmate Services for MS-DOS, SPD 55.07 for more information on PC configurations, and SPD 55.10 for more information on VAXmate configurations.

## Integrated Personal Computing

### ***Prerequisite Software***

- VAX or MicroVAX server systems: VMS or MicroVMS operating system and DECnet-VAX.
- IBM PC client systems: PC DOS V3.20 or V3.30
- COMPAQ client systems: COMPAQ MS-DOS V3.20 Rev A or V3.30
- VAXmate client systems: no prerequisites

### ***Ordering Information***

Customers do not purchase a license to run VAX/VMS Services for MS-DOS, as this license is included with the DECnet-VAX license. The license to use the DECnet/PCSA Client software for the IBM PC may be purchased

- As described in the following information.
- As part of the PC Network Integration Package or PC Network Services Package, which combines the client license with appropriate network hardware. ▲ Refer to "PC Network Integration Package and PC Network Services Package" in this section for more information.
- As part of the PC Integration Packages for MicroVAX 2000 and MicroVAX II, which combine the DECnet-VAX server license, client licenses, and appropriate network hardware. ▲ Refer to "PC Integration Packages for MicroVAX 2000 and MicroVAX II" in this section for more information.

Follow these instructions to purchase VAX/VMS Services for MS-DOS and the DECnet/PCSA Client software.

- For VAXmate clients, order
  - A DECnet/PCSA Client license (Q6ZP3-Ux) for each VAXmate that will run the DECnet/PCSA Client software. This license includes the license to use DECnet-VAXmate. License packages are available for multiple VAXmate clients as indicated in DECnet/PCSA Client Software Product Description 55.07.
  - At least one copy of the binaries and documentation for the VAXmate clients. (One copy may be used to load multiple VAXmates.)
- For IBM PC and PC-compatible clients, order
  - A DECnet/PCSA Client license (QBZP3-Ux) for each PC that will run the DECnet/PCSA Client software. This license includes the license to use DECnet-DOS. License packages are available for multiple PC clients as indicated in DECnet/PCSA Client Software Product Description 55.07.
  - At least one copy of the binaries and documentation for the IBM PC or PC-compatible clients. (One copy may be used to load multiple PCs.)
- For the server system, order the binaries and documentation (Q\*A93-H#) for the VAX or MicroVAX system that will run VAX/VMS Services for MS-DOS.
- To ensure a smooth installation, new sites should order the PCSA DECstart Integration Service for MS-DOS (QS938-SZ) from Software Services.

## Integrated Personal Computing

### **Ordering Information**

▲ Refer to the following Software Product Description (SPD) and Unique Product Identifier (UPI) for further information on supported processor and services.

- VAX/VMS Service for MS-DOS Server
  - SPD 30.50
  - UPI A93
- DECnet/PCSA Client
  - SPD 55.10
  - UPI 0N7

### **PC Network Integration Package and PC Network Services Package**

The PC Network Integration Package and PC Network Services Package allow the IBM PC, PC/XT, Personal Computer AT, PS/2 Model 30, and selected PC compatibles to participate in 802.3/Ethernet local area networks using VAX/VMS Services for MS-DOS software.

The PC Network Services Package includes

- DEPCA 802.3/Ethernet/mouse controller for the IBM PC.
- ThinWire 802.3/Ethernet cable kit.
- License to use DECnet/PCSA Client software. ▲ For more information on DECnet/PCSA Client, refer to “VAX/VMS Services for MS-DOS and DECnet/PCSA Client” in this section.

The PC Network Integration Package includes all the components in the PC Network Services Package, plus a Digital keyboard and three-button mouse. (This package varies for each country.) The Digital keyboard displays Gold Key labels for ALL-IN-1 and WPS-PLUS, as well as IBM PC labels.

### **Ordering Information**

To order individual PC Network Integration Packages or PC Network Services Packages, follow these instructions.

- For each personal computer, order one PC Network Integration Package or one PC Network Services Package as described in the following Order Code Table.
- Order at least one copy of the binaries and documentation for the DECnet/PCSA Client software. ▲ Refer to “VAX/VMS Services for MS-DOS and DECnet/PCSA Client” in this section for ordering information.
- To ensure a smooth installation, new sites should order the PCSA DECstart Integration Service for MS-DOS (QS938-SZ) from Software Services.

In addition to being a component of the PC Network Packages, the DEPCA-AA 802.3/Ethernet controller is available as a module-only option, typically purchased when using non-DECnet network software or when upgrading client PCs from asynchronous to 802.3/Ethernet communications. ▲ For more information, refer to “802.3/Ethernet Communications Controllers” in Section 2.

Three PC Network Packages are bundled into the PC Integration Packages at a lower cost. ▲ For more information, refer to “PC Integration Packages for MicroVAX 2000 and MicroVAX II” in this section.

## Integrated Personal Computing

### PC Network Packages Order Codes

Option	Order Code
PC Network Integration Package includes DEPCA-AA ThinWire 802.3/Ethernet/mouse controller and ThinWire cable kit, Digital VSXXX-AA three-button mouse, LK250 keyboard with cable for IBM PC family, DECnet/PCSA Client single-use software license, Personal Workstation Handbook, and DEPCA Owner's Manual.	DEPCA-KA DEPCB-V*
PC Network Services Package includes DEPCA-AA ThinWire 802.3/Ethernet/mouse controller, ThinWire cable kit, DECnet/PCSA Client single-use software license, and DEPCA Owner's Manual.	DEPCA-BA DEPCB-B*

\*Replace the \* in the order code with the appropriate country: A (English), C (Canadian French), D (Danish), E (Canadian Bilingual), F (Finnish), G (German), I (Italian), K (Swiss French), L (Swiss German), M (Swedish), N (Norwegian), P (French), S (Spanish), T (Hebrew)

### PC Integration Packages for MicroVAX 2000 and MicroVAX II

The PC Integration Packages for MicroVAX 2000 and MicroVAX II reduce the entry-level cost of connecting IBM PCs and selected compatibles to MicroVAX server systems over an 802.3/Ethernet local area network using VAX/VMS Services for MS-DOS and PCSA Client software. Each PC Integration Package provides the components to link three PCs to a MicroVAX system in a local area network.

The PC Integration Package for the MicroVAX II includes

- One IBM PC Network Integration Package (DEPCA-KA) and two PC Network Services Packages (DEPCA-BA). ▲ Refer to "PC Network Integration Packages and PC Network Services Package" in this section for a detailed description.
- One QZD04-UZ DECnet-VAX end-node license, which includes the license to use VAX/VMS Services for MS-DOS on a MicroVAX server system.

The PC Integration Package for the MicroVAX 2000 includes all the components in the MicroVAX II package, plus the DESVA-AA 802.3/Ethernet communications controller for the MicroVAX 2000.

#### **Prerequisite Hardware**

An 802.3/Ethernet communications controller might be needed for early MicroVAX II systems that did not include the controller with the purchase of the system.

#### **Ordering Information**

Order the following:

- A PC Integration Package for either the MicroVAX II or 2000.
- The binaries-and-documentation kit for VAX/VMS Services for MS-DOS. ▲ Refer to "VAX/VMS Services for MS-DOS and DECnet/PCSA Client" in this section for ordering information. The binaries and documentation for DECnet-VAX are included with the binaries and documentation for VMS V5.0.
- The binaries-and-documentation kit for DECnet/PCSA Client software. ▲ Refer to "VAX/VMS Services for MS-DOS and DECnet/PCSA Client" in this section for ordering information.
- To realize a smooth installation, new sites should order the PCSA DECstart Integration Service for MS-DOS (QS938-SZ) from Software Services.

## Integrated Personal Computing

Cables for 802.3/Ethernet are not included because existing networks and physical arrangements can vary.

### *PC Integration Package Order Codes*

Option	Order Code
PC Integration Package for MicroVAX II	DEPCA-SA
PC Integration Package for MicroVAX 2000. Includes one DESVA-AA 802.3/Ethernet communications controller.	DEPCA-RA

## PCLAN/Server 2000

The PCLAN/Server 2000 is a PC-integration solution for low-end user work groups of eight to 30 active personal computer users. Based on a MicroVAX 2000 with VMS V5.0, DECnet-VAX, VMS Services for MS-DOS V2.1, and DECnet/PCSA Client V2.0, the PCLAN/Server 2000 can be installed (hardware and software) and managed (via a system management menu facility) by PC users without any past VAX/VMS expertise. Also, the PCLAN/Server 2000 includes a PC-based VMS mail user interface (PCMAIL), a PC full-screen editor, and a Broadcast utility for the systems administrator.

The PCLAN/Server 2000 can effectively satisfy the needs of a small business or department for disk, file, print, mail and administration services to personal computers over a LAN. This departmental system can grow and can be easily connected to other departmental systems or into an enterprisewide network. A personal computer user can then have networkwide file, mail, and management services.

▲ Refer to your sales representative for further information.

### ***PCMAIL Interface***

PCMAIL is a PC-based mail user interface to VMS mail that resides on the server and provides the PC user with a menu supplemented with pull-down menus for function selection. All mail files remain on the server. When starting up PCMAIL, users are notified of new mail and, while running PCMAIL, they can press a function key to inquire if they have any new messages. Users can create DOS files that are distribution lists for PCMAIL. The mail functions are a subset of those available on VMS mail.

Included with PCMAIL is SEDT, a full-screen, high-functionality PC-based editor that includes online help documentation, split-screen editing, formatting rulers, and cut-and-paste and search-and-replace functions. Other PC-based editors or word processors can serve as the editor for PCMAIL.

### ***Broadcast Utility***

The Broadcast capability allows the system administrator to send messages about server operations to all PC users or selected users connected to the PCLAN/Server 2000.

### ***Features***

- User-installable hardware and software, server licenses, PC client software, and 16 client licenses, with no VAX/VMS experience required.
- Has single part number.
- Simplified user-installable system with shell script and enhanced manager menus, making the product easy to use.

## Integrated Personal Computing

### *Specifications*

Consult your local sales representative for information on specifications.

### *Prerequisite Hardware and Software*

The PCLAN/Server 2000 supports

- IBM PC, XT, AT, and Personal System/2 Model 30 running MS-DOS V3.2 and V3.3 and equipped with a DEPCA, 3COM Etherlink 3C500B, 3C5001, or a MICOM Interlan N15010-1 Ethernet controller.
- COMPAQ DESKPRO 286 Model 40 and DESKPRO Model 2 running COMPAQ MS-DOS V3.2 Rev A and V3.3 equipped with a DEPCA, 3COM Etherlink 3C500B or 3C5001 Ethernet controller.
- Olivetti M24, M28, M240, and M280 running Olivetti MS-DOS V3.2 equipped with a DEPCA, 3COM Etherlink 3C500B or 3C5001 Ethernet controller.

### *Ordering Information*

The single order number for the PCLAN/Server 2000 includes all hardware and software, including the licenses for VMS, DECnet-VAX (which includes a license for VAX/VMS Services for MS-DOS), and a 16-pack of DECnet/PCSA client licenses.

The PCLAN/Server 2000 consists of the following hardware and software:

- A MicroVAX 2000 system that includes
  - 4 Mbytes of memory (expandable to 6 Mbytes)
  - 4 asynchronous lines
  - DESVA-BA controller for standard Ethernet or ThinWire
  - RX33 diskette drive
  - VT320-CA terminal
  - BA40A-AA expansion adapter
  - RD54-FA 159-Mbyte disk
  - TK50Z-FA 95-Mbyte tape
- Software Licenses for
  - VMS
  - DECnet-VAX (including VMS Services for MS-DOS)
  - 16-pack of DECnet/PCSA Client Licenses
- Software including
  - VMS V5.0
  - DECnet-VAX V5.0
  - VMS Services for MS-DOS V2.1 (enhanced)
  - DECnet/PCSA Client V2.0 (enhanced)
- Documentation including
  - System Administrator Documentation Kit
  - User Documentation Kit
  - MicroVAX 2000 Hardware Manuals

*PCLAN/Server 2000 Order Code Table*

Option	Order Code
PCLAN/Server 2000, 120 V, U.S.	DV-200P1-AA
PCLAN/Server 2000, 120 V, no VT, no H/W doc. <sup>1</sup>	DV-200P1-A2
PCLAN/Server 2000, 240 V, no VT <sup>2</sup>	DV-200P1-A3

<sup>1</sup>The order must include a DL-VT320-xx and one or more of the following:

<sup>2</sup>When a DV-200P1-A3 is ordered, the order must include a DL-VT320-xx.

- DV-200P1-AA (PCLAN/Server 2000, 120 V, English Documentation)
- DV-200P1-A3 (PCLAN/Server 2000, 240 V, Multilingual Documentation, No Terminal)
- Choice of the following Hardware Information Kits:
  - English Owner's Manual plus Installation Guide (EK-ZNAAG-GZ)
  - German Installation Guide (EK-MVXGA-IG)
  - French Installation Guide (EK-MVXFA-IG)
  - Spanish Installation Guide (EK-MVXSA-IG)
  - German Owner's Manual (EK-MVXGA-OM)

DECnet System Services is a set of networking products that make a network of VAX systems—including single systems, VAXclusters, and Local Area VAXclusters—appear to be a single system for many key functions. DECnet System Services allows users to share and manage network resources as easily as if these resources were directly attached to the local system. DECnet System Services products include

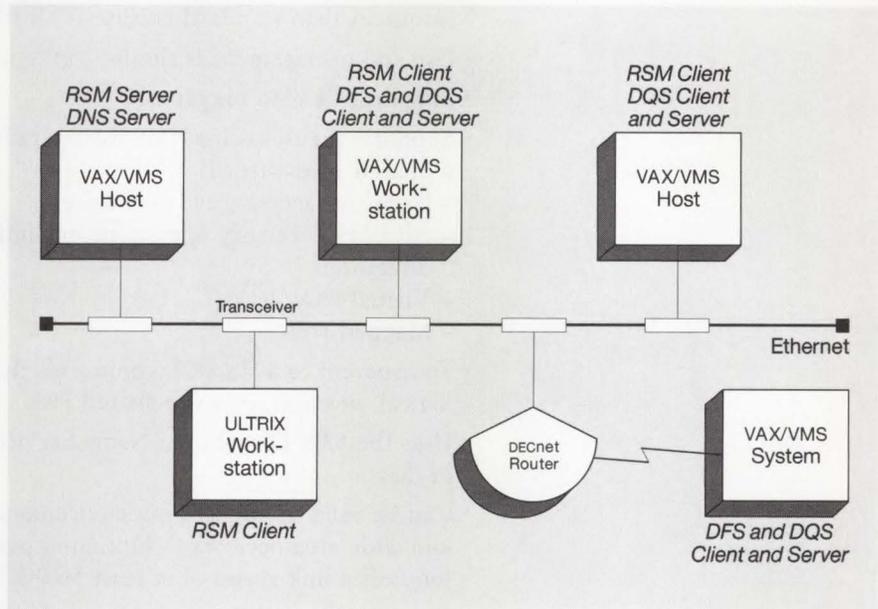
- **VAX Distributed File Service (VAXdfs)**—offers high-performance, network-wide file operations.
- **VAX Distributed Queuing Service (VAXdqs)**—provides distributed use and management of network printing resources.
- **Remote System Manager (VAXrsm)**—Enables one system manager to efficiently and easily manage multiple distributed VMS and ULTRIX systems.
- **VAX Distributed Name Service (VAXdns)**—provides a consistent, networkwide set of names for distributed applications.

Because DECnet System Services products are transparent to existing applications, applications do not have to be rewritten. Also, the average VAX user does not have to be retrained to use the DECnet System Services facilities.

#### **Features**

- Allows individual systems, VAXclusters, and Local Area VAXclusters to share data, printers, and system management resources.
- Files and printers do not have to be duplicated throughout a network because these resources can be made available to anyone needing access.
- One system manager can manage multiple networked systems.
- Transparency to applications makes it unnecessary to rewrite programs to take advantage of DECnet System Services.
- Provides for various management styles ranging from fully centralized to fully distributed network management.
- Provides network transparency to both users and applications.
- Supports local and wide area networks, and cluster topologies.
- Efficient management of PCLAN servers through software distribution and backup and restore services.

*DECnet System Services Configuration*



NBG-111-01

**VAX Distributed File Service (VAXdfs)**

The VAX Distributed File Service is a VMS layered product that provides DECnet-VAX users with high-speed, transparent access to files stored on remote VMS disks as if they were on local disks. VAXdfs supports applications that use virtual I/O and do not require write sharing.

Using VAXdfs, directory structures (a directory and all of its subdirectories) and files can be made available to other VAXdfs nodes. These directory structures are given names that are registered with the VAX Distributed Name Service. The VAX Distributed Name Service provides location independence between the "name" that is associated with a directory structure and the physical location of that directory structure. If this directory structure were moved to a different location, only a single update would be required. After this single update, all VAXdfs nodes automatically use the new location.

VAXdfs nodes that wish to access distributed directory structures simply specify the name of the directory structure, using the mount command supplied with VAXdfs. The user can access files in that directory as though they were on the local system's disk.

A VAXdfs license is required on each VMS node that either makes a directory structure available to other users, or wants to access remote directory structures. Any node with VAXdfs software can be configured to operate as client-only or as both client and server. VAXdfs does limit the number of client or server nodes.

## DECnet System Services

### *Features*

- Provides users with high-performance file access while using fewer CPU resources than standard DECnet-VAX file access.
- Use and management is similar to the use and management of a local disk.
- Supports all VMS file types.
- Supports the following VMS file operations:
  - Shared access (read)
  - Exclusive access (read and write)
  - All VMS Directory operations, including the creation and deletion of directories
  - Virtual I/O
  - Mapped I/O
- Transparent to VMS DCL commands that do not manipulate identifiers, use logical, physical, or write-shared I/O.
- Uses the VAX Distributed Name Service to provide location independence of data.
- Can be used in any DECnet environment, including local area networks and wide area networks. (Optimum performance for directory operations requires a link speed of at least 56.0 Kb/s.)
- Provides file security through standard VMS proxy mechanism.
- Performs end-to-end checksum to guard against network faults.
- Provides a management utility to control VAXdfs components and to display statistical and error information.

### *Required Hardware*

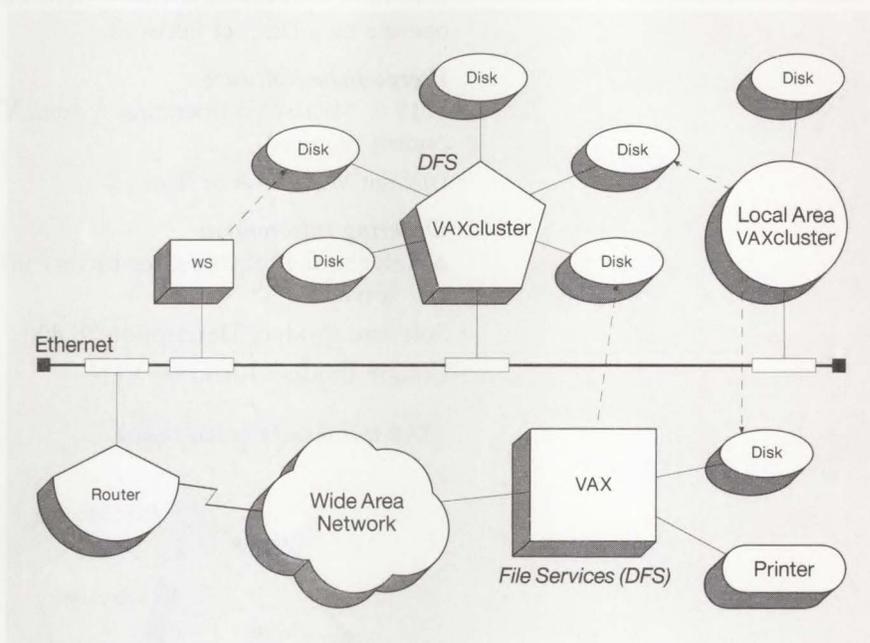
Any valid VAX or MicroVAX system with VMS or MicroVMS configured to operate on a DECnet network.

### *Prerequisite Software*

- VMS operating system V4.4–V5.0 or MicroVMS operating system V4.6–V4.7
- DECnet-VAX, V4.4 or later
- VAX Distributed Name Service, V1.0

### *Ordering Information*

- ▲ Refer to the following for further information on supported processors and services.
- Software Product Description 28.78
- Unique Product Identifier VEQ

*VAX Distributed File Service*

NBG-118-00

**VAX Distributed Queuing Service (VAXdqs)**

The VAX Distributed Queuing Service uses DECnet to extend the standard VMS print queue service, enabling users to print jobs on printers distributed across a local or wide area network. Users can also monitor or change parameters of the job after it is queued.

VAXdqs operates within the client/server environment: Print requests originate from a client node, and are directed to server nodes that provide print services. Any node with VAXdqs software can be configured to operate as client only or as both client and server. VAXdqs does not limit the number of client or server nodes, or queues. The system manager creates the queues and establishes the correspondence between client queues and queues on server nodes.

**Features**

- Supports local and wide area networks, allowing multiple VMS systems to share printers.
- Provides completely transparent support for most qualifiers of the VMS PRINT command.
- Attempts to transfer a print job whenever a server becomes available if it was previously inaccessible.
- VAXdqs server queues can be configured to direct print jobs to a different queue if a printer is unavailable.
- Allows additional VAXdqs queues and VAXdqs nodes to be added without reinstalling VAXdqs.
- Can be configured to limit access to servers, and to keep usage records.
- VAXdqs can be used in any DECnet environment, whether wide area or local area.

## DECnet System Services

### **Required Hardware**

Any valid VAX or MicroVAX system with VMS or MicroVMS configured to operate on a DECnet network.

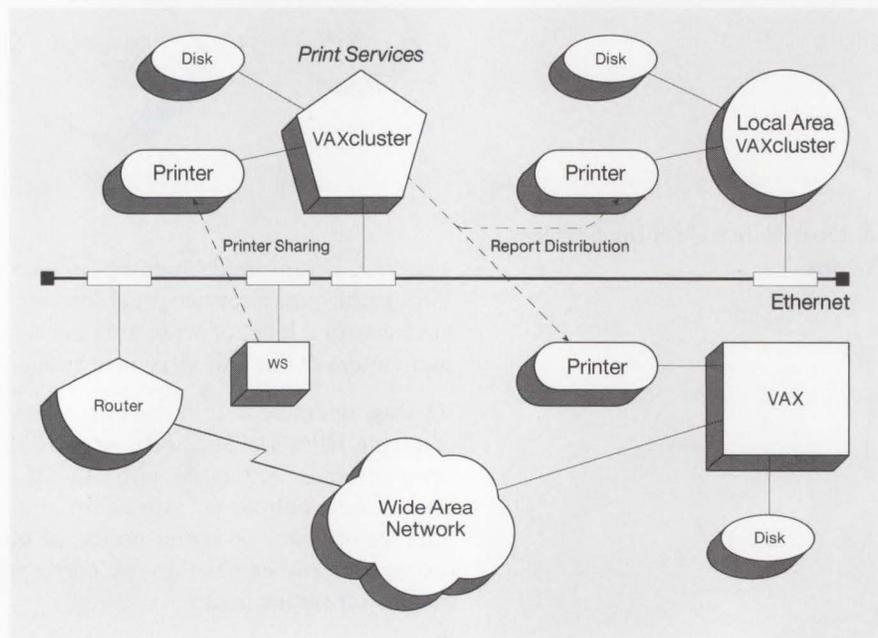
### **Prerequisite Software**

- VMS or MicroVMS operating system, V4.4 or later (MicroVMS Base Component required)
- DECnet-VAX, V4.4 or later

### **Ordering Information**

- ▲ Refer to the following for further information on supported processor and services.
- Software Product Description 28.80
- Unique Product Identifier VEN

### **VAX Distributed Queuing Service**



NBG-117-00

### **VAX Distributed Name Service (VAXdns)**

The VAX Distributed Name Service is a VMS layered product that provides distributed applications with a consistent, networkwide set of names called namespace. This corporate namespace makes it possible for users and applications to refer to resources in the network—like files, disks, and nodes—by using a single name, without knowing where the resource is located.

VAX Distributed Name Service uses a client-server model. A VAXdns server is a node that physically holds some or all of the VAXdns database of names. VAXdns clients are applications like the VAX Distributed File Service, Remote System Manager, and customer applications that uses VAXdns for storing and retrieving names. The VAXdns software these client applications use is called the VAXdns clerk. The VAXdns clerk is distributed with VMS and uses DECnet for its transport.

## DECnet System Services

VAXdns stores name information in databases on VAXdns server nodes. The VAXdns database can be distributed across the network on more than one node to provide availability and performance benefits. When more than one VAXdns server is present in the network, VAXdns coordinates the databases for consistency. As a general rule, two nodes configured as VAXdns servers in each local area network should provide adequate performance and redundancy.

### **Features**

- Provides a consistent networkwide set of names that allows applications to refer to network resources using the same name from any node in the network.
- Provides access control to each name stored in the name service on a per-user basis.
- Includes a VAXdns management-control program to control VAXdns operation and display statistical and error information.
- Provides network event logging using the DECnet-VAX event logging facility. (The DECnet-VAX NCP utility can be used to enable and disable name service events.)
- Supports both wide area and local area networks.
- Stores and manages a large number of names for easier network growth.
- Ensures namespace consistency across all VAXdns server nodes.

### **Required Hardware**

Any valid VAX or MicroVAX system with VMS or MicroVMS configured to operate on a DECnet network.

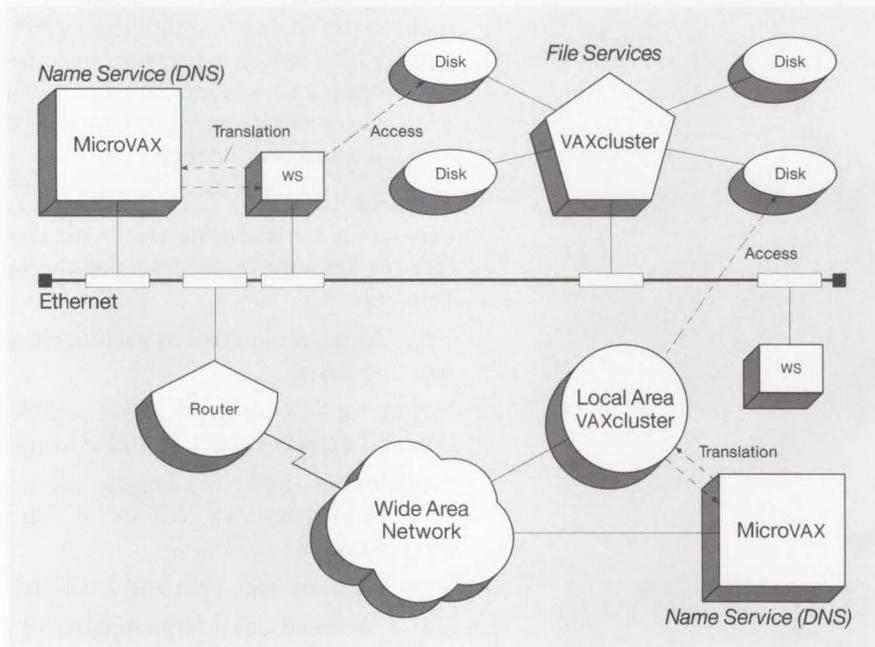
### **Prerequisite Software**

- VMS operating system, V4.6–V5.0
- DECnet-VAX, V4.4–V5.0

### **Ordering Information**

- ▲ Refer to the following for further information on supported processor and services.
- Software Product Description 28.79
- Unique Product Identifier VER

*VAX Distributed Name Service*



NBG-116-00

**Remote System Manager (VAXrsm)**

The Remote System Manager is a network layered product that enables one system manager to efficiently and easily manage many VMS and ULTRIX computer systems. Operating across DECnet, a VMS-based VAXrsm server automates the recurring system management tasks of

- Operating system installation.
- Layered software distribution.
- File backup and restore.
- System administration.

The Remote System Manager environment consists of one or more VMS-based server systems and multiple VMS or ULTRIX client systems connected via DECnet in a local or wide area network. The system manager, operating from the VAXrsm management server, can remotely install software and schedule or initiate backups for the remote client's systems. This allows the system manager to manage more systems and offloads system management tasks from users so that they can be more productive on the job. VAXrsm supports a wide variety of client systems, from single workstations to cluster members to PC LAN servers.

VAXrsm server software has both a menu interface and a command line interface to the management tools that install software, control backup and restore services, and perform administrative tasks like distributing VAXrsm logical names. You can, for example, create a client group or an application set by making menu choices or by issuing a series of VAXrsm commands to suit your system management style.

### **Features**

- Centralized software installation and updating relieve users of system management responsibilities and ensure that they always have the latest versions of operating system software, applications and tools.
- Centralized file backup allows for remote and unattended execution of backup operations and eliminates the need for users to perform their own backups.
- Centralized system management reduces the need for system support resources at remote sites, increases flexibility, and helps lower operating costs.
- Centralized name management, through use of the VAX Distributed Name Service, allows the system manager to define and deal with a group of clients as a single entity. With just one command, the system manager can initiate a task to run simultaneously on multiple clients.
- Centralized distribution and updating of VMS logical names and symbols, the DECnet database, and VMS license information helps guarantee accurate and simple access to network resources for users.
- Supports installation of layered software and backup and restore services in both a local area and a wide area network.
- Supports installation of VMS and ULTRIX operating systems in a local area network or an extended local area network.
- Supports clusters and PC LAN servers as clients.

### **Required Hardware**

- For the VAXrsm server, refer to Software Product Description (SPD) 29.95 for supported processors.
- For the VAXrsm client, all VAX and MicroVAX systems. At least one client must have a load device, such as a TK50 tape drive. Refer to Software Product Description 29.59 for supported processors, specific system and disk storage requirements.

### **Prerequisite Software**

- For VMS servers:
  - VMS Operating System V5.0–V5.2 or MicroVMS Operating System V4.6–V4.7
  - DECnet-VAX V5.0–V5.2
- For VMS clients:
  - VMS Operating System V4.6–V5.2 or MicroVMS Operating System V4.6–V4.7
  - DECnet-VAX V4.6–V5.2
- For ULTRIX-32 clients:
  - ULTRIX-32 V2.0–V3.0
  - DECnet-ULTRIX-32 V2.0–V3.0
  - ULTRIX-32 Worksystem Software V1.1–V2.0
- VAX Distributed Name Service V1.0 or V1.1 must be installed on at least one node in the network and accessible via DECnet from VAXrsm server nodes. Installation on two systems is recommended to provide redundancy in the event of failure of one node.

## DECnet System Services

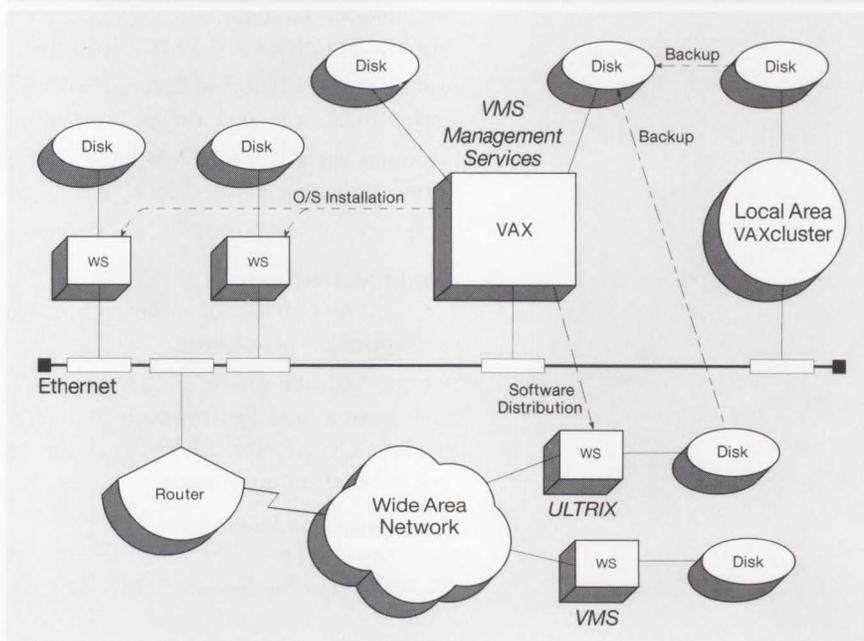
A Remote System Manager server license is required on each VMS node configured as a server. A Remote System Manager client license is required on each VMS and ULTRIX system configured as a VAXrsm client. Remote System Manager server and client nodes must be configured to operate in a DECnet network.

### Ordering Information

▲ Refer to the following for further information on supported processors and services.:

- Software Product Description 29.95
- Unique Product Identifier
  - VMS Server B13
  - VMS Client B14
  - ULTRIX Client ZEZ

### Remote System Manager



NBG-119-00

The following applications supply answers for specific multivendor requirements:

- **VAX Notes**—A computer conferencing software product, VAX Notes allows users to create and access online conferences.
- **VAX VTX**—Videotex is a distributed information retrieval service that the user can navigate by selecting choices from a menu. VAX VTX, a software product layered on VMS, provides videotex services compliant with CCITT F.300 regulations.
- **Computer Integrated Telephony**—An approach that enables users to integrate the features and capabilities of the telephone and telephone-switching network with the data-processing capabilities of computer equipment into a single application. Digital's approach to CIT includes the CIT Server and CIT Applications Interface, both described in this section.

## VAX Notes

VAX Notes is a computer conferencing software product that allows users to create and access online conferences or meetings. Computer conferencing lets users conduct meetings with people in different geographic locations via computer, so that participants can join in a discussion from their desks at any time. It also keeps a detailed record of the proceedings of a meeting, which can be searched by a variety of criteria, such as name of participant, subject, or keyword.

VAX Notes can be used as an “electronic bulletin board” or collaborative document for authoring and reviewing. It can be used for internal classes or seminars, and can provide expertise to groups that lack resources in a given area by referencing expert resources in a company. VAX Notes provides an efficient communication flow across the corporate hierarchy.

▲ Refer to Software Product Description 27.06 for detailed information.

### Features

- **Distributed access**—VAX Notes has been designed for optimal multinode access in a DECnet network, using server technology to achieve rapid response, even from distant nodes. VAX Notes conferences can exist on and be accessed from any VMS node in a DECnet network, offering true distributed processing and access capabilities. Users on remote nodes need not have an account on the node where the conference is located.
- **Moderator support**—A moderator is a person responsible for managing a conference, which can be public or private. For private conferences, the moderator can restrict access to a specific group of participants by specifying name and network location. Public conferences have no restrictions on who may participate. The moderator may send announcements of new conferences to participants, and has the ability to delete notes entered by other participants. Moderators may also create special notices that are displayed for all participants each time the conference is accessed.
- **Ease-of-use**—All functions can be accessed by easy-to-use commands, supported with online contextual help. Documentation quickly familiarizes new users with VAX Notes.
- **Choice of editor interfaces**—VAX Notes provides three screen-oriented user interfaces for editing, allowing users to specify EVE (an extensible interface), EDT-style keypad interface, or WPS-style Gold keypad interface on ANSI-compatible terminals. VAX Notes also includes a line-mode editor for use on non-ANSI terminal devices.

## Business Communications

- Topics and replies—VAX Notes uses a simple topic-and-replies structure to maintain conferences, with no difficult hierarchy to navigate. Directory listings show all topics by author, title and date, and the number of replies. All notes can be read either sequentially or at random. Also, users may read only those notes which they have not yet seen. VAX Notes allows participants to search for various topics and replies using the DIRECTORY and KEYWORD commands.
- Imported Text—VAX Notes allows notes and replies to be created outside VAX Notes (using any editor that can produce ASCII output files), then later imported to the conference.
- Mail Integration—VAX Notes uses VMSmail (included in the VMS Operating System) to allow users to send notes or messages to other users from within VAX Notes.

### ***Prerequisite Hardware***

VAX, MicroVAX or VAXstation configurations as specified in Software Product Description 27.06.xx-A

Note: VAX Notes supports screen-oriented editing only on terminals that respond to ANSI control functions and that operate in ANSI mode. VAX Notes screen-oriented editing optimizes the features of the Digital VT200 and VT100 families of terminals.

Line-mode editing is provided for non-ANSI terminals supported by the VMS Operating System.

### ***Prerequisite Software***

VMS Operating System V5.0. VAX workstations require VMS Workstation Software.

Note: Optional software includes DECnet-VAX, ALL-IN-1, ALL-IN-1 Office Menu, and VAX DECspell.

### ***Ordering Information***

VAX Notes contains three licensing options: a full-function Server, a reduced-function Client, and a User-based option. The Server and User-based options allow access to all VAX Notes capabilities; the User-based option restricts the number of simultaneous users on the node or VAXcluster where the user-based option is installed. The Client option contains the majority of VAX Notes functions, but prevents the creation of conferences. The VAX Notes Client does not function without a VAX Notes Server installed in the network. Use of the VAX Notes Client and User-based options within the same cluster is prohibited.

▲ Refer to the following for further information on supported processors and services.

- Software Product Description 27.06
- Unique Product Identifier 960

**VAX VTX**

VAX VTX is a software package layered on VMS that provides videotex services compliant with CCITT F.300 recommendations. Videotex is a distributed information retrieval service that utilizes a tree-structured database through which the user navigates by selecting choices from a menu. The content of the videotex information base consists of full screen “pages” of information.

The information contained in the infobase is prepared using standard Digital editors (WPS-PLUS, TPU, EDT, DECgraph, and DECslide, etc.) to create the “pages” of information. VAX VTX provides

- A distributed videotex service environment on VAX or MicroVAX systems and Digital networks.
- Access through terminals to page- and menu-oriented, distributed, text or graphics information bases.
- An application-level protocol that permits communication between VAX VTX and transaction-oriented “remote” applications.

VAX VTX services the nontechnical and senior management person with both quick access to the system and the ability to peruse online information without training. VAX VTX provides services to two primary categories of user:

- The Information Provider (IP) prepares page-oriented information for entry into a VAX VTX infobase.
- The enduser or subscriber views, extracts, and uses the information stored in the VAX VTX infobase.

VAX VTX consists of several components, including VTX Server (SRV), Terminal Control/Concentrator (TCP/CON), Terminal Specific Module (TSM), VTX Update utility (VTXUPD), VAX VTX Workbench utility, External Link interface (ELK), VTX Application Service (VAS), and Remote Update Server Link (RUSL). The ELK, VAS, and RUSL utilities enable the programmer to build linkages to other applications or databases within a VMS or non-VMS environment. ▲ Refer to SPD 26.57 for further information.

**Features**

- VAX VTX Workbench provides an environment for the Information Provider to storyboard, design, build and maintain a VTX infobase. The Information Provider can build a complete menu structure through a simple pictorial interface.
- Concentrator support—for X.29 virtual devices, construction of X.25-based gateways, concentrator support for 3270-class terminals based on the use of the DECnet/SNA VMS 3270 Data Stream Programming Interface and customer-written IBM application.
- Ability to modify the Terminal Control Program—The Terminal Specific Module (TSM) allows for changes in keypad to function mapping.
- Document Paginator allows the VTX Information Provider to paginate documents for subsequent use by the VTX Update utility or the VAX VTX Workbench Utility. The document paginator allows pagination of WPS-PLUS files, ASCII files and DDIF documents.

## Business Communications

- Template files—a means by which a VTX Information Provider can associate some background set of information (usually containing company logos and other static information) with the page of information that is currently being entered.
- Context-sensitive keywords—segmented keyword files allow for keyword matches based on the subscriber's current page context.
- ALL-IN-1 Terminal Control Program—included in the VTX base product and fully integrated with ALL-IN-1 as part of ALL-IN-1, Version 2.2 and 2.3 releases, enables the ALL-IN-1 user to access VTX using Gold key mappings for the standard VTX functions. Also allows for integration with the ALL-IN-1 interrupt and scratchpad menus.
- Extensive online help—available whenever the end-user requests input.
- Support for common user interface—enables a customer site to establish a common user interface across the entire range of VAX VTX information retrieval applications.

### ***Prerequisite Hardware***

- Any valid VAX system configuration running VMS with at least 2 Mbytes of dedicated memory
  - MicroVAX II systems must have
    - Minimum of 1 Mbyte of memory
    - TK50 tape drive for installation of the software
    - RD-series system disk
  - VAXstation II systems must have
    - Minimum of 1 Mbyte of memory
    - TK50 tape drive for installation of the software
- ▲ Refer to SPD 26.57 for block space requirements and supported Terminals.

### ***Prerequisite Software***

VMS V5.0 or V5.1

- ▲ For information on VMS classes and tailoring, refer to SPD 25.01 and to SPD 26.57.

### ***Ordering Information***

- Order a VAX VTX full license for the CPU on which the VTX information base will be developed and run. This license provides a functionally complete system containing all five VTX components.
- Order a Terminal Control/Concentrator license for each additional CPU that needs to access the information base over the network. This license provides only the TCP/CON and the TSM components. No information base development can be done with the TCP/CON license. A VAX VTX full license on another CPU is a prerequisite.
- Order the VAX VTX Remote Update license (QL-VZ4Ax-xx) to enable an Information Provider to update remote infobases over the network.
- Order the VAX VALU runtime license to copy a VALU application to another CPU.

## Business Communications

Refer to the following Software Product Description (SPD) and Unique Product Identifier (UPI) for further information on supported processors and services:

- VAX VTX
  - SPD 26.57
  - UPI 031
- Terminal Control/Concentrator
  - UPI 033
- VAX VTX Application Link Utilities (VALU)
  - SPD 26.94
  - UPI 035
- Run-Time Only Option
  - UPI VMB

### VAX/VMS Computer Integrated Telephony PBX Server

The VAX/VMS Computer Integrated Telephony PBX Server (CIT Server) is software that links the Digital computing environment with a PBX. CIT Server software supports communications between a VAX and the Northern Telecom Meridian SL-1 PBX Generic X.11 Release 12 available in North America.

In the Digital computing environment, access to the CIT Server is through the VAX/VMS Computer Integrated Telephony Applications Interface (CIT Applications Interface, described elsewhere in this section), software that provides programmers with an applications interface comprising a library of VMS routines.

These routines allow the applications programmer to establish and control logical communications channels between a VAX and the associated PBX. These channels can be used for basic call processing, such as making and accepting telephone calls, and for additional call processing such as transfer calls and conference calls.

CIT Server software resides on a VAX/VMS host connected to a CIT-compatible PBX by a synchronous communications link. The CIT Server software communicates with the CIT-compatible PBX and the CIT Applications Interface client nodes, acting as an intermediary passing messages between the PBX and the CIT Applications Interfaces.

#### **Features**

- Manages the link between the PBX and the Digital computing environment.
- Allows the transfer of request and status information on the telephones and calls under the user application.
- Acts as an intermediary between the PBX and the CIT Applications Interfaces on the client nodes.

#### **Prerequisite Hardware**

- Any valid VAX, MicroVAX, or VAXstation system as specified in Software Product Description 29.91.xx
- CIT-compatible PBX configured to support that PBX's link protocol:
  - British Telecom REGENT Generic 257
  - Northern Telecom Meridian SL-1 Range

#### **Prerequisite Software**

- VAX/VMS Version 5.0 or later
- DECnet-VAX end-node or full-function node license if more than one VAX is of the configuration
- CIT Applications Interface software, either on the same VAX as the CIT Server software, or on another VAX linked to the CIT Server host by DECnet

#### **Ordering Information**

Refer to the following for further information:

- Software Product Description 29.91.xx
- Unique Product Identifier VGY

**VAX/VMS Computer Integrated  
Telephony Applications Interface  
(VAX/VMS CIT Applications  
Interface)**

The VAX/VMS Computer Integrated Telephony Applications Interface (CIT Applications Interface), a software package, provides programmers with an applications interface comprising a library of VMS routines that enable the programmer to initiate features and monitor the status of telephones connected to a PBX. CIT Applications Interface routines comply with the VMS Standard for Procedure Calling and Condition Handling, presenting a familiar interface to VMS applications programmers.

The CIT routines allow the applications programmer to establish and control logical communications channels between a VAX and the associated PBX. These channels can be used for basic call processing, such as making and accepting calls, and for additional call processing such as transfer calls and conference calls. The routines can be grouped broadly according to the following functions:

- Control of the communications channel—Establishes and releases logical communications channels, and monitors a channel assigned to a telephony device.
- Basic calls processing—includes making calls and hanging up calls.
- Holding and retrieving calls.
- Canceling calls and responding to incomplete calls.
- Transferring and conferencing calls.
- Answering calls.

Note that actual functions may vary with the PBX in use.

The CIT Applications Interface is client software that provides the high-level interface for applications programmers, passing the application's requests to Digital's VAX/VMS CIT Server software (described earlier in this section).

**Features**

- Enables programmers to initiate features and monitor the status of telephones connected to a PBX.
- Interface routines employ the same high-level calls to the CIT Server software to enable telephone functions, regardless of the switch involved.
- Presents a familiar interface to VMS applications programmers (complies with the VMS standard for Procedure Calling and Condition Handling).

**Prerequisite Hardware**

Any valid VAX, MicroVAX, or VAXstation as specified in Software Product Description 29.92.xx

**Prerequisite Software**

- VAX/VMS Version 5.0 or later
- DECnet-VAX end-node or full-function node license if more than one VAX is of the configuration
- CIT Server software, either on the same VAX as the CIT Applications Interface software, or on another VAX linked to the CIT Server host by DECnet

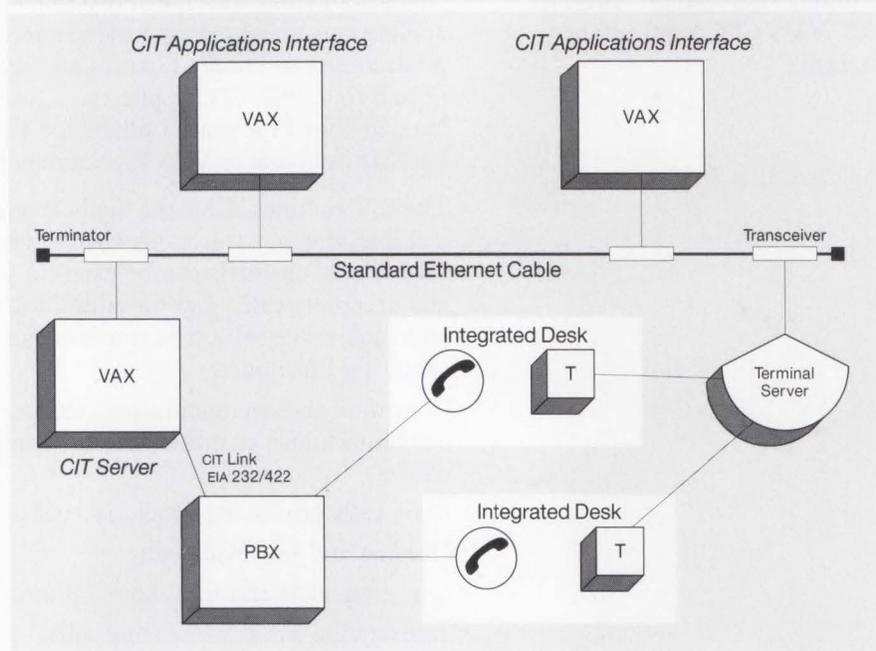
**Ordering Information**

Refer to following for further information:

- Software Product Description 29.92.xx
- Unique Product Identifier VGX

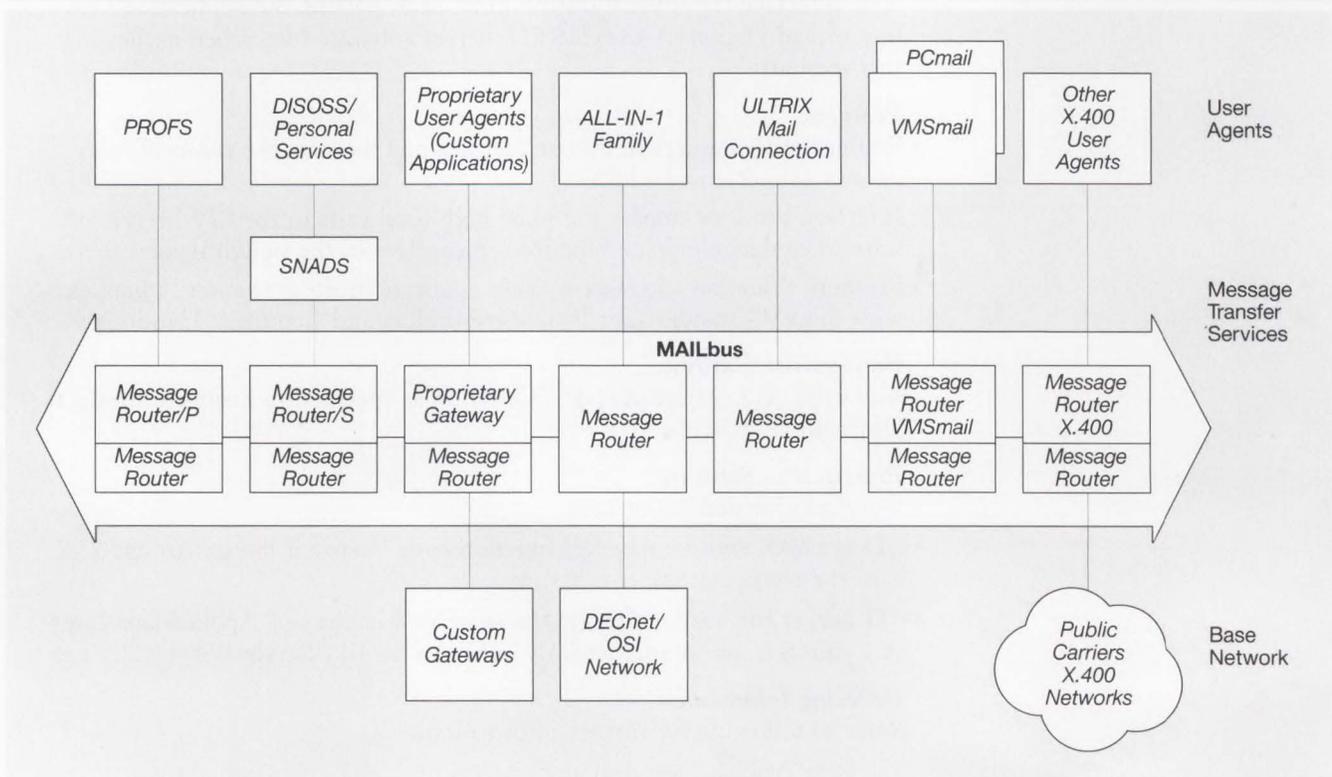
# Business Communications

## Computer Integrated Telephony



NBG-242-00

## Digital's Distributed Electronic Messaging Solution Components



NBG-152-01

**MAILbus Electronic Mail Interchange**—Electronic mail and messaging services allow users and application programs to exchange mail or messages in a multivendor environment. These services are based on the CCITT X.400 standard for message handling.

MAILbus is a set of application software that links multivendor electronic mail systems and messaging applications into an enterprise-wide electronic messaging system. MAILbus provides the ability to tie mail systems together in a corporate-wide electronic mail backbone, and enables electronic mail exchange with public electronic mail systems.

Messages delivered on MAILbus follow the model specified in the CCITT X.400 Message Handling System Recommendations. The recommendations outline three major components for a message-handling system: the OSI network, the Message Transfer Service, and the User Agents. MAILbus is Digital's Message Transfer Service and consists of

- **VAX Message Router Base.**
- **VAX Message Router VMSmail Gateway.**
- **ULTRIX Mail Connection.**
- **VAX Message Router/S Gateway (for IBM SNADS).**
- **VAX Message Router/P Gateway (for IBM PROFS).**
- **VAX Message Router X.400 Gateway (MRX).**
- **VAX Message Router Programmer's Kit (API).**
- **PCMAIL.** ▲ Refer to "Integrated Personal Computing" in this section.

#### ***Installing MAILbus***

Installing a MAILbus system means installing all of the MAILbus components required on the nodes in the network. The order in which one installs the components on a particular node is important. If upgrading an existing electronic messaging system, careful consideration must be given to the order in which the nodes in the network are upgraded. It is imperative that all prerequisite software and hardware are installed prior to the installation of the MAILbus products.

#### ***Configuring MAILbus***

Configuring a MAILbus system means setting up the characteristics of the MAILbus components across the system. Installation and configuration of some of the components are done at the same time. Message Router must be configured prior to the configuration of any other components on a node, because Message Router configuration determines part of the configuration for other MAILbus components. Entries in the Directory Service must be added for all of the people who will use Message Router X.400 Gateway, /S Gateway, and /P Gateway. It is also useful to add entries for all the other people who will use the messaging system.

#### ***Tuning MAILbus***

Tuning the MAILbus system means adjusting the configuration after it has been working for a little while. There are several reasons for tuning the system, for example:

- To increase performance, perhaps by increasing message throughput
- To correct mistakes made at the planning stage
- To adapt the system to changed requirements

## MAILbus Electronic Mail Interchange

The documentation provided with the MAILbus components contain the information necessary for tuning the MAILbus system.

### *Non-mail Applications of MAILbus*

Most existing Message Router and MAILbus systems are electronic mail systems. However, the Message Router Transfer Service can transfer messages of many types, not only mail messages, as the following example shows.

A person planning a meeting, enters the names of the people who are to attend the meeting, and a preferred date and time. The diary software sends messages to the personal diaries of the people attending the meeting, asking for the times they are available. When it has received replies from attendees, it selects the most convenient time for the meeting. It then sends another message, booking this time in the personal diaries of the attendees and informs the person arranging the meeting of the date time.

This example describes an electronic diary application, with the ability to schedule meetings automatically, affecting every user on a network keeping a personal on-line appointment diary.

### VAX Message Router

The base of Digital's MAILbus, or message handling system, is Message Router. It is a layered VMS application that provides a store-and-forward messaging service, and also provides the ability to transfer messages across the mail network. Messages can consist of any information including text, data, and arbitrary files, that need to be transferred within a DECnet network. In addition, Message Router can also maintain a list of the users in the mail system so that each user can be identified.

Message Router is composed of three services: a transfer, a directory, and management services. The transfer service has the responsibility to deliver messages throughout the mail network. The directory service maintains a list of "subscribers" on the mail network. It maintains a current record of the names and addresses of those subscribers on the network. Lastly, the management service is responsible for monitoring the mail network for errors and exception conditions, and assists with the routine management of Message Router.

Electronic mail user agents, such as the ALL-IN-1 family, attach directly to MAILbus to access network store-and-forward services. Other user agents, such as VMSmail and PCMAIL, attach to MAILbus through Gateway products. Additional Gateway products are available that provide the ability to exchange mail with UNIX System V, IBM SNADS, and IBM PROFS. An additional product, the Message Router X.400 Gateway, adapts MAILbus to run in a fully compliant OSI environment.

In order to access the store-and-forward services of Message Router, a user agent or gateway must perform some or all of the following functions:

- Format and display messages.
- Interact with Message Router to send or receive messages.
- Convert a received message from Message Router format to the application format.
- Convert a sending application format into the Message Router format.

## MAILbus Electronic Mail Interchange

Message Router must be installed on any network node that contains user agents or gateways that require connection to MAILbus. It is a standard component of the ALL-IN-1 family and all Mail Gateways, and the Message Router Programmer's Kit.

▲ For more information, refer to Software Product Description 26.33.

### *Features*

- Used by Mail Agents and Gateways to exchange messages in a Digital-only or multivendor environment.
- Logs the progress of messages and informs the sending application if not deliverable. Messages that cannot be immediately delivered are retained in a Message Router node until they can be forwarded. (The system manager controls the number and frequency of retries before the Message Router returns a message to the sender as undeliverable.)
- May be installed in selected VMS nodes along a routing path to store messages that may, for example, be retained for transmission at off-peak hours, or logged into a central, record-keeping node for accounting or statistical analysis.
- May be used by any application adhering to Message Router or X.400 protocols that needs to transfer data in a multivendor environment.
- Used by mail gateways to convert messages addresses between their MAILbus form and the form used in the foreign mail systems.
- Contains application-management services for automated system management, including exception reporting and Management Action Procedures (MAPS), which allow an organization to significantly reduce mail network-management costs.
- Provides a procedure to configure a simplified, low-management network with the ability to easily reconfigure the network to allow for expansion.

### *VAX Message Router Base*

The VAX Message Router Base is supplied as a separate package for installation with customer-written Message Router applications. Also, it may be installed on selected VMS nodes along a routing path, wherever there is a need to store and log messages in transit. This allows for a centrally managed message transfer service.

### *Required Hardware*

Any valid VAX, MicroVAX, or VAXstation system configuration that supports the DECnet Phase IV network.

### *Prerequisite Software*

- VMS or MicroVMS operating system V5.0
- DECnet-VAX, V5.0

### *Ordering Information*

- ▲ Refer to the following for further information on supported processors and services:
  - Software Product Description 26.33
  - Unique Product Identifier 732

## MAILbus Electronic Mail Interchange

### VAX Message Router VMSmail Gateway

VAX Message Router VMSmail Gateway is a layered VMS application that allows VMSmail users and PCMAIL users to send and receive mail in a network from other systems that use the MAILbus. The VMSmail Gateway package contains the Message Router Base and the Gateway to the VMS Personal Mail Utility, and Digital's PCLAN 2000 PCMAIL capability.

#### *Features*

- Allows VMSmail and PCMAIL users to exchange messages using Message Router store-and-forward management, thus ensuring guaranteed delivery.
- Allows VMSmail and PCMAIL users to exchange messages with users of other mail agents on the MAILbus.
- Allows VMSmail and PCMAIL users to exchange messages with the users of non-Digital supplied mail systems via the X.400 Gateway, Message Router/S Gateway, or Message Router/P Gateway.
- Converts incoming Digital DX format and WPS-PLUS documents into ASCII before delivering them to the VMSmail user.
- Includes management tools to configure and operate the gateway.

#### *Required Hardware*

Any valid VAX, MicroVAX, or VAXstation system configuration that supports the DECnet Phase IV network.

#### *Prerequisite Software*

- VMS or MicroVMS operating system V5.0
- DECnet-VAX V5.0

#### *Ordering Information*

- ▲ Refer to the following for further information on supported processors and services.
- Software Description 26.33
- Unique Product Identifier 730

### ULTRIX Mail Connection

The ULTRIX Mail Connection, an electronic mail product layered on ULTRIX, provides high-performance, direct access to the VMS Message Router and thus to the MAILbus domain and all its gateways and user agents. The product allows ULTRIX users to exchange mail messages with VMS-based users (ALL-IN-1, VMSmail), IBM users (via Message Router/P and Message Router/S Gateways), and X.400-based users (via Message Router/X.400 Gateway). In addition to the gateway, the ULTRIX Mail Connection provides an enhanced mail user agent.

Users on ULTRIX and non-Digital UNIX-based systems can use the ULTRIX Mail Connection as an exchange gateway between any of their UNIX-based systems and MAILbus, enabling effective, simple mail communication between industry-standard (UNIX-based systems) and proprietary (VMS) communities.

Note that the ULTRIX Mail Connection gateway handles only ASCII text: Incoming mail messages with non-ASCII body parts, such as WPS-PLUS documents, cause a delivery message to be sent to the ULTRIX recipient with a brief description of the type of message and the sender's name/address, allowing users to make other arrangements.

## MAILbus Electronic Mail Interchange

### *Features*

- Provides connectivity between UNIX-based mail and MAILbus through VMS Message Router V3.0.
- Allows ULTRIX users to exchange mail with ALL-IN-1, VMSmail users, plus access X.400, IBM/PROFS, and IBM/SNADS gateways.
- Acts as a gateway between non-Digital UNIX-based systems and MAILbus.

### *Required Hardware*

For ULTRIX, in addition to the minimum ULTRIX hardware requirements for the prerequisite ULTRIX and DECnet software, ULTRIX Mail Connection requires a minimum of 5 Mbytes disk space allocated permanently.

For VMS, in addition to the minimum hardware requirements for the prerequisite VMS and Message Router software, ULTRIX Mail Connection requires 1,000 blocks (512 Kbytes) of disk space allocated permanently.

### *Required Software*

For the ULTRIX system:

- ULTRIX-32 V2.2 or later, or ULTRIX Worksystem Software V1.1 or later
- DECnet-ULTRIX V2.2 or later

For VMS:

- VMS V4.6, V4.7, or V5.0; or MicroVMS V4.6 or V4.7
- Message Router V3.0 or V3.1
- DECnet-VAX V4.6, V4.7, or V5.0

### *Ordering Information*

▲ Refer to the following for further information on supported processors and services:

- Software Product Description 29.05
- Unique Product Identifier VFG

### **VAX Message Router/S Gateway (for IBM SNADS)**

Message Router/S Gateway is a layered VMS application that allows the transparent exchange of electronic mail, messages, revisable and final-format documents, and MS-DOS files between the users of Digital and IBM Office Networks. The Message Router/S Gateway links IBM systems into a multivendor office network using an international standard (CCITT X.400).

The IBM DISOSS/370 contains the mainframe implementation of Systems Network Architecture Distribution Services (SNADS), which provides a store-and-forward function for the transmission of electronic mail and documents through an SNA network. IBM System 36 and 38, and IBM 5520 also support SNADS, although the connection between DECnet and SNA networks must be through the IBM mainframe. From the Digital office network, WPS-PLUS, ASCII, and Digital Document Exchange (DX) documents and messages are converted to DCA revisable format for transmission to SNADS systems. Documents and messages in DCA format received by the Message Router/S Gateway from the SNADS environment are converted to the Digital DX document format for delivery within the network. MS-DOS files are transferred with no conversion in either direction.

## MAILbus Electronic Mail Interchange

The Message Router/S Gateway need be installed on only one VAX/VMS system in the Digital network, where it serves all Digital network systems that send or receive messages to or from the SNADS environment. The Message Router Base must be installed on the same system as the Message Router/S Gateway.

### **Features**

- Allows users in the IBM SNADS environment to communicate with any other Message Router User Agent or Gateway on the Digital network (once the appropriate entries are made in the Digital Distributed Directory Services).
- Mail senders need know only the recipient's address. IBM users address Digital users following the conventions of the SNADS environment; Digital users address IBM users following the conventions of the Digital environment.
- Digital and IBM users can be included in the same message address or distribution list.
- Delivery confirmation and nondelivery notification messages are supported.
  - ▲ For more information about general Message Router capabilities, refer to "Message Router" in this section.

### **Required Hardware**

- Any valid VAX, MicroVAX, or VAXstation system that supports the DECnet Phase IV network.
- One of the following:
  - A properly configured DECnet/SNA Gateway system. (▲ Refer to Software Product Description 30.15 for specific requirements.)
  - VMS/SNA installed for single-system connection through a synchronous line. (▲ Refer to Software Product Description 27.01 for specific requirements.)

### **Prerequisite Software**

- VMS or MicroVMS Operating System, V4.4 or later (MicroVMS requires both Extended Base and Program Development components.)
- DECnet-VAX, V4.4 or later
- Message Router Base, V3.0 or later (shipped with the MR/S Gateway)
- DECnet/SNA VMS APPC/LU6.2 Programming Interface, V2.0

### **Ordering Information**

- ▲ Refer to the following for further information on supported processor and services.
- Software Product Description 29.24
- Unique Product Identifier VDU

**VAX Message Router/P Gateway  
(for IBM PROFS)**

Message Router/P (MR/P) Gateway is a layered VMS application that allows the transparent exchange of electronic mail, messages, revisable and final-form documents, and MS-DOS files between users in a DECnet environment and users in a IBM Professional Office System (PROFS) or Conversational Monitor System (CMS) in an SNA environment. Digital and IBM users employ standard methods to prepare and send documents and messages. MR/P converts mail messages and documents from either environment and forwards them in a format appropriate to the recipient. MR/P can send mail messages and documents from PROFS users to users in the Digital network, SNADS network (via the Message Router/S gateway), and X.400 network (via Message Router X.400 gateway). Communications between DECnet and IBM SNA environments is through a DECnet/SNA gateway or VMS/SNA software.

The Message Router/P Gateway need be installed on only one VAX/VMS system in the Digital network, where it serves all Digital network systems that send or receive messages to or from the PROFS or CMS environment. The Message Router Base must be installed on the same system as the Message Router/P Gateway.

**Features**

- Allows IBM PROFS or VM CMS users to communicate with any Message Router User Agent or Gateway on the Digital network, once the appropriate entries are made in the Digital Distributed Directory Service. ▲ Refer to “DECnet Distributed Services” in this section for more information on the Distributed Directory Service.
  - Mail senders need know only the recipient’s address: PROFS users address Digital users as they would other PROFS users; Digital users address PROFS users as they would other Digital users.
  - Digital and IBM users can be included in the same message address or distribution list.
  - Delivery confirmation and nondelivery notification messages are supported.
- ▲ For more information about other Message Router capabilities, refer to the Message Router topic in this section.

**Required Hardware**

- Any valid VAX, MicroVAX, or VAXstation system that supports the DECnet Phase IV network.
- One of the following:
  - A properly configured DECnet/SNA Gateway system. ▲ Refer to Software Product Description 30.15 for specific requirements.
  - VMS/SNA installed for single-system connection through a synchronous line. ▲ Refer to Software Product Description 27.01 for specific requirements.

**Prerequisite Software**

- VMS or MicroVMS Operating System V4.4 or later. (MicroVMS requires both Extended Base and Program Development components.)
- DECnet-VAX V4.4 or later
- Message Router Base V3.0 or later (shipped with the MR/S Gateway)
- DECnet/SNA VMS API V2.2

### VAX Message Router X.400 Gateway

#### **Ordering Information**

Refer to the following for further information on supported processors and services:

- Software Product Description 28.94
- Unique Product Identifier VCG

VAX Message Router X.400 Gateway is a layered VMS application that provides a communication path between a Message Router-based network and any other message transfer service that conforms to the CCITT 1984 X.400 Recommendations for Message Handling Systems. The Message Router X.400 Gateway allows users of mail agents running on Message Router, such as ALL-IN-1, to communicate with X.400 mail systems either in other networks or within the same network.

Message Router supports messages constructed using the encoding defined by the National Bureau of Standards (NBS) Specification for the Message Format for Computer-based Message Systems. The structure of the messages follows the format specified in the CCITT X.400 Recommendations. The Message Router X.400 Gateway converts the messaging protocols between NBS and X.409 encoding.

The Message Router X.400 Gateway (together with Digital's OSI products) provides interconnection between Digital's mail systems and other X.400 systems, which may be within the same network or within private or public X.400 networks.

#### **Features**

- Conforms to the CCITT X.400 Recommendations as defined in the profiles produced by CEPT (A311), CEN/CENELEC (A3211), and the NBS/X.400 profile.
- Includes Message Router Base and components of the VAX OSI Applications Kernel (OSAK), which includes the transport (VOTS). The Message Router X.400 Gateway can run on any node in the mail network, provided that it is connected to the mail system by Message Router and has access on the same node to Message Router and either VAX P.S.I. or VAX P.S.I. Access.
- Complements the ALL-IN-1 Integrated Office and Information System, VMS mail, and other mail systems that can access the Message Router.
- Allows electronic mail to be exchanged with other electronic mail systems or public service providers that support the X.400 Recommendations.
- Provides for electronic mail interchange between two independent DECnet networks.
- Provides a directory service to translate between Digital addressing and CCITT X.400 Originator/Recipient name forms.
- Includes management tools to configure and operate the gateway.

#### **Required Hardware**

- Any valid VAX, MicroVAX II, VAXstation II system configuration that supports the DECnet Phase IV network.
- A communications device supported by VAX P.S.I. or a communications device supporting 802.3/Ethernet for Packetnet (X.25) communication.

**Prerequisite Software**

- VMS or MicroVMS operating system V4.4.
- DECnet-VAX, VAX P.S.I. or VAX P.S.I. Access V4.0.
- Any mail system running on Message Router (requires VMSmail Gateway V2.1 for VMSmail connection).
- Message Router Base V3.0 or later (shipped with the Message Router X.400 Gateway).

**Ordering Information**

▲ Refer to the following for further information on supported processor and services.

- Software Product Description 27.50
- Unique Product Identifier VDM

The VAX Message Router Programmer's Kit allows customers to write applications that exchange messages over the network. The Message Router provides guaranteed delivery, thus relieving the application program from the need to consider the network state. User-written applications may exchange messages with the Digital-supplied mail systems and gateways, or may run independently.

The Message Router Programmer's Kit contains the Message Router Base and a runtime library of high-level interface routines that can be invoked from a user application. The kit includes documentation to guide the programmer in writing User Agents and Gateways.

**Required Hardware**

Any valid VAX, MicroVAX, or VAXstation system configuration that supports the DECnet Phase IV network.

**Prerequisite Software**

- VMS or MicroVMS operating system V4.4 or later
- DECnet-VAX

**Ordering Information**

- Software Product Description 26.33
- Unique Product Identifier 733

**VAX Message Router  
Programmer's Kit**

## Section 6

### **Manageability: Services and Products**

This section contains the following topics...

Network and System Management Products

Network Security

Services for the Planning and Design Phase

Services for the Implementation and Startup Phase

Services for the Operations and Growth Phase

Related Network Services

Computer Special Systems

## Manageability: Products and Services

Manageability provides the service and product mix that enables customers to design, control, direct, and support an entire network, as well as manage change in a responsive and flexible manner.

Customers regularly require network information for proactive planning and performance of the system. They also need high network availability, ease of use, and system security. Digital addresses these requirements with

- **Network and system management software.**
- **802.3/Ethernet encryption device for security.**
- **Life-cycle network services.**

Digital supports OSI-based network management, open industry-standard interfaces, and voice/data/video network management. Because network management and control features are embedded in the architecture, the network can maintain itself and adjust to changes in the system by automatically circumventing failed components.

Digital's Network and System Management solutions comprise three layers:

- Inherent management capabilities in network hardware and software
- Network management application products
- Comprehensive network service for the entire life cycle of the network

The base of Digital's strength in management products is DECnet, which automates numerous management functions and provides the basic operational control capabilities for data networking.

Network components are controlled by specific network management products, positioned as being either "site level" (networks connecting systems within a building and multiple buildings in one campus) or "corporate level."

Site-level products are those network management products that are most useful in maintaining a "campuswide" network. Corporate-level products are those products best suited to managing the wide area connections between sites. Note that these products do not require that network management personnel be located where these products are deploying their resources. Customers choose the balance between central and distributed management and support based on their organizational requirements.

The following products comprise Digital's Network and System Management products:

- **DECnet**—offers basic operational control of the data communications network nodes. (▲ Refer to Section 4 for more information on DECnet.)
- **The Remote System Manager (RSM)**—provides application and configuration management for multiple, distributed MicroVAX and/or VAXstation systems.
- **The Terminal Server Manager (TSM)**—provides configuration and fault management of terminal servers in an extended 802.3/Ethernet local area network.
- **NMCC/DECnet Monitor**—is a wide area network performance, fault, and configuration management tool for DECnet products.
- **NMCC/VAX ETHERnim**—is a fault isolation and configuration management tool for extended 802.3/Ethernet local area networks.
- **LAN Traffic Monitor**—is a management tool for measuring bandwidth utilization on multivendor 802.3/Ethernet local area networks.
- **Remote Bridge Management Software (RBMS)**—offers configuration management of LAN Bridges in an extended 802.3/Ethernet local area network.

## Network and System Management Products

### Remote System Manager

Remote System Manager (RSM) is a network application that centralizes and facilitates the recurring system management tasks of

- Distributing and installing software.
- Backing up and restoring files across the network.
- Tracking software configurations among participating systems.

▲ Refer to “DECnet System Services” in Section 5 for more information.

### Terminal Server Manager

The Terminal Server Manager VMS (TSM) is a software tool that allows a user at a VAX host to remotely observe and control terminal servers anywhere in the extended local area network. The user can monitor the availability and modify the characteristics of all Digital terminal servers on the network. Domains of servers can be defined, allowing group operations to be performed.

▲ Refer to “802.3/Ethernet Communications Servers” in Section 2 for more information.

### NMCC/DECnet Monitor

The NMCC/DECnet Monitor is a software tool for the observation and control of complex, corporate backbone networks. NMCC/DECnet Monitor responds to English-like commands and graphically presents network conditions within a color network map (if the user has an optional color monitor). This tool also works with a database of configuration information and network parameters that can be readily accessed and analyzed.

The NMCC/DECnet Monitor is designed to assist in three key areas of network management: configuration, fault, and performance management.

#### *Features*

- Nodes can be instructed to send all DECnet events to NMCC/DECnet Monitor. This avoids major problems and minimizes downtime because it enables a manager to detect problems early.
- Relational database capability provides for either active or passive collection of statistics.
- Visual displays of network configuration and performance information simplify interpretation of data and highlight conditions requiring attention. Network topology is displayed as a logical map for easy recognition of network elements and potential trouble spots.
- Histograms and bar charts display historical information to help users analyze trends and plan for growth and change.
- Realtime event logging with predetermined polling parameters enables users to detect problems early and more efficiently.
- Update and adjustment of line charges for an automatic assessment of the cost/performance of the network.
- Improved online help facility gives immediate information pertinent to a particular screen.
- Separate kernel and user interface give users the flexibility to mix and match centralized or distributed control.

## Network and System Management Products

### *Prerequisite Hardware*

- Any valid VAX or MicroVAX system as specified in Software Product Description 26.91.
- MicroVAX II with RD53 (or greater) system disk
- VT240, VT241, VT330, VT340 terminal (for graphic displays), or VT100 or VT220 (for tabular representation)
- DECnet communication device
- Storage device of 35 Megabytes

### *Prerequisite Software*

- VMS operating system V5.0 or later
- DECnet-VAX V5.0 or later
- Full or runtime license for VAX GKS
- Development license for VAX RDB/VMS

### *Ordering Information*

- ▲ Refer to the following for further information on supported processor and services:
- Software Product Description 26.91
- Unique Product Identifier VTG

### **NMCC/VAX ETHERnim (Ethernet Network Integrity Monitor)**

NMCC/VAX ETHERnim is a network management tool that aids in fault isolation and configuration management of extended local area networks. NMCC/VAX ETHERnim runs as a layered product on the VMS operating system. Once installed it "listens" to a network and builds a database and a graphic topology map of an extended LAN. NMCC/VAX ETHERnim recognizes both Digital and non-Digital devices on a network and includes them in the database and on the map. Full functionality of NMCC/VAX ETHERnim is achieved by having DECnet software and remote test command files in target nodes.

NMCC/VAX ETHERnim is designed to test the communications path through Ethernet protocol and DECnet. It also has the ability to gather system information for its database from remote VMS and RSX nodes by invoking test probes (remote command files).

NMCC/VAX ETHERnim is a multivendor product that recognizes non-DECnet local area network addresses, and gives the network manager the capability of maintaining a large amount of information about each node via a database that can be edited. It can be operated from local terminals (VT125, VT240, VT241, VT330, VT340) using ReGIS graphics for graphic representations of the network under test. ▲ Refer to Software Product Description 26.96 for more information.

### *Features*

- Creates and displays network topology map. Commands provided for network manager to customize the map display.
- Builds a permanent database containing basic information about each node that it detects is directly connected to the local area network.
- Provides a means of path testing to ISO levels I and II to all nodes on the Ethernet (with the exception of the MicroVAX I and VAXstation I), and to DNA network application and user layers for any node running DECnet Phase IV on the Ethernet.

## Network and System Management Products

- Provides a means of determining the VAX processor type for VMS DECnet nodes on the Ethernet.

### ***Prerequisite Hardware***

- Any valid VAX configuration or MicroVAX system, as specified in Software Product Description 26.96 (Note: VAX-11/730 systems require an R80/RL02.)
- VT125, VT240, VT241, VT330 or VT340 graphics terminal

### ***Prerequisite Software***

- VMS Operating System, V5.0 or later
- DECnet-VAX, V4.4 to V4.7

### ***Ordering Information***

- ▲ Refer to the following for further information on supported processor and services:
- Software Product Description 26.96
- Unique Product Identifier 514

## LAN Traffic Monitor

The LAN Traffic Monitor (LTM) is a tool used in multivendor environments to analyze the utilization of an extended LAN. A LAN Bridge 100, downline-loaded with the unique monitoring software, is attached to the 802.3/Ethernet cable and transmits information to the LAN Traffic Monitor Host software program located on any VAX in the extended LAN. LAN Traffic Monitor permits multiple users from anywhere on the extended local area network to access the traffic data.

The LTM collects statistics on all local area network traffic regardless of higher-level protocol. For example, users of DECnet, TCP/IP, LAT, and XNS can study performance on the network by higher-level protocol. LTM gives the network manager the flexibility to monitor different segments of an extended local area network and have this information collected at a central location. LTM provides network utilization graphs that show the network manager the performance of the various local area network segments.

### ***Features***

- Provides timely, accurate information needed to maximize network performance and plan network growth.
- Guarantees the integrity of the traffic statistics by capturing every frame and continuously updating the application software.
- Displays data from multiple monitors on any host running the LTM software in the extended LAN.
- Gathers traffic statistics from any device connected to the local area network and provides data based on nodes, addresses and/or protocol types.
- Provides performance measurements allowing for the optimum configuration and operation of the local area network.
- Simplifies analysis of local area network traffic data through the use of both graphic and tabular displays.
- Easy-to-use menu structure shortens the learning curve of the first-time user.

## Network and System Management Products

### ***Required Hardware***

- LAN Bridge 100 (DEBET) with minimum revision level E
- Any valid VAX or MicroVAX system (as specified in Software Product Description 27.80), with a Digital 802.3/Ethernet controller.

### ***Prerequisite Software***

- VMS Operating System V5.0 or later
- DECnet-VAX on the host processor, V5.0 or later

### ***Optional Software***

RBMS V1.2 (or later) for remote management of downline-load feature in LAN Bridge 100.

### ***Ordering Information***

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.80
- Unique Product Identifier VEH

### **Remote Bridge Management Software (RBMS)**

Remote Bridge Management Software (RBMS) is an optional product used with LAN Bridge 100s (standard, fiber optic, or microwave). RBMS significantly enhances the bridge's operation by allowing the network manager, at a VAX or MicroVAX host, to observe and control any LAN Bridge 100 in the network. For example, RBMS allows the network manager to put a Bridge in backup mode or to block traffic at selected bridges for security reasons.

RBMS resides on a VAX or MicroVAX host and works in conjunction with the LAN Bridge 100's management firmware. A subset of the IEEE 802.1 Management Protocol is used to communicate between the VAX host and the targeted bridge. RBMS provides the functions needed to support the actual control and observation of the LAN Bridge 100.

### ***Features***

- Displays counters, status, characteristics and the forwarding database.
- Allows the user to change the operational state, characteristics and forwarding database.
- Enables the user to remotely downline-load LAN Bridge 100 with LAN Traffic Monitor software, changing the device from its default state as a bridge.
- Uses the IEEE 802.1 management protocol for both DECnet and non-DECnet environments.
- Allows the user to name and refer to each bridge in ASCII format by mapping ASCII names to physical addresses.
- Enables the user to use one command to address a group of bridges through the use of global commands.
- Supports simultaneous access by multiple users on the same or different hosts.
- Provides extensive online help.
- Allows remote troubleshooting of hardware through the Bridge Self Test feature.

## Network and System Management Products

### *Prerequisite Hardware*

Any valid VAX or MicroVAX system (as specified in Software Product Description 27.12) with a Digital 802.3/Ethernet controller connected to an 802.3/Ethernet network which contains at least one LAN Bridge 100.

### *Prerequisite Software*

- VMS Operating System V5.0 or later
- DECnet-VAX V5.0 or later

### *Ordering Information*

▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.12
- Unique Product Identifier 036

**Ethernet Enhanced Security System  
(DESN)**



To help protect the security of network messages, Digital offers the DESNC Ethernet Enhanced Security System that selectively encrypts information across a network, without affecting other network nodes not requiring encryption.

The Ethernet Enhanced Security System is designed for users whose needs exceed current commercial security practice. This system allows implementation of security-enhanced 802.3/Ethernet local area networks (LANs) that permit multiple network nodes to share the same cableplant, assuring that only authorized nodes have access to sensitive data. The Ethernet Enhanced Security System

- Increases the protection of information on 802.3/Ethernet networks through cryptographic protection of data confidentiality and data integrity.
- Supports comprehensive network security management with node access control, key management, and monitoring and control.
- Is compatible with IEEE 802.3 and Ethernet standards.
- Supports single-segment, multiple-segment, and extended LANs defined by the *DECconnect System and Planning Configuration Guide*.

The Ethernet Enhanced Security System comprises two products integrated into standard 802.3/Ethernet environments—Digital's Ethernet Secure Network Controller (DESN) and VAX Key Distribution Center (KDC) layered product.

**Features**

- Network security management centralized at VAX KDC system provides focused management and control.
- Multiple, cooperating VAX KDC systems assure improved network availability and performance.
- Automatic key generation and distribution operate transparently.
- Comprehensive and flexible audit facilities support effective security audit and alarms as well as network monitoring and fault isolation.
- Performance is suitable for high-performance 802.3/Ethernet applications.
- DES-encrypted 802.3/Ethernet frames improve information confidentiality.
- DES-encrypted manipulation-detection codes (MDCs) improve information integrity.
- Node authentication increases security.
- Network security-policy enforcement supports logical groupings of nodes (for example, along security or organizational boundaries).
- Default network security policy quickly and easily enhances security for a network, with minimal impact on existing operations while supporting later development of more sophisticated policies.
- 802.3/Ethernet-compliance provides the flexibility to support
  - Single-segment, multi-segment, and extended LANs.
  - Multiple, simultaneous higher-layer protocols, such as DECnet, LAT, TCP/IP, and NFS.
  - Different network technologies and topologies, for example, any DECconnect network.

### **Qualifications**

This product is currently available only in the United States and Canada. It represents the current state-of-the-art in commercial 802.3/Ethernet security systems; however, no single system provides complete security. Users should follow industry-recognized security practices and should not rely solely on a single security-enhancing product to provide protection from computer misuse, loss of data, or loss of service.

U.S. government regulations specify that cryptographic hardware and software can be exported by license only. Specifically, the department of State's International Traffic in Arms Regulations (22 Code of Federal Regulations Subchapter M) require that an export license be obtained from the Department before any cryptographic hardware or software is exported from the United States. Accordingly, an explicit condition of sale of this product is that the purchaser agrees not to export or cause to be exported this product or any portion of this product from the United States without obtaining the requisite export license from the Department of State.

### **DESN**

The DESNC is a standalone, store-and-forward cryptographic controller that provides realtime encryption and decryption of 802.3/Ethernet frames for LAN environments. Also, the DESNC provides security and network management services such as client node authentication, enforcement of network access control policies, and status reporting.

The DESNC is installed on the transceiver cable between client nodes and the LAN. The DESNC connects directly to the network via a standard 802.3/Ethernet interface (AUI D-shell connector). The DESNC appears as a node to the network.

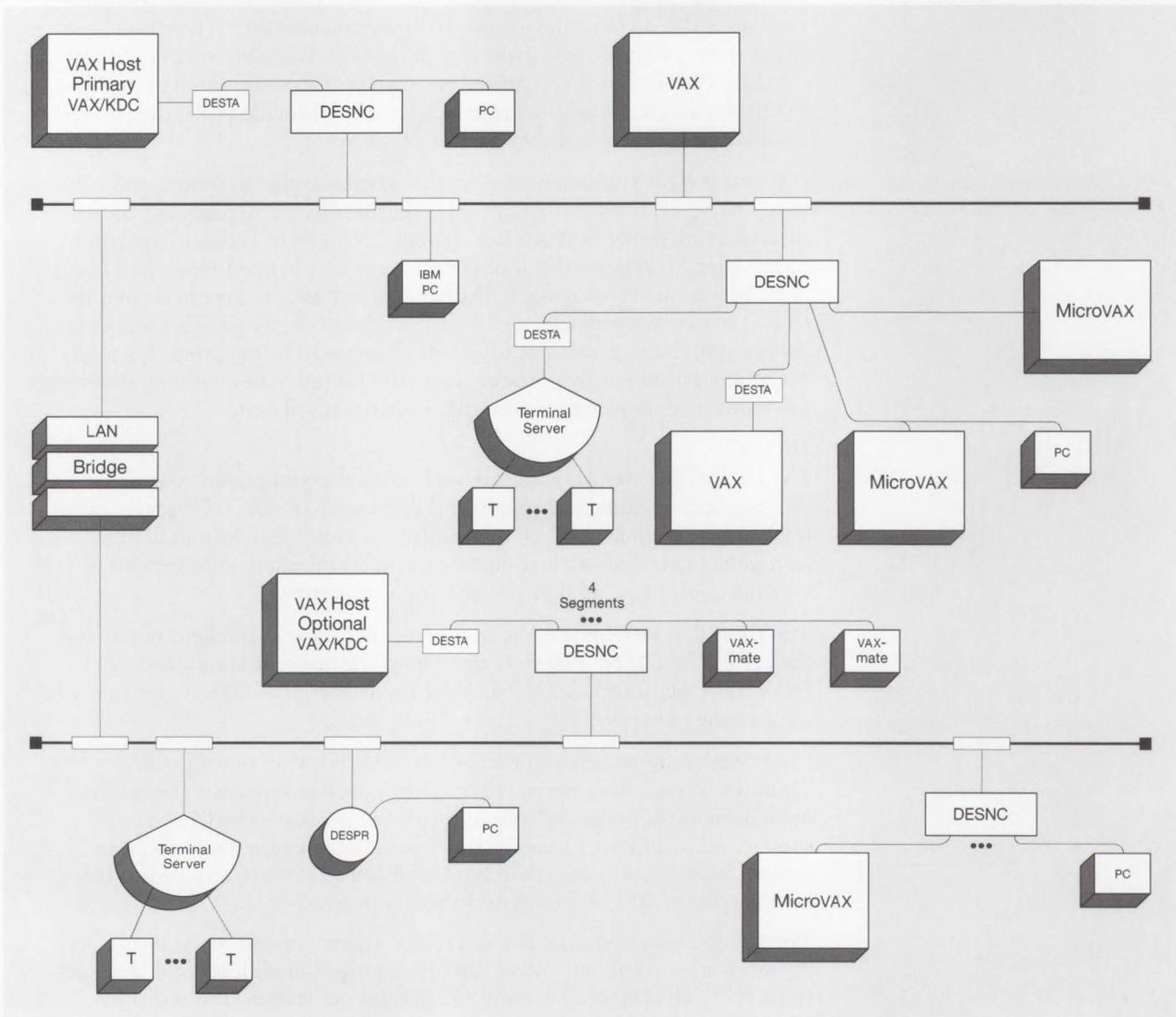
Client nodes are attached to the DESNC controller via four modified ThinWire ports (client ports). Each client port can support a single client node or multiple nodes on "client-port subnetworks." The DESNC can support up to 20 client nodes in any distribution across the four client ports. Client nodes using transceiver-cable interfaces are attached to the DESNC via the DESTA ThinWire Ethernet transceiver.

The DESNC uses cryptography to protect against unauthorized disclosure of information (confidentiality) and unauthorized modification of messages (integrity). The DESNC encrypts 802.3/Ethernet frames received from client nodes for transmission on the network, and decrypts 802.3/Ethernet frames received from the network for transmission to client nodes (refer to the following figure). The DESNC encryption process takes data (plaintext) and a cryptographic key (random 56-bit variable) as inputs and transforms the input data into an unintelligible form (ciphertext). The decryption process converts ciphertext back to plaintext.

The DESNC uses a hardware implementation of the Data Encryption Standard (DES) cryptographic algorithm defined by the National Bureau of Standards in *FIPS PUB 46*. The cryptographic process is transparent to the client nodes, and cryptographic keys are provided by the VAX KDC layered product.

## Network Security

### Typical DESNC Configuration



NBG-112-01

The DESNC and VAX KDC system implement a default access control policy that allows all nodes on a network to communicate with each other, after successful authentication. Such a policy allows for rapid integration of DESNC controllers and VAX KDC systems with minimal impact on existing network operations. Under this open policy, client nodes (that is, nodes connected to DESNC controllers) communicate with each other using encrypted frames on the network. All other communication, such as client node-to-node, is unencrypted.

## Network Security

Customers can optionally use DESNC controllers in conjunction with an associated VAX KDC system to implement more sophisticated access control policies. Fundamentally, the network nodes can be partitioned into separate access classes (for example, logical groups such as engineering, finance, and marketing) that are protected from each other. The access control policy may be defined to allow two nodes to communicate unencrypted even if one of them is connected to a DESNC controller.

### ***VAX KDC System***

The VAX KDC system, attached to the LAN, manages the DESNCs. The VAX KDC system distributes operational firmware, keying material, and other security control information (for example, audit criteria) to the DESNC controllers.

A VAX KDC system comprises

- A VAX processor running VMS (VAX KDC node).
- The VAX KDC layered software, which runs on VMS.
- A DESNC configured to support a VAX KDC node (KDC-DESN).

The VAX KDC system also provides tools to allow a system security manager to implement and manage a security-enhanced LAN. These tools allow a system security manager to

- Define and maintain the configuration of the DESNC(s).
- Monitor the operational and security status.
- Actively control the DESNCs on the LAN.
- Maintain an audit trail of security-relevant events.
- Define and maintain the network access control policy.

### ***Configuration Requirements***

Standard LAN topologies have few restrictions, and the addition of DESNC controllers and VAX KDC systems to an existing LAN will generally not disrupt operations or the basic network topology. However, some configuration requirements must be followed to ensure proper operation of a security-enhanced LAN. Also, in certain situations, additional guidelines can improve the efficiency and security of a security-enhanced LAN. Contact your local Digital Network Team representative for assistance in assessing configuration requirements.

### ***Prerequisite Hardware***

- Any VAX processor (as specified in Software Product Description 27.77) to support a VAX KDC system
- A valid 802.3/Ethernet local area network, either standard or ThinWire

### ***Prerequisite Software***

- VMS Operating System V5.0 or later to support a VAX KDC system
- DECnet-VAX V5.0 or later to support a VAX KDC system

## Network Security

### ***Ordering Information***

Minimum configuration includes two DESNCs and one VAX KDC system on an 802.3/Ethernet LAN. This minimum configuration typically supports two to seven client nodes and can support a maximum of 39 client nodes.

To order software that supports earlier versions of VMS and DECnet-VAX, consult your Digital Sales Representative. ▲ Refer to the following for further information on supported processor and services:

- Software Product Description 27.77
- Unique Product Identifier 03U

### ***Ethernet Enhanced Security System (DESN) Hardware Order Codes***

<b>Option</b>	<b>Order Code</b>
Digital Ethernet Secure Network Controller (DESN) LAN Encryption Device, 120 Vac	DESN-BA

Digital's Network Services are provided through its Customer Services organizations, and include Educational Services, Field Service, Software Services, and the Computer Special Systems group, and address customer needs in each phase of the network life cycle with services for

- **The network planning and design phase.**
- **The network implementation and startup phase.**
- **The network operations and growth phase.**

Services for each phase have a modular structure so that the customer can select only those services needed. For complex network projects, program management resources are also available from the service organizations to help plan and manage the delivery of all the network services needed throughout the network life cycle.

In addition to the life-cycle network services, Digital offers related services such as software and hardware installation, preventive maintenance, telephone support, and education. Also, the Computer Special Systems (CSS) group offers design and manufacturing services to meet custom needs.

### ***Availability***

Although Digital's Network Services are developed for worldwide availability, packaging and delivery models as well as service availability may differ outside the United States. Check with the local Digital service organizations to determine the services available in your area. Specific differences in the European network services are noted in this section.

Services provided in the Planning and Design Phase aid customers in planning and designing their new or expanding networks. This includes the design of distributed applications, the design and analysis of the network topology, the actual layout of the hardware components of the network, and training seminars to aid in determining appropriate network strategies. These services include

- **NETplan Requirements Analysis.**
- **NETplan Design Analysis.**
- **NETplan Application Design.**
- **NETplan Protocol Design.**
- **NETplan Physical Design.**
- **NETplan Planning Seminars.**

### NETplan Requirements Analysis

NETplan Requirements Analysis consists of customer interviews and data interpretation by Software Services to plan local or wide area networks. The service assists the customer in planning a new network or modifying an existing one to meet identified business needs, organizational constraints, and operational requirements. Digital Software Services consultants analyze information flows, network requirements based on business needs, organizational structures, and operational procedures in order to establish network design criteria and constraints.

NETplan Requirements Analysis provides the planning needed to enable the customer to meet current network requirements and plan for future growth. The service also assists the customer in identifying potential problem areas that might affect the network design.

In NETplan Requirements Analysis, Software Service consultants interview customers to identify their business plans, applications, and users, as well as network performance, availability, reliability, and cost constraints. Software Services then interprets the data by translating the customer's business needs and application requirements into network design criteria. The result of these activities is a comprehensive requirements analysis document describing business and network requirements and network design assumptions, and providing a network inventory.

In Europe, the activities performed and documentation provided in NETplan Requirements Analysis are offered in combination with NETplan Design Analysis. This combined Network Planning and Design Service is offered as the DEC NETplan service.

### NETplan Design Analysis

NETplan Design Analysis, delivered by Software Services, consists of designing and analyzing alternative network solutions, and selecting a recommended network design for local and wide area networks. The service assists the customer in designing a new network or redesigning an existing one to meet identified network design criteria and constraints.

## Services for the Planning and Design Phase

NETplan Design Analysis assists the customer in selecting a recommended network design based on an indepth analysis of predicted performance, associated communications facilities, and approximate cost. The service also provides the customer with an indication of potential problem areas or limitations of the network design. The results of the design analysis are compiled in a written report and discussed with the customer in a presentation. Topics addressed are alternative network designs, the analysis conducted on each alternative, and the recommended network design.

In Europe, the activities performed and documentation provided in NETplan Design Analysis are offered in combination with NETplan Requirements Analysis. This combined Network Planning and Design Service is called the DEC NETplan Service.

### NETplan Application Design

The NETplan Application Design Service assists customers with distributed application design activities. This service, offered by Professional Software Services (PSS) in the United States and Software and Applications Services (SWAS) in Europe, is tailored to meet the customer's needs in any of the following areas:

- Distributed application requirements analysis
- Distributed application design
- Distributed application specification development
- Project leadership of complex distributed application design efforts

#### *Features*

- Digital's design skills fit the customer's requirements.
- Tasks performed remain under the supervision, management, and control of the customer.
- Expertise is provided by the manufacturer of the customer's hardware, system software, and layered product software.
- The cost is minimized by buying exactly the service needed.

The deliverables for any distributed application design project are specified as part of project planning activities, and typically include the results of application requirements analyses, application design documentation, and functional design specifications.

### NETplan Protocol Design

The NETplan Protocol Design Service assists customers in using application interface options available within the Digital environment to design distributed applications for communication between Digital and other vendors' hardware and software. This assistance is currently limited to Digital's DECnet/SNA Gateway products, which facilitate communication between applications on VAX systems and IBM mainframes.

This service, offered by PSS in the United States and SWAS in Europe, is tailored to meet customer distributed application design needs in a multivendor network environment for any of the following areas:

- Distributed application requirements analysis
- Distributed application design
- Distributed application specification development
- Project leadership of complex distributed application design efforts

## Services for the Planning and Design Phase

▲ For a list of service features, refer to NETplan Application Design in this section. The deliverables for any protocol design project are specified as part of project planning activities, and are typically similar to those of NETplan Application Design.

### NETplan Physical Design

When planning and designing the physical layout of a network, issues such as the type of building, type of occupancy, local codes, and restrictions must be taken into consideration. To ensure that the physical design fully meets the needs of the customer's application and minimizes potential problems during installation, Digital Field Service offers a comprehensive NETplan Physical Design service.

In addition to the cable routing, the cableplant topology, design frequencies, component input and output levels, and anticipated network expansion must all be included in the electrical design.

#### *Site Survey Report*

Initially, Field Service conducts a site survey and prepares a Site Survey Report. This identifies all existing equipment to be connected to the network, outlines any structural work required (including aerial and underground cable runs), and identifies any other factors that may affect installation costs or timeframes.

#### *Physical Layout Design*

From the Network Design and Site Survey Report, Field Service develops the Physical Layout Design for the network. This includes a set of working drawings indicating the proposed cableplant runs and location of all networked equipment, proposed cable frequency allocations, calculated input/output levels at design frequencies of the cable components, and a bill of material for the components used in the design. The Physical Layout Design is used as the basis for generating a comprehensive Installation Plan with schedules and costs, including quotations from vendors or contractors.

In Europe, the NETplan Physical Design activities are offered as a DECsite/Local Area Network Physical Design Service providing support for network physical implementation services.

### NETplan Planning Seminars

NETplan Planning Seminars are provided by Educational Services to aid the customer's staff in determining the networking strategy and multivendor interconnect strategy most appropriate for the customer environment. The seminars, targeted toward network planners and managers, include

- Open Systems Interconnection (OSI), which discusses the International Standards Organization (ISO) Model for a layered network architecture, the need for standards among product vendors, advantages of a layered architecture, functions of the OSI, DNA, and SNA layers, and Digital's product set that is compatible with OSI.
- Digital/IBM Complementary Computing, which presents an introduction to the complete DNA/SNA interconnect product line, including the DECnet/SNA Gateway and the VMS/SNA link to IBM networks.

These services assist customers in all network implementation and startup activities. This includes managing installations, orienting users, establishing operating procedures and standards, developing applications, and training. The services are

- **NETstart Installation Management.**
- **NETstart Certification.**
- **NETstart Startup Assistance.**
- **NETstart Application Development.**
- **NETstart Protocol Development.**
- **NETstart Startup Training.**

### **NETstart Installation Management**

Field Service manages all of the installation activities to ensure a smooth, timely, and well-coordinated network installation. Working from the Network Design and Physical Layout Design, Field Service manages the site preparation and installation activities to ensure completion on time with high-quality standards.

#### ***Network Installation Plan***

The first step in the installation process is the development of the Network Installation Plan. This plan defines the schedules for all site preparation and installations, and identifies the individuals responsible for each activity. The scope of a network installation may require that part of the work be subcontracted to a qualified contractor able to meet Digital's high-quality standards. As the customer's prime contractor, Digital manages and schedules all subcontractor activities.

#### ***Pre-installation Inspection***

Field Service conducts a pre-installation inspection of the site with the installer and reviews all details of the required work. This allows Field Service to prepare the final, detailed quotation for the installation.

#### ***Installation Inspections***

During site preparation and installation, Field Service carries out installation inspections and any required interim testing. These inspection and testing services are also available to customers who are either using their own personnel or dealing directly with a contractor for site preparation or installation work.

For broadband networks, installation inspections include cableplant certification.

#### ***Network Acceptance Testing***

Upon completion of the installation of the equipment, Field Service carries out Network Acceptance Testing of the cable installation and associated communications equipment.

#### ***Network Documentation***

Field Service provides site documents including "as-built" drawings of the installed network (showing cable routing, equipment location), and electrical test results. This documentation becomes part of the Site Management Guide for sites under Digital Service Agreements.

In Europe, the NETstart Installation Management activities are currently offered as a DECsite Turnkey/Installation Management Service providing support for network physical implementation services.

## Services for the Implementation and Startup Phase

### NETstart Certification

Digital Field Service conducts broadband network certification tests to ensure that the network meets or exceeds all design specifications.

#### **Network Certification**

Channel Certification—Field Service conducts certification of broadband Ethernet. This channel certification ensures successful product connectivity and qualifies the customer's network products for onsite maintenance agreements.

#### **Certification Report**

Certification tests are conducted for continuity, frequency response, signal-to-noise ratios, hum modulation, and RF radiation. Field Service then provides a Certification Report that includes documentation of critical signals and noise levels and photographs of cable frequency responses. Any areas for which specifications are not met are highlighted and corrective actions are proposed.

### NETstart Startup Assistance

Digital's Software Services offers startup assistance to help users and network support personnel get up to speed quickly. Consultation and assistance is offered for network software implementation, orientation on how to use the network, and establishing standards for network operation and management. Specific subjects, such as account and security procedures, application development considerations, and network troubleshooting procedures, are also addressed.

These services cover Digital's DECnet software, and are structured to ensure an efficient startup of the customer's DECnet network. They are designed for managers, operations personnel, and program developers who are either just starting to learn about network communications and DECnet, understand network communications but are new to DECnet, or are familiar with DECnet but need assistance in expanding their DECnet configuration.

In the United States, these services are offered as DECnet DECstart and DECnet DECstart-Plus. They are packaged to deliver a defined set of tasks at the customer's site for a fixed price.

In Europe, these services are offered as DEC NETstart. Tasks are selected based on the level of service required, then adapted to each customer's needs through planning discussions with a Digital network specialist. As a result of the level of service selected and the planning discussions conducted, a fixed quote and delivery plan are proposed.

The DEC NETstart service consists of 22 structured tasks made available in three levels of service:

- NETstart 3 intended for first-time users of Digital network products, or for users with some experience but with limited manpower resources
- NETstart 2 intended for users with some DECnet experience who are expanding their network and need support during this period
- NETstart 1 intended for users with a good level of DECnet experience who need support only in implementing the network software

### NETstart Application Development

The NETstart Application Development Service assists customers in distributed application development and implementation. This service, offered by Professional Software Services (PSS) in the United States and Software and Applications Services (SWAS) in Europe, is tailored to meet the customer's needs in any of the following areas:

- Distributed application coding and testing
- Distributed application design (software code) reviews
- Distributed application performance analysis and tuning
- Distributed application implementation and acceptance testing
- Project leadership of complex distributed application development efforts

The deliverables for any distributed application development project are specified as part of project planning activities, and typically include coded and tested applications, distributed application documentation, and implementation of the distributed application in the customer's network.

### NETstart Protocol Development

NETstart Protocol Development Services assists customers in using application interface options available within the Digital environment to develop and implement distributed applications that communicate between Digital and other vendors' hardware and software. This assistance is currently limited to Digital's DECnet/SNA Gateway products, which facilitate communications between VAX systems and IBM mainframes.

This service, offered by PSS in the U.S. and SWAS in Europe, is provided as a project tailored to meet customer needs in a multivendor environment for any of the following areas:

- Distributed application coding and testing
- Distributed application design (software code) reviews
- Distributed application performance analysis and tuning
- Distributed application implementation and acceptance testing
- Project leadership of complex distributed application development efforts

The deliverables for any protocol development or implementation project are specified as part of project planning activities, and are similar to those of NETstart Application Development.

### NETstart Startup Training

NETstart Startup Training are training courses offered by Educational Services that prepare the customer's staff to design, develop, and use distributed applications, and to use the network. The training courses include

- Using DECnet-VAX: How to Use VAXmail and Other DECnet Utilities.
- Programming DECnet-VAX.
- Programming DECnet-RSX.
- Managing and Programming VAX P.S.I.
- Managing and Programming DECnet-RSX.

Using DECnet-VAX provides an introduction to DECnet as it is implemented on the VMS operating system to aid users in communicating with other users within the network. The remaining courses provide details about the implementation of the communications software (DECnet-VAX, DECnet-RSX and VAX P.S.I.) on Digital's systems as an aid to managing and developing applications that utilize the network.

These services provide network operations support including network maintenance management, management tools assistance, and operations training. The services are

- **NETsupport Maintenance Management.**
- **NETsupport Management Tools Assistance.**
- **NETsupport Operations Training.**

### **NETsupport Maintenance Management**

NETsupport Maintenance Management provides customers with a single point of contact and a single service contract to resolve all network maintenance issues for Digital networks and multivendor networks. This service focuses on the maintenance of a customer's entire network in a partnership role with the customer. NETsupport Maintenance Management enables Digital to act as the customer's agent to the service vendors for all of the equipment in the network. Digital negotiates the contractual levels of service and pricing with each vendor, and presents the customer with a single-source solution for managing all network maintenance services.

NETsupport Maintenance Management provides services that extend to the entire network including multivendor equipment.

NETsupport Maintenance Management provides five major service elements: maintenance planning, configuration management, fault isolation, fault-resolution management, and predictive maintenance. The Central NETsupport Center (located at the Customer Support Center in Colorado Springs, Colorado) provides fault isolation and diagnosis, fault resolution management, maintenance planning, technical assistance, vendor relations, and reporting. Configuration management is performed by the local area NETsupport consultant.

NETsupport Maintenance Management includes the installation on the customer's network of a network maintenance server with network support software tools. This network maintenance server acts as Digital's "tool box" containing network fault-isolation tools. The maintenance server is accessible from the Central NETsupport Center, and serves as the network remote diagnostic console.

Wide Area and Local Area Interconnect Services are offered as part of this service. ▲ Refer to "Related Network Services" in this section for more information.

In Europe, network maintenance management service activities are offered as the NETsystem Maintenance Management Service.

### **NETsupport Management Tools Assistance**

NETsupport Management Tools Assistance is provided by Software Services to assist customers in implementing and utilizing Digital's advanced network management products. (▲ Refer to "Network and System Management Products" in this section for descriptions of these products.) This service is currently limited to the NMCC/DECnet Monitor. Assistance is provided in planning, implementation, and startup.

## Services for the Operations and Growth Phase

In the United States, this service is provided as the NMCC/DECnet Monitor DECstart Service. This service provides assistance in implementing NMCC/DECnet Monitor, Digital's comprehensive software product that monitors the nodes, lines, and circuits in a DECnet network. The service helps customers use the NMCC/DECnet monitor to maximize their network performance, and consists of pre-installation assistance, software implementation, and user orientation. As part of this service, the Digital software consultant assists in selecting the operating parameters and options that best address customer network management goals. The Digital software consultant also helps the customer plan, install, and evaluate NMCC/DECnet Monitor operations against stated goals.

Europe offers an enhanced version of this service called NETmon Traffic Monitoring and Consulting Service, which focuses on Digital implementing and using the software to assist customers in monitoring and analyzing the performance of the network. NETmon is a structured, modular service that is adapted to a customer's needs. The principal elements of the service include

- A Digital network consultant to assist in defining the various aspects of monitoring and analysis, and to establish a base of software tools, parameters, and data structures that are used in the monitoring activity.
- Onsite orientation in the use of the principal monitoring tool (NMCC/DECnet Monitor).
- Two consulting reports per year that analyze the network performance and capacity characteristics, and interpret the traffic data.
- A monitoring tool (NMCC/DECnet Monitor) and the associated prerequisite software (RDB Relational Database and GKS Graphic software), which the customer can also use.
- Support of the installed tools and the monitoring activity.

NETmon is provided primarily as an annual service agreement with emphasis in the first year on establishing sound monitoring practices and gaining firm operational control over the network. In subsequent years, the emphasis shifts to proactive capacity management and price/performance decisions. For customers with temporary network performance consulting and traffic monitoring or audit service needs covering a limited time period (maximum three months), a one-time NETmon Audit Service is also available.

## Services for the Operations and Growth Phase

### NETsupport Operations Training

NETsupport Operations Training is provided by Educational Services to help customers effectively manage and operate their computer network. Training courses are provided to develop skills in network hardware and software management.

The network hardware management-oriented courses are

- UNIBUS Data Communication Hardware Maintenance.
- Q-bus Data Communication Hardware Maintenance.
- Terminal Server Maintenance.
- Digital Baseband Ethernet Hardware Maintenance.

The network software management-oriented courses are

- Network Management I.
- DECnet-VAX Network Security.
- DECnet-VAX Internals.
- Network Troubleshooting.
- PCSA/VAX-based Server System Management.

The courses are designed for network managers, system managers with network responsibilities, maintenance engineers, and technicians.

Digital's Network Services provide a coordinated network-level solution to a customer's network planning, implementation, startup, and operational needs. These services complement many existing network component-level services and packages available from Digital's Customer Services organizations.

Seminars and training courses addressing the design, implementation, and operations phases are part of a complete Network Training Curriculum offered by Digital's Educational Services. This includes courses for people at all the skill levels required to run a successful and efficient network.

As part of Digital's commitment to meet the total computing needs of its customers, Field Service provides a single-source service for its own products and those of selected manufacturers in the networks market. Most networks, including those with non-Digital products, may be completely maintained under a standard Digital Service Agreement. Field Service delivers its services on a worldwide basis, thus ensuring a consistent and high-quality response to distributed or multinational networking requirements.

The related network services that Field Service provides include

- Wide Area Interconnect Service for the wide area links and data communications equipment (DCE).
- Local Area Interconnect Service for the cableplant and associated interconnect hardware.
- Software installation services for network and communications products.
- Maintenance services for the network hardware and software products.

Software Services provides a comprehensive set of related network services that offer customers support for individual layered networking products, network management and operations, and customer-specific networking needs. The related network services include Startup Packages, Network Tools, and the Computer Services Business, which provides automated information and software access to customers. The Computer Services Business includes service bureau services, disaster recovery services, and facility management services.

Digital Educational Services offers courses in their training centers in the United States, Japan, Canada, Mexico, Europe, and Australia. The network curriculum begins with the Introduction to Data Communications course, which provides the basic foundation for building additional skills. The curriculum can then be categorized into three areas: network architectures training, programmer training, and network management training.

Digital Educational Services offers the following courses:

- Introduction to Data Communications
- Using DECnet-VAX: How to Use VAXmail and Other DECnet Utilities
- Open Systems Interconnection
- Digital Network Architecture
- Digital-to-IBM Complementary Architecture
- Programming DECnet-VAX
- Programming DECnet-RSX
- Managing and Programming DECnet-RSX

### Related Educational Services Training Courses

## Related Network Services

- Managing and Programming VAX P.S.I.
- Network Management I
- DECnet-VAX Network Management
- DECnet-VAX Network Security
- DECnet-VAX Internals
- Network Troubleshooting

In addition, Digital Press publishes the following books:

- *Technical Aspects of Data Communications*
- *Local Area Networks: An Introduction to the Technology*
- *KERMIT: A File Transfer Protocol*
- *Campus Networking Strategies*
- *Campus Computing Strategies*
- *The Digital Technical Journal: Number 3, Networking Products*

A complete list of courses and course descriptions is available in the *Customer Education and Training Catalog*, Systems Computing and Networking section.

### Wide Area Interconnect Service

Wide Area Interconnect Service is focused on remote fault isolation, resolution, and verification for wide area links and data communication equipment (DCE). Wide Area Interconnect Service is offered network-wide. The service covers fault identification, problem notification, response tracking, escalated attention to critical problems, verification of repairs, and predictive maintenance.

Wide Area Interconnect Service is offered as a standalone service and also as part of the comprehensive NETsupport Maintenance Management Service.

### Local Area Interconnect Service

Local Area Interconnect Service addresses the broad range of services necessary to isolate, repair, verify, and maintain the cableplant and interconnect hardware in good operating condition. Digital acts as the customer's single-source, prime contractor for cableplant maintenance services. This service offers customers Basic and DECservice level of maintenance support for standard baseband 802.3/Ethernet networks as well as fiber and twisted-pair cableplants. Scheduled preventive maintenance is provided according to equipment standards as specified by Digital and component manufacturers. Under terms of the contract, broadband networks receive regularly scheduled preventive maintenance according to standards specified by Digital and component manufacturers. For European options, contact the local Digital sales office.

## Related Network Services

### Software Installation Services

Installation services are available for the VMS/SNA, DECnet/SNA Gateway, and DECnet products. This service provides assistance in installing the equipment and familiarizing the customer with the operation of these products.

Digital installs most Digital network and communications products at no additional cost when they are purchased with an operating system and System Startup Service Package for that operating system. There are some exceptions to this.

The following networking products are not installed with a System Startup Package:

X25router 2000	Micro/R SX 2780/3780 Emulator
Micro/R SX 3271 Protocol Emulator	MUX200/VAX
NMCC/DECnet Monitor	NMCC/VAX ETHERnim
RSX-11/P.S.I./M	UN1004/R SX
VAX 2780/3780 Protocol Emulator	VAX 3271 Protocol Emulator
VAX NTR Protocol Emulator	VAX OSI Transport Service
VAX P.S.I. and P.S.I. Access	VMS/SNA

The DECnet/SNA Gateway and VMS/SNA products are not installed with a System Startup Package, but the installation service may be purchased separately as an Orientation and Installation Service. Any DECnet/SNA Access Routines purchased with DECnet/SNA Gateways or VMS/SNA are installed as part of the Orientation and Installation Service. This includes

- DECnet/SNA VMS APPC/LU6.2 Programming Interface.
- DECnet/SNA VMS Application Programming Interface.
- DECnet/SNA VMS Data Transfer Facility (VMS server and VMS client).
- DECnet/SNA VMS DISOSS Document Exchange Facility.
- DECnet/SNA VMS Distributed Host Command Facility.
- DECnet/SNA VMS Printer Emulator.
- DECnet/SNA VMS Remote Job Entry.
- DECnet/SNA VMS 3270 Data Stream Programming Interface.
- DECnet/SNA VMS 3270 Terminal Emulator.

▲ Refer to Appendix C for the appropriate Software Product Description numbers.

### Ongoing Maintenance

Field Service provides the full range of onsite and offsite contractual services for the network and its associated communications equipment including Digital-qualified vendor products and broadband network interconnection cables. Baseband network interconnection cables (such as coaxial, fiber optic, or twisted pair cables) will be repaired or replaced on a time-and-materials basis only. Digital may use a qualified contractor to carry out cable repair work.

#### **DECservice**

DECservice is Digital's most comprehensive onsite service product, providing a commitment to fast response time, continuous service effort, extended-hours coverage, preventive maintenance, installation of the latest engineering changes, and automatic priority attention for complex problems.

## Related Network Services

### ***Basic Service***

To those customers who do not need the level of service provided by DECservice, Digital offers the Basic Service Agreement, which provides economical, full service coverage. Customer service calls receive priority second only to DECservice calls. Services provided include preventive maintenance, installation of the latest engineering changes, and automatic priority attention for complex problems.

## Software Product Services

For customers who do not require startup assistance for their operating system, Software Product Services offers DECsupport, Basic, and Self-Maintenance annual service contracts that cover Digital networking software products and select non-Digital communications software products. (▲ Refer to "Software Services Startup Packages" in this section for an explanation of the startup assistance available.)

### ***DECsupport Service for Software***

DECsupport provides maximum user productivity and system utilization by saving customers the time and associated costs of doing their own routine software maintenance and installation of updates. It also provides critical on-site assistance when required. DECsupport provides

- Installation of updates.
- Preventive maintenance.
- Onsite remedial support if required.
- Telephone support.
- Digital's Software Information Network.
- Software media and documentation updates.
- Technical newsletters.
- Software Performance Reports.

### ***Basic Service for Software***

Basic Service for Software is designed for customers who have the time, technical expertise, and resources to maintain their own systems, but who need technical support to answer questions or to solve problems. Basic Service for Software provides

- Telephone support.
- Digital's Software Information Network.
- Software media and documentation updates.
- Technical newsletters.
- Software Performance Reports.

### ***Self-maintenance Service for Software***

Self-maintenance Service for Software is for customers who have technical staffs with the time and resources to maintain their own system software, and who require only software updates and written communication channels with Digital. Self-maintenance Service for Software provides

- Software media and documentation updates.
- Technical newsletters.
- Software Performance Reports.

### Startup Packages

For customers buying new systems, Startup Packages provide the support necessary to successfully install software, to use the system, and to maintain the software during the first year.

Digital offers three Startup Packages. Each service package provides training (available immediately upon purchase), software installation, DECstart (where applicable), and one year of service for the operating system and dependent software. In Europe, these service packages are referred to as OPTIMUM Services.

These packages are priced at the system level; that is, they cover all Digital-licensed software operating on a particular system at no additional charge.

#### ***Startup Package III***

Startup Package III provides technical assistance and training for system users. It provides the most comprehensive full year of service support for operating systems and their dependent software. Startup Package III provides

- SPS DECsupport Agreement.
- Initial media/documentation.
- Training.
- DECstart Plus.
- Software installation.

#### ***Startup Package II***

Startup Package II is appropriate when a customer's technical staff has the time and resources to support the new system after Digital has trained the staff, installed the product, and oriented the staff concerning system operation. Startup Package II provides

- SPS Basic Agreement.
- Initial media/documentation.
- Training.
- DECstart.
- Software Installation.

#### ***Startup Package I***

Startup Package I is appropriate for a technical staff requiring minimal training and having the time, resources, and skills to install and support the new system. Digital provides telephone advisory support and media updates to maintain the software at its most current level. Startup Package I provides

- SPS Basic Agreement.
- Initial media/documentation.
- Training on selected systems.

## Related Network Services

### Computer Services Business

Digital Computer Services Business is supplied by Software Services to provide automated information and software access to its customers. The services provided are available in the United States and the General International Area (GIA) only. The three principal service offerings are Service Bureau Services, Disaster Recovery Services, and Facility Management Services.

#### ***Service Bureau Services***

These services, accessed locally and delivered remotely from Digital's Computer Services Centers, are

- Enhanced Application Network Services—Digital provides a combination of terminals/micros, customer host processors, Digital host processors, and Digital's nationwide network to develop and implement integrated applications.
- Hardware/Software Evaluation Services—Digital provides the availability of VAX and PDP systems and software to enable customers to evaluate hardware and software products. Customers can evaluate products through demonstrations, benchmarks, and trial use.
- Project Resource Services—Digital provides VAX and PDP computing resources and associated software to support Software Services consulting projects.
- Incremental Computer Resources—VAX and PDP computing resources are provided to meet special customer needs such as peak load processing. Timesharing access is also available for predelivery software development and peak-load processing.

A telephone support service offering a 24-hours-a-day, 365-days-a-year hotline staffed by Digital software experts is also available.

#### ***Disaster Recovery Services***

Backup and disaster recovery services allow customers to anticipate and plan for disruptions involving their computer facilities, and to continue processing critical applications at computer facilities other than their own. The services include

- Restart—Disaster Recovery Services for VAX, PDP, and DECSYSTEM-20 computing resources available within 24 hours for emergency processing.
- Disaster/Plan 80—A planning methodology available to customers in developing their own contingency plan.

#### ***Facility Management Services***

Facility Management Services are long-term, customized, dedicated services consisting of computing resources and operational staff available either at the customer site or at a Digital site. Facility Management services free customers from the need to develop operations resources to support information systems.

Computer Special Systems (CSS) is a customer-driven, quick-response organization of more than 1500 engineering, manufacturing, marketing, and support services personnel worldwide. For more than 20 years, CSS has been designing, manufacturing and marketing quality systems, products, and services to help meet customers' special information systems needs. Some examples are

- Custom hardware products and systems.
- Special configurations of standard equipment.
- Non-standard communications protocol.
- Industrial and environmental packaging.
- Special peripherals and graphics products.
- Integration of third-party systems and products.

Computer Special Systems provides the following services:

- Custom Configuration Service—provides systems that integrate Digital standard products in non-standard ways or integrate Digital products with customer or vendor equipment.
- Custom Design Service—provides tailored products and systems by offering combined hardware, software and manufacturing capabilities to solve specific customer computing needs.
- Hardware Integration Service—provides systems that integrate Digital, customer, and other vendors' hardware and related software. Products of other vendors may be supplied by the customer and integrated by Digital, or they may be supplied and integrated by Digital.
- Project Management Service—uses Digital's project management methodology to manage every phase of the project, from engineering design and manufacturing to the integration of equipment from other vendors.
- Functional Specification Service—provides the analytical and design skills necessary to produce a functional specification. The specification is the blueprint for subsequent system design and used for monitoring progress during system development. It is also the basis for final customer acceptance of the completed system.

**A Network Configuration and Performance Guidelines**

**B Environmental Specifications**

**C Software Product Description List**

**D Related Documentation**

## Network Configuration and Performance Guidelines

### Phase IV Network Terms

### DNA Phase IV Network Configuration Guidelines

802.3/Ethernet configuration guidelines focus on connecting terminals, communications servers, and host systems to a local area network. The guidelines follow a brief overview of configuration guidelines for Phase IV networks including a discussion of connecting Phase III to Phase IV networks.

The information here, together with the product descriptions, should help in preparing a preliminary network plan. Digital sales representatives and Digital network specialists can give detailed network planning assistance.

**Full-function node**—a node that originates, terminates, and acts as a transit node for data. It can have multiple lines.

**End node**—a node that originates and terminates data but cannot act as a transit node for data destined for other nodes: a single physical line. The difference between full-function nodes and end nodes is strictly in the DECnet software.

**Router**—a dedicated communications server that acts as a transit node for data destined for other nodes. A router server is a combination of hardware and software, and is not an originating or terminating node. To maintain routing performance, applications software should run on a router server.

The number of full-function nodes and router servers in a network should be kept down because of the overhead associated with routing. The goal is to minimize the use of full-function (routing) nodes and maximize the use of end nodes. Although end nodes cannot act as transit nodes, they require less memory, have a single physical link, can spend more time running user applications, and require very little network management.

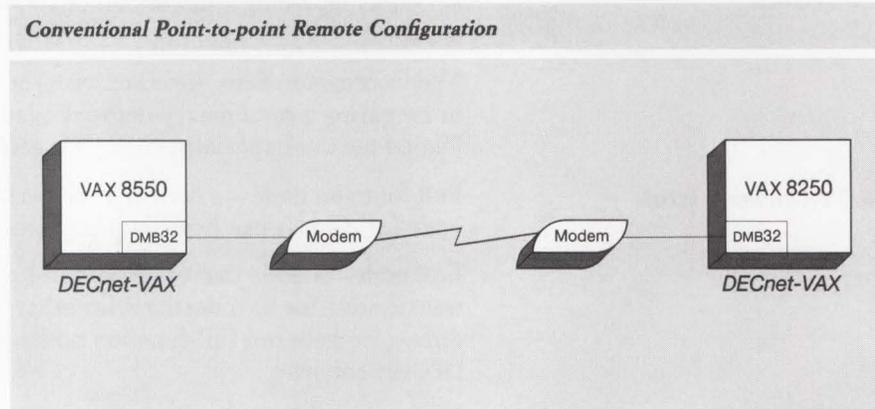
The following table shows architectural limits, aggressive limits, and conservative limits for router servers in one local area network. Architectural limits cannot be exceeded in any circumstances: While DNA Phase IV networks have fixed architectural limits, most configurations will not be affected by them. Aggressive limits are not fixed but represent the point where both performance and memory requirements should be analyzed: Exceeding these guidelines requires careful analysis by a network consultant or software specialist. Conservative limits represent a point that is easily achievable and where communications performance is acceptable.

*Phase IV Network Limits Per Area*

	Architectural	Aggressive	Conservative
Number of router servers per local area network	32	16	8

### ***Remote Multipoint Configurations and Guidelines***

The conventional point-to-point method of connecting remote VAX systems is shown in the following figure.

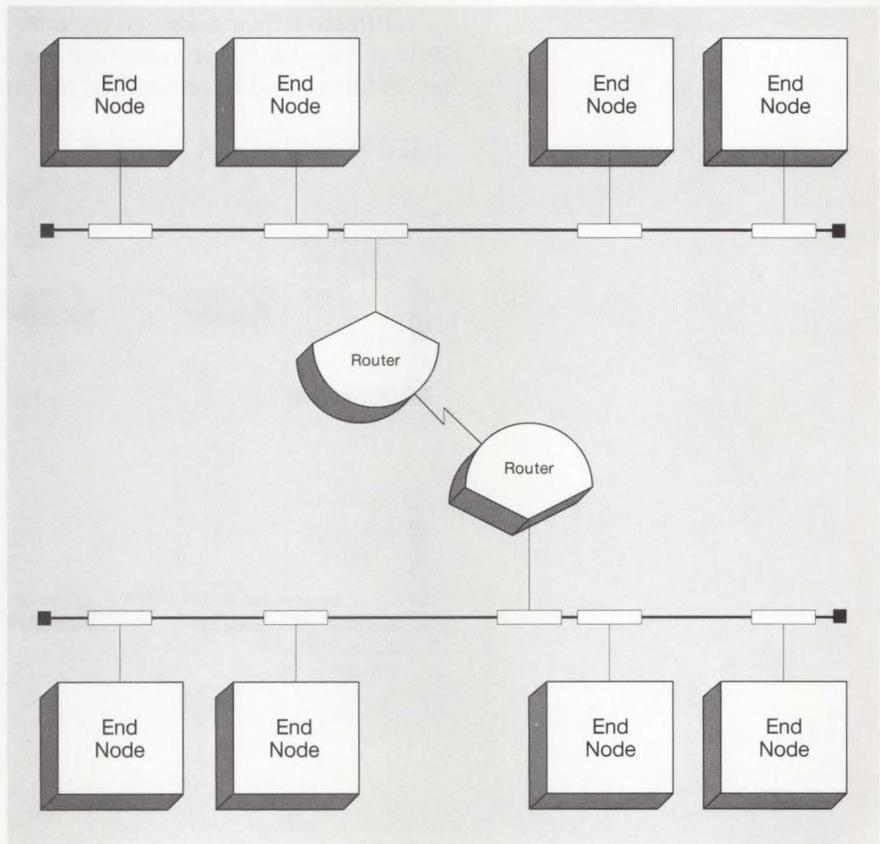


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The following guidelines apply only to remote multipoint configurations. Local multipoint links should use more cost-effective 802.3/Ethernet connections.

- Remote multipoint configurations reduce phone line costs in leased private-line networks. They offer a substantial amount of savings for large, geographically dispersed transaction-processing applications over the alternative dialup lines.
- No nested multipoint configurations should be used. This is not a technical limitation, but rather a proven rule for customer success. The following figure illustrates a nonnested configuration.
- Consult individual Software Product Descriptions for supported remote multipoint configurations (such as the number of tributaries per control node).

*Remote Multipoint Nonnested Configurations*

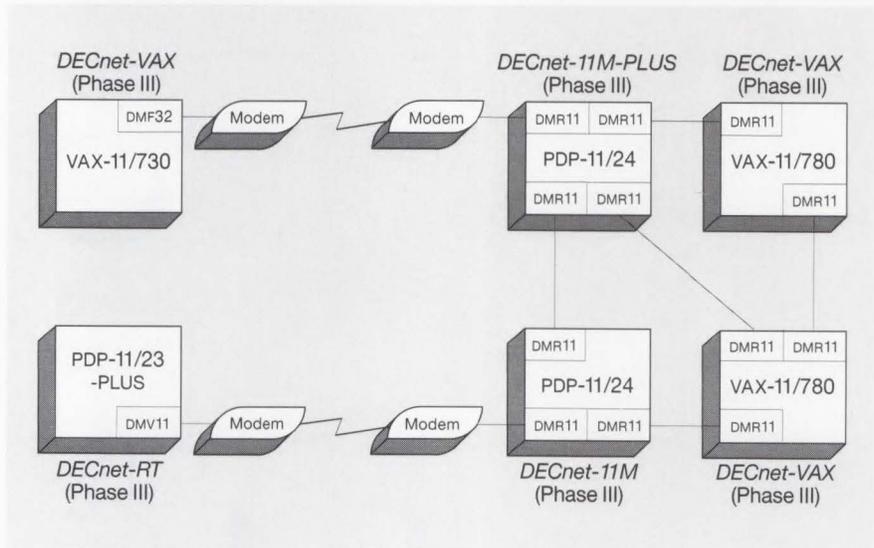


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**Converting Networks from Phase III to Phase IV**

This discussion is for customers who have Phase III networks and are interested in converting to Phase IV. The following figure illustrates a typical Phase III network that includes local and remote links and a mix of CPUs and operating systems. Note the number of communications controllers, modems, and lines required to implement this network.

*Typical Phase III Network*



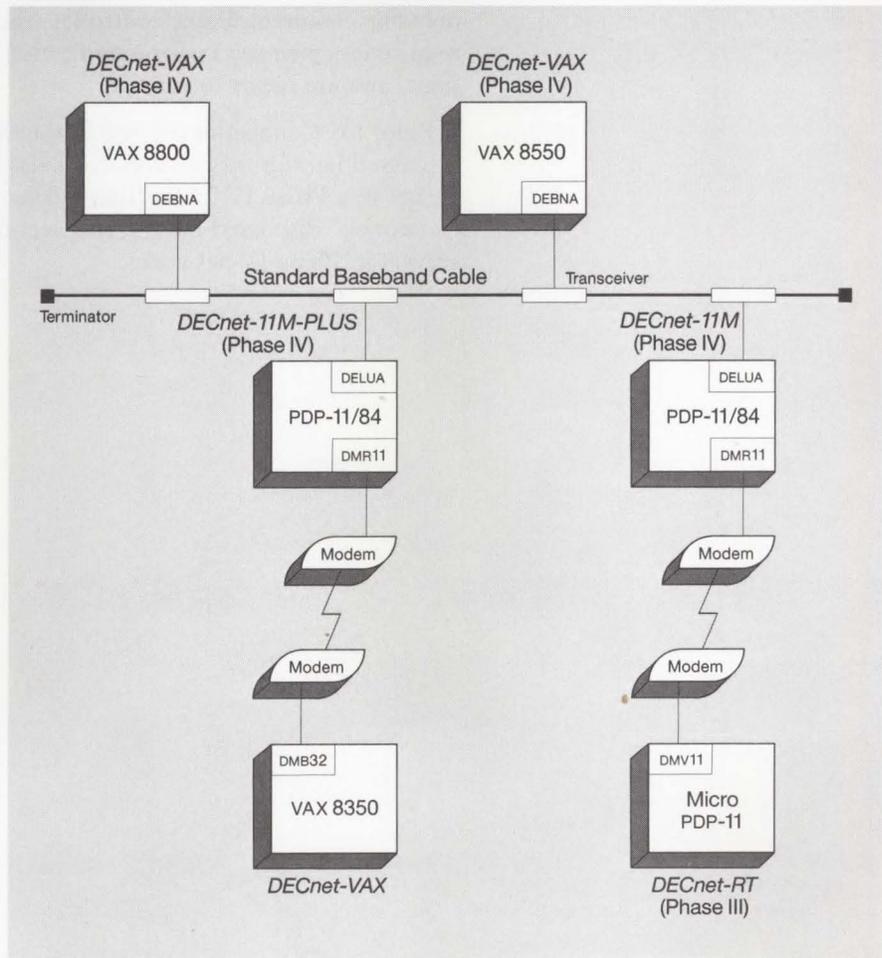
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### 802.3/Ethernet Configuration Guidelines

The following figure illustrates a Phase IV network with the same level of connectivity as the previously described Phase III network. Note that the Phase IV network uses a standard baseband 802.3/Ethernet cable and 802.3/Ethernet communications controllers rather than the traditional communications controllers shown in the Phase III network. In this example, all systems (except the DECnet-RT system) are running Phase IV software and are directly connected to the local area network.

The Phase IV network can have a maximum of 63 areas with up to 1,023 nodes per area for a total of 64,000 nodes. This total is especially important because of the number of personal computers now included in networks.

*802.3/Ethernet-based Phase IV Network*



NBG-196-00

## 802.3/Ethernet Configuration Guidelines

A comparison between the Phase III and Phase IV networks shows the following:

- There is a significant cost savings and performance improvement with the Phase IV network. For example, a transceiver plus the 802.3/Ethernet communications controller costs less and performs better than a synchronous DMR11.
  - The Phase IV network increases configuration flexibility.
    - Transceivers can be easily relocated along the standard baseband cable.
    - 802.3/Ethernet technology eliminates the need for redundant lines within the local portion of the network.
    - A node can be added or removed from the LAN for maintenance without affecting the operation of the rest of the LAN.
  - Many nodes can be designated as end nodes. This means that they need only one communications controller (the 802.3/Ethernet controller), they require less memory for communications, have more time to run applications, and are easier to manage.
- ▲ Refer to “Connecting Shared Resources to an 802.3/Ethernet LAN,” discussed later in this section, for a description of the use of the Terminal Server in a Phase IV LAN. “Connecting an 802.3/Ethernet LAN to Remote Networks,” discussed later in this section, describes the use of router servers in Phase IV networks.

## 802.3/Ethernet Configuration Guidelines

### 802.3/Ethernet-based Products

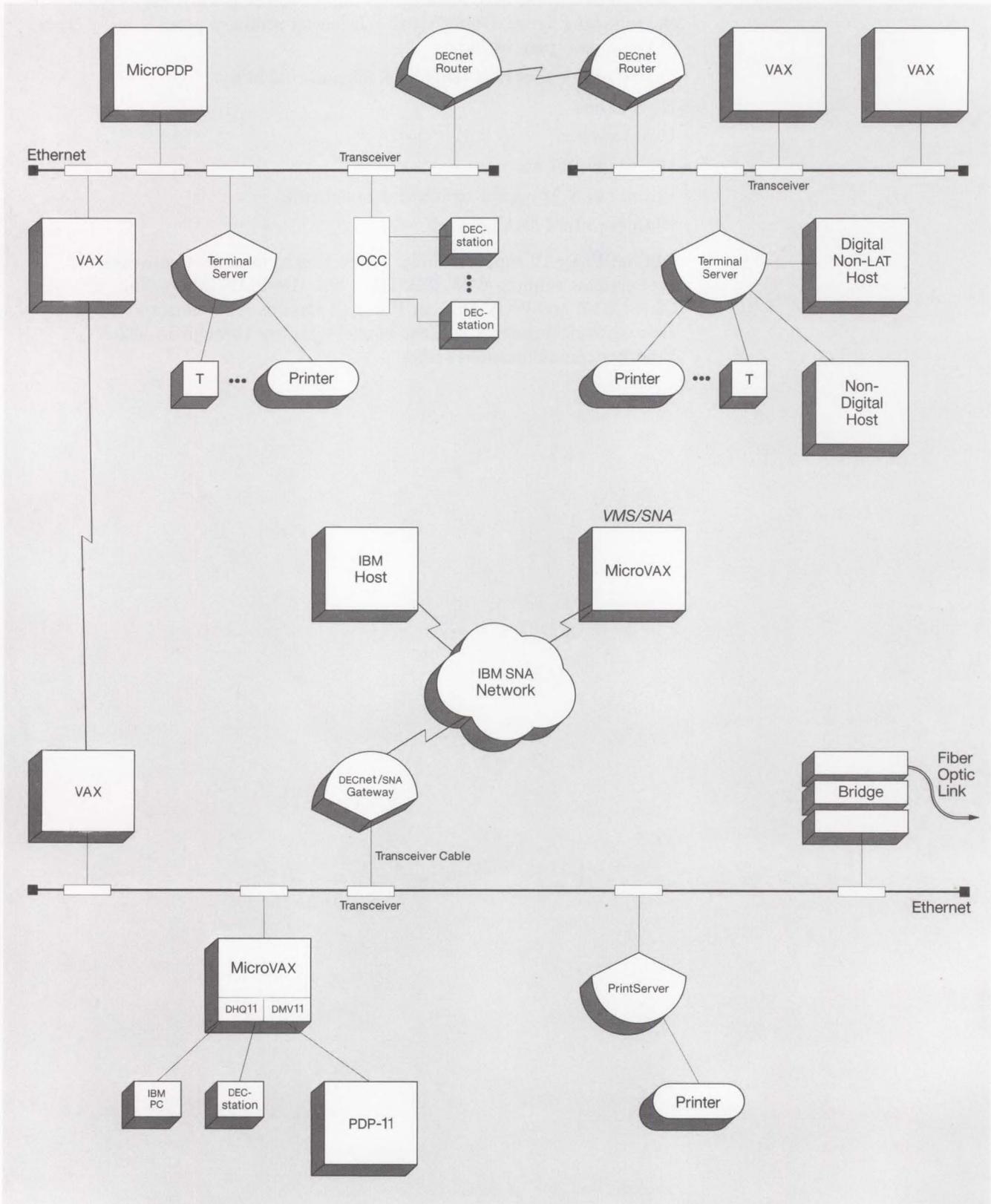
Digital's 802.3/Ethernet products allow a network configuration to be tailored to current needs while allowing for future growth. As illustrated in the following figure, Digital's 802.3/Ethernet products provide many types of communication, including

- Digital terminal to host (Digital, X.25, and IBM hosts).
- Host to host.
- Host to server.
- DECnet to DECnet.
- DECnet to X.25 packet-switched data network.
- DECnet to IBM SNA network.

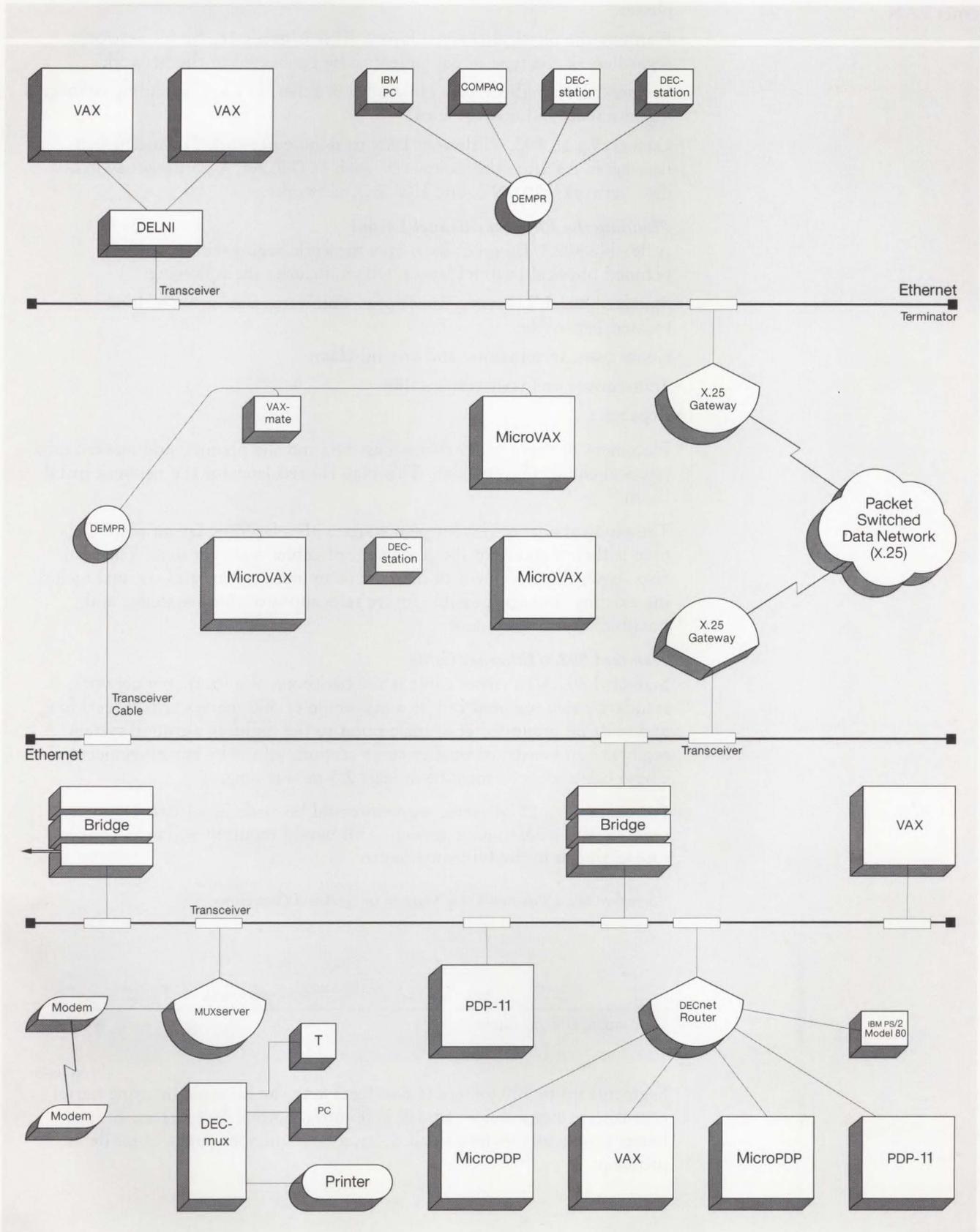
DECnet Phase IV supports direct connection to local area networks for host systems running VMS, RSX-11M, RSX-11M-PLUS, Micro/R SX, RSTS/E, ULTRIX-32, and P/OS. DECnet Phase III systems can connect to the local area network through a DECnet Phase IV host or through an 802.3/Ethernet communications server.

# 802.3/Ethernet Configuration Guidelines

## DECnet Network with Many Segments



### 802.3/Ethernet Configuration Guidelines



## 802.3/Ethernet Configuration Guidelines

### Planning a Baseband 802.3/ Ethernet LAN

Planning a baseband 802.3/Ethernet LAN can be divided into three phases:

- Planning the physical channel layout. This is necessary for all networks, regardless of the type of equipment to be connected to the network.
- Connecting shared resources to an 802.3/Ethernet LAN, including connecting terminals and host systems.
- Connecting an 802.3/Ethernet LAN to remote networks, including connecting an LAN to other networks, such as DECnet, X.25 packet-switched data networks (PSDNs), and IBM SNA networks.

#### *Planning the Physical Channel Layout*

A flexible 802.3/Ethernet local area network begins with a carefully planned physical channel layout, which includes the following:

- Standard 802.3/Ethernet, fiber optic, ThinWire, and/or unshielded twisted-pair cable
- Connectors, terminators, and ground clamp
- Transceivers and transceiver cable
- Repeaters

Placement of these components must be carefully planned and marked on a physical channel layout plan. This plan is used later for the network installation.

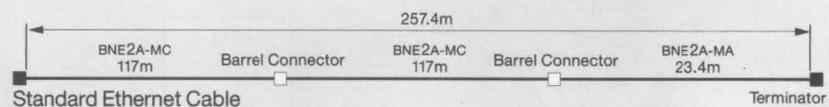
The physical channel layout plan starts with a building layout plan. This plan is then marked for the placement of cables and repeaters. The plan also shows the placement of the host computer systems and servers, including existing systems, possible future relocations of those systems, and possible future equipment.

#### *Standard 802.3/Ethernet Cable*

Standard 802.3/Ethernet cable is the backbone of a local area network. A standard cable segment can be a maximum of 500 meters (1,640 feet) long and must be grounded at a single point to the building's ground system. A segment can consist of smaller cable sections joined by barrel connectors. These cable sections must be at least 2.5 meters long.

For example, a 257.4-meter segment could be made up of two 117-meter sections and a 23.4-meter section. This would require two barrel connectors as shown in the following figure.

*Standard 802.3/Ethernet Cable Segment using Barrel Connectors*



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Segments up to 500 meters (1,640 feet) long can be made by using barrel connectors; a repeater or bridge is required beyond 500 meters. Because barrel connectors incur a small delay, a large number might cause delay problems.

The installation of the main 802.3/Ethernet cable segment and the connection of branching segments should be carefully planned. Planning the placement of equipment at this stage can save time later when connecting host systems and servers to the local area network (even while it is operating).

### **Connectors and Terminators**

Barrel connectors connect two standard baseband cable sections, creating a segment up to a maximum length of 500 meters (1,640 feet).

Terminators (50 ohms) electronically terminate the ends of a standard baseband cable segment. Each end of the cable section must have either a terminator or a connector.

### **Fiber Optic Cable**

General purpose fiber optic cable, plenum fiber optic cable (used where the cable path is through air plenums), and aerial fiber optic cable (for connecting buildings through the air or in conduit underground) are available through other vendors. Installation requirements for all three types of fiber optic cable are given below.

Digital fiber optic cable certification is needed to assess proper connectivity and determine if the installation meets acceptable attenuation limits. Certification is also required for Digital Field Service to support an installation. A Digital Field Service Network Planning Consultant or Digital-recommended installer (see Section 6) can provide this service.

The fiber optic cable and connectors must meet certain requirements: Operating temperature and humidity must be within the ranges listed in the following table.

- Connectors on these cables must be Amphenol 906 type SMA or equivalent.

**Operating Temperature and Humidity Ranges for Fiber Optic Cable**

Cable	Operating Temperature	Humidity
General Purpose	0°C–70°C	95%, noncondensing
Aerial	–30°C–60°C	95%, noncondensing
Plenum	0°C–70°C	95%, noncondensing

### **ThinWire 802.3/Ethernet Cable**

ThinWire cable is recommended for offices and other local work areas to bring 802.3/Ethernet capability to personal computers, workstations and low-end systems. ▲ For more information, refer to “Planning a ThinWire 802.3/Ethernet LAN,” discussed later in this section.

### **Unshielded Twisted-pair Cable**

Unshielded twisted-pair cable is recommended for those customers who have already installed telephone-type twisted-pair cabling, and want to minimize the cost and network disruption of installing new network cable. ▲ Refer to “Unshielded Twisted-pair Cable Guidelines,” described later in this section, for more information.

## 802.3/Ethernet Configuration Guidelines

### *Transceivers and Transceiver Cable*

Devices are connected to standard baseband cable via transceivers and transceiver drop cable. The transceiver transmits signals on the transceiver cable to the connected devices and detects message collisions. Transceivers mount on the standard baseband cable by means of a tap and can be easily installed using Digital's Ethernet Transceiver Installation Tool Kit.

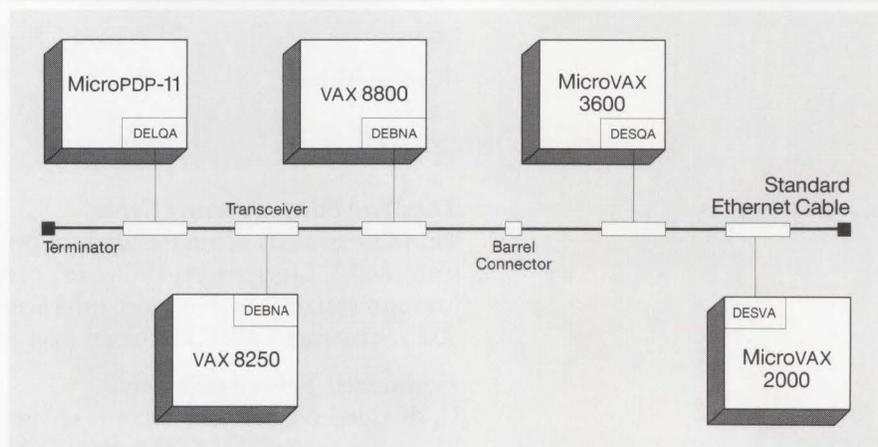
The transceiver drop cable is available in standard and office types, both of which support Ethernet or IEEE 802.3 hardware. Office cable is thinner than standard cable and is easier to run in an office environment. Because office cables have a high signal loss, they are limited to a maximum distance of 12.5 meters, whereas standard cable can run up to 50 meters.

Remember these rules when planning installation of transceivers and transceiver cable on the standard baseband cable:

- There is a maximum of 100 transceivers per standard 500-meter cable segment.
- Transceivers must be at least 2.5 meters (8.2 feet) apart. Standard 802.3/Ethernet baseband cable is premarked every 2.5 meters to ensure adequate spacing.
- Each transceiver needs a corresponding transceiver cable.
- Transceiver drop cable can be a maximum of 50 meters (165 feet) in length. Some devices have an internal cabling equivalency which must be subtracted from the 50-meter maximum. Consult the device's technical manual for the appropriate cable equivalency.

The following figure shows an 802.3/Ethernet network with each system attached to the standard baseband cable by means of a transceiver and transceiver cable. The systems communicate with the network through an 802.3/Ethernet communications controller.

**802.3/Ethernet LAN with Connected Processors**



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### *Ethernet Repeaters*

An Ethernet repeater allows network expansion beyond the 500-meter (1,640-foot) limit of one standard Ethernet cable segment. Two repeaters (the maximum allowed without an intervening bridge) can connect three standard Ethernet cable segments, making them function as if they were one cable by retiming, amplifying, and repeating all signals received from one segment, then passing the signals to the next segment.

Digital offers two repeaters for standard Ethernet cable:

- Local repeater—connects two standard Ethernet cable segments in the same building. The two cable segments can be a maximum of 100 meters (328 feet) apart.
- Fiber optic repeaters—connect two standard Ethernet cable segments at greater distance, such as between buildings, using fiber optic cable.

Repeaters can be used effectively in a multifloor building to expand a network. A backbone standard Ethernet cable segment can be installed vertically from the basement to the top floor of a building with repeaters and a branching segment installed on each floor.

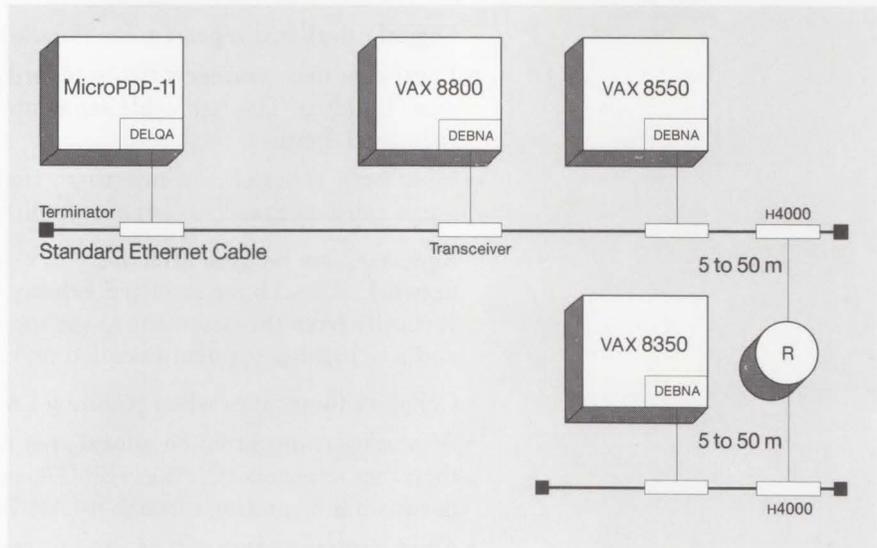
Consider these rules when planning LAN expansion using repeaters:

- A message transmitted on a local area network must pass through no more than two repeaters (DEREP, DEMPR, or DESPR) before either reaching its destination or passing through a LAN Bridge.
- Fiber optic repeaters can be used to connect multiple Ethernet segments. However, the total amount of fiber optic cable used in the path between any two nodes may not exceed 1,000 meters (3,282 feet).
- Local repeaters may be placed in parallel for backup purposes—one active and the other inactive. If one fails, the other activates.
- A repeater cannot be connected to a DELNI, or to a transceiver with heart-beat enabled.
- Both local and fiber optic repeaters are connected to the standard Ethernet cable via H4000 Ethernet transceivers and Ethernet transceiver cables.

### 802.3/Ethernet Configuration Guidelines

The following figure illustrates an Ethernet LAN that has been expanded from one floor to another floor within the same building. In this example, because the distance between the two standard Ethernet cables is 100 meters, a local repeater is used.

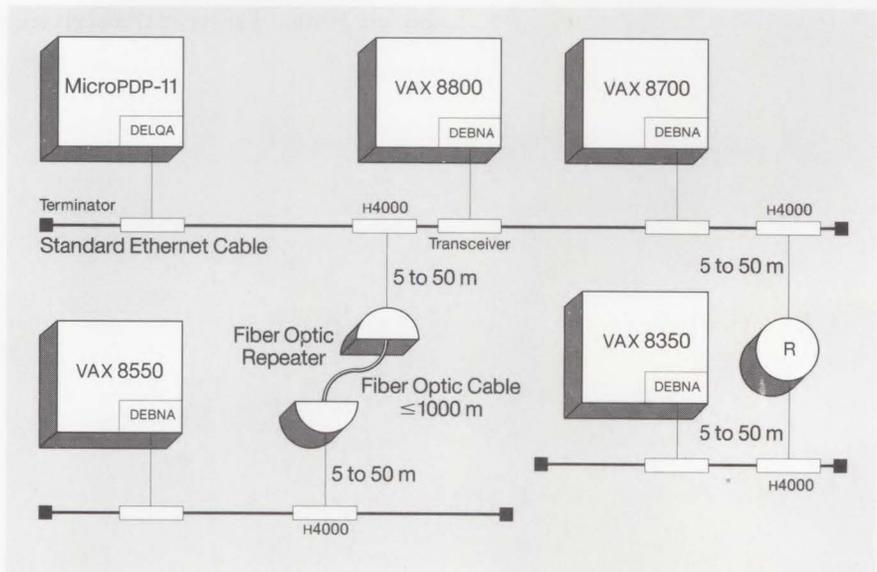
*Ethernet LAN Expansion using a Local Repeater  
(100-m maximum separation between Ethernet cables)*



NBG-200-00

If it is necessary to expand the network to another building up to 1,000 meters (3,280 feet) away, a fiber optic repeater is necessary as shown in the following figure. A LAN Bridge 100 is used rather than a repeater when it is necessary to keep local traffic within a building.

*Ethernet LAN Expansion using a Fiber Optic Repeater  
(1000-m maximum separation between repeaters)*



NBG-201-01

### *Standard Baseband Ethernet Distance Guidelines*

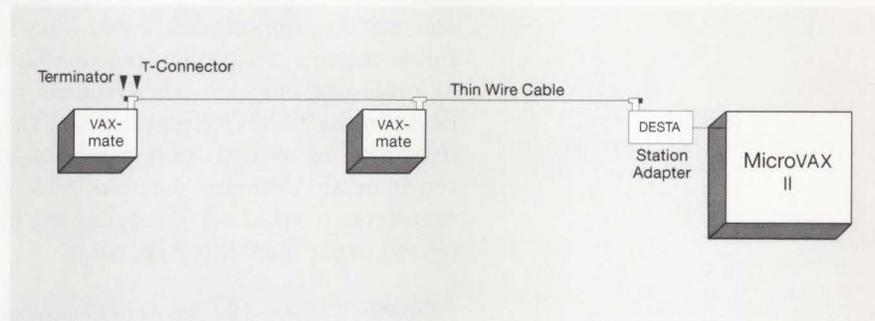
Standard baseband 802.3/Ethernet is a branching, nonrooted tree topology with a maximum node separation (the distance between the two farthest systems on the network) of 2.8 kilometers (1.74 miles). Up to 1,023 transceivers can be connected to the standard baseband cable, allowing thousands of devices to be connected.

The 2,800 meter (9,194 feet) maximum distance between any two nodes is the sum of two 50-meter (164 feet) transceiver cables, three 500-meter (1,640 feet) standard 802.3/Ethernet cable segments, four 50-meter (164 feet) transceiver cables connected to repeaters, and 1,000 meters (3,280 feet) of fiber optic cable.

A few simple rules for configuring a standard 802.3/Ethernet local area network, derived from certain limits that are imposed on the physical channel, ensure the optimal performance of the network. The maximum configuration for an 802.3/Ethernet local area network is as follows:

- A segment of standard baseband cable can be a maximum of 500 meters (1,640 feet) in length. Each segment of standard baseband cable is terminated at both ends, at which point transmitted signals stop.
- There can be a maximum of 100 physical connections (transceivers) on any segment of cable (at 2.5-meter intervals). Note that a number of devices can be connected to one transceiver via a DELNI.
- Repeaters are used to continue signals from one segment of the local area network to another. A repeater requires a transceiver connection on both segments it joins and counts toward the 100 transceiver maximum for each segment. A message transmitted on a local area network must pass through no more than two repeaters (DEREP, DEMPR, or DESPR) before either reaching its destination or passing through a LAN Bridge.
- The network must be grounded at one point.
- The maximum length of standard baseband cable between any two transceivers is 1,500 meters (4,920 feet).
- A total of 1,000 meters (3,280 feet) of fiber optic cable is allowed for expanding the network using fiber optic repeaters.
- A standalone DELNI configuration supports up to eight devices (systems, not terminals) using transceiver cables between 40 and 45 meters (131.2 and 147.6 feet) in length, depending on the communications controller.
- A hierarchical standalone DELNI configuration supports up to 64 devices using standard transceiver cables between 40 and 45 meters (131.2 and 147.6 feet) in length, depending on the communications device, and up to 50 meters (164 feet) for another DELNI which, in turn, can support devices between 40 and 45 meters (131.2 and 147.6 feet) in length, depending on the communications device. A hierarchical standalone DELNI LAN is not connected to the standard baseband cable.
- A connected DELNI configuration supports up to eight devices using standard transceiver cables between 35 and 40 meters (114.8 and 131.2 feet) in length, depending on the communications device.
- Transceiver cable length is limited to 50 meters (164 feet) for connection to host systems and communications servers.
- Some devices have internal cabling that may reduce the effective length of the transceiver cable.

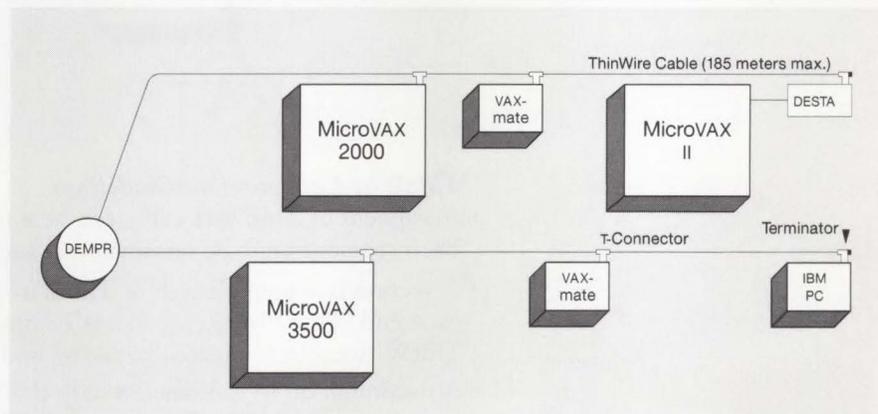


*ThinWire Small Work Group Configuration*

NBG-203-00

*Standalone Departmental Configurations*

The standalone departmental configuration allows up to eight 185-meter ThinWire segments to connect to the Multiport Repeater (DEMPR). The DEMPR can be used in a radial topology to connect personal computers, workstations, and low-end systems in a work area or throughout the floor of a building. Each of the eight ThinWire cable segments that connect to the DEMPR can accommodate up to 29 stations. Therefore, one DEMPR can connect 232 stations. The DEMPR will isolate faults in a segment so that the rest of the network will stay in operation. The following figure illustrates the standalone departmental configuration.

*ThinWire Standalone Departmental Configuration*

NBG-204-00

Eight DEMPRs can also be connected to a DELNI in a standalone departmental configuration. In this configuration, the 802.3/Ethernet limit of 1,023 stations can be connected.

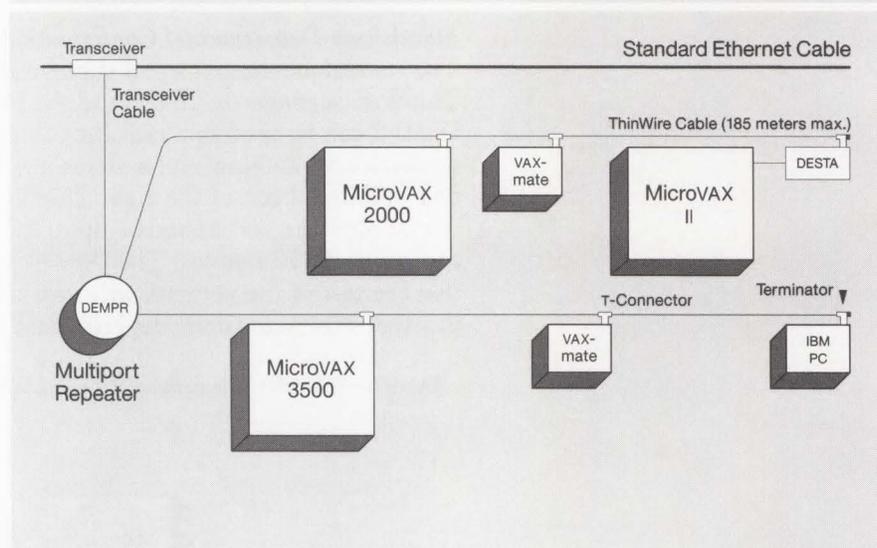
*Connected Departmental Configurations*

In connected departmental configurations, ThinWire segments connect to the backbone cable for access to more computing resources on the larger local area network. Up to eight ThinWire segments can connect to a DEMPR, which connects to the backbone cable via a baseband transceiver. In addition, up to eight DEMPRs can connect to a DELNI, which connects to the backbone standard baseband cable using an H4005 (or H4000-BA) transceiver.

## 802.3/Ethernet Configuration Guidelines

When connected to standard 802.3/Ethernet cable, the ThinWire repeater functions as a repeater between all stations attached to it and all devices connected to the standard cable. The ThinWire repeater must count as a full repeater when configuring an 802.3/Ethernet LAN. Because it counts as a repeater, only one other repeater can be configured in the path between the ThinWire repeater and any station on the rest of the local area network. For configuration simplicity, bridges rather than repeaters are recommended between standard 802.3/Ethernet segments where ThinWire repeaters are attached. The following figure illustrates a ThinWire connected departmental configuration.

*ThinWire Connected Departmental Configuration*



NBG-205-00

### *ThinWire Configuration Guidelines*

- A segment of ThinWire cable can be a maximum of 185 meters in length. Each segment must be terminated at each end with 50-ohm terminators.
- A section is a single length of ThinWire cable with male BNC connectors at each end. ThinWire segments are composed of one or more sections of ThinWire cable connected by barrel and/or T-connectors.
- A maximum of 30 stations (28 with the DECconnect system) may be connected to a single ThinWire segment. The DECconnect faceplate, the ThinWire repeater, a BNC T-connector, or barrel connector counts as one station. There must be 0.5 meters (19 inches) between T-connectors.
- A ThinWire repeater provides internal cable termination and can therefore be placed only at the end of a segment.
- A message transmitted on a local area network must pass through no more than two repeaters (DEREP, DEMPR, or DESPR) before either reaching its destination or passing through a LAN Bridge.
- A ThinWire repeater must be connected to standard baseband cable using either a baseband transceiver or a DELNI. The DELNI in this configuration cannot be connected to another DELNI, and it must connect to the standard baseband cable with an H4005 transceiver (or H4000-BA). The standard 802.3/Ethernet segment to which a DELNI/DEMPR or DELNI/DESPR configuration is attached may not exceed 300 meters (984 feet).

## 802.3/Ethernet Configuration Guidelines

- A station requiring a DESTA must be connected directly to the DESTA with transceiver cable. The DESTA must connect directly to the BNC T-connector. No cable is allowed between the DESTA and the BNC T-connector. The DESTA cannot be connected to a DEREPEP.
- There must be only one ground per cable segment. Ensure that no other connectors contact the ground. If the segment is attached to a ThinWire repeater, the repeater provides the ground and no other ground connections are allowed.
- ThinWire cable segments must never be configured in a loop.
- ThinWire cable segments must never have any branch segments. All T-connectors must attach directly to stations, not to other segments of ThinWire cable.

### ***DECconnect ThinWire Configurations***

ThinWire can be used to supply 802.3/Ethernet capability from a satellite equipment room to a faceplate in an office or other work area, as long as the 185-meter distance requirement is observed. ▲ Refer to Section 2 for more information.

### ***Unshielded Twisted-pair Guidelines***

The unshielded twisted-pair Ethernet adapter can attach to these types of unshielded twisted-pair cable:

- DECconnect unshielded twisted four-pair cable (H8245/H8246)
- AT&T Type C and D
- Northern Telecom 3-Pair
- IBM Type 3

Allowable distance over unshielded twisted-pair cable is 50 to 70 meters.

Each unshielded twisted-pair adapter supports a single device only. Twisted-pair installations are restricted to one station per twisted-pair segment.

A twisted-pair cable segment must be dedicated to 802.3/Ethernet services. No concurrent services, such as telephone or low-speed data, can be used within the same cable sheath as the 802.3/Ethernet cable.

When configuring 802.3/Ethernet twisted-pair products, the cable qualification is as important as the product itself. Customers planning to use existing wiring qualify for testing if they can answer yes to the following questions:

- Is your wire unshielded twisted-pair?
- Is it one of the following types: DECconnect unshielded twisted four-pair cable (H8245/H8246), AT&T Type C or D, Northern Telecom 3-Pair, or IBM Type 3?
- Is your wiring newer than two years old?
- Does each sheath contain a maximum of four pairs of wire?
- Is the cable currently unoccupied?
- Will the cable be used for 802.3/Ethernet communications only?

▲ For more information on configuring unshielded twisted-pair cable, refer to the configuration manuals listed in Appendix D.

### Planning an Extended Baseband 802.3/Ethernet LAN

The extended LAN is an 802.3/Ethernet environment that uses bridges to connect several 802.3/Ethernet segments into one large network of up to 8,000 nodes. By using LAN Bridges in network configurations, it is possible to extend network size without diminishing network performance.

The LAN Bridge forwards packets destined for other segments of the extended LAN, filtering out the packets destined for a node within the same segment. This "packet filtering" allows the customer to configure a segment based on traffic flow, thereby making the best use of network bandwidth. For example, the bridge can be used to isolate a network segment with heavy traffic from the rest of the extended LAN.

The following configuration rules apply to standard, fiber optic, and microwave versions of the LAN Bridge 100.

#### *Configuration and Distance Guidelines*

- An extended LAN may have up to 8,000 stations.
- Digital recommends that an extended LAN have no more than seven bridges between stations. Protocols that have time-sensitive parameters may suffer performance loss if packets move through more than seven bridges, as a result of the accumulation of slight delays caused by the store-and-forward function.
- Bridges can be placed in parallel with other bridges to provide an auto-backup capability. Bridges causing loops in this situation automatically enter a backup state. A bridge that is in the backup state continues to monitor traffic on both LANs and, if the primary bridge fails, automatically activates and forwards messages.
- The LAN Bridge 100 can be used to connect network segments using any standard 802.3/Ethernet medium, that is coaxial cable, fiber optic cable, or microwave. ▲ See the "Microwave Link" description following this description for additional information concerning microwave connection implementation.
- Distance from the transceiver to bridge can be a maximum of 50 meters, a total of 100 meters between segments. Internal cabling may reduce the effective length of the transceiver cable.

#### *Fiber Optic Links*

Fiber optic links can be built using two fiber optic bridges, two fiber optic repeaters, or one fiber optic bridge and one fiber optic repeater. Two bridges connected by a fiber optic link count as two in the seven-bridge limitation.

- When building links with fiber optic repeaters, there must be no more than 1,000 meters of fiber between stations.
- Distance from the transceiver to bridge can be a maximum of 50 meters. Internal cabling may reduce the effective length of the transceiver cable.
- The fiber optic bridge and repeater utilize SMA-type connectors. SMA-to-ST patch cable assembly is required when connecting these products to ST-based cable plants.
- The fiber optic repeater must be an H4000 transceiver to attach to the standard Ethernet cable.

- When building links with the fiber optic bridge and fiber optic repeater combination, the length of the fiber optic link must be included as part of the configuration of the LAN to which the fiber optic repeater is attached. ▲ For more information, refer to the topic on Ethernet repeaters in “Planning a Baseband 802.3/Ethernet LAN” in this section.
- When building a link with two fiber optic bridges, each link length is limited by the system budget for signal loss. Therefore, with 62.5/125 micron fiber cable, a link with a power budget of 12.0 dB can be 3,000 meters long. Many 3,000-meter links can be built throughout the extended LAN.
- The fiber optic bridge and repeater are designed to operate with fibers of other sizes including 100/140, 85/125, and 50/125. The following table lists the distance and power-budget specifications.

*Optical Specifications for Fiber Optic Bridge (DEBET-RH/RJ) and Repeater (DEREP-RH/RJ)*

Fiber Type*	Power Budget (dB)**	Attainable Distance (km)**		
		DEBET to DEBET	DEREP to DEREP	DEBET to DERET
50/125	08.0	.0	1.0	1.5
62.5/125	12.0	3.0	1.0	1.5
85/125	13.5	3.0	1.0	1.5
100/140	16.0	3.0	1.0	1.5

\*Diameter in microns.

\*\*With no more than  $1 \times 10^{-10}$  bit error rate.

### **Microwave Link**

Microwave links are implemented using the Digital METROWAVE Bridge and the M/A-COM, Inc., MA-23 LAN microwave radio equipment.

- 802.3/Ethernet LAN configuration rules for the METROWAVE Bridge are based on the same configuration rules that apply to a pair of fiber optic LAN Bridge 100s: microwave-based METROWAVE uses two LAN Bridge 100s and counts as two bridges in an extended LAN configuration. Digital advises a maximum of seven bridges between the two farthest nodes in an extended LAN when time-critical protocols such as LAT are used.
- Line-of-sight single-link distances up to 4.5 miles (bridge to bridge) are possible. Maximum path length is determined by 802.3/Ethernet propagation delay specifications, designed to detect signal collisions during simultaneous two-way transmissions.

As with coaxial or fiber optic cable, microwave has an associated latency that can be the same or less than a fully configured maximum-length 802.3/Ethernet LAN. The maximum allowable delay determines the 4.5-mile (7,240-meter) distance restriction for METROWAVE. (A standard 802.3/Ethernet LAN has a maximum distance limitation of 2,800 meters between its two farthest nodes. A single LAN Bridge 100 can join two such maximum LANs.)

### 802.3/Ethernet Configuration Guidelines

The path length is also a function of the cable distance as measured along the path of the cables between the two links. The cable distance is determined by adding the following distances on both ends of the link:

- the distance from the LAN Bridge 100 to the microwave adapter, plus
- the distance from the microwave adapter to the receiver (RX) and transmitter (TX) controllers, plus
- the distance from the RX/TX controllers to the RF (radio frequency) units.

The following table lists the resulting point-to-point antenna path given various total (both sides) cabling distances from the LAN Bridge to the antenna:

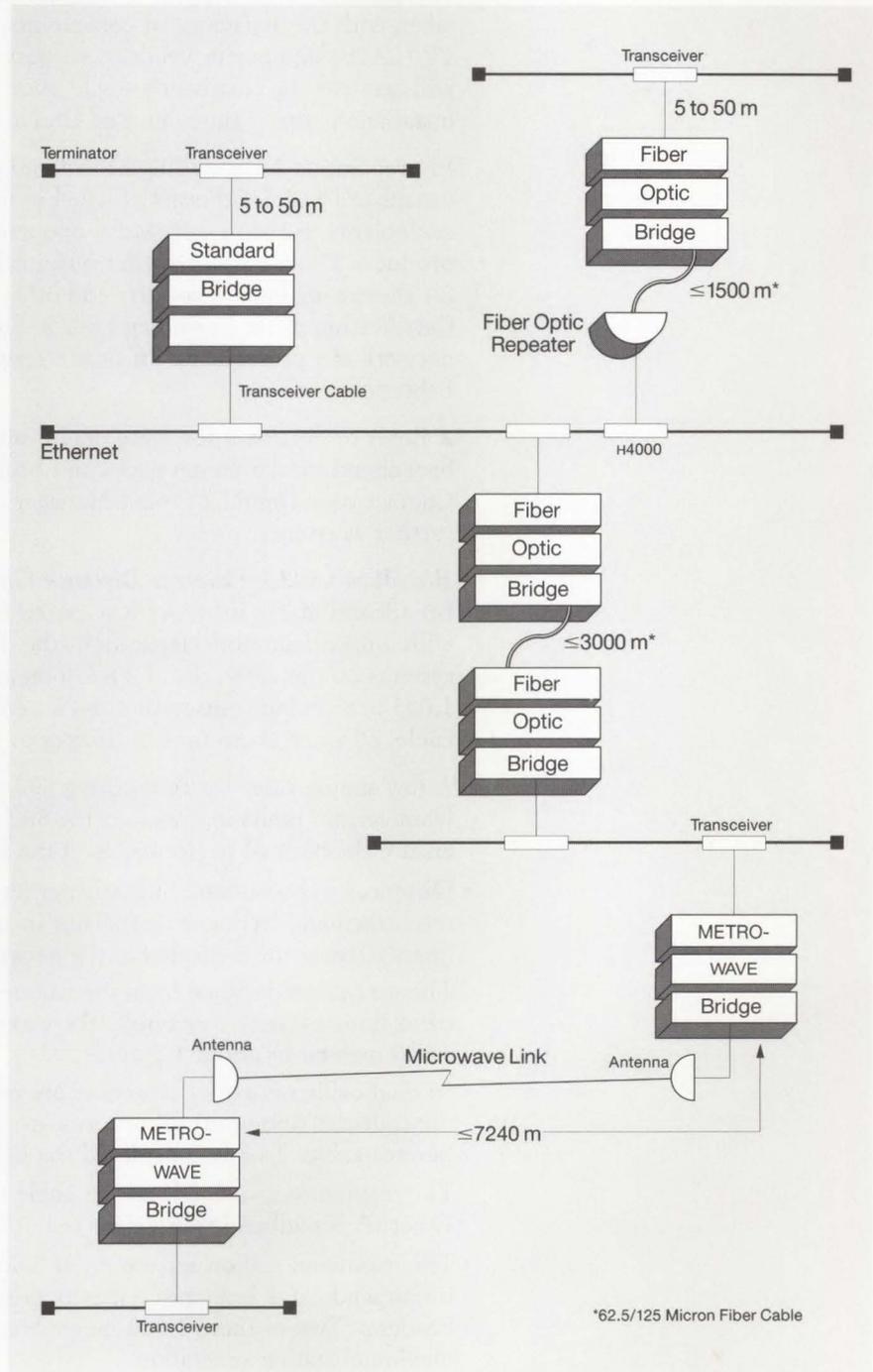
Total Cabling Distance (ft)	Antenna Path (miles)
100	4.48
200	4.45
600	4.33
1,000	4.21
2,000	3.91

- The microwave transmitter and receiver controllers may be up to 1,000 feet from the antenna.
- A METROWAVE Bridge must be located at each end of the microwave link and includes the following:
  - Standard baseband 802.3/Ethernet transceiver
  - LAN Bridge 100
  - BNE3M-20 cable connecting the standard baseband transceiver to the LAN Bridge 100
  - Microwave adapter
  - BNE4D-02 cable connecting the LAN Bridge 100 and microwave adapter
- The METROWAVE Bridge is available premounted in 31.5-inch-high cabinets, or in noncabinet configurations that make it suitable for rackmounting in satellite equipment room (SER) racks.
- Two METROWAVE Bridges connected by a microwave link count as two in the seven-bridge limitation.
- Although it is packaged with a baseband transceiver, the METROWAVE Bridge can also be attached to standard 802.3/Ethernet cable using a DELNI, to ThinWire cable using a DESTA, or to broadband cable using a broadband transceiver.

## 802.3/Ethernet Configuration Guidelines

The following figure illustrates the extended baseband LAN configuration and distance guidelines.

**Extended Baseband LAN Configuration and Distance Guidelines**  
(Standard, Fiber Optic, and METROWAVE Bridges)



NBG-206-01

### Planning a Broadband 802.3/ Ethernet LAN

Broadband local area networks use a different cabling system than baseband networks. The network cable, coaxial drop cables, and cable components (amplifiers, splitters, taps, etc.) necessary to construct broadband networks are the same as those used for cable TV.

The planning and installation of a broadband cable system is usually undertaken with the assistance of consultants, installation contractors, and cable TV (CATV) equipment vendors. As part of its Network Services, Digital will serve as the customer's single point of contact for the planning, design, installation, and maintenance of Digital broadband networks.

In preparation for installing broadband networks, Digital certifies the broadband 802.3/Ethernet channel in new and existing broadband cableplants to ensure successful operation of broadband 802.3/Ethernet products. Digital also provides ongoing and remedial maintenance services for these broadband products and other Digital-qualified vendor products. Certification of the broadband 802.3/Ethernet channel in the customer's network is a prerequisite for onsite service contracts for broadband 802.3/Ethernet products.

▲ Refer to Section 6 for more details about Digital's Network Services for broadband local area networks and broadband 802.3/Ethernet products. Contact your Digital Account Manager or Local Field Service Office for further assistance.

#### ***Broadband 802.3/Ethernet Distance Guidelines and Configuration***

Broadband 802.3/Ethernet is a rooted branching nonrooted tree topology with a maximum node separation (the distance between the two farthest systems on the network) of 3.8 kilometers (approximately 2.4 miles). Up to 1,023 broadband transceivers can be connected to the broadband network cable, allowing thousands of devices to be connected.

A few simple rules for configuring 802.3/Ethernet on broadband, derived from certain limits imposed on the 802.3/Ethernet physical channel, ensure the optimal performance of the network.

- Distances in broadband 802.3/Ethernet are measured from the location of the broadband frequency translator in single cable networks. The frequency translator is located at the network "headend."

The maximum distance from the frequency translator to the farthest broadband transceiver (for example, the maximum radius of the network) is 1,900 meters, or about 1.2 miles.

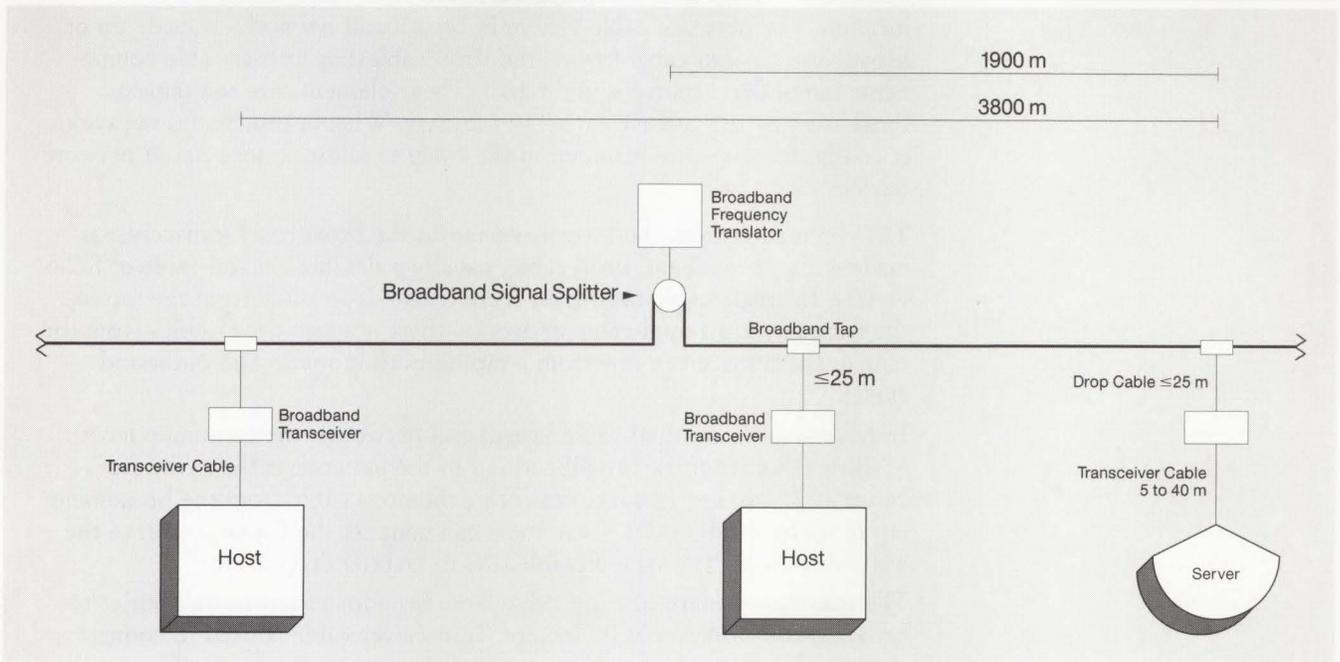
- In dual cable networks, distances are measured from the point at which the transmit (inbound) cable turns around and becomes the receive (outbound) cable. This is considered the headend of the dual cable network.

The maximum distance from the cable turnaround to the farthest 802.3/Ethernet broadband transceiver is 1,900 meters, or about 1.2 miles.

- The maximum station separation of 3,800 meters is achieved when the broadband cable branches out in opposite directions from the network headend. Two of these 1,900 meter branches add up to 3,800 meters of maximum station separation.

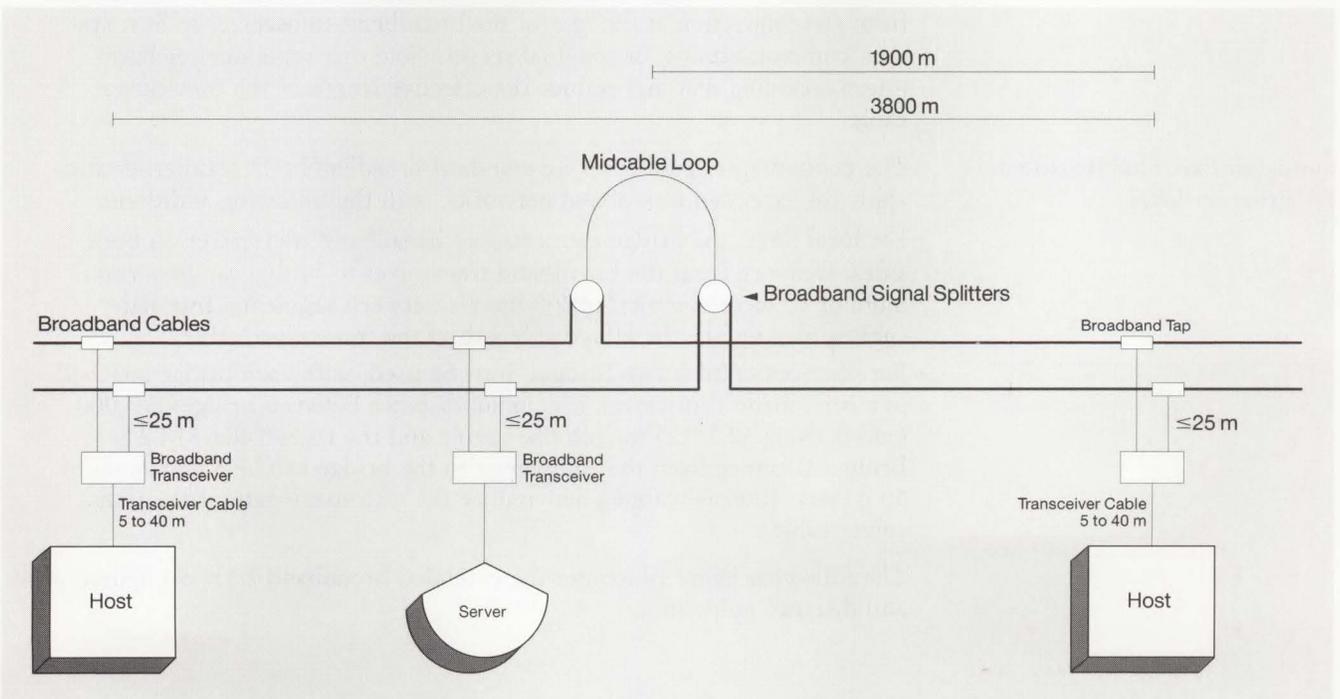
# 802.3/Ethernet Configuration Guidelines

## Broadband 802.3/Ethernet Distance Guidelines: Single-cable Networks



NBG-207-00

## Broadband 802.3/Ethernet Distance Guidelines: Dual-cable Networks



NBG-208-00

### 802.3/Ethernet Configuration Guidelines

Because the broadband cable can branch out in any direction, the network can consist of virtually unlimited numbers of “spokes” from the headend location. The network cable system in broadband networks is made up of broadband coaxial cable (trunk and drop cables) as well as cable components (amplifiers, splitters, and taps,). These elements are the same as those used by the cable TV (CATV) industry. When a broadband network is configured, taps are installed in the cable to allow connection of network devices.

The connection from the broadband tap to the broadband transceiver is made with a broadband drop cable, usually a flexible coaxial cable of RG-6 variety. In single-cable networks, there is one drop cable from the tap to the transceiver. In dual-cable networks, there are two drop cables from the taps to the transceiver, one from a tap on both inbound and outbound cables.

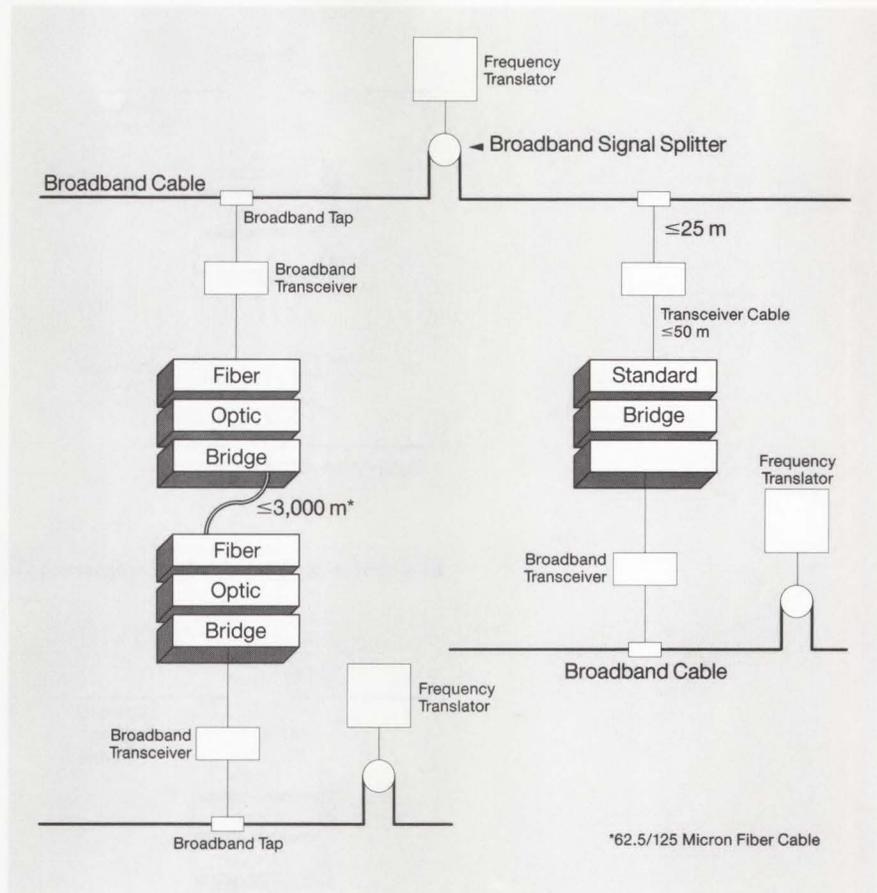
- In both single- and dual-cable broadband networks, the maximum length of drop cable from the broadband tap in the network cable to the transceiver is 25 meters. In some networks, the drop cable from the broadband tap leads to a wall outlet. Customers can connect the Ethermodem to the wall outlet using the same flexible (RG-6) coaxial drop cable.
- The maximum length of drop cable from broadband tap to wall outlet to broadband transceiver is 25 meters. Transceiver cable is used to connect the broadband transceiver to an 802.3/Ethernet communications controller, LAN Bridge 100, communications server, or terminal server.
- Transceiver cable length is limited to 50 meters (164 feet), and is measured from the connection at the rear of the broadband transceiver to host system, communications, or terminal server. Note that some devices have internal cabling that may reduce the effective length of the transceiver cable.

#### Planning an Extended Broadband 802.3/Ethernet LAN

The configuration guidelines for standard broadband 802.3/Ethernet also apply for extended broadband networks, with the following additions:

- For local links, the bridge connects to a broadband transceiver on both sides. Distance from the broadband transceiver to bridge can be a maximum of 50 meters, a total of 100 meters between segments. Internal cabling may reduce the effective length of the transceiver cable.
- For fiber optic links, two bridges must be used, with each bridge attached to a broadband transceiver. Maximum distance between bridges is 3,000 meters using 62.5/125 micron fiber cable and the DEBET-RH/RJ LAN Bridge. Distance from the transceiver to the bridge can be a maximum of 50 meters. Internal cabling may reduce the effective length of the transceiver cable.

The following figure illustrates the extended broadband LAN configuration and distance guidelines.

*Extended Broadband LAN Configuration and Distance Guidelines (Single Cable)*

NBG-209-01

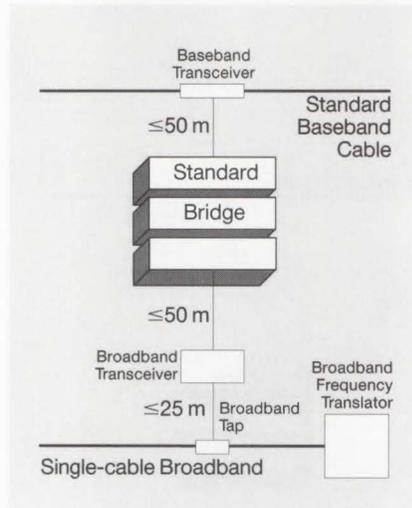
### Connecting Baseband to Broadband LANs

Baseband and broadband LANs can be connected using the LAN Bridge 100. For local links, the bridge connects to a baseband 802.3/Ethernet transceiver on the baseband side of the link using transceiver cable with a maximum length of 50 meters. On the broadband side of the link, the bridge connects to a broadband transceiver using transceiver cable with a maximum length of 50 meters. Internal cabling may reduce the effective length of the transceiver cable on both sides of the bridge.

For fiber optic links, two bridges must be used. The bridge on the baseband side of the link is connected to a baseband transceiver; the bridge on the broadband side of the link is connected to a broadband transceiver. Maximum distance between bridges is 3,000 meters using 62.5/125 micron fiber cable and the DEBET-RH/RJ LAN Bridge. Distance from each transceiver to the bridge can be a maximum of 50 meters. Internal cabling may reduce the effective length of the transceiver cable.

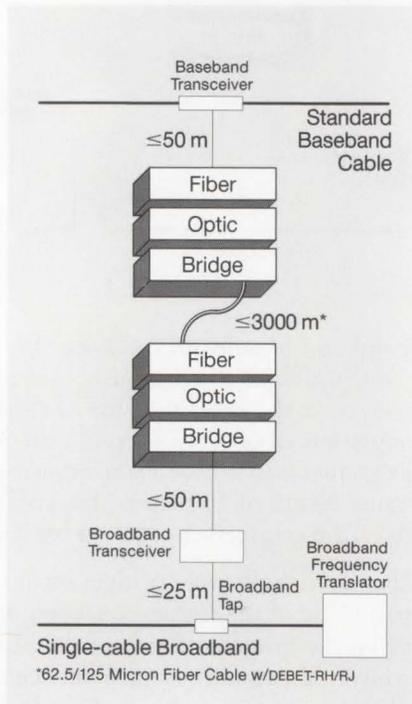
## 802.3/Ethernet Configuration Guidelines

### Baseband-to-broadband LAN Configuration Guidelines (Standard Bridge)



NBG-210-02

### Baseband-to-broadband LAN Configuration Guidelines (Fiber Optic Bridge)



\*62.5/125 Micron Fiber Cable w/DEBET-RH/RJ

NBG-211-02

### Connecting Shared Resources to an 802.3/Ethernet LAN

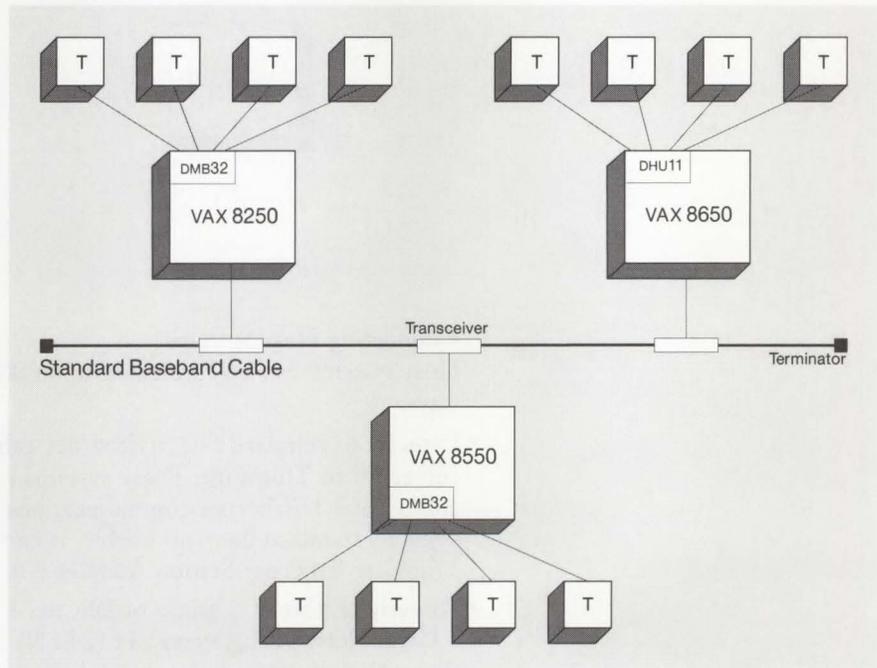
When planning a baseband or broadband 802.3/Ethernet LAN, alternatives for connecting shared resources (including terminals, host systems, and communications servers) should be explored.

#### Connecting Terminals

There are two ways to connect terminals to the 802.3/Ethernet LAN: direct connection to a host system on the LAN, and connection to a terminal server on the LAN.

Direct connection is the conventional method of connecting terminals to a host. Directly connected terminals can access any other host system in a network, then operate as if they were connected to the other host system. However, this connection scheme lacks flexibility because terminal controllers must be added to each host system; wiring must extend from each terminal to the directly connected host, which may be a long distance away; and directly connected terminals incur the overhead of passing through their direct host to connect to another host. The following figure illustrates a LAN configuration with directly connected terminals.

802.3/Ethernet LAN with Many Terminals Per Host



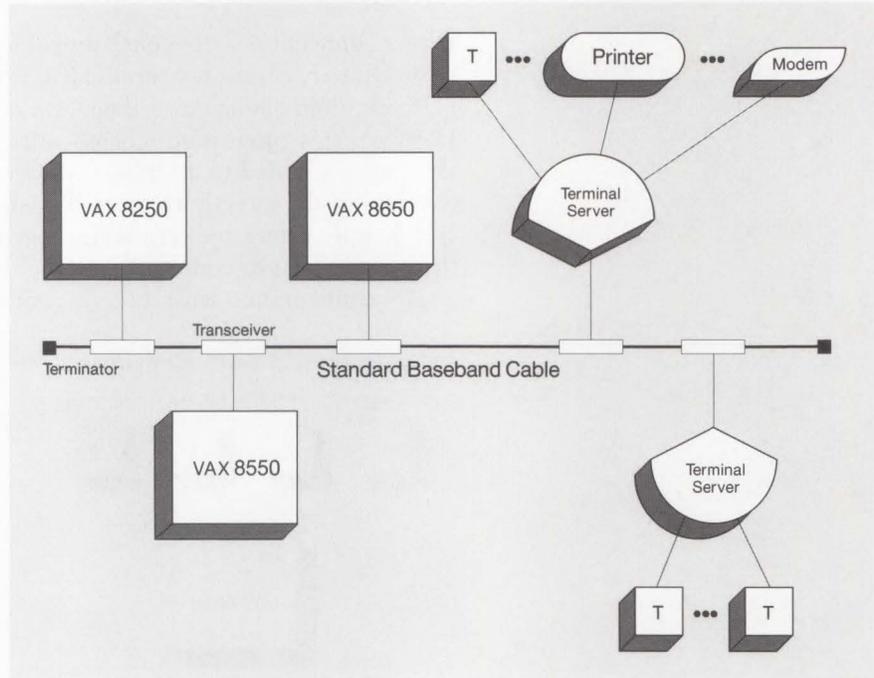
NBG-212-00

Terminal servers allow a more flexible connection scheme than direct connection. A group of terminals connect to a terminal server, which then connects directly to the LAN, allowing the terminals to access any host on the LAN. Printers and modems can also connect to a terminal server, allowing them to be shared by all host systems on the LAN. Terminal servers can be placed close to the users' workplace, thereby reducing the length of wire extending from each terminal.

## 802.3/Ethernet Configuration Guidelines

The following figure shows an 802.3/Ethernet configuration using terminal servers. Compared to the configuration shown in the previous figure, the terminal server configuration reduces the number of controllers for each host, reduces the length of wires extending from terminals, and offers greater flexibility in accessing host systems on the LAN.

**802.3/Ethernet LAN Configuration Using Terminal Servers**



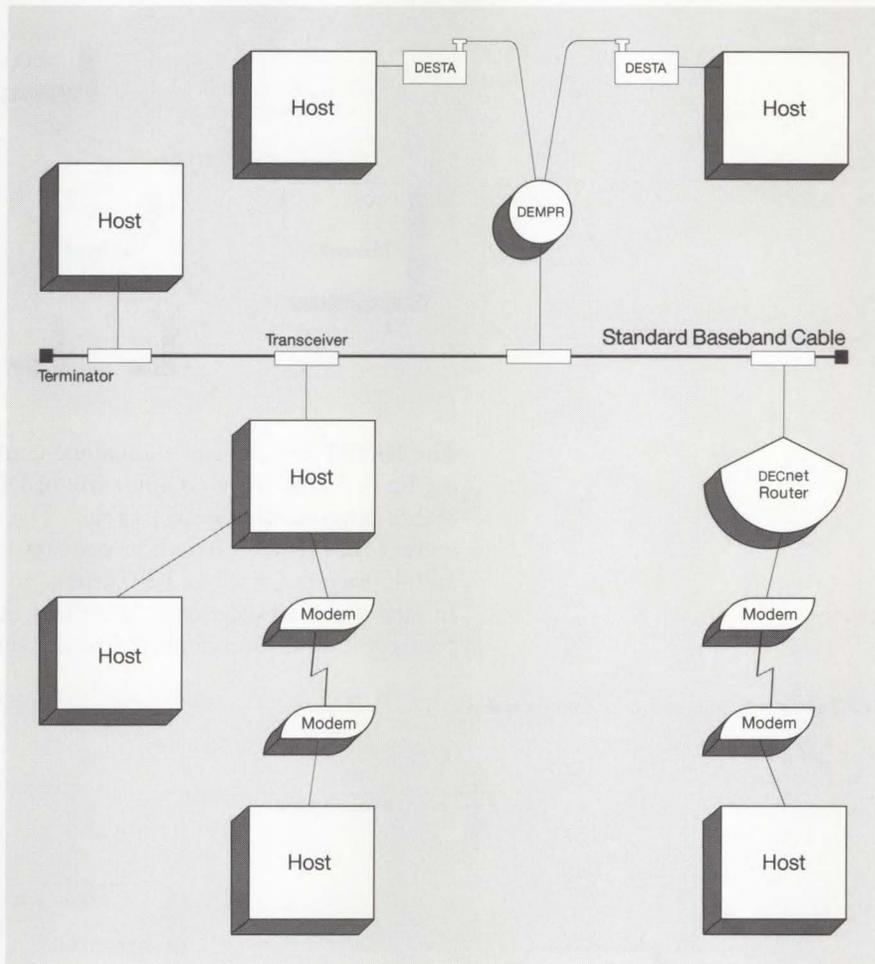
NBG-213-00

### **Connecting Host Systems**

Host systems can be connected to an 802.3/Ethernet LAN in the following ways:

- Directly to standard 802.3/Ethernet cable (using an 802.3/Ethernet transceiver) or to ThinWire. These systems require DECnet Phase IV software and an 802.3/Ethernet communications controller. If the controller connects to standard baseband cable, it can connect to ThinWire via a ThinWire Ethernet Station Adapter (DESTA).
- Directly as part of a group of DECnet Phase IV host systems connected to a Local Network Interconnect (DELNI). Each host system requires DECnet Phase IV software and an 802.3/Ethernet communications controller.
- Indirectly via a DECnet Phase IV host system that is connected to the 802.3/Ethernet cable. Connected host systems can have DECnet Phase III or Phase IV software. Connections can be hardwired or through modems.
- Indirectly through a DECrouter 2000, DECrouter 200, or X25router 2000. Connected host systems can have DECnet Phase III or Phase IV software. Connections can be hardwired or through modems.

Connecting Host Systems to an 802.3/Ethernet LAN



NBG-214-00

### **DECnet Host System Software**

DECnet Phase IV software allows host systems to communicate with up to 64,000 addressable nodes in a local or wide area network environment. An addressable node is either a host system or communications server. ▲ Refer to Section 4 for detailed information on Digital's DECnet software products.

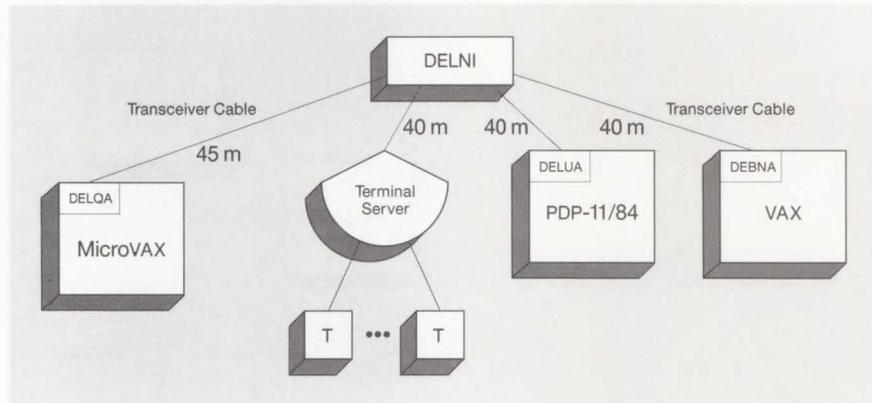
### **Local Network Interconnect (DELNI)**

The Local Network Interconnect (DELNI) provides low-cost 802.3/Ethernet performance for a group of 802.3/Ethernet-compatible devices in a 50-meter area. The DELNI can be configured in three ways:

- Standalone
- Hierarchical standalone
- Connected

The DELNI standalone configuration, illustrated in the following figure, supports up to eight systems or system-based devices (not terminals) using standard 802.3/Ethernet transceiver cables up to 50 meters (164 feet) away.

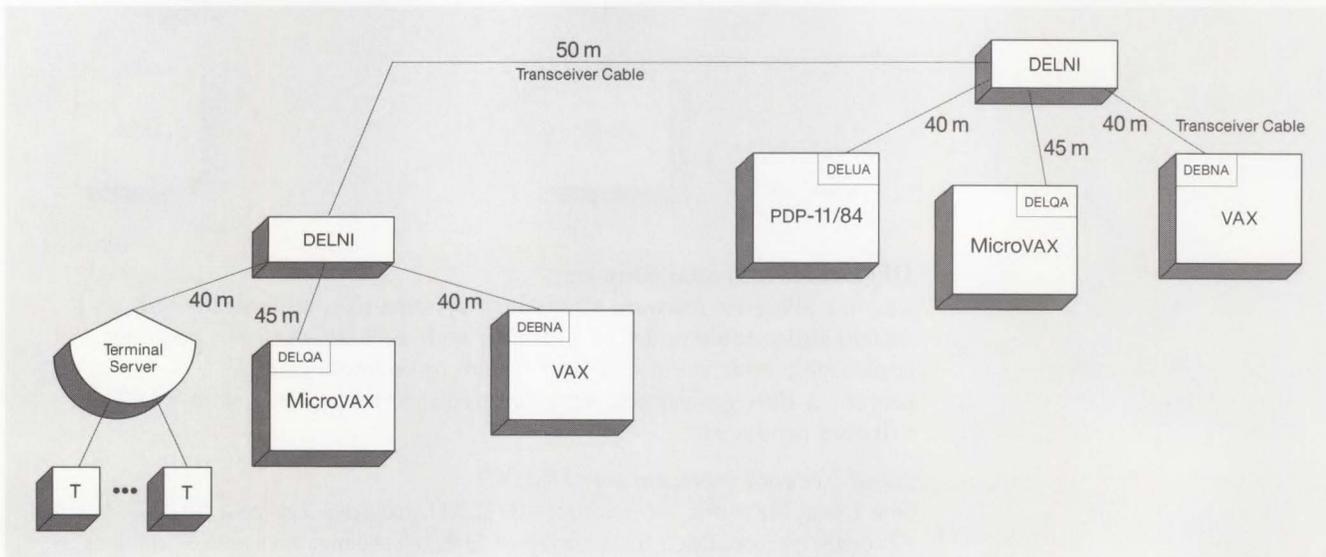
**DELNI Standalone Configuration**



NBG-135-02

The DELNI hierarchical standalone configuration, illustrated in the following figure, supports a combination of DELNIs and devices using standard 802.3/Ethernet transceiver cables. The transceiver cable can be up to 50 meters (164 feet) in length to connect to another DELNI, and between 40 and 45 meters (131.2 and 147.6 feet) in length to connect to 802.3/Ethernet communications controllers. A DELNI hierarchical standalone configuration is not connected to the standard baseband cable.

**DELNI Hierarchical Standalone Configuration**

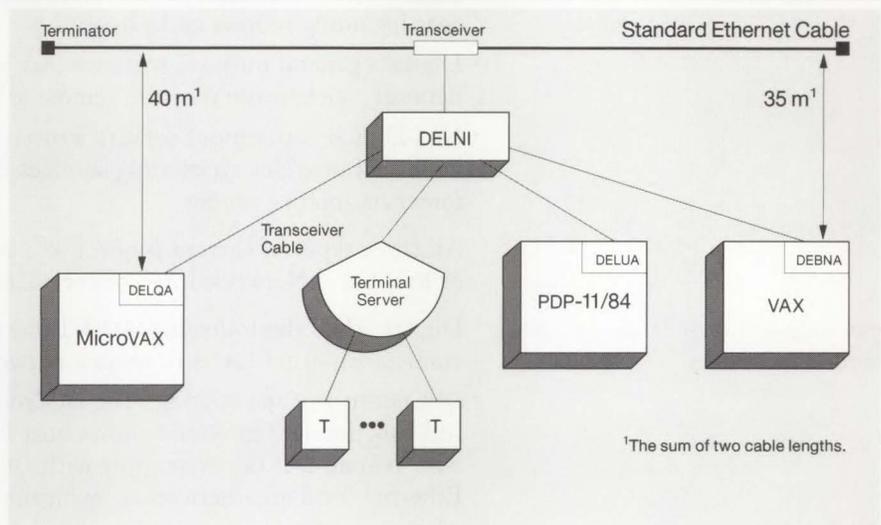


NBG-136-02

The DELNI connected baseband configuration, illustrated in the following figures, supports up to eight devices using standard transceiver cables. The total maximum length of transceiver cable is 40 meters (131.2 feet). In a baseband configuration without an Etherjack, this would be the sum of the length of the cables from the transceiver to the DELNI and from the DELNI to the host system or communications server. However, a particular controller may restrict this length. For example, the maximum cable length from the transceiver to the DELUA is 35 meters (115 feet).

In broadband configurations, the Chipcom Ethermodem should not be used with a DELNI because this is an unsupported configuration.

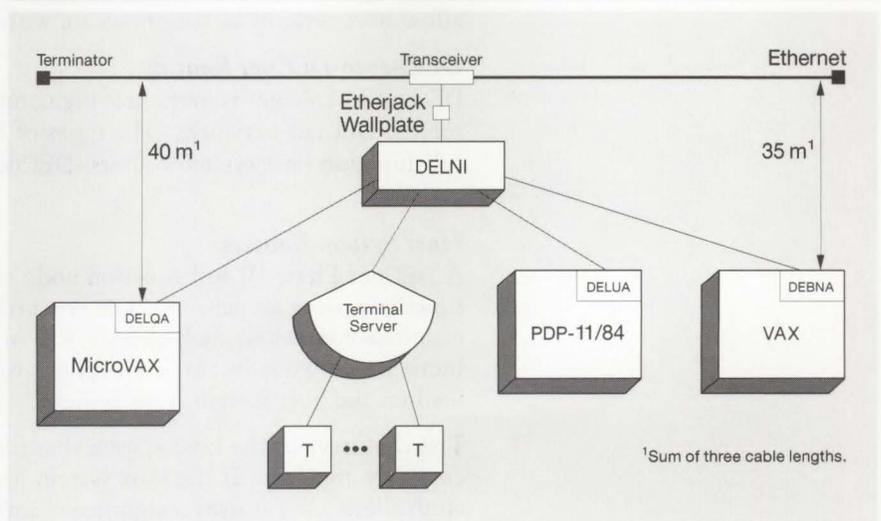
**DELNI Connected Configuration**



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In configurations with an Etherjack (baseband only), the lengths to be considered are from the transceiver to the Etherjack, Etherjack to DELNI, and DELNI to the host system or communications server.

**DELNI Connected Configuration Using an Etherjack**



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## 802.3/Ethernet Configuration Guidelines

### **Connecting Servers**

Servers are specialized network nodes that act as shared resources. Three types of servers can be used on an 802.3/Ethernet LAN:

- Digital's 802.3/Ethernet communications server hardware/software packages including routers and gateways.
- Digital's general purpose software that provides server functions in the network, such as file transfer, remote job entry, and remote printing.
- Non-Digital applications servers written by users, for example, a computer node that provides typesetting services using software written by a customer or another vendor.

All three types of servers connect to a standard 802.3/Ethernet transceiver or to a Local Network Interconnect (DELNI).

Digital offers the following 802.3/Ethernet communications servers to connect Ethernet LANs to remote networks:

- DECnet-to-DECnet routing: The DECrouter 200, DECrouter 2000, or a full-function DECnet node allows host Ethernet systems to communicate with remote DECnet systems or with DECnet systems on other 802.3/Ethernet local area networks by means of point-to-point links.
- DECnet-to-X.25 communications: The X25router 2000, or a full-function DECnet node with a Packetnet software product, allows host systems to communicate with other DECnet systems as well as non-Digital systems over an X.25 Packet Switching Data Network. ▲ Refer to Section 4 for more information about Packetnet software products.
- DECnet-to-IBM SNA communications: The DECnet/SNA Gateway products allow host systems to communicate with IBM systems in SNA networks.

### **DECnet-to-DECnet Routing**

DECnet-to-DECnet routers provide communications between local and remote DECnet networks. The types of DECnet-to-DECnet routers are full-function host system routers, DECnet router servers, and DECnet gateways.

### **Host System Routers**

A DECnet Phase IV full-function node can manage 802.3/Ethernet routing functions using asynchronous or synchronous lines connected to a communications controller, such as a DMB32 or a DSV11. This may be adequate if there are only one or two connections to remote nodes and if the routing load on the host system is fairly light.

The resources of the host system that functions as a routing node should be carefully analyzed. If the host system has more than two communications controllers, or if it uses a significant amount of CPU processing time for routing, a DECrouter 2000 or DECrouter 200 should be considered. These servers are dedicated to routing functions, while full-function nodes must also run applications. In addition, the physical line interfaces for the DECnet Router Server or DECrouter 200 are much less expensive than those provided by communications controllers.

### **Connecting an 802.3/Ethernet LAN to Remote Networks**

### ***DECrouter 2000***

The DECrouter 2000 performs DECnet routing functions between Phase IV nodes on an 802.3/Ethernet LAN and remote DECnet nodes, and provides connections between independent 802.3/Ethernet networks.

For routing purposes, Phase IV DECnet networks consist of a number of linked areas. Each area is not limited to a specific geographic region, but is often localized, such as a LAN in a building. (Here LAN refers to any local area network that conforms to the Ethernet, IEEE 802.3, or the ISO 8802/3 standards.)

Packet routing is handled by specified routing nodes, which may have to do this task in addition to providing services to users. Routing works on two levels:

- Level 1—Among nodes within an area (called intra-area routing)
- Level 2—From one area to another (called inter-area routing)

The DECrouter 2000 is a dedicated routing system that can act as a Level 1 and/or Level 2 router. The system routes information over one LAN circuit and up to four synchronous DDCMP circuits. This gives other DECnet nodes on the LAN access to remote nodes, and also relieves them of the routing overhead.

An example application for the DECrouter 2000 might be as a Level 2 router for a LAN whose nodes are in a single DECnet area, connected to two remote nodes in the same DECnet area, and two other nodes in other areas. In this case it would act as both a Level 1 and Level 2 DECnet router.

### ***Routing Capabilities***

- Level 1 and/or Level 2 Phase IV DECnet routing
- Ability to route messages between 63 areas, each with up to 1023 nodes, the maximum permitted by the architecture. (Satisfactory operation in large networks requires proper network planning.)
- Adaptive routing over the synchronous links and to/from the LAN.
- Ability to communicate with remote Phase III nodes in the same DECnet area.
- Path splitting where there are two or more equal-cost paths between the DECrouter 2000 and the destination DECnet node. For this feature, all the destination nodes on the network must support out-of-order packet caching.

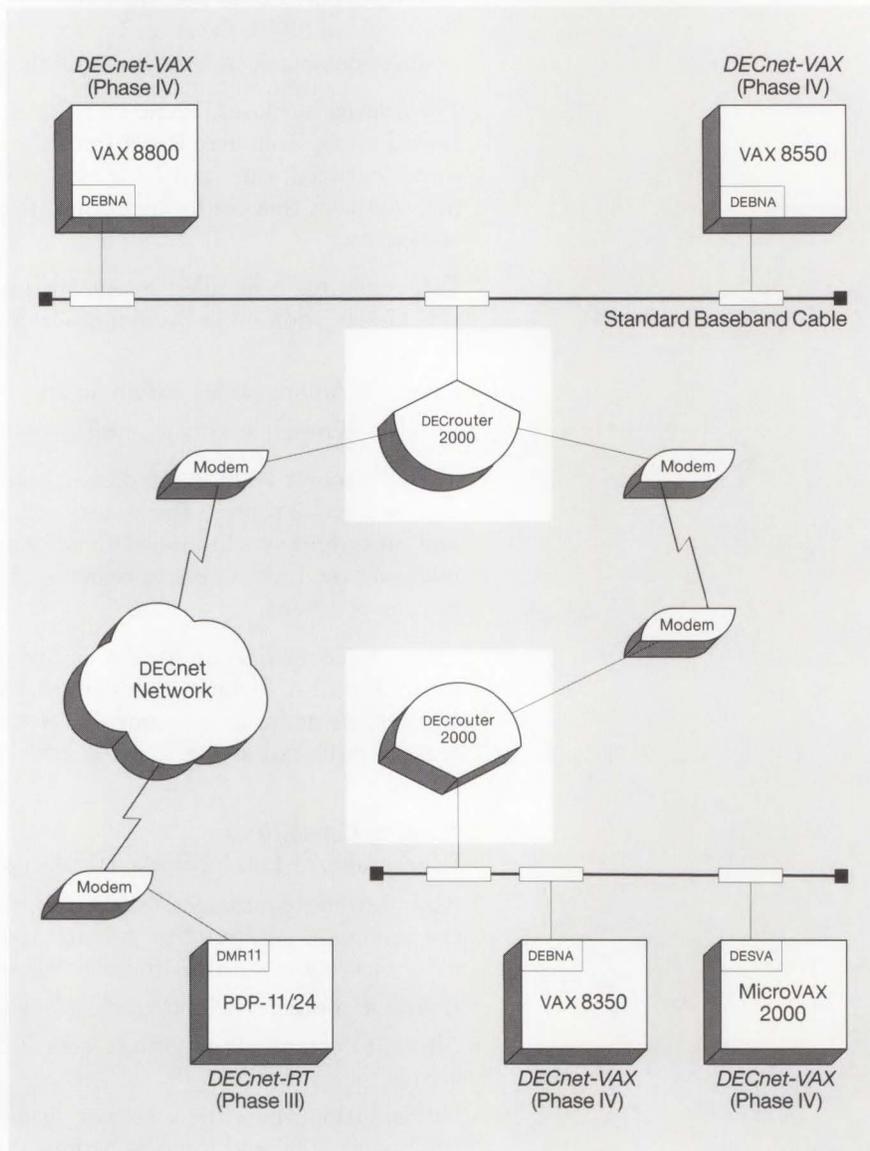
### ***Synchronous Line Capabilities***

- Data speeds of up to 256 Kb/s
- EIA-232-C, EIA-422, EIA-423, V.24, V.35 and X.21 electrical interfaces: X.21 is supported in leased-line mode only
- Full modem control on all synchronous lines

### ***DDCMP Capabilities***

- Communicates with all supported synchronous Digital DDCMP products, excluding the DMC11.
- Ability to work on point-to-point or multipoint links. However, on DDCMP multipoint links, the DECrouter 2000 can act only as a tributary.
- Full- or half-duplex communications.

## 802.3/Ethernet LAN Configuration Using a DECrouter 2000



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**Network and Configuration Management Capabilities**

- Configuration using a downline-loaded image and a configuration utility.
- Remote management from any suitable DECnet node using the DECnet Network Control Program.
- Remote problem diagnosis (for example, using the TRACE tool).
- Automatic attempt to dump and reload following a system failure.
- Event logging to any Phase IV DECnet node.
- Dynamic reconfiguration while the system is running.

**Network Management**

The network manager controls the DECrouter 2000 by using the DECnet Network Control Program from any DECnet Phase IV node. For example, the manager can use the utility from one of the systems on the LAN.

The utility provides three basic functions:

- Displays statistics and error information for the DECrouter 2000 (for example, statistics on line usage or errors).
- Controls the DECrouter 2000 (for example, starting and stopping lines, setting parameters, and loading the software).
- Tests the components of the network (for example, loopback messages of all or part of a communications path to isolate a defective component).

In addition, a separate utility available on VMS load hosts assists problem-solving by tracing information at various stages in its path through the DECrouter 2000.

### **Host Systems**

The DECrouter 2000 has no file storage of its own, and so relies on host systems to

- Load the software.
- Log events.
- Receive any memory dumps.

The minimum requirement is for one host to load the DEC MicroServer, the hardware base for the DECrouter 2000. Event-logging and dump-reception facilities can be used at the discretion of the customer. Only a DECnet Phase IV DECnet-VAX or DECnet-ULTRIX node on the same LAN can be a load host or dump receiver.

The DECrouter 2000 software can be installed on a number of load hosts. This helps to protect against loss of service if a single load host is unavailable or unable to load the system for any reason. Each load host must be on the same LAN, but not necessarily in the same DECnet area as the DECrouter 2000.

## **DECnet-to-X.25 Communications**

As networks grow and users require more network functions, nodes, and communications alternatives, the complexity of the network increases. Digital's communications over Packet Switched Data Networks (PSDNs) can be a cost-effective alternative for customers who want to transmit a low volume of data remotely. Public PSDNs charge primarily on the amount of data transmitted, and to a lesser extent, if at all, on distance and time factors.

If a customer requires only short, low-speed data transmissions, a dialup line might be cost-effective because it avoids the PSDN connection charge. If high-volume continuous data transmission is required, the customer will want to avoid the PSDNs "data-sent" charge, making a leased line more appropriate. Somewhere in the middle (medium data rates and volume), X.25 PSDNs are cost-effective. Because most X.25 networks charge by the amount of data sent, customers may want to mix capabilities (leased line, dialup, and packet switched), depending on the traffic patterns and line costs.

The CCITT X.25 specification defines the network protocols for communications among multivendor systems over X.25 Packet Switched Data Networks. There are two ways of connecting 802.3/Ethernet nodes to an X.25 network: host-based system connections or the X25router 2000.

### ***Host-based System Connections to X.25 Networks***

Individual VAX or RSX host systems can connect to an X.25 network using the VAX P.S.I. or RSX-11 P.S.I. products. During installation, customers can choose to allow the VAX P.S.I. system to act as a gateway to a PSDN. Other VAX systems in the DECnet network need only install VAX P.S.I. Access to take advantage of the facilities available through or from the X.25 PSDN. ▲ For more detailed information, refer to the “Packetnet Communications Software” in Section 4.

### ***X25router 2000***

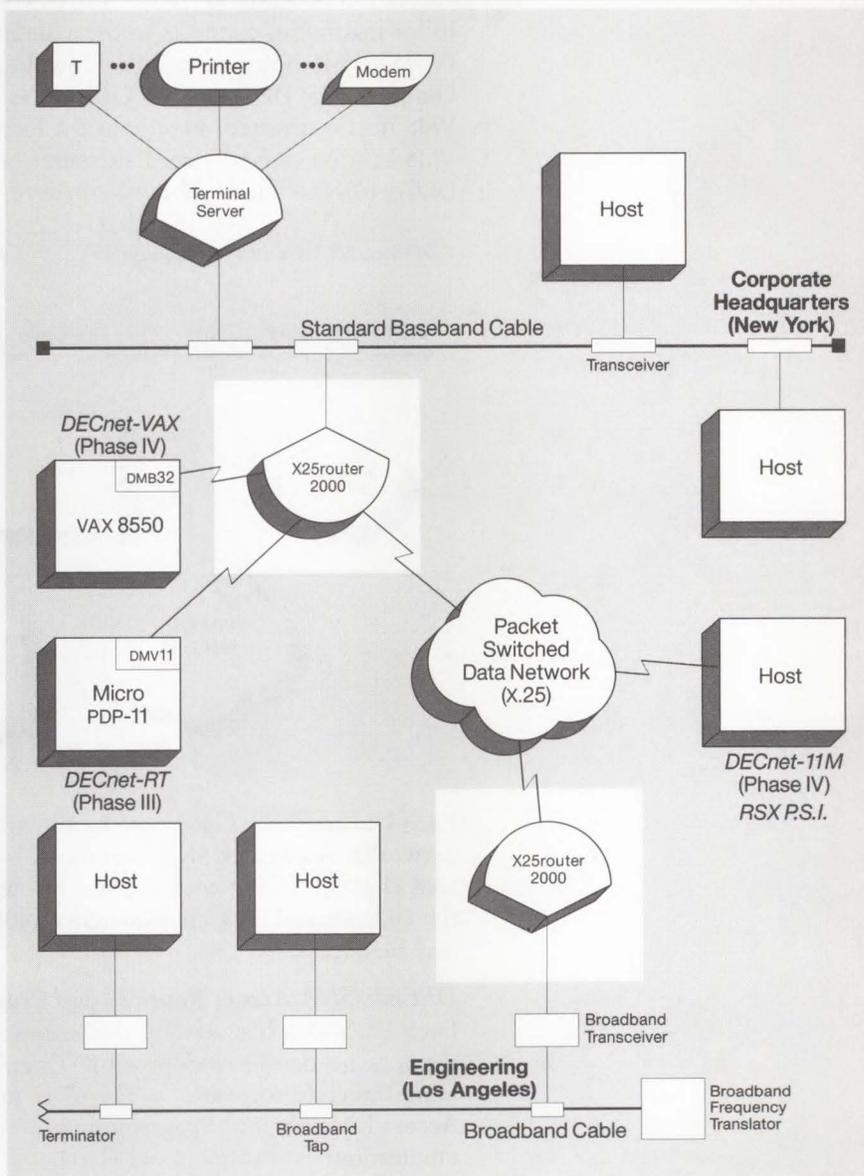
The X25router 2000 is an addressable node on the network available for access by any host node on the network. The X25router 2000 connects host nodes to other DECnet nodes in an X.25 network using the Data Link Mapping (DLM) capability of the gateway software. ▲ Refer to “802.3/Ethernet Communications Servers” in Section 2 for a description of the X25router 2000.

In addition to acting as a Level 1 (local) router and supporting limited numbers of DDCMP synchronous lines, the X25router 2000 gives VAX P.S.I. Access systems access to all facilities offered by the connected X.25 network.

Most often the design of geographically dispersed networks is influenced by the expense of transferring data over telecommunications facilities owned by common carriers. Network implementations use either leased lines for high-volume, continuous data transfer, or PSDN communications for low-to-medium-volume data transfer. For customers with one or both of these requirements, the X25router 2000 offers a unique solution. Because the X25router 2000 supports both X.25 and DDCMP (leased) lines, it offers flexible configurations.

The X25router 2000 allows users to make traditional wide area network DECnet connection using DDCMP to DECnet nodes on an 802.3/Ethernet local area network, and to DECnet nodes connected to an X.25 network, as illustrated in the following figure.

*X25router 2000 Configuration (DECnet-to-DECnet)*



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A VAX/VMS host system on the local area network must have a copy of the basic X25router 2000 software. This host system downline-loads the software into the X25router 2000. Then the X25router 2000 is started and DECnet-to-DECnet communications are available to all other host systems on the LAN.

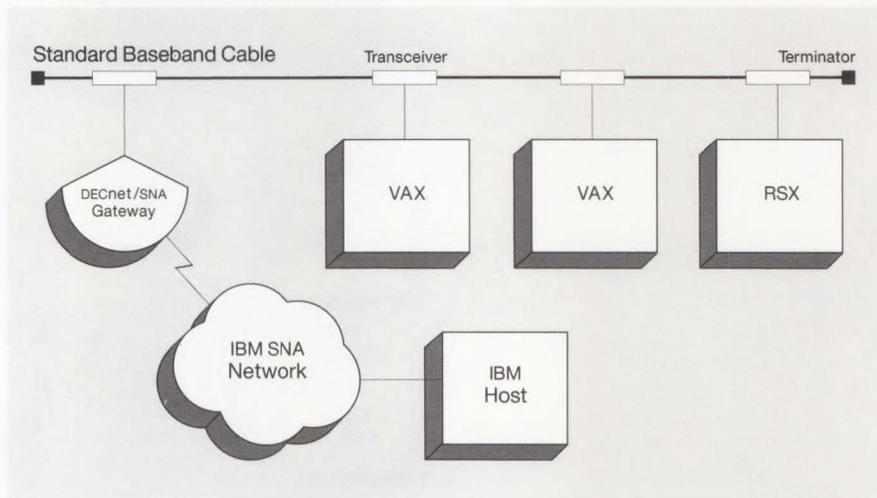
**Digital-to-non-Digital Communications over X.25 Networks**

Refer to "Packetnet Communications Software" in Section 4 for a description of Digital's P.S.I. and P.S.I. Access products, which are used with the X25router 2000 to provide X.25 and X.29 communications capabilities. Section 4 also contains a table indicating the relative advantages and disadvantages of gateway versus direct X.25 connections, and the alternative use of VAX P.S.I. in multihost mode.

**DECnet-to-IBM/SNA Communications**

The DECnet/SNA Gateway products link Digital VAX/VMS nodes within a DECnet network to an IBM SNA network. The gateway, illustrated in the following figure, connects to the standard 802.3/Ethernet cable. A Phase IV VAX/VMS host is needed to downline-load software to the DECnet/SNA Gateway. The DECnet/SNA Gateway is accessible directly by any Phase IV VMS host connected directly to the local area network or any Phase III VMS host connected via a DECrouter or DECnet routing system with DECnet/SNA Gateway Access software.

*DECnet/SNA Gateway Configuration*



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Each DECnet/SNA Gateway-ST can handle up to four lines to remote SNA networks. A DECnet/SNA Gateway-CT provides one link directly to an IBM channel. In network applications with extremely heavy traffic between the DECnet and SNA environments, more than one DECnet/SNA Gateway may be necessary.

***DECnet/SNA Access Routines and Programming Interfaces***

Each VAX/VMS host system that accesses the IBM systems in the SNA network needs the appropriate DECnet/SNA Access Routine or Programming Interface software. ▲ For more information about DECnet/SNA Access Routines and Programming Interfaces, refer to "Digital/IBM Communications Software" in Section 4.

DECnet-VAX

▲ Refer to DECnet-VAX Software Product Description 25.03 load unit tables for guidelines.

DECnet-RSX

This topic provides performance guidelines for file transfer and task-to-task communication for DECnet-11M-PLUS V4.0.

The performance of a network can be affected by several factors. One major consideration is the type of processor used. The CPU can be a limiting factor in terms of performance.

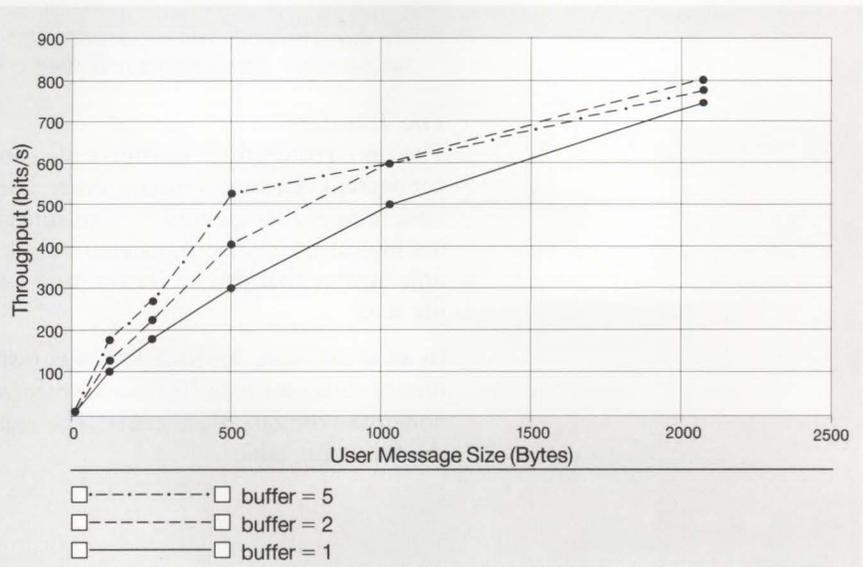
Another factor in determining network performance is the communication device used. Because a communication device with a low line speed can be the bottleneck in a configuration, it is important to choose a line that meets the user's needs. Note that the user bit transfer rate should not be expected to equal the line speed.

**Throughput Data**

When writing programs for task-to-task communications, there are trade-offs to consider. It is more difficult to develop software that uses multibuffering than software that uses single-buffering. Also, when tasks use multibuffering, it may be necessary to increase the number of network buffers. A program's buffering level may actually slow down execution time and increase user response time on the system. Each configuration and application has an "optimal" buffering level. It is important to consider at what point the small increase in performance is no longer worth the additional buffering required to extract the extra throughput. With this performance trade-off, it is necessary to evaluate and determine how the user's needs will be best satisfied.

The following figure illustrates how an increase in the buffering rate improves the bit rate and throughput as the buffering level increases from one to two. In a typical situation, expected results can range from 150 Kb/s to 600 Kb/s for multibuffering.

**Effects of Multibuffering on Bit Rate**



## Performance Guidelines

Transmission of a large message will generally have a higher throughput than that of a small message. All messages have an associated CPU overhead, independent of the message size. If the CPU is a limiting factor, the transmission of a long message will push more bits through than a small one will. In other words, holding the CPU utilization constant, a higher bit transfer rate will be realized with a longer message.

Large user message sizes are more demanding on a system than small ones. With a limited capacity, an increase in throughput may not be worth the degradation of the total system. However, it is also not advisable to have a system buffer size smaller than normal user message size. In that situation, each message would have to be segmented.

The user should never expect to reach a bit rate equal to the line speed because there will always be some protocol overhead to consider. For a given level of buffering, throughput depends on processor speed, message size, and line speed. For single-buffering situations, one might typically expect rates of 50 Kb/s to 500 Kb/s.

CPU utilization generally decreases as message size increases primarily because of the fixed costs associated with transmission of each message. A large message has a lower CPU cost per byte and CPU cost per second because the fixed cost is distributed over a larger message and a longer transmission time period.

The following table lists the typical CPU utilizations for task-to-task communications over an 802.3/Ethernet local area network.

*CPU Utilization for Task-to-task Communications over 802.3/Ethernet*

PDP Systems	CPU Utilization	Communication Device	Operating System
11/44 to 11/44	63% to 75%	DEUNA	RSX-11M-PLUS
11/53 to 11/53	85% to 97%	DEQNA	Micro/RSX*
11/83 to 11/83	85% to 95%	DEQNA	Micro/RSX

\*The throughput can increase for PDP-11/53 systems by loading the network into lower memory space. This lower memory space is located on the CPU board.

### **File Transfers**

The time required to transfer a file can be divided into two categories: connection time and transfer time. There is a fixed amount of connection time required to execute startup functions such as opening files and creating logical links. The transfer time is a function of the number of bits per unit of time that can be transmitted over the network by NFT/FAL and the file size.

In an actual case, an RMS FAL was installed on the remote node. ASCII files of different lengths were transferred from a local node to a remote node over the 802.3/Ethernet. The results from the NFT task are shown in the following table.

## Performance Guidelines

### *Network File Transfer Over 802.3/Ethernet*

Configuration	Connection Time (secs)	Blocks/second Transferred
11/44 to 11/44	2.5	60.24
11/44 to 11/750	2.7	34.36
11/53 to 11/53 (Network loaded by default)	2.9	45.45
11/83 to 11/83 (Micro/R SX)	2.2	82.64
11/83 to 11/83 (RSX-11M-PLUS)	2.2	84.75

### **Routing Nodes**

Information regarding the amount of routing done by a system can be gathered by using NCP circuit counters. This tells how many packets have been routed through each circuit since the counters were zeroed.

Routing nodes are affected by many factors, including the amount of traffic on the network, the stability of the nodes in the network, the topology of the network, and the amount of work (other than routing) done by the routing node.

In a study of the packet throughput performance of two DECnet routing nodes, the following measurements resulted:

- The highest number of transit packets a PDP-11/44 node can route each second is 306. Note that this number decreases if routing updates are required, or system and network activity increases.
- The number of milliseconds required to transmit a packet through a VAX-11/750 and PDP-11/44 is 3.9 and 3.3, respectively. Note that this number increases if routing updates are required, or system and network activity increases.

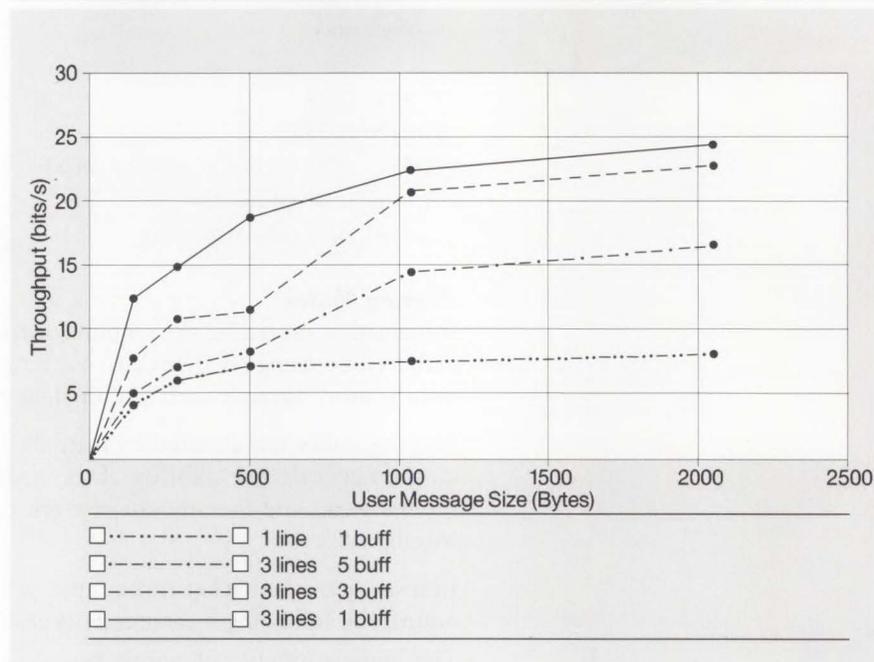
### **Equal-cost Load Splitting**

DECnet-RSX/11M-PLUS V4.0 supports a feature called equal-cost load splitting. A routing node can split its network load over communication paths of equal cost. Using this feature, the aggregate throughput for multiple paths is significantly higher than that of a single path.

The following figure compares the aggregate throughput for PDP-11/83-to-PDP-11/83 communications over three 9.6 Kb/s lines to that of one 9.6 Kb/s line. The buffering level for three line tests varies from one to five. In this figure, the aggregate throughput for three lines is about three times that for one line provided there is enough load to saturate all the lines (using large message sizes and high buffering levels). Using small packet sizes and low buffering levels results in less aggregate throughput, but is always higher than the single-line throughput. Users are able to take advantage of equal-cost load splitting when the line is the bottleneck.

## Performance Guidelines

*Throughput with Equal-cost Load Splitting*



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### DECnet-DOS and DECnet-VAXmate

Software testing for DECnet-DOS and DECnet-VAXmate V2.0 performance was conducted on standalone systems connected by unshared transmission media. Only those machines under test were on the network at the time of the tests, and the remote node was running no other processes except those required to carry out the experiments. In general, the user cannot expect to see the same throughput and response times because most hosts and networks have multiple users contending for available resources.

#### **File Transfer**

The total transfer time of a file is composed of two parts. The first is a fixed overhead to initialize the process. This is referred to as the startup cost. The second is the time to transfer the file. The transfer time is expressed in seconds per block.

With the asynchronous line, the line speed is the bottleneck of the system and the transfer time for all the machines is approximately the same. The difference in throughput is a result of the difference in startup time. Because the IBM PC/AT is a faster processor than the IBM PC/XT and PS/2 Model 30, it has a shorter startup time, faster overall response time, and higher throughput.

With 802.3/Ethernet local area networks, the line speed is not the limiting factor; therefore, the speed of the processor is a factor in both the startup cost and the block transfer cost.

*DECnet-DOS and DECnet-VAXmate Startup Times and Transfer Costs*

Processor	Startup Time	Transfer Cost per Block
<b>9.6 Kb/s line</b>		
VAXmate→MicroVAX	3.60	0.60
PC/XT→MicroVAX	6.50	0.76
PC/AT→MicroVAX (6 MHz)	3.60	0.61
PC/AT→MicroVAX (8 MHz)	3.30	0.60
PS/2 Model 30→MicroVAX	4.50	0.97
PS/2 Model 50→MicroVAX	3.30	0.60
<b>19.2 Kb/s line</b>		
PS/2 Model 50→MicroVAX	3.30	0.31
<b>802.3/Ethernet line</b>		
VAXmate→MicroVAX	3.00	0.036
PC/XT→MicroVAX	5.60	0.117
PC/AT→MicroVAX (6 MHz)	3.60	0.046
PC/AT→MicroVAX (8 MHz)	3.40	0.037
PS/2 Model 30→MicroVAX	3.40	0.059

To calculate an approximate response time, multiply the transfer time by the number of blocks of the file and add the startup cost.

For example, to transfer a 1000-block file from an IBM/XT to a MicroVAX II over a 9.6 Kb/s line:

$$\begin{aligned} &(\text{Blocks} \times \text{transfer cost per block}) + \text{startup time} = \text{response time} \\ &(1000 \times 0.76) + 6.5 = 766.5 \text{ seconds} \end{aligned}$$

### **802.3/Ethernet File-transfer Performance**

In an 802.3/Ethernet configuration, maximum throughput using DECnet-VAXmate for file transfer on the VAXmate is 98 Kb/s, using DECnet-DOS on the 8 MHz IBM PC/AT is 94 Kb/s, while the maximum using DECnet-DOS on the PC/XT is 32 Kb/s. These measurements are the same for both of the supported third-party interfaces. With the greater speed of the IBM PC/AT, there is a greater load on the remote node. This is negligible with small files of less than 50 blocks, but when transferring larger files this could affect network performance if the remote node is multitasking and highly utilized.

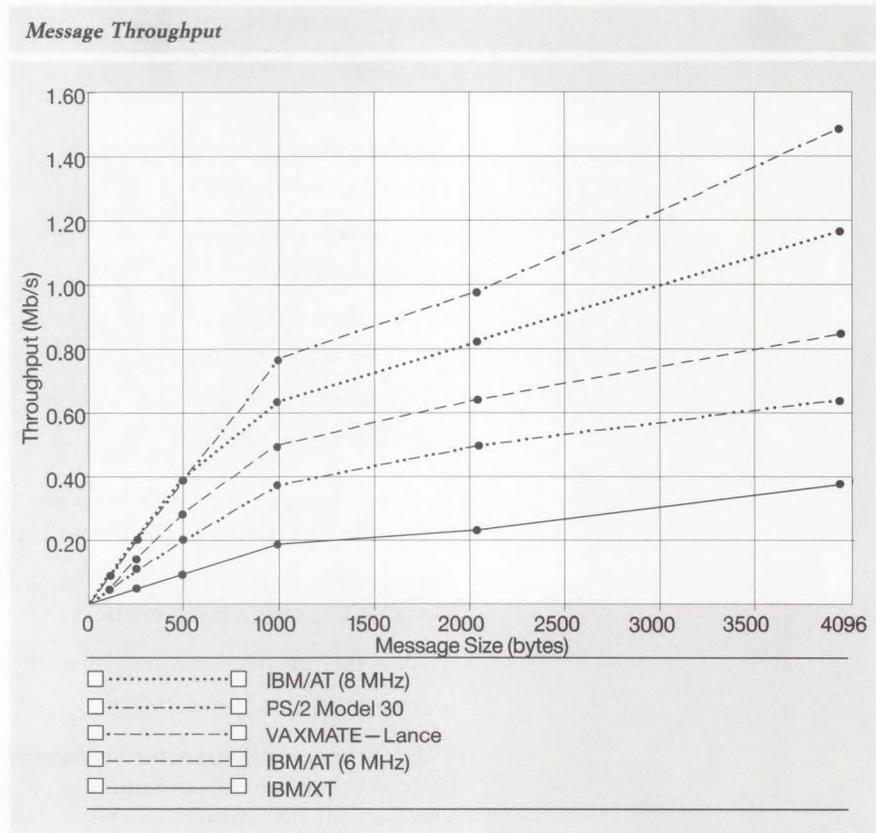
### **Task-to-task Communications**

When using task-to-task communications, segment buffer size for all communications was set at the system default of 557 bytes, which includes the user-message and protocol overhead. For the most efficient use of the network, the user should use these sizes as a guideline when programming intertask communications.

## Performance Guidelines

When using task-to-task communications on the local area network, the throughput increases with message size. The maximum throughput for DECnet-DOS on the IBM PC/AT with 8 MHz is 1.16 Mb/s; for DECnet-VAXmate on the VAXmate, it is 1.5 Mb/s. The remote CPU utilization is correspondingly higher on the remote node when using a VAXmate.

The following chart shows the throughput for messages of various sizes. All nodes were on the 802.3/Ethernet local area network. Single-buffered task-to-task communication was measured.



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## Terminal Servers

Terminal Server performance is characterized best by the following metrics:

- Host CPU interrupt load (for protocol messages)
- Server system throughput
- Average response time
- 802.3/Ethernet utilization

The metrics are constrained by the terminal workload on the host. For example, a large number of users running an editor will generate a greater load than users running VMS MAIL. For the information presented below, an average workload is defined as a mix of terminal users running applications such as MAIL or doing program development with editing.

## Performance Guidelines

The LAT protocol is an 802.3/Ethernet-based virtual-circuit protocol. Because LAT buffers characters from many terminals into shared LAT messages, the interrupt load (protocol message processing) on the host can be greatly reduced. Testing indicates that the host load for LAT terminals is comparable for that of the terminals connected directly through a DMF32 device. LAT terminals may provide some savings in the character interrupt load of DZ11 terminals. In fact, the larger the number of users with a common destination on one terminal server, the less overhead.

The DECserver 200, V2.0, can process an aggregate output throughput of over 14,000 characters per second, and an aggregate input throughput of over 11,900 characters per second for eight terminals running at 19.2 Kb/s.

The average response time is 43–125 milliseconds, depending on whether the terminal driver or the applications program on the host performs character echoing. Expect the response time to be approximately 45–50 milliseconds when the terminal driver handles echoing.

The DECserver 550 V1.1 can process and aggregate output throughput of 160,000 characters a second for 128 terminals running at 19.2 Kb/s with a circuit timer of 20 milliseconds. The aggregate input throughput is over 14,000 characters a second. The average response time is 63–145 milliseconds, depending on whether the terminal driver or the host application program performs character echoing. The average response time is approximately 63–70 milliseconds when the terminal driver handles echoing. (All performance measurements are application-dependent.)

802.3/Ethernet utilization will vary with the number of hosts connected to a server and the speed at which terminals are transmitting data. Estimates indicate that this utilization should be well below one percent in most cases.

Note that overall server performance is highly dependent on the value of the circuit timer and the number of hosts connected to the server. The shorter the value, the lower the response time. However, this increases the general overhead on the server, hosts, and the 802.3/Ethernet local area network. The higher the value, the lower this overhead becomes. However, this will increase the response times. For the information above, the circuit timer default of 80 milliseconds is assumed.

### Distributed File Service V1.1

Standard file access involves a user accessing a file on a local disk. The VAX Distributed File Service (VAXdfs) V1.1 is a VMS layered product that provides DECnet-VAX users with high-speed, transparent access to files stored on remote disks. VAXdfs is best for users who require frequent access to, and sharing of files on remote systems.

#### *VAXdfs Capacity and Capacity Planning*

The typical VAXdfs environment comprises a large number of clients accessing a server. The node that issues a request for remote file access is a client, and the node where the file resides is a server. When using VAXdfs to access remote files, data will be processed by the client CPU, communication controllers, the network, the server CPU, and the server disk drive.

These devices constitute the VAXdfs operating environment. The device with the least capacity will constrain VAXdfs maximum throughput. It is called the bottleneck in the VAXdfs environment. The capacity of the bottleneck will determine VAXdfs maximum throughput, which is VAXdfs capacity.

## Performance Guidelines

The tests were done across configurations consisting of various server CPU type, communication controller, and server disk drive combinations. The tests were done on RMS record I/O sequential READ and run on VMS 5.0. SYSGEN parameters NPAGEDYN, INTSTKPAGES, GBLSECTIONS, GBLPAGES and CHANNELCNT were set according to the recommendations made by the VAX Distributed File Service Installation Guide. The RMS multiblock count was set to 16, multibuffer count to 3, NCP pipeline quota to 32,767, and VAXdfs buffer size to 9,218; and SRPCOUNT, IRPCOUNT, and LRPCOUNT are increased to have at least 20 free packets each. VAXdfs maximum throughputs and bottlenecks for these configurations using standard Ethernet as network medium are given in the following table.

<i>VAXdfs V1.1 Capacity</i>				
Server CPU Type	Communication Controller	Disks	Capacity*	Bottleneck
VAX 8700, VAX 8800, VAX 8810, VAX 8820, VAX 8830, VAX 8840, VAX 8842	DEBNA	RA	248	DEBNA
VAX 8700, VAX 8800, VAX 8810, VAX 8820, VAX 8830, VAX 8840, VAX 8842	DELUA	RA	136	DELUA
VAX 8600, VAX 8650	DELUA	RA	136	DELUA
VAX 8600, VAX 8650	DEUNA	RA	68	DEUNA
VAX 8500, VAX 8530, VAX 8550	DEBNA	RA	248	DEBNA
MicroVAX 3500, MicroVAX 3600, VAXStation 3200, VAXStation 3500	DELQA	RA	214	DELQA
MicroVAX II, VAXstationII/GPX	DEQLA, DEQNA	RA	124	CPU
MicroVAX II, VAXstationII/GPX	DEQNA	RD	109	RQDX3
VAX 11/750	DELUA, DEUNA	RA	63	CPU

\*Four-block I/Os per second.

It can be seen from the preceding table that choosing a more powerful CPU for a server does not guarantee better performance, because for high-end and midrange machine servers, the capacity of the server's communication controller bottlenecks VAXdfs performance. That is, the communication controller's capacity is saturated before the server CPU is. In particular, if a DELUA or DEUNA is used instead of DEBNA for high end machine servers, VAXdfs capacity will be significantly lower. To ensure good performance, both server CPU and its communication controller types must be carefully chosen.

### *Factors Affecting Maximum Throughput*

Note that VAXdfs maximum throughput cannot be achieved when only one single user is using VAXdfs to access files in a server. VAXdfs maximum throughput can be achieved only when the bottleneck's capacity is saturated. In general, a single user will not saturate the bottleneck. As an example, a single user on a MicroVAX II/RD client can achieve a throughput of 52 I/O's for the VAX 8700/DEBNA/RA configuration, although the configuration has a capacity of 248 I/O's.

VAXdfs maximum throughput may be achieved with multiple VAXdfs users on several clients. The per-user throughput will, however, drop when the number of users increase. For example, for the MicroVAX 3500/DELQA configuration, the per-user throughput is 0.89 Mb/s with one user, but it drops to 0.46 Mb/s with eight users, although the overall VAXdfs throughput increases to 3.67 Mb/s. A client with a more powerful CPU will not get a larger share of VAXdfs capacity when the VAXdfs is saturated. A powerful CPU will only have a drawing power when the server CPU is lightly loaded or when few requests are being queued. The server CPU is the critical resource with all active clients contending for service, but essentially without priority constraints. If the server CPU is lightly loaded, a client with more powerful CPU may get a bigger share of VAXdfs capacity.

To answer the question of how many users can be supported by VAXdfs for a given configuration, the following can be done:

- Users must first define the minimum throughput requirement for their applications. If it is difficult to assess the minimum requirement in terms of Mb/s, an alternative is to find a good approximation by using the local file access in a MicroVAX II/RD as a yardstick.
- The RMS record I/O sequential READ local file access throughput measured is 57 I/Os. Users may want to have at least, two-thirds of the local file access throughput, which is 38 I/Os. The maximum throughput obtained from the following table divided by the minimum throughput requirement is the number of active users that can be supported by VAXdfs. For example, if a VAX 8700/DEBNA is used, whose maximum VAXdfs throughput is 248 I/O's, at least six active users can be supported with per-user throughput greater than 38 I/Os.
- Note that here we use "active" users, instead of just users. While six active users can be supported to satisfy the minimum per-user throughput requirement, more than six users can be supported as long as only six users may be using VAXdfs to access remote files at the same time. The information, average number of active users is important because, for example, a large number of workstations may be connected to a server, but often only a small percentage of them are using VAXdfs at the same time.

The number of active VAXdfs users can be obtained at any time by using the VAXdfs control command SET SERVER/INVALIDATE\_PERSONA\_CACHE to flush VAXdfs persona cache on the server. After a short period of time VAXdfs will construct a fresh user list, and by using the VAXdfs control command SHOW SERVER/USER you can see the current active VAXdfs users. Monitoring the number of active users over a period of time will indicate the VAXdfs load, which can be used to find the percentage of active users.

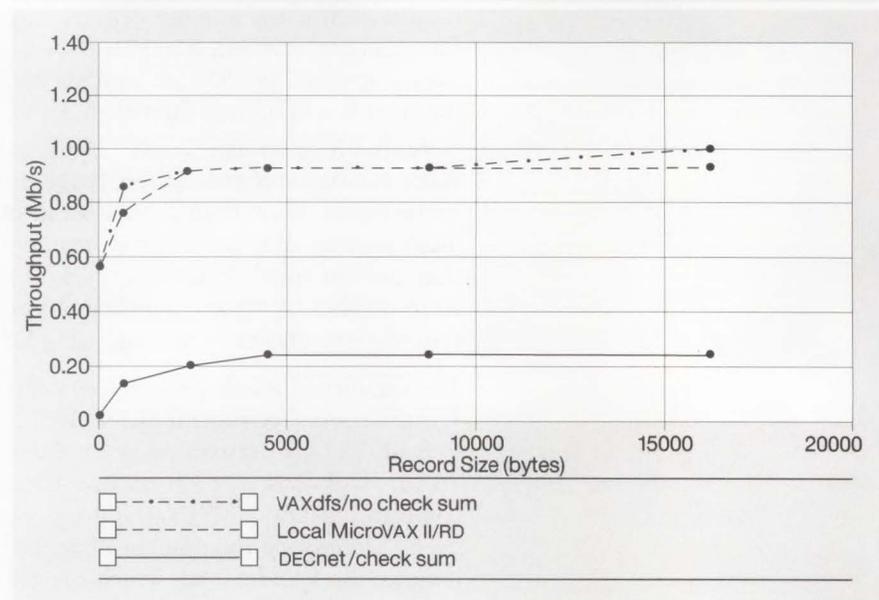
## Performance Guidelines

### Performance

When the checksum is disabled, VAXdfs performance using a MicroVAX II/RA as a server resembles that of local file access in a MicroVAX II/RD, and is significantly faster than DECnet/DAP for sequential file access of RMS records of 8,192 bytes or smaller. In fact, the smaller the record size, the more performance gain VAXdfs will have over DECnet/DAP. For example, in the MicroVAX II/RD-MicroVAX II/RA client-server configuration, using VAXdfs to read data from a sequential file in a MicroVAX II/RA server is 267 percent faster than DECnet/DAP for the record size of 512 bytes and 51 percent faster for the record size of 2,048 bytes. However, when record size is larger than 8,192 bytes or each network I/O transfers more than 8,192 bytes of data, VAXdfs may not be the optimal file access means.

The figure "DECnet/DAP, VAXdfs, and Local File Access Performance Comparison" compares the RMS record I/O sequential READ performance of VAXdfs, DECnet/DAP, and local file access using the MicroVAX II/RD-MicroVAX II/RA configuration. Their CPU time comparison using a MicroVAX II/RA and a VAX 8700/RA as a server is shown in the figure "DECnet/DAP VAXdfs, and Local File Access CPU Time Comparison." The CPU times for local file access in the CPU time comparison figure are measured for a MicroVAX II/RD, MicroVAX II/RA and VAX 8700. Note that in both Figures VAXdfs throughput is measured with checksum off, and DECnet/DAP with checksum on. In the VAX Distributed File Service Management Guide, it is suggested that VAXdfs checksum be run for a short time and turned off after no checksum errors are found. The use of VAXdfs checksum will consume additional capacity. ▲ Please refer to VAX Distributed File Service Management Guide for more checksum information. DECnet/DAP checksum is considered part of normal DECnet/DAP operations, but can be disabled if so desired.

*DECnet/DAP, VAXdfs and Local File Access Performance Comparison*



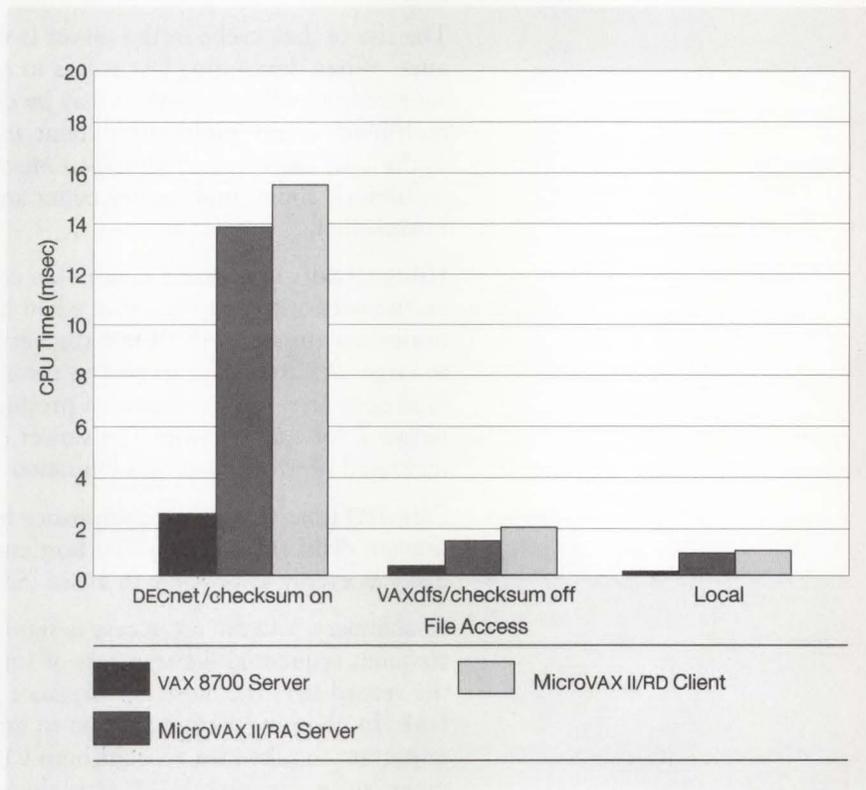
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## Performance Guidelines

### Throughput Comparison Values

VAXdfs/no checksum	MicroVAXII/RD	DECnet/checksum
0.59	0.53	0.04
0.88	0.75	0.13
0.92	0.93	0.19
0.93	0.94	0.21
0.93	0.94	0.21
1.00	0.93	0.23

### DECnet/DAP, VAXdfs and Local File Access CPU Time Comparison



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The figure depicting throughput comparison demonstrates that the performance of both DECnet/DAP and VAXdfs varies with record size, and VAXdfs has better performance than DECnet/DAP under light load (single client). As the number of active users increases, the VAXdfs load increases to the extent that the bottleneck is saturated. When VAXdfs is under this heavy load, VAXdfs performance will remain constant regardless of record size, whereas DECnet/DAP performance is greatly affected by record size.

## Performance Guidelines

In addition, when large amounts of data transfers using VAXdfs nearly saturate the server CPU, VAXdfs will demonstrate a greater performance advantage over DECnet/DAP for data of small record size, due to the VAXdfs caching and offloading strategy that distributes loads evenly between clients and server. For example, for RMS record I/O sequential READ in the MicroVAX II/RD-MicroVAX II/RA client-server configuration, VAXdfs is 443 percent faster than DECnet/DAP for the record size of 512 bytes at heavy load, as compared to the aforementioned light load 267 percent difference. Recall that as the number of users increases, the per-user throughput for both VAXdfs and DECnet/DAP will drop. The 443 percent difference was derived from the per-user throughput.

The use of data cache in the server is very important to VAXdfs performance. When demanding fast access to a remote shared file frequently accessed by multiple users, it may be desirable to tune the client RMS multiblock count, multibuffer count and server data cache. ▲ Please refer to the *VAX Distributed File Service Management Guide* for more client multiblock count, multibuffer count and server cache management information.

Using VAXdfs to access a remote file can easily generate a substantial load on the network, a consequence when large amounts of data transfers are made over the network. When the network is experiencing heavy load due to large VAXdfs traffic, expect to see slower response time since network load does affect performance of products such as VAXdfs that rely on the network for data transfer. The slower response time is a consequence of increased network load, not limitation of VAXdfs capacity.

Disk I/O time is often a performance bottleneck to many products. To prevent disks from becoming a bottleneck, distribute VAXdfs load over disks as evenly as possible to avoid individual disk bottlenecks.

In summary, VAXdfs file access is significantly faster than DECnet/DAP for frequent sequential file transfers of small record size. In fact, the smaller the record size, the more performance gain VAXdfs will have over DECnet/DAP. In choosing a configuration to satisfy performance requirements, it is important to take into account both CPU and communication controller types, since a powerful CPU type alone does not guarantee good performance. We also suggested a way to estimate the number of users that can be supported by VAXdfs for a given configuration. It depends on the minimum performance requirements and the average percentage of active users who may be using VAXdfs to access remote files at the same time.

A summary of VAXdfs efficiency points follows:

- Disable the checksum function after the network displays no errors.
- Determine the major bottleneck in the VAXdfs network.
- Spread the workload of VAXdfs evenly over the VAXdfs Server I/O disks.
- Estimate the number of users that can be supported by a specific VAXdfs configuration.
- VAXdfs Caching and offloading strategy, (distributing loads evenly between clients and servers).
- Keep the record size of VAXdfs-mounted files under 8,192 bytes for maximum performance.

### VAX Distributed Name Service

The VAX Distributed Name Service (VAXdns) provides a means of assigning unique names to network resources (disks, systems, applications, etc.) so that a network application or network user can find resources within the network. Once an application has named a resource using VAXdns, the name is available for all users of the application. Users can move from one system to the next and refer to application resources by the same name.

The collection of names in the Distributed Name Service database is called a (namespace). A namespace is located on VMS nodes where the VAXdns server software is installed. VAXdns refers to the named resources in namespace as (objects). Each object name refers to a specific entity. Associated with every object is a set of (attributes) describing properties of an object. An application reads object attributes for information such as a network node address or object status.

The VAXdns clerk, which is located on every VMS system, receives application requests from the Distributed Name Service clerk (\$DNS) system service. This system service allows an application to register a resource in the namespace and then access the resource from any point in the network by a single name. All applications designed to take advantage of the Distributed Name Service must use either the VAXdns clerk system service or the VAXdns run-time routines to register, modify, or find information in the VAXdns database.

#### ***Performance Considerations***

The primary objective of the VAXdns performance testing was to measure the response time and CPU load on both client and server for READ and ADD operations. Another objective was to provide the formulas to predict the response time and server CPU time, which should help in determining the VAXdns hardware and software configuration.

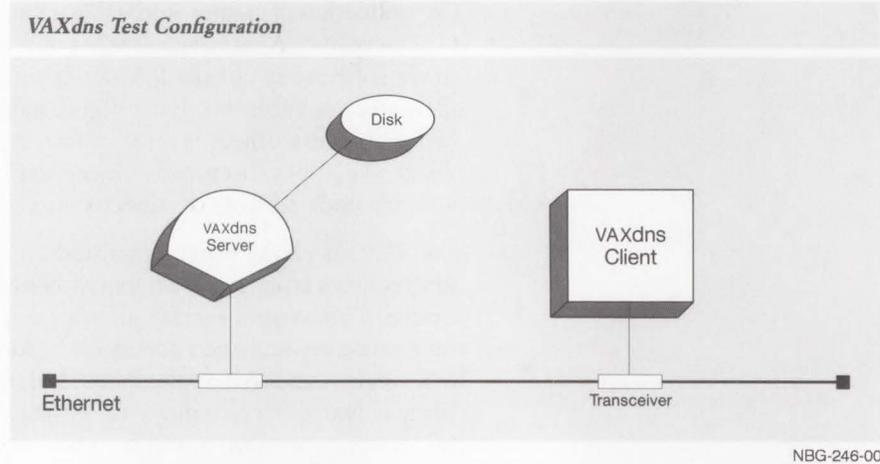
VAXdns performance is best characterized by the following metrics:

- Overall response time: The elapsed time for a particular name service clerk call to be performed. The response time can be characterized as a function of the client and nameserver CPU time, disk I/O speed, and DECnet line speed.
- Server CPU time: The CPU overhead encountered by the system on which the nameserver resides. This CPU time includes the CPU time consumed by the TA, BACKGROUND and ADVER processes, as well as the CPU time consumed by the other supporting processes; such as, RMS, DECnet, and job control.
- Client CPU time: The CPU overhead encountered by the system on which the clerk resides for a particular name service clerk call to be performed.

## Performance Guidelines

### Test Environment

All tests were performed in a standalone environment with the processors and communication lines idle except for the tests being run. The following table lists the hardware used in the test configurations. The following figure describes the test configuration, while the table lists the hardware configurations.



### Hardware Configurations

Set-up Number	Nameserver	Client	Disk for Database
1	MicroVAX-II	MicroVAX-II	RD53
2	MicroVAX-II	MicroVAX-II	RA81
3	VAX 3600	MicroVAX-II	RA82
4	VAX 3600	VAX 3600	RA82

The clerk and server nodes were connected via private Ethernet. All server and client systems were dedicated for performance testing.

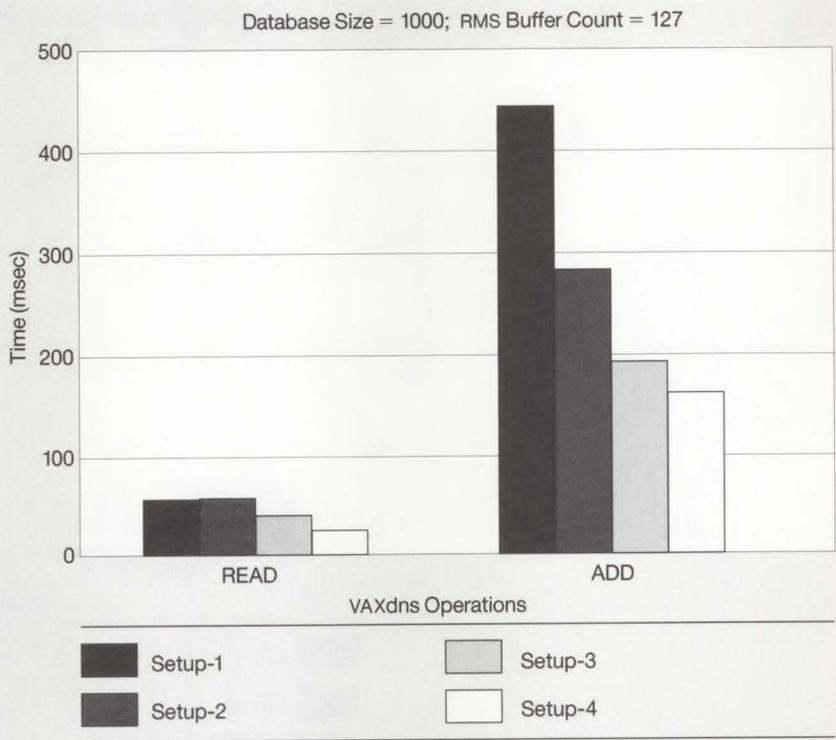
### Performance Results

It was observed that while the clerk and server run on the MicroVAX-II machines, the response time (the elapsed time of clerk-server-clerk communication) for a random attribute lookup is 54.16 milliseconds for the case of server cache hit (no disk I/O) and the server CPU time is 30.25 milliseconds.

For the case of server cache miss, the response time is increased by 42.11 milliseconds for each disk I/O (RA81) and the server CPU time is increased by 6.76 milliseconds. For the same configuration, the response time of adding an attribute (e.g., DECnet node address) is 280.89 milliseconds and server CPU time is 193.43 milliseconds when the database has a 1,000 objects and RMS buffer count is set to 127. The following two figures show the response time and server CPU time of READ and ADD operations for different configurations.

## Performance Guidelines

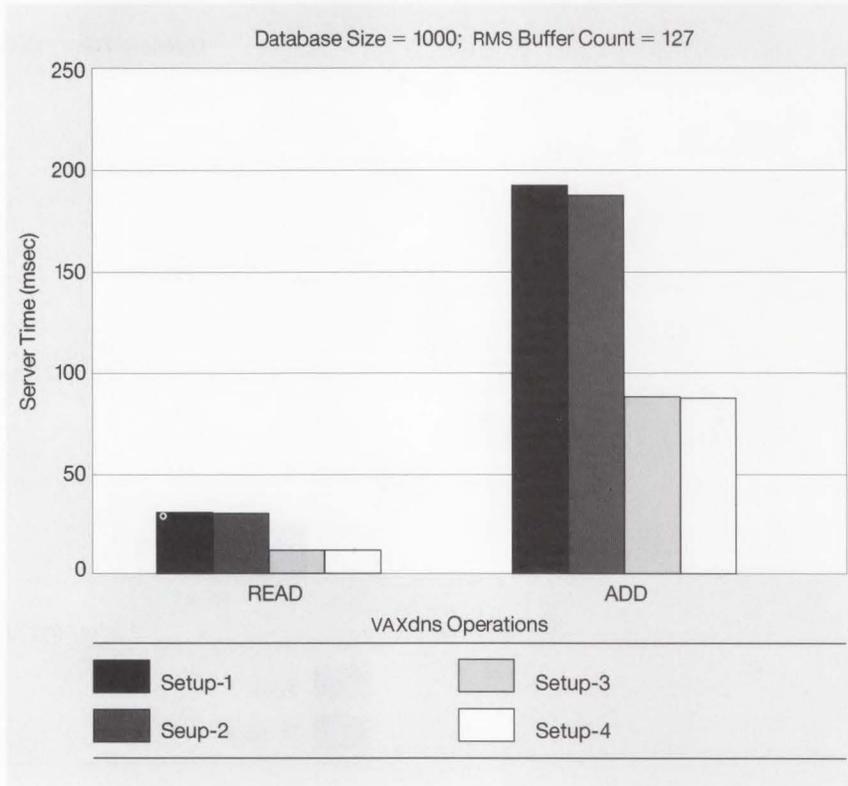
*Response Time of READ and ADD Operations*



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## Performance Guidelines

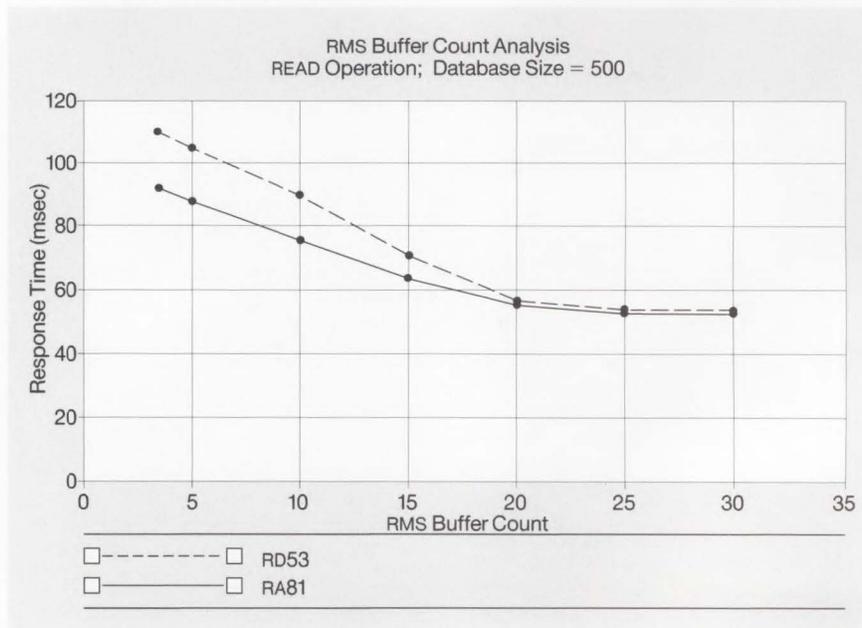
### Server CPU Time of READ and ADD Operations



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The following figure shows the curves of the response time versus RMS buffer count for two different disk types (RA81 and RD53).

### Response Time vs RMS Buffer Count



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## Performance Guidelines

It was noted that the response time was approximately linear with the RMS buffer count, in the region of 3 to 23 (the sum of data bucket and index bucket) for both disk setups. From this phenomenon and test result, the following formulas were derived to give the approximate response time and server CPU time for READ operation.

$$\text{Response Time} = \text{Resp. Time of Cache Hit} + \text{Probability of Cache Miss} \times \text{time per disk I/O}$$

$$N1 - (N2 - N3) \times 1 = T1 \pm \dots \times 42.11 \times \dots \times N1 \times R \times N1 - (N2 - N3)$$

$$\text{Server CPU Time} = T2 \pm \dots \times 6.76 \times N1$$

- where T1: Response time of cache hit (no disk I/O)
- T2: Server CPU time of cache hit (no disk I/O)
- N1: Number of data bucket
- N2: RMS buffer count
- N3: Number of index bucket
- R: Ratio of disk I/O speed relative to RA81

N1 and N3 can be determined by invoking the RMS analyze program. Enter the following at the DCL prompt:

```
ANALYZE/RMS/STATISTICS/OUTPUT=filename.DAT
clearinghouse_filename.typ
From output file (filename.DAT above), number of data bucket can be calculated by (if both keys are used)
```

$$\text{No. of Data Bucket (N1)} = \frac{\text{Count of Data Blocks for Key \#0} \times \text{Bucket Size for Area Descriptor \#0} + \text{Count of Data Blocks for Key \#1} \times \text{Bucket Size for Area Descriptor \#1}}{\text{Bucket Size for Area Descriptor \#0}}$$

$$\text{No. of Index Bucket (N3)} = \frac{\text{Count of Index Blocks for Key \#0} \times \text{Bucket Size for Area Descriptor \#0} + \text{Count of Index Blocks for Key \#1} \times \text{Bucket Size for Area Descriptor \#1}}{\text{Bucket Size for Area Descriptor \#0}}$$

From the test results, the response time (T1) and server CPU time (T2) of cache hit for different configurations are listed below:

<i>Response Time and Server Time Configurations</i>			
Server CPU	Client CPU	Resp. Time (T1)	Server CPU Time (T2)
MicroVAX-II	MicroVAX-II	54.16 msec	28.66 msec
VAX-3600	MicroVAX-II	38.95 msec	11.88 msec
VAX-3600	VAX-3600	23.87 msec	11.88 msec

Moreover, the server throughput can be approximately calculated as follows: It is assumed the maximum server CPU utilization is 75%.

$$\text{Server Throughput} = (1/\text{Server CPU Time}) \times 75\% = 750/\text{Server CPU Time(msec)}$$

The server CPU time can also be derived from the above formula.

Example: In the current system, client and server run on MicroVAX-II and clearinghouse is created on an RA81, Database size = 500 objects, RMS Buffer Count = 15 and RMS bucket size is 32 blocks.

By Using RMS ANALYZE, the number of data bucket and index bucket are 20 and 1 (only key #0 is used in this case).

## Performance Guidelines

By using formulas

$$\text{Resp. Time} = 54.16 + [20 - (15 - 1)] / 20 * 42.11 * 1 = 66.79 \text{ msec}$$

The response time from testing is 65.80 msec

$$\text{Error Rate} = 66.79 - 65.80 / 65.80 = 1.51\%$$

$$\text{Server CPU Time} = 28.66 + [20 - (15 - 1)] / 20 * 6.76 = 30.69 \text{ msec}$$

The server CPU time from testing is 30.74 msec

$$\text{Error Rate} = 30.74 - 30.69 / 30.74 = 0.17\%$$

Moreover, the server throughput can be approximately calculated as follows:

It is assumed the maximum server CPU utilization is 75%.

$$\text{Server Throughput} = (1 / \text{Server CPU Time}) * 75\% = 750 / \text{Server CPU Time (msec)}$$

The server CPU time can also be derived from the above formula.

The test results of VAXdns performance in wide area networks show the server CPU time is the same for processing either LAN requests or WAN requests. But for the WAN requests, the overall response time was increased by the router processing overhead and the request/response transmission delay on a synchronous line. It was observed that the router processing overhead is 4.28 milliseconds, which is four times the CPU processing time of the DECrouter 2000. The request/response transmission delay can be calculated as follows.

$$\text{request packet size} + \frac{\text{response packet size}}{\text{line speed}} \text{ Total transmission delay} = \frac{\text{request packet size}}{\text{line speed}} + \frac{\text{response packet size}}{\text{line speed}}$$

## Conclusions

Because the typical VAXdns environment consists of a large number of clients accessing a single nameserver, the performance primarily depends on the following characteristics of the server:

- CPU performance: affected by the speed of the processor.
- Disk performance: determined by access time and transfer rate.
- Probability of cache hit/miss: depends on the database size and number of RMS buffer.

It was noted that for READ operations, these factors play the same role on the overall performance. But for ADD operations, the probability of cache hit and disk performance are the crucial factors affecting the VAXdns performance. Thus, if the database is large (more than 1,000 objects) and it is modified frequently, using a faster disk is much more important than using a faster CPU server in order to improve the overall performance. The following table summarizes the crucial factors affecting VAXdns performance for different cases.

### Critical Factors on DNS Performance

DNS Operations	Small database (100 objects)	Large database (1,000 objects)
READ	Server CPU	Server CPU, disk
ADD	Server CPU, disk	Disk

In conclusion, VAXdns performance can be enhanced by caching both index and data buckets and by increasing the RMS buffers. Another solution for time-sensitive environments would be to use a faster disk (e.g., using RA disk instead of RD disk).

### VAX FTAM

VAX File Transfer, Access, and Management (FTAM) is a file-access protocol defined by the International Standards Organization (ISO) that specifies how files are transferred and manipulated across heterogeneous environments. VAX FTAM, which implements this protocol on VMS, uses VOTS to provide the transport over which the data is communicated.

VAX FTAM implements three functions, accessible at the DCL level: COPY/OSI, DELETE/OSI, and DIRECTORY/OSI. These are possible for three OSI-defined file types: stream files (FTAM-1), variable record length files (FTAM-2), and unspecified files such as binary-image files (FTAM-3).

Taking into account the functions of VAX FTAM, the primary performance metrics for a particular configuration are the maximum throughput, the CPU load on each processor, and the elapsed time for an operation. This is desirable for each file type as well as for different file sizes, and on different CPUs.

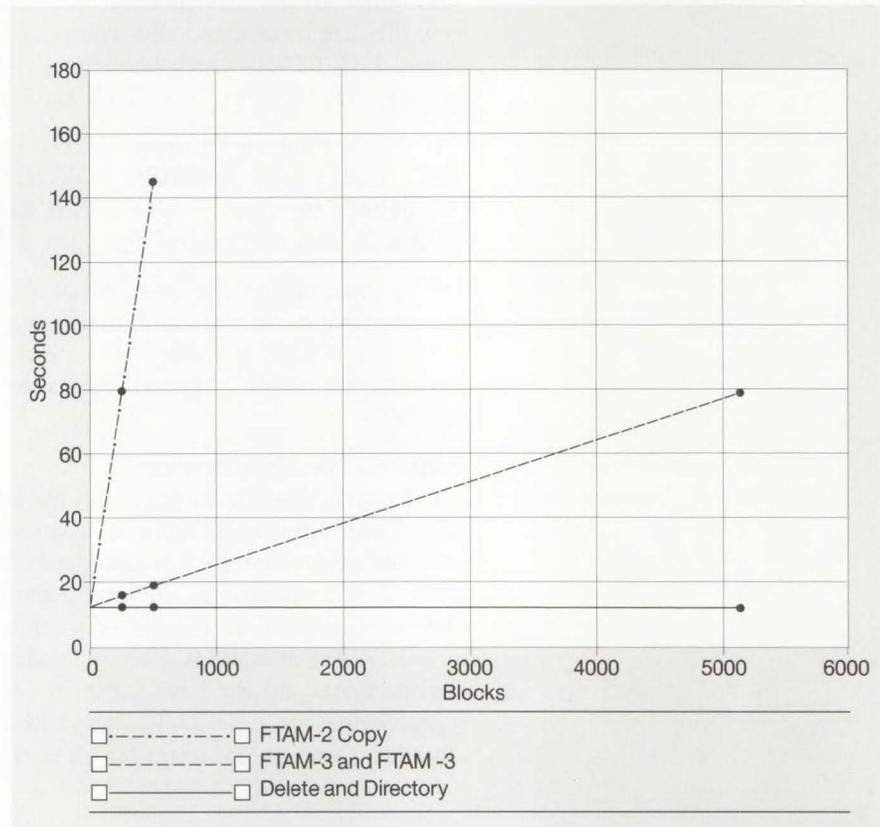
#### *Elapsed Time Measurements*

The elapsed time for an operation has a fixed part consisting of the time taken to set up various regimes, and sometimes a variable part depending on whether the operation is size-dependent. In the case of DELETE and DIRECTORY operations, the time taken is independent of file size; COPY operations depend on the size of the file. Due to the heterogeneous nature of VAX FTAM operations—where sender and receiver can be from different environments and can have different capabilities—the setup involved is high. Consequently DELETE and DIRECTORY setup take about the same amount of time as the setup for a file copy.

## Performance Guidelines

The following figure gives the elapsed time for all three types of files. Most noticeably FTAM-2 files are transferred record by record and the speed is heavily dependent on the size of the record in the file.

*Elapsed Time for VAX FTAM Operations Using MicroVAX II and Files with 80-byte Records*

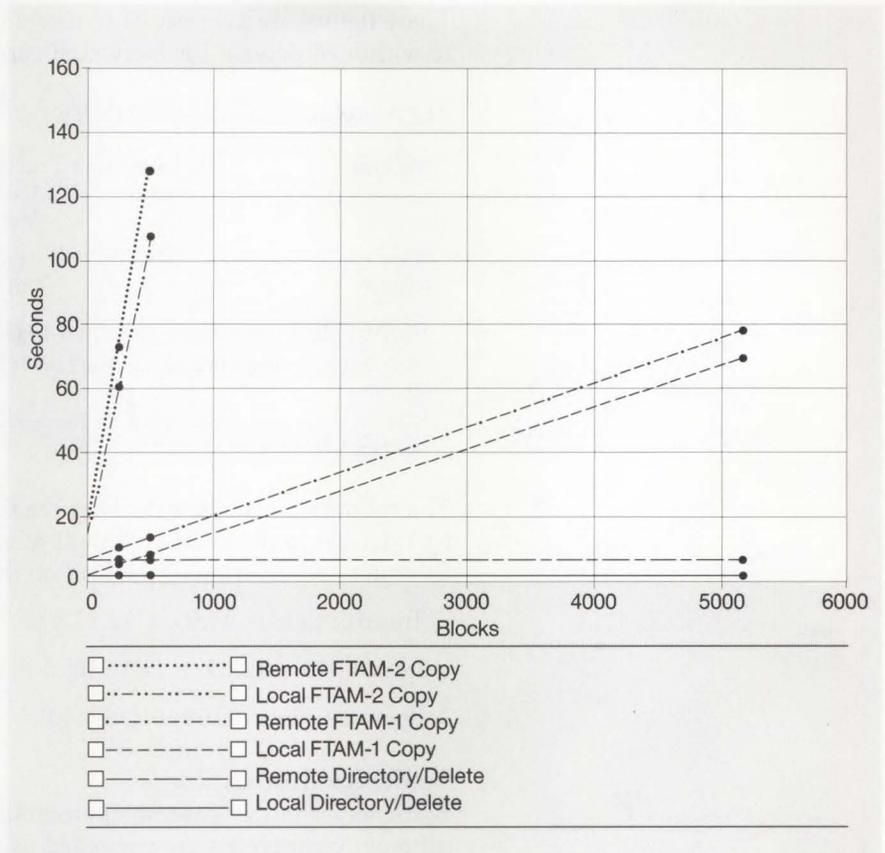


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### *CPU Time Measurements*

An important metric of performance is the CPU load imposed on the systems running VAX FTAM. As for the elapsed time measurements, the CPU cost for DELETE, DIRECTORY, and the setup time for COPY are comparable because the common functions executed in setting up each regime outweigh the differences between the actual operations performed. The following figure gives the CPU load for all three functions on both nodes.

CPU Time for VAX FTAM Operations Using MicroVAX IIs and Files with 80-byte Records



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In the figure, "Remote" denotes the CPU time consumed on the Responder, and "Local" on the initiator.

**Calculating Elapsed Time and CPU Load for Any File**

Using curve-fitting methods, one can arrive at a set of equations to describe the behavior of the system, which would allow one to determine the expected elapsed time and CPU load for any file transfer between two systems. The following table gives the elapsed time as a setup time and a time per block for FTAM-1 and FTAM-3 files, and the setup time and time per record for FTAM-2 files. The example at the end of this section illustrates how this can be used.

**Elapsed Time for VAX FTAM**

Processor/Disk	File Type*	Setup Time (secs)	Incremental Cost (ms/block)
MicroVAX II/RA60	FTAM-1	13.03	12.22
MicroVAX II/RA60	FTAM-2	12.68	262.40
VAX 8800/RA81	FTAM-1	7.44	3.58
VAX 8800/RA81	FTAM-2	7.30	38.00

\*FTAM-3 files behave similarly to FTAM-1 files.

## Performance Guidelines

Similarly, the CPU load can be divided into a set-up time and an incremental cost. The following table lists these values for the same operations. These figures are averages of transfers in both directions and are accurate to within 20 percent for individual copies.

### *CPU Load Imposed on a MicroVAX II*

File Type <sup>1</sup>	Local Setup (secs)	Local Incr Cost (msecs/block)	Remote Setup (secs)	Remote Incr Cost (msecs/block)
FTAM-1	2.69	11.5 <sup>2</sup>	6.69	11.8 <sup>3</sup>
FTAM-2	2.93	205.6	6.67	237.2

<sup>1</sup>FTAM-3 files behave similarly to FTAM-1 files.

<sup>2</sup>This figure is an approximation based on 94% CPU utilization for the maximum file transfer.

<sup>3</sup>This figure is an approximation for the responder incremental CPU cost based on an average CPU utilization of 97%.

The following example calculates the time required to transfer a 200-block FTAM-1 file from one MicroVAX II to another MicroVAX II over the Ethernet and determines the load on the two CPUs.

$$\text{Transfer time} = 13.03 + 12.22 \times 10^{-3} \times 200 = 15.5 \text{ secs}$$

$$\text{Local CPU} = (2.69 + 11.5 \times 10^{-3} \times 200) \times 100 / 15.5 = 32\%$$

$$\text{Remote CPU} = (6.69 + 11.8 \times 10^{-3} \times 200) \times 100 / 15.5 = 58\%$$

### **Bottleneck Analysis**

Bottleneck analysis gives an approximation of maximum throughput when different components are combined using simple arithmetic. The assumption is that the slowest component is always busy and effectively determines the throughput. The resources in this case are the initiator CPU, responder CPU, communications line, and disk. The throughput is then defined by

$$T = 1/\max(\text{CPU init, CPU resp, Xfer time, disk time}) \text{ blocks/s}$$

$$T = 4096/\max(\text{CPU init, CPU resp, Xfer time, disk time}) \text{ b/s}$$

where CPU init is the CPU time on the initiator; CPU resp, the CPU time on the responder; Xfer time, the time to actually transmit the data over the communications medium; and disk time, the average time to read/write a block on the disk. Thus, with MicroVAX IIs, an IEEE 802.3 line, and the assumption that on average an RA-series disk takes 1.1 seconds per block when contiguously reading a file, the maximum throughput would be

$$4096/\max(11.5, 11.6, 1.08, 1.1) = 347 \text{ Kb/s}$$

### **Overview of Performance Metrics**

The following metrics effectively characterize the performance of VAX FTAM:

- The overhead of setting up all the regimes conforming to the ISO FTAM standard was measured at only 13 seconds between MicroVAX IIs.
- Between MicroVAX IIs, an FTAM-1 file could be transferred at a maximum of 335 Kb/s over an IEEE 802.3 line. Between VAX 8800s, the maximum throughput was much higher at 1.14 Mb/s.

DECrouter 200

- The maximum throughput was reached when copying large FTAM-1 or FTAM-3 files. The steady-state throughput for an FTAM-2 file containing 80-byte records is 16 Kb/s; however, for very large records the throughput of FTAM-2 files increases dramatically as a result of the low incremental cost. For 1024-byte records, for example, the measured throughput was 107 Mb/s.
- Between machines other than those mentioned, the maximum throughput through the system can be estimated using bottleneck analysis.

The process of properly configuring the DECrouter 200 is based on understanding the desired performance characteristics of the network as well as the desired network topology. The DECrouter 200 does not trade off configuration characteristics against memory requirements: It has sufficient memory to accommodate a maximally configured network, and sufficient memory allocated for a large number of large buffers. Even with all eight asynchronous lines fully active, the DECrouter 200 can support the maximum of 1,023 nodes within the area, the maximum of 32 other routing nodes in the same area and on the same local area network, and a network buffer size of up to 1,482 bytes.

**Communication Line Characteristics**

The rate at which user data can be transmitted over a communications line may approach, but will never reach, the actual line speed. The actual throughput is a function of many factors including the line quality, protocol overhead, topology, and network applications.

The DECrouter 200 supports all eight asynchronous lines simultaneously active at line speeds of up to 19.2 Kb/s. The DECrouter 200 operates these lines in full duplex point-to-point mode only. The DECrouter 200 does not support multipoint lines.

**System Throughput Characteristics**

In addition to the asynchronous line characteristics, the processing power of the DECrouter 200 must be taken into consideration. Assuming equal distribution of 802.3/Ethernet-to-asynchronous and asynchronous-to-802.3/Ethernet traffic in an office environment, the respective maximum values can be averaged to a value of 175 packets a second. Thus on average, the DECrouter 200 can route a maximum of 175 packets per second when all eight asynchronous lines are running at speeds of 19.2 Kb/s each.

The DECrouter 200 can support all eight asynchronous lines, each running at 19.2 Kb/s (full-duplex), in all types of communications except asynchronous to asynchronous.

The following table lists the maximum throughput for different types of communications.

*Maximum Packets per Second*

Type of Communication	100 data bytes/packet	1500 data bytes
Ethernet to Ethernet	786.3	786.3
Ethernet to asynchronous	205.2	20.5
Asynchronous to Ethernet	144.8	15.6
Asynchronous to asynchronous	100.7	9.0

## Performance Guidelines

Care must be taken when designing a valid configuration that the average route-through packet-per-second rate does not exceed 170 packets-per-second. Determining the average packet-per-second rate requires an understanding of the applications that will generate data routed by the DECrouter 200 in the overall network. ▲ For more detailed information on configuring the DECrouter 200, refer to Software Product Description 27.72.

In order to achieve a viable configuration, the user and/or a Digital software specialist should perform a level of application analysis which addresses both communication-line characteristics and system-throughput characteristics.

### ***Computing Packet-per-second Rate from Available Routers***

DECnet packets (messages to be routed) are 150 bytes long on average. The actual average packet size for your network may be different depending on the types and amount of traffic. The average can be computed from an existing router by examining the various circuit counters for the router and using the following equations:

$$\text{Total transit packets} = (\text{transit packets sent} + \text{transit packets received} + \text{originating packets sent} + \text{terminating packets received})$$

$$\text{Total bytes} = (\text{bytes received} + \text{bytes sent})$$

$$\text{Average packet size} = [(\text{total packets})/(\text{total bytes})]$$

In the absence of existing routers, use 150 bytes per packet as the average packet size.

Once the average packet size has been selected, the average packet-per-second rate can be computed. The average can be computed from an existing router by examining the various circuit counters for the router and using the following equation:

$$\text{Average transit packets} = [(\text{transit packets sent} + \text{transit packets received})/2]$$

$$\text{Average packet per second} = [(\text{Average transit packets})/(\text{Seconds since counters were last cleared})]$$

Note that the transit-packet counters should contain values much larger than the originating or terminating-packet counters. If not, the circuit under investigation is not being used for route-through traffic. Note also that the counters used for these computations should accumulate statistics for as long as possible in order to make the results more accurate.

### ***Computing Packet-per-second Rate from Line Speeds***

An alternate metric is the maximum packet delivery rate possible for any particular line. This value is computed as follows:

$$\text{Characters per second} = [(\text{Line speed})/(\text{Bits per character})]$$

where asynchronous lines have 10 bits per character and synchronous lines have 8 bits per character, and where line speed is expressed in bits per second.

$$\text{Max packets per second} = [(\text{Char per second})/(\text{Avg packet size})]$$

Note that if the line is full duplex, the resulting Max packets per second must be doubled.

If the actual packet-per-second rate cannot be determined ahead of time, the computation of the maximum packet-per-second rate based on the line speed should be used: The total of the maximum packet per second rates for all the proposed lines should be kept below the 140 packet-per-second limit. Using this technique to configure the DECrouter 200 may make the resulting configuration overly restrictive. After the DECrouter 200 runs for some time and the actual packet per second rate is determined, it may be possible to add more lines based upon the measured packet-per-second rate.

In configurations in which the DECrouter 200 is used to link large sections of your network (such as linking two large Ethernet segments), it is expected that the actual packet-per-second rate will approach the maximum packet-per-second rate as computed based upon line speed. This is because the DECrouter 200s are the focus of traffic for many nodes on both sides of the large network sections.

In configurations in which the DECrouter 200 is used to couple a small network section or a series of endnodes to the Ethernet, the actual packet-per-second rate may not approach the computed maximum packet-per-second rate, because individual nodes generally do not saturate the communications lines in both directions for extended periods of time.

Note that configuring the DECrouter 200 as the designated router reduces the amount of processing power available to be used for routing packets. It is desirable in many configurations to configure the DECrouter 200 as the designated router in order to offload this function from a host system. However, it is important that this additional work be taken into account when designing the DECrouter 200 into a viable configuration. Typically, configuring the DECrouter 200 as the designated router will reduce the maximum packet per second rate from 140 to 120 packets per second.

## DECrouter 2000

Many factors affect network performance, especially in wide area networking where public-network and communication-services characteristics need also be considered. Primarily, the performance of a DECrouter 2000 node is a function of the expected network traffic and normal workload. Thus, router performance depends on the following factors:

- Communication line characteristics
- System throughput characteristics

### *Communication Line Characteristics*

The DECrouter 2000 can be set up in a number of ways. The number of synchronous links supported on the system depends on the maximum line speed in use and on the electrical interface used. The following table shows the number of lines supported for each combination of line speed and electrical interface.

## Performance Guidelines

### *Number of Synchronous Lines Supported*

Electrical Interface	Maximum Line Speed (Kb/s)		
	19.2	64	256
EIA-232-C	4	—	—
EIA-422	4	4	2
EIA-423	4	4	2
V.24	4	—	—
V.35	4	4	2
X.21 Leased Line	4	4	2

The actual packet rate will be less than that indicated by the aggregate synchronous line speed, and is determined by such factors as:

- Type of traffic (routing expolates or data packets) and data rates.
- The path of messages through the DECrouter 2000 system (LAN-to-LAN, synchronous-to-LAN, or synchronous-to-synchronous).
- Communications line characteristics.
- Frequency and type of errors on the synchronous links.
- Network topology.
- Protocol overhead.

### *System Throughput Characteristics*

The performance of the DECrouter 2000 is measured in packets per second. The line utilization depends on the average size of packets routed. Actual performance may not reach the maximum if line-speed is the limiting factor; conversely, line saturation may not be achieved on high-speed lines with small packet sizes.

Performance depends on whether traffic is routed predominantly between the synchronous lines and the 802.3/Ethernet or from one synchronous line to another. For synchronous-to-synchronous routing, the expected performance is 340 packets per second. For 802.3/Ethernet traffic, the performance is 480 packets per second.

To achieve a viable configuration, the user and/or a Digital software specialist should perform a level of application analysis which addresses both communications-line characteristics and system-throughput characteristics.

### *Computing Packet-per-second Rate from Available Routers*

DECnet packets (messages to be routed) are 150 bytes long on average. The actual average packet size for your network may be different depending on the types and amount of traffic. The average can be computed from an existing router by examining the various circuit counters for the router and using the following equations:

$$\text{Total transit packets} = (\text{transit packets sent} + \text{transit packets received} + \text{originating packets sent} + \text{terminating packets received})$$

$$\text{Total bytes} = (\text{bytes received} + \text{bytes sent})$$

$$\text{Average packet size} = [(\text{total packets})/(\text{total bytes})]$$

## Performance Guidelines

In the absence of existing routers, use 150 bytes per packet as the average packet size.

Once the average packet size has been selected, the average packet-per-second rate can be computed. The average can be computed from an existing router by examining the various circuit counters for the router and using the following equation:

$$\text{Average transit packets} = [(\text{transit packets sent} + \text{transit packets received})/2]$$

$$\text{Average packet per second} = [(\text{Average transit packets})/(\text{Seconds since counters were last cleared})]$$

Note that the transit-packet counters should contain values much larger than the originating or terminating-packet counters. If not, the circuit under investigation is not being used for route-through traffic. Note also that the counters used for these computations should accumulate statistics for as long as possible in order to make the results more accurate.

### ***Computing Packet-per-second Rate from Line Speeds***

An alternate metric is the maximum packet delivery rate possible for any particular line. This value is computed as follows:

$$\text{Characters per second} = [(\text{Line speed})/(\text{Bits per character})]$$

where asynchronous lines have 10 bits per character and synchronous lines have 8 bits per character, and where line speed is expressed in bits per second.

$$\text{Max packets per second} = [(\text{Char per second})/(\text{Avg packet size})]$$

Note that if the line is full duplex, the resulting Max packets per second must be doubled.

If the actual packet-per-second rate cannot be determined ahead of time, the computation of the maximum packet-per-second rate based on the line speed should be used: The total of the maximum packet per second rates for all the proposed lines should be kept below the 480 packet-per-second limit. Using this technique to configure the DECrouter 2000 may make the resulting configuration overly restrictive. After the DECrouter 2000 runs for some time and the actual packet per second rate is determined, it may be possible to add more lines based upon the measured packet-per-second rate.

In configurations in which the DECrouter 2000 is used to link large sections of your network (such as linking two large Ethernet segments), it is expected that the actual packet-per-second rate will approach the maximum packet-per-second rate as computed based upon line speed. This is because the DECrouter 2000s are the focus of traffic for many nodes on both sides of the large network sections.

In configurations in which the DECrouter 2000 is used to couple a small network section or a series of endnodes to the Ethernet, the actual packet-per-second rate may not approach the computed maximum packet-per-second rate, because individual nodes generally do not saturate the communications lines in both directions for extended periods of time.

## Performance Guidelines

### X25router 2000

Note that configuring the DECrouter 2000 as the designated router reduces the amount of processing power available to be used for routing packets. It is desirable in many configurations to configure the DECrouter 2000 as the designated router in order to offload this function from a host system. However, it is important that this additional work be taken into account when designing the DECrouter 2000 into a viable configuration. Typically, configuring the DECrouter 2000 as the designated router will reduce the maximum packet per second rate from 480 to 340 packets per second.

Configuring the X25router 2000 is influenced primarily by trade-offs of cost and performance while satisfying the user's application requirements. Network applications typically range from low-speed, low-cost situations (that is, connecting a few remote lines over low-speed communications lines) to those of relatively high performance (that is, connecting two local area networks). The addition of X.25 packet switching considerations to those associated with point-to-point DECnet communications necessarily makes arriving at the optimum configuration more difficult.

Note that the rate at which user data can be transmitted (throughput) over a communications line approaches, but never reaches, the actual line speed. The actual throughput is a function of many factors, including the line quality, protocol overhead, topology, and network application.

The X25router 2000 supports four lines at 64 Kb/s, or two lines at 256 Kb/s. The X25router 2000 offers superior price/performance especially in the area of routing DECnet packets over an X.25 network. This is because the implementation of Data Link Mapping (DLM) has been optimized with considerable performance benefits.

Traditionally many customers have implemented host-based X.25 routing. The cost of this solution is not just the cost of the communications controller but also of the CPU cycles it consumes. The amount of the CPU utilized varies considerably with the network size and application, but whenever routing requires more than a standalone system, an X25router solution will generally be more cost-effective. Indeed, in the case of the midrange to high-performance systems, a dedicated X25router 2000 can usually be more cost-effective even for standalone situations.

The following table compares X25router 2000 performance against MicroVAX II and VAX 3500 systems with DSV11s that were dedicated as a communications server. Two scenarios were examined:

- Routing DECnet packets over an X.25 packet switched network
- Routing native X.25 packets over a packet switched network as an X.25 Gateway

In these performance figures, "packets per second" refers to packets received from the 802.3/Ethernet local area networks and routed onto the synchronous lines or vice versa.

*Performance for DEC MicroServer Compared with MicroVAX II and VAX 3500 using DSV11s*

Processor	DECnet over X.25 (packets per second)	Native X.25 (packets per second)
X25router 2000	170	120
MicroVAX II with two DSV11s	90	95
VAX 3500 with two DSV11s	160	170

To achieve a viable configuration, the user or a Digital software specialist should perform a level of application analysis that addresses these factors.

Refer to “DECnet/SNA Data Transfer Facility” elsewhere in this section, for information on evaluating the performance of the DECnet/SNA Gateway for Channel Transport.

**Performance Considerations**

The following information is useful in evaluating the performance of the DECnet/SNA Gateway products. However, performance depends on specific conditions in hardware, software, and procedure.

All tests were performed in a standalone environment: The only processes running on the various VAX systems and IBM mainframe were dedicated to the performance testing. The performance results for similar configurations may differ with additional users and tasks.

**Test Conditions**

The DECnet/SNA Gateway for Synchronous Transport (Gateway-ST) allows network-to-network connections between an IBM S/370 (using a Front End Processor as the physical link) and VAX systems through DECnet. The performance of the Gateway-ST was tested using three access methods:

- DECnet/SNA Data Transfer Facility
- DECnet/SNA VMS Remote Job Entry
- DECnet/SNA VMS 3270 Terminal Emulator

**DTF Performance**

Refer to “DECnet/SNA Data Transfer Facility” elsewhere in this section, for information on DTF performance.

**Remote Job Entry Performance**

The DECnet/SNA VMS Remote Job Entry (RJE) access routine was used in conjunction with JES2 software on the IBM mainframe. RJE allows the VAX system to function as an SNA/RJE workstation. The VAX system submits batch jobs to the IBM host and receives job output.

**DECnet/SNA Gateway for Channel Transport**

**DECnet/SNA Gateway for Synchronous Transport**

## Performance Guidelines

For the RJE test, a JCL file (Job Control Language) was submitted to the IBM host with commands to transfer a file back to the VAX system. The file was transferred to either a print or punch stream. (The print stream produces 132-column printed output; the punch stream produces RMS data files.) Performance measurements of the Gateway-ST included steady-state throughput, Gateway CPU utilization, and local host CPU utilization (on a MicroVAX II). The RU size was set to 512 bytes. Compression was turned on for the RJE data streams. (Compression produces fewer bytes through the test link.)

### **Test Results**

The results of the testing showed the Gateway-ST CPU to be fully utilized at line speeds above 56 Kb/s. (The Gateway-ST can have a maximum line speed of 256 Kb/s.) This saturation is due to the functional translation performed in the Gateway-ST CPU by the RJE server software. The maximum throughput observed through the Gateway-ST was approximately 55 Kb/s.

### **Terminal Emulator Performance**

The DECnet/SNA VMS 3270 Terminal Emulator (TE) allows VAX users with Digital's VT terminals to run interactive programs and applications on IBM host systems.

Because traffic generated by TE sessions occurs in bursts, it is difficult to characterize "steady-state performance" in the gateway. However, two performance metrics of primary interest were measured: the minimum number of TE sessions needed to saturate the Gateway-ST CPU, and the response time per TE transaction.

Both DTF and TE utilize the same server in the Gateway-ST: Gateway Access Server (GAS) is one of three servers in the gateway: the others are exclusively for RJE and DHCF. This means that the time to serve an RU through the gateway for TE traffic should be the same as the time needed for an RU generated by DTF (assuming the RUs are the same size). By using the DTF results earlier, we can calculate the time taken to serve a TE-generated RU. Inverting this number (1 divided by the service time for 1 RU) gives the minimum sessions needed to saturate the Gateway CPU.

In reality, TE sessions have two components: a service time for the RU, and "think time" that is usually some order of magnitude higher than service time in the gateway (a human being interpreting the screen takes some amount of seconds as opposed to milliseconds). Looking at both components reveals that many more TE sessions are needed to saturate the gateway than the minimum number derived from RU processing.

### **Example**

Consider a 505-byte transaction. The session for this transaction is out-bound on a 128-Kb/s line, using an RU of 512 bytes (the closest RU for the size of the transaction). Using the DTF results from above, the time needed to serve this RU would be 7.2 milliseconds. (This is based on 12.92 RUs per second in the gateway. The equation is CPU utilization over average number of RUs per second). The result should also be the time needed to service a TE RU. By inverting this number (1 divided by 7.2 milliseconds), 139 transactions can be serviced by the gateway per second. This is the minimum number of sessions needed to saturate the Gateway-ST. (The Gateway-ST will support only 128 sessions.)

## Performance Guidelines

In the example above the "think time" is 0 seconds. If the "think time" is set to a more realistic 5 seconds, the Gateway-ST then theoretically supports  $139 \times 5$ , or 695 sessions.

This example clearly shows that the Gateway CPU is never the bottleneck for TE because the maximum number of sessions is higher than 128 (the number of sessions the Gateway-ST device is emulating). The major source of TE utilization is still the VAX system doing the character translation. It has been shown that the VAX CPU will become a bottleneck with only a few TE sessions, depending on the size of the transaction and the power of the VAX processor.

This example for number of sessions should also hold true for the MS-DOS and ULTRIX 3270 TE products, though neither of these configurations were tested.

The other performance metric measured for TE was response time. Response time in general is composed of the aggregate delay imposed by several network components:

- Between the terminal line and the VAX system
- In the VAX host
- In the Ethernet between the VAX System and the Gateway
- In the gateway
- In the synchronous line to the IBM network component
- In the IBM host process

Delays are encountered on the return trip also. The line delays are composed of transmission time and queuing waits. Delays in processors are composed of processing time and queuing waits. The most significant delay is the one in the VAX host, followed by the time between the terminal and the VAX processor. (Most of the testing was done without terminal servers.)

Using the test configuration as an example, the response time was measured to be approximately 3.5 seconds for a transaction size of 1,890 bytes, both inbound and outbound. (This was using one TE user on a MicroVAX II through the Gateway-ST; a larger VAX and the use of Terminal Servers would decrease this number).

### Performance Results for the DECnet/SNA Gateway-CT and DECnet/SNA Gateway-ST

#### ***File Transfer***

RJE throughput is the same with both Gateway-CT and -ST (under 56 Kb/s) regardless of the line speed. DTF remains the product of choice for high speed data transfer. With DTF, line utilization averages 96 percent in Gateway-ST, for example, 249 Kb/s on a 256-Kb/s line.

The Gateway-CT approaches transfer rates of between 640 Kb/s and 1.2 Mb/s using DTF.

#### ***Interactive Access***

Terminal-emulation throughput is more a function of the VAX CPU (processing terminal screen I/O) than either Gateway CPU. In real-world conditions, both Gateway-ST (with 128-session capability) and Gateway-CT (with 255-session capability) will provide TE users with more than adequate performance.

## Performance Guidelines

### VMS/SNA

These guidelines describe the performance of VMS/SNA V1.1 software when transferring files and messages from an IBM host to a VAX system. The following VMS/SNA products were tested:

- DECnet/SNA VMS DISOSS Document Exchange Facility (DDXF)
- DECnet/SNA VMS Remote Job Entry (RJE)
- DECnet/SNA VMS 3270 Terminal Emulator

The testing showed that DDXF takes 30 to 50 seconds to transfer a file from the IBM system to the VAX system. For short files the transfer time is the same regardless of the line speed (4.8, 9.6, or 56.0 Kb/s). Files longer than 20 or 30 blocks take a longer time to transfer at low line speeds. With the 56.0 Kb/s line, DDXF transfers most files in under a minute.

RJE transfers a file at the rate of one block/sec with a 4.8-Kb/s line and four blocks/s with a 56.0-Kb/s line.

The 3270 Terminal Emulator allows VAX users to connect to an IBM host and run applications designed for the IBM 3270 terminal. After the IBM application has generated a screen of data, the terminal emulator displays it on the terminal in one to five seconds, depending on the amount of data and the line speed.

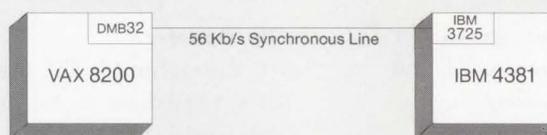
#### ***Test Configurations and Conditions***

The CPU utilization of the VAX machines was measured by running a low-priority background process that counts its own CPU usage. It is presumed that the remaining CPU time was used to transfer the files and messages.

All the tests were performed in a standalone environment with the processors and communication lines idle except for the tests being run. Note that performance of a similar configuration with multiple users and tasks may not equal the results discussed here.

The following figures show the hardware configurations used in the tests.

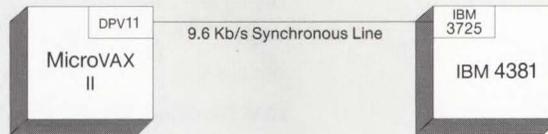
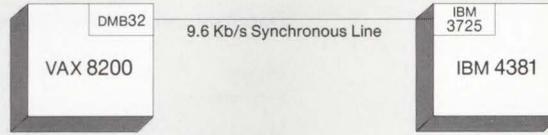
#### ***VMS/SNA Configuration with 56.0 Kb/s Synchronous Line***



NBG-227-00

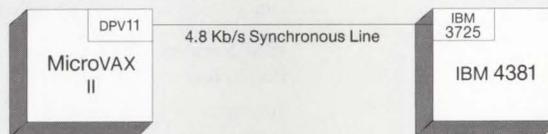
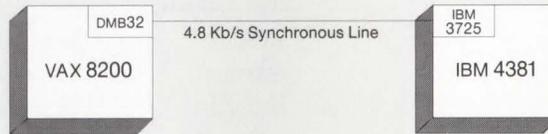
## Performance Guidelines

### Configurations with 9.6 Kb/s Synchronous Line



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### Configurations with 4.8 Kb/s Synchronous Line



NBG-229-01

## Performance Guidelines

The following list shows some of the model and version numbers of the hardware and software used in the test configurations.

### *Hardware and Software Components Used in Test*

#### **Digital Hardware**

MicroVAX II with RD53 disk drive  
VAX 8200 with RA60 disk drive

#### **Digital Software**

VMS V4.4  
DECnet-VAX V4.4 (used for the RJE testing)

#### **IBM Hardware**

4381 P13, CPU (3.2 Mips with 16-Mbyte memory)  
3725 001, Communications controller (with 1.5-Mbyte memory)  
3880 003, Disk controller  
3380 AA4, Disk drive (2.5 Gbytes per controller)

#### **IBM Software**

MVS/SP Release 3.8  
JE2/SP V2, release 3.7  
ACF/VTAM V3, release 3.7  
ACF/NCP V4, release 2.0  
CICS/VS V1, release 6.1  
DISOSS/370 V3, release 2.0

#### **IBM Network Parameters**

Secondary 4  
Pacing count:  
MAXOUT: 7  
MAXDATA 521 for the 4.8- and 9.6-Kb/s lines;  
(segment size): 1,033 for the 56.0-Kb/s line

### **DECnet/SNA VMS DDXF**

The DDXF software accesses the Distributed Office Support System/370 (DISOSS) software on the IBM system. DDXF transfers DISOSS text files called documents. The following DDXF functions were tested:

- The FILE function, which copies a document from the VAX system to DISOSS on the IBM system.
- The RETRIEVE function, which copies a document from DISOSS to the VAX system.
- The SEND function, an electronic mail function that sends a document to a list of DISOSS users.
- OBTAIN function, an electronic mail function that allows a user to check what mail is on the DISOSS account.

DISOSS has two document types: simple and complex. Simple documents are straightforward text documents; complex documents have special formatting features such as italic and bold fonts, lists, and tables. Complex files generally require more CPU time than simple files on the VAX system to translate to DISOSS format.

## Performance Guidelines

The Request Unit/Response Unit (RU), which is the message size on the SNA network, was set to 512, 1024, and 2048 bytes.

For the test system, the following formula gives the approximate response time for DDXF to transfer a document of a given size:

$$\text{Response time (s)} = \text{connect time} + (\text{number of blocks} \times \text{time per block})$$

where a block is 512 bytes of user data.

In most test cases, the connect time was 30 to 45 seconds, and was unaffected by the line speed, RU size, or file type. The connect time for the OBTAIN operation was a little longer at 40 to 50 seconds. The connect time would probably be faster with a larger, more powerful IBM system.

The time per block is shown in the following table, which also shows throughput and line utilization while the document data is actually being transferred (without including the connect time).

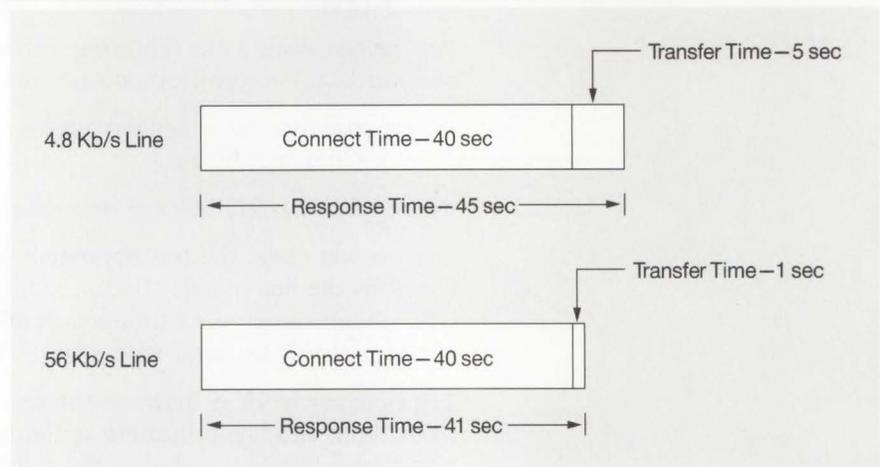
<i>DDXF Performance</i>			
<b>Line Speed (Kb/s)</b>	<b>Time per Block (s)</b>	<b>Throughput (Kb/s)</b>	<b>Line Utilization</b>
4.8	0.91 to 0.98	4.2 to 4.5	92 to 99%
9.6	0.45 to 0.53	7.7 to 9.0	84 to 99%
56.0	0.10 to 0.22	19 to 40	35 to 75%

Part of the connect time results from the fact that DDXF logs into and out of the IBM system for each command. DISOSS allows only one user to log into an account. If a new user logs in, the previous user is interrupted and logged out. To reduce the possibility of being logged out unexpectedly, DDXF logs out after each command.

With these connect times, the line speed does not affect the response time very much for small files. For example, transferring a five-block file would take 30 to 45 seconds connect time plus the time to transfer the data blocks. As shown in the figure "File Transfer with Five-block File," the response time is 45 seconds with the 4.8-Kb/s line and 41 seconds with the 56.0-Kb/s line. The user would not notice any improvement in the response time with the 56-Kb/s line. With a 30-block file, as shown in the figure "File Transfer Time with 30-block File," the user would start to notice an improvement in response time.

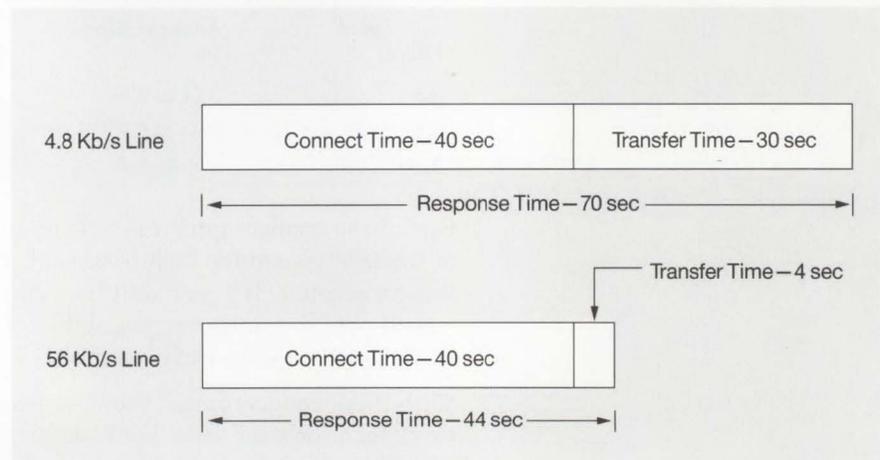
## Performance Guidelines

### File Transfer Time with Five-block File



NBG-230-00

### File Transfer Time with 30-block File



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For the 4.8- and 9.6-Kb/s lines, line speed is the limiting factor. Varying the RU size, the file type, the type of operation, or the hardware device makes no significant difference in response time or throughput.

For the 56.0-Kb/s line, line speed is not as much a limiting factor, and other factors start to influence performance. The RU size has a considerable effect on the throughput. Transfers with a 2048-byte RU have a greater throughput than a 512-byte RU. Transfers with the 2048-byte RU size may have 0 to 50 percent greater throughput. Simple files may have 0 to 20 percent greater throughput than complex files. The FILE and RETRIEVE operations have perhaps 5 to 15 percent greater throughput than the SEND and OBTAIN operations for the 56.0-Kb/s line.

The following table shows the CPU utilization of the VAX system while it is actually transferring the document data, not during the connect time.

## Performance Guidelines

### *CPU Utilization for Document Transfers with DDXF*

Line speed (Kb/s)	VAX 8200 with DMB32	MicroVAX II with DPV11
4.8	11%	14%
9.6	20%	29%
56.0	98%	—

### *DECnet/SNA VMS Remote Job Entry*

DECnet/SNA VMS Remote Job Entry (RJE) allows a VAX system to function as one or more SNA/RJE workstations. The VAX system can thus transmit jobs to the IBM host and receive the job output.

For these tests, a JCL file was submitted to the IBM host with commands to transfer a file back to the VAX system. The time it took to transfer the file back to the VAX system was measured. The file was transferred as an output printer stream. The RU was 512 bytes.

The following formula determines the actual transfer time of a file, not counting the time to submit the job to the IBM system.

$$\text{Transfer Time (sec)} = \text{Number of Blocks} \times \text{Time per Block}$$

For testing, the number of blocks was calculated at 512 bytes of user data per block. This calculation does not include any extra bytes associated with RMS overhead.

The time per block is shown in the following table:

### *RJE Performance with Data Compression*

Line Speed (Kb/s)	Record Size (bytes)	Time per block (sec)	Throughput (Kb/s)	Line Utilization
4.8	40 to 160	0.65	6.3	130%
9.6	40 to 160	0.34	12.0	130%
56.0	40	0.20	20.0	36%
56.0	80 to 160	0.16	26.0	46%

The measurements shown in the table were measured using data compression, where the IBM system replaces strings of the same character with one or two bytes of data. In the test files, 50 percent of the data was compressible. The resultant compressed data was 60 percent as long as the original data. (With the 56.0-Kb/s line, the greater throughput with data compression is usually not worth the extra CPU cost to compress and decompress the data.)

Record sizes of 40, 80, 120, and 160 bytes were tested. The record size made little difference for the 4.8- and 9.6-Kb/s lines: throughput was a few percent greater with the larger records. With the 56.0-Kb/s line, the throughput was about the same for the 80, 120, and 160 bytes records. However, the throughput for the 40-byte records was about 25 percent slower.

## Performance Guidelines

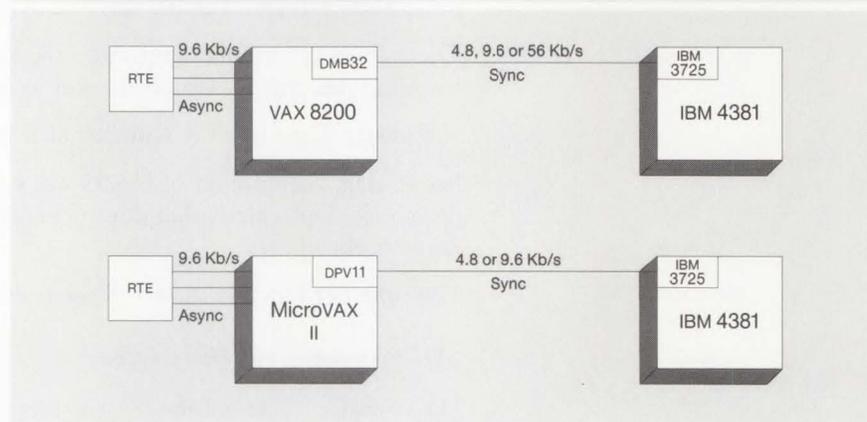
The testing showed that when the IBM host sends more than one data stream simultaneously, the overall throughput is the same as sending one stream. For example, if data is sent in three streams, each stream goes one-third the speed of a single stream.

### *DECnet/SNA VMS 3270 Terminal Emulator*

The 3270 Terminal Emulator is a software product that allows VAX users with VT100 and VT200 series terminals to emulate IBM 3270 terminals. This allows VAX users to connect to an IBM host over the network and run IBM-based application programs.

For testing, a remote terminal emulator (RTE) system was connected to three 9.6-Kb/s terminal lines on the VAX system, as shown in the following figure. This RTE system requested a screen of data as would a terminal user, then measured the time it took to receive the screen of data.

*Configurations for Testing the 3270 Terminal Emulator*



NBG-232-01

The following table shows the results of the testing.

*3270 Terminal Emulator Performance*

Data Size (bytes)	Line Speed (Kb/s)	Response Time (sec)	Line Utilization	CPU Utilization
256	4.8	1.9	11%	12%
256	9.6	1.6	6%	15%
256	56.0	1.3	1%	14%
1536	4.8	6.1	28%	9%
1536	9.6	4.7	17%	13%
1536	56.0	3.4	4%	13%

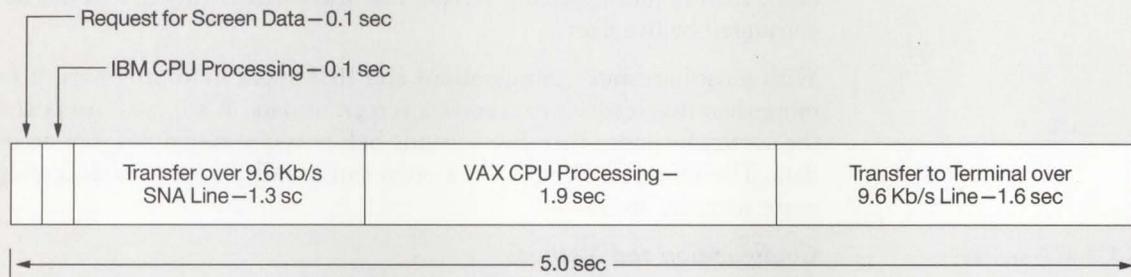
Tests were run with RU sizes of 256, 1536, and 2048. The performance was not significantly affected by varying the RU size.

When the user presses a key to request a screen of data, the VAX sends a message to the IBM system over the SNA line. The application program on the IBM system generates the screen of data, then transmits the screen of data over the SNA line to the VAX system. The VAX system translates the data to VT100/200 format, then transmits the data over a 9.6-Kb/s asynchronous line to the terminal.

## Performance Guidelines

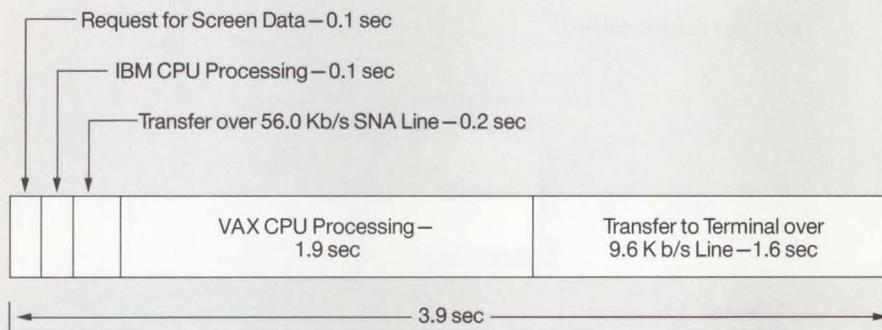
The following figure shows the approximate time for each step of a 1536-byte transfer under the test conditions. The request for screen data includes VAX processing of request and transmission over the SNA line. The IBM CPU processing includes IBM-communications-controller and application-program processing.

**3270 Terminal Emulator Response Time over 9.6 Kb/s Line**



NBG-145-00

**3270 Terminal Emulator Response Time over 56.0 Kb/s Line**



NBG-146-00

Increasing the SNA line speed from 9.6 to 56.0 Kb/s does not significantly increase the response time. At 9.6 Kb/s, the transfer time over the SNA line is 1.3 seconds out of the total response time of 5.0 seconds. Increasing the line speed to 56.0 Kb/s nearly eliminates the transfer time over the SNA line, but improves the overall response time by only 3.9 seconds.

Note that in this test the IBM system generated the screen of data in only 0.1 second. Under normal conditions the IBM application program often takes considerably more time to generate a screen of data.

Using a 19.2-Kb/s line to the terminal instead of the 9.6-Kb/s line improves the response time further, saving about 0.8 second on a 1536-byte transfer. Using a VAXstation II for the VAX processor virtually eliminates the terminal transfer time.

## Performance Guidelines

These tests ran with one, two, and three users. The response time with three users is the same as with one user. The only exception is when the VAX processor translates data for two users simultaneously, at which time each user has to wait an extra one to two seconds.

The number of users that a MicroVAX II can support depends on how often each user requests a screen of data and the size of the data transfers. A 1536-byte data transfer takes about two seconds of VAX CPU time. If each user waits five seconds to receive a screen of data, studies it for five seconds, then requests another screen, the MicroVAX II capacity would be consumed by five users.

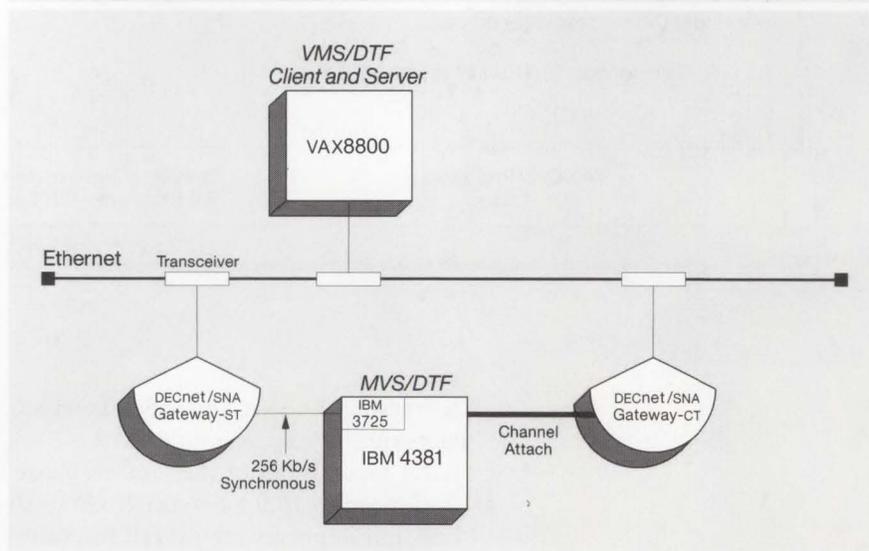
With most hardware configurations and IBM application programs, it takes more than five seconds to receive a screen of data. Also, most users study the screen for more than five seconds before requesting a new screen of data. Therefore, a MicroVAX II system can usually support considerably more than five users.

### DECnet/SNA Data Transfer Facility V2.0

#### Configuration and Methods

All measurements were conducted on standalone systems and a private Ethernet. Only the tasks necessary for measuring were running on the VMS V4.6 system. All unnecessary applications on the IBM system were stopped during testing. Although this method yields benchmarks for the product, users in a timesharing environment may not see the same response time and throughput as observed in a test environment. However, the percentage of CPU and line used by the application will be consistent.

#### DTF Test Configuration



NBG-245-00

The file transfer measurements were designed to transfer 10-megabyte files when using Gateway-ST V1.0 (Synchronous Transport) and 35-megabyte files when using Gateway-CT V1.0 (Channel Transport). The files were transferred from the local node to the IBM host (inbound to IBM) and from the IBM host to the local node (outbound from IBM). Files with record sizes of 80, 4096, and 8187 were transferred using a Request Unit (RU) of 1024, 2048 and 8192 bytes and SRCVPAC pacing window values of 4, 8 and 16.

## Performance Guidelines

The steady-state throughput through the Gateway, the percent CPU utilization of the VMS/DTF system, the CPU utilization of the DTF address space on the IBM host for tests which yielded maximum throughput, and the percent line utilization on the gateways are the important performance metrics in evaluating the performance of the DTF V2.0 software. These are considered as functions of the RU size, the VMS Record size, and the Pacing Window size.

In all cases the IBM files were non-VSAM sequential, character translation was turned on, RMS network block count was 16, and a single DTF session was run. Constant parameters for the Gateway-CT connected to a block multiplex channel include 64 receive buffers, and the VTAM IOBUF size on the IBM host was 128 bytes. Constant parameters for the Gateway-ST include line duplex set to full, DATMODE set to full, SDLC extended response mode, pause value of 100 ms, 255 receive buffers, frame size of 1417 bytes, and the Virtual Route Pacing Window in NCP was set at 64.

### Main Results

The following table gives the maximum throughputs observed under different testing conditions. The relevant parametric values are listed.

*Maximum Throughput Table*

Gateway	Direction	Throughput (Kbps)	RU size (bytes)	Record Size (bytes)	Pacing Window	% VAX Util. <sup>1</sup>	% Line Util.	% IBM Util.
CT	Inbound	680.20	8192	4096	16	20.11	-	32.85
CT	Outbound	1251.80	8192	8187	16	334.32	-	38.67
ST	Inbound	249.50	4096	4096	4	7.52	97.96	-
ST	Outbound	210.79	4096	80	4	10.97	82.91	-

<sup>1</sup>Indicates combined DTF Server and Client CPU. Client to Server CPU utilization is about 1:3.

The most important performance metric studied for the performance of DTF V2.0 is the steady-state throughput. It has been observed that the throughput is maximal when the RU size, record size and RMS network block count were configured such that each RU is completely filled with one or more records. Partially utilized RU's reduce line utilization.

In the case of Gateway-CT, the maximal outbound transfer is significantly higher than the corresponding inbound transfer. For outbound transfers RU's of maximal size (up to 8192 bytes) are received from VTAM, where for inbound transfers the RU's are sent to VTAM in 128 byte buffers (VTAM IOBUF=128). Therefore the number of packets being handled by the gateway and VTAM is much less in the outbound case.

The bottleneck for DTF file transfers through the Gateway-CT was the gateway CPU, thus limiting the throughput in both the inbound and outbound directions. The bottleneck for DTF file transfers through the Gateway-ST was the SDLC line (256Kbps).

Similar testing was done for DTF V1.0 using a MicroVAX II for the VMS DTF Server and Client with a 56 Kb/s line (Gateway V1.x). These tests showed that the line was the bottleneck.

## Performance Guidelines

### ***Throughput vs Record Size***

The throughput increases as the record size increases. This is due to less overhead per byte with larger record sizes. The increase is more significant for outbound transfer.

### ***Throughput vs Record Size and RU size***

The throughput increases as RU size increases. The increase in throughput is more significant when RU size is increased in cases which have small RU sizes and large record sizes. In these cases, a single record spans over multiple RUs causing throughput to be reduced. Multiple RU's/record does not occur when the RU size is greater than the record size plus control headers. The increase is not significant for RU sizes greater than 4096 bytes.

It was observed that maximal throughput (for a fixed record size) occurs when a single RU is completely filled with one or more complete records.

### ***Throughput vs Pacing Window***

The throughput increases more noticeably when the Pacing Window is increased from 4 to 8. From 8 to 16, there is not a significant increase.

### ***DTF Client and Server CPU Utilization***

- The observed data for Gateway-CT indicates that the VMS/DTF CPU utilization is significantly higher for outbound transfers than for inbound. This is because of the high outbound data throughput as noted above. If the VMS/DTF CPU utilization is normalized to per Kilobit of data, it is still higher for outbound than it is for inbound.
- The VMS/DTF CPU utilization per Kilobit of data (normalized) is higher for smaller record size file transfers than it is for larger record size transfers. This is because the overhead of processing a record is amortized over a larger number of data bits in the latter case.
- The VMS/DTF utilization per Kilobit transmitted is smaller for larger RU sizes since the overhead of processing an RU is amortized over a larger number of bits.
- The VMS/DTF CPU utilization does not vary significantly with changes in Pacing Window.

### ***DTF Address Space CPU Utilization on IBM Host***

- The DTF address space CPU utilization increases only slightly with decrease in Pacing Window.
- For Gateway-CT, the DTF address space CPU utilization per kilobit of data transferred is significantly more in the case of inbound than it is in the case of outbound. This is due to the additional overhead of VTAM receiving RU's in 128 bytes buffers (IOBUF = 128).

## Performance Guidelines

<i>Results for Gateway-CT V1.0-Inbound</i>					
Rec Size (bytes)	RU size (bytes)	SS Tput (Kbps)	% VAX Util.	% VAX Util./Kilobits	% IBM Util.
<b>Pacing Window = 16</b>					
8187	8192	679.02	19.17	0.0282	32.20
4096	8192	680.20	20.11	0.0296	32.85
4096	4096	661.09	20.06	0.0303	-
4096	2048	499.15	18.10	0.0363	-
80	8192	574.71	27.99	0.0487	29.82
80	4096	565.44	27.65	0.0489	-
80	2048	428.38	23.75	0.0554	-
<b>Pacing Window = 4</b>					
8187	8192	649.05	17.93	0.0276	33.75
4096	8192	632.57	18.46	0.0292	33.60
4096	4096	627.08	19.46	0.0310	-
4096	2048	475.02	17.00	0.0358	-
80	8192	561.74	25.40	0.0452	29.89
80	4096	555.48	26.99	0.0486	-
80	2048	371.89	19.66	0.0529	-
<i>Results for Gateway-CT V1.0-Outbound</i>					
Rec Size (bytes)	RU size (bytes)	SS Tput (Kbps)	% VAX Util.	% VAX Util./Kilobits	% IBM Util.
<b>Pacing Window = 16</b>					
8187	8192	1251.80	34.32	0.0274	38.67
4096	8192	1241.90	40.00	0.0322	38.85
4096	4096	1093.70	36.95	0.0338	-
4096	2048	880.50	37.35	0.0424	-
80	8192	918.96	43.47	0.473	30.39
80	4096	897.02	47.60	0.0531	-
80	2048	703.22	42.55	0.0605	-
<b>Pacing Window = 4</b>					
8187	8192	1201.20	32.84	0.0273	40.27
4096	8192	1198.10	37.18	0.0310	40.95
4096	4096	987.69	36.28	0.0367	-
4096	2048	724.76	30.27	0.0418	-
80	8192	782.87	37.37	0.0477	30.83
80	4096	788.62	41.12	0.0521	-
80	2048	701.12	42.73	0.0609	-
<i>Results for Gateway-ST V1.0-Inbound</i>					
Rec Size (bytes)	RU size (bytes)	SS Tput (Kb/s)	% VAX Util.	% VAX Util./Kb/s	% Line Util.
<b>Pacing Window = 4</b>					
4096	4096	249.50	7.52	0.0301	97.96
4096	2048	229.62	8.41	0.0366	90.16
80	4096	248.38	12.07	0.0485	97.43
80	2048	229.99	12.02	0.0522	90.30

## Performance Guidelines

### *Results for Gateway-ST V1.0-Outbound*

Rec Size (bytes)	RU size (bytes)	SS Tput (Kb/s)	% VAX Util.	% VAX Util./ Kb/s	% Line Util.
<b>Pacing Window = 4</b>					
4096	4096	208.61	7.59	0.0363	82.05
4096	2048	188.38	8.04	0.0426	74.17
80	4096	210.79	10.97	0.0520	82.91
80	2048	191.31	11.51	0.0601	75.32

## Bisync Emulators

These performance measurements show test results for several bisync emulators. The purpose of these tests was to produce a set of results on a typical configuration for each of these bisync emulators. These results can then be extrapolated to other systems to allow the user to estimate the capabilities of these emulators on different configurations.

Bisync terminal emulators have traditionally been positioned as low performance and high functionality; that is, performance was not an issue.

### **3270 Terminal Emulation**

Issues for 3270 Terminal Emulation are

- Number of terminals supported on a single system.
- Incremental response time.
- Line speed.
- CPU load.

The following configuration was used to test the VAX 3271 protocol emulator: VAX-11/780, VMS V3.4, and a 9.6-Kb/s synchronous line using a modem eliminator. Note that 9.6 Kb/s is the highest line speed that offers the greatest throughput, but also has the highest impact (CPU cycles) on the VAX system. Two rates of data entry were used: a typical software engineering environment and a "worst-case" simulation using the autorepeat feature of the VT100. For the typical software engineering environment, the protocol emulator and the first terminal used 10 percent of the CPU. Each subsequent terminal used an additional 2 percent of the CPU. When the autorepeat mode of the VT100 was used for simulating "worst-case" data entry, the protocol emulator and one terminal required 25 percent of the CPU. (Each additional terminal required another 6 percent.)

As far as response time is concerned, the test results do not add significant incremental delay to what the IBM host system imposes.

These figures can be extrapolated to other configurations to give a general idea of typical performance capabilities—that is, a VAX-11/750 increases the VAX-11/780 figures by a factor of approximately 1.5, and the VAX-11/730 increases the VAX-11/780 figures by a factor of approximately 3.

The following configuration was used to test the RSX 3271 Protocol Emulator: PDP-11/70, RSX-11M (no extended memory support), and a 9.6-Kb/s synchronous line using a modem eliminator.

Two rates of data entry were used: a typical software engineering environment and a "worst case" simulation using the autorepeat feature of the VT100.

For the typical software engineering environment, the protocol emulator and the first terminal used 10 percent of the CPU. Each subsequent terminal used an additional five percent of the CPU. When the autorepeat mode of the VT100 was used for simulating "worst case" data entry, the protocol emulator and one terminal required 15 percent of the CPU. (Each additional terminal required another 10 percent.)

The CPU use on the RSX-11M configuration is somewhat lower than on the VAX configuration because the VAX terminal emulation utility runs in compatibility mode.

### ***2780/3780 Protocol Emulation***

Issues for 2780/3780 protocol emulation are

- Throughput (number of records transferred per unit of time).
- CPU load.
- Line speed.

The 2780/3780 protocol emulator includes many different options for translating and manipulating records: use of space compression, transparency or nontransparency, 2780 or 3780, fixed-or variable-length records, and so on. Because of the variety of options for record translation and manipulation, it is difficult to present any conclusive results.

Typically, a 9.6-Kb/s line on a VAX-11/750 with a DUP11 device uses about 10 percent of the CPU. Lower line speeds will result in decreased CPU use. In addition, using a DMF32 device on a VAX instead of the DUP11 decreases the CPU use by about 1.5.

Typically, a 9.6 Kb/s line using a modem eliminator on a PDP-11/70 also uses about 10 percent of the CPU. As is to be expected, CPU use will increase on processors smaller than those tested.

For example, the results for the VAX-11/750 configuration (10 percent CPU usage) can be extrapolated to 20 percent CPU use for the VAX-11/730. The results for the PDP-11/70 configuration (10 percent CPU use) can be extrapolated to 20 percent CPU use for the PDP-11/34 and 14 percent for the PDP-11/44.

On the other hand, CPU use will decrease on processors larger than those tested. For example, the results for the VAX-11/750 configuration (10 percent CPU use) can be extrapolated to seven percent CPU use for the VAX-11/780.

### LAN Bridge 100

The LAN Bridge 100 is a high-performance device that connects two 802.3/Ethernet segments. The bridge receives frames from both 802.3/Ethernet segments, determining which segment contains the destination node. If the destination for the frame is not on the same segment as the source, the bridge transmits the frame to the other segment; if the destination node is on the same segment, the bridge discards the frame.

Factors affecting the performance of the LAN Bridge 100 include the latency the bridge adds to the transmission of a frame and the maximum throughput of the bridge. The latency of the bridge is the amount of time the frame spends in the bridge, that is, time to process and transmit an incoming 802.3/Ethernet frame. Maximum throughput is the rate at which the bridge can receive frames on one segment and forward them to the other segment.

The latency introduced by the bridge is very small: approximately 107 ms for minimum-length (64-byte) frames.

#### ***Packet Processing Rates***

The LAN Bridge 100 has high-throughput capability. Under test conditions, the bridge can forward bursts of frames at full 802.3/Ethernet bandwidth. At "steady state" (continuous steady stream), the bridge can forward 13,404 minimum-size packets and can filter 24,272 minimum-size packets. (Minimum-size packets are the worst-case condition for a bridge.)

#### ***Fiber Optic Bridge***

The Fiber Optic Bridge interfaces one transceiver cable and a fiber optic link. It contains high-performance optics, allowing communication over longer distances. The other end of the fiber optic cable can connect to another fiber optic bridge or to a fiber optic repeater.

The relationship between achievable distance and power budget involves several factors that influence distance gained as power budget increases:

- Cable length, type, loss characteristics, and overall quality
- Number of splices and connections in the fiber

Because each network environment is unique, actual obtainable distance may vary by cableplant.

The following table summarizes the power budget and distance specifications for the fiber optic LAN Bridge 100 (DEBET-RH/RJ) and the fiber optic DEREPEP repeater (DEREP-RH/RJ). These specifications are based on the four major multimode fiber types generally in use today. Distances shown are worst-case conditions with best-case fiber.

## Performance Guidelines

### *Power Budget and Distance Specifications for Fiber Optic Bridge (DEBET-RH/RJ) and Fiber Optic Repeater (DEREP-RH/RJ)*

Fiber Type (micrometer)	Power Budget <sup>1</sup> (decibels)	Attainable Distance (km) <sup>1</sup>	
		Bridge to Bridge <sup>2</sup>	Bridge to Repeater <sup>2</sup>
50/125	08.0	2.0	1.5
62.5/125	12.0	3.0	1.5
85/125	13.5	3.0	1.5
100/140	16.0	3.0	1.5

<sup>1</sup>With no more than  $1 \times 10^{-10}$  bit error rate.

<sup>2</sup>DEBET-RH/-RJ and DEREP-RH/RJ versions are compatible with the previous fiber optic bridge and repeater (-RC/RD), but are limited to the performance specified by the -RC/RD.

# Appendix B

## Environmental Specifications

The environmental information provided in this appendix will help you plan for installation when ordering products. Detailed site preparation information is provided in the individual site preparation guide for the specific products.

Hardware products are classified and tested according to one of the classes of temperature/humidity environments shown in the following table.

<i>Environment Classes</i>				
<b>Class</b>	<b>Temperature</b>	<b>Relative Humidity</b>	<b>Maximum Wet Bulb</b>	<b>Minimum Dew Point</b>
A	15°C (59°F) to 32°C (90°F)	20–80%	25°C (77°F)	2°C (36°F)
B	10°C (50°F) to 40°C (104°F)	10–90%	28°C (82°F)	2°C (36°F)
C	5°C (41°F) to 50°C (122°F)	10–95%	32°C (90°F)	2°C (36°F)

# Appendix C

## Software Product Description List

Software Product	SPD	Version
DECnet-11M	10.75.xx	4.3
DECnet-11M-PLUS	10.66.xx	4.0
DECnet-11S	10.74.xx	4.3
DECnet-DOS	50.15.xx	2.1
DECnet-Micro/R SX	18.27.xx	4.0
DECnet-RT	10.72.xx	2.1
DECnet-ULTRIX	26.83.xx	3.0A
DECnet-VAX	25.03.xx	5.1
DECnet-VAXmate	55.05.xx	2.1
DECnet/E	10.73.xx	4.1
DECnet/PCSA Client: PC	55.07.xx	2.1
DECnet/PCSA Client: VAXmate	55.10.xx	2.1
DECnet/SNA MS-DOS 3270 Terminal Emulator	30.63.xx	1.0
DECnet/SNA ULTRIX 3270 Terminal Emulator	29.88.xx	1.0
DECnet/SNA VMS 3270 Terminal Emulator	26.84.xx	1.4
DECnet/SNA Data Transfer Facility	27.85.xx	2.0
DECnet/SNA Gateway	30.15	1.5
DECnet/SNA Gateway for Channel Transport	29.76.xx	1.0
DECnet/SNA Gateway for Synchronous Transport	25.C6.xx	1.0
DECnet/SNA Printer Emulator	26.70.xx	1.1
DECnet/SNA VMS 3270 Data Stream Programming Interface	26.87.xx	1.3
DECnet/SNA VMS Application Programming Interface	26.86.xx	2.2
DECnet/SNA VMS APPC/LU6.2 Programming Interface	26.88.xx	2.0
DECnet/SNA VMS DISOSS Document Exchange Facility	26.72.xx	1.4
DECnet/SNA VMS Distributed Host Command Facility	26.71.xx	1.2
DECnet/SNA VMS Gateway Management	29.70.xx	2.0
DECnet/SNA VMS RJE	26.85.xx	1.3
DECrouter 200	27.72.xx	1.1
DECrouter 2000	28.85.xx	1.0
DECserver 200 for RSX-11M-PLUS and Micro/R SX	15.72.xx	2.0
DECserver 200 for ULTRIX-32	27.54.xx	2.0
DECserver 200 for VMS	27.53.xx	2.0
DECserver 500/550 for RSX-11M-PLUS and MicroR SX	18.53.xx	1.1
DECserver 500/550 for VMS	26.97.xx	1.1
EDE with IBM DISOSS	26.92.xx	2.1
EDE-W Document Exchange	26.37.xx	2.0
FUSION TCP/IP	29.81.xx	3.3
KMS11 RSX X.25 LAPB Link Level Software (UNIBUS)	13.42.xx	2.0
KMV1A Driver and Development Tools	28.26.xx	1.0

Software Product	SPD	Version
KMV1A MicroVMS Driver	28.23.xx	2.0
KMV1A MicroVMS Development Tools	28.24.xx	1.0
KMV1A MicroVMS X.25 Link Level	28.25.xx	1.0
KMV1A X.25 Link Level (Q-bus)	13.43.xx	1.0
KMV1A RSX and Micro/RSX Development Tools	13.41.xx	1.0
KMV1A RSX and Micro/RSX HDLC Framing Software	14.22.xx	1.0
LAN Traffic Monitor	27.80.xx	1.1
Micro/RSX 2780/3780 Emulator	18.32.xx	1.1
Micro/RSX 3271 Protocol Emulator	18.33.xx	1.1
MUX200/VAX Protocol Emulator	25.02.xx	2.0
MUXserver 100 Remote Terminal Server (VMS)	28.45.xx	2.2
MUXserver 100 Remote Terminal Server (RSX)	15.27.xx	2.2
MUXserver 100 Remote Terminal Server (ULTRIX)	28.46.xx	2.0
MUXserver 300/DECmux 300 Remote Terminal Server	25.E9	1.0
NMCC/DECnet Monitor	26.91.xx	2.1
NMCC/VAX ETHERnim	26.96.xx	2.1
poly-COM	A3.23.xx	1.2
Remote Bridge Management Software	27.12.xx	1.2
Remote System Manager	29.59.xx	2.1
RSX-11 2780/3780 Emulator	10.01.xx	4.1
RSX-11 P.S.I./M	10.42.xx	3.0
RSX-11 P.S.I./M-PLUS	10.43.xx	3.0
RSX-11/3271 Protocol Emulator	10.88.xx	3.1
RSX-11M/M-PLUS RJE/HASP Emulator	10.48.xx	1.3
Terminal Server Manager	27.64.xx	1.2
ULTRIX Mail Connection	29.05.xx	1.0
VAX 2780/3780 Protocol Emulator	25.07.xx	1.7
VAX 3271 Protocol Emulator	25.21.xx	2.4
VAX Computer Integrated Telephony Application Interface	29.92.xx	1.0
VAX DEC/MAP	27.66.xx	1.0
VAX Distributed File Service	28.78.xx	1.1
VAX Distributed Name Service	28.79.xx	1.1
VAX Distributed Queuing Service	28.80.xx	1.1
VAX FTAM	29.86.xx	1.1
VAX KCT32	26.04.xx	2.0
VAX Key Distribution Center	27.77	1.1
VAX KMS11-BD/BE HDLC/BSC Framing	26.55.xx	2.0
VAX KMS11-BD/BE X.25 Link Level	25.80.xx	2.0
VAX Message Router Programmer's Kit	26.33.xx	3.1
VAX Message Router X.400 Gateway	27.50.xx	2.1
VAX Message Router/P Gateway	28.94.xx	1.1

Software Product	SPD	Version
VAX Message Router/S Gateway	29.24.xx	1.1
VAX Message Router VMStmail Gateway	26.33.xx	3.1
VAX Notes	27.06.xx	2.0
VAX NTR Protocol Emulator	25.68.xx	1.1
VAX OSI Applications Kernel (OSAK)	27.47.xx	1.1
VAX P.S.I.	25.40.xx	4.2
VAX P.S.I. Access	27.78.xx	4.2
VAX PrintServer 40 Client	27.67.xx	2.1
VAX PrintServer 40 Support Host	27.68.xx	2.1
VAX Public Access Communications (VAXPAC)	28.51.xx	1.1
VAX VALU	26.94.xx	2.1
VAX VTX	26.57.xx	3.1
VAX Wide Area Network Device Drivers	29.64.xx	1.1
VAXmate Services for MS-DOS	55.09.xx	2.1
VAX/VMS Operating System	25.01.xx	5.1
VAX/VMS PBX Server Computer Integrated Telephony	29.91.xx	1.0
VAX/VMS Services for MS-DOS	30.50.xx	2.1
VIDA with IDMS/R	27.25.xx	2.1
VMS/SNA	27.01.xx	1.3
VMS/ULTRIX Connection	25.A4.xx	1.0
WIN/TCP	29.80.xx	3.0
WPS-PLUS/PC	30.75.xx	1.0
X25router 2000	28.86.xx	1.0

# Appendix D

## Related Documentation

Document	Order Code
<b>Networks and Communications Handbooks</b>	
Introduction to RSX-11 P.S.I.	AA-M369B-TC
Introduction to VAX-11 P.S.I.	AA-L0670C-TE
<b>Architecture Specifications</b> (Order through DECdirect)	
DECnet-DNA Ethernet Data Link Functional Specification V1.0	AA-Y298A-TK
DECnet-DNA Ethernet Node Product Architecture Specification V1.0	AA-X440A-TK
DECnet-DNA Phase V General Description	AA-N149A-TC
DECnet-DNA Maintenance Operations Functional Specification V3.0	AA-X436A-TK
DECnet-DNA Network Management Functional Specification V4.0	AA-X437A-TK
DECnet-DNA NSP Functional Specification V4.0	AA-X439A-TK
DECnet-DNA Routing Layer Functional Specification V2.0	AA-X435A-TK
DNA Phase V General Description	AA-DNAPV-GD
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DECconnect System Installation and Verification Guide	EK-DECSY-VG
DECconnect System Planning and Configuration Guide	EK-DECSY-CG
DECconnect System Requirements Evaluation Workbook	EK-DECSY-EG
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VAX Software Buyer's Guide	EB-31128-48
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VAX Systems and Options Catalog	EC-I0060-46

### ***The Cost of Network Ownership***

This 70-page comprehensive report summarizes the cost-of-network-ownership case studies conducted by an information technology management consulting firm. The research report discusses the approach taken, describes the cost model, and presents the key findings and conclusions of the study commissioned by Digital.

The report presents 17 case studies of American and European networks, of which there were three types:

- Corporate
- Multiple field office
- Manufacturing site

Also, two appendices include detailed information of an IBM and Digital case analysis.

The following are report excerpts:

- "On average, only one-third of the five-year ownership costs are related to the acquisition of the networks, while nearly two-thirds of the costs are for operations and routine change."
- "Personnel costs account for 25 percent of the five-year costs."
- "The average per-port cost of centralized corporate networks is more than double that of distributed networks."
- "Among the corporate networks on which the model was tested, average personnel costs were lower for Digital networks than for IBM networks."

To obtain *The Cost of Network Ownership* (EJ-32929-42), consult your local sales representative.

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- DEC MicroServer-SP
- Fiber Optic Ethernet System
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- DEC MULTIcontroller (DSH32)
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- 3270 Terminal Option Card for the DECserver 550 (in photo)

