Networks and Communications Buyer's Guide

1987 October–December

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Networks

Networks and Communications Buyer's Guide
1987 October–December

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Suggestions for Using this Guide

Introduction

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

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

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

Background Information

General background information about Digital networking and communications is presented in *Section 1: Digital Network Architecture Overview, Ethernet Overview,* and *DECconnect Overview.*

For more detailed information, refer to the publications lised in *Appendix D.*

Product Information

Locating Products

Products are listed by product area in the *Table of Contents* and alphabetically in the *Index.*

New Products

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

Packaged Products

Network products available in pre-packaged configurations are described in *Section 6: Standard Network Packages.*

Software Product Descriptions

Condensed software product descriptions are located in *Section 3: Networks and Communications Software Products.* Each description is followed by order codes and any prerequisite hardware and software.

Software required for Ethernet Communications Servers is described in *Ethernet Communications Servers.*

Full Software Product Descriptions (SPD) are published separately. The SPD number for products referred to in this guide are listed in *Appendix C.*

Hardware Product Descriptions

Hardware product descriptions are in *Section 2: Ethernet Local Area Networks, Section 4: Communications Hardware Products,* and *Section 5: DECconnect Cabling System.* 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 7: Network Services.*

Product Comparisons

Tables comparing the features and capabilities of products are located in the following subsections: *Ethernet Communications Servers, Extended Ethernet Local Area Networks, DECnet Communications Software, Digital-to-IBM Communications Software, Asynchronous Devices, Synchronous Devices, Modems,* and *Communications Cables.*

Product Performance Information

Product performance information is discussed in *Appendix A* and in individual product descriptions.

Specifications

Specifications for hardware products are listed in individual product descriptions.

Prerequisite Products

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

Configuration Information

Overview Configurations

General overview configurations are described in *Ethernet Overview* and *Ethernet Configuration Guidelines.*

Sample Configurations

Sample configurations for the following applications are illustrated in *Ethernet Overview:* Office, Factory, CAD/CAM, Hospital, Laboratory, and University.

Ethernet Configuration Information

Ethernet configuration information is located in *Ethernet Configuration Guidelines.*

DECconnect Configuration Information

DECconnect configuration information is located in *Section 5: DECconnect Cabling System.*

Ordering Information

Order Codes

Order codes are listed in tables after each product description.

Order Code Explanations

Order code formats are explained at the beginning of *Section 3* for software and *Section 4* for hardware.

Pre-Packaged Ordering

To order network products in pre-packaged configurations, refer to *Section 6: Standard Network Packages.*

European Ordering

European order codes are now the same as U.S order codes.

Comments and Suggestions

Comments and suggestions for the guide can be made using the comment cards attached under the back cover.

What's New to the Networks and Communications Buyer's Guide

DELQA Ethernet Controller

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

For more information about the DELQA Etherenet controller, refer to Section 2, *Ethernet Communications Controllers.*

CX Asynchronous Communications Controllers

The CX communications controllers provide asynchronous communications for the Industrial VAX (IVAX) and Industrial PDP (IPDP) computers that utilize the BA200 series system enclosures. Three versions are available: the CXY08 with 8 RS232-C lines, the CXA16 with 16 DEC423 (a superset of RS423) lines, and the CXB16 with 16 RS422 lines.

For more information about the CX communications controllers, refer to Section 4, *Asynchronous Communications Controllers.*

IBM PC Interconnection Standard Network Package

The IBM PC Interconnection Package is a Standard Network Package that connects IBM PCs to a ThinWire Ethernet network using a DEPCA Ethernet controller. The package includes DECnet-DOS and the client license for VMS Services for MS-DOS™. A work group of eight or less PCs connect to the network using a DEMPR; groups larger than eight PCs use a DELNI/DEMPR configuration.

For more information about IBM PC Interconnection Package, refer to Section 6, *Local Area Work Group Interconnection.*

Remote Site Interconnection Standard Network Package

The Remote Site Interconnection Package is a Standard Network Package that links terminals, printers, and personal computers (in terminal emulation mode) at a remote site to an Ethernet local area network through a leased telephone line. The package uses the terminal server and statistical multiplexing techniques of the MUXserver 100/DECmux II configuration.

For more information about the Remote Site Interconnection Package, refer to Section 6, *Wide Area Interconnection*.

Message Router

Message Router is a VMS layered application that performs a store and forward transfer service. Messages can consist of any information, including text, data and arbitrary files, that need to be transferred within a DECnet Phase IV network.

The Message Router is a standard component of ALL-IN-1 and PC ALL-IN-1 configurations. In addition, it is available in the following packages:

- Message Router Base for installing the Message Router on nodes running user-written applications
- Message Router VMSmail Gateway for transferring VMS mail via the Message Router
- Message Router X.400 Gateway for transferring X.400 mail via the Message Router
- Message Router Programmer's Kit for developing message transfer applications

For more information about Message Router, refer to Section 3, *Mail Interchange*.

Abbreviations and Definitions

Abbreviations and definitions of terms used in this guide are listed below.

System Unit Space in chassis for mounting prewired backplane(s) that can accept Hex- or Quad-sized modules.

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

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

Hex Slot Space in prewired backplane that will accept 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. These 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.

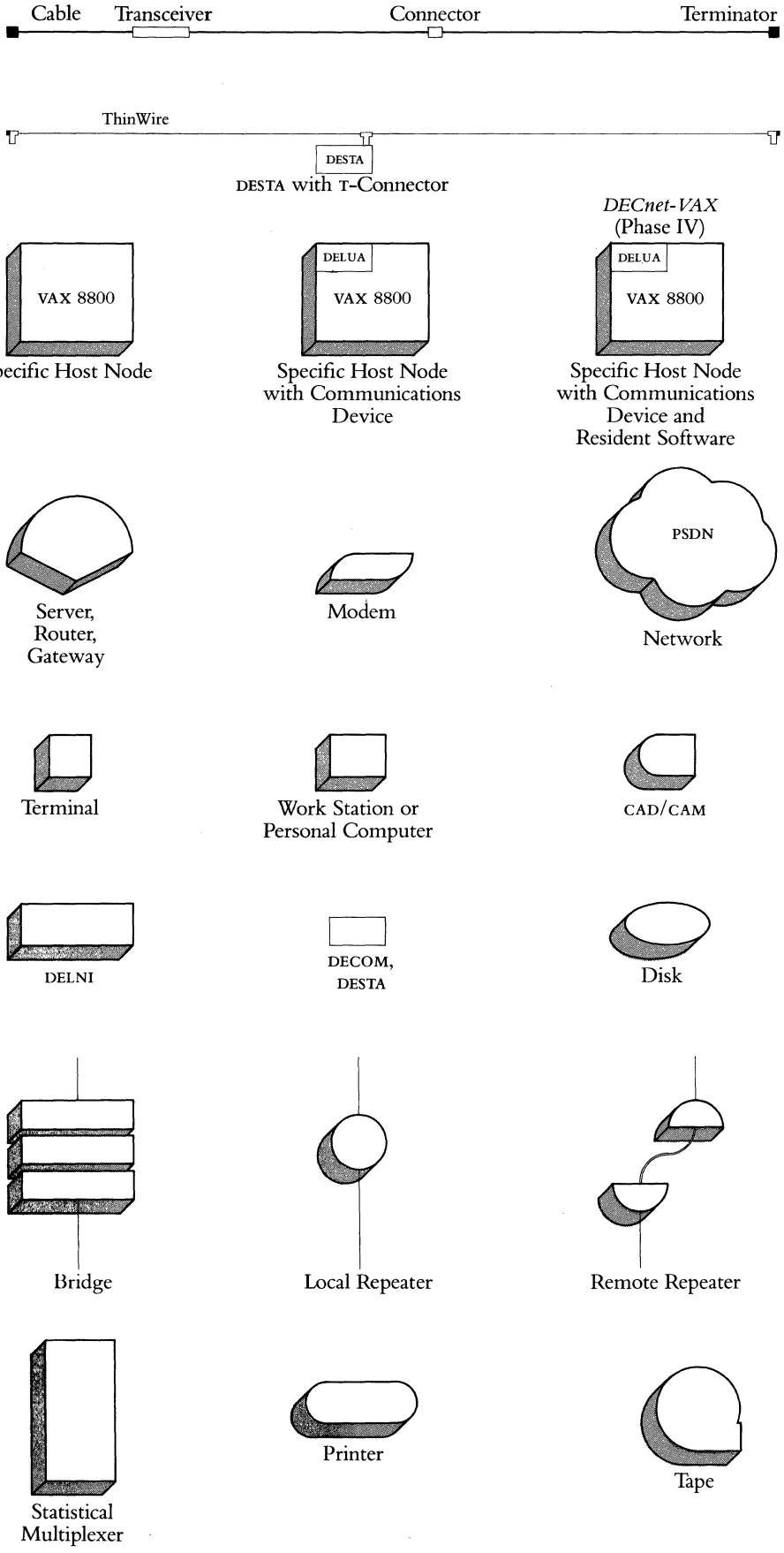
KB/s Kilobytes per second. (K = 1,024)

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

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

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

Key to Symbols Used in This Guide



Section 1

Digital Network Architecture Overview

Section 1

Digital Network Architecture Overview

Introduction

Digital offers extensive capabilities that permit the linking of computers and terminals into flexible configurations called networks. Networks increase the efficiency and cost-effectiveness of data processing operations.

Networking lets computer systems and terminals—whether located around a facility or around the world—share resources and exchange information, files, and programs. The smaller computers in a network have access to the powerful capabilities of larger systems, while the larger computers can take advantage of smaller dedicated systems chosen for specific application environments.

Distributed processing is the general term used to describe the placement of computers where they are needed, whether on the floor of a manufacturing facility, in an accounting department, in a laboratory, or in a corporate office. With the continuing proliferation of personal computers at the local level, the ability to form integrated local networks that facilitate cost-effective resource sharing and information exchange has become increasingly important.

In addition to the broad spectrum of product offerings, the Computer Special Systems Group has the capability of providing technical resources to design and manufacture high performance custom network interfaces to other vendors' systems and non-standard networks. This capability allows customers the flexibility of configuring and implementing multi-vendor networks which match their unique requirements. The custom products designed by Computer Special Systems are fully supported by Digital.

The information presented in this section is a general overview of DNA. For a more detailed discussion of DNA, refer to the handbook *Digital's Networks: An Architecture with a Future.*

DNA and ISO Overview

The Digital Network Architecture, DNA, is the framework for all Digital communication products (DECnet, DECnet/SNA Gateway, communications servers, and so on). The International Standards Organization (ISO), a group responsible for promulgating industry standards, has created an architectural model for open systems interconnection. DNA, like many other vendors' architectures, is closely based on the ISO model. The ISO model is just that, however—a model for future standards development. Therefore, network architectures from different vendors can be implemented based on the ISO model and still be mutually incompatible. Much work remains to be done in the area of international standards; however, the vendors who currently are implementing systems based on international standards will be the first to offer heterogeneous connectivity in the future. Table 1.1 shows the architectural layers of ISO and DNA.

Table 1.1 Architectural Layers of ISO and DNA

ISO Layers	DNA Layers
Application	User
	Network management
Presentation	Network application
Session	Session control
Transport	End-to-end communications
Network	Routing
Data Link	Data link
Physical Link	Physical link

DNA Phases

A hierarchical, layered architecture such as DNA offers flexibility by allowing for the substitution and addition of new technologies in future phases while maintaining compatibility with previous phases. This means that a customer's application-level software investment is protected while Digital adds new products and capabilities from one phase of DNA to another. For example, the layered structure of DNA allowed the incorporation of the CCITT X.25 data link protocol into DNA Phase III and the even more recent incorporation of the Ethernet data link protocol into DNA Phase IV. Digital will continue to offer products that take advantage of the latest advances in communication technology and network applications in future phases of DNA.

Since 1976 when DECnet Phase I was introduced, each new phase of DNA has included new features that extend its networking capabilities. Figure 1.1 shows each of the phases of DNA and its associated capabilities. The functions and protocols offered by each phase of DNA are implemented by an equivalent phase of the layered software product DECnet. Specific DECnet versions are offered for each of Digital's operating systems.

DNA Layer Capabilities and Functions

DNA has eight layers. Each layer has capabilities that perform a specific set of functions and services. By interacting, the layers control the operation of the network.

Figure 1.2 shows the DNA layers in sequence from the highest to lowest layer. The highest layers define the functions available to the network user. The lowest layers define the transmission media, technique, and format.

Figure 1.1
The Phases of DNA and Associated Capabilities

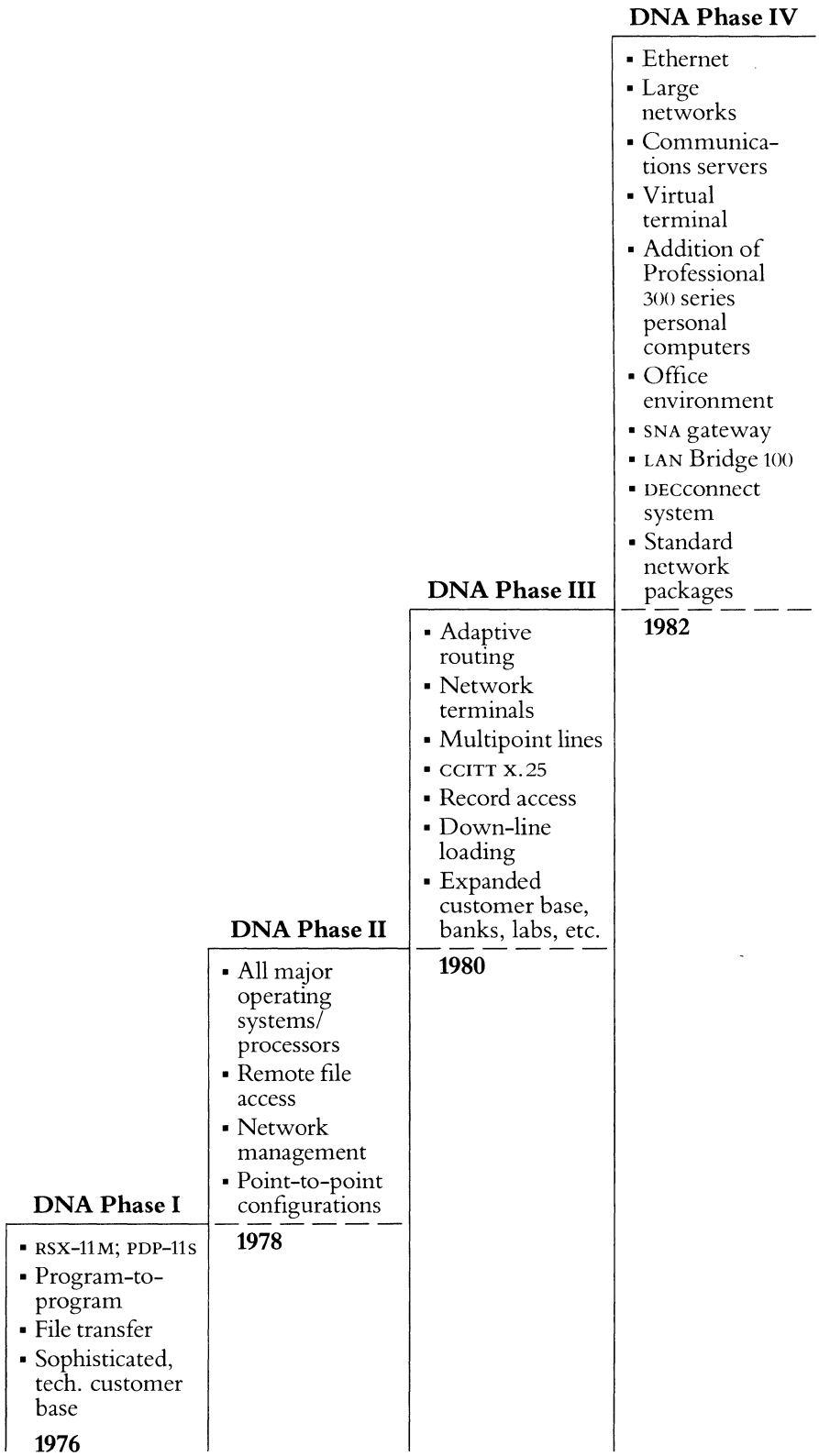


Figure 1.2
DNA Layers, Capabilities and Functions

DNA Layers	Capabilities	Functions
(Highest layer) 8 User	File transfer	Contains user-supplied functions and programs.
7 Network management	Remote resource access Downline system load Remote command file submission	Uses Network Information and Control Exchange (NICE) protocol for tasks, such as down-line loading, up-line dumping, and testing.
6 Network application	Virtual terminals	Uses Data Access Protocol (DAP) for remote file access and transfer. Uses Loopback Mirror Protocol for loopback testing.
5 Session control	Program to program	Uses Session Control Protocol for sending and receiving logical link data and disconnecting logical links.
4 End-to-end communication		Uses Network Services Protocol (NSP) to handle all system-independent aspects of creating logical links, such as data flow control.
3 Routing	Adaptive routing	Routes user data in packets to its destination and control congestion on the lines.
2 Data link	DDCMP Point-to-point	Uses DDCMP, X.25, or Ethernet protocol. Makes the connection between adjacent nodes and ensures accuracy and sequencing of messages.
1 Physical link (Lowest layer)	X.25 Ethernet Multipoint	Manages the physical transmission of data over a channel. Functions include monitoring channel signals, clocking on a channel, and handling interrupts from the hardware.

DNA Layers and DECnet Protocols

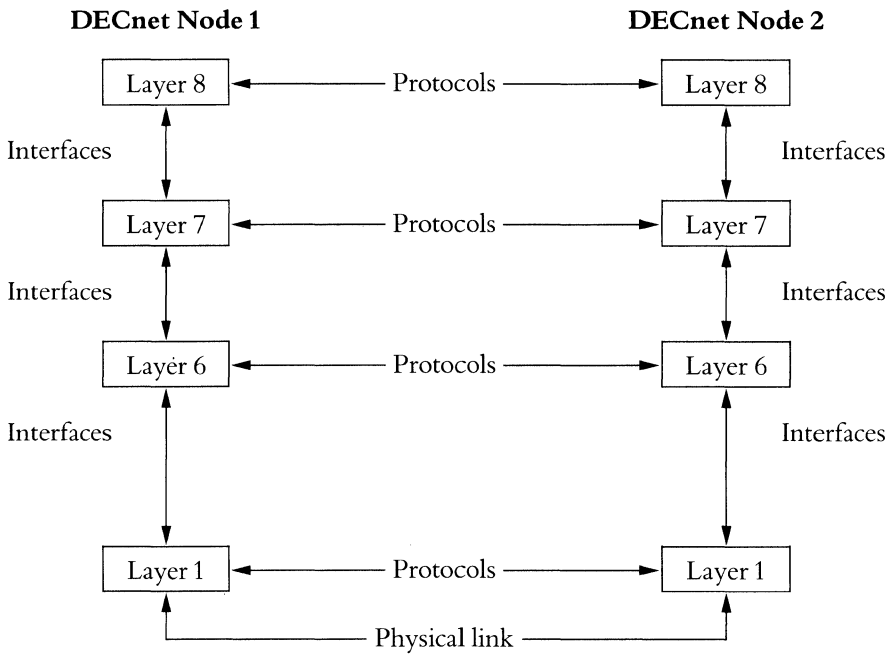
DNA defines standards for protocols, interfaces, and communications functions. These standards allow various operating systems, communication devices, and computer hardware to function in a network. Users are able to access resources and programs on other network nodes, which are devices with communication capabilities.

As mentioned earlier, DNA is the basis for the design of all DECnet software products. Figure 1.3 shows the two types of relationships between DNA layers and the protocols used in DECnet software.

Interfaces specify relationships between different DNA layers within the same DECnet node. Usually one layer interfaces with the layer immediately below it to receive a service.

Protocols specify relationships between equivalent DNA layers that are in separate DECnet nodes. Protocols define the form and content of messages exchanged between nodes.

Figure 1.3 Relationships between DNA Layers and DECnet Protocols



A major advantage of the DNA structure is that the layers are independent of each other. Each layer can be changed without significantly affecting other layers. The unique adaptive quality of DECnet software is the result of DNA's layered structure. DECnet software is especially important because it allows Digital to adapt DECnet to include new communications technologies, such as Ethernet, without affecting the user's applications.

Networking Environments

There are basically two types of networking environments: those involving communication strictly between Digital systems (Digital-to-Digital) and those involving communication between Digital systems and foreign systems (Digital-to-non-Digital). Digital therefore offers the following product lines for both local and remote communications:

- DECnet—Products that allow communications between Digital systems, and also Digital-to-non-Digital systems (DECnet-DOS).
- Internet—Products that connect Digital systems to IBM and other vendors' systems
- Packetnet—Products that connect Digital-to-Digital and Digital-to-non-Digital systems via X.25 packet-switched data networks.

Hardware and Software Networking Products

Network environments are implemented by hardware and software products. Table 1.2 divides Digital's networking product set into the following categories: hardware communication products, software communication products, and communications servers. Each of these categories is further defined according to the type of communication involved: Digital-to-Digital host communication (local traditional, local area network, remote), Digital-to-non-Digital host communication, and terminal connection.

Table 1.2
Digital's Networking Product Set

		Hardware Communications Products	Software Communications Products	LAN Communications Subsystems Servers
Digital-to-Digital Host Communication				
	Local Traditional	Synchronous Devices	All DECnet Software, DLX	N/A
	LAN	Synchronous LAN Devices, LAN Bridge 100	DECnet-VAX, PRO/DECnet, DECnet-11M, -11M-PLUS, -11S, DECnet-Micro/RSX, DECnet-ULTRIX, DECnet-DOS, DECnet/E	DECnet Router, DECnet Router/X.25 Gateway, DECrouter 200
	Remote	Synchronous Devices	All DECnet Software, VAX P.S.I., RSX-11 P.S.I., TOPS-20 P.S.I.	DECnet Router, DECnet Router/X.25 Gateway, DECrouter 200
Digital-to-Non-Digital Host Communication		Synchronous Devices	All Internet, Packetnet, and OSI products. DECnet-ULTRIX	DECnet/SNA Gateway, DECnet Router/X.25 Gateway
Terminal Connection		Asynchronous Devices	CX/DX/AX, poly-COM, VTERM	DECserver 200, MUXserver 100/DECmux II

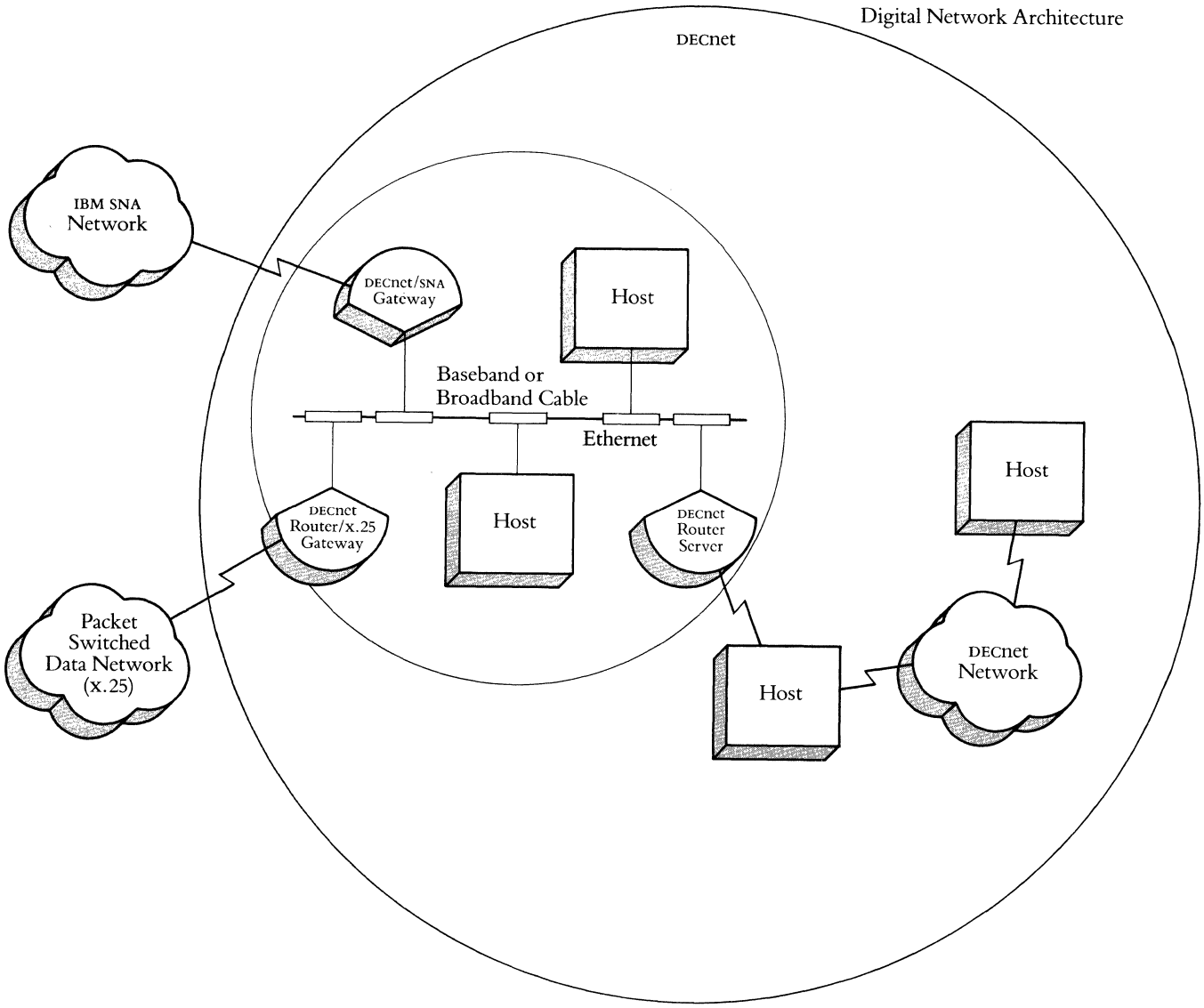
As shown in Table 1.2, Digital offers a broad range of networking products—from basic communication devices for our OEMs to full networks complete with network application programs for commercial business customers. For example, communication hardware products (without higher-level network software) are used for realtime data monitoring/control applications. Non-DECnet software communications products are used in remote job entry (RJE) and protocol emulation applications. DECnet products and LAN communications servers use the full capabilities of DNA in departmental applications in the office, engineering, laboratory, manufacturing, education, and business environments.

DNA Phase IV and Ethernet

The incorporation of the Ethernet local area network technology into DNA Phase IV and specifically into DECnet demonstrates Digital's commitment to providing a complete set of products to address local area networking needs. The existing DECnet product line already offers comprehensive wide area network support. Ethernet products improve resource sharing by increasing performance of data traffic in a local area and by connecting to other local and remote communications networks. Ethernet, a part of DECnet, offers remote or long-haul connections and local connections as one integral network. Ethernet is being developed and designed specifically for the kind of communications and resource sharing that take place in a local work environment, most often a room, a building, or a complex of buildings.

Ethernet protocols are added to the two lowest layers of DNA. Only these layers change: the structure of all other layers remains unchanged. Figure 1.4 shows the relationships that exist among Ethernet, DECnet, and DNA.

Figure 1.4
Ethernet, DECnet, and DNA Relationships



Section 2

Ethernet
Local Area Networks

Ethernet

Section 2

Ethernet Local Area Networks

Overview

A local area network (LAN) is a privately owned data communications system that offers high-speed communications channels optimized for connecting information processing equipment. The geographical area is usually limited to a section of a building, an entire building, or a cluster of buildings.

Local area networks can be designed with a variety of technologies and can be arranged in different configurations. Consequently, they vary with respect to their transmission speeds, the distances they can span, their operating and performance characteristics, and the capabilities and services they offer.

Ethernet is a high-speed, local area communications network. This section provides a conceptual overview of the major operational techniques and products that make up an Ethernet network. This section also shows how products are configured.

Reasons for Implementing Ethernet

Local area networks provide a fast, efficient means of exchanging information. Many varieties of information processing equipment can be easily interconnected through a local area network. Resource sharing allows users to share expensive peripheral devices and databases. Local area networks also expand the possibilities for global resource sharing by offering standards for communication between equipment of different vendors and between local and remote networks.

Ethernet is the Digital local area network. Ethernet networks provide rapid access to data in remote locations, and the high data rate supported by Digital's DECnet software makes file transfers practical. Ethernet can be implemented on baseband (coaxial) or broadband (CATV) cable.

In Baseband Ethernet (Standard or ThinWire), a single network cable replaces the numerous interconnecting cables in traditional data networks. Standard Ethernet cable is recommended for communications between floors and buildings. ThinWire cable is recommended for communications between workstations, personal computers, and low-end systems in local work areas on a floor. Ethernet on broadband offers customers the ability to put Ethernet, along with video, voice, and other data communications on the same network wiring system. It is most feasible for customers who must distribute multiple information services to a large user population over an extensive local area.

Ethernet baseband or broadband represents 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 since new systems and additional capability can be added without disturbing the operation of the network.

Ethernet/IEEE 802.3 Compliant Products

All Digital second generation Ethernet products support the IEEE 802.3 LAN standard. The IEEE 802.3 standard is compatible with and technically very similar to the Ethernet standard, which Digital's first-generation products support. 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.

Ethernet Channel Access

The technique used to access the Baseband or Broadband 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). When the channel is clear, all users have equal access to it.

Collision Detection (CD). Two or more users may sense a clear channel and simultaneously try to transmit. This results in collision of data. Ethernet senses the collision condition, stops the transmission, and automatically tries to retransmit the data after waiting a randomly selected amount of time.

Baseband and Broadband Ethernet Cabling

For baseband, an Ethernet communications controller in the host connects to a Digital H4000 Transceiver using a four-twisted-pair wire transceiver cable. The H4000 Ethernet transceiver is clamped onto the Ethernet coaxial cable without cutting the coaxial cable or interrupting data transmissions. A maximum of 100 transceivers can be used on an Ethernet coaxial cable segment. A single segment of coaxial cable can be up to 500 meters (1,640 feet) long. Multiple coaxial 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 connects segments of Ethernet coaxial cable when a larger local area network is created. Figure 2.1 shows a basic Baseband Ethernet cabling layout.

For broadband, the Ethernet communications controller in the host connects to the broadband transceiver (DECOM or Ethermodem) using the same four-twisted-pair wire transceiver cable as 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, refer to Section 7, Network Services, or contact your Digital sales account manager or local field service office. Figure 2.2 shows a basic Broadband Ethernet cabling layout.

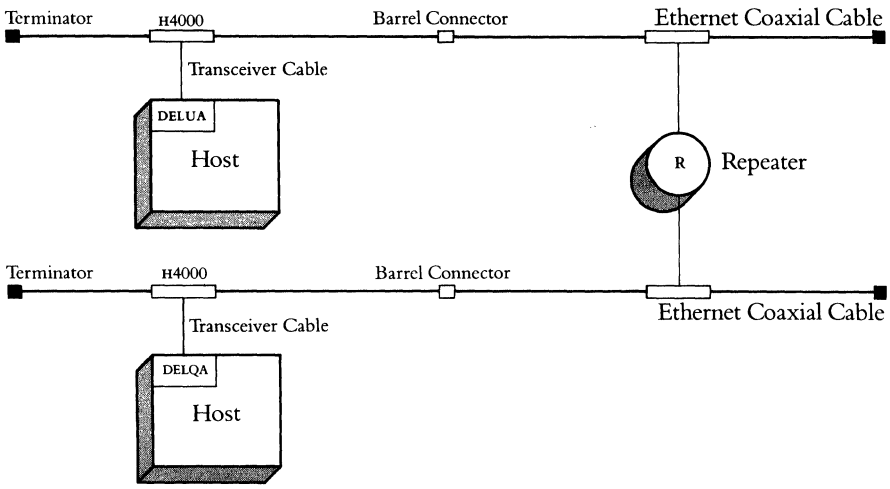


Figure 2.1
Basic Baseband Ethernet Cabling Layout

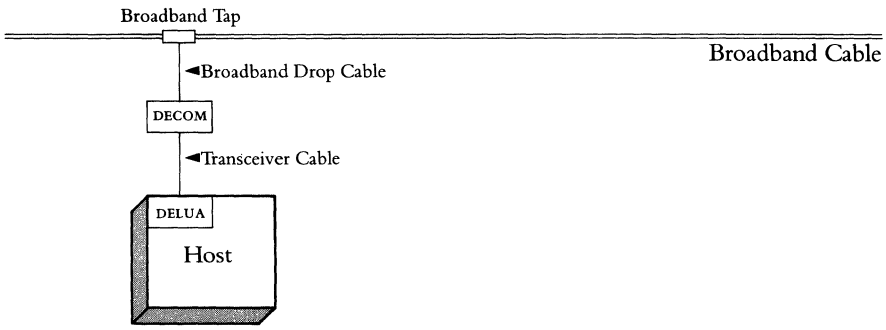


Figure 2.2
Basic Broadband Ethernet Cabling Layout

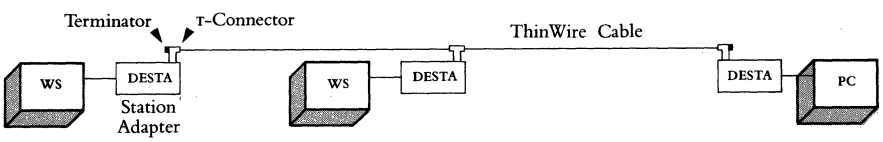
ThinWire Ethernet Cabling

ThinWire Ethernet offers an alternative cabling system compatible with standard Ethernet. ThinWire provides full Ethernet capability for personal computers, workstations, and low-end systems in office and other local work areas. ThinWire is a low-cost, flexible system that utilizes ThinWire cable to connect up to 30 stations with one 185 meter segment. With ThinWire, the following configurations are possible:

- A single segment of up to 30 stations.
- A standalone network of up to eight segments attached to a ThinWire Multiport Repeater (DEMPR) hub. This configuration allows interconnection of up to 232 stations.
- A standalone network of up to eight DEMPR hubs connected to a Local Network Interconnect (DELNI). This configuration allows interconnection of up to 1,023 stations (Ethernet limit).
- A network in which the DEMPR or DELNI mentioned above is connected to a standard Ethernet using an H4000-BA Transceiver.

Refer to ThinWire Ethernet Products in this section for more information. ThinWire is also the cable recommended for high-speed data communication in the floor plan portion of Digital's DECconnect Cabling System. Refer to Section 5 for more information about DECconnect and ThinWire Ethernet.

Figure 2.3
Basic ThinWire Cabling Layout



Ethernet Communications Controllers

Ethernet communications controllers implement the Ethernet or IEEE 802.3 data link layer functions and CSMA/CD protocol to make electrical connections between nodes. Digital has the following Ethernet communication controllers:

- The DELUA allows VAX and PDP-11 UNIBUS systems to connect to Ethernet/IEEE 802.3 networks.
- The DELQA allows MicroPDP and MicroVAX Q-bus systems to connect to the Ethernet network.
- The DESVA allows MicroVAX 2000 and VAXstation 2000 computers to connect to Ethernet/IEEE 802.3 ThinWire networks.
- The NIA20 allows KL10-based systems to connect to the Ethernet network.
- The DECNA allows Professional 300 Series computers to connect to the Ethernet network.
- The DEPCA allows IBM PC, PC AT, and PC/XT computers to connect to Ethernet/IEEE 802.3 ThinWire networks.

The DELUA, DELQA, DECNA, or NIA20 is a combination of hardware module, distribution panel, and cables that are installed in the host system. They connect via transceiver cable to the H4000 Transceiver (for baseband), a DECOM or Ethermodem (for broadband), or an Ethernet Local Network Interconnect (DELNI).

The DESVA and DEPCA supply a BNC connector for direct connection to ThinWire Ethernet. They connect to standard Ethernet cable through a DEMPR, or, in the case of the DEPCA, through a DEPCA-AU adapter.

Servers

A server is any network node where shared resources are located. There are a number of different types of servers: 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 the node is dedicated to that function, may be viewed as providing server functions. Figure 2.4 illustrates the various types of servers for baseband or broadband networks.

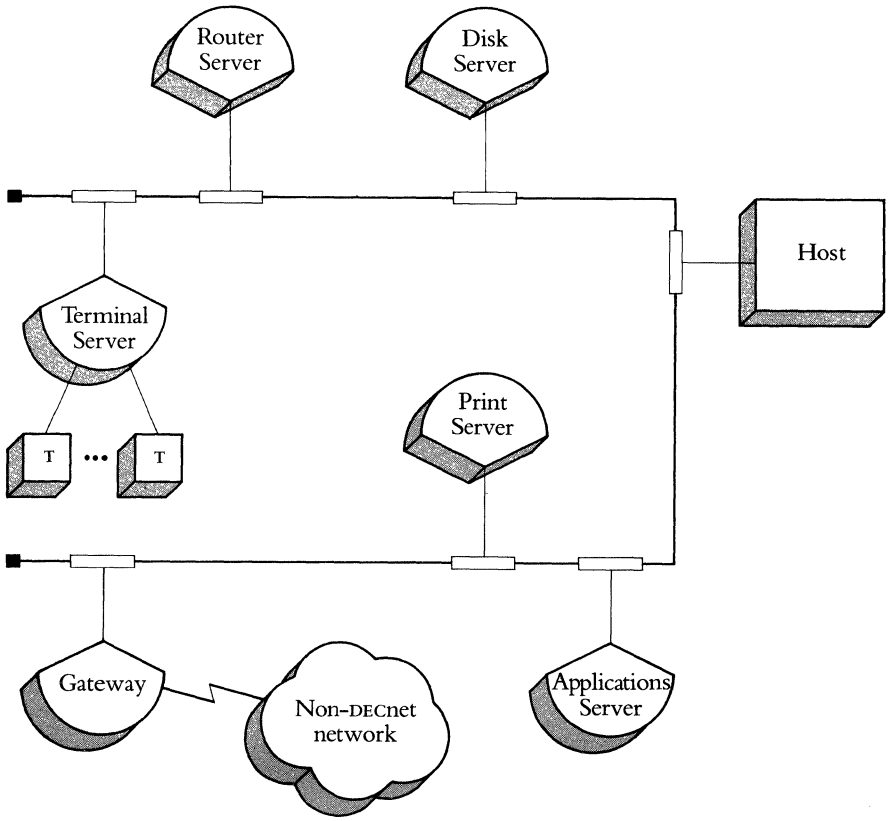


Figure 2.4
Generic LAN Servers

A host providing server functions can run other applications if its nonprocessing services do not justify total dedication. By adding servers to a network (dedicating one or several hosts to nonprocessing functions), other hosts on the network can be dedicated to applications processing. Adding a server to a network frees valuable host power for user applications.

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.

It is possible for users to build servers by providing their own unique application software. For example, a computer node providing typesetting services, using software written by the customer, might be viewed as an application server. Also, a VAX 8700 connected to an Ethernet running the standard VAX/VMS operating system may be viewed as a compute server on a network, while a VAX 8250 with a laser printer may be viewed as a print server to the network. Table 2.1 illustrates server software alternatives.

Table 2.1
Server Software Alternatives

General Purpose Servers
Print Server/File Server (e.g., VAX/VMS Host)
Database Access (e.g., Datatrieve Host)
Packaged/Special Purpose Servers
Terminal Server
Router
Gateway
Application Server
User Developed

Ethernet Communications Servers

Ethernet communications servers are dedicated, special purpose units that promote resource sharing across many host systems within a local area network (LAN).

Currently, there are four types of communications servers for use on a Baseband or Broadband Ethernet. The four types include: Terminal Servers, Router Servers, DECnet Router/X.25 Gateways, and DECnet/SNA Gateways. For additional information, refer to the product descriptions in this section.

Figure 2.5 illustrates the use of communications servers on an Ethernet LAN.

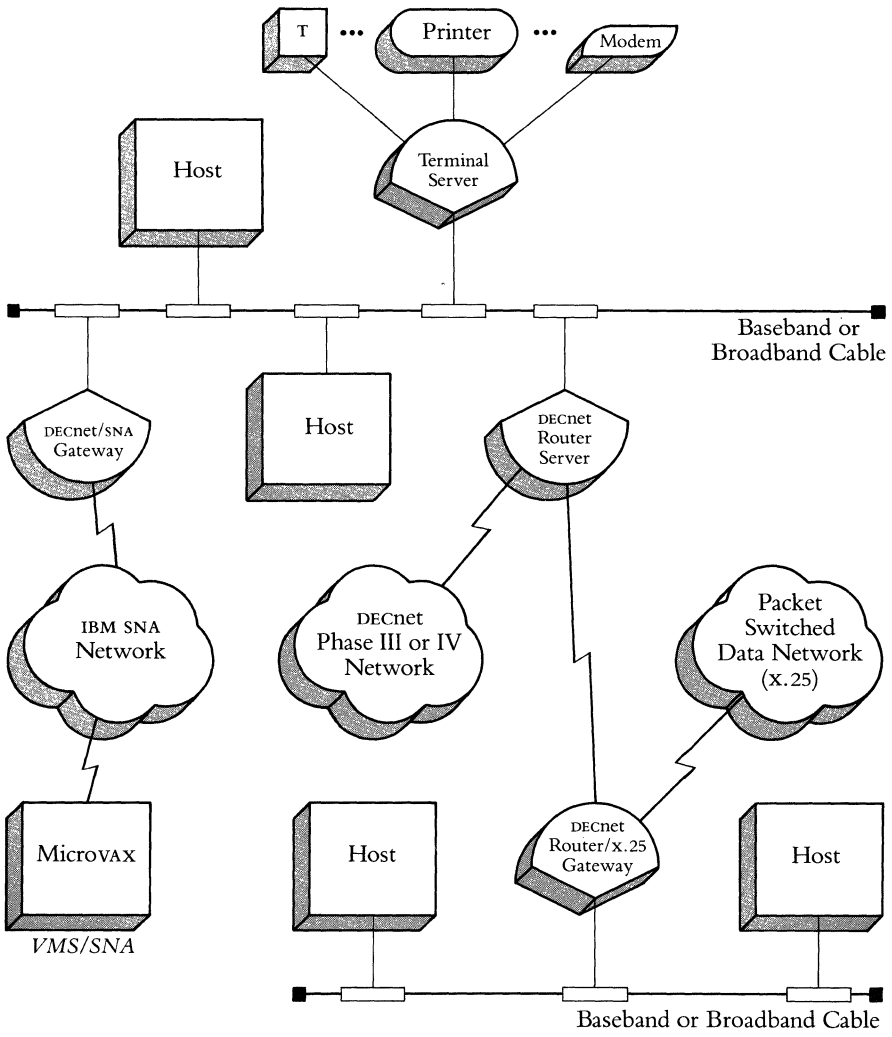


Figure 2.5
Baseband or Broadband Ethernet LAN Configuration Illustrating the Use of Communications Servers

Ethernet LAN Bridge 100 and Extended Local Area Networks

The LAN Bridge 100 interconnects network segments, which use any standard Ethernet/IEEE 802.3 medium, to create an extended LAN. The standard Ethernet distance limit is 2,800 meters between any two nodes. An extended LAN lengthens this distance without degrading Ethernet's 10 Mb/s throughput capability. An extended LAN may consist of up to 8,000 nodes and, using fiber optic and microwave bridges, span distances of up to 22,000 meters.

The bridge dynamically manages data traffic flow between Ethernet segments, selectively forwarding packets to keep local traffic local and reduce traffic over the entire network. Baseband-to-baseband, broadband-to-broadband, and baseband-to-broadband network configurations are possible using the bridge as a link.

Figure 2.6 illustrates an Extended LAN configuration using the LAN Bridge 100. Refer to Section 2: *Extended Ethernet Local Area Networks Products* for more information.

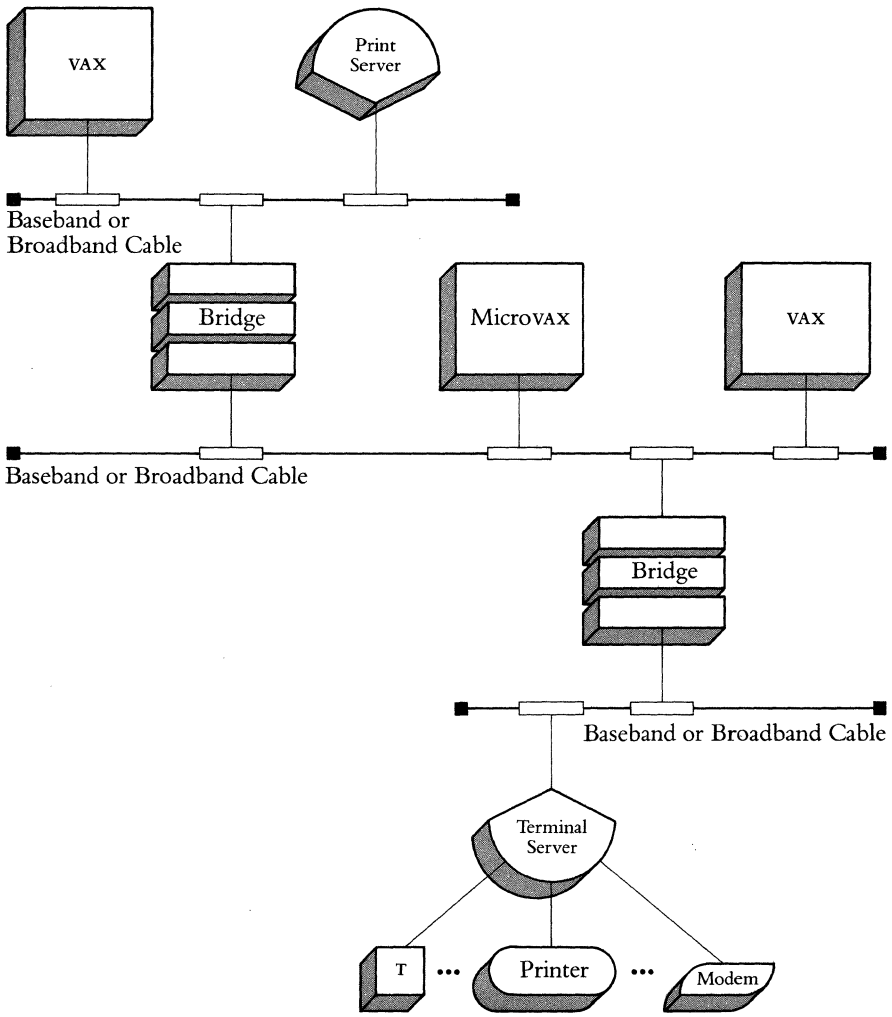


Figure 2.6
Baseband or Broadband Ethernet LAN Configuration with an Ethernet LAN Bridge

Ethernet Advantages

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

- SIMPLIFIED NETWORK DESIGN
  Ethernet's architecture and design rules are streamlined and uncomplicated given that cable, transceivers, and controllers meet the IEEE 802.3 and/or Ethernet specifications. For specific design rules, refer to Ethernet Configuration Guidelines in this section.

- SIMPLIFIED INSTALLATION
  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.

- REDUCTION OF WIRING
  A single network cable in Baseband Ethernet replaces the many interconnecting cables in traditional data networks.

  By implementing Ethernet on broadband with other video, data, and voice channels, the number of wiring systems can also be significantly reduced.

- 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 H4000 Transceiver is designed with triple redundant circuitry to prevent a single failure from disabling the network.

  The Baseband Ethernet coaxial cable's heavy construction, rigid concentricity requirements, and passive nature make it very reliable.

  The Broadband Ethernet Transceivers are also designed with redundant circuitry to prevent a single failure from disabling the network.

- HIGH-SPEED COMMUNICATION
  Ethernet provides high-speed (10 million b/s) links between all network nodes.

- SHARED DATABASES
  The 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
  Ethernet allows special purpose peripherals such as high-speed printers, very large disks, and high resolution graphics packages to be shared by multiple users.

- INTERCONNECTION 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 equipment at the Ethernet datalink level or through the X.25 and SNA Gateways.

  For additional information about broadband features, benefits, and applications, refer to the product descriptions in this section.

Typical Baseband Ethernet Applications

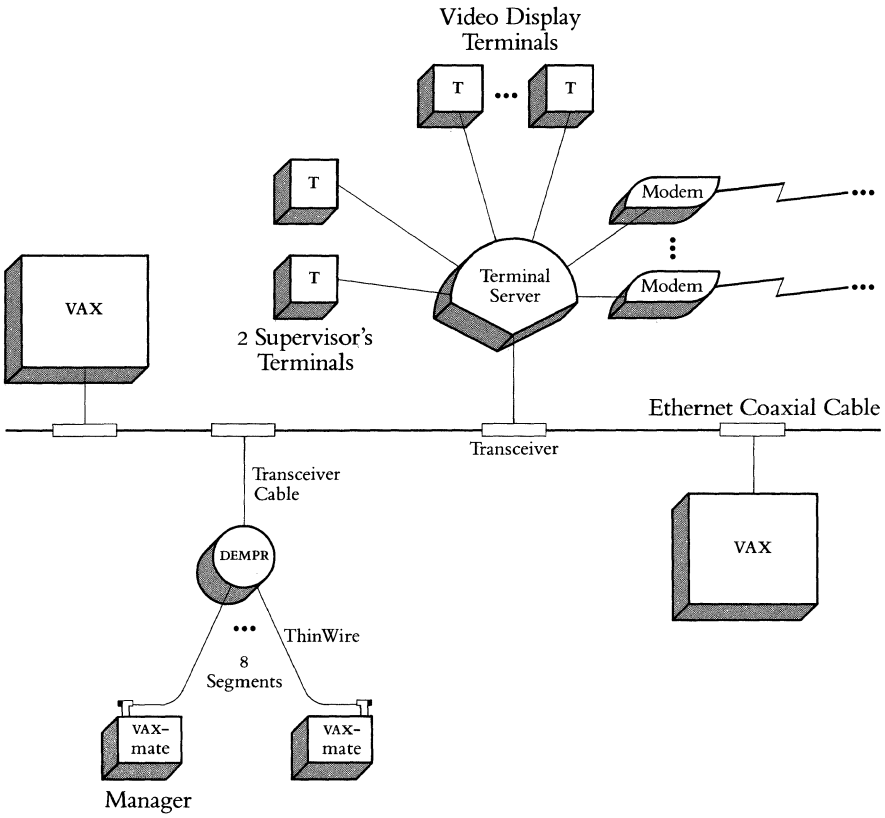
The following pages describe examples of appropriate applications for Baseband Ethernet.

Office Applications

Figure 2.7 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 Ethernet cable, which allows up to 29 additional devices to be added as the company grows.

The Ethernet coaxial 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 permit remote offices or sales representatives with small portable terminals to call in orders or check a particular account at any time.

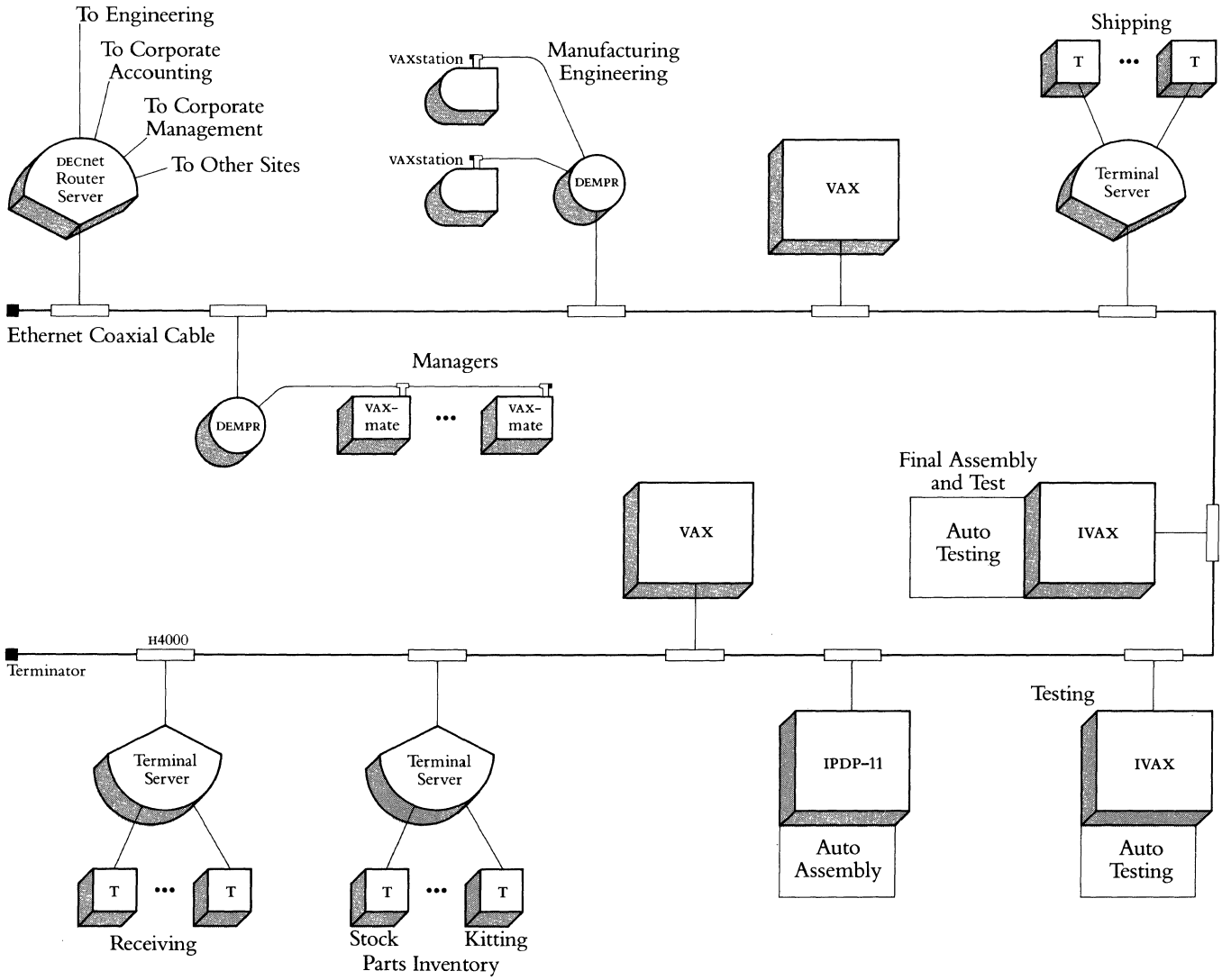
Figure 2.7
Baseband Ethernet
Office Application



Factory Applications

Figure 2.8 illustrates a typical application of Ethernet in a factory. Such a configuration provides control of 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.

Figure 2.8
Baseband Ethernet
Factory Application

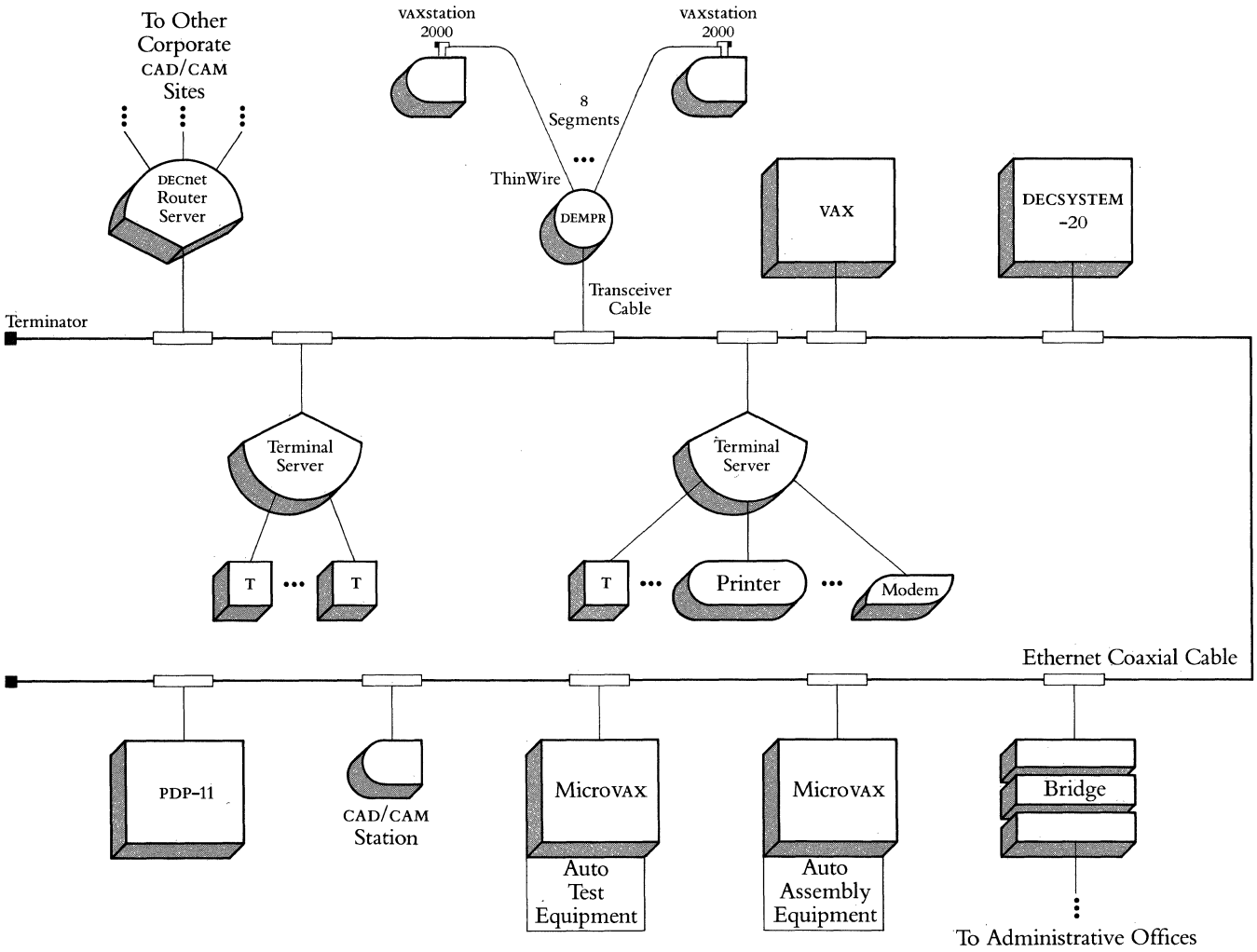


CAD/CAM Applications

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

Figure 2.9 depicts an engineering department using Ethernet to connect a number of workstations to CAD/CAM hosts. The workstations are connected to a segment of ThinWire Ethernet cable, which 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.

Figure 2.9
Baseband Ethernet
CAD/CAM Application



Hospital Applications

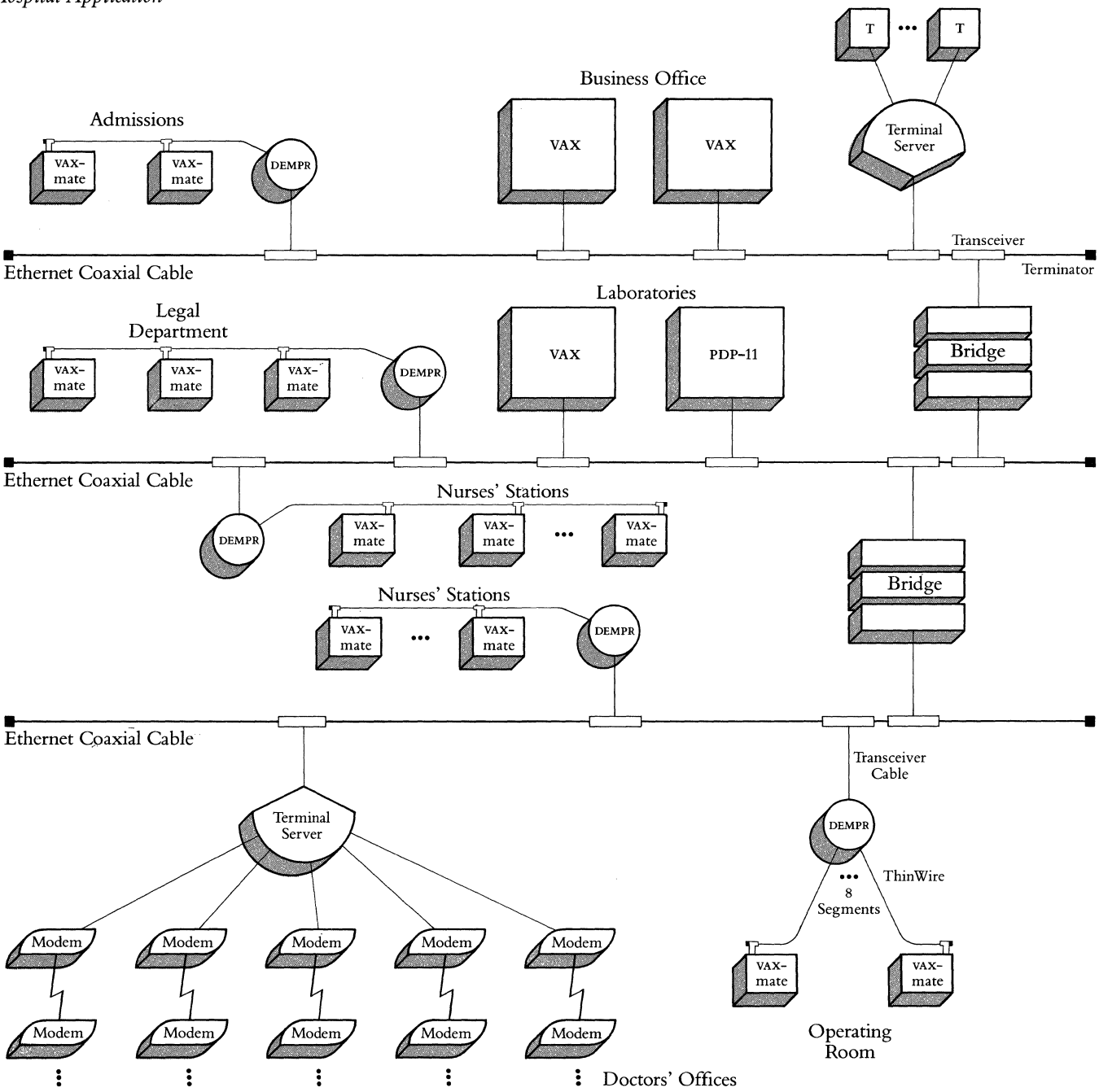
Connection of testing and laboratory computers to a hospital's central computer and to a number of remote monitoring stations requires a high-speed network. With Ethernet's high data transfer rate, even remote access to full-color bit-maps, such as CAT scans, is practical.

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

Figure 2.10 depicts an 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 Ethernet, which provides flexibility in configuration.

Figure 2.10 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.

Figure 2.10
Baseband Ethernet
Hospital Application

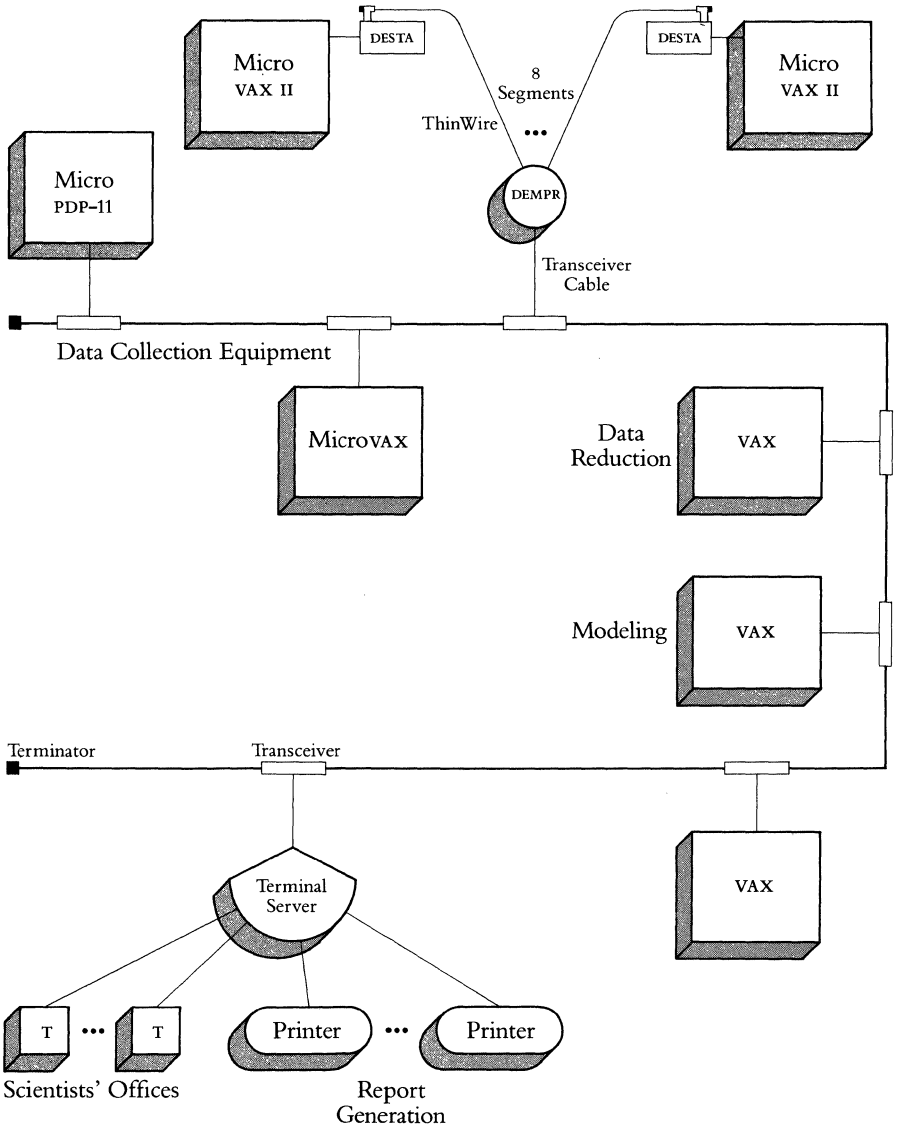


Laboratory Applications

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. The MicroVAX II computers are connected to a single segment of ThinWire Ethernet cable, which provides a cost-effective link to the high-speed devices.

Figure 2.11 illustrates how various laboratory computers and other resources are typically connected by Ethernet.

Figure 2.11
Baseband Ethernet
Laboratory Application

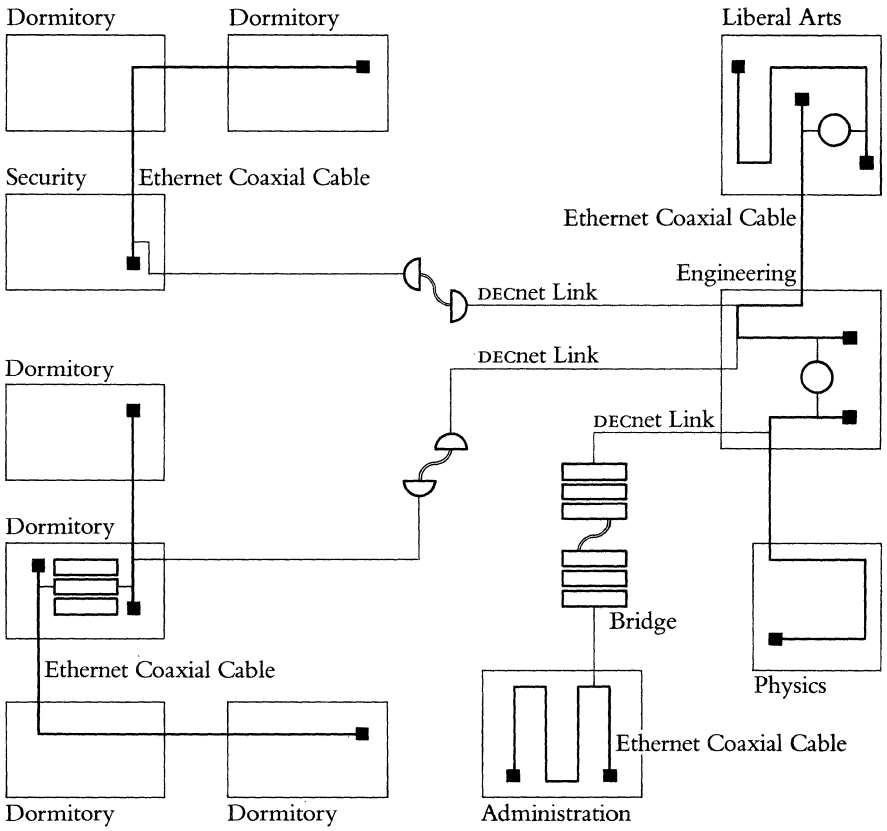


University Applications

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

Figure 2.12 illustrates an Ethernet application used in a university system. Note that bridges isolate local traffic on segments from local traffic throughout the rest of the university.

Figure 2.12
Baseband Ethernet
University Application



Typical Broadband Ethernet Applications/Installations

Along with the Ethernet channel, the broadband network can be used to distribute 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. Examples of some of these follow.

- Corporate Offices
  Fortune 500 customers can distribute services such as corporate teleconferencing, security monitoring, and employee video training along with their Ethernet channel onto a Broadband LAN. Among a wide variety of applications, energy management and building access control can use the 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.

- Plant Environment
  Industries, such as auto or aviation manufacturing, can use the broadband network to monitor a variety of data collection stations. The 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 Ethernet can coexist with MAP.

- University Campus
  Broadband is 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 Ethernet channel can provide access to important educational tools and a variety of databases, while sharing the cable with applications like video training seminars. In addition, by wiring classrooms and dormitories with the broadband coaxial cable, universities can also connect the growing number of personal computers via the 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 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, all it requires is one broadband cable.

Baseband Ethernet/IEEE 802.3 Products

Introduction

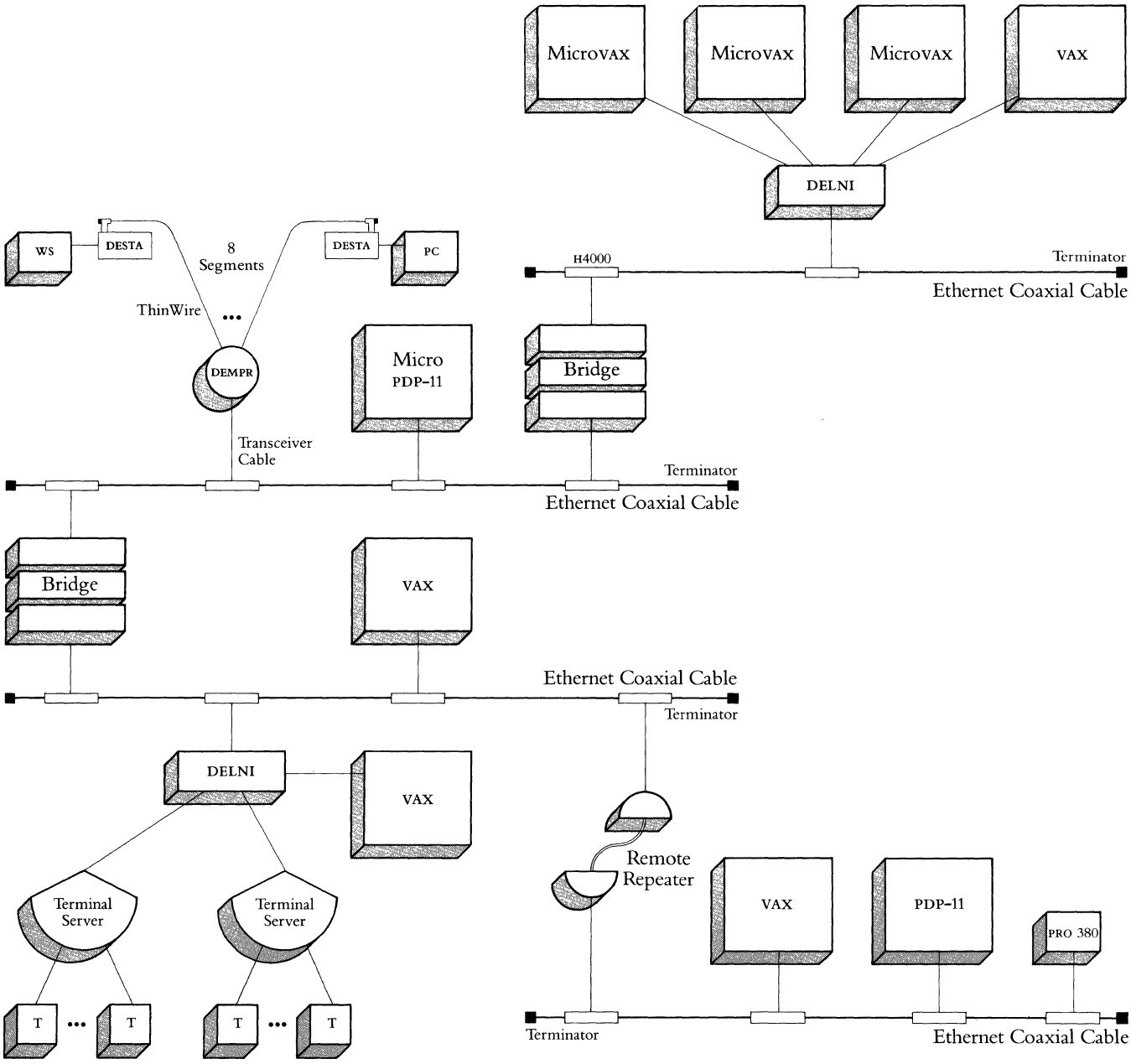
The incorporation of the Ethernet local area network technology into DECnet Phase IV demonstrates Digital's commitment to providing a complete set of products to address local area networking needs. Ethernet has been developed and designed specifically for the kinds of communications and resource sharing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

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

Ethernet hardware products combine to create a physical channel over which the DECnet and Ethernet protocols are implemented. Baseband Ethernet/IEEE 802.3 products currently available include the ThinWire Ethernet Products, Ethernet Coaxial Cable, the Transceiver Cable, connectors, terminators, Etherjack, the Local Network Interconnect (DELNI), the Ethernet Transceiver (H4000), the Ethernet Repeaters (DEREP), the Ethernet Communications Controllers, LAN Bridge products, and TransLAN.

Ethernet Communications Servers currently available include the DECserver 200, MUXserver 100/DECmux II, DECnet Router Server, DECrouter 200, DECnet/X.25 Gateway, and DECnet/SNA Gateway.

Figure 2.13
Baseband Ethernet Products



Ethernet Baseband Coaxial Cable

Ethernet baseband coaxial cable is the main transmission medium of an Ethernet baseband network. Coaxial cable is available in four standard lengths (sections). Sections can be joined using barrel connectors to create segments up to 500 meters (1,640 feet) long. Ethernet LANs can be extended beyond 500 meters by adding Ethernet Repeaters. Refer to Ethernet Configuration Guidelines in this section for more detailed information.

- The coaxial cable segments are premarked for transceiver placement at 2.5-meter (8.2-foot) intervals providing easy installation.
- Teflon™-insulated 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 Teflon-insulated 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 when burned.
- High immunity to electrical noise allows the coaxial cable to be used in a variety of environments.
- Preinstalled connectors on coaxial cable ends make terminators and barrel connectors easy to install.

Table 2.2
Ethernet Baseband Coaxial Cable Order Codes

Option	Order Code
Teflon Coaxial Cable:	
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
PVC Coaxial Cable:	
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

Fiber optic cable consists of optical fibers made of plastic or glass, allowing the cable to serve as a very-high-performance transmission medium in certain applications. Digital offers a general-purpose fiber optic cable suitable for use inside a building where the cable will not be routed through air plenums. This type of fiber optic cable can also be used in conduit between buildings where the environmental conditions of temperature and humidity do not exceed the cable specifications. Fiber optic cable is used with the remote LAN Bridge 100 and remote Ethernet Repeater.

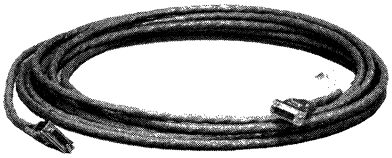
The operating temperature of general purpose fiber optic cable ranges from 0°C to 70°C with humidity conditions up to 95% noncondensing.

Digital fiber optic cable certification is needed to assess proper connectivity. The installation must also meet acceptable attenuation limits. Your Digital Field Service Network Planning Consultant can provide this service. Refer to Ethernet Configuration Guidelines in this section, and Section 7, Network Services, for more detailed information. For additional information regarding fiber optic cable certification, refer to *The Ethernet Installation Guide,* Volume II, Appendix A.

Table 2.3
Fiber Optic Cable Order Codes

Option	Order Code
General-purpose Fiber Optic Cable:	
15 m (49.2 ft) long	BN25B-15
30 m (98.4 ft) long	BN25B-30
60 m (196.8 ft) long	BN25B-60
90 m (295.2 ft) long	BN25B-90
150 m (492.0 ft) long	BN25B-A5
300 m (984.0 ft) long	BN25B-C0
500 m (1,640.5 ft) long	BN25B-E0
750 m (2,460.0 ft) long	BN25B-H5
1,000 m (3,280.0 ft) long	BN25B-L0

Transceiver Cable



A transceiver cable connects the H4000 Transceiver or the Local Network Interconnect (DELNI) to an Ethernet communications controller, Broadband Ethernet Transceiver (DECOM), or Ethernet 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 a jacket of either Teflon or PVC (polyvinyl chloride). Teflon-insulated 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 Ethernet networks or IEEE 802.3 networks use BNE3H, K, L, or M series cable.

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 an H4000 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 since 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- or Teflon-insulated transceiver cable by a factor of four (for example, two meters, or 6.6 feet, of office transceiver cable is electrically equivalent to eight meters, or 26.2 feet, of standard transceiver cable). Since 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 Ethernet networks or IEEE 802.3 networks use BNE4C or D series cable.

Table 2.4
Transceiver Cable and Office Transceiver Cable Order Codes

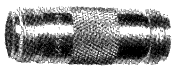
Option	Order Code
Transceiver Cable with PVC Insulation, Straight Connectors:	**Standard Ethernet or IEEE 802.3**
5.0 m (16.4 ft) long	BNE3H-05
10.0 m (32.8 ft) long	BNE3H-10
20.0 m (65.6 ft) long	BNE3H-20
40.0 m (131.2 ft) long	BNE3H-40
Transceiver Cable with PVC Insulation, Right-angle Connectors:	
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
Transceiver Cable with Teflon Insulation, Straight Connectors:	
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
Transceiver Cable with Teflon Insulation, Right-angle Connectors:	
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
Office Transceiver Cable with PVC Insulation, Straight Connector:	
2 m (6.6 ft) long	BNE4C-02
5 m (16.4 ft) long	BNE4C-05
Office Transceiver Cable with PVC Insulation, Right-angle Connector:	
2 m (6.6 ft) long	BNE4D-02
5 m (16.4 ft) long	BNE4D-05

Coaxial Cable Connectors and Terminators

Digital sells Ethernet Coaxial Cable sections with connectors at each end of the cable. Coaxial cables can be ordered separately, with end connectors purchased later.

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

Barrel Connectors



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

Terminators

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

Ground Clamp

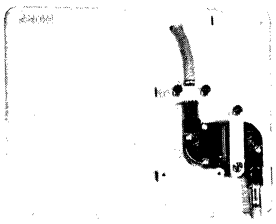
Each Ethernet Coaxial Cable segment requires one ground connection in each building the segment passes through. Also, the ground clamp provides grounding for each ThinWire segment with a DEMPR.

Ethernet Turnaround Connector

The Ethernet Turnaround Connector (H4080) 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 Ethernet Turnaround Connector consists of a transceiver installed on a short length of coaxial cable. Both ends of the Ethernet Turnaround Connector's coaxial cable are terminated. The Turnaround Connector is attached to the transceiver cable that 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 onto the Ethernet cable. The Turnaround Connector tests the controller and the transceiver cable that will connect it to the Ethernet.

Etherjack (DEXJK)



The Etherjack (DEXJK) is a device for mounting cable connectors. Cables can be run either along a wall-base 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 H4000 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.

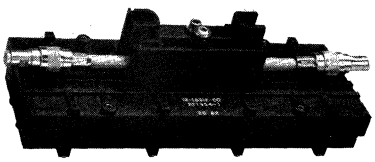
Ethernet Transceiver Installation Tool Kit

Self-installation of an H4000 Transceiver requires the Ethernet Transceiver Installation Tool Kit (12-24664-02).

Table 2.5
Additional Baseband Ethernet Product Order Codes

Option	Order Code
Ethernet coaxial cable barrel connector	12-19817-01
Ethernet coaxial cable terminator	12-19816-01
Ethernet ground clamp	12-21766-01
Ethernet turnaround connector	H4080
Ethernet transceiver cable straight angle connector kit	H4054-00
Ethernet transceiver cable right angle connector kit	H4055-00
Etherjack	DEXJK
Ethernet Installation Tool Kit (H4000)	12-24664-02

Baseband Ethernet Transceiver (H4000)



The Ethernet Transceiver (H4000) provides the functional interface between network nodes and the Ethernet coaxial cable. It sends signals over the cable, receives signals from the cable, and detects message collisions that occur. The H4000 uses a unique tapping mechanism for the physical connection to the cable so that cutting the cable (and interrupting traffic on the network) is not required. The H4000 can be customer-installed using the Ethernet Installation Tool (see appropriate product description). The H4000 Transceiver is used in conjunction with an Ethernet communications controller at the host system. The transceiver cables must be ordered separately (see appropriate product description).

Features

- The transceiver clamps onto the Ethernet coaxial cable without cutting it, allowing the unit to be installed, repaired, or removed without interrupting network operation.
- Simple installation and replacement procedures make for quick and easy network reconfiguration. Network devices can be added to or removed from the network easily.
- Redundant protective circuitry, high noise immunity, and an internal self-test make the H4000 a highly reliable physical channel, reducing maintenance cost.
- The continuous message loopback feature simplifies and speeds fault isolation, reducing maintenance time and cost.
- The U.L.-approved, rugged, insulated housing allows the H4000 to be installed in environmental airspace without conduits.
- New drop-in signal probe makes maintenance quicker, easier, and less expensive.

Specifications

Physical Size:
Length: 30.2 cm (11.9 in)
Width: 9.5 cm (3.74 in)
Height: 9.0 cm (3.54 in)
Weight: 1.1 kg (2.5 lbs)

Power Requirements:
Voltage required at transceiver:
11.4 to 15.75 Vdc through 4 ohms
at maximum distribution impedance
Maximum current: 0.50 A
Typical current: 0.35 A

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

Table 2.6
H4000
Order Codes

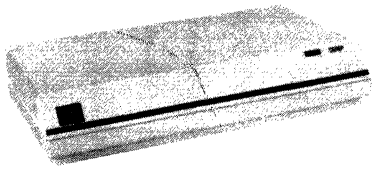
Option	Order Code
Ethernet transceiver	H4000
Ethernet transceiver (for use with a ThinWire DELNI/DEMPR combination)	H4000-BA

Installation in Environmental Airspace

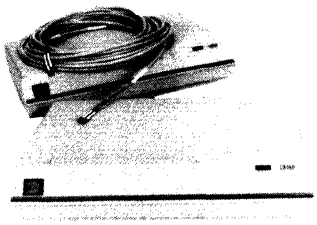
Commercial buildings commonly have drop ceilings. The space between the drop ceiling and the floor above is called environmental airspace. Environmental airspace is often used for return air for heating and air conditioning systems (called return airspace) and to run wiring, such as coaxial cable. Equipment 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 U.L. must be placed in a conduit when installing it in return airspace.

Digital's Teflon-insulated cable and the H4000 are approved by the U.L. 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 U.L. approval.

Ethernet Repeaters (DEREP)



Local Ethernet Repeater (DEREP-AA)



Remote Ethernet Repeater (DEREP-RA)

The Ethernet Repeater (DEREP), a tabletop, standalone device, connects up to three segments of Baseband Ethernet coaxial cable to extend an Ethernet LAN beyond the 500-meter (1,640 feet) single coaxial cable segment. Each repeater can add a segment of coaxial cable up to 500 meters (1,640 feet) long on which 99 additional (100 total) H4000 Transceivers can be installed. The local repeater is used to connect two coaxial cable segments no more than 100 meters (328 feet) apart, while the remote repeater (fiber optic) connects two coaxial cable segments up to 1,000 meters (3,280 feet) apart. The repeater retimes, amplifies, and repeats all signals it receives from one coaxial cable segment and passes the signal to the next segment.

The Ethernet Repeater cannot be used in Broadband Ethernet networks, or between Baseband and Broadband Ethernets. Repeaters cannot be directly connected to DELNIS.

Local repeaters are connected to the Baseband Ethernet via two H4000 Transceivers and two transceiver cables. The remote (fiber optic) repeater has two versions:

- Two local repeaters each with a fiber optic interface board. (DEREP-RA or RB).
- One local repeater with a fiber optic interface board (DEREP-RC or RD) for use with a fiber optic LAN Bridge 100.

The fiber optic cable (BN25B) for the remote repeater must be ordered separately.

Features

- The repeater connects segments of coaxial cable, increasing the length of an Ethernet LAN and the number of devices supported.
- Because the repeater connects to an H4000 Transceiver, installation does not interrupt network operation.
- Repeaters can be installed and maintained by the customer, thus reducing cost.
- Repeaters contain an internal self-test feature that simplifies fault isolation, increases reliability, and reduces maintenance costs.
- The remote repeater (fiber optic) is not affected by electrical or electromagnetic interference and is protected from moisture. This provides 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 will automatically not repeat 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 remote repeater assist in network troubleshooting.
- A second local repeater can be configured into the network providing automatic backup for any single local repeater, increasing network availability.

Figure 2.14 illustrates a local and remote Ethernet Repeater configuration.

Figure 2.14 Local and Remote Ethernet Repeater Configuration

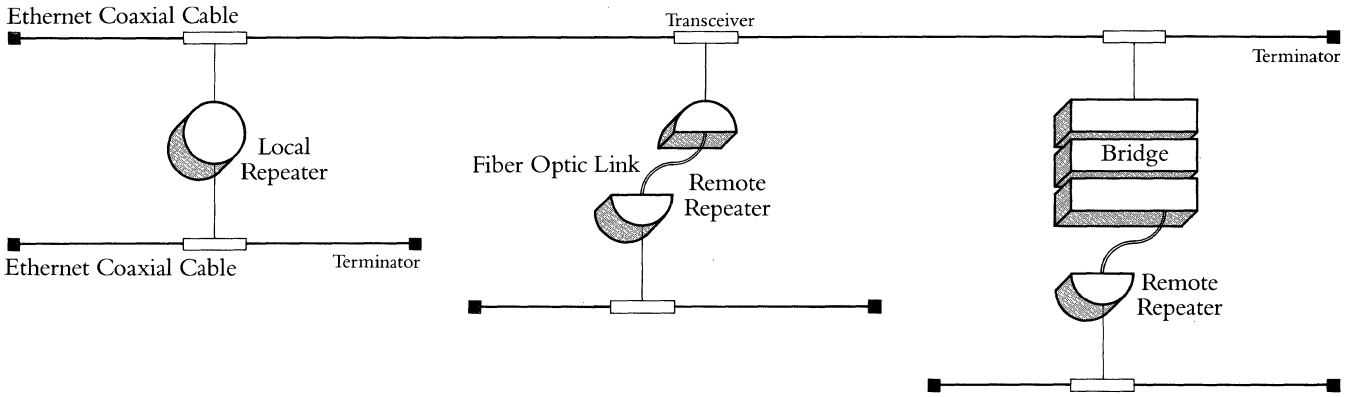


Table 2.7 Ethernet Repeater Order Codes

Option	U.S. Order Codes	Non-U.S. Order Codes
Local Repeater	DEREP-AA	DEREP-AB
Remote Repeater (two boxes)	DEREP-RA	DEREP-RB
Remote Repeater (single box)	DEREP-RC	DEREP-RD

Specifications

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

Power Requirements:
110 Vac, 60 Hz or 220 Vac, 50 Hz (switch-selectable)

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

DEREP Country Kits

The non-U.S. versions of both the local and remote repeaters require country kits. (U.S. versions do not require a country kit.) Each kit contains installation instructions and a power cord. Non-U.S. local repeaters require one country kit, and non-U.S. remote repeaters require two. For cases where the country in which the repeater is to be used is not listed, select a country kit that uses the same plug configuration.

Table 2.8
Ethernet Repeater
Country Kit Order Codes

Country Kits:	Local Repeater	Remote 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
Germany	DEREK-AG	DEREK-RG
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

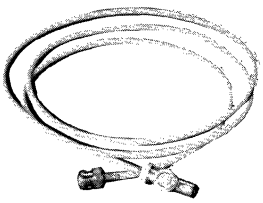
ThinWire Ethernet Products

Introduction

ThinWire Ethernet offers an alternative baseband cabling system that provides full Ethernet capability for personal computers, workstations, and low-end systems in offices and other local work areas. ThinWire Ethernet is a low-cost, flexible companion system to standard Ethernet that utilizes an industry standard cable to connect up to 30 stations in one 185 meter segment.

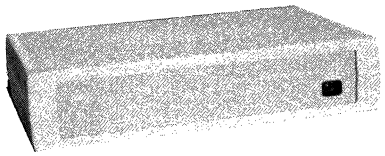
ThinWire Cable

Features



- ThinWire Ethernet cable is a thin, flexible, and easy to install coaxial cable, making it very suitable for work area installations.
- ThinWire Ethernet products are compatible with the IEEE 802.3 specification, which allows users greater capability to participate in multivendor Ethernet networks.
- Standard Ethernet devices may be connected to ThinWire Ethernet using a ThinWire Ethernet Station Adapter (DESTA). The DESTA is a compact, inexpensive IEEE 802.3 transceiver.
- A maximum of eight ThinWire Ethernet segments may be connected to a ThinWire Ethernet Multiport Repeater (DEMPR) to form a network of up to 232 stations. A Local Network Interconnect (DELNI) may be used to concentrate up to eight DEMPRs. These configurations can either stand alone or connect to the standard Ethernet using an H4000-BA Transceiver .

ThinWire Ethernet Multiport Repeater (DEMPR)



The DEMPR is a multiport device that provides eight ports for connection of eight ThinWire Ethernet segments, and one port for connection to an H4000 Transceiver. It can be used either as a standalone device (local) or it can be connected to a standard Ethernet (global). The DEMPR serves as a repeater between each of its nine ports. A DEMPR must be counted as a repeater when configuring a standard Ethernet network.

Each ThinWire Ethernet segment can be up to 185 meters in length (600 feet), and can accommodate connection of up to 29 stations, for a total of 232 stations per DEMPR.

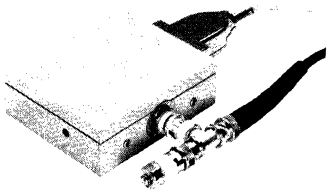
Eight DEMPRs can be connected to a Local Network Interconnect (DELNI). This configuration provides up to 64 cable segments for connection of up to 1,023 stations (Ethernet limit). This configuration, in turn, can be used either in a standalone network, or connected to a standard Ethernet. An H4000-BA Transceiver is required for connecting the DELNI in this configuration to a standard Ethernet cable.

Physical Size:
Length: 31.11 cm (12.25 in)
Width: 48.9 cm (19.25 in)
Height: 11.43 cm (4.5 in)

Power Requirements:	DEMPR-AA	DEMPR-AB
Nominal Voltage	100 to 120 Vac 3-wire single phase	189 to 240 Vac 1N + PE single phase
Frequency	47 to 63 Hz	47 to 63 Hz
Maximum current	0.83 Amp	0.42 Amp
Maximum power	40 watts	40 watts

Operating Environment: 5° to 50°C (41° to 122°F)
Relative Humidity: 10% to 90% (noncondensing)

ThinWire Ethernet Station Adapter (DESTA)



The ThinWire Ethernet Station Adapter (DESTA) allows connection of a single Ethernet station to ThinWire Ethernet cabling. The Station Adapter can be attached to Ethernet controllers designed to connect to standard Ethernet cable, allowing connection to ThinWire Ethernet. It also allows Digital's Ethernet Communications and Terminal Servers to connect to ThinWire Ethernet.

The DESTA has one 15-pin connector port that allows it to be mounted in or near the Ethernet station, and a second port for connection to the ThinWire Ethernet cable. It contains Ethernet transceiver (IEEE 802.3) logic, provides transceiver functions, and receives its power from the controller.

Specifications

Physical Size:
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
Voltage required at transceiver: −9
Maximum Current: 250 mA
Typical Current: 200–250 mA

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

ThinWire Ethernet Configuration Guidelines

For ThinWire Ethernet configuration guidelines, refer to "Planning a ThinWire Ethernet LAN" in *Ethernet Configuration Guidelines.*

ThinWire Ethernet and DECconnect

ThinWire Ethernet is the cable recommended for high speed data communications for the floor area portion of Digital's DECconnect Cabling System. Refer to Section 5 for more information about DECconnect and ThinWire Ethernet.

Table 2.9 ThinWire Ethernet Product Order Codes

Option	Order Code
ThinWire Ethernet Multiport Repeater	DEMPR-AA (120 V)
ThinWire Ethernet Multiport Repeater	DEMPR-AB (240 V)
ThinWire Ethernet Station Adapter	DESTA-AA
PVC cable with connectors and boots:	
3 feet	BC16M-3
6 feet	BC16M-6
10 feet	BC16M-10
15 feet	BC16M-15
30 feet	BC16M-30
ThinWire Ethernet PVC cable (1000′)	H8243-A
ThinWire Ethernet Plenum (Teflon) cable (1000′)	H8244-A
Male coaxial connectors and boots (12-25566-01)	H8222
T-connectors and boots (12-25534-01)	H8223
Barrel connectors and boots (12-25567-01)	H8224
Terminators and boots (12-25535-01)	H8225
Installation kit	H8242

DEMPR Country Power Cords

The non-U.S. version of the DEMPR (240V) requires a specific power cord for installation in individual countries.

Table 2.10
DEMPR Country Power Cord Order Codes

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

Broadband Ethernet Products

Overview

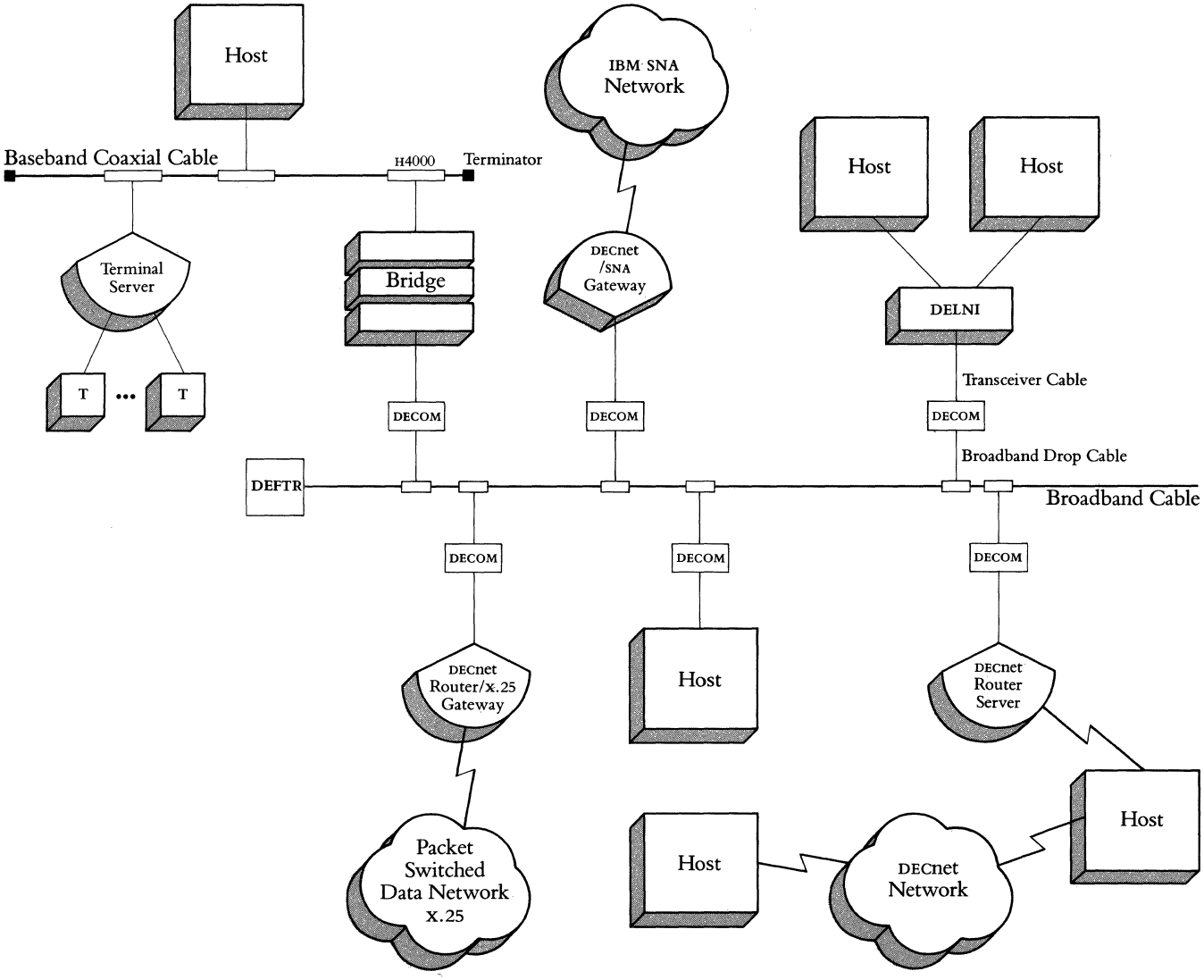
Ethernet on broadband is most often selected by customers who have multiple services to distribute over large local areas. Broadband networks use frequency division multiplexing to carry many channels on one wiring system, enabling customers to transmit data, video, and voice over the same cable, simultaneously. The broadband cable and components are the same as those used for cable TV. Digital Network Services provides design, installation, and on-going network maintenance and serves as the customer's single point of contact for the broadband network, Digital hardware and software products, and qualified vendor products.

Ethernet on broadband is an extension of what Digital has done with Ethernet on baseband, the first form of media available for 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 file transfers and high-resolution graphics displays, and for transmitting text, electronic mail, and facsimile data. The broadband Ethernet transceivers use the same controllers and DECnet Phase IV software as baseband. In addition, the broadband transceiver is used in conjunction with the DELNI, and the same bridges, routers, gateways, terminal servers, and communications servers as Baseband Ethernet networks. Note that the transceiver cable is the same as for baseband.

Repeater Restrictions

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

Figure 2.15
Broadband Ethernet
Configuration



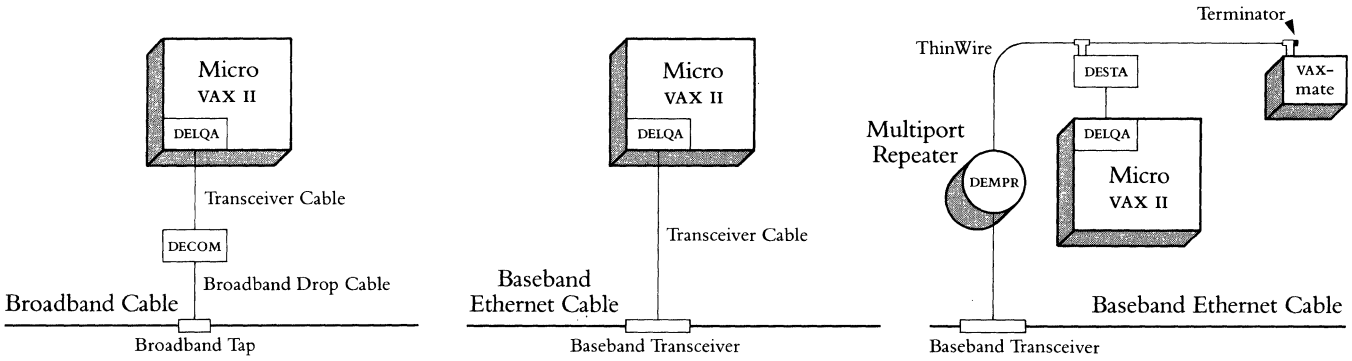
Broadband Ethernet Products

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

Broadband	Baseband	ThinWire
Packets are transmitted by a Broadband Ethernet Transceiver.	Packets are transmitted by an H4000 Transceiver.	Packets are transmitted by a built-in DESTA transceiver.
Broadband Ethernet can share the cable with many other independent channels, such as video, data, and voice.	Baseband Ethernet is the only channel on the cable.	Baseband Ethernet 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 DEMPR. ThinWire cable connects devices to the DEMPR.*

*ThinWire is also available in standalone configurations. Refer to *Ethernet Configuration Guidelines* in this section for more information.

Figure 2.16
Broadband, Baseband and ThinWire Cable Connection Comparison



Digital's Broadband Ethernet products implement an Ethernet channel for both single and dual cable broadband LANs. As previously noted, almost all of the 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.
- UNIBUS, (DELUA), Q-bus, (DELQA), Professional 300 Series (DECNA), and KL10-based (NIA20) Ethernet controllers.
- Local Network Interconnects (DELNI).
- Communications servers (Routers, Terminal Servers, and Gateways).
- LAN Bridge 100.

For more detailed information about these products, refer to the appropriate sections of this guide.

Broadband-specific Ethernet Products

Digital offers a complete set of Ethernet hardware and software products that are baseband and broadband compatible. Two products have been specifically created for the broadband environment. These are the Broadband Ethernet Transceiver (DECOM) and the Broadband Ethernet Frequency Translator (DEFTR). Both devices can be used with the Digital networking products originally developed for Baseband Ethernet LANs, with the exception of the Ethernet Repeater (DEREP).

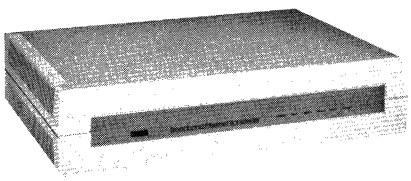
Digital's Third-Party Program has qualified two products that incorporate additional multivendor services for use with Broadband Ethernet LANs. The products, the Ethermodem™ and the Frequency Translator, are available through CHIPCOM™ Corporation in most European countries. Note: Customers must use DECOMs or Ethermodems but not both, since they are not designed to coexist on the same cable. The figure below provides a guide for choosing between the products.

Table 2.11
DECOM and Ethermodem Comparison

DECOM	Chipcom Ethermodem
Coexists with one MAP channel	Coexists with up to three MAP channels
One port modem	Two port modem
One set of hardware transmit and receive signals	Several fixed frequency sets
Mid split configuration	Mid or high split configuration
Single and dual cable	Single and dual cable
3800m station-to-station	3800m station-to-station

In addition, Ethermodem is 802.3 compliant and coexists with Ethernet, MAP, IBM PC NET, or Sytek LocalNet 20.™
Single-cable DECOM installations require a DEFTR.
Single-cable Ethermodem installations require a CHIPCOM Frequency Translator.

Broadband Ethernet Transceiver (DECOM)

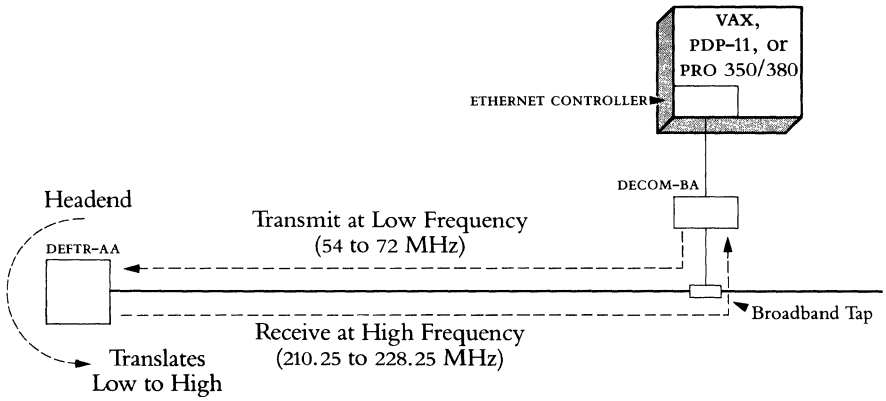


The Broadband Ethernet Transceiver is both the physical and electrical interface to the broadband coaxial cable. The transceiver transmits signals to and receives signals from systems connected to it and detects message collisions. DECOM is the broadband equivalent of the H4000 (Baseband) Transceiver and uses the same transceiver cable as the H4000. The DECOM can be conveniently mounted on a shelf or placed on a table top.

Because there are two types of Broadband Networks—single cable and dual cable—Digital has created two versions of the Broadband Transceiver. The single-cable transceiver (DECOM-BA) transmits at 54 to 72 megahertz and receives at 210.25 to 228.25 megahertz. This transceiver requires a frequency translator (DEFTR) at the headend of the network to convert the Broadband Ethernet signals from their transmit to their receive frequencies.

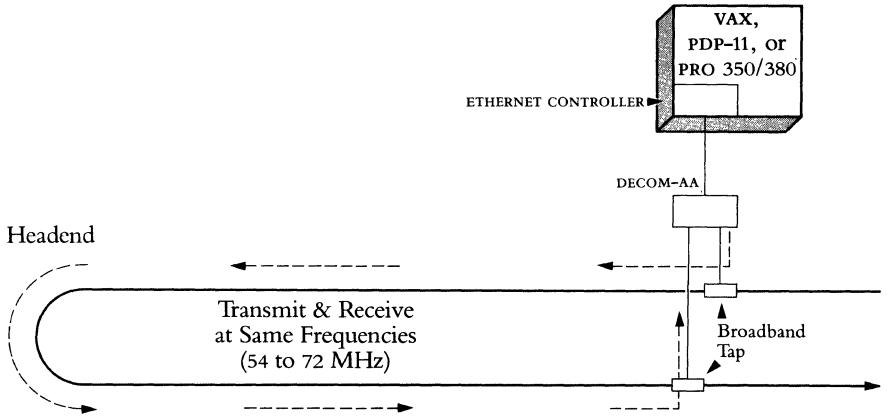
The dual-cable transceiver (DECOM-AA) transmits and receives the Ethernet signals at the same frequencies, from 54 to 72 megahertz. For this version of the transceiver, a frequency translator is not required at the network headend.

Figure 2.17
Single-cable
Broadband Transceiver



DECOM-BA and DEFTR-AA are used together in single-cable broadband networks.

Figure 2.18
Dual-cable
Broadband Transceiver



Features

- Redundant protective circuitry makes the transceiver a reliable physical channel device. Failures are confined to a single transceiver, preventing the entire network from going down.
- Internal self-test and loop-back capabilities allow speedy diagnosis of problems and easy fault isolation.
- Diagnostic indicator lights help to verify correct configurations, check out equipment, and solve any faults. Customers can install transceivers themselves.
- Adjustments at installation are unnecessary. The design of the transceiver allows it to operate successfully in a wide range of cable environments.
- The transceiver does not interfere with other channels operating on the network because its transmissions are well-contained within its specific bandwidth.
- Because collisions are seen by all receiving transceivers, the Ethernet channel can be monitored at any Ethernet node.
- Transceiver can be mounted on a shelf or located on a table-top.

DECOM Specifications

Physical Size:
Length: 32.08 cm (12.63 in)
Width: 48.89 cm (19.25 in)
Height: 10.69 cm (4.21 in)
Weight: 6.21 kg (13.7 lb) DECOM-AA
6.44 kg (14.2 lb) DECOM-BA

Power Requirements:
115 V ac, 60 Hz or 230 V ac, 50 Hz

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

Transmitter Output Level: 50 ± 2 dBmV
Receiver Level Range: −3 dBmV to +15 dBmV

Table 2.12
DECOM Order Codes

Option	U.S. Order Codes	Non-U.S. Order Codes
Broadband Ethernet Transceiver (dual cable)	DECOM-AA	DECOM-AB
Broadband Ethernet Transceiver (single cable)	DECOM-BA	DECOM-BB

DECOM Country Kits

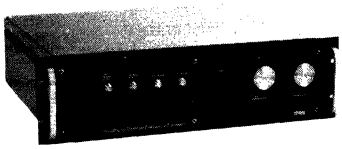
Transceiver cable is not supplied with the DECOM Transceiver and must be ordered separately. The H4000 Transceiver and DECOM use the same transceiver cables (see the appropriate product description).

The U.S. version of the DECOM Transceiver does not require a country kit. The U.S. version includes the required power cord and user manual. The non-U.S. version includes the user manual (in English) and requires one country kit. Order the appropriate country kit for the power cord.

Table 2.13
DECOM Country Kit Order Codes

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

Broadband Ethernet Frequency Translator (DEFTR)



The Broadband Ethernet Frequency Translator (DEFTR) is located at the network headend making bidirectional communication on the Ethernet channel possible in single-cable broadband LANs. The DEFTR receives all Ethernet signals transmitted by systems connected to the network by DECOM, translates them, and retransmits them at the appropriate DECOM receive frequencies. The Frequency Translator has a highly reliable design for consistent availability of the Ethernet channel and front panel monitors that help customers isolate and diagnose both headend and transceiver problems. Customers have the option of configuring two translators in parallel when redundancy is required.

Specifications

Physical Size:
Width (rack mountable):
43.2 cm (17 in)
Height: 13.3 cm (5.25 in)
Depth: 38.9 cm (15.13 in)
Weight: 9.1 kg (20 lbs)

Power Requirements:
Switch-selectable:
115 V ac, 60 Hz or 230 V ac, 50 Hz
Input Range: 54–72 MHz
Output Range: 210.25–228.25 MHz

Effective Frequency Translation: 156.25 MHz
Nominal Bandwidth: 18 MHz
Maximum Output: 63 dBmV
Gain: 56 ± 2 dB

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

Table 2.14 Broadband Ethernet Frequency Translator Order Codes

Option	U.S. Order Codes	Non-U.S. Order Codes
Broadband Ethernet Frequency Translator	DEFTR-AA	DEFTR-AB

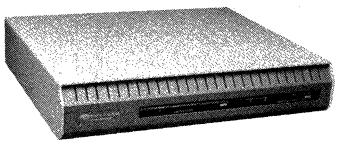
DEFTR Country Kits

The U.S. version of the Broadband Ethernet Frequency Translator (DEFTR) does not require a country kit. The U.S. version includes the required power cord and the user manual. The non-U.S. version of the DEFTR includes the user manual (in English) and requires one country kit. Order the appropriate country kit to the power cord.

Table 2.15 Broadband Ethernet Frequency Translator Country Kit Order Codes

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

Chipcom Ethermodem™ Series



The Chipcom two-port Ethermodem links baseband 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 Mbps performance and are transparent to higher level network software such as DECnet, TCP/IP, and XNS. Contact your local Digital sales representative for ordering and service information.

The DELNI, DEREP repeater, and DEMPR ThinWire repeater should not be used with the Ethermodem as this is an unsupported configuration. Chipcom and Digital broadband products can neither communicate nor coexist on the same broadband cable due to frequency conflicts.

Features

- IEEE 802.3 and Ethernet V2.0 compatible.
- 10 Mbps CSMA/CD performance with full collision enforcement.
- Multiple frequency ranges to allow greater flexibility when configuring with MAP, IBM™ PC network, and SYTEK™ services.
- Functions in either mid-split or high-split single cable networks.
- 3800m 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.
- On-board self-test, digital and RF loopback.
- Can be rack or shelf mounted.

Non-U.S. Orders

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

Specifications

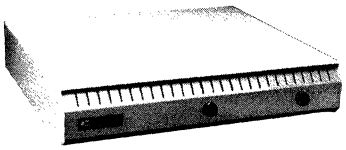
Physical Size:

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 lbs)

Power Requirements:

Power source: 115/220 Vac
Frequency tolerance: 50/60 Hz ± 10%
Maximum AC watts drawn: 40 W
Power connector: IEC male
Transmitted power: 50 dBmv ± 2 dB, 56 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



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 Size:

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 lbs)
Mounting: 48.26 cm (19.0 in) standard rack

Power Requirements:

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

Translation frequency: 192.25 MHz ± 25 KHz
Nominal bandwidth: 18 MHz
Gain: 55 ± 2 dB

Baseband/Broadband Ethernet Products

Introduction

The next three sections describe a variety of products which are compatible with both Baseband and Broadband Ethernet. These products include the DELNI, communications controllers, LAN Bridge 100, routers, gateways, and terminal servers. Although the text and figures primarily depict baseband configurations, they can easily be converted to illustrate broadband. The major difference between the two is the use of different transceivers, the H4000 for baseband and DECOM or Ethermodem for broadband. For configuration information, including distance requirements, refer to Ethernet Configuration Guidelines at the end of this section.

Transceiver Cable

A transceiver cable connects the H4000 Transceiver or the Local Network Interconnect (DELNI) to an Ethernet Communications Controller.

This cable is also used to connect the DECOM Broadband Ethernet Transceiver to an Ethernet Communications Controller, Local Network Interconnect (DELNI), or LAN Bridge 100.

See the Transceiver Cable product description in Baseband Ethernet Products for specific information.

Local Network Interconnect (DELNI)

The Local Network Interconnect (DELNI) is a low-cost, table top 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 the device is connected to the Ethernet through an H4000 or DECOM 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.

Figure 2.19 illustrates the standalone configuration that supports up to eight systems using standard Ethernet transceiver cables.

Figure 2.20 illustrates the hierarchical standalone configuration that supports a combination of DELNIs and devices using standard transceiver cables. Hierarchical standalone configurations are not connected to the Ethernet coaxial cable.

Figures 2.21 and 2.22 illustrate the connected configuration that supports up to eight devices using standard Ethernet transceiver cable. This configuration is connected to the Ethernet coaxial cable via H4000 Transceivers and transceiver cable. For specific distance requirements for baseband or broadband, refer to Ethernet Configuration Guidelines at the end of this section.

The DELNI can also be used in ThinWire Ethernet configurations to concentrate up to eight DEMPRs. Refer to *ThinWire Ethernet IEEE 802.3 Products* in this section or Section 5 for more information.

Features

- A connected DELNI LAN reduces the cost of multiple connections to the Ethernet coaxial 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 coaxial cable and H4000 Transceivers in very small networks.
- Transceiver cable wiring to a centrally located DELNI offers added 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.

Figure 2.19
DELNI Standalone Configuration

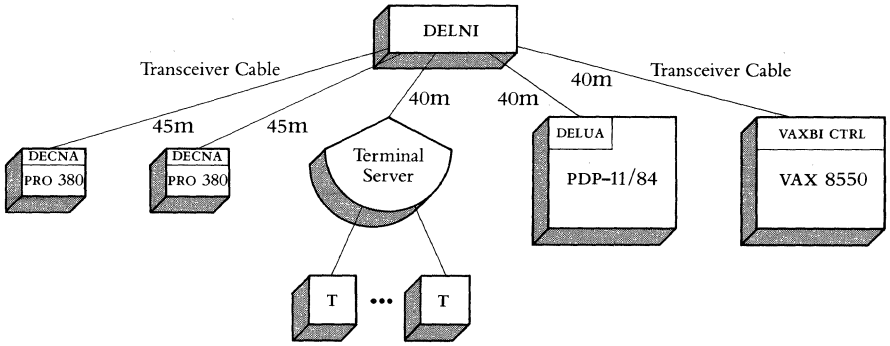


Figure 2.20
DELNI Hierarchical Standalone Configuration

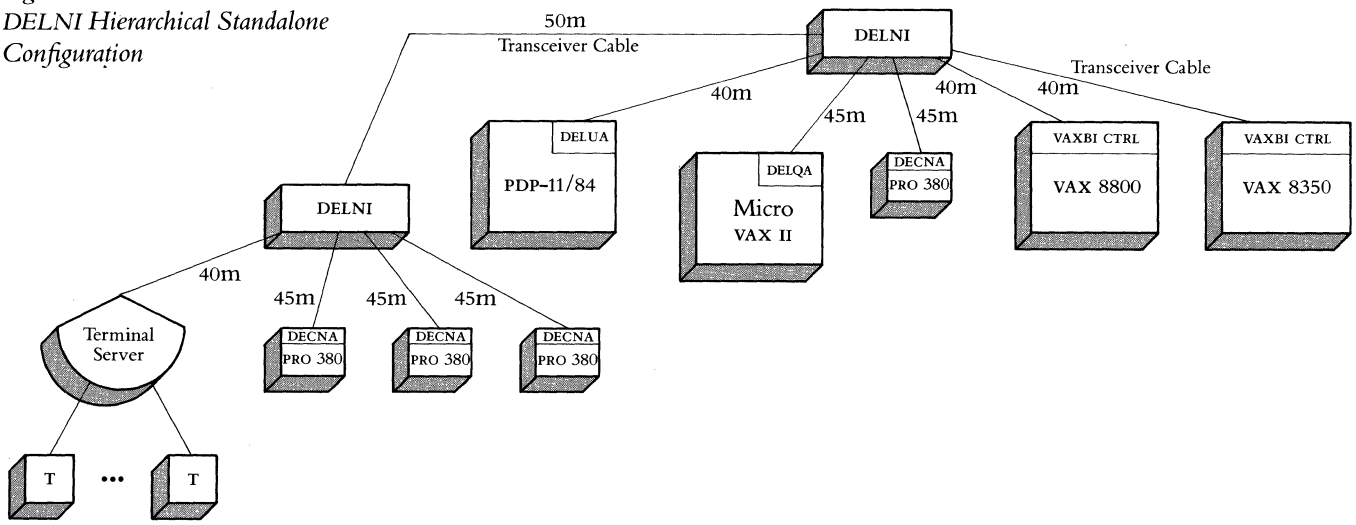
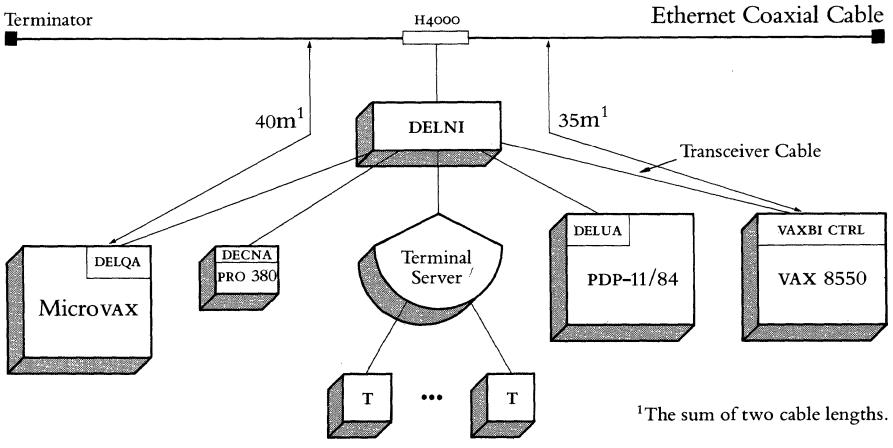


Figure 2.21
DELNI Connected Configuration



[1]The sum of two cable lengths.

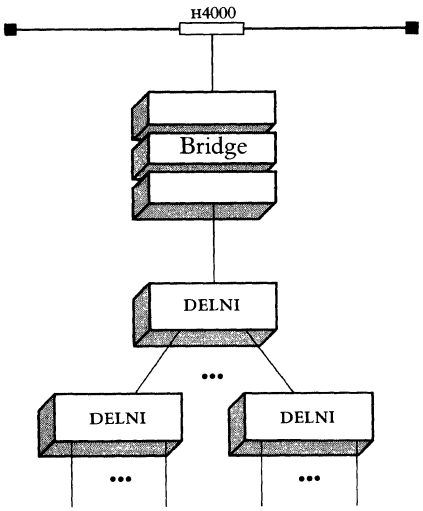


Figure 2.22
DELNI Hierarchial Connected Configuration

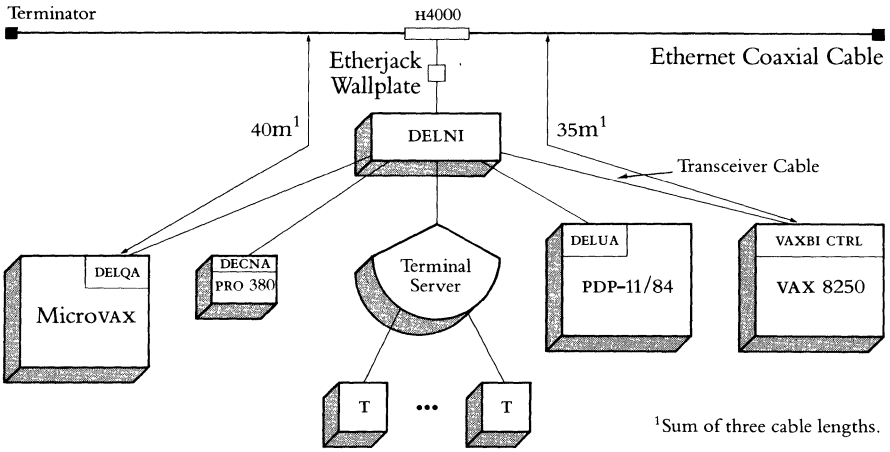


Figure 2.23
DELNI Connected Configuration Using an Etherjack

Specifications

Physical Size:
Length (rack mount): 44.5 cm (17.5 in)
Length (with cover): 48.9 cm (19.25 in)
Width (rack mount): 17.8 cm (7.0 in)
Width (with cover): 19.7 cm (7.75 in)
Height (rack mount): 6.4 cm (2.5 in)
Height (with cover): 8.9 cm (3.5 in)
Weight: 6.4 kg (14.0 lbs)

Power Requirements:
Switch-selectable:
120 V or 240 V, 47–63 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: Class C (Refer to Appendix B for details.)

Table 2.16
DELNI Order Codes

Option	U.S./Canada Order Code	Non-U.S./Canada Order Code
Local Network Interconnect	DELNI-AA	DELNI-AB

DELNI Country Kits

The U.S. versions of the Local Network Interconnect do not require country kits. Each non-U.S. version of the Local Network Interconnect (DELNI) requires one country kit. Each kit contains installation instructions and a power cord. For cases where the country in which the DELNI is to be used is not listed, select a country kit that uses the same plug configuration. An Ethernet communications controller in each node and a transceiver cable to connect each controller to the DELNI are also required. For DELNI-connected configurations, an H4000 Transceiver and transceiver cable are needed. See Ethernet Configuration Guidelines in this section for DELNI-connected configurations in Broadband Local Area Networks.

Table 2.17
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
Germany	DELNK-AG
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

Ethernet Communications Controllers

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

- The DECNA, which connects Professional 300 series systems to standard Ethernet cable
- The DELUA, which connects UNIBUS systems to standard Ethernet cable
- The DEPCA, which connects the IBM PC, PC/XT, and Personal Computer AT to ThinWire Ethernet cable
- The DELQA, which connects Q-bus systems to standard Ethernet cable
- The DESVA, which connects MicroVAX 2000 and VAXstation 2000 systems to ThinWire Ethernet cable
- The NIA20, which connects DECsystem-10s and DECSYSTEM-20s to standard Ethernet cable

Controllers designed for standard Ethernet cable connect to the cable via an H4000 transceiver or a Local Network Interconnect (DELNI). They can connect to ThinWire Ethernet cable via a ThinWire Ethernet station adapter (DESTA).

Controllers designed for ThinWire Ethernet cable connect to the cable via a BNC connector. They can connect to standard Ethernet cable via a ThinWire Ethernet Multiport Repeater (DEMPR), which then connects to the H4000 or DELNI. With the addition of an optional DEPCA-AU adapter, the DEPCA can connect to standard Ethernet cable (via the H4000 or DELNI) without going through a DEMPR.

Table 2.18
Ethernet Communications Controllers

	DECNA	DELUA	DEPCA	DELQA	DESVA	NIA20
Bus	PRO300 series bus	UNIBUS	IBM PC-bus	Q-bus	MicroVAX 2000 and VAXstation 2000 bus	CBUS
Number of lines	1	1	1	1	1	1
DMA	YES	YES	YES	YES	YES	YES
Maximum speed (consult SPD)	10 Mb/s	10 Mb/s	10 Mb/s	10 Mb/s	10 Mb/s	10 Mb/s
Ethernet cable	Standard[1]	Standard[1]	ThinWire	Standard[1]	ThinWire	Standard[1]
DECnet support	PRO/DECnet	DECnet-VAX,[2] DECnet-ULTRIX, DECnet-RSX	DECnet-DOS, PCSA/PC Client[3]	DECnet-VAX,[2] DECnet-ULTRIX, DECnet-RSX, DECnet-Micro/RSX DECnet/E	DECnet-VAX,[2] DECnet-ULTRIX	DECnet-10, DECnet-20
Operating system support	P/OS	VMS, ULTRIX-32, ULTRIX-32m, ULTRIX-11, RSX-11M, RSX-11M-PLUS, RSX-11S	IBM PC DOS	MicroVMS, ULTRIX-32, ULTRIX-32m, ULTRIX-11, RSX-11M, RSX-11M-PLUS, RSX-11S, Micro/RSX Micro/RSTS VAXELN	MicroVMS, ULTRIX-32m	TOPS-10, TOPS-20

[1] Controllers designed for standard Ethernet cable can connect to ThinWire Ethernet cable via a ThinWire Ethernet station adapter (DESTA).
[2] DECnet-VAX allows multiple Ethernet controllers per host within the limitations listed in the Load Unit Table in SPD 25.03. Each controller must be connected to a separate Ethernet that is not joined to other Ethernets by a bridge or repeater, though it may be joined by a DECnet Router.
[3] PCSA/PC Client software includes DECnet-DOS support.

DELUA

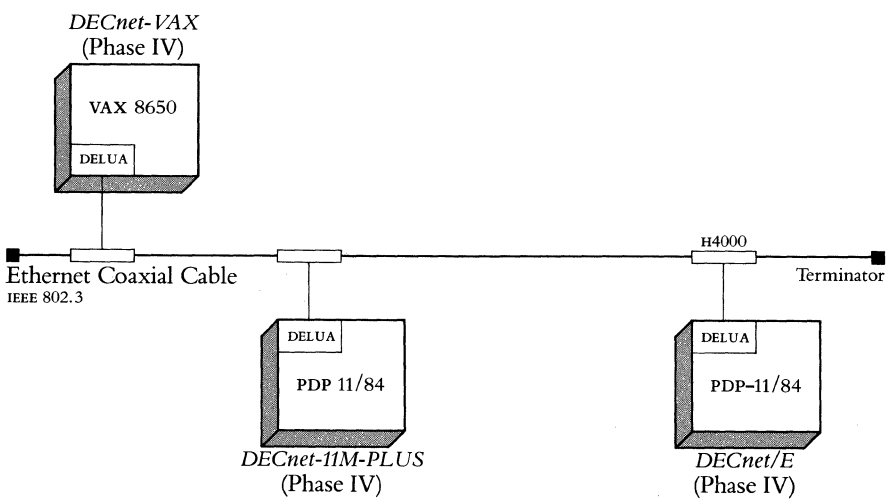
The Ethernet/IEEE 802.3-to-UNIBUS high-performance synchronous communications controller (DELUA) connects UNIBUS systems (VAX and PDP) to both Ethernet V2.0 and IEEE 802.3 local area networks. It is M68000 microprocessor based, operates at 10 Mb/s, and has 4 Mb/s throughput capability. (Actual device speed and throughput depends on operating system, system configuration, and application.) The 80KB 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 micro-diagnostics, 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 coaxial cable via transceiver cable (BNE3X or BNE4X series) and either a Baseband Ethernet Transceiver (H4000) or Local Network Interconnect (DELNI). The DELUA also connects to a DESTA and ThinWire cable in ThinWire Ethernet networks. Transceiver cable can be a maximum of 40 meters (131 feet) and must be ordered separately. Refer to *Communications Cables* in Section 4 for all order codes.

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

Figure 2.24 Ethernet/IEEE 802.3-to-UNIBUS Communications Controller (DELUA) in an Ethernet LAN



Specifications

Mounting Code: 1 hex slot

Power Requirements:
DC amps drawn at +5V: 8.0A
DC amps drawn at −15V: 1.0 (to power the H4000 transceiver)

Bus Loads: AC 4, DC 1

I/O Connection Panel Inserts: 1 panel unit

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

Table 2.19
DELUA Order Codes

Option	Order Code
Ethernet/IEEE 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

DELQA

The DELQA is an Ethernet-to-Q-bus communications controller that connects MicroPDP-11 and MicroVAX II 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 Ethernet coaxial cable by means of a CK-DELQA-XX cabinet kit, transceiver cable (BNE3C or BNE3A series), and an H4000 Ethernet transceiver or a 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.
- On-board selftest executes extensive testing of the DELQA circuitry at each power-up or reset.
- On-board MOP provides the ability to decrease the demand on system software, thus reducing processor time required to support network management activities.

System Support

MicroPDP-11/23, MicroPDP-11/53, MicroPDP-11/73, MicroPDP-11/83, VAXstation II, VAXstation II/GPX, and MicroVAX II.

Software Support

DECnet-VAX, DECnet-ULTRIX, DECnet-RSX, DECnet-Micro/RSX, DECnet/E, Local Area VAXcluster software (LAVC), VMS, MicroVMS, ULTRIX-32, ULTRIX-32m, ULTRIX-11, RSX-11M, RSX-11M-PLUS, RSX-11S, Micro/RSX, Micro/RSTS, and VAXELN.

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 2.2, DC 0.5

I/O Connection Panel Insert: Size A

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

Table 2.20
DELQA Order Codes

Option	Order Code
Ethernet-to-Q-bus communications controller	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

DESVA

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

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

Table 2.21 DESVA Order Codes

Option	Order Code
ThinWire Ethernet communications controller, option for MicroVAX 2000. Includes Networking Guide, T-connector, and two terminators.	DESVA-AA

DEPCA

The DEPCA is an 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 selftest 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 datalink and selftest firmware (contained in a 16 KB ROM memory on the DEPCA module).

The DEPCA connects directly to the ThinWire Ethernet coaxial cable, using integral transceiver (MAU) circuitry. With the addition of the DEPCA-AU connector option, the DEPCA can connect to an H4000 transceiver or Local Network Interconnect (DELNI).

The DEPCA is offered as a module-only option or as a component of the Network Integration Packages. For more information, refer to Section 3, *Network Integration Packages.*

Specifications

Mounting Code: 1 8-bit PC-bus slot (2 when used with DEPCA-AU)

Power Requirements:
DC amps drawn at +5V: 2.0 (max)
DC amps drawn at +12V: 1.350 (max) (1.0 to power H4000 transceiver)
DC amps drawn at −12V: 0.050 (max)

Bus Loads: 2 LSTTL

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

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

Table 2.22 DEPCA Order Codes

Option	Order Code
ThinWire 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 Ethernet transceiver adapter connects the DEPCA Ethernet communications controller to standard Ethernet cable via an H4000 transceiver or DELNI.	DEPCA-AU

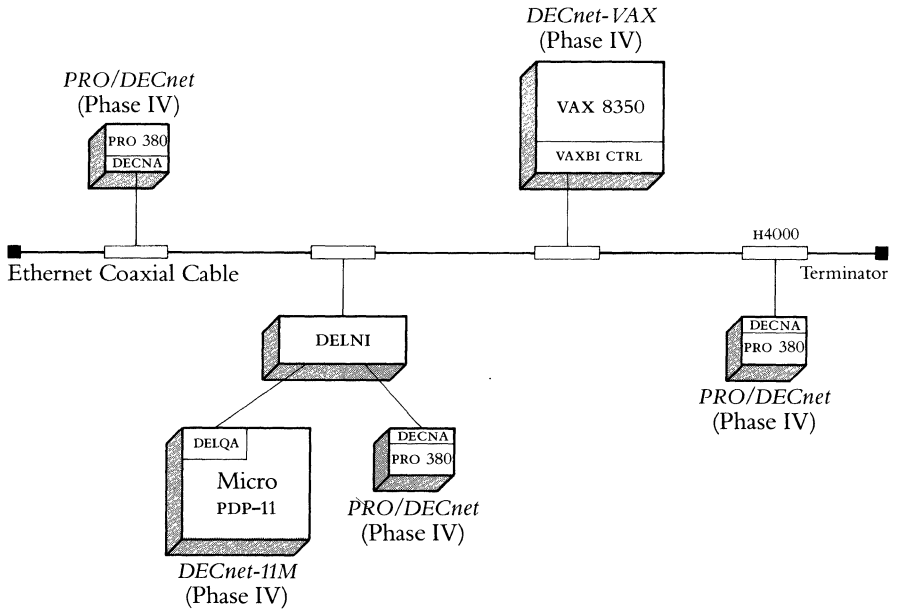
DECNA

The Ethernet-to-Professional 300-Series synchronous communications controller (DECNA) connects Professional 300 Series personal computers to Ethernet Local Area Networks (LANs). The DECNA complies fully with the Ethernet specification and operates at 10 Mb/s.

The DECNA provides Ethernet data link layer functions and a portion of the physical channel functions. The DECNA is supported by PRO/DECnet. Digital also provides documentation and device drivers as part of PRO/DECnet, so that users can write their own higher-level protocols for specialized applications and communications in multivendor environments.

The DECNA physically and electrically connects to the Ethernet coaxial cable via Ethernet or IEEE 802.3 transceiver cable (BNE3X or BNE4X series) and a Baseband Ethernet Transceiver (H4000) or a Local Network Interconnect (DELNI). The DECNA also connects to a DESTA and ThinWire cable in ThinWire Ethernet networks. A five meter (16 foot) transceiver cable is included with the DECNA. Cable segments up to a maximum of 45 meters (148 feet) in length can be added.

Figure 2.26
Ethernet-to-Professional Communications Controller (DECNA) in an Ethernet LAN



Specifications

Mounting Code: 1 Professional 350 slot

Power Requirements:
DC amps drawn at +5 V: 2.8
DC amps drawn at +12 V: 0

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

Table 2.23
DECNA Order Code

Option	Order Code
DECNA single-line interface connects Professional 300 series personal computers to Ethernet LANs. Includes module, internal cables, turn-around connector, installation manual, PRO/DECnet license, 90-day hardware/software warranty.	DECNA-K

NIA20

The NIA20 is a high-performance synchronous communications controller that connects KL10-based systems to both Ethernet V2.0 and IEEE 802.3 local area networks. The NIA20 is microprocessor based, operates at 10 Mb/s, and has 4 Mb/s throughput capability. (Actual device speed and throughput depends on operating system, system configuration, and applications in use.) A separate DMA controller is used for access to host memory locations.

The NIA20 microcode implements data encapsulation and decapsulation, data link management, and all channel access functions to ensure maximum throughput with minimum processor intervention. It provides significant network maintainability features including remote loopback of data from other stations, resident micro-diagnostics, and system identification.

The NIA20 physically and electrically connects to the coaxial cable via transceiver cable (BNE3X or BNE4X series) and either a Baseband Ethernet Transceiver (H4000) or Local Network Interconnect (DELNI). The DELUA also connects to a DESTA and ThinWire cable in ThinWire Ethernet networks. Transceiver cable can be a maximum of 40 meters (131 feet) and must be ordered separately. Refer to *Communications Cables* in Section 4 for all order codes.

Table 2.24
NIA20 Order Codes

Option	Order Code
Ethernet/IEEE 802.3 CBUS single line interface communications controller.	
Ethernet port adapter for KL10-E	NIA20-AA
Ethernet port adapter for KL10-D	NIA20-BA
Ethernet port adapter for KL10-R	NIA20-CA

Extended Ethernet Local Area Network Products

Introduction

A standard Ethernet LAN has a distance limitation of 2,800 meters between the furthest two nodes on the network. This limitation is the sum of two 50-meter transceiver cables, three 500 meter coaxial cable segments, four 50-meter transceiver cables connected to repeaters, and 1000 meters of fiber optic link. An Extended LAN allows this limitation to expand through the use of the Ethernet LAN Bridge 100, METROWAVE Bridge, and TransLAN.

LAN Bridge 100

The LAN Bridge 100 (DEBET) is a device that interconnects two or more Ethernet LANS creating an extended local area network. The LAN Bridge 100 utilizes a Store and Forward feature to receive, regenerate and transmit packets. This feature allows users to build Extended LANS several times larger than the previous Ethernet guidelines allowed. When planning an extended LAN, Digital recommends configuring a maximum of seven bridges in a series. This figure insures the performance of time critical protocols. No restrictions exist on the number of bridges when time-critical protocols are not an issue. An extended LAN can contain more than 8,000 node addresses with only minor degradation to network performance due to an 8,000 node address buffer. An Extended LAN spanning distances up to 22,400 meters can be constructed by using fiber optic or microwave bridges.

The LAN Bridge 100 can connect Broadband Ethernets, Baseband Ethernets, 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. The locally destined traffic remains local. The remote traffic is forwarded to the appropriate destination.

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

Changes in network configuration are detected by the bridge automatically within seconds and its memory is updated. Bridges can be placed in parallel with other bridges to provide an auto-backup capability. Bridges causing loops in this situation automatically enter a back up state. A bridge that is in the back up state continues to monitor traffic on both LANS and if the primary bridge fails, it automatically takes over and forwards messages.

Variations of the LAN Bridge 100 are:

- The Standard Bridge (DEBET-A★), which interfaces with two transceiver drop cables
- The Fiber Optic Bridge (DEBET-R★), which interfaces with one transceiver drop cable and a fiber optic link. The Fiber Optic Bridge is required for sites that have more than 90 meters between two LANS. A pair of standard 45-meter transceiver cables would be insufficient to cover the distance.
- The METROWAVE Bridge (DEMWB-A★), which interfaces with one transceiver drop cable and a microwave link. The METROWAVE Bridge connects geographically separated LANS where cable is neither feasible nor economical.

Table 2.25 compares the LAN extension features of LAN Bridge 100 with the Ethernet Repeater (DEREP) and DECnet Router Server.

Table 2.25
Comparison of Extended LAN Devices

Features	Repeater	Bridge	Router
ISO layer	Physical	Data Link	Network
Forwarding capability	Forwards bits	Forwards frames	Forwards messages
Addressing function	No address	MAC address[1]	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	Low
Cost	Low	Medium	High
Transparent to upper level protocols	Yes	Yes	No
Message segmentation	N/A	No	Yes
Load sharing	No	No	Yes
Common carrier	No	No	Yes
Multivendor network	Yes	Yes	No
Auto back-up[2]	Yes	Yes	Yes
Area routing	N/A	N/A	Yes

[1] Medium Access Control (requires Ethernet or IEEE 802.3 packet format)
[2] Ability to activate upon failure of a parallel device.

Figure 2.27
Baseband-to-baseband LAN Bridge 100 Configuration

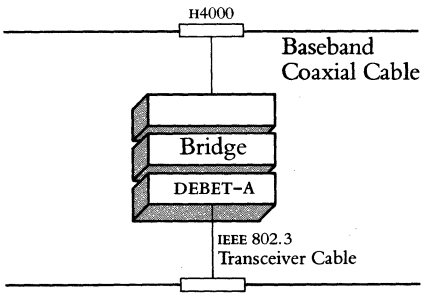
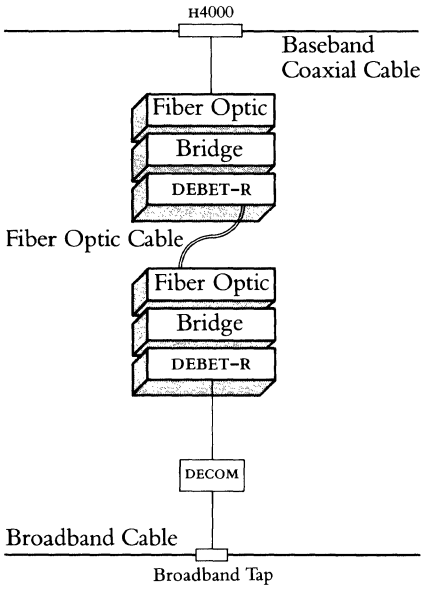


Figure 2.28
Broadband-to-baseband Fiber Optic LAN Bridge 100 Configuration



Features

- Store and Forward—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, TCP/IP, XNS, LAT.
- Baseband and Broadband Ethernet Compatible—Connects Ethernet LANs: baseband to baseband, baseband to broadband, broadband to broadband.
- No Software Required—Does not require down-line loading. No requirement to have a DEC host on the network.
- RBMS Software Available for Enhanced Management Ability—By using a VAX running VMS and RBMS, a user can observe and control any Bridge in the Extended LAN.
- IEEE 802.3/Ethernet Device—Can be used in networks that are IEEE 802.3, Standard Ethernet, or ThinWire Ethernet compliant.
- Dynamic Learning—Automatically detects and adjusts to changes in network configuration.
- Auto Back-up (using redundant bridges)—Increases availability and reliability of the network.
- Write Access Switch—Write protection: controls the access necessary to change operating parameters.
- Non-Volatile RAM Available for Storing Settable Parameters—Protects the settable operating parameters against loss due to power failures.
- Fiber Optic Version—Provides a Fiber Link for up to 2000 meters.
- Rack or Wall Mount—Can be used in a wiring closet or mounted in a 19-inch rack.

Specifications

Physical Size:	*With Plastic Encl.*	*Without Plastic Encl.*
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 lbs)	7.3 kg (16 lbs)

Power Requirements:
Low-range line voltage: 120–93 to 128 V
High-range line voltage: 240–207 to 253 V
Frequency Tolerance: 47 to 63 Hz
Maximum ac watts drawn: 150 W
Maximum heat dissipation: 500 BTU/hr

Required Hardware

Standard LAN Bridge 100 (DEBET-A★)

Baseband communications—Two of the following in any combination: Baseband Ethernet Transceiver (H4000), or Local Network Interconnect (DELNI).

Broadband communications—Two of the following in any combination: Broadband Ethernet Transceiver (DECOM) or Local Network Interconnect (DELNI).

Fiber Optic LAN Bridge 100 (DEBET-R★)

Either another Fiber Optic Bridge or a Fiber Optic Repeater (DEREP-R★), in addition to the above required hardware for baseband or broadband communications.

Optional Management Software

Remote Bridge Management Software (RBMS) is an optional software package that allows users, at a VAX or MicroVAX host, to manage any Bridge in an extended 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 data base. The manager also uses RBMS to change various operating parameters such as Bridge state, link state and address filtering characteristics. For more information, refer to Remote Bridge Management Software (RBMS) in *Network and System Management Products* in Section 3.

Table 2.26
LAN Bridge 100
Order Codes

Option	U.S. Order Codes	Non-U.S. Order Codes
Standard bridge	DEBET-AA	DEBET-AB
Fiber optic bridge	DEBET-RC	DEBET-RD

LAN Bridge 100
Country Power Cords

The non-U.S. version of the LAN Bridge 100 requires a power cord specific to individual countries.

Table 2.27
LAN Bridge 100
Country Kit 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

METROWAVE Bridge

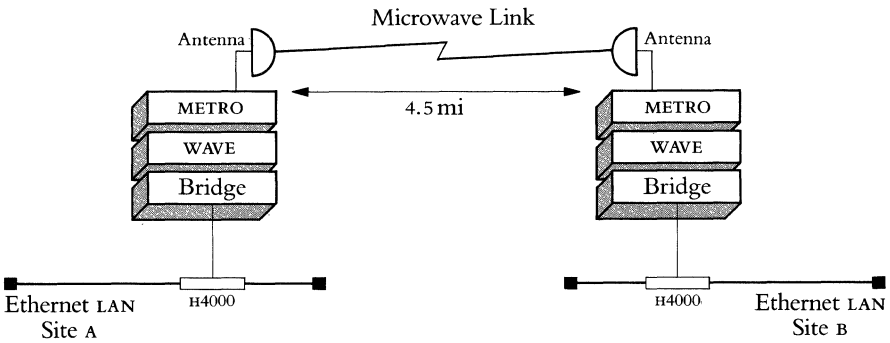
The METROWAVE Bridge connects geographically separated Ethernet LANs within a metropolitan or campus environment in which cable is neither feasible nor economical. The METROWAVE Bridge is a high performance Ethernet device that connects two Ethernet LANs separated by such obstacles as streets, highways, and waterways. Transparent to the user, the bridge provides high speed transmission via a 23 gigahertz (GHz) wideband, duplex, frequency-modulated microwave link over line-of-sight distances up to 4.5 miles. (Path length is determined by several factors including antenna size and signal attenuation.)

The METROWAVE Bridge, a member of the LAN Bridge 100 product family, provides a microwave connection that delivers the same high performance and store-and-forward filtering capability as the LAN Bridge 100. Compliant with Ethernet Version 2.0, the METROWAVE Bridge can simultaneously handle any protocols that run on Version 2.0 of Ethernet, accommodating totally Digital, multivendor, or totally non-Digital networks.

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 signal levels to standard Ethernet signal levels.

A complete METROWAVE Bridge system is comprised of two microwave link stations:

Figure 2.29
METROWAVE Bridge Configuration



Features

- The microwave link, transparent to the user, allows connection when cable is too expensive or not feasible.
- 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 can be combined with the METROWAVE Bridge to increase flexibility and reduce overall costs.

Availability

This product is available only in the United States. Limited availability of private-use licenses for 23 GHz microwave equipment exists in some other countries. Please call the Digital Computer Special Systems group at 1-800-832-6277 for details.

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* (ED 29584-49), or 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 co-located with the antenna and is powered by a cable from the microwave transmitter and receiver controllers.

The following specifications are the aggregrate 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* (ED 29584-49).

Physical Dimensions:	Power Requirements:
Depth: 31.25 in	Voltage Tolerance: 93-128 Vac
Width: 21.35 in	Line Frequency: 60 Hz
Height: 31.50 in	Maximum Current: 4.1 A (120 Vac)
Weight: 100 lb	Power Consumption: 326 W (Maximum)

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

Prerequisite Software

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

Optional Software

Remote Bridge Management Software (RBMS) is recommended for enhanced control and monitoring of the microwave link.

Table 2.28 METROWAVE Bridge Order Codes for Digital Components

Option	Order Code
A METROWAVE Bridge includes two each: LAN Bridge 100, H4000 Ethernet transceiver, microwave adapter, BNE3M-20, BNE4D-02, and cable adapter. The METROWAVE Bridge is available pre-mounted in 31.5 inch high cabinets, or in non-cabinet configurations suitable for rack mounting in Satellite Equipment Room (SER) racks.	
METROWAVE Bridge in 2-cabinet configuration package	DEMWB-AA
METROWAVE Bridge in 2-SER-compatible configuration package	DEMWB-BA
METROWAVE Bridge in 1 cabinet and 1 SER-compatible configuration package	DEMWB-CA

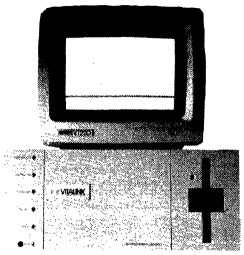
Ordering M/A-COM Components

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

- two transmitter controllers
- two receiver controllers
- two 23GHZ RF units
- two 4-foot coaxial cables
- two 2- or 4-foot microwave antennas

The MA-23 LAN and its installation must be 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.

TransLAN



Digital and Vitalink Communications Corporation have entered into a third party marketing agreement to develop a device to allow interconnections of multiple Ethernet or IEEE 802.3 LANs into one extended network. The Vitalink product, TransLAN,™ can connect via satellite or terrestrial link and extend the LAN from 1.74 miles (2.8 kilometers) to thousands of miles.

TransLAN (including both hardware and software), is a bridge that provides protocol-transparent interconnection of similar or dissimilar higher-level protocols on two or more LANs. It serves as a link-level relay, transferring data independently of the higher-level protocols in use. In order to translate between higher-level protocols, gateways are required.

TransLAN can connect Ethernet LANs to digital transmission systems, including satellites and terrestrial private lines. On one side, TransLAN can connect to an Ethernet LAN, while on the other side, it can provide industry-standard V.35 or RS232 connections. This can then connect to either satellite earth stations or other transmission schemes. LAN-to-LAN connections are supported at speeds up to 2.048 Mbps and each bridge can support four line cards.

Using TransLAN, Digital systems networked with DECnet Ethernet can communicate. Beyond the requirement that systems connect to an Ethernet LAN, the bridge does not restrict higher-level communications protocols.

Features

- Connecting Ethernet or IEEE 802.3 LANs via TransLAN allows long distance broadcast communications, similar to using one Ethernet locally.
- Using multiple bridges connecting LANs, one node can send messages to many other local and remote nodes concurrently.
- Interconnects DECnet Phase III and DECnet Phase IV networks. Depending on the functions required and network configuration, you may choose a bridge or a router. A DECnet Router Server is usually less expensive.
- TransLAN can connect Digital nodes running DECnet or other networking software on one Ethernet LAN to Digital nodes running DECnet or other networking software on another Ethernet LAN. The same requirement that exists on one local LAN, that stations communicating with each other must run on the same protocols, also applies to nodes running on separate LANs connected by TransLAN.
- TransLAN can connect non-Digital nodes on one Ethernet LAN to similar non-Digital nodes on a remote Ethernet LAN. TransLAN can also connect Digital nodes on the two LANs at the same time. (Note that communication is limited to homogeneous systems.)

Non-U.S. Orders

TransLAN is available in some non-U.S. countries via distributors. Contact a local marketing representative for country-specific information.

LAN Bridge 100 and TransLAN Extended LANs

Digital's Ethernet Bridge, the LAN Bridge 100, is designed to transparently interconnect a series of up to eight Ethernet segments, creating an extended LAN that could be 22 kilometers (22,000 meters) or 14 miles long. Using the LAN Bridge 100, the full 10 Mb/s throughput is available 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. One exception, however, is Digital's implementation of Remote Bridge Management Software (RBMS) that allows a privileged user anywhere in the network to monitor and analyze the network.

LAN Bridge 100 and TransLAN Extended LANs (Continued)

Vitalink's TransLAN Bridge is primarily intended for the interconnection of LAN's 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 RS232 connections and is capable of transmitting at a maximum rate of 2.048 Mbps. This can be a constraint when the average traffic load is higher than the 2.048 Mbps capability. Additionally, depending on the communications links (satellite or terrestrial) delay may be apparent. Unlike RBMS, bridge management is done from a bridge management console attached to the TransLAN Bridge.

Specifications

Physical Dimensions:
Height: 14.0 cm (5.5 in)
Width: 43.2 cm (17 in)
Length: 54.1 cm (21.3 in)
Weight: 12.2 kg (27 lbs)

Power Requirements:
AC watts drawn at 100 V, 47 Hz: 400
AC watts drawn at 120 V, 47 Hz: 400
AC watts drawn at 230 V, 47 Hz: 400

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

User Port Interface: Ethernet Version 2.0 or IEEE 802.3

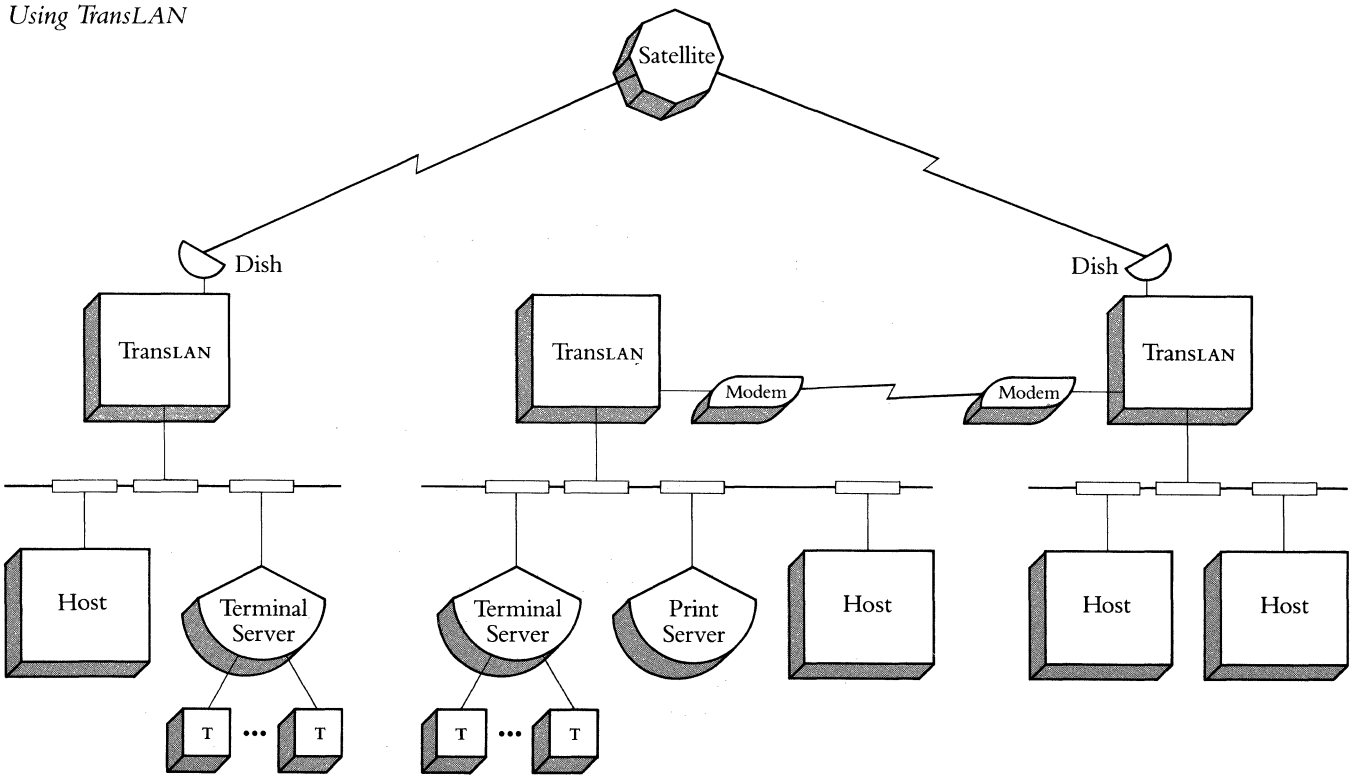
Satellite/Terrestrial Port Interfaces: (16) V.35 / (16) RS-232

Satellite/Terrestrial Port Data Capacity: 2.048 Mbps

Frame Processing Rates:
15,000 frames per second filtering
600 to 1,500 frames per second forwarding, depending on the application

TransLAN is serviced and supported by Vitalink. For more information, contact your local Digital Sales Office.

Figure 2.30 Network Configuration Using TransLAN



Ethernet Communications Servers

Introduction

Ethernet Communications Servers are dedicated, special purpose subsystems that promote resource sharing across many host systems within a local area network (LAN).

The following communications servers may be used on an Ethernet:

- *Terminal Server*—Digital's terminal server products include: The DECserver 200 (DSRVB) logically connects up to eight digital terminals or serial printers to one or more hosts on an Ethernet LAN. The DECserver 200 has a version with modem control (MC) and a version for use with the DECconnect Communications System (DL). The MUXserver 100/DECmux II remote terminal server that connects up to 16 Digital terminals, PCs, or serial printers at remote sites to one or more host systems on the Ethernet LAN.
- *DECnet Router* (DECSA)—Transfers data packets from DECnet nodes on an Ethernet to remote DECnet nodes or other Ethernet LANs.
- DECrouter 200 (DSRVC)—Transfers data packets from DECnet nodes on an Ethernet to remote DECnet nodes or other Ethernet LANs via asynchronous lines.
- *DECnet Router/X.25 Gateway* (DECSA)—Connects DECnet/Ethernet LANs to X.25 packet-switched data networks (PSDNs) and to remote DECnet systems.
- *DECnet/SNA Gateway* (DECSA)—Connects Ethernet LANs to IBM hosts in an SNA network.

The DECnet Router, DECnet Router/X.25 Gateway, and DECnet/SNA Gateway share a common hardware base (DECSA)—it is the individual line cards and the special function software that determine the type of function the communications server performs. A server, complete with line cards and software, can perform only one function. If communications needs change, however, the function of a DECSA server can be adapted by changing the line cards and downline-loading new software.

Features

- Provides resource sharing across multihost systems within an Ethernet LAN.
- Performs a dedicated function whose cost can be spread over many users.
- Increases Ethernet LAN configuration flexibility.
- Offload communications processing from host systems (except for the DECnet Router/X.25 Gateway), reducing CPU overhead.
- Lowers cost of ownership through customer installation and maintenance of line cards (DECSA only).
- Automatic diagnosis on startup checks communications server operation prior to use, increasing network reliability.
- For DECSA hardware, online card testing and replacement by customer decreases repair time and minimizes disruption of communications.

Table 2.29
Summary of Ethernet Communications Servers

Hardware Type	DSRVB	DSRVC	DSRZA/ DFMZA	DECSA		
Server Type	**Terminal Server**	**Router**	**Remote Terminal Server**	**Router**	**Gateways**	
Server Product	**DECserver 200**	**DECrouter 200**	**MUXserver 100/ DECmux II**	**DECnet Router**	**DECnet Router/X.25 Gateway**	**DECnet/ SNA Gateway**
Number of Lines/ Maximum Throughput	8 @ 19.2K b/s	8 @ 19.2K b/s	16 @ 19.2K b/s	32 @ 19.2K b/s 8 @ 56K b/s 2 @ 250K b/s 1 @ 500K b/s	X.25-1 @ 19.2K b/s 2 @ 9.6K b/s DDCMP-6 @ 19.2K b/s	2 @ 56K b/s
MultiCPU Access	YES	YES	YES	YES	YES	YES
Modem Control	MC version—YES DL version—NO	FULL	No	FULL	FULL	FULL
Protocols	Asynchronous	Asynchronous DDCMP	Asynchronous	DDCMP	DDCMP X.25 (LAPB)	SDLC
Downline Load Host Support[1]	DECnet-VAX, DECnet-11M-PLUS, DECnet-MicroRSX, DECnet-10/20, DECnet-ULTRIX	DECnet-VAX, DECnet-ULTRIX	DECnet-VAX, DECnet-11M-PLUS, DECnet-MicroRSX, DECnet-ULTRIX,	DECnet-VAX, DECnet-11M, DECnet-11M-PLUS	DECnet-VAX[4]	DECnet-VAX[3]
Operational Host Support[1]	VMS, MicroVMS, RSX-11M-PLUS, MicroRSX, ULTRIX-32[2] ULTRIX-32m[2] TOPS-10/20	Any Phase IV DECnet node	VMS, MicroVMS, RSX-11M-PLUS, MicroRSX, ULTRIX-32, ULTRIX-32m, TOPS-20	Any Phase III or IV DECnet node	VMS (certain CPUs only)	VMS, MicroVMS, (MicroVAX II only)
Primary Buying Reason	Connection to non-LAT hosts, modem control; DEC 423 connection	Cost-effective PC-to-Ethernet connection	Efficient remote terminal connection; low price per line	Connects Phase III nodes and wide area networks to Ethernet; host CPU off-loading of communications processing	MultiCPU access to PSDNs; dedicated function	Multivendor network communications

[1] The Terminal Server and the DECnet/SNA Gateway support only DECnet Phase IV implementations while the DECnet Router and the DECnet Router/X.25 Gateway support any Phase III or Phase IV implementation.

[2] LAT support.

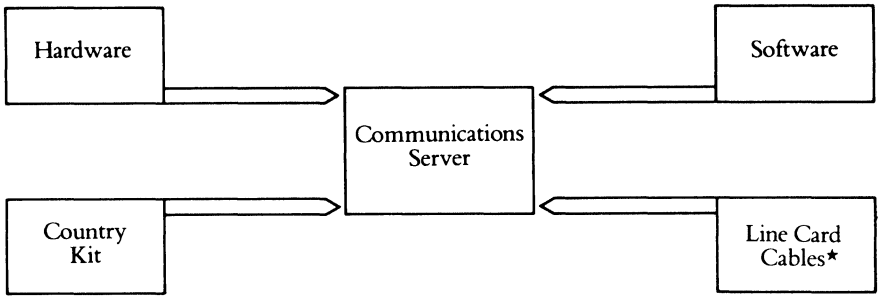
[3] Not supported on MicroVAX I.

[4] Supported on VAX-11/730, VAX-11/750, and VAX-11/780 series.

Ordering Information

All communications servers are made up of components that must be ordered separately.

Figure 2.31
Components of a Communications Server



*DECSA hardware only.

To order an Ethernet Communications Server, follow these steps.

Step 1—Obtain the prerequisite network hardware and software.

- All Ethernet physical channel hardware (for example, coaxial cable, terminators).
- An H4000 Transceiver (or DELNI) and a transceiver cable for each server.
- At least one Phase IV DECnet host for downline-loading the server software and running a supported operating system (refer to product description).

Step 2—Select the type of Ethernet Communications Server.

- Terminal Server.
- DECnet Router Server.
- DECrouter 200.
- DECnet Router/X.25 Gateway.
- DECnet/SNA Gateway.

Step 3—Specify and order the components of the desired Communications Server. The components that must appear as line items on a customer's order are:

- Server hardware.
- Server software (See Step 4).
- Interface cables.
- Country kit (included with some servers).
- Add-on optional line cards and line card cables (available only on some servers).

Step 4—Specify and order server software licenses and distribution kit. Consult the appropriate Software Product Description (SPD). A software license is required for each terminal server unit.

Terminal Server Overview

Terminal servers provide a cost-effective and flexible way to logically connect terminals to hosts in an Ethernet LAN. Each terminal connected to a terminal server can access services running on service nodes connected to the same Ethernet (refer to Prerequisite Software for supported hosts). Terminal servers connect asynchronous terminals at speeds up to 19,200 bits per second to local Ethernet hosts that implement the Local Area Transport (LAT) protocol.

Digital offers the following terminal server products:

- DECserver 200—an eight line server which consists of DECserver 200 V1.0 or later software downline loaded into DSRVB hardware. The DECserver 200 has a version with modem control (MC) and a DEC423 version for use with the DECconnect Communications System (DL).
- MUXserver 100/DECmux II—a 16 line remote server which consists of MUXserver 100 V2.0 software downline loaded into DSRZA hardware, and a remote multiplexer, the DFMZA.

Server software, including diagnostics, is downline-loaded into the server from a load host. In the event of hardware or software malfunction, the unit will attempt to upline-dump the memory image (for later analysis) and automatically reload 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 these terminal servers handle terminal communications from the terminal to the host over a single Ethernet host interface, 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 to maintaining high availability to the cluster. Features such as login load balancing, automatic login failover, and multi-session 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 (for example, the DECmate II and III, the Rainbow personal computer, and the Professional 300 Series computers).

Terminals connected to terminal servers can access remote DECnet nodes through intervening DECnet Phase IV routing nodes on the same Ethernet. They can also connect to VAX/VMS host systems on Ethernet running the appropriate software access routines and thus access a DECnet Router/X.25 Gateway or DECnet/SNA Gateway. Note that a host does not have to be running DECnet to communicate with the terminal servers. However, DECnet must be running on at least one host connected to the same Ethernet in order to downline load the terminal server.

Printer Support

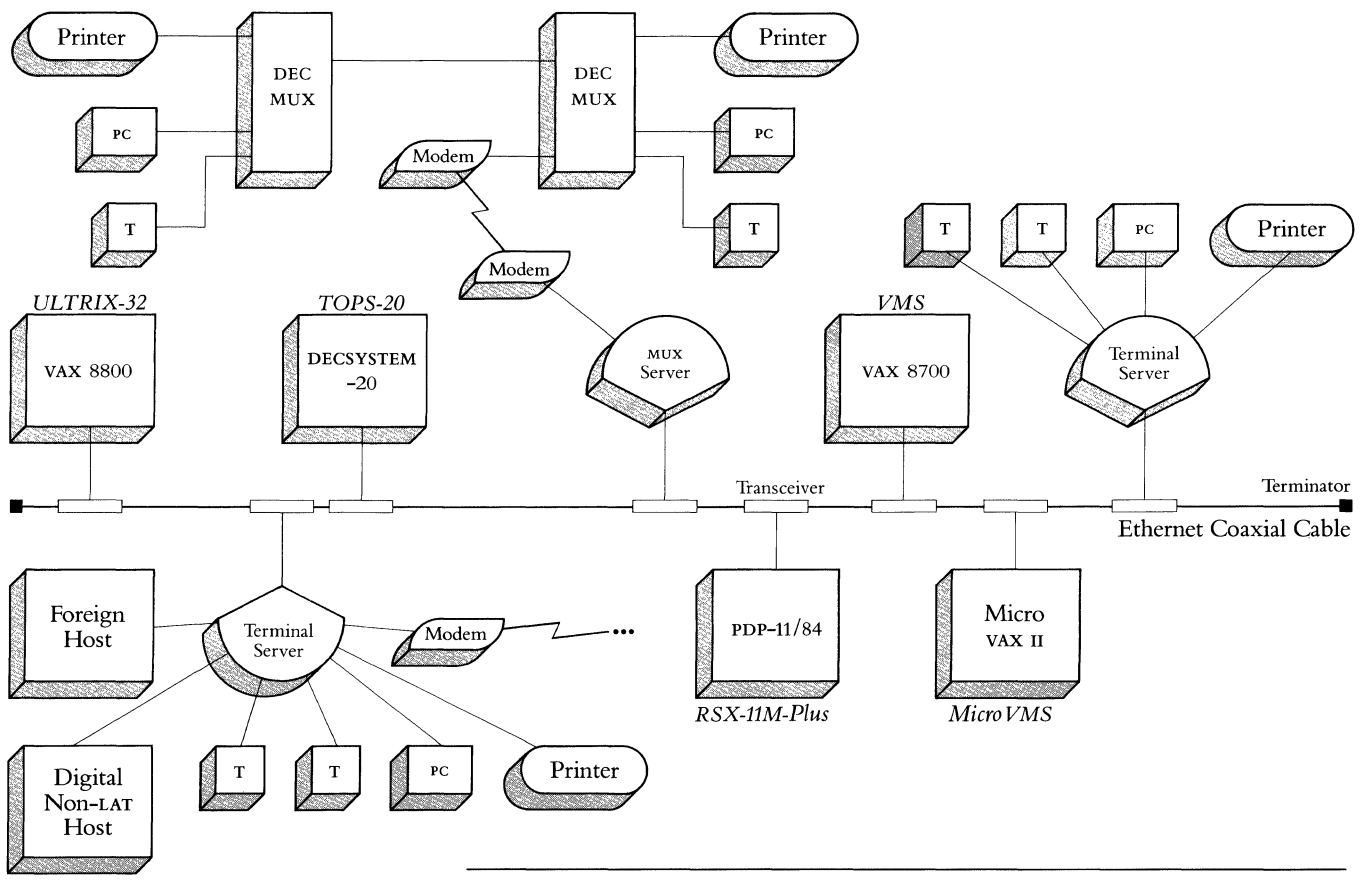
A terminal server used for printer applications provides a cost-effective way to distribute a printer or a collection of printers in an Ethernet LAN. Each printer connected to a server can be shared between multiple VMS hosts connected to the same Ethernet. A terminal server can connect asynchronous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

Features

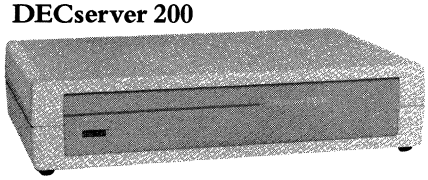
The following features are common to Digital terminal servers:

- 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 will connect 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 Session Failover—The server provides increased reliability and redundancy by allowing terminals logically connected to a failed host to access other hosts on the Ethernet.
- 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: PFT Profile Transfer for PRO Series Computers, CX/DX File Transfer for DECmate II and III, poly-XFR File Transfer for Rainbow and IBM Personal Computers.

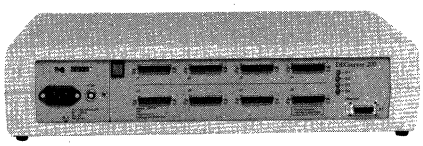
Figure 2.32
Ethernet LAN Configuration
Using Terminal Servers



DECserver 200



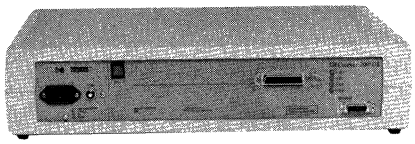
The DECserver 200 is a network terminal switch for Ethernet local area networks. It supports the simultaneous operation of up to 8 terminals at speeds up to 19,200 bits per second full duplex. Two versions of the DECserver 200 are available: DECserver 200/MC and DECserver 200/DL. Each version is described below.



DECserver 200/MC

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

- RS-232-C 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 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 RS-232-C interfaces can be connected to the DECserver 200.



DECserver 200/DL

The DECserver 200/DL (Data Leads) has a single 36 pin DECconnect connector capable of supporting 8 DECconnect ports (DEC423). A special DECconnect cable is required to connect the DECserver 200/DL to equipment which can interface to DECconnect signals. DECserver 200/DL does not support modems or applications with devices which require modem control signals. The DECserver 200/DL is intended for applications utilizing the DECconnect system or any applications using local terminals and printers. Refer to Section 5 for more information.

Features

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

Specifications

Physical Size:
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 lbs)

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

Prerequisite Hardware

- All Ethernet physical channel hardware.
- Either an H4000 Transceiver, a DELNI, or DESTA and transceiver drop cable.
- For DECserver 200/DL, the H3104-B SER adapter kit.

Prerequisite Software

- DECserver 200 software must be downline-loaded from one of the following Ethernet load hosts: DECnet-VAX, DECnet-11M-PLUS, DECnet-Micro/RSX, DECnet-10/20, DECnet-ULTRIX.

  See the Software Product Description for the version number requirements.
- For service node support, one of the following operating systems is required: VMS, MicroVMS, RSX-11M-PLUS with DECnet-11M-PLUS, Micro/RSX with DECnet-Micro/RSX, ULTRIX-32, ULTRIX-32m, TOPS-10/20.

  See the Software Product Description for the version number requirements.
- For printer support, service node software is included on the DECserver 200 software distribution media (VMS only).

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 Section 3, *Network and System Management Products.*

Table 2.30
DECserver 200 Hardware Order Codes

Option	Order Code
8-line DECserver 200, 120V (supports 8 EIA RS232 physical terminal connections). Includes country kit.	DSRVB-AA
8-line DECserver 200, 120V (supports 8 DECconnect terminal connections [DEC423]). Includes country kit.	DSRVB-BA
8-line DECserver 200, 240V (supports 8 EIA RS232 physical terminal connections). Requires country kit.	DSRVB-AB
8-line DECserver 200, 240V (supports 8 DECconnect terminal connections [DEC423]). Requires country kit.	DSRVB-BB

Terminal Cables

To connect terminals to the DECserver 200, order the following cables. When ordering cables refer to *Communications Cables* in Section 4 for cable options and be sure to specify the length, for example, BC22F-25:

DECserver 200/MC

- 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 which utilize CTS/RTS flow control.
- BC17D—Null modem cable for host systems and other devices which do not utilize CTS/RTS flow control.

DECserver 200/DL: The DECserver 200/DL requires the H3104-B SER adapter kit, which includes required cables.

DECserver 200 Country Kits

The U.S. DECserver 200 (DSRVB-AA and DSRVB-BA) includes a country kit. The non-U.S. DECserver 200 (DSRVB-AB and DSRVB-BB) requires a country kit. Each country kit includes a power cord, hardware manual, and rack mounting brackets.

Table 2.31
DECserver 200 Country Kit Order Codes

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

*The U.S. versions of the DECserver 200 (DSRVB-AA and BA) include a country kit. A U.S. country kit is also available as a separate line item.

Table 2.32
DECserver 200 Software
Order Codes for VMS/MicroVMS

Option	Order Code						
Load Host Operating System	**VMS/MicroVMS**						
License Options: *A license is required for each DECserver 200.*	**MicroVAX II[1]**	**VAX 11/750**	**VAX 11/780 VAX 11/782[2] VAX 11/785**	**VAX 8200 VAX 8300[3]**	**VAX 8500 VAX 8550 VAX 8700[4]**	**VAX 8600 VAX 8650**	**VAX 8800**
Single-use license	QZZ06-UZ	QDZ06-UZ	QEZ06-UZ	Q*Z06-UZ	Q#Z06-UZ	QKZ06-UZ	QMZ06-UZ
Materials and Service Options:							
Distribution and documentation	QZZ06-H3 QZZ06-H5	QDZ06-HG QDZ06-HM	QEZ06-HM QEZ06-HY	Q*Z06-HM Q*Z06-H3	Q#Z06-HM	QKZ06-HM	QMZ06-HM
Software revision right-to-copy	QZZ06-HZ	QDZ06-HZ	QEZ06-HZ	Q*Z06-HZ	Q#Z06-HZ	QKZ06-HZ	QMZ06-HZ
Documentation only	QLZ06-GZ	QLZ06-GZ	QLZ06-GZ	QLZ06-GZ	QLZ06-GZ	QLZ06-GZ	QMZ06-GZ
Installation service	QZZ06-I3 QZZ06-I5	QDZ06-IG QDZ06-IM	QEZ06-IM QEZ06-IY			QKZ06-IM	
U.S. Software Product Service Agreements:[5]							
DECsupport service	QZZ06-93 QZZ06-95	QDZ06-9G QDZ06-9M	QEZ06-9M QEZ06-9Y	Q*Z06-9M Q*Z06-93	Q#Z06-9M	QKZ06-9M	QMZ06-9M
Basic service	QZZ06-83 QZZ06-85	QDZ06-8G QDZ06-8M	QEZ06-8M QEZ06-8Y	Q*Z06-8M Q*Z06-83	Q#Z06-8M	QKZ06-8M	QMZ06-8M
Self-maintenance service	QZZ06-33 QZZ06-35	QDZ06-3G QDZ06-3M	QEZ06-3M QEZ06-3Y	Q*Z06-3M Q*Z06-3Y	Q#Z06-3M	QKZ06-3M	QMZ06-3M

[1] For MicroVAX I order codes, consult DECserver 200 Software Product Description.
[2] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[3] ★ = 5 for VAX 8200; 7 for VAX 8300.
[4] # = 9 for VAX 8500, 2 for VAX 8550 and VAX 8700.
[5] For Non-U.S. service agreement codes, consult local Digital Sales Representative.

Table 2.33
DECserver 200 Software
Order Codes for ULTRIX, RSX, and TOPS

Option	Order Code						
Load Host Operating System	**ULTRIX 32/32m**				**Micro/RSX**	**RSX-11M-PLUS**	**TOPS 10/20**
License Options:[1] *A license is required for each DECserver 200.*	**VAX 8200 VAX 8300[2]**	**VAX 8500**	**VAX 8600 VAX 8650**	**VAX 8550 VAX 8700 VAX 8800[2]**	**MicroPDP-11/xx**	**PDP-11/xx**	**DECSYSTEM-10/20[2]**
Single-use license	Q*Z14-UZ	Q9Z14-UZ	QKZ14-UZ	Q*Z14-UZ	QYZ06-UZ	QRZ06-UZ	Q*Z06-AM Q*Z06-DZ
Materials and Service Options:							
Distribution & documentation	Q*Z14-HG Q*Z14-HM	Q9Z14-HM	QKZ14-HM	Q*Z14-HM	QYZ06-H3 QYZ06-H5	QRZ06-HH QRZ06-HM	Q*Z06-HM
Software revision right-to-copy	Q*Z14-HZ	Q9Z14-HZ	QKZ14-HZ	Q*Z14-HZ	QYZ06-HZ	QRZ06-HZ	Q*Z06-HZ
Documentation only	QLZ14-GZ	QLZ14-GZ	QLZ14-GZ	QLZ14-GZ	QYZ06-GZ	QRZ06-GZ	QLZ06-GZ

[1] Refer to SPD 27.54 for VAX-11 order codes.
[2] ★ = 5 for VAX 8200, 7 for VAX 8300, 2 for VAX 8550 and VAX 8700, M for VAX 8800, T for TOPS-20, and H for TOPS-10.

MUXserver 100/DECmux II Remote Terminal Server

The MUXserver 100/DECmux II Remote Terminal Server connects up to 16 remote asynchronous terminals, personal computers, and printers through a pair of modems and a leased phone line to a local Ethernet. The MUXserver 100 connects to the Ethernet 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 Ethernet 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.

Specifications

Physical Size:	MUXserver 100:	DECmux II:
Height	9.52 cm (3.75 in)	11.43 cm (4.5 in)
Width	45.73 cm (18 in)	34.29 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)

Power Requirements:	
Low-range line voltage	100 Vac–120 Vac (DSRZA-BA and DFMZA-BA)
High-range line voltage	200 Vac–240 Vac (DSRZA-BB and DFMZA-BB)
Frequency tolerance	50/60 ± 3 Hz, 50/60 ± 3 Hz
Maximum AC watts drawn	50 W (MUXserver 100), 33 W (DECmux II)
Maximum heat dissipation	393 Btu/h (MUXserver 100), 210 Btu/h (DECmux II)
Environmental Class (See Appendix B for details.)	C

Configurations

Each DECmux II can connect up to 8 remote devices. However, since each MUXserver 100 can accept up to 16 channels, 2 DECmux IIs can be linked to 1 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 2 external modems operating at a maximum speed of 19,200 bps. Configurations include:

- 16 Users at One Site: 2 DECmux IIs can be linked at the same remote site with an RS232 cable (maximum distance: 50 feet) or an RS422 cable (maximum distance: 3,280 feet) to accommodate up to 16 users.
- 16 Users at Two Sites: Each site can have up to 8 users connected to a DECmux II. Each site connects through a phone link to one MUXserver 100.
- Two Sites with a 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 2 DECmux IIs with 2 modems and a leased phone line. Each site can have a maximum of 8 users.
- One Local Site and One Remote Site: If only 8 remote devices need Ethernet connection, 8 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 RS422 cable.

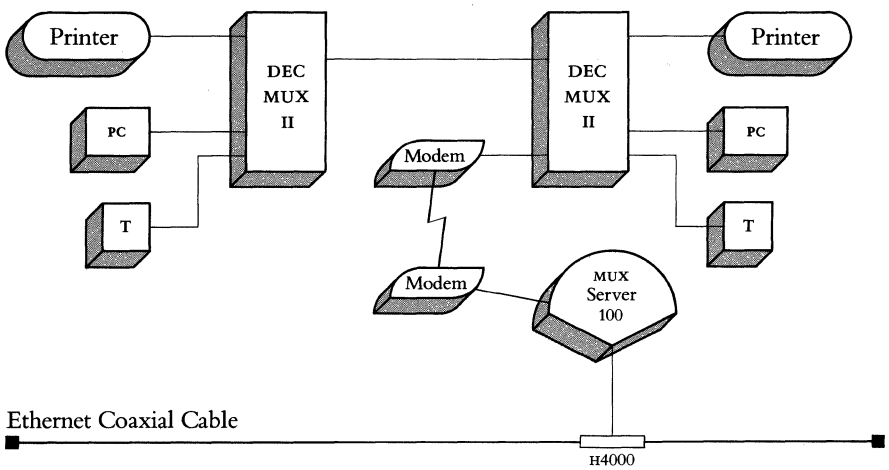


Figure 2.33
MUXserver 100/DECmux II Configuration

Prerequisite Hardware

- 1 MUXserver 100 with 1 or 2 DECmux IIs plus user port cables.
- 1 3002 or equivalent leased phone line and 1 pair of external modems and cables, where needed.
- All Ethernet physical channel hardware.
- An H4000, DECOM, DESTA, or DELNI and transceiver drop cable.

Prerequisite Software

- To downline load MUXserver 100 Software, one or more load hosts on the Ethernet must run one of the following:

  DECNET-VAX
  DECnet-11M-PLUS
  DECnet-Micro/RSX
  DECnet-ULTRIX

  See the Software Product Description for the version number requirements.

- Service node support is available on the following operating systems:

  VMS
  MicroVMS
  RSX-11M-PLUS
  Micro/RSX
  ULTRIX-32
  ULTRIX-32m
  TOPS-20

  Remote printer support is only available for VMS and MicroVMS 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 Section 3, *Network and System Management Products.*

Table 2.34
MUXserver 100/DECmux II
Hardware Order Codes

Option	Order Code
MUXserver 100, 120 volt (supports 16 remote devices connected to DECmux II ports). Includes U.S. country kit.	DSRZA-BA
DECmux II, 120 volt (supports 8 EIA RS232 terminal, PC, or printer connections). Includes U.S. country kit.	DFMZA-BA
MUXserver 100, 240 volt (supports 16 remote devices connected to DECmux II ports). Requires country kit.	DSRZA-BB
DECmux II, 240 volt (supports 8 EIA RS232 terminal, PC, or printer connections). Requires country kit.	DFMZA-BA

Table 2.35
MUXserver 100/DECmux II
Software Order Codes for VMS/MicroVMS

Option	Order Code					
Load Host Operating System	**VMS/MicroVMS**					
License Options: *A license is required for each MUXserver 100.*	**MicroVAX II**	**VAX 11/780 VAX 11/782[1] VAX 11/785**	**VAX 8200 VAX 8300[2]**	**VAX 8500 VAX 8550[3]**	**VAX 8600 VAX 8650**	**VAX 8700 VAX 8800[3]**
Single-use license	QZZAW-UZ	QEZAW-UZ	Q⋆ZAW-UZ	Q#ZAW-UZ	QKZAW-UZ	Q#ZAW-UZ
Materials and Service Options:						
Distribution and documentation	QZZAW-H3 QZZAW-H5	QEZAW-HM QEZAW-HY	Q⋆ZAW-H3 Q⋆ZAW-HM	Q#ZAW-HM	QKZAW-HM	Q#ZAW-HM
Software revision right-to-copy	QZZAW-HZ	QEZAW-HZ	Q⋆ZAW-HZ	Q#ZAW-HZ	QKZAW-HZ	Q#AW6-HZ
Documentation only	QLZAW-GZ	QLZAW-GZ	QLZAW-GZ	QLZAW-GZ	QLZAW-GZ	QLZAW-GZ

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] ⋆ = 5 for VAX 8200; 7 for VAX 8300.
[3] # = 2 for VAX 8550 or VAX 8700; M for VAX 8800; 9 for VAX 8500.

Table 2.36
MUXserver 100/DECmux II
Software Order Codes for ULTRIX and RSX

Option	Order Code							
Load Host Operating System	**ULTRIX 32/32m**						**Micro/RSX**	**RSX-11M-PLUS**
License Options: *A license is required for each MUXserver 100.*	**MicroVAX II**	**VAX 11/780 VAX 11/782[1] VAX 11/785**	**VAX 8200 VAX 8300[2]**	**VAX 8500 VAX 8550[3]**	**VAX 8600 VAX 8650**	**VAX 8700 VAX 8800[3]**	**MicroPDP-11/xx**	**PDP-11/xx**
Single-use license	QZZCK-UZ	QEZCK-UZ	Q⋆ZCK-UZ	Q#ZCK-UZ	QKZCK-UZ	Q#ZCK-UZ	QYDAW-UZ	QJDAW-UZ
Materials and Service Options:								
Distribution & documentation	QZZCK-H3 QZZCK-H5	QEZCK-HM QEZCK-HY	Q⋆ZCK-H3 Q⋆ZCK-HM	Q#ZCK-HM	QKZCK-HM	Q#ZCK-HM	QYDAW-H3 QYDAW-H5	QJDAW-HH QJDAW-HM
Software revision right-to-copy	QZZCK-HZ	QEZCK-HZ	Q⋆ZCK-HZ	Q#ZCK-HZ	QKZCK-HZ	Q#ZCK-HZ	QYDAW-HZ	QJDAW-HZ
Documentation only	QLZCK-GZ	QLZCK-GZ	QLZCK-GZ	QLZCK-GZ	QLZCK-GZ	QLZCK-GZ	QYDAW-GZ	QJDAW-GZ

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] ⋆ = 5 for VAX 8200; 7 for VAX 8300.
[3] # = 2 for VAX 8550 or VAX 8700; M for VAX 8800; 9 for VAX 8500.

Required cables

To configure the MUXserver 100/DECmux II, order the following cables. When ordering cables refer to *Communications Cables* in Section 4 for cable options and be sure to specify the length, for example, BC22F-25.

Cable	Order Code
Modem cable to connect external modem to MUXserver 100 or DECmux II.	BC22F
Null modem cable to connect 2 DECmux IIs together.	BC17D
Null modem cable to connect terminals, personal computers, or printers to DECmux II user ports.	BC22D

Please Note: RS422 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-English/French 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.

Table 2.37 MUXserver 100/DECmux II Country Kit Order Codes

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

★The U.S. versions of the MUXserver 100 (DSRZA-BA) include a country kit. A U.S. country kit is also available as a separate line item.

DECrouter 200

The DECrouter 200 provides communications between systems running DECnet software and systems on Ethernet-based DECnet networks. Systems that can connect to the DECrouter 200 include the Digital Rainbow, the Digital Professional 300 series, 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 Kbps. It has a maximum throughput rate of 170 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 endnodes. It performs the routing functions on the Ethernet to allow Phase IV endnodes not directly connected to the Ethernet to communicate with directly-connected Phase IV hosts. The DECrouter 200 can also be the designated router on the Ethernet, allowing endnodes to communicate with nodes off the Ethernet.

The DECrouter 200 implements Phase IV DECnet asynchronous DDCMP routine and network management. It can be used to connect to Phase III nodes to provide Phase III networks with connectivity to Phase IV Ethernet 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 and endnodes in the same area. Endnodes connected directly to an Ethernet must use the DECrouter 200 or Phase IV host-routing nodes on the same Ethernet for message routing off that Ethernet.

Features

- Eight asynchronous lines with dial-in capability
- Supports standard RS232 connections, ThinWire connections (using the DESTA Ethernet Station Adapter), and standard Ethernet connections
- 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 running on any valid MicroVAX II, VAX-11/730, VAX-11/750, VAX-11/780, VAX-11/782, VAX-11/785, VAX 8200, VAX 8300, VAX 8500, VAX 8550, VAX 8600, VAX 8650, VAX 8700, or VAX 8800 system configurations. (Note that ULTRIX and DECnet-ULTRIX do not support the VAX-11/782 configuration.)

Prerequisite Hardware

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

The load host must have one of the following devices to read the distribution medium: 1600 bpi magnetic tape, RX50 floppy diskette, or TK50 tape cartridge.

Prerequisite Software

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

- VAX/VMS with DECnet-VAX, V4.2 or later
- MicroVMS with DECnet-MicroVMS, 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

For more information, refer to the Software Product Description (SPD) for the DECrouter 200 V1.0 (27.72.00) and for the appropriate load host(s).

Table 2.38
DECrouter 200 Hardware Order Codes

Description	Order Code
DECrouter 200, RS-232 version, 120 V	DSRVC-AA
DECrouter 200, RS-232 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 RS-232-C/CCITT V.24 null modem cable used to connect directly to locally situated nodes that do not require modem control signals.
- BC17D—EIA RS-232-C/CCITT V.24 null modem cable used to connect directly to locally situated nodes that require modem control signals.
- BC22E—EIA RS-232-C/CCITT V.24 cable used to connect to modems and modem-type devices.

The DECrouter 200 hardware (DSRVC) requires an Ethernet transceiver cable to connect the integral Ethernet port to the transceiver. The transceivers to which the DSRVC may be connected include:

- H4000—Ethernet transceiver (requires a BNE3(A,B,C,or D) up to 50 meters, or a BNE4(C or 2) up to 12.5 meters).
- DELNI—Local Network Interconnect (requires a BNE3(A,B,C,or D) up to 50 meters, or a BNE4(C or 2) 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 2) up to 12.5 meters).
- DECOM—Broadband Ethernet transceiver (requires a BNE3(A,B,C,or D) up to 50 meters, or a BNE4(C or 2) up to 12.5 meters).

Table 2.39
DECrouter 200 Country Kits

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

*Refer to the Price List for more information.

Table 2.40
DECrouter 200 Software Order Codes for VMS/MicroVMS

Option	Order Code				
License Options: *A license is required for each CPU.*	**MicroVAX II VAX-station II**	**VAX-11/700 Series**	**VAX 8200 VAX 8300 VAX 8500 VAX 8550**	**VAX 8600 VAX 8650**	**VAX 8700 VAX 8800**
Single-use license	Q*Z43-UZ	Q*Z43-UZ	Q#Z43-UZ	QKZ43-UZ	Q#Z43-UZ
Initial license (primary and cluster)			Q#Z43-1P		Q#Z43-1P
Monthly availability (primary)			Q#Z43-JP		Q#Z43-JP
Materials and Service Options:					
Distribution and documentation	Q*Z43-H3 Q*Z43-H5	Q*Z43-HM	Q#Z43-HM	QKZ43-HM	Q#Z43-HM
Software revision right-to-copy	Q*Z43-HZ	Q*Z43-HZ	Q#Z43-HZ	QKZ43-HZ	Q#Z43-HZ
Documentation only	QLZ43-GZ	QLZ43-GZ	QLZ43-GZ	QLZ43-GZ	QLZ43-GZ
Installation service	Q*Z43-I3 Q*Z43-I5	Q*Z43-IM	Q#Z43-IM	QKZ43-IM	Q#Z43-IM
U.S. Software Product Service Agreements[1]:					
DECsupport service	Q*Z43-93 Q*Z43-95	Q*Z43-9M	Q#Z43-9M	QKZ43-9M	Q#Z43-9M
Basic service	Q*Z43-83 Q*Z43-85	Q*Z43-8M	Q#Z43-8M	QKZ43-8M	Q#Z43-8M
Self-maintenance service	Q*Z43-33 Q*Z43-35	Q*Z43-3M	Q#Z43-3M	QKZ43-3M	Q#Z43-3M

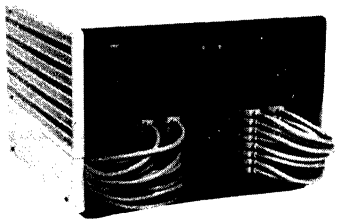
* = Z for MicroVAX II; 4 for VAXstation II and VAXstation II/GPX; C for VAX-11/730; D for VAX-11/750; E for VAX-11/780, VAX-11/782, and VAX-11/785. For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
# = 5 for VAX 8200, 7 for VAX 8300, 9 for VAX 8500, 2 for VAX 8550 and 8700, and M for VAX 8800.
[1] For Non-U.S. service agreements, consult a local Digital Sales Representative.

Table 2.41
DECrouter 200 Software Order Codes for ULTRIX-32 and ULTRIX-32m

Option	Order Code				
License Options: *A license is required for each CPU.*	**MicroVAX II VAXstation II**	**VAX-11/700 Series**	**VAX 8200 VAX 8300 VAX 8500 VAX 8550**	**VAX 8600 VAX 8650**	**VAX 8700 VAX 8800**
Single-use license	Q*Z51-UZ	Q*Z51-UZ	Q#Z51-UZ	QKZ51-UZ	Q#Z51-UZ
Initial license (primary and cluster)			Q#Z51-1P		Q#Z51-1P
Monthly availability (primary)			Q#Z51-JP		Q#Z51-JP
Materials and Service Options:					
Distribution and documentation	Q*Z51-H5	Q*Z51-HM	Q#Z51-HM	QKZ51-HM	Q#Z51-HM
Software revision right-to-copy	Q*Z51-HZ	Q*Z51-HZ	Q#Z51-HZ	QKZ51-HZ	Q#Z51-HZ
Documentation only	QLZ51-GZ	QLZ51-GZ	QLZ51-GZ	QLZ51-GZ	QLZ51-GZ
Installation service	Q*Z51-I5	Q*Z51-IM	Q#Z51-IM	QKZ51-IM	Q#Z51-IM
U.S. Software Product Service Agreements[1]:					
DECsupport service	Q*Z51-95	Q*Z51-9M	Q#Z51-9M	QKZ51-9M	Q#Z51-9M
Basic service	Q*Z51-85	Q*Z51-8M	Q#Z51-8M	QKZ51-8M	Q#Z51-8M
Self-maintenance service	Q*Z51-35	Q*Z51-3M	Q#Z51-3M	QKZ51-3M	Q#Z51-3M

* = Z for MicroVAX II; 4 for VAXstation II and VAXstation II/GPX; C for VAX-11/730; D for VAX-11/750; E for VAX-11/780, and VAX-11/785.
# = 5 for VAX 8200, 7 for VAX 8300, 9 for VAX 8500, 2 for VAX 8550 and 8700, and M for VAX 8800.
[1] For Non-U.S. service agreements, consult a local Digital Sales Representative.

DECnet Router Server



The DECnet Router performs DECnet routing functions that connect DECnet Phase III or Phase IV local or remote hosts to the Ethernet or that connect two independent Ethernets.

DECnet Routers implement Phase IV DECnet adaptive routing algorithms and network management. Through the use of Phase IV DECnet protocols, DECnet computer networks can contain up to 63 areas, each containing up to 1,023 nodes with proper network planning. DECnet Routers offer a cost-effective means of building such networks while off-loading the routing function from network hosts.

Features

- Hierarchical routing for increased network efficiency.
- Offloads the routing function from Ethernet hosts.
- Allows Phase III nodes to connect to an Ethernet.
- Reduces cabling complexity and increases network reliability.
- Offers full network management capabilities.
- Allows large network support.

The DECnet Router Server is a dedicated communications system in a DECnet network. It performs Phase IV adaptive routing for nodes on an Ethernet. As a routing node, the DECnet Router can receive and forward messages to nodes in other Ethernets and remote networks. The DECnet Router connects directly to an Ethernet to provide adaptive routing to remote nodes connected via its asynchronous lines. These nodes can be local or remote and Phase III or Phase IV DECnet routing or end nodes.

The DECnet Router supports both intra-area (Level 1) and inter-area (Level 2) routing for transporting messages between nodes. These nodes can be remote Phase III/IV routing nodes or end nodes in the same area or a different area, or other DECnet Router Servers connected to other Ethernet LANs in the same area or different areas. End nodes connected directly to an Ethernet LAN must use DECnet Router Servers or Phase IV host routing nodes on the same LAN for message routing off that LAN. A routing node is not required on an Ethernet LAN if the end nodes connected to that LAN communicate only with each other. However, if the Ethernet LAN directly connects nodes with different area addresses, an area routing node is required to transport messages between these areas. Use of the DECnet Router Server offloads certain communications processing on those nodes that would otherwise serve as routing nodes on the Ethernet LAN.

The DECnet Router supports direct connection of up to 16 low-speed synchronous EIA RS-232-C/CCITT V.28 interfaces, 32 low-speed asynchronous EIA RS-232-C/CCITT V.28 interfaces (up to 19,200 bits per second FDX) or up to eight high-speed synchronous CCITT V.35 interfaces (up to 56,000 bits per second FDX). Please note that not all DECnet host systems support asynchronous connection to the router, consult individual DECnet SPDs for supported configurations. The unit optionally supports a single 500,000-bit-per-second connection, or two 250,000-bit-per-second connections through a synchronous CCITT V.35 line interface.

The DECnet Router is Phase III compatible. This allows Ethernet nodes to communicate with remote Phase III and Phase IV nodes connected to the server.

Network management for the DECnet Router includes facilities to:

- Control operation of the server.
- Monitor operation of the server.
- Troubleshoot server networking problems.

These activities are performed normally by one or more system managers from Ethernet load hosts. All network management functions are performed from a host node on the Ethernet, rather than from the server itself.

The Ethernet Communications Server software is loaded over the Ethernet from a DECnet load host. All software, including diagnostics, is downline loaded into the unit. In the event of hardware or software malfunction, the unit will attempt to upline dump the DECnet Router memory image and automatically reload the software across the network.

The DECnet Router provides modem support for Digital's DF100 Series synchronous modems, and the Bell 208A, 208B, 209, 212, or equivalents.

Specifications

Physical Size:
Height: 41.9 cm (16.5 in)
Width: 64.8 cm (25.5 in)
Depth: 55.9 cm (22.0 in)
Weight: 39.9 kg (88.0 lb) for 16-line Terminal Server, Router, and Gateways without line cards; 49.9 kg (110.0 lb) for 32-line Terminal Server without line cards

Power Requirements:
Low-range line voltage: 120 Vac nominal
90 to 128 (rms) single-phase, three-wire
High-range line voltage: 240 Vac nominal
180 to 256 (rms) single-phase, three-wire
Line current @ 120 Vac: 7.0 A, Switch selectable (DECSA-CA and DECSA-FA: 3.5A)
Line current @ 240 Vac: 3.5 A, Switch selectable (DECSA-CA and DECSA-FA: 1.75A)
Frequency tolerance: 47 to 63 Hz
Maximum ac power consumption:
16-line Router, Gateways: 411 W
Maximum heat dissipation:
16-line Router, Gateways: 1417 BTU/h

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

Prerequisite Hardware

- All Ethernet physical channel hardware (for example, coaxial cable and terminators).
- An H4000 Transceiver (or a DELNI) and transceiver cable.

Prerequisite Software

The DECnet Router requires a Phase IV DECnet host to downline-load server software. One or more of the following systems can be used as Ethernet hosts:

- VAX/VMS or MicroVAX/MicroVMS operating system with DECnet-VAX Phase IV networking software.
- RSX-11M operating system with DECnet-11M or an RSX-11M-PLUS operating system with DECnet-11M-PLUS Phase IV networking software.

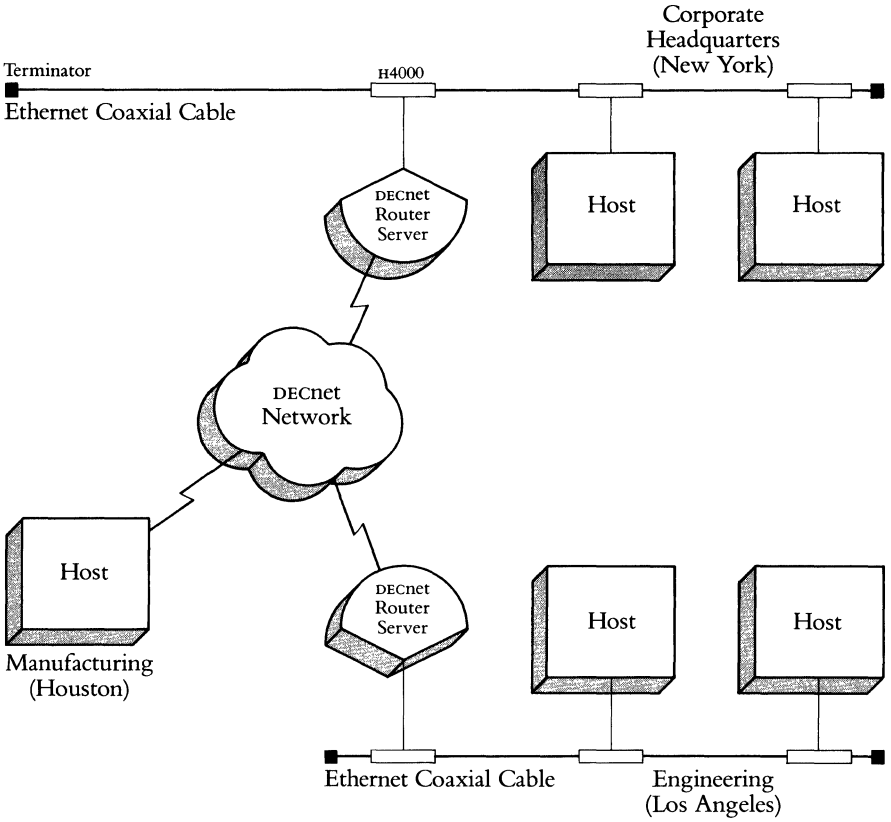


Figure 2.34
Ethernet LAN Configuration Using a DECnet Router Server

Table 2.42
DECnet Router Server Hardware Order Codes

Option	Order Code
DECnet router server unit and one-line synchronous EIA RS-232-C/CCITT V.28 line card (DCSAX-LA)	DECSA-EA
16-line router server unit and eight DCSAX-LC two-line asynchronous line cards (supports 16 EIA RS-232-C/CCITT V.28 physical terminal connections)	DECSA-CA
32-line router server unit and 16 DCSAX-LC two line asynchronous line cards (supports 32 EIA RS-232-C/CCITT V.28 physical terminal connections)	DECSA-DA
Upgrade kit	DCSAX-UA

Table 2.43
DECnet Router Server
Software Order Codes

Option	Order Code						
License Options: *A license is required for each CPU.*	**MicroVAX I**	**MicroVAX II**	**VAX-11/700 Series[1]**	**VAX 8200 VAX 8300 VAX 8500 VAX 8550[2]**	**VAX 8600 VAX 8650**	**VAX 8700 VAX 8800[3]**	**RSX-11M RSX-11M -PLUS**
Single-use license	QN725-UZ	QZ725-UZ	Q*725-UZ	Q#725-UZ	QK725-UZ	Q+725-UZ	QP725-UZ
Initial license (primary & cluster)				Q#725-1P		Q+725-1P	
Monthly availability (primary)				Q#725-JP		Q+725-JP	
Materials and Service Options:							
Distribution and documentation	QN725-H3	QZ725-H3	Q*725-HH	Q#725-HM	QK725-HH	Q+725-HM	QP725-HH
		QZ725-H5	Q*725-HM		QK725-HM		QP725-HM
Software revision right-to-copy	QN725-HZ	QZ725-HZ	Q*725-HZ	Q#725-HZ	QK725-HZ	Q+725-HZ	QP725-HZ
Documentation only	QL725-GZ	QL725-GZ	QL725-GZ	QL725-GZ	QL725-GZ	QL725-GZ	QL725-GZ
Installation service	QN725-I3	QZ725-I3	Q*725-IH	Q#725-IM	QK725-IH	Q+725-IM	QP725-IH
		QZ725-I5	Q*725-IM		QK725-IM		QP725-IM
U.S. Software Product Service Agreements:[4]							
DECsupport service	QN725-93	QZ725-93	Q*725-9H	Q#725-9M	QK725-9H	Q+725-9M	QP725-9H
		QZ725-95	Q*725-9M		QK725-9M		QP725-9M
Basic service	QN725-83	QZ725-83	Q*725-8H	Q#725-8M	QK725-8H	Q+725-8M	QP725-8H
		QZ725-85	Q*725-8M		QK725-8M		QP725-8M
Self-maintenance service	QN725-33	QZ725-33	Q*725-3H	Q#725-3M	QK725-3H	Q+725-3M	QP725-3H
		QZ725-35	Q*725-3M		QK725-3M		QP725-3M

[1] * = D for VAX-11/750; E for VAX-11/780, VAX-11/782, and VAX-11/785. For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] # = 5 for VAX 8200, 7 for VAX 8300, 9 for VAX 8500, and 2 for VAX 8550.
[3] + = 2 for VAX 8700 and M for VAX 8800.
[4] For Non-U.S. Service Agreements, consult local Digital Sales Representative.

Cable Requirements

For local EIA RS-232-C/CCITT V.28 connection to the DECnet Router, order BC17D null modem cables. For remote connections, order BC17C extension cables for DCSAX-LA EIA RS-232-C/CCITT V.28 line cards, BC17E extension cables for DCSAX-LB CCITT V.35 line cards (note: BC17E cable lengths shorter than 50 feet may not work properly with Bell DDS modems), and BC22E extension cables for DCSAX-LC EIA RS-232-C/CCITT V.28 line cards. When ordering cables, be sure to specify the length, for example, BC17C-25. Refer to *Communications Cables* in Section 4 for cable order codes. All line card cables are fully shielded to comply with FCC RFI/EMI specifications.

Caution: The connectors on the Digital-supplied cables are designed to attach to the handle on each line card. For those customers who choose to use other cables with a server, be advised that there is a restriction on the size and construction of the cable connector housing as follows:

1. Maximum height of the connector housing is .610 inches.
2. Connectors with housings that extend beyond the face of the connector cannot be used.

Should customers elect to use cables which violate the restrictions above, the BC17L cable, a 4-foot adapter cable, is available for attaching to the DCSAX-LA line cards with EIA RS-232-C/CCITT V.28 interfaces, and the BC17L cable (a 4-foot adapter cable) is available for attaching to the DCSAX-LC line cards with EIA RS-232-C/CCITT V.28 interfaces.

DECnet Router Server Country Kits

Every DECnet Router requires a country kit. Each country kit contains a power cord, hardware manuals in English, and labels with the front panel display in the appropriate national language.

Table 2.44 DECnet Router Server Country Kit Order Codes

Country	Order Code
Australia	DECSK-AZ
Canada (English)	DECSK-AA
Canada (French)	DECSK-AC
England	DECSK-AE
France	DECSK-AP
Germany	DECSK-AG
Ireland	DECSK-AE
Japan	DECSK-AJ
New Zealand	DECSK-AZ
Spain	DECSK-AS
United States	DECSK-AA

DECnet Router Server Options

The DECnet Router, with one Protocol Assist Module (PAM), DECSA-EA, can be expanded by adding up to seven additional DCSAX-LA, DCSAX-LB, and DCSAX-LC line cards (up to the aggregate throughput limit of 500,000 bits per second for the server). The DECSA-EA can be further expanded by adding a second PAM (Communications Server Upgrade Kit, DCSAX-UA) and up to 15 additional DCSAX-LA and DCSAX-LC line cards (up to the aggregate throughput limit of 500,000 bits per second for the server). The maximum number of line cards depends on line speed. The aggregate line speed for the DECnet Router cannot exceed 500,000 bits per second. The following represent some valid line configurations:

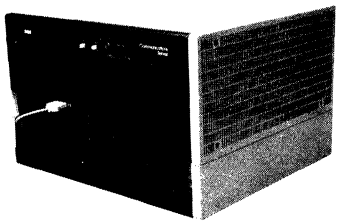
- Add up to seven DCSAX-LA/DCSAX-LC cards to a one PAM configuration; add up to 15 DCSAX-LA/DCSAX-LC cards to a two PAM configuration.
- Add up to seven DCSAX-LB/DCSAX-LC cards at 56,000 bits per second each to a one PAM configuration.
- Add eight DCSAX-LB cards at 56,000 bits per second each and discard the DCSAX-LA line card included with the server hardware for a one PAM configuration.
- Add two DCSAX-LB cards at 250,000 bits per second each and discard the DCSAX-LA line card included with the server hardware for a one PAM configuration.
- Add one DCSAX-LB card at 500,000 bits per second each and discard the DCSAX-LA line card included with the server hardware for a one PAM configuration.

For totally asynchronous applications, use the 32-line asynchronous DECSA-DA (including 16 DCSAX-LC line cards). The aggregate line speed for the DECnet Router cannot exceed 500,000 bits per second. Asynchronous and synchronous line cards can be mixed in DECnet Router Server configurations. In this type of configuration, a single PAM can handle somewhere between eight and 16 lines. DECSA-CA can be expanded by adding a second PAM, Communications Server Upgrade Kit (DCSAX-UA) and either up to eight synchronous (DCSAX-LA/LB line cards) or 16 asynchronous (DCSAX-LC line cards). The actual number of line cards supported depends upon the line speed and must be calculated separately for each configuration. The DECSA-DA is a fully configured asynchronous line card unit and cannot be expanded.

Table 2.45 DECnet Router Server Line Card Order Codes

Option	Order Code
One-line synchronous EIA RS232-C/CCITT V.28 line card at speeds up to 19.2K b/s (FDX/HDX)	DCSAX-LA
One-line synchronous CCITT V.35 line card at speeds up to 500K b/s (FDX/HDX)	DCSAX-LB
Two-line asynchronous EIA RS-232-C/CCITT V.28 line card at speeds up to 19.2K b/s (FDX/HDX)	DCSAX-LC

DECnet/SNA Gateway



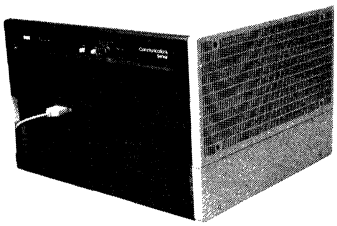
The DECnet/SNA Gateway allows users to share information between suitably configured VAX/VMS or MicroVAX/MicroVMS systems in a DECnet environment and IBM systems in a Systems Network Architecture (SNA) environment.

The DECnet/SNA Gateway requires

- DECSA-FA hardware, and
- software downline-loaded from a DECnet Phase IV host.
- The DECnet/SNA Gateway works in conjunction with DECnet/SNA Access Routines and Programming Interfaces residing on the host system.

Refer to Digital-to-IBM Communications Software in Section 3 for more information.

DECnet Router/X.25 Gateway



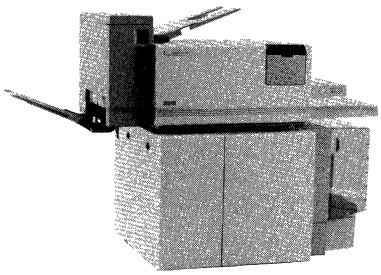
The DECnet Router/X.25 Gateway is a variant of the DECnet Router Server. It supports both DECnet lines (leased, dial-up, and hardwired) and international standard X.25 lines in the same server. The DECnet Router/X.25 Gateway requires

- DECSA-EA hardware, and
- software downline-loaded from a DECnet Phase IV host.
- The DECnet Router/X.25 Gateway works with VAX P.S.I. ACCESS software residing on the host system.

Refer to Packetnet Communications Software in Section 3 for more information.

Other Ethernet Servers

PrintServer 40



The PrintServer 40 is a high speed, shared resource, monochromatic laser printer that provides print services on an 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 defacto industry standard, as its page description language. PostScript enables the PrintServer 40 to produce highly professional, complex documents with rotated type, textures, patterns, halftones, and images in any size and shape. Also included are three translators to convert data syntaxes of ANSI, ReGIS, and Tektronix 4010/4014™ to PostScript, thus ensuring compatibility between the customer's application and the PrintServer 40.

The PrintServer 40 is down-line loaded and managed from a VMS or MicroVMS system running the VAX PrintServer 40 Supporting Host software. It is accessed by suitably configured VMS or MicroVMS systems running the VAX PrintServer 40 Client software. For more information on the VAX PrintServer 40 Supporting Host software, refer to SPD 27.68. For more information on the VAX PrintServer 40 Client software, refer to SPD 27.67.

Features

- Laser electrographic printing of up to 40 pages per minute on plain paper and transparencies, using dry toner, heat and pressure fusing.
- High-speed Ethernet interconnect on VAX and MicroVAX systems.
- 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.
- 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.

Prerequisite Software

- VAX/VMS operating system version 4.4 or higher
- DECnet-VAX

Table 2.46
PrintServer 40 Hardware Order Codes

Option	Order Code
U.S. model: PrintServer 40, 40 ppm 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 Ethernet printer, 200/208/220/230/240 V, 50 Hz, detached power cord. Client and Support Host licenses are included.	LPS40-A3

Table 2.47
PrintServer 40 Cable Order Codes

Option	Order Code
For H4000/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.	
Ethernet PVC-jacketed right angle male-to-female transceiver cable	BNE3B-10 BNE3B-20 BNE3B-40
Ethernet teflon-jacketed right angle male-to-female transceiver cable	BNE3D-10 BNE3D-20 BNE3D-40
IEEE 802.3 PVC-jacketed right angle male-to-female transceiver cable	BNE3K-10 BNE3K-20 BNE3K-40
IEEE 802.3 teflon-jacketed right angle male-to-female transceiver cable	BNE3M-05 BNE3M-10 BNE3M-20 BNE3M-40

Table 2.48
PrintServer 40 Software Order Codes

Option	Order Code
Client and Support Host licenses are packaged with the PrintServer 40 configurations. However, software media must be ordered separately with the initial PrintServer purchase for a particular site:	
VAX/VMS Support Host media on magtape	QL798-HM
VAX/VMS Support Host media on TK50	QL798-H5
VAX/VMS Support Host media on RX50	QL798-H3
VAX/VMS Client media on magtape	QL797-HM
VAX/VMS Client media on TK50	QL797-H5
VAX/VMS Client media on RX50	QL797-H3
Support Host documentation	QL798-GZ
Client documentation	QL797-GZ

Ethernet Configuration Guidelines

Introduction

This section focuses on guidelines for connecting terminals, communications servers, and host systems to an Ethernet Local Area Network. The guidelines follow a brief overveiw of configuration guidelines for Phase IV networks including a discussion of connecting Phase III to Phase IV networks.

The information in this section, together with the preceding product descriptions, should help in preparing a preliminary network plan. Digital Sales Representatives and Digital Network Specialists can give detailed network planning assistance.

Phase IV Network Terms

Definitions of commonly used Phase IV network terms follow:

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 transmit node for data destined for other nodes. A router server is a combination of both hardware and software. It is not an originating or terminating node. No applications software can run on a router server.

DNA Phase IV Network Configuration Guidelines

There are several elements of a DNA Phase IV network that affect performance and memory use. For this reason, the following elements must be analyzed and potentially limited:

- Number of router servers on one Ethernet cable.
- Number of full-function nodes in the network.
- Total number of nodes in the network.

The number of full-function nodes and router servers in a network should be kept down because of the overhead associated with routing. Your goal is to minimize the use of router servers and maximize the use of end nodes. End nodes are less flexible than full-function nodes because they have a single physical link, but they require less memory and are less expensive. By using fewer routing nodes, you reduce system overhead and obtain better system performance. The tradeoff is less configuration flexibility.

Table 2.49 shows architectural limits, aggressive limits, and conservative limits for DNA Phase IV networks within one area. Architectural limits cannot be exceeded under 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 careful analysis of both performance and memory requirements are necessary. Conservative limits represent a point that is easily achievable and where communications performance is acceptable.

The aggressive and conservative limits included in this section are guidelines to be used for network planning. If these guidelines are exceeded in order to meet application requirements, careful analysis by a Network Coordinator or Software Specialist is necessary.

Table 2.49
Phase IV Network Limits

	Architectural	Aggressive	Conservative
Number of router servers/routing nodes on one Ethernet	32	8	4
Total number of router servers/routing nodes in the network	1023	100	50
Total number of nodes (end nodes and routing nodes) in the network	1023	300	100

Remote Multipoint Configurations and Guidelines

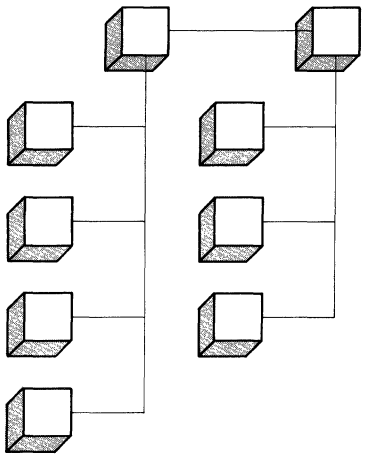
The conventional method of connecting remote VAX systems is shown in Figure 2.35.

Figure 2.35
Conventional Remote Configuration

The following guidelines apply only to remote multipoint configurations. Local multipoint links should use more cost-effective 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. Figure 2.36 illustrates a non-nested configuration.
- Consult individual Software Product Descriptions for supported remote multipoint configurations (number of tributaries per control node, etc.).

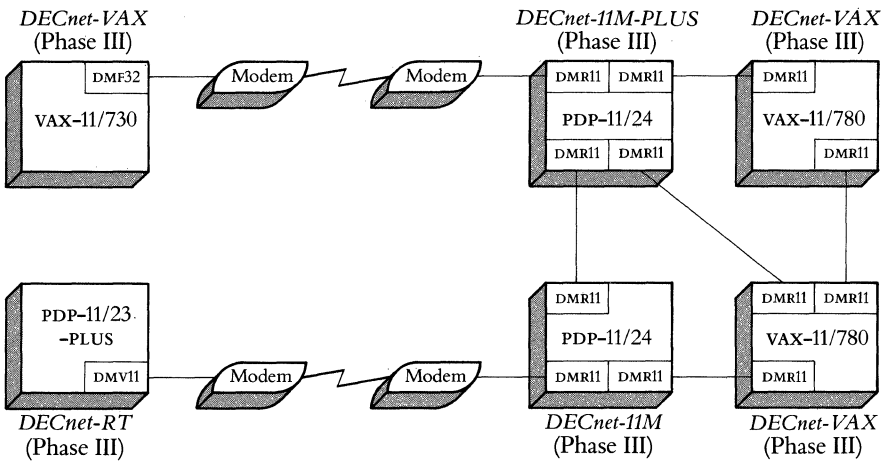
Figure 2.36
Remote Multipoint Non-nested Configurations



Converting Networks from Phase III to Phase IV

The following discussion is for those customers who already have Phase III networks and are interested in converting them to Phase IV networks. Figure 2.37 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 interface devices, modems, and lines required to implement this network.

Figure 2.37
Typical Phase III Network

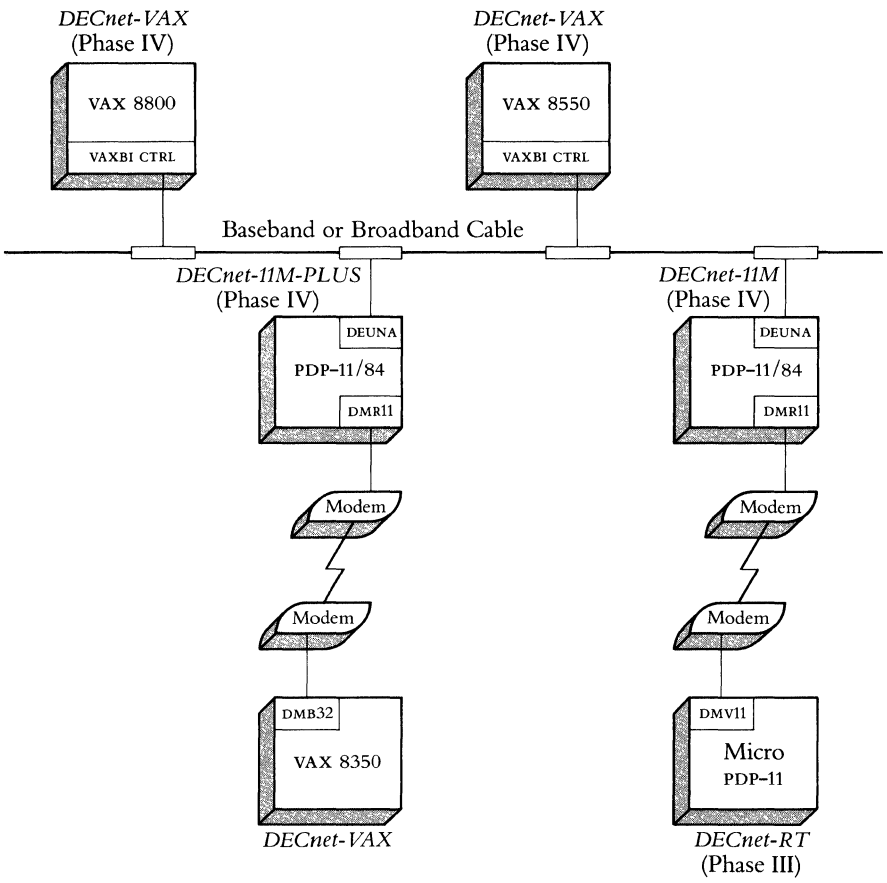


Today, among other applications, DECnet Phase III networks are used to provide rapid, easy file transfer. The typical network in Figure 2.37 could be doing extensive numerical analysis on the VAX-11/780 and VAX-11/750 systems, front-end data collection on the PDP-11/44 and PDP-11/24, and data collection on the remote VAX-11/730 and PDP-11/23-PLUS. The primary terminal I/O occurs at the VAX-11/780 systems to do final review of the collected data. In essence, the major flow of DECnet data is from the bottom to the top of the diagram. Additional lines in the local portion of the network increase reliability.

In Phase IV, the maximum number of nodes in a DECnet network has been increased to 1,023 (with area routing, this number expands to 64,000 nodes). This increase is especially important because of the number of personal computers that will be included in networks.

Figure 2.38 illustrates a Phase IV network with the same level of connectivity as the Phase III network in Figure 2.37. Notice that the Phase IV network uses an Ethernet coaxial cable and 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 Ethernet.

Figure 2.38
Ethernet-based
Phase IV Network



A comparison between the Phase III and Phase IV networks shows that there is a significant cost savings with the Phase IV network. For example, an H4000 Transceiver plus the Ethernet controller costs less than a synchronous DMR11. In addition to the cost savings, the Phase IV network increases the configuration flexibility so that transceivers can be easily relocated along the length of the Ethernet cable. The Ethernet technology also 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.

Refer to *Connecting Shared Resources to an Ethernet LAN* for a discussion of the use of the Terminal Server in a Phase IV LAN, and *Connecting an Ethernet LAN to Remote Networks* for a discussion of the use of Router Servers in Phase IV networks.

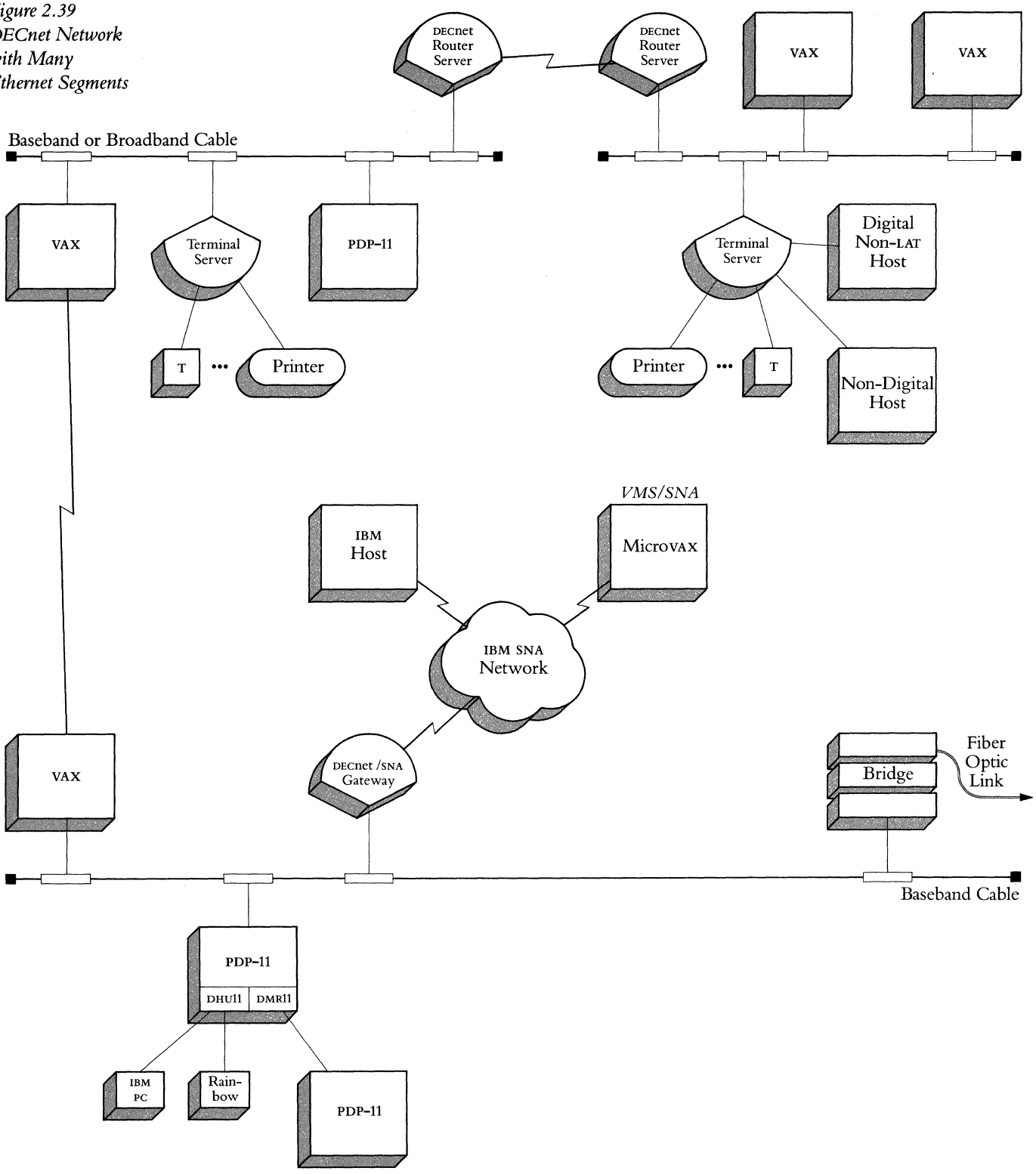
Ethernet-based Products

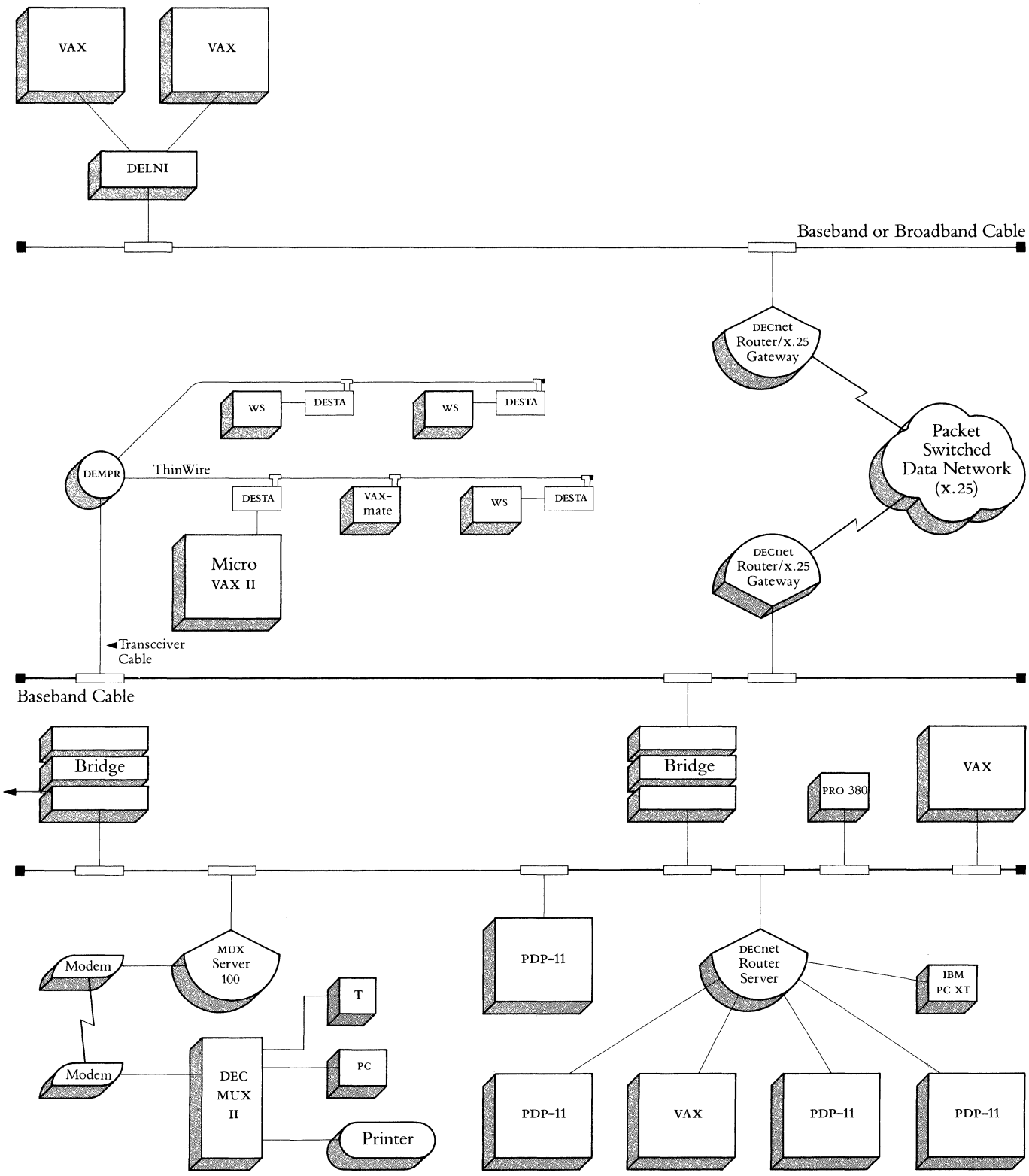
Digital's Ethernet product set allows a network configuration to be tailored to current needs while allowing for future growth. As illustrated in Figure 2.39, Digital's Ethernet products provide many types of communication, including:

- Digital terminal to host (Digital, X.25, and IBM hosts)
- Host to host
- Host to server
- DECnet to DECnet
- DECnet to X.25 packet-switching data network
- DECnet to IBM SNA network

DECnet Phase IV supports direct connection to Ethernet LANS for host systems running VAX/VMS, RSX-11M, RSX-11M-PLUS, RSX-MS, Micro/RSX, MicroVMS, RSTS/E, ULTRIX-32, ULTRIX-32m, and P/OS. DECnet Phase III systems can connect indirectly to the Ethernet through a DECnet Phase IV host or through an Ethernet Communications Server.

Figure 2.39
DECnet Network with Many Ethernet Segments




VAX
VAX
DELNI
Baseband or Broadband Cable
DECnet Router/X.25 Gateway
WS
DESTA
WS
DESTA
DEMPR
ThinWire
DESTA
VAX-mate
WS
DESTA
Micro VAX II
Packet Switched Data Network (X.25)
DECnet Router/X.25 Gateway
Transceiver Cable
Baseband Cable
Bridge
Bridge
PRO 380
VAX
Modem
MUX Server 100
T
PDP-11
DECnet Router Server
IBM PC XT
Modem
DEC MUX II
PC
Printer
PDP-11
VAX
PDP-11
PDP-11

Planning a Baseband Ethernet LAN

Planning an 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 Ethernet LAN: This section includes information about connecting terminals and host systems to an Ethernet LAN.
- Connecting an Ethernet LAN to remote networks: This section has information about connecting an Ethernet LAN to other networks, such as DECnet, X.25 packet-switching data networks (PSDNs), and IBM SNA networks.

Planning the Physical Channel Layout

A flexible Ethernet LAN begins with a carefully planned physical channel layout, which includes the following:

- Standard Ethernet coaxial, fiber optic, and/or ThinWire Ethernet 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 Ethernet Coaxial Cable

Coaxial cable is the backbone of an Ethernet LAN. A coaxial 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. For example, if a 257.4-meter segment is required, it could be made up of two 117-meter sections and a 23.4-meter section. This would require two barrel connectors as shown in Figure 2.40. Segments up to 500 meters (1,640 feet) can be made by using barrel connectors. Beyond 500 meters a repeater is required.

The installation of the main Ethernet coaxial cable segment and where to use repeaters to connect branching segments should be carefully planned. Preplanning the placement of equipment at this stage can save time later when connecting host systems and servers to the Ethernet (even while it is operating.)

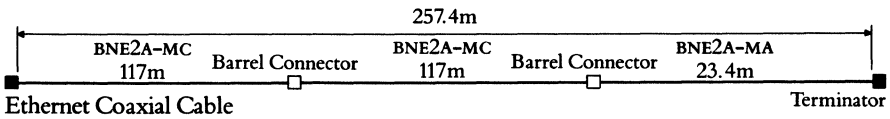


Figure 2.40
Ethernet Coaxial Cable Segment using Barrel Connectors

Fiber Optic Cable

Digital offers general purpose fiber optic cable (see Baseband Ethernet Products in this section for further details). 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.

The 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 Field Service to support an installation. Your Field Service Network Planning Consultant or Digital-recommended installer (see Section 7) will provide this service.

The fiber optic cable and connectors used must meet the following requirements:

- The fiber should be a Corning 1508TM type fiber or equivalent.
- Connectors on these cables must be Amphenol 906™ type SMA or equivalent.
- Bandwidth must be greater than or equal to 300MHz per kilometer at 850nm.
- Cable attenuation must be less than or equal to 6dB per kilometer at 850nm over the operating temperature range.
- Total system loss must be less than 12.5db, to be verified after the installation.
- Temperature and Humidity must be:

	Operating Temperature	Humidity
General Purpose	0° C to 70° C	95%, noncondensing
Aerial	−30° C to 60° C	95%, noncondensing
Plenum	0° C to 70° C	95%, noncondensing

Connectors, Terminators and Ground clamps

Barrel connector.
Connects two coaxial cable sections, creating a segment up to a maximum length of 500 meters (1,640 feet).

Terminator (50 ohm).
Electronically terminates the ends of a coaxial cable segment. Each end of the coaxial cable section must have either a terminator or a connector.

Ground clamp.
Each Ethernet coaxial cable segment requires one ground clamp in each building it passes through.

ThinWire Ethernet Cable

ThinWire Ethernet Cable is recommended for offices and other local work areas to bring Ethernet capability to personal computers, workstations and low-end systems. Refer to Planning a ThinWire Ethernet LAN in this section for more information.

Transceivers and Transceiver Cable

Devices are connected to Ethernet coaxial cable via transceivers and transceiver drop cable. The H4000 Transceiver transmits signals on the transceiver cable to the connected devices and detects Ethernet message collisions. H4000 transceivers mount on the standard Ethernet by means of a tap and can be easily installed using Digital's Ethernet Transceiver Installation Tool Kit.

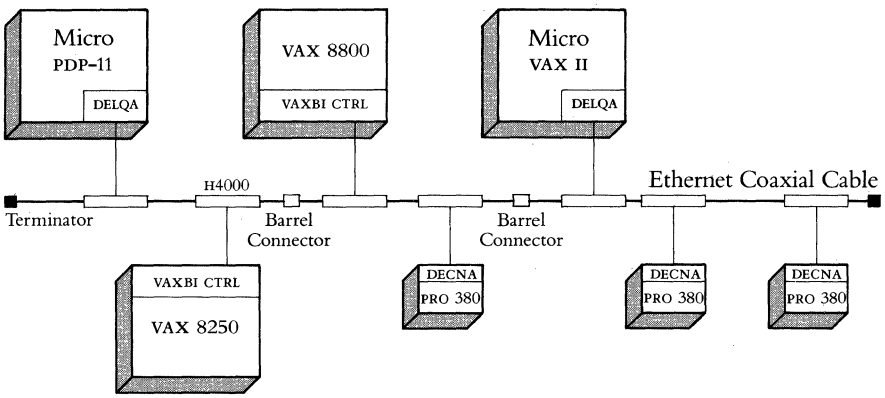
There is one general purpose transceiver cable that supports both Ethernet and IEEE 802.3 hardware. This cable is available in standard and office types. Because office cables have a high signal loss, they are limited to a maximum distance of 12.5 meters. They are, however, thinner than standard cables and easier to run in an office environment.

Remember these rules when planning installation of transceivers and transceiver cable on the Ethernet:

- There is a maximum of 100 transceivers per coaxial cable segment.
- Transceivers must be at least 2.5 meters (8.2 feet) apart. Digital premarks its Ethernet coaxial cable 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.

Figure 2.41 shows an Ethernet network with each system attached to the Ethernet cable by means of a transceiver and transceiver cable. The systems communicate with the network through an Ethernet communications controller.

Figure 2.41 Ethernet LAN with Connected Processors



Ethernet Repeaters

The Ethernet Repeater allows network expansion beyond the 500-meter (1,640-foot) limitation of one coaxial cable segment. Repeaters can connect up to three coaxial cable segments together and make them function as if they were one piece of cable by retiming, amplifying, and repeating all signals received from one segment and passing the signals to the next segment.

Digital offers two Ethernet repeaters:

- Local Repeater—connects two coaxial cable segments in the same building. The two cable segments can be a maximum of 100 meters (328 feet) apart.
- Remote Repeater—connects two coaxial cable segments at greater distance, such as between buildings. The remote repeater consists of two local repeaters with fiber optic interface boards connected by fiber optic cable.

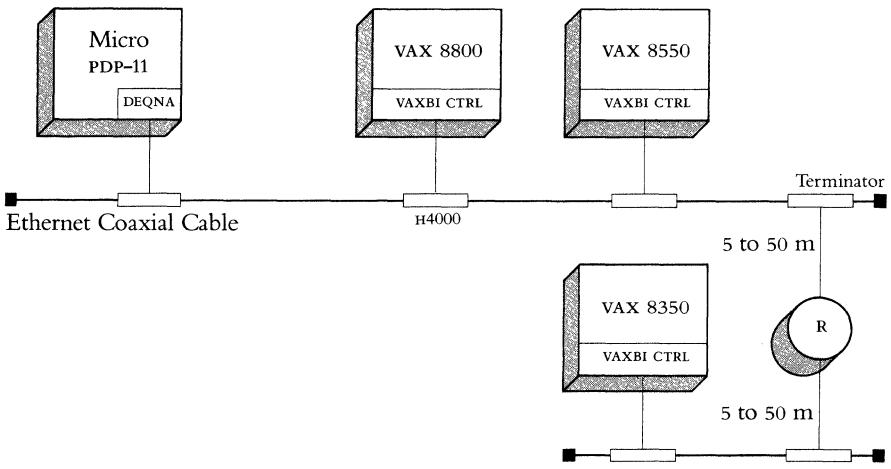
Repeaters can be used effectively in a multifloor building to expand a network. A backbone coaxial cable segment can be installed vertically from the basement to the top floor of a building with repeaters and a branching segment installed on each floor.

Consider these rules when planning LAN expansion using repeaters:

- A maximum of two repeaters may be placed in the path between any two transceivers.
- One remote repeater pair may be separated by a maximum of 1000 meters (3,282 feet) of fiber optic cable.
- Remote repeaters may 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 1000 meters.
- 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.
- Both local and remote repeaters are connected to the Ethernet coaxial cable via two H4000 Transceivers and two Ethernet transceiver cables.

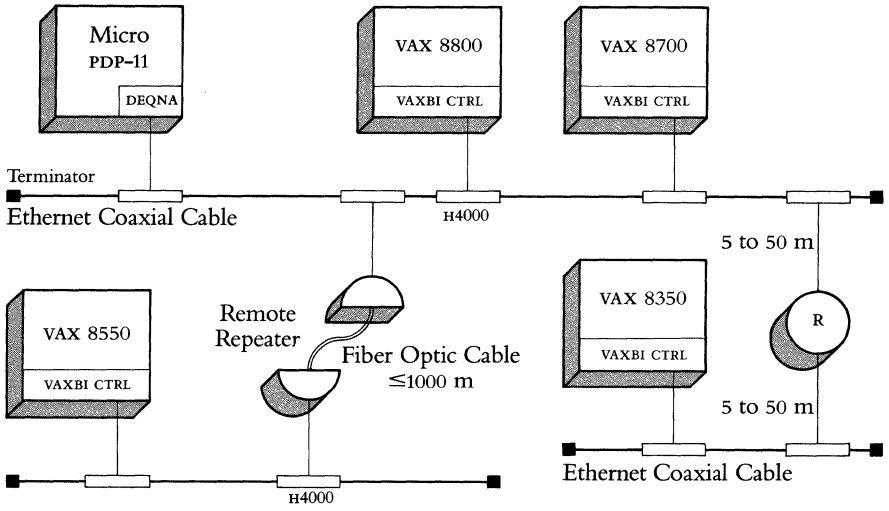
Figure 2.42 illustrates an Ethernet LAN that has been expanded from one floor to another floor within the same building. In this example, the distance between the two Ethernet cables is 100 meters, so a local repeater is required.

Figure 2.42
Ethernet LAN Expansion using a Local Repeater (100M maximum separation between cable segments)



If it is necessary to expand the network to another building up to 1,000 meters (3,280 feet) away, a remote repeater is necessary as shown in Figure 2.43. Notice that the remote link uses a fiber optic cable.

Figure 2.43 Ethernet LAN Expansion using a Remote Repeater (1000M maximum separation between cable segments)



Standard Ethernet (Baseband) Distance Guidelines

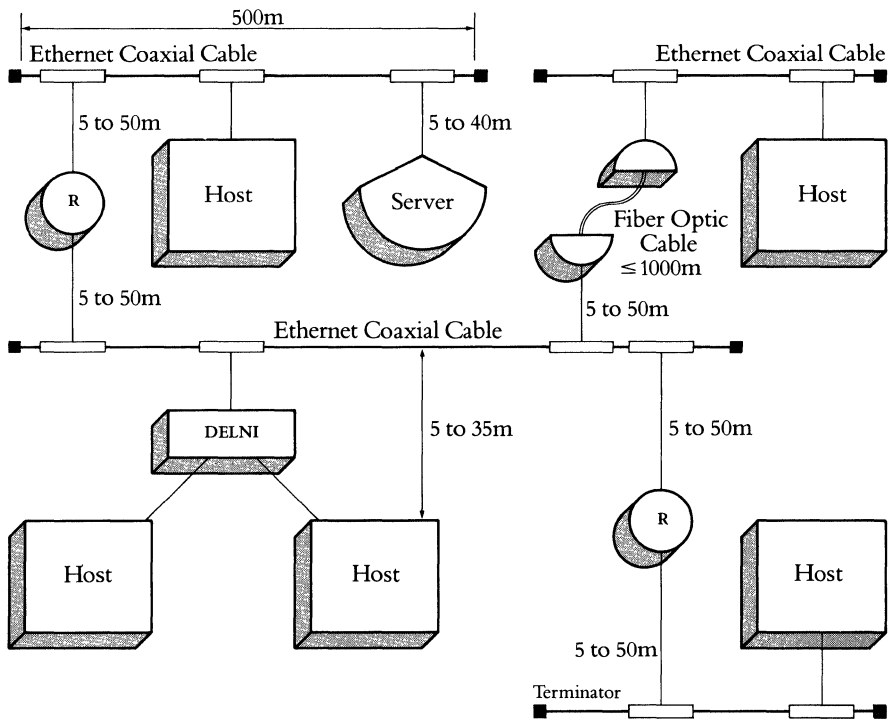
Standard Ethernet is a branching non-rooted tree topology with a maximum node separation (the distance between the two furthest systems on the network) of 2.8 kilometers (1.74 miles). Up to 1,023 transceivers can be connected to the Ethernet coaxial cable, allowing connection of thousands of devices.

A few simple rules for configuring an Ethernet, derived from certain limits that are imposed on the physical channel, ensure the optimal performance of the network. The maximum configuration for an Ethernet is as follows:

- A segment of coaxial cable can be a maximum of 500 meters (1,640 feet) in length. Each segment of coaxial 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.
- Repeaters are used to continue signals from one segment of the Ethernet to another. A maximum of two repeaters (either DEREP or DEMPR) can be placed in the path between any two transceivers. A repeater requires a transceiver connection (a physical connection position) on both of the segments it joins, and counts toward the 100 transceiver maximum for each segment. Repeaters can be placed at any or every available physical connection position on a cable segment (up to 100) and can be used to extend the network topology from one to three dimensions.
- The maximum length of coaxial 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 remote repeaters.
- A standalone DELNI configuration supports up to eight devices (systems, not terminals) using standard Ethernet transceiver cables between 40 and 45 meters (131.2 and 147.6 feet) away depending on the communications controller.

- A hierarchical standalone DELNI configuration supports up to 64 devices using standard Ethernet transceiver cables between 40 and 45 meters (131.2 and 147.6 feet) away 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) away depending on the communications device. The DELNI LAN is not connected to the Ethernet coaxial cable.
- A connected DELNI configuration supports up to eight devices using standard Ethernet transceiver cables between 35 and 40 meters (114.8 and 131.2 feet) away depending on the communications device.
- 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) coaxial cable segments, four 50-meter (164 feet) transceiver cables connected to repeaters, and 1,000 meters (3,280 feet) of fiber optic cable.
- 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.

Figure 2.44
Baseband Ethernet
Distance Guidelines



Planning a ThinWire Ethernet LAN

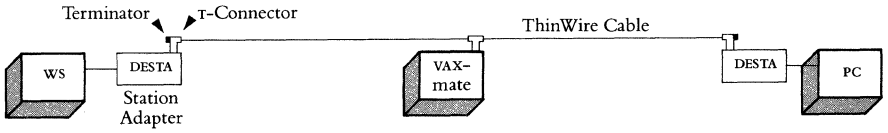
While standard Ethernet is recommended for use between satellite equipment rooms of a facility and between buildings, ThinWire is recommended for use within the floor areas of a facility. ThinWire Ethernet is an alternative baseband cabling system which can be configured as a standalone network or connected to the backbone Ethernet in local work areas. ThinWire Ethernet products include ThinWire coaxial cable, the Multiport Repeater (DEMPR), the Station Adapter (DESTA), and connection components.

Three configurations are recommended for ThinWire installation. Each configuration is described below. Specific configuration guidelines are listed after the descriptions.

Work Area Configuration

The Work Area configuration allows users to interconnect personal computers, workstations, low-end systems, and Ethernet communications servers using ThinWire cable and T-connectors. A segment of ThinWire cable is divided into sections. Two sections of cable are joined by a T-connector and the bottom of the "T" is inserted into a DESTA or ThinWire Ethernet controller. The DESTA has a 15-pin D connector for attachment to standard Ethernet devices and a BNC connector for connection to the ThinWire. Up to 30 devices can be connected to a single 185 meter segment of ThinWire.

Figure 2.45
ThinWire Ethernet Work Area Configuration

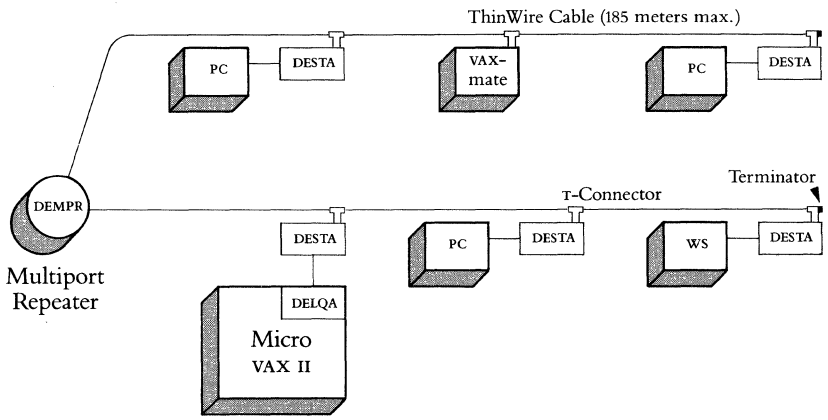


Standalone Configurations

The standalone 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 interconnect personal computers, workstations, and low-end systems in a work area or throughout the floor of a building. Each of the eight ThinWire coaxial cable segments that connect to the DEMPR can accommodate up to 29 stations. Therefore, one DEMPR can interconnect 232 stations. The DEMPR will isolate faults in a segment so that the rest of the network will stay in operation. Figure 2.46 illustrates the standalone configuration.

Eight DEMPRs can also be connected to a DELNI in a standalone configuration. In this configuration, the Ethernet limit of 1,023 stations can be interconnected.

Figure 2.46
ThinWire Ethernet Standalone Configuration

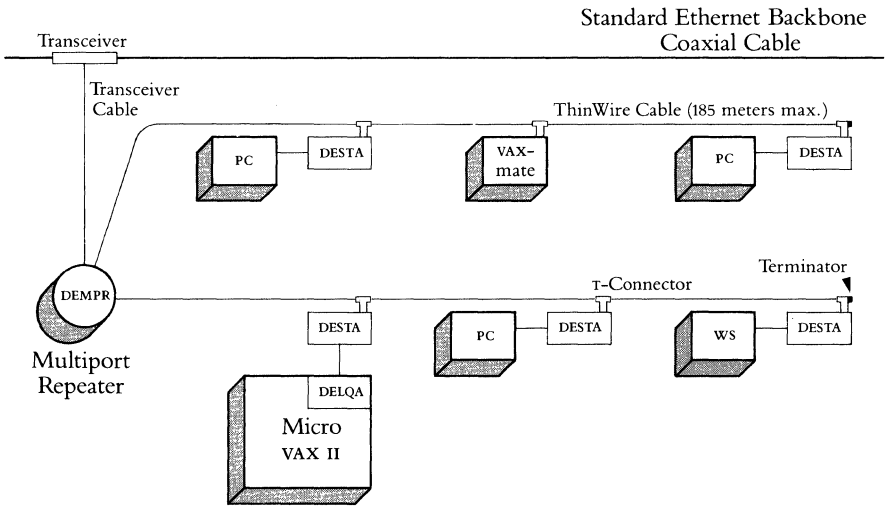


Connected Configurations

In connected configurations, the two standalone configurations described above are connected to the standard Ethernet backbone for access to more computing resources on the larger Ethernet. The DEMPR connects to the standard Ethernet cable using an H4000 Transceiver. The DELNI connects to the backbone Ethernet using an H4000-BA Transceiver only.

When connected to a standard Ethernet, the DEMPR functions as a repeater between all stations attached to it and all devices connected to the standard Ethernet. The DEMPR must count as a full repeater when configuring an Ethernet LAN. Since the DEMPR counts as a repeater, only one other repeater can be configured in the path between the DEMPR and any station on the rest of the Ethernet. For configuration simplicity, Bridges (DEBET) rather than Repeaters (DEREP) are recommended for use between standard Ethernet segments where DEMPRs are attached. Figure 2.47 illustrates a ThinWire Ethernet connected configuration.

Figure 2.47
ThinWire Ethernet Connected Configuration



ThinWire Ethernet Configuration Guidelines

- A segment of ThinWire coaxial cable may 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 coaxial cable with male BNC connectors at each end. ThinWire segments are composed of one or more sections of ThinWire cable interconnected 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 faceplate counts as one station. Each of the BNC T-connectors or barrel connectors counts as one station. The DEMPR counts as one station. There must be 0.5 meters (19 inches) between T-connectors.
- A DEMPR provides internal cable termination and can therefore be placed only at the end of a segment.
- A maximum of two repeaters (DEREP or DEMPR) may be connected between two stations in a standard Ethernet LAN.
- A DEMPR must be connected to the standard Ethernet cable using an H4000. A DELNI/DEMPR combination must be connected to the standard Ethernet cable using an H4000-BA only. The DELNI in this configuration cannot be connected to another DELNI. The standard Ethernet segment to which a DELNI/DEMPR configuration is attached may not exceed 300 meters (984 feet).
- A station 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 DEREP.
- There must be one and only one ground per cable segment. Ensure that no other connectors contact the ground. If the segment is attached to a DEMPR, the DEMPR 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 Ethernet coaxial cable.

DECconnect ThinWire Configurations

ThinWire can be used to supply 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 5, DECconnect Communications System for more information.

Planning an Extended Baseband Ethernet LAN

The Extended LAN is an Ethernet environment that uses Bridges to connect several Ethernet configurations into one large network of up to 8000 nodes. By using Ethernet 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 particular network segment that has a heavy traffic load from the rest of the Extended LAN.

The following configuration rules apply to standard, fiber optic, and microwave versions of the LAN Bridge 100.

Extended LAN Configuration and Distance Guidelines

Local Links:

- An Extended LAN may have up to 8000 stations.
- Digital recommends that an Extended LAN have no more than seven (7) Bridges between stations. A packet should not travel through more than 7 Bridges due to the accumulation of slight delays caused by the store and forwarding feature. Protocols that have time sensitive parameters may suffer performance loss if packets move through more than 7 bridges.
- Bridges can be placed in parallel with other Bridges in order 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, it automatically activates and forwards messages.
- The LAN Bridge 100 can be used to interconnect network segments using any Standard Ethernet/IEEE 802.3 medium (i.e., baseband or broadband).
- 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.

Remote Fiber Optic Link

- 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 the Ethernet configuration rule of no more than 1000 meters of fiber between stations must not be exceeded.
- 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 Repeater must use an H4000 Transceiver to attach to the standard Ethernet cable.
- When building Fiber Links with the Fiber Optic Bridge and Fiber Optic Repeater combination, the length of the Fiber Link must be included as part of the configuration of the LAN to which the Fiber Optic Repeater is attached. (Refer to *Ethernet Repeaters* in this section.)
- When building a Fiber Link with two Fiber Optic Bridges, each link length is limited by the 12.5 DB system budget for signal loss. Therefore, using the present DEC 100/140 micron fiber cable, a link can be 2000 meters. Many 2000 meter links can be built throughout the Extended LAN.
- The Fiber Optic Bridge and Repeater are designed to operate with 100/140 Micron Fiber to achieve the 1000 meter limitation.
- The Fiber Optic Bridge and Répeater are also designed to operate with other size fibers including 62.5/125, 85/125, and 50/125. When using an alternative size fiber the System DB budget is reduced.

Remote Microwave Link

- Microwave links are implemented using the Digital METROWAVE Bridge and the M/A-COM, Inc. MA-23 LAN microwave radio equipment.
- Line-of-sight distances up to 4.50 miles (bridge to bridge) are possible. Maximum path length is determined by Ethernet propagation delay specifications which are designed to detect signal collisions during simultaneous two-way transmissions. This path length is also a function of the cabling distance between the microwave transmitter and receiver controller units and the RF (Radio Frequency) unit. The following table displays the resulting point-to-point antenna path given various total (both sides) controller-to-antenna distances:

TOTAL CONTROLLER-TO-ANTENNA DISTANCE (ft)	ANTENNA PATH (miles)
100	4.48
200	4.45
600	4.33
1000	4.22
2000	3.92

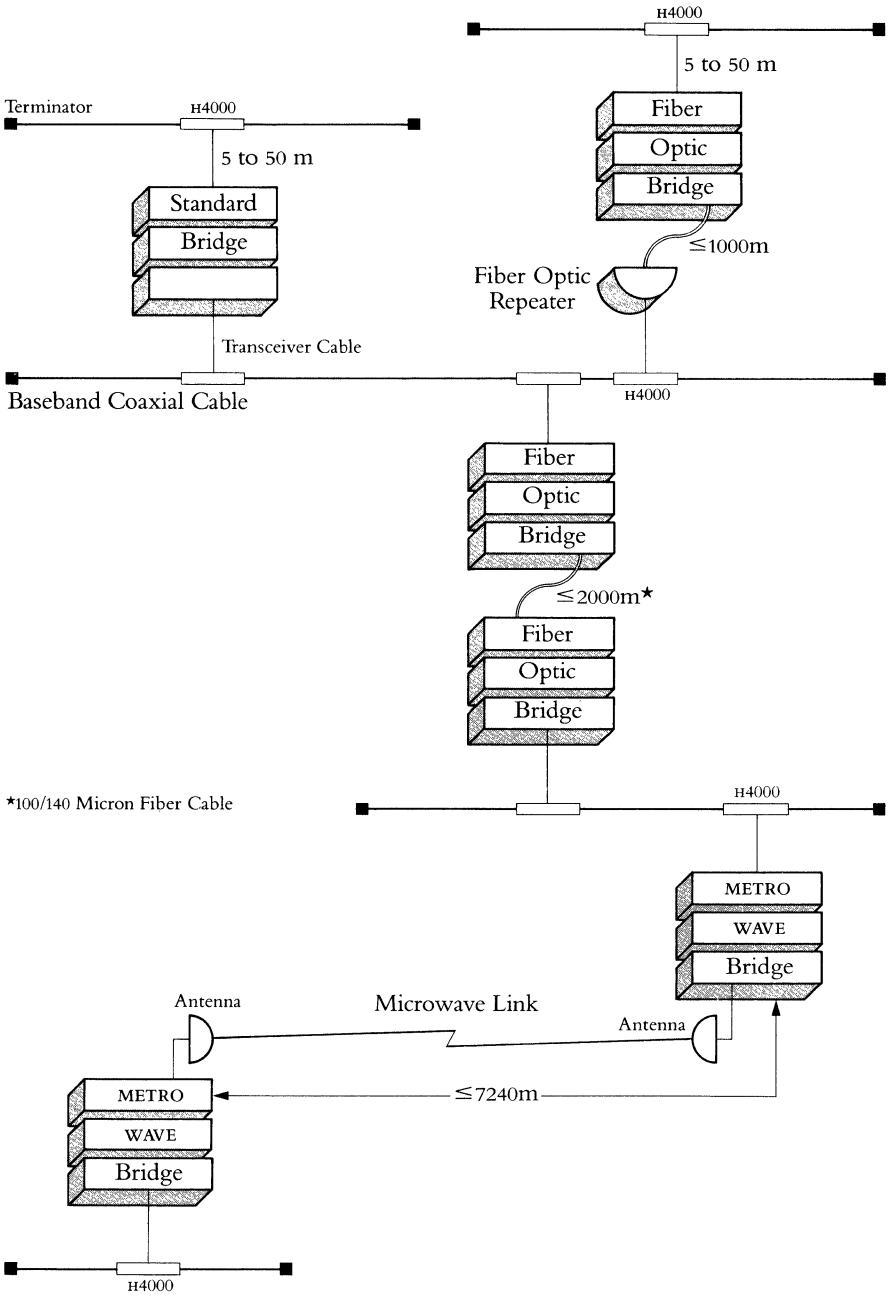
- The microwave transmitter and receiver controllers may be up to 1000 feet from the antenna.
- A METROWAVE Bridge must be located at each end of the microwave link and includes the following:

  H4000 transceiver
  LAN Bridge 100
  BNE3M-20 cable connecting the H4000 transceiver to the LAN Bridge 100
  Microwave adapter
  BNE4D-02 cable connecting the LAN Bridge 100 and microwave adapter

  The METROWAVE Bridge is available pre-mounted in 31.5 inch high cabinets, or in non-cabinet configurations, making it suitable for rack mounting in Satellite Equipment Room (SER) racks.
- The maximum distance between the H4000 transceiver and the LAN Bridge 100 is 20 meters.
- Two METROWAVE Bridges connected by a microwave link count as two in the seven bridge limitation.
- Although it is packaged with an H4000 transceiver, the METROWAVE Bridge can also be attached to standard Ethernet cable using a DELNI, to ThinWire cable using a DESTA, or to broadband cable using a DECOM.

  Figure 2.48 illustrates the Extended Baseband LAN configuration and distance guidelines.

Figure 2.48
Extended Baseband LAN Configuration and Distance Guidelines (Standard, Fiber Optic, and METROWAVE Bridges)



Planning a Broadband Ethernet LAN

In Broadband Local Area Networks, a different cabling system is used than for Baseband Ethernet 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 most often 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 Ethernet Channel in new and existing broadband cableplants to ensure successful operation of the Broadband Ethernet products. Digital also provides ongoing and remedial maintenance services for these Broadband Ethernet products and other Digital-qualified vendor products. Certification of the Broadband Ethernet Channel in the customer's network is a prerequisite for on-site service contracts for broadband Ethernet products.

Refer to Section 7 for more details about Digital's Network Services for Broadband Local Area Networks and the Broadband Ethernet products. Contact your Digital Account Manager or Local Field Service Office for further assistance.

Broadband Ethernet Distance Guidelines and Configuration

Broadband Ethernet is a rooted branching non-routed tree topology with a maximum node separation (the distance between the two furthest systems on the network) of 3.8 kilometers (approximately 2.4 miles). Up to 1,023 DECOM or Ethermodem transceivers can be connected to the broadband network cable, allowing connection of thousands of devices.

A few simple rules for configuring Ethernet on broadband, derived from certain limits that are imposed on the Ethernet physical channel, ensure the optimal performance of the network. These configuration guidelines are described below.

- Distances in Broadband Ethernet are measured from the location of the Ethernet frequency translator in single cable networks. The frequency translator will be located at the network "headend".

  The maximum distance from the frequency translator to the furthest Ethernet broadband modem (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 furthest Ethernet broadband modem 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.

Figure 2.49
Broadband Ethernet
Distance Guidelines:
Single-cable Networks

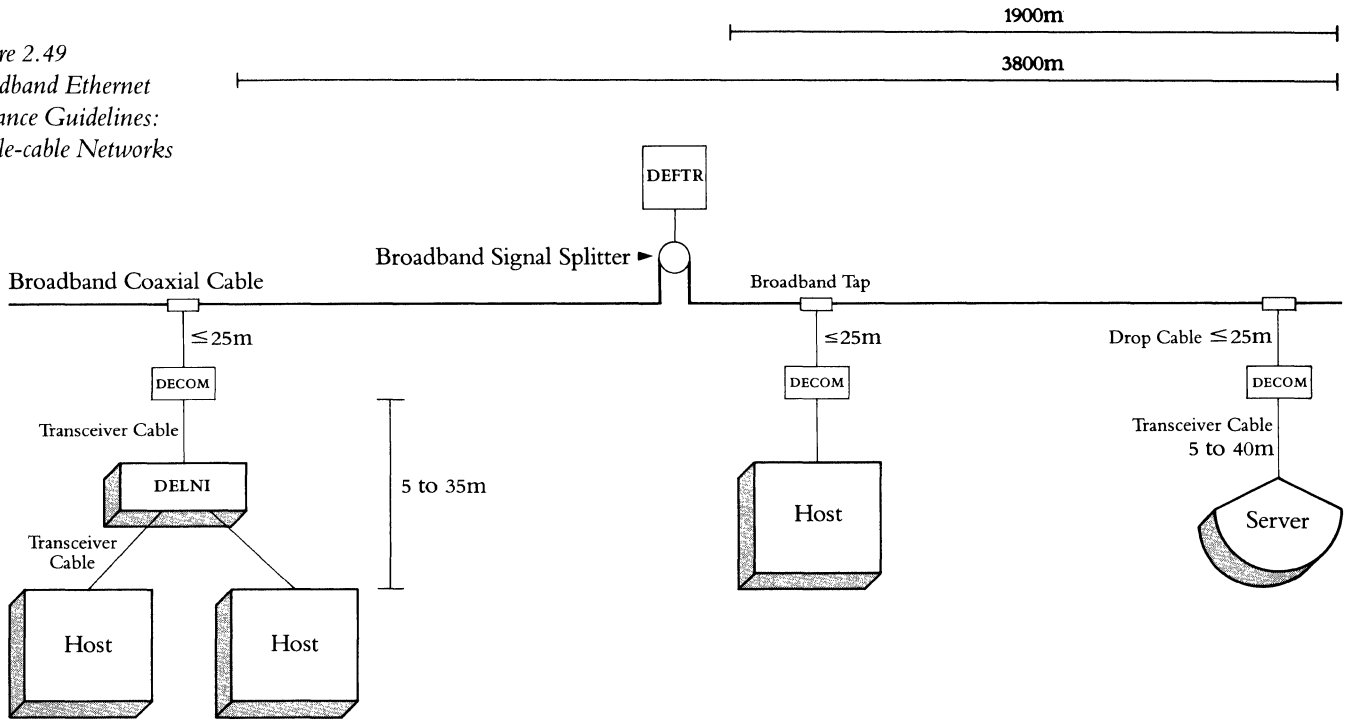
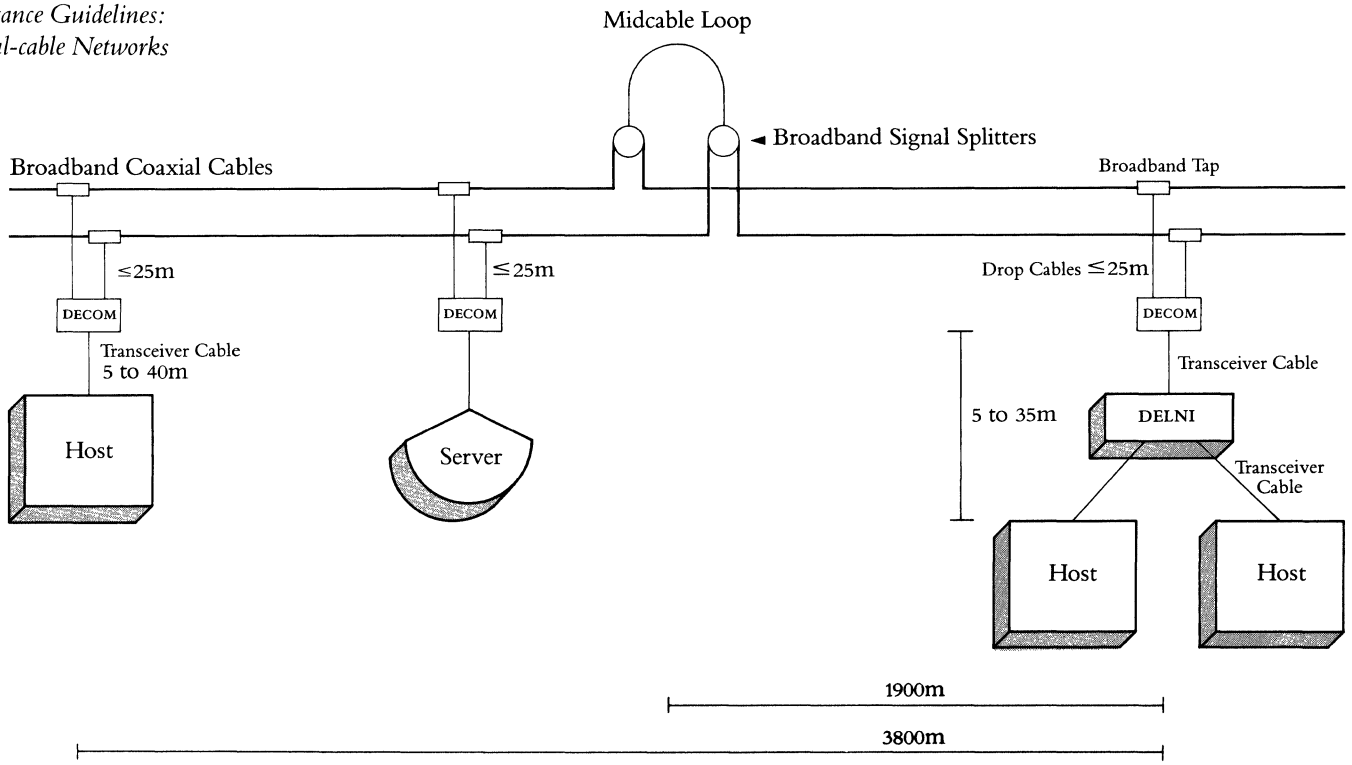


Figure 2.50
Broadband Ethernet
Distance Guidelines:
Dual-cable Networks

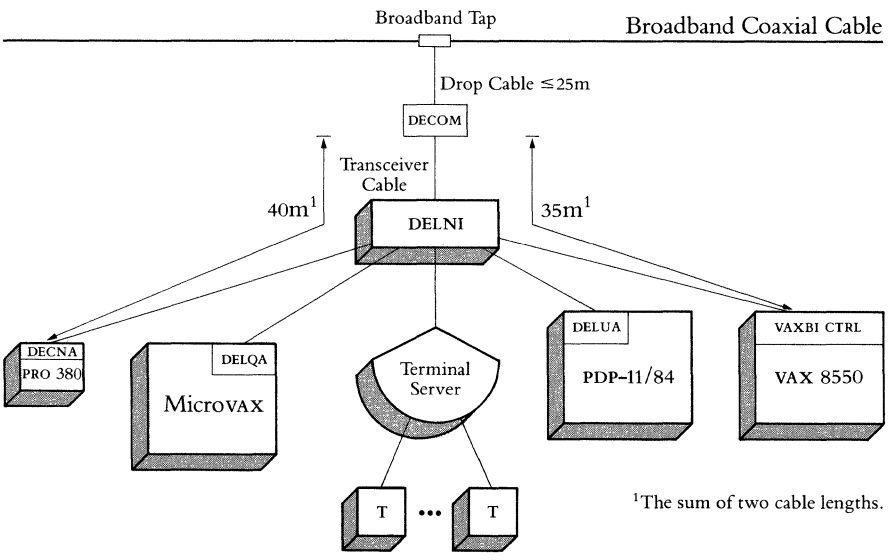


Since the broadband cable can branch out in any direction, the network can consist of virtually unlimited numbers of "spokes" from the headend location. The network cable system in broadband networks is made up of broadband coaxial cable (trunk and drop cables) as well as cable components (amplifiers, splitters, taps, etc.). 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 the 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 the 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 DECOM Transceiver is 25 meters. In some networks, the drop cable from the broadband tap leads to a wall outlet. Customers can connect DECOM to the wall outlet using the same flexible (RG-6) coaxial drop cable.
- The maximum length of drop cable from the broadband tap to the wall outlet to the broadband transceiver is also 25 meters. Transceiver cable is used to connect DECOM to an Ethernet Communications Controller, LAN Bridge 100, DELNI, Communications 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.
- A connected DELNI configuration for broadband Ethernet supports up to eight devices using standard transceiver cables between 35 and 40 meters (114.8 and 131.2 feet) away depending on the communications controller or device.

Figure 2.51
DELNI Connected Configuration (Broadband)

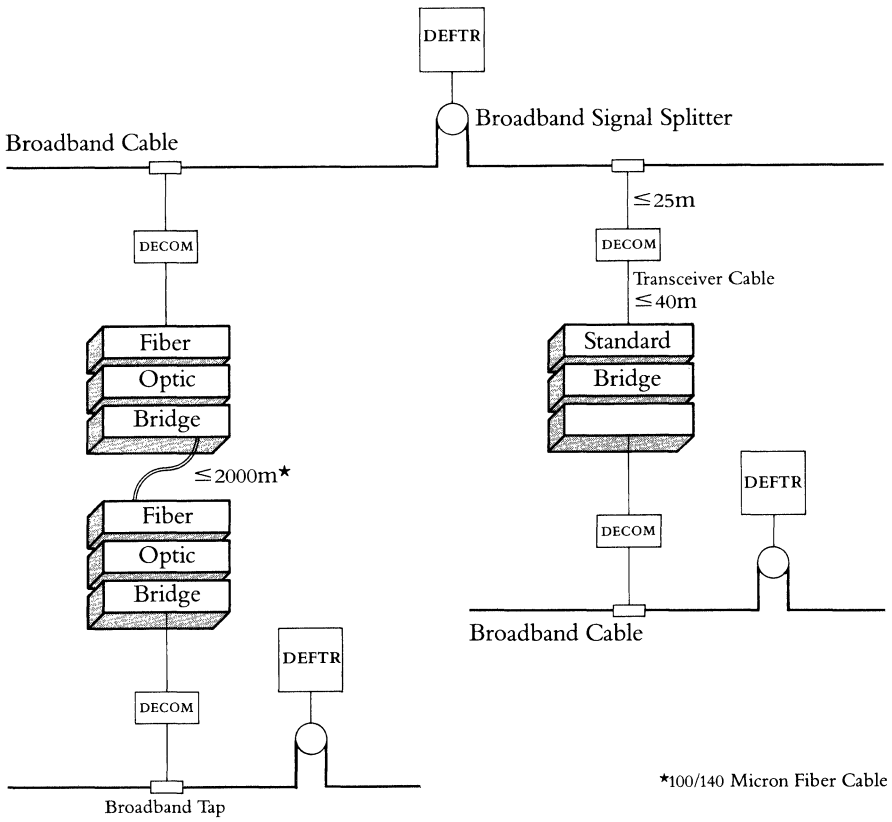


Planning an Extended Broadband Ethernet LAN

The configuration guidelines for standard broadband 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. Each Bridge is attached to a DECOM. Maximum distance between bridges is 2000 meters, using 100/140 micron fiber cable. 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. Figure 2.52 illustrates the extended broadband LAN configuration and distance guidelines.

Figure 2.52 Extended Broadband LAN Configuration and Distance Guidelines (Single Cable)



Connecting Baseband to Broadband LANs

Baseband and broadband LANs can be connected using the Ethernet LAN Bridge 100. For local links, the Bridge connects to an H4000 Transceiver on the baseband side of the link. Transceiver cable length can be a maximum of 50 meters. On the broadband side of the link, the Bridge connects to a broadband transceiver. Transceiver cable length from the DECOM to the Bridge can be a maximum 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 an H4000 Transceiver. The Bridge on the broadband side of the link is connected to a broadband transceiver. Maximum distance between bridges is 2000 meters, using 100/140 micron fiber cable. 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.

Figure 2.53
Baseband to Broadband LAN Configuration Guidelines (Standard Bridge)

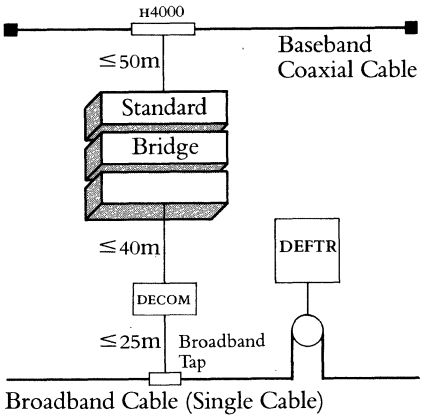
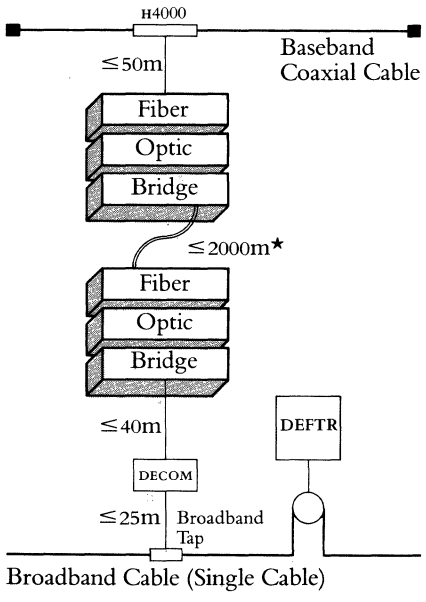


Figure 2.54
Baseband to Broadband LAN Configuration Guidelines (Fiber Optic Bridge)



*100/140 Micron Fiber Cable

Connecting Shared Resources to an Ethernet LAN

When planning a Baseband or Broadband Ethernet LAN, alternatives for connecting shared resources (including terminals, host systems, and communications servers) to the Ethernet coaxial cable should be explored. The following sections discuss these issues.

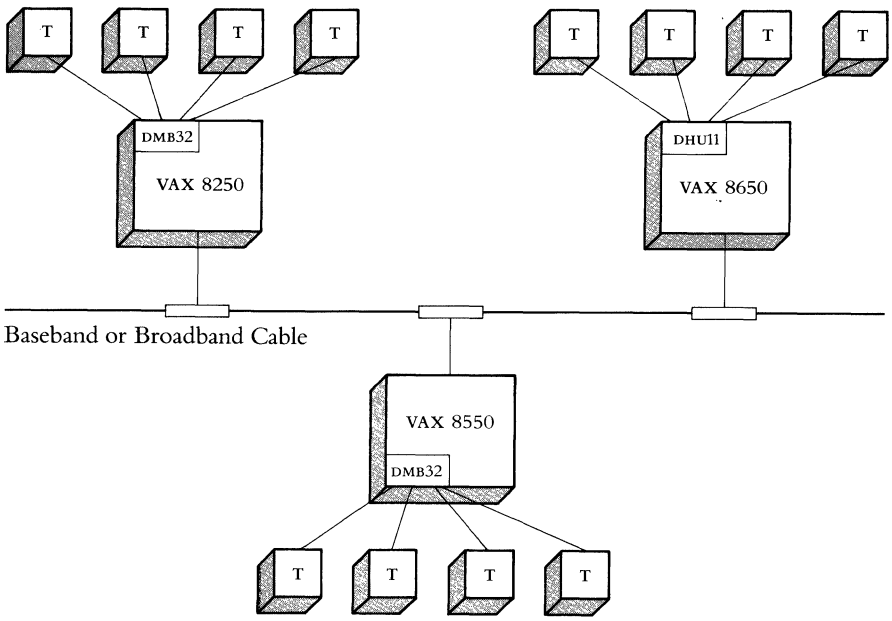
Connecting Nonintelligent Terminals

There are two ways to connect nonintelligent terminals to the Ethernet LAN:

- Direct connection to a host system on the LAN
- 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. Figure 2.55 illustrates a LAN configuration with directly connected terminals.

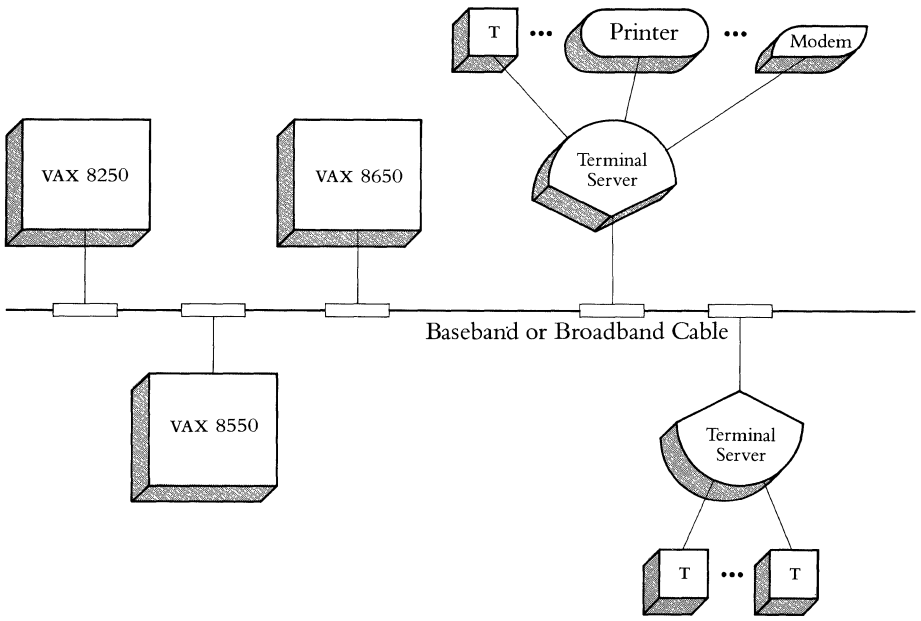
Figure 2.55
Ethernet LAN with Many Terminals Per Host



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 Ethernet 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.

Figure 2.56 shows an Ethernet configuration using terminal servers. Compared to the configuration shown in Figure 2.55, 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.

Figure 2.56 Ethernet LAN Configuration Using a Terminal Server

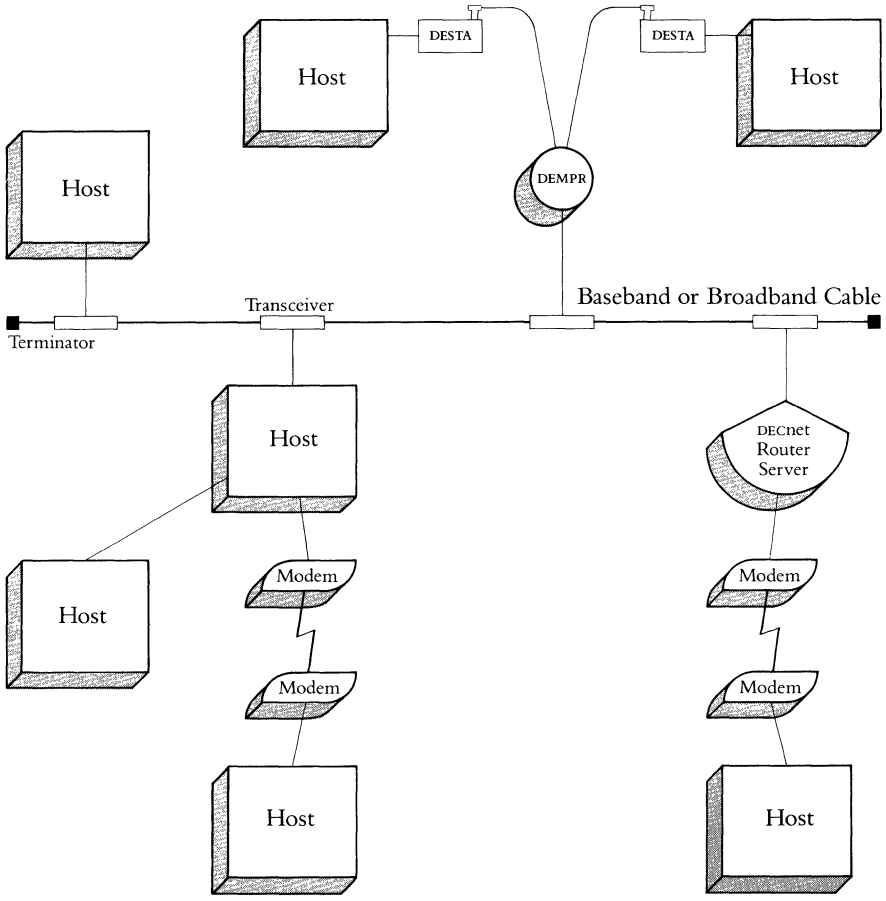


Connecting Host Systems

Host systems can be connected to an Ethernet LAN in the following ways (as illustrated in Figure 2.57):

- Directly to standard Ethernet cable using an H4000 Transceiver or to ThinWire. These systems require DECnet Phase IV software and an Ethernet communications controller. If the Ethernet controller connects to standard Ethernet 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 Ethernet communications controller.
- Indirectly through another DECnet Phase IV host system already connected to the Ethernet coaxial cable. Connected host systems can have DECnet Phase III or Phase IV software. Connections can be hardwired or through modems.
- Indirectly through a DECnet Router Server, a DECrouter 200, or DECnet Router/X.25 Gateway. Connected host systems can have DECnet Phase III or Phase IV software. Connections can be hardwired or through modems.

Figure 2.57
Connecting Host Systems to an Ethernet LAN



DECnet Host System Software

DECnet Phase IV software allows host systems and intelligent terminals 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 an Ethernet communications server. Refer to Section 3 of this guide for detailed information on Digital's DECnet software products.

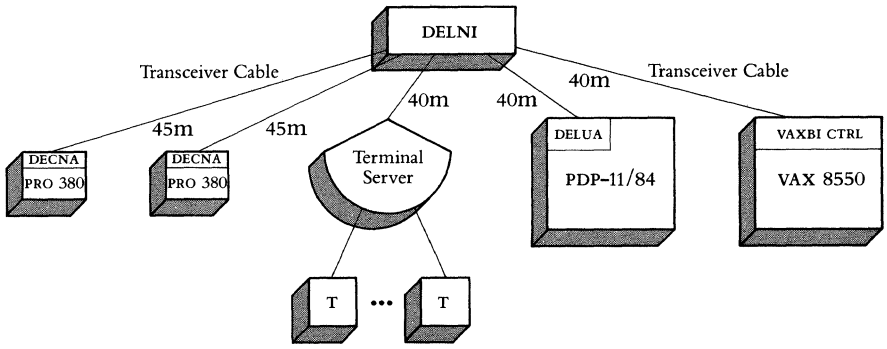
Local Network Interconnect (DELNI)

The Local Network Interconnect (DELNI) provides low-cost Ethernet performance for a group of Ethernet-compatible devices in a 50-meter area. The DELNI can be configured in three ways:

- Standalone
- Hierarchical standalone
- Connected

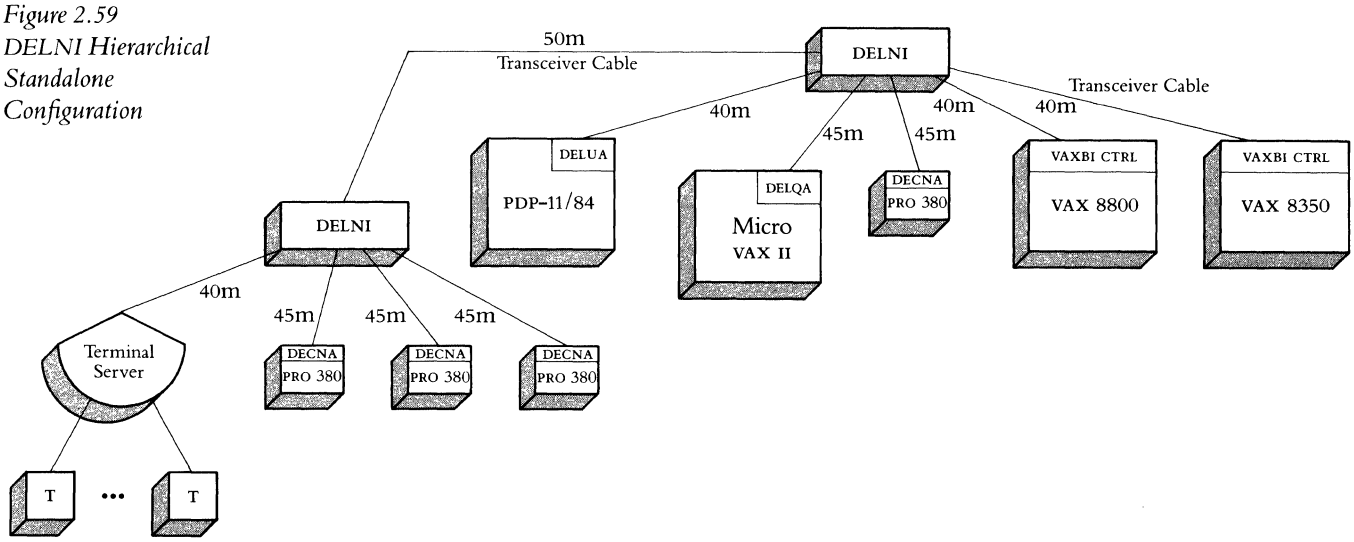
The DELNI standalone configuration, illustrated in Figure 2.58, supports up to eight systems or system-based devices (not terminals) using standard Ethernet transceiver cables up to 50 meters (164 feet) away.

Figure 2.58 DELNI Standalone Configuration



The DELNI hierarchical standalone configuration, illustrated in Figure 2.59, supports a combination of DELNIs and devices using standard Ethernet transceiver cables up to 50 meters (164 feet) away for other DELNI and between 40 and 45 meters (131.2 and 147.6 feet) depending on the communications controller. The DELNI hierarchical standalone configuration is not connected to the Ethernet coaxial cable.

Figure 2.59
DELNI Hierarchical Standalone Configuration



The DELNI connected baseband configuration, illustrated in Figures 2.60 (without an Etherjack) and 2.61 (with an Etherjack), or the DELNI connected broadband configuration, illustrated in Figure 2.62, supports up to eight devices using standard Ethernet 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 H4000 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 H4000 to the DEUNA in Figure 2.60 or the DECOM to DEUNA in Figure 2.62 is 35 meters (115 feet).

In a broadband configuration, this would be the sum of the length of transceiver cables from the DECOM to the DELNI and from the DELNI to the host system or communications server. However, in both the baseband and broadband case, a particular controller may restrict this length.

In broadband configurations, the Chipcom Ethermodem should not be used with a DELNI as this is an unsupported configuration.

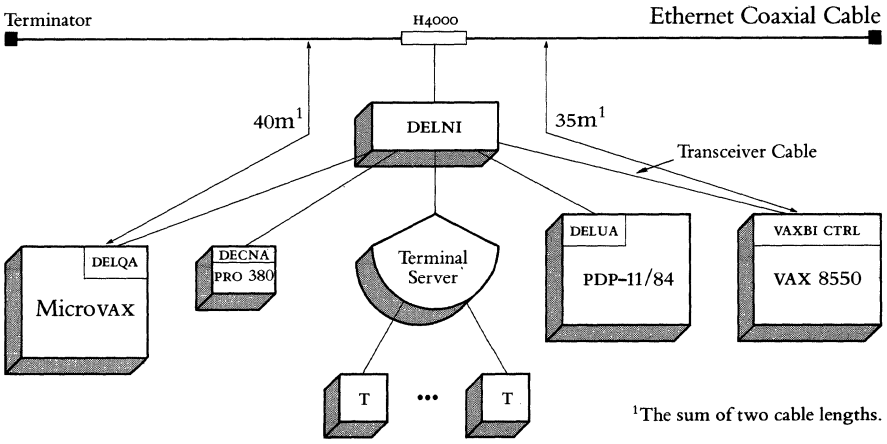


Figure 2.60 DELNI Connected Configuration (Baseband)

In configurations with an Etherjack (baseband only), the lengths to be considered are from the H4000 to the Etherjack, Etherjack to DELNI, and DELNI to the host system or communications server.

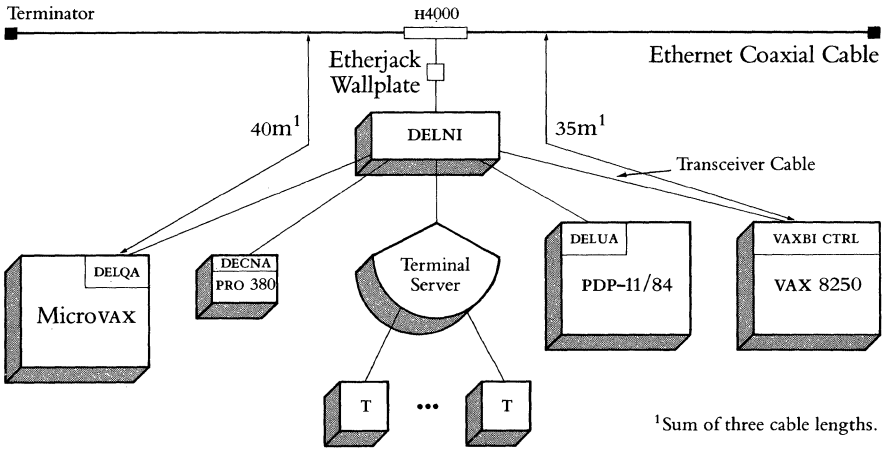


Figure 2.61 DELNI Connected Configuration (Baseband) Using an Etherjack

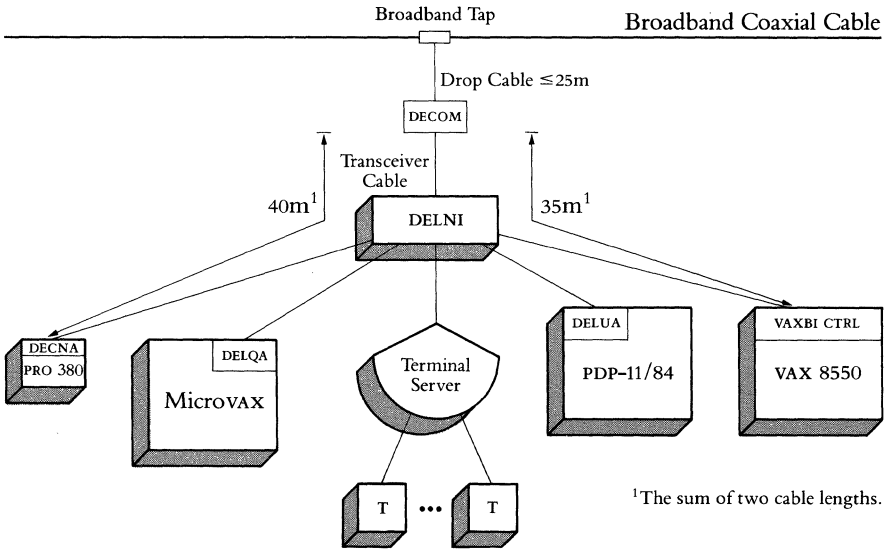


Figure 2.62 DELNI Connected Configuration (Broadband)

Connecting Servers

Servers are specialized network nodes that act as shared resources. There are three types of servers that can be used on an Ethernet LAN:

- Digital's Ethernet communications server hardware/software packages including the DECnet Router Server, the DECnet Router/X.25 Gateway, and the DECnet/SNA Gateway.
- 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 an H4000 Transceiver or to a Local Network Interconnect.

Connecting an Ethernet LAN to Remote Networks

Digital offers the following Ethernet communications servers to connect Ethernet LANs to remote networks:

- DECnet-to-DECnet routing: The DECnet Router, the DECrouter 200, or a full-function DECnet node allows host Ethernet systems to communicate with remote DECnet systems or with DECnet systems on other Ethernets by means of point-to-point links.
- DECnet-to-X.25 communications: The DECnet Router/X.25 Gateway allows host Ethernet systems to communicate with other DECnet systems as well as non-Digital systems over an X.25 packet-switching data network.
- DECnet-to-IBM SNA communications: The DECnet/SNA Gateway allows host Ethernet 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. There are four types of DECnet-to-DECnet routers: full-function host system routers, DECnet Router Servers, DECrouter 200, and DECnet Router/X.25 Gateways.

Host System Routers

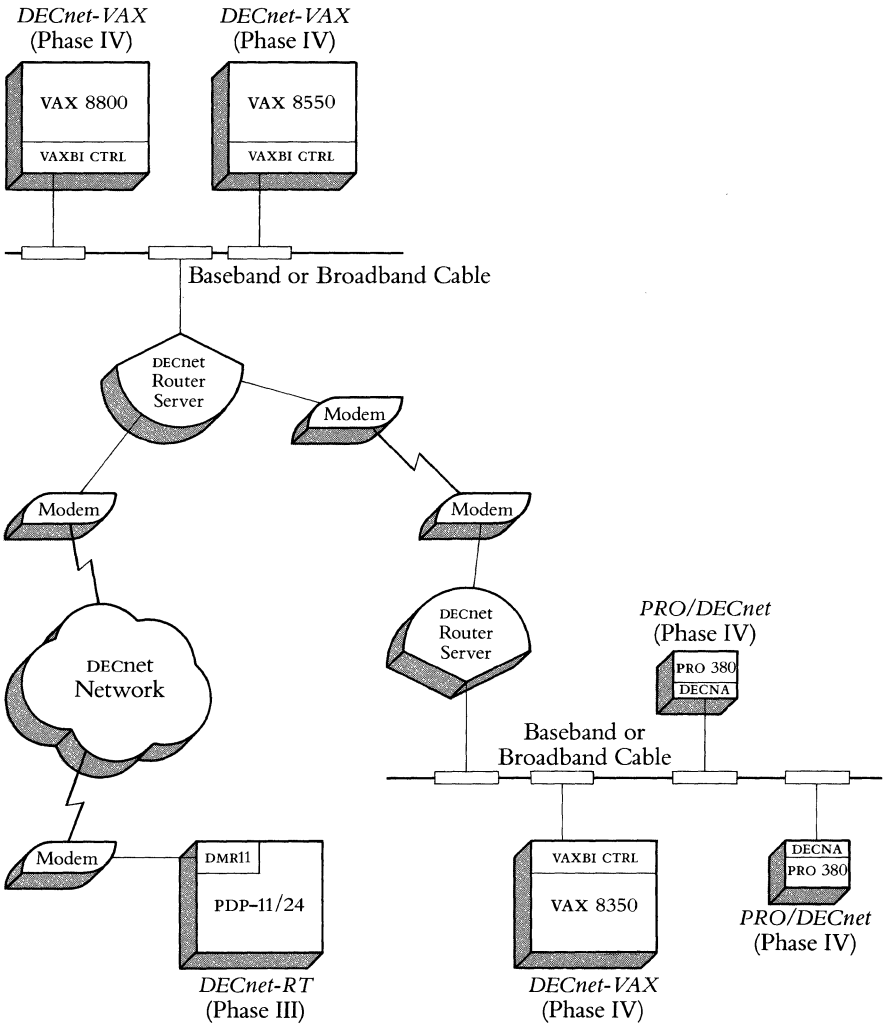
A DECnet Phase IV full-function node can manage Ethernet routing functions using asynchronous or synchronous lines connected to a communications controller, such as a DMF32 or a DMR11. This may be adequate if there are only one or two connections to remote nodes and if the routing load on the host system 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 DECnet Router Server 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.

DECnet Router Server

DECnet Router Servers perform DECnet routing functions between Phase IV nodes on an Ethernet and remote DECnet nodes, and provide connections between independent Ethernets. A DECnet Router Server can also be used to connect a Phase III node to an Ethernet LAN.

Figure 2.63
Ethernet LAN Configuration Using a DECnet Router Server



The DECnet Router Server allows the Phase III node to communicate, transparently to the user, with systems on the Ethernet and to any other remote Phase IV node. A Phase III node can also be connected to an Ethernet via a Phase IV host node. In addition, the DECnet Router offloads routing functions from locally connected host processors and Level I routing nodes. This allows the host systems to function as end nodes or Level I routers in the network with more CPU time for applications processing.

The DECnet Router Server can manage routing to nodes in up to 62 areas, each containing up to 1,023 nodes. These nodes can be:

- Other DECnet Router Servers on another Ethernet network.
- Ethernet or non-Ethernet DECnet Phase III or IV routing nodes.
- Ethernet or non-Ethernet DECnet Phase III or IV end nodes.

A DECnet Phase IV host system on the Ethernet is required to support the DECnet Router Server. The Ethernet host downline loads routing software into the DECnet Router Server, configures Router resources, sets parameters, and initiates operation. The performance of the DECnet Router depends on the following four factors:

- Amount of network traffic and processing needed to route traffic through the network.
- Message segment size (number of bytes).
- Communications line characteristics.
- Size of buffers.

The total throughput for all lines on one DECnet Router cannot exceed 500,000 bits per second. If there is heavy network traffic between the Ethernet nodes and remote nodes, two or more DECnet Routers could split the load. There is an architectural maximum of 32 DECnet Router Servers and/or host routing nodes on a single Ethernet LAN. Digital recommends careful traffic and topology planning if this number exceeds 10 routers.

In area-based networks, data travels within and between areas. Regardless of the number of areas between source and destination nodes, routing nodes forward a packet of data to its intended location. Router is a general term for any node in a network that can receive and forward messages or packets addressed to other nodes in the network. There are two types of routers in area-based networks: Level 1 routers, which are responsible for communication within an area, and Level 2 routers, which are responsible for communication between areas.

A Level 1 router operates in the same way as traditional Phase III and Phase IV DECnet routing nodes. It handles routing within an area and keeps itself informed of the state of all nodes in that area, but it does not concern itself about nodes outside its area. When a node in one area (area 5, for example) wishes to communicate with a node in another area (area 7, for example), a Level 1 router in area 5 forwards the request to the nearest Level 2 router in the same area.

All interarea communication takes place through Level 2 routers. Each Level 2 router keeps track of the least-cost path to each area in the network, as well as the state of the nodes within its area.

In an area-based network, the Level 1 routers maintain routing databases that are similar to the routing databases in traditional Phase III and Phase IV DECnet nodes. The routing database of a Level 1 router includes information on path length and path cost to every node and the nearest Level 2 router in its area. A Level 2 router makes use of a second database—an area routing table—to determine the least-cost path to the other areas in the network.

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 those customers who want to transmit a low volume of data remotely. PSDNs charge primarily on the amount of data transmitted; they are distance-independent.

Therefore, if a customer requires only short, low-speed data transmissions, a dial-up line might be more cost-effective since it avoids the PSDN connection charge. On the other hand, if high-volume continuous data transmission is required, the customer will want to avoid the PSDNs "data-sent" charge, and a leased line would be more appropriate.

Somewhere in the middle (medium data rates and volume), X.25 PSDNs are a cost-effective alternative. If an Ethernet-based network already exists, one approach could be for the customer to add P.S.I. software and the appropriate synchronous devices to a DECnet-VAX or DECnet-RSX host. If only one or two X.25 lines are required for one local network or if high throughput is required, this approach is the most cost-effective. With Phase IV, the DECnet Router/X.25 Gateway alternative provides both DECnet-to-DECnet and Digital to non-Digital communication over a PSDN.

Both the DECnet Router Server and the DECnet Router/X.25 Gateway reduce the number of communications devices, potentially reduce the number of remote lines, and offload the host from burdensome routing. It is conceivable that all remote communications from a local Ethernet could occur via a DECnet Router or Gateway (or multiple DECnet Routers or Gateways). These servers therefore offload a portion of the processor overhead traditionally used to handle the routing of DECnet messages.

The DECnet Router Server is an excellent alternative for customers running DECnet throughout their local and remote network. It can accommodate a number of remote lines running Digital Data Communications Message Protocol (DDCMP). In fact, the DECnet Router will translate from the Ethernet protocol (CSMA/CD) to DDCMP.

The CCITT X.25 specification defines the network protocols for communications among multivendor systems over X.25 packet-switching data networks (PSDNs). There are two ways of connecting Ethernet nodes to an X.25 network: host-based system connections or the DECnet Router/X.25 Gateway.

Host-Based System Connections to X.25 Networks

Individual VAX or RSX host systems can be connected to an X.25 network using the VAX P.S.I. or RSX-11 P.S.I. products. There are two VAX P.S.I. options, the full-function VAX P.S.I. and VAX P.S.I. Access. Both enable process-to-process and terminal communications between a VAX and Data Terminal Equipment (DTE) in a PSDN supporting the X.25 protocol. Note that only full-function VAX P.S.I. supports direct physical connection to the PSDN. Full-function VAX P.S.I. can be configured for either multihost or native-mode operation. The addition of the multihost mode allows the VAX P.S.I. system to act as a gateway to a PSDN, supporting access to the network by other local or remote DECnet-VAX hosts. Only one VAX host in the customer's DECnet network need purchase access to the PSDN. With VAX P.S.I. on that host, configured in multihost mode, 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 subsection of Section 3.

DECnet Router/X.25 Gateway

The DECnet Router/X.25 Gateway allows many users on an Ethernet LAN to share access to an X.25 network for either Digital-to-Digital communications or Digital-to-non-Digital communications. The DECnet Router/X.25 Gateway is an addressable node on the network and is available for access by any host system on the network.

The DECnet Router/X.25 Gateway connects host Ethernet nodes to other DECnet nodes in an X.25 network using the Data Link Mapping (DLM) capability of the Gateway software.

In addition to performing all the functions of the DECnet Router, the DECnet Router/X.25 Gateway also gives VAX Ethernet host systems with the VAX P.S.I. Access Software access to all of the facilities offered by the X.25 network to which the DECnet Router/X.25 Gateway is connected. These facilities include support for both X.29 terminals dialing into a network Packet Assembler/Disassembler (PAD) or X.29 terminals connected to a VAX host PAD, and support for process-to-process communications between Digital and other vendors' systems.

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 DECnet Router/X.25 Gateway offers a unique solution.

For information on the PSDNs currently supported by the DECnet Router/X.25 Gateway, refer to the Packetnet subsection of Section 3.

Digital-to-Digital Communications Over X.25 Networks

The DECnet Router/X.25 Gateway basic software (without the VAX P.S.I. Access Software) provides only DECnet-to-DECnet communications. With it, users can make traditional wide-area network DECnet connection using DDCMP to DECnet nodes on an Ethernet, and to DECnet nodes connected to an X.25 network (as illustrated in Figure 2.64). Since 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 DECnet Router/X.25 Gateway product supports Level 1 routing, but does not support Level 2 (Area) routing.

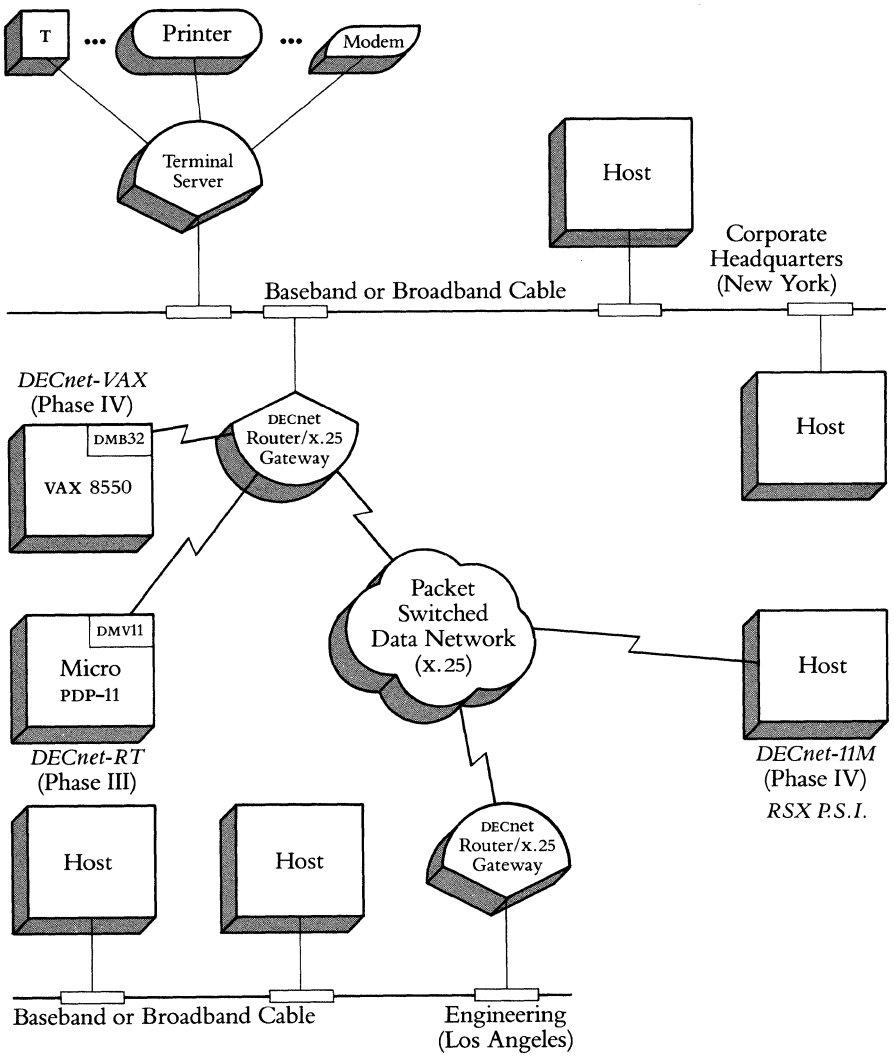


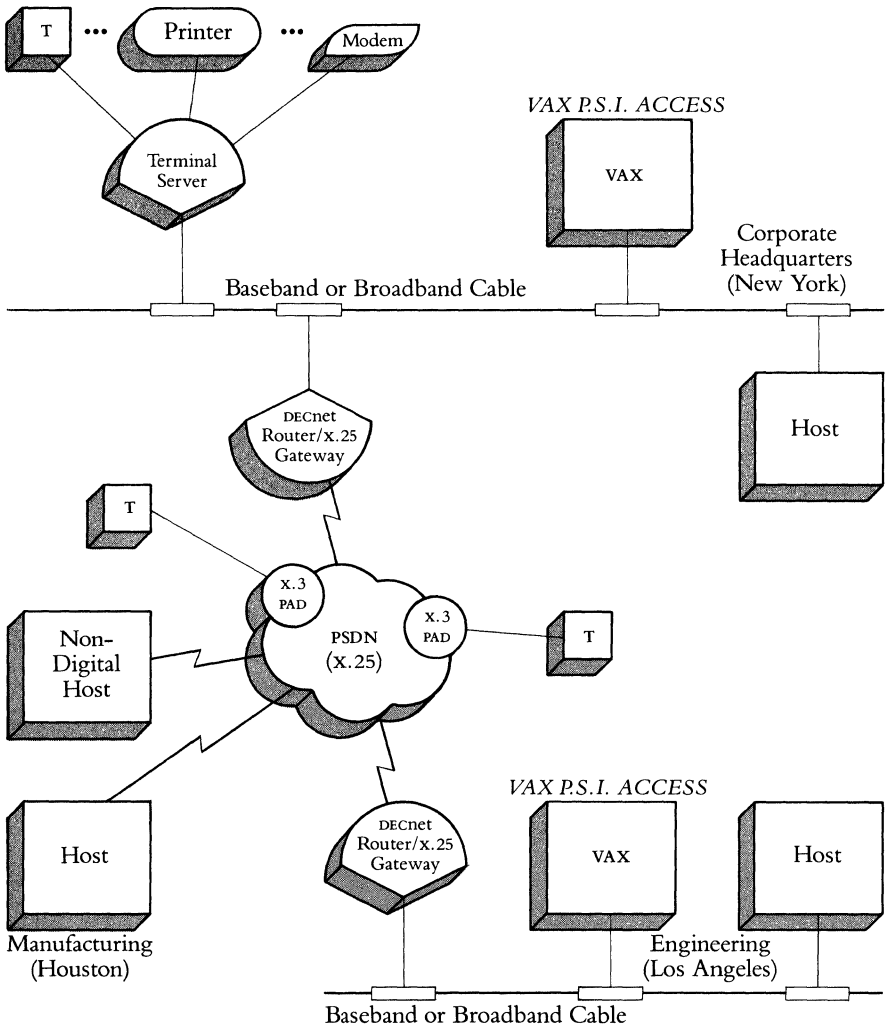
Figure 2.64 DECnet Router/X.25 Gateway Configuration (DECnet-to-DECnet Only)

At least one VAX/VMS host system on the Ethernet LAN must have a copy of the basic DECnet Router/X.25 Gateway software. This host system downline loads the software into the DECnet Router/X.25 Gateway. Then the DECnet Router/X.25 Gateway is started up and DECnet-to-DECnet communications are available to all other host systems on the Ethernet LAN.

Digital-to-non-Digital Communications Over X.25 Networks

Since many networks contain non-Digital systems, Digital fully supports the concept of cooperative computing via the VAX P.S.I. Access Software. The DECnet Router/X.25 Gateway basic software plus the VAX P.S.I. Access Software provide extended X.25 capabilities including communications with non-Digital hosts and asynchronous terminals connected to the X.25 network (as illustrated in Figure 2.65). 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).

Figure 2.65
DECnet Router/X.25
Gateway Configuration
(Digital-to-non-Digital Included)



The VAX P.S.I. Access Software provides the following capabilities to VAX hosts on an Ethernet LAN:

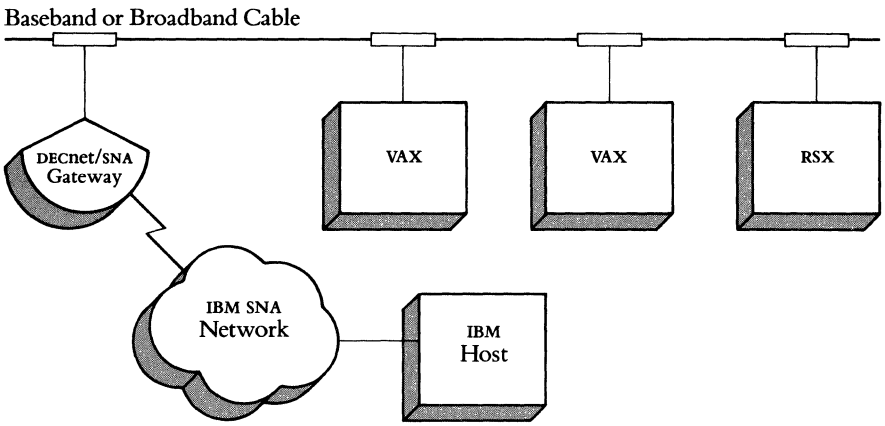
- Remote terminals, including both dial-up terminals and terminals directly connected to a host VAX system with X.29 terminal support, can access the facilities of the X.25 network either by dialing into a network PAD or by using the host VAX system as a PAD.
- Software routines allow access to the protocol level of X.25 traffic. This means that the host VAX system user can write utility software to support process-to-process data transfer between unlike systems on the X.25 network. For example, a message service/file transfer utility such as MAIL could be written, assuming complementary software on the other systems.

DECnet IBM/SNA Communications

The DECnet/SNA Gateway links Digital VAX/VMS and MicroVMS host systems within a DECnet network to an IBM SNA network.

The gateway (illustrated in Figure 2.66) connects directly to the Ethernet coaxial cable. A VAX/VMS Ethernet host running Phase IV software is required to downline load software to the DECnet/SNA Gateway. The DECnet/SNA Gateway is accessible directly by any Phase IV VAX/VMS host system connected directly to the Ethernet network or any Phase III VAX host connected logically via a DECnet Router or DECnet system with host routing capabilities that has the DECnet/SNA Gateway access routine software.

Figure 2.66 DECnet/SNA Gateway Configuration



Each DECnet/SNA Gateway can handle up to two lines to remote SNA networks. 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 or MicroVMS 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-to-IBM Communications Software in Section 3.

Section 3

Networks and
Communications Software

Software

Section 3

Networks and Communications Software

Introduction

This section of the Guide describes the various communications software products available from Digital. The following categories of software are described in this section:

- DECnet Communications Software
- Internet Communications Software including:
  Digital-to-IBM
  Digital-to-UNIVAC
  Digital-to-CDC
  Digital-to-Unix, and
  Digital-to-Wang Communications Software
- Packetnet Communications Software
- Open Systems Interconnection (OSI) Products
- File Transfer and Terminal Emulation Products
- Network and System Management Products
- Additional Software Products

Networks and Communications Software Ordering Information

When ordering the networks and communications software products described in this section, refer to Table 3.1 to determine the appropriate license, service, and medium code. Each software option has a seven-digit code. The first two digits designate the software type and processor, the third through fifth digits designate the product number, and the last two digits designate the license or service, and medium. For example, QC425-UZ can be broken into the following three parts: QC425 (the DECnet/SNA Gateway Management Access Routines for the VAX-11/725 and VAX-11/730), U (single-use license, warranty), Z (no hardware dependency). Note: DDS refers to Digital Distributed Software (not tested by Digital) and DCS refers to Digital Classified Software.

Software Ordering Information

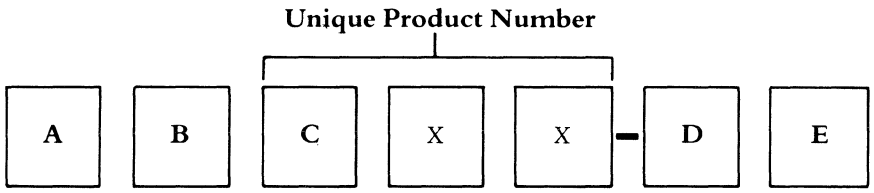


Table 3.1
Software Option Codes Chart

A—Software Type

Description	Code	Description	Code
System	Q	Diagnostic	Z

B—Processor

Description	Code	Description	Code
VAX 8550 and VAX 8700	2	PDP-11	J
MicroVAX 2000	3	VAX 8600 series	K
VAXstation II	4	VAX Cross Product, Generic	L
VAX 8200 and VAX 8250	5	VAX 8800	M
VAXmate	6	MicroVAX I	N
VAX 8300 and VAX 8350	7	PDP-11	P
VAXstation 2000	8	Workstation/VAXstation I	Q
VAX 8500 and VAX 8530	9	PDP-11	R
DCS, U.S.	A	Software Services	S
Professional	B	DECSYSTEM-20	T
VAX-11/725, VAX-11/730 Series	C	DCS, Europe	U
VAX-11/750 Series	D	Rainbow	V
VAX-11/780 series	E	DECmate	W
PDP-8, WPS, DECmate I	F	Discount Scheme	X
DEC-developed, Europe	G	Micro-11	Y
DECsystem-10	H	MicroVAX II	Z
DCS, GIA	I		

C—Language Identifier*

Description	Code	Description	Code
English, Canada	3	Dutch/Flemish	H
French, Canada	4	Japanese	J
English, U.S.	A	Hebrew	M
Finnish	B	Norwegian	N
Italian	C	Portuguese	P
Danish	D	Arabic	R
English, U.K.	E	Spanish	S
French	F	Swedish	T
German	G	DDS Products	X

*The following software options use the third character language identifier: QA, QB, QG, QI, QU, QV, QW, ZN, ZY. The third character in all other options is part of the unique product number.

Table 3.1
Software Option Codes Chart
(Continued)

D—License and Service

Description	Code	Description	Code
Additional Dispatch Subscription or initial license	1*	Installation Service for Software	I*
Dispatch Subscription Service (PDP-8)	2*	Monthly Rental Support Service/or Monthly Periodic Payment License Fee (for software)	J
Self-Maintenance Service for Software	3*	Additional Update Service	K*
Source Update Service	4*	Sources Update	L
System Start-up Service Package Level I	5	Location-use sources license, sources and Microfiche listings	M
Additional Telephone Support Center Contact	6*	Sources or sources and binaries, documentation, license required	N
System Start-up Service Package Level II	7	Binaries (unlicensed diagnostics)	P
Basic Service for Software	8*	Single-use license for VAXcluster node	Q
DECsupport Service for Software	9*	Binaries and/or documentation (unlicensed diagnostics)	R
Single-use license, binaries, documentation, warranty	A	Professional Software Services (consulting)	S
System Start-up Service Package Level III	B	Single-use license, supplementary software/or User Upgrade License, key (for MicroVMS products)	T
Single-use license, binaries, documentation/or Single-use license, warranty, key (for MicroVMS products)	C	Single-use license, warranty	U
Single-use license	D	Single-use sources license, sources or sources and binaries, documentation, warranty	X
Location-use sources license, sources	E	Single-use sources license, sources or sources and binaries, documentation	Y
Location-use sources license, microfiche listings	F	Maintenance Service	Z
Documentation-only	G		
Binaries and documentation, license required	H		

*Dispatch subscription not available in Europe

E—Media

Description	Code	Description	Code
RX18 Floppy Diskette	2	RA60 Disk Cartridge	J
RX50 Floppy Diskette	3	RP04 Disk Pack	K
RC25 Disk Cartridge	4	RP06 Disk Pack	L
TK50 Streaming Tape Cartridge	5	9-track 1600 BPI Magtape (PE)	M
TK25 Cartridge	6	TU60 Cassette	N
RX33 Floppy Diskette	7	Option for Periodic Payment License	P
RRD50/Optical Disk	8	RL01 Disk Cartridge	Q
6250 BPI 9-Track Magtape	A	Microfiche	R
Papertape	B	ROM Chip	S
DECtape	C	RK06 Disk Cartridge	T
9-track 800 BPI Magtape (NRZI)	D	RK07 Disk Cartridge	V
RK05 Disk Cartridge	E	Multi Media Distribution	W
7-track Magtage	F	RX02 Double Density Diskette	X
TU58 DECtape II Cartridge	G	RX01 Floppy Diskette	Y
RL02 Disk Cartridge	H	No hardware dependency/or Option for Period Payment License	Z
RX31 floppy diskette	I		

DECnet Communications Software

Overview

Digital Network Architecture (DNA) is being 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 and 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:

- Routing (1,023 nodes)—(Area routing with 63 areas, 1,023 nodes per area available on DECnet-VAX V4.0, Router Server V1.1, DECnet-11M/S V4.2, and DECnet-11M-PLUS V3.0)
- Communications server support
- Network virtual terminals
- Ethernet support

Digital offers two packages, full-function and end-node, for Phase IV DECnet products.

The full-function package includes routing capability. For customers who have never used DECnet, it is strongly recommended that they purchase DECnet with the full service offerings including installation service.

The end-node only package offers full DECnet support with the exception of the routing function; that is, this DECnet package offers only single-line access to a network. Data can originate and terminate at this node, but data destined for other nodes cannot transit this node. The real benefit of this package is the ability to access DECnet Routers, DECnet Router/X.25 Gateways, or host routing nodes, and not incur routing message and database management processor overhead. An end node reduces overhead needed for routing, thus increasing application performance.

Table 3.2 shows which DECnet products support full-function and end-node Phase IV packages and which continue to support Phase III.

Table 3.2
DECnet Packaging Support

	Phase IV Packaging Support		Phase III Packaging Support
	Full-Function Package	End-Node Package	
DECnet-VAX	•	•	
DECnet-11M	•	•	
DECnet-11M-PLUS	•	•	
DECnet-Micro/RSX		•	
DECnet-11S	•	•	
DECnet-20	•	•	
DECnet-10	•	•	
DECnet-RT			• (end-node only)
DECnet/E	•		
PRO/DECnet		•	
DECnet-ULTRIX		•	
DECnet-DOS		•	
DECnet-Rainbow		•	
DECnet-VAXmate		•	

DECnet Product Capabilities

Each of Digital's current DECnet software products gives the customers a particular set of capabilities. They are summarized for all products in Table 3.3. Definitions of the capabilities are as follows.

- *Program-to-program communication* means that cooperating programs running under different operating systems and written in different languages can exchange data.
- *Network virtual terminal capability* allows a terminal user to establish a logical connection to other Phase IV systems in the network.
- *File transfer* is the capability to exchange files among systems in a network.
- *Remote command/batch file submission and execution* means that a user at a source node can request that a destination node 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 record access.

(continued next page)

DECnet Product Capabilities (continued)

- *Downline system loading* is the capability of developing software on a node with adequate peripheral, compiler, and memory support and then sending it to a target RSX-11S system or communications server where it will ultimately be used.
- *Downline task loading* is the capability of developing a task or program on a node with adequate peripheral, compiler, and memory support and then sending it to a target DECnet-11S system where it will ultimately be used.
- *Upline dumping* is the capability of an RSX-11S system or communications server to automatically send a system-image dump to an adjacent node if the RSX-11S system or communications server fails.

Table 3.3
DECnet Product Capabilities

Capability	DECnet Products										
	-RT	-11M	-11S[4]	-11M-PLUS	Micro/RSX	/E	-VAX	-10/-20	PRO/	-ULTRIX	-DOS -Rainbow -VAXmate
Program-to-Program Communications	•	•	•	•	•	•	•	•	•	•	•
Network Virtual Terminal[1]	•	•	•[2]	•	•	•	•	•	•[2]	•	•[2]
File Transfer	•	•	•[4]	•	•	•	•	•	•	•	•
Command/Batch File Submission and Execution	•[2]	•	•	•	•	•	•[3]	•[2]	•[2]	•	•[2]
Remote Resource Access	•	•	•[2,4]	•	•	•	•	•	•	•	•
Down-Line System Loading		•		•	•		•				
Down-Line Task Loading		•		•	•		•				
Upline Dumping		•	•	•	•		•				

[1] Terminals on these systems can log onto like systems in the network. DECnet-11S does not support connection from remote command terminals.
[2] Requester-only function.
[3] Command file must reside on remote node.
[4] Local system supports unit record equipment only.

Table 3.4
DECnet Product Support

	DECnet											
CPU	**-RT**	**/E**	**-RSX**	**-Micro/ RSX**	**-VAX**	**-20**	**-10**	**PRO/ DECnet**	**-ULTRIX**	**-DOS**	**-Rainbow**	**-VAXmate**
VAX CPUs					•				•			
PDP-11 CPUs	•	•	•	•								
DECSYSTEM-2040/2060						•						
DECsystem-10							•					
Professional 350/380								•				
IBM PC, PC/XT, PC AT										•		
Rainbow 100											•	
VAXmate												•
Ethernet Controllers[7]												
DECNA								•				
DELUA		•	•		•				•			
DEPCA										•[8]		
DELQA		•	•	•	•				•			
DESVA					•				•			
NIA20						•	•					
VAXBI					•				•			
Communications Controllers[7]												
DHQ11			•	•	•							
DHU11			•		•							
DLVJ1	•											
DMB32					•[1]							
DMF32					•							
DMR11	•	•	•		•	•	•		•			
DMV11	•	•	•	•	•				•			
DMZ32					•							
DN20/DN20F						•	•					
DN21						•	•					
DPV11	•		•	•								
DUP11	•		•		•							
DZQ11			•	•	•							
PCL11-B			•									
Function												
CCITT X.25[1]			•[6]		•	•						
Phase III	•		•		•	•	•					
Phase IV routing		•[6]	•		•	•	•					
Phase IV end node		•	•	•	•	•		•	•	•	•	•
SNA access[1]					•							
File transfer	•	•	•[6]	•	•	•	•	•	•	•	•	•
Network virtual term.	•[2]	•[2]	•[3]	•[3]	•[3]	•[2]	•[2]	•[3]	•[3]	•[3,4]	•[3,4]	•
Multipoint	•	•	•		•							
Remote resource access		•	•	•	•			•	•	•	•	•

• DECnet services available for current products.

[1] Requires additional software beyond DECnet.

[2] Supports homogeneous network virtual terminal.

[3] Supports CTERM, heterogeneous network virtual terminal.

[4] Supports outgoing requests only.

[5] Except area routine.

[6] Except DECnet-11s.

[7] Refer to the appropriate SPD for support of retired products.

[8] Also supported by third-party products.

DECnet-RSX

DECnet-RSX allows a suitably configured PDP-11 computer system to participate as a node in a DECnet network. DECnet-RSX Phase IV supports all Phase IV capabilities. The functions available to a user partially depend upon the configuration of the rest of the network.

For prerequisite hardware and software, consult the following SPDs: DECnet-11M 10.75, DECnet-11S 10.74, DECnet-11M-PLUS 10.66, and DECnet-Micro/RSX 18.27.

Table 3.5
DECnet-11M
Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**End Node**	**Full Function**
Single-use license	QJ765-UZ	QJ764-UZ
Materials and Service Options:		
Distribution and documentation	QJ765-H*	QJ764-H*
Software revision right-to-copy	QJ765-HZ	QJ764-HZ
Documentation only	QJ765-GZ	QJ764-GZ

*D, H, M, V, 5

Table 3.6
DECnet-11S
Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**End Node**	**Full Function**
Single-use license	QJ763-UZ	QJ762-UZ
Materials and Service Options:		
Distribution and documentation	QJ763-H*	QJ762-H*
Software revision right-to-copy	QJ763-HZ	QJ762-HZ
Documentation only	QJ763-GZ	QJ762-GZ

*D, H, M, V, 5

Table 3.7
DECnet-11M-PLUS
Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**End Node**	**Full Function**
Single-use license	QJ767-UZ	QJ766-UZ
Materials and Service Options:		
Distribution and documentation	QJ767-H*	QJ766-H*
Software revision right-to-copy	QJ767-HZ	QJ766-HZ
Documentation only	QJ767-GZ	QJ766-GZ

*D, H, M, V, 5

Table 3.8
DECnet-Micro/RSX
Order Codes
(End Node Only)

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	QY766-UZ
Materials and Service Options:	
Distribution and documentation	QY766-H★
Software revision right-to-copy	QY766-HZ
Documentation only	QY766-GZ

★3, 5

DECnet-VAX

DECnet-VAX allows a suitably configured VAX/VMS or MicroVMS system to participate as a node in a DECnet network. There are two types of licensing options available to users. One option is software for a routing or full-function node. The other option is for an end node, which offers cost benefits.

DECnet-VAX Phase IV supports all Phase IV capabilities. The functions available to a user partially depend upon the configuration of the rest of the network. DECnet products and functions available to users on a mixed network can be determined by comparison of the SPDs for the common products.

DECnet-VAX allows multiple Ethernet controllers per host within the limitations listed in the Load Unit Table in SPD 25.03. Each controller must be connected to a separate Ethernet that is not joined to other Ethernets by a bridge or repeater, though it may be joined by a DECnet Router.

For prerequisite hardware and software, consult SPD 25.03.

Table 3.9
DECnet-VAX End Node Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★D04-UZ[1]
VAXcluster license	Q★D04-QZ[2]
Initial license, primary	Q★D04-1P[3]
Monthly availability, primary	Q★D04-JP[3]
Materials and Service Options:	
Distribution and documentation	Q★D04-H#
Software revision right-to-copy	Q★D04-HZ
Installation Service	Q★D04-I#
U.S. Software Product Service Agreements:[4]	
DECsupport service	Q★D04-9#
Basic service	Q★D04-8#
Self-maintenance service	Q★D04-3#
MicroVAX I: ★ = N; # = 3	VAX 8200: ★ = 5; # = 3 or M
MicroVAX II: ★ = Z; # = 3 or 5	VAX 8250: ★ = 5; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8300: ★ = 7; # = 3 or M
VAXstation I: ★ = Q; # = 3	VAX 8350: ★ = 7; # = 3 or M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAX-11/725: ★ = C; # = G	VAX 8550: ★ = 2; # = M
VAX-11/730: ★ = C; # = G	VAX 8600: ★ = K; # = M
VAX-11/750: ★ = D; # = G	VAX 8650: ★ = K; # = M
VAX-11/780: ★ = E; # = Y	VAX 8700: ★ = 2; # = M
VAX-11/782: ★ = E; # = Y	VAX 8800: ★ = M; # = M
VAX-11/785: ★ = E; # = Y	

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Available on VAX-11/750, VAX-11/78x, VAX 8600, and VAX 8650.
[3] Available on VAX 82x0, VAX 83x0, VAX 85x0, VAX 8700, and VAX 8800.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

Table 3.10
DECnet-VAX Full-function Order Codes

Option	Order Code
Upgrade from End Node to Full Function:[5]	
Single-use license	Q★D09-UZ[1]
VAXcluster license	Q★D09-QZ[2]
Monthly availability	Q★D09-JP[3]
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★D05-UZ[1]
VAXcluster license	Q★D05-QZ[2]
Initial license, primary	Q★D05-1P[3]
Monthly availability, primary	Q★D05-JP[3]
Materials and Service Options:	
Distribution and documentation	Q★D05-H#
Software revision right-to-copy	Q★D05-HZ
Installation Service	Q★D05-I#
U.S. Software Product Service Agreements:[4]	
DECsupport service	Q★D05-9#
Basic service	Q★D05-8#
Self-maintenance service	Q★D05-3#
MicroVAX I: ★ = N; # = 3	VAX 8200: ★ = 5; # = 3 or M
MicroVAX II: ★ = Z; # = 3 or 5	VAX 8250: ★ = 5; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8300: ★ = 7; # = 3 or M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8350: ★ = 7; # = 3 or M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAX-11/725: ★ = C; # = G	VAX 8530: ★ = 9; # = M
VAX-11/730: ★ = C; # = G	VAX 8550: ★ = 2; # = M
VAX-11/750: ★ = D; # = G	VAX 8600: ★ = K; # = M
VAX-11/780: ★ = E; # = Y	VAX 8650: ★ = K; # = M
VAX-11/782: ★ = E; # = Y	VAX 8700: ★ = 2; # = M
VAX-11/785: ★ = E; # = Y	VAX 8800: ★ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Available on VAX-11/750, VAX-11/78x, VAX 8600, and VAX 8650.
[3] Available on VAX 82X0, VAX 83X0, VAX 85X0, VAX 8700, and VAX 8800.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.
[5] Not available on VAXstation I.

PRO/DECnet

PRO/DECnet allows a suitably configured Professional 300 Series computer to participate as a non-routing (end) node in DECnet computer networks. The Professional node can communicate with other DECnet nodes using either the Professional's integral Communications Port (COMM1) for asynchronous or synchronous DDCMP wide area network communications, or the NET1 port and optional DECNA Ethernet interface for Ethernet Local Area Network communications (but not both at the same time).

PRO/DECnet is an end-node-only implementation of the Phase IV Digital Network Architecture (DNA), and is warranted for use only with supported Phase IV products supplied by Digital. The Professional system with PRO/DECnet can perform remote file access, remote file transfer, network management, network fault isolation, and network virtual terminal using the DNA protocols. The optional PRO/Tool Kit contains libraries which allow developers to write applications for communication in a DECnet network.

PRO/DECnet is also prerequisite software to the use of the PRO in a shared resource environment. A Professional 300 Series system can act as a server to a group of Professional 300 Series systems which are logically connected to the server via Ethernet hardware. These systems become workstations which can share files, applications, and peripherals. This configuration requires that the workstation registration software (provided with P/OS Hard Disk) be installed.

Required Hardware

Any Winchester-based or Shared Resource configuration Professional Series 300 System with

- Minimum of 512 KB of main memory
- A network connection with one of the categories below

For DECnet Ethernet/Shared Resource Local Area Support:
A DECNA-K, the Ethernet Controller for the Professional which comes in a kit including the Transceiver Cable (BCC06-15), the loopback connector (PC3XX-BA), a hardware diagnostic diskette and documentation.

For Asynchronous/Synchronous Wide Area Network Support:
EIA RS232C/CCITT V.28 cable; BC22D-XX (null modem), BCC04-XX (modem cable) or demonstrated equivalents.

Prerequisite Software

Workstation registration software provided with P/OS Hard Disk

Table 3.11
PRO/DECnet Order Codes

Option	Order Code
Materials and Services Option:	
PRO/DECnet single-use license, binary distribution kit on RX50 diskette, PRO/DECnet user's guide	QBA44-A3
PRO/DECnet binary distribution kit on RX50 diskette, PRO/DECnet user's guide	QBA44-H3
Option to allow increments of 4 CPUs, each connected to the same server, to run PRO/DECnet	QB014-UZ

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.

For prerequisite hardware and software, consult SPD 10.73.

Table 3.12
DECnet/E Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU).*	**PDP-11**	**MicroPDP-11**
Single-use license	QP692-UZ	QY692-UZ
Materials and Service Options:		
Distribution and documentation	QP692-HD QP692-HH QP692-HM QP692-HV	QY692-HH QY692-H5 QY692-HM
Software revision right-to-copy	QP692-HZ	
Documentation only	QP692-GZ	QY692-GZ

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.

For prerequisite hardware and software, consult SPD 10.72.

Table 3.13
DECnet-RT Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	QJ687-UZ
Materials and Service Options:	
Distribution and documentation	QJ687-H3 QJ687-HH QJ687-HM QJ687-HX
Software revision right-to-copy	QJ687-HZ
Documentation only	QJ687-GZ

DECnet-10 and DECnet-20

DECnet-10 software allows a suitably configured DECsystem-10 to participate as a routing or nonrouting node in a DECnet network. DECnet-10 is a Phase IV network product and is warranted for use with supported Phase III and Phase IV DECnet products. For prerequisite hardware and software, consult SPD 8.60.

DECnet-20 software allows a suitably configured DECSYSTEM-2040/2060/2065 to participate as a routing or nonrouting node in DECnet computer networks. DECnet-20 is a Phase IV network product and is warranted for use with supported Phase III and Phase IV DECnet products. For prerequisite hardware and software, consult SPD 23.02 and SPD 23.20.

Table 3.14
DECnet-10 and DECnet-20 Order Codes

Option	Order Code			
License Options: *(A license is required for each CPU.)*	**DECsystem -1090/1091/ 1095**	**DEC-SYSTEM -2020 (TOPS-10)**	**DECsystem -1090/1091**	**DEC-SYSTEM -2020/ 2060/2065 (TOPS-20)**
Single-use license, binaries, documentation, support services	QH683-AM	QH684-AM	QTD04-AM	QTD20-AM
Single-use license only, no binaries, no documentation, no support services	QH683-DZ	QH684-DZ	QTD04-DZ	QTD20-DZ
Update/Unsupported Options:				
Binaries, documentation	QH683-HM	QH684-HM	QTD04-HM	QTD20-HM
Right-to-copy for single-use license only	QH683-HZ	QH684-HZ	QTD04-HZ	QTD20-HZ
Source Option:				
Source license, sources, no support services, no documentation	QH683-EM	QH684-EM	QTD04-EM	
Additional Services:*				
The following post-warranty software product services for this software product are available to licensed customers: Self-maintenance, Basic service, and DECsupport service, the *prerequisite* being the purchase of the equivalent level TOPS-10 software product service.				

*Customers should contact their local Digital office for additional information on the availability of these services.

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 includes a semi-transparent, bi-directional gateway that acts as a bridge between DECnet networks and Internet (TCP/IP-based) networks. This software gateway allows DECnet and Internet users to communicate through file transfers, remote logins, and mail correspondence. The gateway 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, bi-directional software gateway between DECnet networks and Internet (TCP/IP-based) networks
- Task-to-task communications
- Network virtual terminal
- Remote file transfer
- Electronic mail

Prerequisite Hardware

One of the following:

- Any valid VAX system configuration running ULTRIX-32 with the following communication devices: DEUNA, DELUA, or VAXBI Ethernet controller, or DMR11 synchronous controller interface. (Refer to the Order Code Table for a list of supported VAX processors.)
- Any valid MicroVAX II or VAXstation II/GPX system configuration running ULTRIX-32 with the following communication devices: DELQA Ethernet controller interface, or DMV11 synchronous controller.
- Any valid VAXstation 2000 or MicroVAX 2000 configuration running ULTRIX-32 with a DESVA Ethernet controller.

Prerequisite Software

ULTRIX-32 operating system.

Table 3.15
DECnet-ULTRIX Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★716-UZ
Initial license (primary & cluster)	Q★716-1P[1]
Monthly availability	Q★716-JP[1]
Materials and Service Options:	
Distribution and documentation	Q★716-H#
Software revision right-to-copy	Q★716-HZ
Documentation only	QL716-GZ
Installation Service	Q★716-I#
U.S. Software Product Service Agreements:[2]	
DECsupport service	Q★716-9#
Basic service	Q★716-8#
Self-maintenance service	Q★716-3#
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 82x0: ★ = 5; # = J or M
MicroVAX II: ★ = Z; # = 5	VAX 83x0: ★ = 7; # = J or M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8500: ★ = 9; # = J or M
VAXstation II/GPX: ★ = 4; # = 5	VAX 8530: ★ = 9; # = J or M
VAX-11/730: ★ = C; # = M	VAX 8550: ★ = 2; # = J or M
VAX-11/750: ★ = D; # = J or M	VAX 8600: ★ = K; # = M
VAX-11/780: ★ = E; # = J or M	VAX 8650: ★ = K; # = M
VAX-11/785: ★ = E; # = J or M	VAX 8700: ★ = 2; # = J or M
	VAX 8800: ★ = M; # = J or M

[1] Available on VAX 8200, VAX 8300, VAX 8500, VAX 8550, VAX 8700, and VAX 8800 only.
[2] For non-U.S. service agreements, consult a local Digital Sales Representative.

DECnet-DOS

DECnet-DOS allows the IBM PC, PC/XT, and Personal Computer AT systems to participate as non-routing (end) nodes in DECnet local area and wide area computer networks.

Features

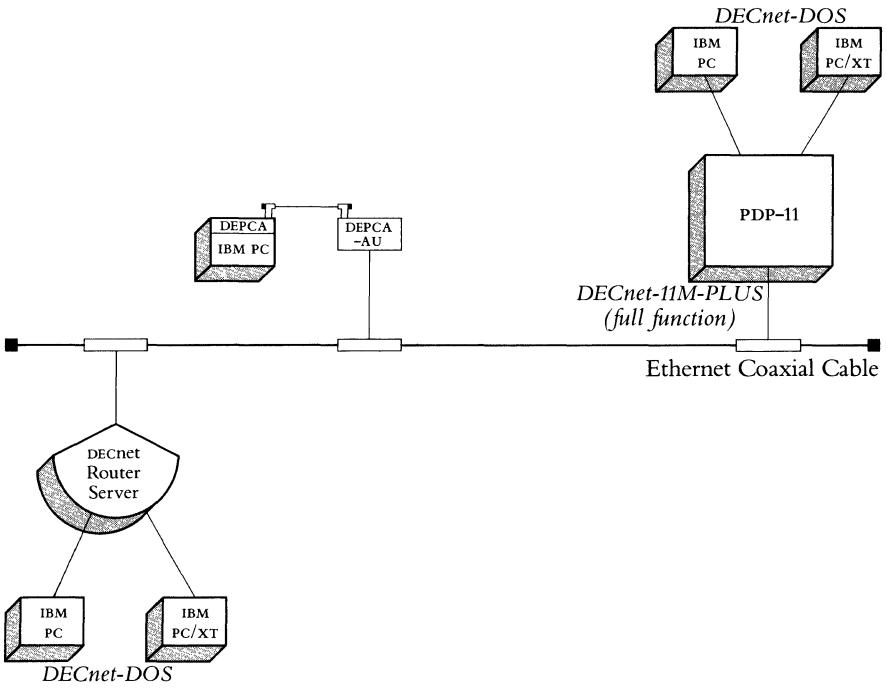
- Allows IBM personal computers to access the network through the asynchronous communications port or through the following Ethernet communications controllers:

  Digital: DEPCA multibuffered Ethernet controller

  MICOM Systems: NI5010-1 and NI5010-2 IBM PC Ethernet/IEEE 802.3 controllers

  3Com Corporation: IE2 and IE4 Etherlink/IBM PC Ethernet Network Interfaces
- Supports task-to-task communications, remote file access, utilities for network file operations, network command terminals, and network resource sharing using DNA protocols
- Allows access to full DECnet-DOS functions for MS-DOS user programs written in MACRO-86 Assembler (MASM) 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.

Figure 3.1
DECnet-DOS Configuration



Prerequisite Hardware

The following minimum configurations are valid.

- IBM PC Model 5150 System Unit with 256 KB memory.
- IBM PC/XT Model 5160 System Unit with 256 KB memory.
- IBM Personal Computer AT Model 5170 System Unit with 256 KB memory.

Note: Operation of any Ethernet controllers with broadband modems is not supported. Refer to SPD 50.15 for configuration details.

Prerequisite Software

IBM PC Disk Operating System V3.1 or V3.2

Table 3.16
DECnet-DOS Order Code

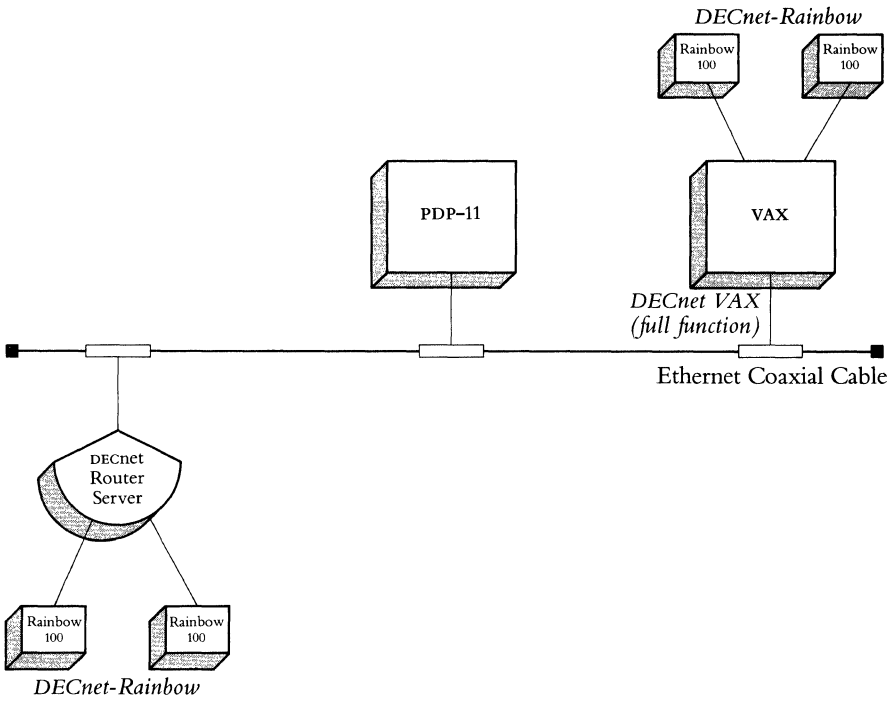
Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license[1]	QVA05-UZ
64-pack license	QVA05-U6
96-pack license	QVA05-U7
128-pack license	QVA05-U8
192-pack license	QVA05-U9
500-pack license	QVA05-UB
1000-pack license	QVA05-UC
Distribution and documentation	QVA05-HI
Software revision right-to-copy	QVA05-HZ

[1] A DECnet-DOS license is included in the DEPCA Network Integration Packages. For more information, refer to Section 3, *Network Integration Packages.*

DECnet-Rainbow

DECnet-Rainbow allows Rainbow 100 personal computer systems to participate as non-routing (end) nodes in DECnet computer networks. DECnet-Rainbow offers task-to-task communications, remote file access, utilities for network file operations, network command terminal support, and network resource-sharing capabilities using the Digital Network Architecture (DNA) protocols. Access to the network is through the asynchronous communication port. Access to full DECnet-Rainbow functions is supported for MS-DOS user programs written in MACRO-86 Assembler (MASM) and the C language.

Figure 3.2
DECnet-Rainbow Configuration



Prerequisite Hardware

Refer to SPD 50.14 for configuration details.

Any valid Rainbow 100 (Rainbow 100A, 100B, 100+) MS-DOS V2.11 configuration with

- 256 KB system memory, of which 80 KB are allocated to the network driver
- 650 KB available disk for DECnet-Rainbow software, and
- EIA RS232C/V.24 cable (null modem, or for use with modem).

Prerequisite Software

Rainbow MS-DOS Operating System, Version 2.11

Table 3.17
DECnet-Rainbow Order Code

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	QVA03-UZ
Distribution and documentation	QVA03-H3

DECnet-VAXmate

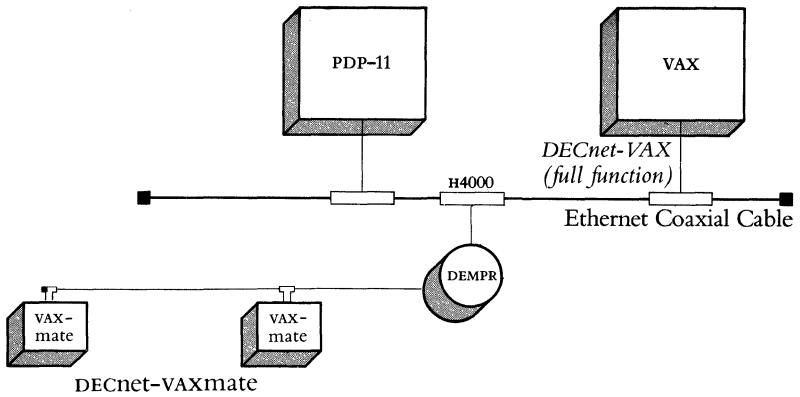
DECnet-VAXmate allows Digital's VAXmate personal computer/workstations to participate as non-routing (end) nodes in DECnet computer networks. This software is one of the DECnet-DOS family of products for personal computer systems running Microsoft Corporation's MS™-DOS operating system, and specific 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

- Allows VAXmates to connect either to baseband Ethernet through the integral Ethernet adapter, or to an adjacent routing node through the integral serial communications port
- Supports task-to-task communications, remote file access, utilities for network file operations, network command terminals, and network resource sharing using DNA protocols
- Allows access to full DECnet-DOS functions for MS-DOS user programs written in MACRO-86 Assembler (MASM) or the C language
- Provides SETHOST 180-column support for DEC national character sets and DEC multinational character sets

Refer to Software Product Description 50.05.xx for more information about DECnet-VAXmate.

Figure 3.3 DECnet-VAXmate Configuration



Minimum Hardware Required

Any valid VAXmate MS-DOS V3.1 configuration with:

- Memory allocated to the network driver and buffers:
  105 KB for Ethernet connection
  75 KB for asynchronous serial line connection
- 800 KB available disk space for DECnet-VAXmate drivers and all utilities.

Note: Operation of the Ethernet interface with broadband modems is not supported.

Prerequisite Software

VAXmate Microsoft Disk Operating System V3.1.

Table 3.18 DECmate-VAXmate Order Code

Option	Order Code
License, Materials, and Service Options:	
Single-use license	Q6000-UZ
Distribution and documentation	Q6000-H7

DECnet Applications for PCs

VAX/VMS Services for MS-DOS™ and PC ALL-IN-1 are applications built on DECnet-DOS. All three products allow personal computers to participate in a DECnet network, and to share network resources such as printers and disks. They also allow PC users to share data with other DECnet users, and to connect their PCs as terminals on DECnet nodes. Network management features are provided in all products. Each product suits a particular environment.

DECnet-DOS allows PCs to participate in DECnet networks as Phase IV end nodes. It provides standard DECnet utilities to the PC user, and allows communication with Phase III or Phase IV DECnet nodes, regardless of the operating system they are running.

DECnet-DOS is well suited to the experienced DECnet user, technical users, and distributed applications developers. It provides a documented application programming interface that allows programmers to develop distributed applications using program-to-program communications. VMS Services for MS-DOS and PC ALL-IN-1 are examples of sophisticated applications built with these tools.

While DECnet-DOS provides the DECnet facilities in a standard DECnet environment, VAX/VMS Services for MS-DOS and PC ALL-IN-1 use the DECnet facilities in a client/server relationship, giving the PC user the operating environment needed for general networking applications.

VAX/VMS Services for MS-DOS allows VMS network nodes to provide MS-DOS style services to the PC user. MS-NET™ protocols are layered on top of DECnet, allowing multiple users to read and write the same file simultaneously.

VAX/VMS Services for MS-DOS acts like an extension of the local MS-DOS system, making facilities such as VMS files, VMS directories, or VAX printers appear as MS-DOS equivalents. The primary advantage of VAX/VMS Services for MS-DOS is that services are transparent and can be utilized by MS-DOS applications without software modification. Also, MS-DOS users can use these facilities without substantial retraining.

In contrast to the MS-DOS orientation of VAX/VMS Services for MS-DOS, PC ALL-IN-1 provides a user environment that is similar in style to ALL-IN-1 on VMS: the user interface is menu driven, and data files are stored in a "file cabinet," from which users remove files for use with PC or VMS applications. Users share files by allowing other users on that PC ALL-IN-1 system to access folders in the file cabinet, or by mailing copies of files and documents to other users. The result is that PC ALL-IN-1 hides from the PC users both the MS-DOS characteristics of the PC and the VMS characteristics of the VAX systems.

VAX/VMS Services for MS-DOS

VAX/VMS Services for MS-DOS™ allows the VAXmate, IBM PC, IBM PC/XT, and IBM Personal Computer AT to act as clients to VAX, MicroVAX, or VAXmate servers in a local area network. The VAXmate and IBM PC clients utilize 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 software and VAX, MicroVAX, or VAXmate server software. A user interface, terminal emulators, on-line user information, network management, utility software, and MS-DOS for VAXmates is included. PC-DOS and PCSA/PC software are prerequisite for IBM PCs.

VAX/VMS Services for MS-DOS is part of Digital's Personal Computing Systems Architecture (PCSA), which integrates industry-standard personal computing into larger-scale multiuser computing environments. The operating system and user interface are adaptations of MS-DOS and MS-Windows.™ The network software is based on an adaptation of MS-NET,™ which allows it to be used in a DECnet-based network. The networking software features the following services: File Services, Print Services, File Transfer, Network Management and Control, VT200 Series Terminal Emulation, and Command Terminal Emulation. (Full IBM PC support of VAX/VMS Services for MS-DOS requires the DEPCA-KX Network Integration package. For more information, refer to Section 3, *Network Integration Packages.*)

VAXmate and IBM PC systems function as clients in the VAX/VMS Services for MS-DOS environment, utilizing the services provided by a VAX, MicroVAX, or VAXmate configured as a server. For additional information, refer to SPD 30.50 for VAXmates, and SPD 55.07 for IBM PCs.

Features

- Ethernet-based communications for high speed data exchange.
- Access to VAX-based or VAXmate 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 applications software.

Prerequisite Hardware

- Server systems: Any valid VAX, MicroVAX, or VAXmate system connected to the same local area network as the VAXmate or IBM PC clients. A VAXmate server system must have an RCD31-EA VAXmate Expansion Box. (Refer to Table 3.20 for a list of supported processors.)
- Client systems: Any valid VAXmate, IBM PC Model 5150, IBM PC/XT Model 5160, or IBM Personal Computer AT Model 5170 connected to the same DECnet network as the VAX, MicroVAX, or VAXmate server system.

  A local area network that includes IBM PC clients must include either an IBM PC with DEPCA-K★ package or a VAXmate for creation of the client key diskettes. (Refer to SPD 55.07 for more information on IBM PC configurations, SPD 30.50 for more information on VAXmate configurations, and Section 3, *Network Integration Packages* for more information on the DEPCA-K★ package.)

Prerequisite Software

- VAX or MicroVAX server systems: VAX/VMS or MicroVMS operating system and DECnet-VAX.
- VAXmate server systems: no prerequisites.
- IBM PC client systems: PC-DOS V3.10
- VAXmate client systems: no prerequisites.

Table 3.19
VAX/VMS Services for MS-DOS Client Software Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**VAXmate**	**IBM PC**
Single-use license	Q6A04-UZ	QBZF7-UZ[1]
Distribution and documentation[2]		QBZF7-HI
Software revision right-to-copy[2]		QBZF7-HZ

[1] A PCSA/PC client license and a DECnet-DOS license for the IBM PC are included in the DEPCA-K★ and DEPCA-BA Network Integration packages.
[2] The VAXmate Client Distribution and Documentation option and Software Revision Right-to-copy option are included with the respective server options.

Table 3.20
VAX/VMS Services for MS-DOS™ Server Software Order Codes

Option	Order Code						
License Options: *(A license is required for each CPU.)*	**MicroVAX II**	**VAXmate**	**VAX-11/780 Series[1]**	**VAX 8200 VAX 8300[2]**	**VAX 8500 VAX 8550[3]**	**VAX 8600 VAX 8650**	**VAX 8700 VAX 8800[4]**
Single-use license	QZA93-UZ	Q6A93-UZ	QEA93-UZ	Q★A93-UZ	Q#A93-UZ	QKA93-UZ	Q+A93-UZ
VAXcluster license			QEA93-QZ	Q★A93-QZ	Q#A93-QZ	QKA93-QZ	Q+A93-QZ
Initial license (primary and cluster)				Q★A93-1P	Q#A93-1P		Q+A93-1P
Monthly availability:							
▪ primary				Q★A93-JP	Q#A93-JP		Q+A93-JP
▪ cluster				Q★A93-JZ	Q#A93-JZ		Q+A93-JZ
Materials and Service Options:							
Distribution and documentation	QZA93-H3 QZA93-H5	Q6A93-H7	QEA93-HM	Q★A93-HM	Q#A93-HM	QKA93-HM	Q+A93-HM
Software revision right-to-copy	QZA93-HZ	Q6A93-HZ	QEA93-HZ	Q★A93-HZ	Q#A93-HZ	QKA93-HZ	Q+A93-HZ

[1] For software licensing purposes, a VAX-11/782 is considered a single CPU.
[2] ★ = 5 for VAX 8200 and 7 for VAX 8300.
[3] # = 9 for VAX 8500 and 2 for VAX 8550.
[4] + = 2 for VAX 8700 and M for VAX 8800.

Network Integration Packages

The Network Integration Packages allow the IBM PC, PC/XT, and Personal Computer AT to participate in Ethernet local area networks using VAX/VMS Services for MS-DOS™ software. The packages include the DEPCA-AA Ethernet controller, a license to use all the components of DECnet-DOS, and a PCSA/PC Client license, which allows an IBM PC to act as a client to the server that provides VAX/VMS Services for MS-DOS. (For more information on the PCSA/PC Client capabilities, refer to Section 3, *VAX/VMS Services for MS-DOS.*)

There are two Network Integration Packages available. The first package, the DEPCA-K★, includes a Digital keyboard and mouse, and provides full Personal Computing Systems Architecture (PCSA) capability, including MS-Windows,™ On-line User Information system, and terminal emulators. The second package, the DEPCA-BA, does not include the Digital keyboard and mouse, and provides a subset of the DEPCA-K★ functions, including file and print services.

In addition to the Network Integration Packages, the DEPCA-AA Ethernet Controller is available as a module-only option. For more information, refer to Section 2, *Ethernet Communications Controllers.*

Table 3.21
Network Integration Package Order Codes

Option	Order Code
Network Integration Package includes DEPCA-AA ThinWire Ethernet communications controller, ThinWire assembly kit, DIGITAL VSXXX-AA mouse, LK250 keyboard, LK250/IBM keyboard cable, PCSA/PC Client single-use software license (QBZF7-UZ), DECnet-DOS single-use software license (QVA05-UZ), and Personal Workstation Handbook.	DEPCA-K★
Network Services Package includes DEPCA-AA ThinWire Ethernet communications controller, ThinWire assembly kit, PCSA/PC Client single-use software license (QBZF7-UZ), DECnet-DOS single-use software license (QVA05-UZ).	DEPCA-BA

★ Variations for local language keyboards are: 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 ALL-IN-1

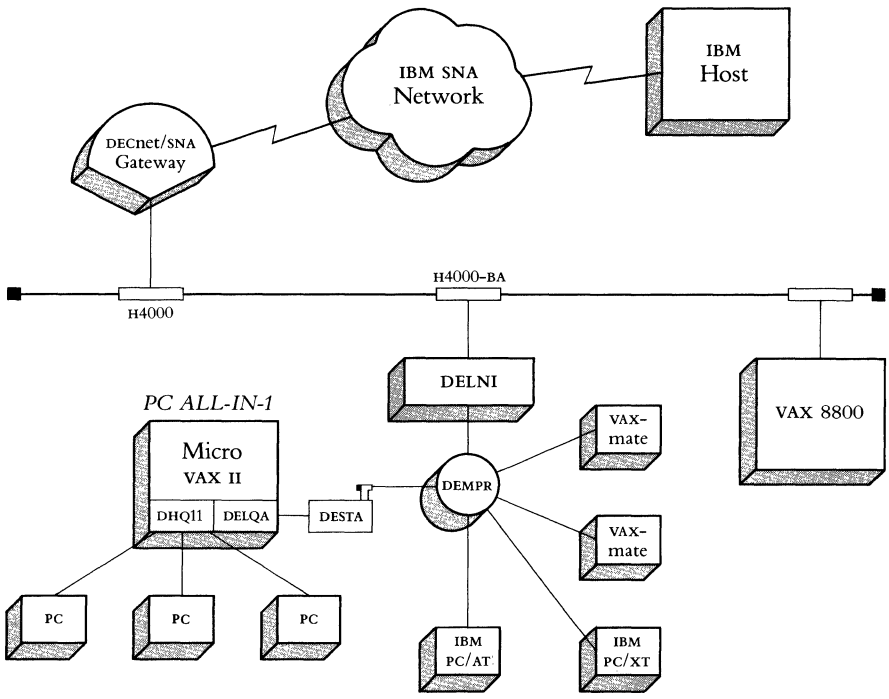
PC ALL-IN-1 creates a workgroup environment for standalone personal computers by networking personal computers to a PC ALL-IN-1 MicroVAX II Server. The PC ALL-IN-1 MicroVAX II Server is the vehicle which provides resource sharing, personal computer and host interconnectivity, and information sharing to personal computer users. Capabilities include the ability to share printers, backup data, exchange data/documents and messages, and access corporate data bases for local decision support applications. The system also provides common desktop applications to the personal computer users such as document processing and electronic mail.

The personal computers that the PC ALL-IN-1 Server supports are the hard disk variations of Digital's Rainbow 100+ or 100B (the 100A is not supported), Digital VAXmate, IBM PC/XT™ (Model 278), and IBM Personal Computer AT™ (Models 68, 99, and 239).

PC ALL-IN-1 is packaged as a "ready-to-run" system. All the necessary hardware (except for the personal computers and connection cables), software, and services are bundled as standard configurations under a single part number. This packaging facilitates system installation, operations, maintenance and expansion. PC ALL-IN-1 requires no system generation, no full-time system manager, no VMS or command-level interface knowledge, and no system backup/restore expertise.

There are two PC ALL-IN-1 standard configurations available. Refer to the order code table for details.

Figure 3.4
PC ALL-IN-1
Configuration



The PC ALL-IN-1 standard configurations are licensed for 30 users in total (in any combination of Ethernet or asynchronous connections). Sixteen asynchronous connections are standard for the configuration. This can be increased to 30 asynchronous connections by adding two additional asynchronous controllers. PC ALL-IN-1 can support both ThinWire or Standard Ethernet.

PC ALL-IN-1 standard configurations can support a maximum of four LN03 printers and up to three modems (with the restriction that the total number of modems and printers not exceed four). The standard configurations include an LN03. The console terminal has its own dedicated line.

Refer to Software Product Description 28.39 for more information about PC ALL-IN-1.

Prerequisite Hardware

For personal computers connected via asynchronous lines:

- 640 KB Memory
- 10 MB Winchester Disk
- Asynchronous RS232 communications port

For personal computers connected via Ethernet:

- 640 KB Memory
- 10 MB Winchester Disk
- Ethernet card/connector (supported cards are Digital DEPCA, 3Com™ Etherlink Models IE2 or IE4, and MICOM Systems™ Models NI5010-1 or NI5010-2).

Prerequisite Software

For VAXmate: MS-DOS, V3.1 standalone.

For IBM PC/XT (Model 278) and Personal Computer AT (Models 68, 99, and 239): PC-DOS, V3.1

For Rainbow 100: MS-DOS, Version 2.11

Note: There is no prerequisite software for the server.

Software Only Option

PC ALL-IN-1 server software can be purchased separately (without the MicroVAX II server hardware). The software checks the server to determine on which of the two configurations it is running. Refer to the Order Code table for components of the software-only option.

Table 3.22
PC ALL-IN-1
Order Codes

Option	Order Code
Standard PC ALL-IN-1 configurations include a MicroVAX II, Ethernet controller, 16 RS423 asynchronous ports, 4 lines for printers and /or modems, one 95 MB Streaming tape, one LN03 laser printer with printer stand and supplies, and one VT220 console terminal with dedicated line. Also included are the PC ALL-IN-1 single-use license, software media, documentation, and one year of hardware and software support.	
Standard PC ALL-IN-1 configuration described above with 5 MB memory and three 71 MB disk drives	DJ-630B1-AA
Standard PC ALL-IN-1 configuration described above with 9 MB memory, one 71 BM disk drive, and two 159 MB disk drives	DJ-630B2-AA
Software-only option includes license for server, license for 30 PCs, media, documentation, 3 days of DECstart Service, and a choice of Startup Package II or III.	
Software-only option with Startup Package II	QZZH3-B5
Software-only option with Startup Package III	QZZH3-75
Software license for the PC	QZZH1-UZ
Documentation only	QZA00-GZ
User documentation kit	QZC00-GZ

Mail Interchange

Message Router

Message Router is a VMS layered application that performs a store and forward transfer service. Messages can consist of any information, including text, data and arbitrary files, that need to be transferred within a DECnet Phase IV network.

Message Router supports messages constructed with fields 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 standard for Message Handling Services.

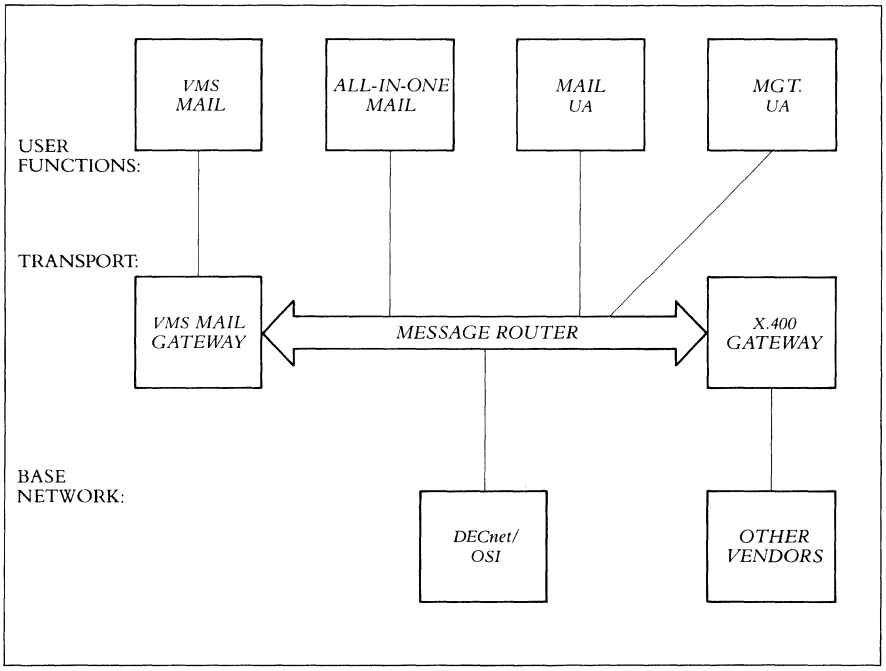
Message Router must be installed on any network node that sends and receives messages via Message Router. It requires application programs, called User Agents or Gateways, that perform the following functions:

- 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.

The Message Router is a standard component of ALL-IN-1 and PC ALL-IN-1 configurations. In addition, it is available in the following packages:

- Message Router Base for installing the Message Router on nodes running user-written applications
- Message Router VMSmail Gateway for transferring VMS mail via the Message Router
- Message Router X.400 Gateway for exchanging mail with X.400 mail systems
- Message Router Programmer's Kit for developing message transfer applications

Figure 3.5
Message Router Environment



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 undeliverable. 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.

Message Router Base

The Message Router Base is supplied as a separate package for installation on nodes running customer-written Message Router applications. It may also 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.

The Message Router Base provides management tools to configure and operate the messaging service.

For more information about the Message Router Base, refer to the *Message Router* topic in this section.

Required Hardware

Any valid VAX, MicroVAX, or VAXstation system configuration that supports the DECnet Phase IV network. (Refer to the Order Code Table for a list of supported processors.)

Prerequisite Software

- VAX/VMS or MicroVMS operating system V4.4 or later
- DECnet-VAX

Table 3.23
Message Router Base
Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q*732-UZ[1]
VAXcluster license	Q*732-QZ[2]
Initial license, primary & cluster	Q*732-1P[3]
Monthly availability, primary	Q*732-JP[3]
Monthly availability, cluster	Q*732-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q*732-H#
Software revision right-to-copy	Q*732-HZ
Documentation only	QL732-GZ
Installation Service	Q*732-I#
U.S. Software Product Services:[4]	
DECsupport service	Q*732-9#
Basic service	Q*732-8#
Self-maintenance service	Q*732-3#
MicroVAX II: * = Z; # = 3 or 5	VAX 83x0: * = 7; # = 3 or M
MicroVAX 2000: * = 3; # = 3 or 5	VAX 8500: * = 9; # = M
VAXstation II: * = 4; # = 3 or 5	VAX 8530: * = 9; # = M
VAXstation 2000: * = 8; # = 3 or 5	VAX 8550: * = 2; # = M
VAX-11/730: * = C; # = G or M	VAX 86x0: * = K; # = M
VAX-11/750: * = D; # = G or M	VAX 8700: * = 2; # = M
VAX-11/78x: * = E; # = M or Y	VAX 8800: * = M; # = M
VAX 82x0: * = 5; # = 3 or M	

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

Message Router VMSmail Gateway

Message Router VMSmail Gateway is a layered VMS application that allows VMSmail users to send and receive mail in a network from other systems that use Message Router. The VMSmail Gateway package contains the Message Router Base and the Gateway to the VMS Personal Mail Utility.

Features

- Allows VMS mail users to exchange messages using Message Router store and forward management, thus ensuring guaranteed delivery.
- Allows VMS mail users to exchange messages with users of other Digital-supplied mail systems, for example, ALL-IN-1 and PC ALL-IN-1.
- Allows VMS mail users to exchange messages with the users of non-Digital supplied mail systems via the X.400 Gateway.
- 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. (Refer to the Order Code Table for a list of supported processors.)

Prerequisite Software

- VAX/VMS or MicroVMS operating system V4.4 or later
- DECnet-VAX

Table 3.24
Message Router VMSmail Gateway Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★730-UZ[1]
VAXcluster license	Q★730-QZ[2]
Initial license, primary & cluster	Q★730-1P[3]
Monthly availability, primary	Q★730-JP[3]
Monthly availability, cluster	Q★730-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★730-H#
Software revision right-to-copy	Q★730-HZ
Documentation only	QL730-GZ
Installation Service	Q★730-I#
U.S. Software Product Services:[4]	
DECsupport service	Q★730-9#
Basic service	Q★730-8#
Self-maintenance service	Q★730-3#
MicroVAX II: ★ = Z; # = 3 or 5	VAX 83x0: ★ = 7; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8550: ★ = 2; # = M
VAX-11/730: ★ = C; # = G or M	VAX 86x0: ★ = K; # = M
VAX-11/750: ★ = D; # = G or M	VAX 8700: ★ = 2; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8800: ★ = M; # = M
VAX 82x0: ★ = 5; # = 3 or M	

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

Message Router X.400 Gateway

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.

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 VAX OSI Applications Kernal (OSAK). 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, VAX OSI Transport Service (VOTS), 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 that supports VAX P.S.I. V4.0.

Prerequisite Software

- VAX/VMS or MicroVMS operating system V4.4.
- DECnet-VAX, VAX P.S.I. or VAX P.S.I. ACCESS V4.0, and VOTS V1.1.
- Any mail system running on Message Router (requires VMSmail Gateway V2.1 for VMSmail connection).

Table 3.25
Message Router X.400 Gateway Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★Z66-UZ[1]
VAXcluster license	Q★Z66-QZ[2]
Initial license, primary & cluster	Q★Z66-1P[3]
Monthly availability, primary	Q★Z66-JP[3]
Monthly availability, cluster	Q★Z66-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★Z66-H#
Software revision right-to-copy	Q★Z66-HZ
Documentation only	QLZ66-GZ
Installation Service	Q★Z66-I#
U.S. Software Product Services:[4]	
DECsupport service	Q★Z66-9#
Basic service	Q★Z66-8#
Self-maintenance service	Q★Z66-3#
MicroVAX II: ★ = Z; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAX-11/730: ★ = C; # = G or M	VAX 8550: ★ = 2; # = M
VAX-11/750: ★ = D; # = G or M	VAX 86x0: ★ = K; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8700: ★ = 2; # = M
VAX 82x0: ★ = 5; # = 3 or M	VAX 8800: ★ = M; # = M
VAX 83x0: ★ = 7; # = 3 or M	

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

Message Router Programmer's Kit

The 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 run-time 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. (Refer to the Order Code Table for a list of supported processors.)

Prerequisite Software

- VAX/VMS or MicroVMS operating system V4.4 or later
- DECnet-VAX

Table 3.26
Message Router Programmer's Kit Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★733-UZ[1]
VAXcluster license	Q★733-QZ[2]
Initial license, primary & cluster	Q★733-1P[3]
Monthly availability, primary	Q★733-JP[3]
Monthly availability, cluster	Q★733-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★733-H#
Software revision right-to-copy	Q★733-HZ
Documentation only	QL733-GZ
Installation Service	Q★733-I#
U.S. Software Product Services:[4]	
DECsupport service	Q★733-9#
Basic service	Q★733-8#
Self-maintenance service	Q★733-3#
MicroVAX II: ★ = Z; # = 3 or 5	VAX 83x0: ★ = 7; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8550: ★ = 2; # = M
VAX-11/730: ★ = C; # = G or M	VAX 86x0: ★ = K; # = M
VAX-11/750: ★ = D; # = G or M	VAX 8700: ★ = 2; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8800: ★ = M; # = M
VAX 82x0: ★ = 5; # = 3 or M	

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

Internet Communications Software

Digital's Internet family of products supports the interconnection 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. Many different programming languages and the wide range of computing power provided by Digital's family of computers are supported.

Internet Communications Software includes:

- Digital-to-IBM
- Digital-to-UNIVAC
- Digital-to-CDC
- Digital-to-Unix
- Digital-to-Wang
- Packetnet
- Open Systems Interconnection (OSI)

Digital-to-IBM Communications Software

Digital-to-IBM Communications Software products offer services that range from interconnection of the Digital Network Architecture (DNA) and IBM System Network Architecture (SNA) to single-function, system-to-system protocol emulation.

The *DECnet/SNA Gateway* provides interconnection of Digital and IBM environments on a network-to-network level. It allows VMS or MicroVMS systems in a DECnet network to access resources, programs, and information within an SNA network. It also allows 3270 display users within the SNA network to access DECnet-based VMS or MicroVMS system resources within the DNA environment. The DECnet/SNA Gateway provides the advantage of Ethernet capability and access to the SNA environment, without incurring additional processor overhead within the LAN.

VMS/SNA provides many of the same functions as the DECnet/SNA Gateway. However, VMS/SNA is more suitable for installations that require a single direct link to the SNA environment.

Both the DECnet/SNA Gateway and VMS/SNA require installation of the appropriate *DECnet/SNA Access Routines and Programming Interfaces.* These products provide Gateway Management and allow Digital or IBM users to interact using the following services: 3270 Terminal Emulator (3270 TE), Remote Job Entry (RJE), DECnet/SNA Data Transfer Facility, 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), 3270 Data Stream Programming Interface (3270 DS), and Application Programming Interface (API).

Digital's *Binary Synchronous Communications (BSC) Protocol Emulator* products provide point-to-point communications emulation between Digital and IBM systems and are designed to satisfy single-function Digital-to-IBM communication requirements. If the amount of communication between Digital systems and IBM mainframes is relatively low, BSC may be the appropriate interconnection method. Digital offers two types of IBM Internet products using the BSC technology—3271 protocol emulation software and 2780/3780 protocol emulation.

DECnet-DOS allows the IBM PC, PC/XT, and Personal Computer AT systems to participate as non-routing (end) nodes in DECnet and Ethernet computer networks. Refer to DECnet Communications Software in this section for more information.

Several other products are available for Digital-to-IBM communications: *VIDA* allows integration of data from IDMS on IBM mainframes with VAX databases, *DECnet/SNA TOPS-20 Access Products* allow access to the IBM environment for DECSYSTEM 20-series users, and *WPS-PLUS/PC* provides Digital-style word processing for IBM PC users.

DECnet/SNA Gateway

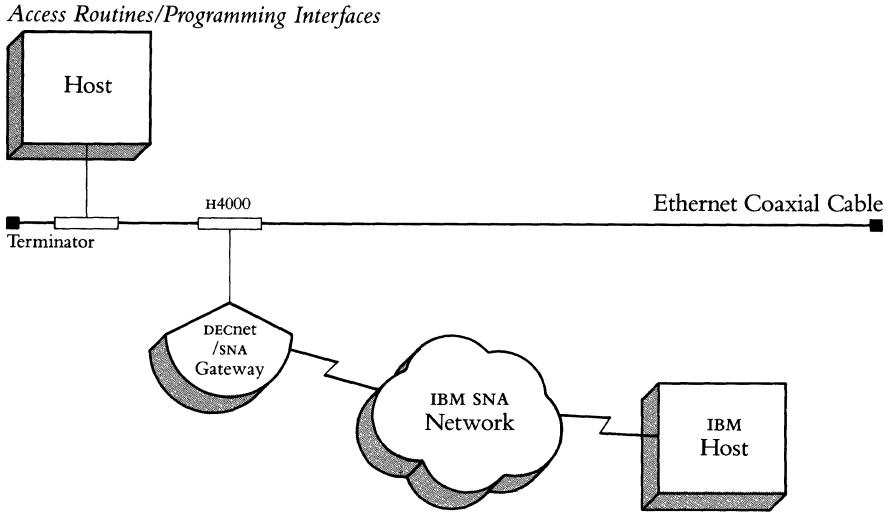
The DECnet/SNA Gateway allows users to share information between suitably configured VAX/VMS or MicroVAX/MicroVMS systems in a DECnet environment and IBM systems in a Systems Network Architecture (SNA) environment.

The DECnet/SNA Gateway links the two vendors' network environments, rather than merely providing single-function communications emulation between two computers. Architecturally, the DECnet/SNA Gateway is a DECnet Phase IV node to DECnet and a Physical Unit Type 2 node to SNA. The DECnet/SNA Gateway implements SNA protocols and supports two local or remote connections at 56 Kb/s. When ordering the DECnet/SNA Gateway, specify hardware, software and appropriate DECnet/SNA Access Routine/Programming Interface order codes.

Features

- Links the DECnet environment to the IBM SNA environment.
- Provides these SNA functions: 3270 Terminal Emulator, Remote Job Entry, DECnet/SNA Data Transfer Facility, Application Programming Interface, DISOSS Document Exchange, EDE with IBM DISOSS, Distributed Host Command Facility, Printer Emulator, Advanced-Program-to-Program Communication LU6.2 Programming Interface, and 3270 Data Stream Programming Interface.
- Has Gateway Management software for control and troubleshooting.

Figure 3.6
DECnet/SNA
Gateway Configuration



Prerequisite Hardware

- DECnet/SNA Gateway hardware (DECSA-FA).
- All Ethernet physical channel hardware (for example, coaxial cable and terminators).
- An H4000 transceiver (or a DELNI) and appropriate transceiver cable.

Prerequisite Software

The DECnet/SNA Gateway requires a Phase IV DECnet host to support downline software loading. One or more of the following systems may be used as Ethernet hosts:

- VAX/VMS operating system with DECnet-VAX Phase IV networking software.
- MicroVAX II operating system with DECnet-VAX Phase IV networking software.

Table 3.27
DECnet/SNA
Gateway Hardware Order Code

Option	Order Code
DECnet/SNA Gateway unit and one-line synchronous EIA RS-232-C/CCITT V.28 line card (DCSAX-LA)	DECSA-FA

Table 3.28
DECnet/SNA Gateway Software Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★452-UZ[1]
VAXcluster license	Q★452-QZ[2]
Initial license, primary & cluster	Q★452-1P[3]
Monthly availability, primary	Q★452-JP[3]
Monthly availability, cluster	Q★452-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★452-H#
Software revision right-to-copy	Q★452-HZ
Documentation only	QL452-GZ
Installation Service	Q★452-I#
MicroVAX I: ★ = N; # = 3	VAX 82x0: ★ = 5; # = 3 or M
MicroVAX II: ★ = Z; # = 3 or 5	VAX 83x0: ★ = 7; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8550: ★ = 2; # = M
VAX-11/730: ★ = C; # = G	VAX 86x0: ★ = K; # = M
VAX-11/750: ★ = D; # = G or M	VAX 8700: ★ = 2; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8800: ★ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Available on VAX-11/750, VAX-11/78x, VAX 8000 Series.
[3] Available on VAX 82x0, VAX 83x0, VAX 85x0, VAX 8700, and VAX 8800.

DECnet/SNA Gateway Country Kits

Every DECnet/SNA Gateway requires a country kit. Each country kit contains a power cord, hardware manuals in English, and labels with the front panel display in the appropriate national language.

Table 3.29
DECnet/SNA Gateway Country Kit Order Codes

Country	Order Code
Australia, New Zealand	DECSK-AZ
Canada (French)	DECSK-AC
England, Ireland	DECSK-AE
France	DECSK-AP
Germany	DECSK-AG
Japan	DECSK-AJ
Spain	DECSK-AS
United States, Canada (English)	DECSK-AA

DECnet/SNA Gateway Options

These guidelines for add-on line cards reflect performance constraints. The performance of the line cards is described in the appropriate Software Product Description. There are four variations of the total number of allowed add-on cards. One and only one variation may be used:

- One DCSAX-LA card at 9.6 Kb/s.
- Two DCSAX-LA cards at 9.6 Kb/s each.
- One DCSAX-LA card at 9.6 Kb/s and one DCSAX-LB at 56.0 Kb/s.
- Two DCSAX-LB cards at up to 56.0 Kb/s. Discard the DCSAX-LA line card included with the server hardware.

VMS/SNA

VMS/SNA is a VMS-layered software product that allows suitably configured VAX systems to directly participate in an IBM Systems Network Architecture (SNA) networking 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 DPV11 to an IBM 37X5 Communications Controller.

VMS/SNA provides the high-level capabilities of a system-to-network link, performing such functions as accessing IBM application programs or other system resources, acting as a 3270 display station, exchanging documents and electronic mail messages between the VMS operating system and IBM's DISOSS, and implementing distributed application programs that run between the VMS and IBM systems.

Systems requiring access to the SNA environment must be configured with the appropriate Access Routines or Programming Interfaces. For more information, refer to DECnet/SNA VMS Access Routines and Programming Interfaces in this section.

Features

- VMS/SNA serves as a transport base for other IBM related capabilities including 3270 Terminal Emulation, DISOSS document exchange, Printer Emulation, Remote Job Entry, DECnet/SNA Data Transfer Facility, Application Programming Interface (LU 0, 1, 2, 3), APPC/LU6.2 Programming Interface, and 3270 Data Stream Programming Interface (LU 2). Note: Distributed Host Command Facility (DHCF) is not supported for VMS/SNA.
- SNA Node Management (SNANM) provides a node management facility to control, monitor, and troubleshoot VMS/SNA and the IBM/SNA environment. The SNANM system image SET and SHOW commands display information about the circuit status, circuit counters, access names, and circuit state.
- The SNA Protocol Trace Utility (SNATRACE) performs SDLC frame level, physical unit, and session level tracing of a circuit to aid in problem isolation, determination, and resolution.

Figure 3.7
VMS/SNA Configuration for MicroVAX

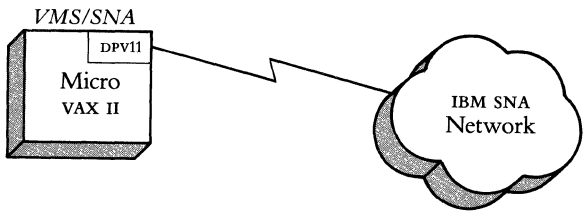
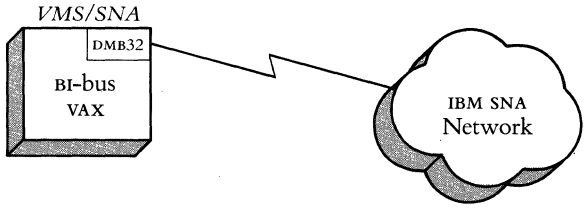


Figure 3.8
VMS/SNA Configuration for BI-bus VAX



Comparison of VMS/SNA and DECnet/SNA Gateway

The following applications are best suited 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 mobil units.

The following applications are best suited for DECnet/SNA Gateway:

- 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 DHCF access routine provides this capability.
- Sites requiring SNA access from VAXstation II systems.

The following environments are best suited 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.

The following environments are best suited for DECnet/SNA Gateway:

- 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.

Table 3.30 Comparison of VMS/SNA and DECnet/SNA Gateway Capabilities

VMS/SNA V1.1	DECnet/SNA Gateway
Local and Communication Processing	Communication Processing only
Q-Bus support via DPV11 VAXBI bus support via DMB32 No UNIBUS support	Ethernet based Supports all VAX systems
Single line to 64 Kb/s	Two lines to 56 Kb/s
No DHCF	DHCF support
Node management internal	Gateway management uses DECnet tools
No VAXstation II support	VAXstation II support

Prerequisite Hardware

One of the following:

- A MicroVAX I or MicroVAX II with at least two megabytes additional memory, a DPV11 communications controller, and a modem or modem eliminator.
- A VAXBI-based system, a DMB32 communications controller, and a modem or modem eliminator. Refer to the VMS/SNA Order Code table for a list of supported processors.

Prerequisite Software

- Either MicroVMS, V4.4 or later, or VAX/VMS, V.4 or later. For MicroVMS, only the Base System component is required.
- DECnet-VAX
- One of the DECnet/SNA Access Routines listed under Optional Software.
- For VAXBI systems with DMB32, the DMB32 device driver.

Optional Software

- 3270 Terminal Emulator (SPD 26.84.xx)
- Remote Job Entry (SPD 26.85.xx)
- Data Transfer Facility (SPD 27.85.xx)
- Printer Emulator (SPD 26.70.xx)
- DISOSS Document Exchange Facility (SPD 26.72.xx)
- Application Programming Interface (SPD 26.86.xx)
- 3270 Data Stream Programming Interface (SPD 26.87.xx)
- APPC/LU6.2 Programming Interface (SPD 26.88.xx)
- EDE with IBM DISOSS (SPD 26.92.xx)

Table 3.31
VMS/SNA Order Codes

Option	Order Code
Licenses: *(A license is required for each CPU.)*	
Single-use license	Q★362-UZ
Materials and Services	
Distribution and documentation	Q★362-H#
Software revision right-to-copy	Q★362-HZ
Documentation only	QL362-GZ
Installation	Q★362-I#
U.S. Software Product Service Agreements:[1]	
DECsupport Service	Q★362-9#
Basic service	Q★362-8#
Self-maintenance service	Q★362-3#
MicroVAX I: ★ = N; # = 3	VAX 8530: ★ = 9; # = M
MicroVAX II: ★ = Z; # = 3 or 5	VAX 8550: ★ = 2; # = M
VAX 82x0: ★ = 5; # = 3 or M	VAX 8700: ★ = 2; # = M
VAX 83x0: ★ = 7; # = 3 or M	VAX 8800: ★ = M; # = M
VAX 8500: ★ = 9; # = M	

[1] For non-U.S. service agreements, consult a local Digital Sales Representative.

DECnet/SNA Access Routines and Programming Interfaces

Access Routine software packages are required for both the DECnet/SNA Gateway and a VMS/SNA host for communication with the SNA network.

DECnet/SNA Access Routines and Programming Interfaces allow users to perform specific functions on IBM host systems connected to the SNA network. The following products, which are ordered separately, are available:

- DECnet/SNA Gateway Management
- 3270 Terminal Emulator (3270 TE)
- Remote Job Entry (RJE)
- DECnet/SNA Data Transfer Facility
- 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)
- 3270 Data Stream Programming Interface (3270 DS)
- Application Programming Interface (API)

DECnet/SNA VMS Gateway Management

The DECnet/SNA VMS Gateway Management access routine controls, monitors, and troubleshoots the Gateway. All management functions are performed from a node on the Digital network, rather than from the Gateway. The Gateway Management routines provide configuration and initialization facilities and allow a VAX/VMS operator to bootstrap or restart a Gateway. This routine also provides event logging and error counters. Fault isolation tools, such as SDLC frame level loopback, verify communication facilities and connection to the IBM line adapter.

The Gateway Management access routine is required for use with VAX/VMS systems executing the other access routines using the DECnet/SNA Gateway.

Table 3.32
DECnet/SNA VMS Gateway Management Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q⋆452-UZ[1]
VAXcluster license	Q⋆452-QZ[2]
Initial license, primary & cluster	Q⋆452-1P[3]
Monthly availability, primary	Q⋆452-JP[3]
Monthly availability, cluster	Q⋆452-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q⋆452-H#
Software revision right-to-copy	Q⋆452-HZ
Documentation only	QL452-GZ
Installation Service	Q⋆452-I#
U.S. Software Product Services:[4]	
DECsupport service	Q⋆452-9#
Basic service	Q⋆452-8#
Self-maintenance service	Q⋆452-3#
MicroVAX I: ⋆ = N; # = 3	VAX 82x0: ⋆ = 5; # = 3 or M
MicroVAX II: ⋆ = Z; # = 3 or 5	VAX 83x0: ⋆ = 7; # = 3 or M
MicroVAX 2000: ⋆ = 3; # = 3 or 5	VAX 8500: ⋆ = 9; # = M
VAXstation II: ⋆ = 4; # = 3 or 5	VAX 8530: ⋆ = 9; # = M
VAXstation 2000: ⋆ = 8; # = 3 or 5	VAX 8550: ⋆ = 2; # = M
VAX-11/730: ⋆ = C; # = G or M	VAX 86x0: ⋆ = K; # = M
VAX-11/750: ⋆ = D; # = G or M	VAX 8700: ⋆ = 2; # = M
VAX-11/78x: ⋆ = E; # = M or Y	VAX 8800: ⋆ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

DECnet/SNA VMS 3270 Terminal Emulator (3270 TE)

The DECnet/SNA VMS 3270 Terminal Emulator (3270 TE) access routine allows a VT200 terminal (or other device operating in VT100 emulation mode) on a suitably configured VAX or MicroVAX system to interact with programs on an IBM system written for 3270 display stations. Specifically, this gives the 3270 TE user the emulated features of a 3278 Model 2, 3, 4, or 5 display. Note that the access routines are not required for routing nodes between the VAX/VMS system and the gateway. 3270 TE is available for use with both VMS/SNA and the DECnet/SNA Gateway.

Table 3.33
DECnet/SNA VMS
3270 Terminal Emulator
Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q⋆454-UZ[1]
VAXcluster license	Q⋆454-QZ[2]
Initial license, primary & cluster	Q⋆454-1P[3]
Monthly availability, primary	Q⋆454-JP[3]
Monthly availability, cluster	Q⋆454-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q⋆454-H#
Software revision right-to-copy	Q⋆454-HZ
Documentation only	QL454-GZ
Installation Service	Q⋆454-I#
U.S. Software Product Services:[4]	
DECsupport service	Q⋆454-9#
Basic service	Q⋆454-8#
Self-maintenance service	Q⋆454-3#
MicroVAX I: ⋆ = N; # = 3	VAX 82x0: ⋆ = 5; # = 3 or M
MicroVAX II: ⋆ = Z; # = 3 or 5	VAX 83x0: ⋆ = 7; # = 3 or M
MicroVAX 2000: ⋆ = 3; # = 3 or 5	VAX 8500: ⋆ = 9; # = M
VAXstation II: ⋆ = 4; # = 3 or 5	VAX 8530: ⋆ = 9; # = M
VAXstation 2000: ⋆ = 8; # = 3 or 5	VAX 8550: ⋆ = 2; # = M
VAX-11/730: ⋆ = C; # = G or M	VAX 86x0: ⋆ = K; # = M
VAX-11/750: ⋆ = D; # = G or M	VAX 8700: ⋆ = 2; # = M
VAX-11/78x: ⋆ = E; # = M or Y	VAX 8800: ⋆ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

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.

Table 3.34
DECnet/SNA VMS Remote Job Entry Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★453-UZ[1]
VAXcluster license	Q★453-QZ[2]
Initial license, primary & cluster	Q★453-1P[3]
Monthly availability, primary	Q★453-JP[3]
Monthly availability, cluster	Q★453-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★453-H#
Software revision right-to-copy	Q★453-HZ
Documentation only	QL453-GZ
Installation Service	Q★453-I#
U.S. Software Product Services:[4]	
DECsupport service	Q★453-9#
Basic service	Q★453-8#
Self-maintenance service	Q★453-3#
MicroVAX I: ★ = N; # = 3	VAX 82x0: ★ = 5; # = 3 or M
MicroVAX II: ★ = Z; # = 3 or 5	VAX 83x0: ★ = 7; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8550: ★ = 2; # = M
VAX-11/730: ★ = C; # = G or M	VAX 86x0: ★ = K; # = M
VAX-11/750: ★ = D; # = G or M	VAX 8700: ★ = 2; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8800: ★ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

DECnet/SNA Data Transfer Facility (DTF)

The DECnet/SNA Data Transfer Facility (DTF) provides bidirectional data transfer between an IBM MVS system in a Systems Network Architecture (SNA) environment and one or more VAX/VMS systems in a DECnet network. The VAX/VMS user accesses the DECnet/SNA DTF product through standard DCL file manipulation commands (such as COPY or DIR), a Record Management System (RMS) programming interface, an interface to the File Transfer Checkpoint and Recovery Utility, or the DTF Management Utility interface. The IBM user accesses the DECnet/SNA DTF product through ISPF panels or a TSO command processor. A TSO command processor can also be invoked in a JES batch job.

For IBM MVS systems, DECnet/SNA DTF supports files with the physical sequential data set organization, with fixed, variable and variable spanned records, and resident on disk or tape. For VAX/VMS systems, DECnet/SNA DTF supports RMS sequential, relative or indexed files using sequential record access, with fixed, variable length, and variable-length with fixed-length control (VFC) record formats. (Only print file format is supported with VFC.) DECnet/SNA DTF allows data translation from the Digital Multinational Character Set to EBCDIC on a record-by-record basis and vice versa. To translate binary, integer, floating point, packed decimal, and numeric strings, the VAX Common Data Dictionary is required on the VMS/DTF Server node. The information content of the file is maintained across a file transfer.

The DTF software contains these components: DECnet/SNA VMS DTF Client software that runs on any DECnet-VAX system that needs to use DTF; DECnet/SNA VMS DTF Server software that runs on a DECnet-VAX system to communicate between the VMS/DTF client systems and the MVS/DTF systems (includes client support); and, 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.)

DECnet/SNA DTF is available for use with both VMS/SNA and the DECnet/SNA Gateway. Refer to SPD 27.85 for prerequisite hardware and software for both the IBM MVS and VAX/VMS systems.

Table 3.35
DECnet/SNA VMS DTF Server and Client Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**Server**	**Client**
Single-use license	Q*ZDI-UZ	Q*ZGS-UZ
VAXcluster License[1]	Q*ZDI-QZ	Q*ZGS-QZ
Initial license (primary & cluster)[2]	Q*ZDI-1P	Q*ZGS-1P
Monthly availability: primary[2]	Q*ZDI-JP	Q*ZGS-JP
Monthly availability: cluster[2]	Q*ZDI-JZ	Q*ZGS-JZ
Distribution and documentation	Q*ZDI-H#	Q*ZGS-H#

MicroVAX II: * = Z; # = 3 or 5
MicroVAX 2000: * = 3; # = 3 or 5
VAXstation II: * = 4; # = 3 or 5
VAXstation 2000: * = 8; # = 3 or 5
VAX-11/730: * = C; # = M
VAX-11/750: * = D; # = M
VAX-11/780: * = E; # = M
VAX-11/782[3]: * = E; # = M
VAX 11/785: * = E; # = M
VAX 8200: * = 5; # = 3 or M
VAX 8250: * = 5; # = 3, or M
VAX 8300: * = 7; # = 3 or M
VAX 8350: * = 7; # = 3 or M
VAX 8500: * = 9; # = M
VAX 8550: * = 2; # = M
VAX 8600: * = K; # = M
VAX 8650: * = K; # = M
VAX 8700: * = 2; # = M
VAX 8800: * = M; # = M

[1] Available on VAX-11/750, VAX-11/78X, VAX 82X0, VAX 83X0, VAX 85X0, VAX 86X0, VAX 8700, and VAX 8800.
[2] Available on VAX 82X0, VAX 83X0, VAX 85X0, VAX 8700, and VAX 8800.
[3] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.

Table 3.36
DECnet/SNA MVS DTF Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	QXI01-UZ
Initial license	QXI01-1P
Monthly availability	QXI01-JP
Distribution and documentation	QXI01-HA

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.

Table 3.37
DECnet/SNA VMS DDXF Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q⋆042-UZ[1]
VAXcluster license	Q⋆042-QZ[2]
Initial license, primary & cluster	Q⋆042-1P[3]
Monthly availability, primary	Q⋆042-JP[3]
Monthly availability, cluster	Q⋆042-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q⋆042-H#
Software revision right-to-copy	Q⋆042-HZ
Documentation only	QL042-GZ
Installation Service	Q⋆042-I#
U.S. Software Product Services:[4]	
DECsupport service	Q⋆042-9#
Basic service	Q⋆042-8#
Self-maintenance service	Q⋆042-3#
MicroVAX I: ⋆ = N; # = 3	VAX 82x0: ⋆ = 5; # = 3 or M
MicroVAX II: ⋆ = Z; # = 3 or 5	VAX 83x0: ⋆ = 7; # = 3 or M
MicroVAX 2000: ⋆ = 3; # = 3 or 5	VAX 8500: ⋆ = 9; # = M
VAXstation II: ⋆ = 4; # = 3 or 5	VAX 8530: ⋆ = 9; # = M
VAXstation 2000: ⋆ = 8; # = 3 or 5	VAX 8550: ⋆ = 2; # = M
VAX-11/730: ⋆ = C; # = G or M	VAX 86x0: ⋆ = K; # = M
VAX-11/750: ⋆ = D; # = G or M	VAX 8700: ⋆ = 2; # = M
VAX-11/78x: ⋆ = E; # = M or Y	VAX 8800: ⋆ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

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.

Table 3.38
EDE with IBM DISOSS
Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★761-UZ[1]
VAXcluster license	Q★761-QZ[2]
Initial license, primary & cluster	Q★761-1P[3]
Monthly availability, primary	Q★761-JP[3]
Monthly availability, cluster	Q★761-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★761-H#
Software revision right-to-copy	Q★761-HZ
Documentation only	QL761-GZ
Installation Service	Q★761-I#
U.S. Software Product Services:[4]	
DECsupport service	Q★761-9#
Basic service	Q★761-8#
Self-maintenance service	Q★761-3#
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAX-11/730: ★ = C; # = G or M	VAX 8550: ★ = 2; # = M
VAX-11/750: ★ = D; # = G or M	VAX 86x0: ★ = K; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8700: ★ = 2; # = M
VAX 82x0: ★ = 5; # = 3 or M	VAX 8800: ★ = M; # = M
VAX 83x0: ★ = 7; # = 3 or M	

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

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 the DECnet/SNA Gateway. 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 VAX/VMS commands, reading VAX mail, editing files, and monitoring and controlling VAX/VMS processors. DHCF is available for use with the DECnet/SNA Gateway only.

Table 3.36
DECnet/SNA VMS DHCF Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★043-UZ[1]
VAXcluster license	Q★043-QZ[2]
Initial license, primary & cluster	Q★043-1P[3]
Monthly availability, primary	Q★043-JP[3]
Monthly availability, cluster	Q★043-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★043-H#
Software revision right-to-copy	Q★043-HZ
Documentation only	QL043-GZ
Installation Service	Q★043-I#
U.S. Software Product Services:[4]	
DECsupport service	Q★043-9#
Basic service	Q★043-8#
Self-maintenance service	Q★043-3#
MicroVAX II: ★ = Z; # = 3 or 5	VAX 83x0: ★ = 7; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8550: ★ = 2; # = M
VAX-11/730: ★ = C; # = G or M	VAX 86x0: ★ = K; # = M
VAX-11/750: ★ = D; # = G or M	VAX 8700: ★ = 2; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8800: ★ = M; # = M
VAX 82x0: ★ = 5; # = 3 or M	

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

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.

Table 3.40
DECnet/SNA VMS PrE Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q*044-UZ[1]
VAXcluster license	Q*044-QZ[2]
Initial license, primary & cluster	Q*044-1P[3]
Monthly availability, primary	Q*044-JP[3]
Monthly availability, cluster	Q*044-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q*044-H#
Software revision right-to-copy	Q*044-HZ
Documentation only	QL044-GZ
Installation Service	Q*044-I#
U.S. Software Product Services:[4]	
DECsupport service	Q*044-9#
Basic service	Q*044-8#
Self-maintenance service	Q*044-3#
MicroVAX I: * = N; # = 3	VAX 82x0: * = 5; # = 3 or M
MicroVAX II: * = Z; # = 3 or 5	VAX 83x0: * = 7; # = 3 or M
MicroVAX 2000: * = 3; # = 3 or 5	VAX 8500: * = 9; # = M
VAXstation II: * = 4; # = 3 or 5	VAX 8530: * = 9; # = M
VAXstation 2000: * = 8; # = 3 or 5	VAX 8550: * = 2; # = M
VAX-11/730: * = C; # = G or M	VAX 86x0: * = K; # = M
VAX-11/750: * = D; # = G or M	VAX 8700: * = 2; # = M
VAX-11/78x: * = E; # = M or Y	VAX 8800: * = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

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 or MicroVMS 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 and the set for the extended mode provides users with an easier-to-use interface than the earlier versions of the product. API is available for use with both VMS/SNA and the DECnet/SNA Gateway.

Table 3.41
DECnet/SNA VMS Application Programming Interface Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q⋆455-UZ[1]
VAXcluster license	Q⋆455-QZ[2]
Initial license, primary & cluster	Q⋆455-1P[3]
Monthly availability, primary	Q⋆455-JP[3]
Monthly availability, cluster	Q⋆455-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q⋆455-H#
Software revision right-to-copy	Q⋆455-HZ
Documentation only	QL455-GZ
Installation Service	Q⋆455-I#
U.S. Software Product Services:[4]	
DECsupport service	Q⋆455-9#
Basic service	Q⋆455-8#
Self-maintenance service	Q⋆455-3#
MicroVAX I: ⋆ = N; # = 3	VAX 82x0: ⋆ = 5; # = 3 or M
MicroVAX II: ⋆ = Z; # = 3 or 5	VAX 83x0: ⋆ = 7; # = 3 or M
MicroVAX 2000: ⋆ = 3; # = 3 or 5	VAX 8500: ⋆ = 9; # = M
VAXstation II: ⋆ = 4; # = 3 or 5	VAX 8530: ⋆ = 9; # = M
VAXstation 2000: ⋆ = 8; # = 3 or 5	VAX 8550: ⋆ = 2; # = M
VAX-11/730: ⋆ = C; # = G or M	VAX 86x0: ⋆ = K; # = M
VAX-11/750: ⋆ = D; # = G or M	VAX 8700: ⋆ = 2; # = M
VAX-11/78x: ⋆ = E; # = M or Y	VAX 8800: ⋆ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

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 that is called by VMS or MicroVMS programs acting as Logical Unit 6.2 (LU6.2) transaction application programs. Any of the VMS or MicroVMS programming languages conforming to the VAX/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.

Table 3.42
DECnet/SNA VMS APPC/LU6.2 Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★022-UZ[1]
VAXcluster license	Q★022-QZ[2]
Initial license, primary & cluster	Q★022-1P[3]
Monthly availability, primary	Q★022-JP[3]
Monthly availability, cluster	Q★022-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★022-H#
Software revision right-to-copy	Q★022-HZ
Documentation only	QL022-GZ
Installation Service	Q★022-I#
U.S. Software Product Services:[4]	
DECsupport service	Q★022-9#
Basic service	Q★022-8#
Self-maintenance service	Q★022-3#
MicroVAX I: ★ = N; # = 3	VAX 82x0: ★ = 5; # = 3 or M
MicroVAX II: ★ = Z; # = 3 or 5	VAX 83x0: ★ = 7; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8550: ★ = 2; # = M
VAX-11/730: ★ = C; # = G or M	VAX 86x0: ★ = K; # = M
VAX-11/750: ★ = D; # = G or M	VAX 8700: ★ = 2; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8800: ★ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

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 or MicroVMS 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 MicroVMS application. 3270 DS is available for use with both VMS/SNA and the DECnet/SNA Gateway.

Table 3.43
DECnet/SNA VMS 3270 DS Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★363-UZ[1]
VAXcluster license	Q★363-QZ[2]
Initial license, primary & cluster	Q★363-1P[3]
Monthly availability, primary	Q★363-JP[3]
Monthly availability, cluster	Q★363-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q★363-H#
Software revision right-to-copy	Q★363-HZ
Documentation only	QL363-GZ
Installation Service	Q★363-I#
U.S. Software Product Services:[4]	
DECsupport service	Q★363-9#
Basic service	Q★363-8#
Self-maintenance service	Q★363-3#
MicroVAX I: ★ = N; # = 3	VAX 82x0: ★ = 5; # = 3 or M
MicroVAX II: ★ = Z; # = 3 or 5	VAX 83x0: ★ = 7; # = 3 or M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8530: ★ = 9; # = M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8550: ★ = 2; # = M
VAX-11/730: ★ = C; # = G or M	VAX 86x0: ★ = K; # = M
VAX-11/750: ★ = D; # = G or M	VAX 8700: ★ = 2; # = M
VAX-11/78x: ★ = E; # = M or Y	VAX 8800: ★ = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.
[4] For non-U.S. service agreements, consult a local Digital Sales Representative.

VIDA (VAX/IBM Data Access)

VIDA is a VAX software component in a VAX/IBM interconnect system which 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 which access data through DSRI.

VIDA uses DIGITAL's 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 the SNA Gateway to the VAX user's application software. The accessed data can also be stored in a VAX database or file. Refer to SPD 27.25.xx for detailed information about VIDA.

Required Hardware

Digital Hardware: Any valid VAX or MicroVAX system configuration and Ethernet-based DECnet/SNA Gateway. Refer to SPD 27.25.xx for individual system requirements.

IBM Hardware: Any valid IBM system which supports the required Cullinet Software and Digital's DECnet/SNA VMS 3270 Data Stream Programming Interface (Refer to SPD 26.87.xx).

Prerequisite Software

Digital Software: VMS or MicroVMS Operating Systems 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 SPD 26.87.xx).

CULLINET Software: IDMS-DC/UCF, ICMS Version 10.0 and IDMS/R Version 10.0 with Information Database (IDB)

Table 3.44
VIDA Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q*B12-UZ[1]
VAXcluster license	Q*B12-QZ[2]
Initial license, primary & cluster	Q*B12-1P[3]
Monthly availability, primary	Q*B12-JP[3]
Monthly availability, cluster	Q*B12-JZ[3]
Materials and Service Options:	
Distribution and documentation	Q*B12-H#
Software revision right-to-copy	Q*B12-HZ
Documentation only	QLB12-GZ
Installation Service	Q*B12-I#
MicroVAX I: * = N; # = 3	VAX 82x0: * = 5; # = 3 or M
MicroVAX II: * = Z; # = 3 or 5	VAX 83x0: * = 7; # = 3 or M
MicroVAX 2000: * = 3; # = 3 or 5	VAX 8500: * = 9; # = M
VAXstation II: * = 4; # = 3 or 5	VAX 8530: * = 9; # = M
VAXstation 2000: * = 8; # = 3 or 5	VAX 8550: * = 2; # = M
VAX-11/730: * = C; # = G or M	VAX 86x0: * = K; # = M
VAX-11/750: * = D; # = G or M	VAX 8700: * = 2; # = M
VAX-11/78x: * = E; # = M or Y	VAX 8800: * = M; # = M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] Not available on MicroVAX and VAXstation systems, or on the VAX-11/730.
[3] Not available on MicroVAX and VAXstation systyems, on the VAX-11/700 series, or on VAX 8600 series.

DECnet/SNA TOPS-20 Access Products

The DECnet/SNA TOPS-20 Access Products allow users on one or more TOPS-20 systems to transfer data between a TOPS-20 system acting as an RJE (Remote Job Entry) workstation and IBM batch subsystems. These products also implement distributed application programs that run between TOPS-20 and IBM systems.

The TOPS-20 Access Products provide full support for the DX24 Gateway. This support includes accepting an upline dump from the Gateway when it is directly connected to the TOPS-20 system (via the DN20). The TOPS-20 Access Products provide limited support for the DECnet/SNA Gateway. The TOPS-20 system cannot configure the software image for the DECnet/SNA Gateway nor downline load the DECnet/SNA Gateway over the Ethernet. However, TOPS-20 Access Products can use the DECnet/SNA Gateway as long as there is another node (VMS, RSX) in the network with the respective Gateway Management software. This node must be capable of configuring the image and loading/dumping the DECnet/SNA Gateway over the Ethernet.

Gateway Management

Network Management for the DECnet/SNA Gateway includes normal DECnet network management activities, as well as the following tasks specific to the DECnet/SNA Gateway:

- Control of the DECnet/SNA Gateway
- Monitoring of the DECnet/SNA Gateway
- Troubleshooting
- Monitoring the SNA/SDLC lines

These activities are usually performed by the TOPS-20 system manager of one of the nodes attached to the Gateway or shared by several DECnet system managers. All network management functions are performed from a TOPS-20 node rather than from the Gateway itself.

The Gateway Management access product is REQUIRED on every TOPS-20 node that uses the DECnet/SNA Gateway. At least one RSX-11M, RSX-11M-PLUS, VAX/VMS or TOPS-20 system must be adjacent to each Gateway and include this product.

Remote Job Entry

The Remote Job Entry (RJE) facility allows a DECnet/TOPS-20 node to function as an SNA/RJE workstation, or as a group of workstations, that can transmit batch jobs to an IBM host and receive job output. The TOPS-20 user can prepare batch jobs in files, submit the jobs, and obtain the job output from the IBM system. By using batch interaction with the IBM host, this product provides the capability for periodic updating of databases and other applications.

Application Interface

The Application Interface enables a user-written application on a TOPS-20 node to exchange messages with a cooperating application on an IBM host. The Application Interface exists on the TOPS-20 system as a subroutine library of functions that is linked with the user-written program.

Functionally, the interface is similar to the DECnet task-to-task capability. The interface provides TOPS-20 users with mechanisms for accessing IBM systems from application programs.

Prerequisite Hardware

Any valid DECSYSTEM 2040, 2060, or 2065 System with valid DECnet connection to a Non Ethernet-based DECnet/SNA Gateway.

Prerequisite Software

- TOPS-20 V5.1 (or later) Operating System.
- DECnet-20 V3.0 or later.

Table 3.45
DECnet/SNA TOPS-20 Gateway Management Access Routine Order Codes

Option	Order Code
DECnet/SNA TOPS-20 Gateway Management, Single-Use License, Binaries, Documentation, Support Services	QT104-AM
DECnet/SNA TOPS-20 Gateway Management, Single-Use License-Only Option, No Documentation, No Support Services	QT104-DZ
DECnet/SNA TOPS-20 Gateway Management, Binaries, Documentation, No Support Services	QT104-HM
DECnet/SNA TOPS-20 Gateway Management, Right-to-Copy for Single-Use, No Binaries, No Documentation	QT104-HZ
Documentation Only	QL104-GZ

Table 3.46
DECnet/SNA TOPS-20 RJE Access Routine Order Codes

Option	Order Code
DECnet/SNA TOPS-20 Remote Job Entry, Single-Use License, Binaries, Documentation, Support Services	QT105-AM
DECnet/SNA TOPS-20 Remote Job Entry, Single-Use License-Only Option, No Documentation, No Support Services	QT105-DZ
DECnet/SNA TOPS-20 Remote Job Entry, Binaries, Documentation, No Support Services	QT105-HM
DECnet/SNA TOPS-20 Remote Job Entry, Right-to-Copy for Single-Use, No Binaries, No Documentation	QT105-HZ
Documentation Only	QL105-GZ

Table 3.47
DECnet/SNA TOPS-20 Application Interface Access Routine Order Codes

Option	Order Code
DECnet/SNA TOPS-20 Application Interface, Single-Use License, Binaries, Documentation, Support Services	QT106-AM
DECnet/SNA TOPS-20 Application Interface, Single-Use License-Only Option, No Documentation, No Support Services	QT106-DZ
DECnet/SNA TOPS-20 Application Interface, Binaries, Documentation, No Support Services	QT106-HM
DECnet/SNA TOPS-20 Application Interface, Right-to-Copy for Single-Use, No Binaries, No Documentation	QT106-HZ
Documentation Only	QL106-GZ

Binary Synchronous Communications Protocol Emulators

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.

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 VAX/VMS user with a mechanism for transferring data between the VAX/VMS or MicroVMS operating 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 9,600 bps per line (4800 bps for MicroVAX II).

Features

- Can be invoked interactively or by a VAX/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 is capable of automatically answering 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 I, MicroVAX II, or VAXstation II system with DPV11 communications interface.
- A VAX-11/7xx 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. Refer to the VAX 2780/3780 Order Code table for a list of supported processors.

Optional Hardware

- For MicroVAX II or VAXstation II, 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 8500, VAX 8550, VAX 8700, or VAX 8800, up to three additional DUP11, DMF32, or DMB32 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, VAX/VMS and, if using the DMB32, the DMB32 Synchronous Device Driver.

Table 3.48
VAX 2780/3780 Protocol Emulator Order Codes

Option	Order Code
Licenses: *(A license is required for each CPU.)*	
Single-use license	Q*111-UZ
VAXcluster license[1]	Q*111-QZ
Initial license (primary & cluster)[2]	Q*111-1P
Monthly availability: primary[2]	Q*111-JP
Monthly availability: cluster[2]	Q*111-JZ
Materials and Services:	
Distribution and documentation	Q*111-H#
Software revision right-to-copy	Q*111-HZ
Documentation only	QL111-GZ
Installation	Q*111-I#
U.S. Software Product Service Agreements:[3]	
DECsupport service	Q*111-9#
Basic service	Q*111-8#
Self-maintenance service	Q*111-3#
MicroVAX I: * = N; # = 3	VAX 8200: * = 5; # = 3 or M
MicroVAX II: * = Z; # = 3 or 5	VAX 8300: * = 7; # = 3 or M
VAXstation II: * = 4; # = 3 or 5	VAX 8500: * = 9; # = M
VAX-11/725: * = C; # = G or M	VAX 8550: * = 2; # = M
VAX-11/730: * = C; # = G or M	VAX 8600: * = K; # = M
VAX-11/750: * = D; # = G or M	VAX 8650: * = K; # = M
VAX-11/780: * = E; # = Y or M	VAX 8700: * = 2; # = M
VAX-11/782:[4] * = E; # = Y or M	VAX 8800: * = M; # = M
VAX-11/785: * = E; # = Y or M	

[1] Available on VAX-11/750, VAX-11/780, VAX-11/782, VAX-11/785, VAX 8200, VAX 8300, VAX 8500, VAX 8550, VAX 8600, VAX 8650, VAX 8700, and VAX 8800.
[2] Available on VAX 8200, VAX 8300, VAX 8500, VAX 8550, VAX 8700, and VAX 8800.
[3] For non-U.S. service agreements, consult a local Digital Sales Representative.
[4] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.

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 VAX/VMS or MicroVMS 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, on-line 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. Refer to SPD 25.21.xx 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.
- 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 I, MicroVAX II, or VAXstation II system with DPV11 communications interface.
- A VAX-11/7xx 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. Refer to the VAX 3271 Order Code table for a list of supported processors.

Optional Hardware

- For MicroVAX II or VAXstation II, 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 communications interface
- For VAX 8500, VAX 8550, VAX 8700, or VAX 8800, 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, VAX/VMS operating system

Table 3.49
VAX 3271 Protocol Emulator Order Codes

Option	Order Code
Licenses: *(A license is required for each CPU.)*	
Single-use license	Q*112-UZ
VAXcluster license[1]	Q*112-QZ
Initial license (primary & cluster)[2]	Q*112-1P
Monthly availability: primary[2]	Q*112-JP
Materials and Services:	
Distribution and documentation	Q*112-H#
Software revision right-to-copy	Q*112-HZ
Documentation only	QL112-GZ
Installation	Q*112-I#
U.S. Software Product Service Agreements:[3]	
DECsupport service	Q*112-9#
Basic service	Q*112-8#
Self-maintenance service	Q*112-3#
MicroVAX I: * = N; # = 3	VAX 8200: * = 5; # = 3 or M
MicroVAX II: * = Z; # = 3 or 5	VAX 8300: * = 7; # = 3 or M
VAXstation II: * = 4; # = 3 or 5	VAX 8500: * = 9; # = 3 or M
VAX-11/725: * = C; # = G or M	VAX 8550: * = 2; # = 3 or M
VAX-11/730: * = C; # = G or M	VAX 8600: * = K; # = M
VAX-11/750: * = D; # = G or M	VAX 8650: * = K; # = M
VAX-11/780: * = E; # = Y or M	VAX 8700: * = 2; # = 3 or M
VAX-11/782:[4] * = E; # = Y or M	VAX 8800: * = M; # = M
VAX-11/785: * = E; # = Y or M	

[1] Available on VAX-11/750, VAX-11/780, VAX-11/782, VAX-11/785, VAX 8500, VAX 8550, VAX 8600, VAX 8650, and VAX 8700.
[2] Available on VAX 8200, VAX 8300, VAX 8500, VAX 8550, VAX 8700, and VAX 8800.
[3] For non-U.S. service agreements, consult a local Digital Sales Representative.
[4] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.

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.

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.

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 bits per second half duplex, although CPU utilization on small RSX-11M systems will make support of more than two lines running at 9,600 bits per second impractical.

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.

Table 3.50
RSX-11 2780/3780
Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	QJD82-UZ
Materials and Service Options:	
Distribution and documentation	QJD82-HD QJD82-HH QJD82-HM QJD82-HQ QJD82-HT QJD82-HV
Software revision right-to-copy	QJD82-HZ
Source Code and Materials Options:	
Source license and sources distribution	QJD82-ED QJD82-EM
Source license and sources listings	QJD82-FR
Sources distribution option	QJD82-ND QJD82-NM

Micro/RSX 2780/3780 Emulator

The Micro/RSX 2780/3780 Emulator is a layered software product that extends the ability to communicate with IBM systems using Binary Synchronous Communication (BSC) protocols in both a batch and interactive manner.

Micro/RSX 2780/3780 emulates the communications protocol of an IBM 2780 or 3780 remote batch terminal. Data may be transferred between the Micro/RSX system and the IBM system that supports the IBM 2780 or 3780 protocol.

Prerequisite Hardware

- Any system with 512 Kbytes of memory, and
- One DPV11 synchronous communications device. Note: Maximum line speed is between 2400 and 4800 b/s.

Prerequisite Software

Micro/RSX V3.0

Follow the guidelines described in the Software Product Description regarding prerequisite support and the customer's responsibility for installation of this product.

Table 3.51
Micro/RSX 2780/3780
Emulator Order Code

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license with limited warranty, documentation, binaries on RX50	QYD82-UZ

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, on-line 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 an IBM system and the other a PDP-11. 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 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.

Prerequisite Hardware

RSX-11M or RSX-11M-PLUS system configuration with:

- A 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.

  1,200 bytes 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 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.
- 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.

Features (Continued)

- 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 which 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.

Table 3.52 RSX-11/3271 Protocol Emulator Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**RSX-11M Systems**	**RSX-11M-PLUS Systems**
Single-use license	QJD76-UZ	QJD84-UZ
Materials and Service Options:		
Distribution and documentation	QJD76-HD QJD76-HH QJD76-HM QJD76-HQ QJD76-HT QJD76-HV	QJD84-HD QJD84-HH QJD84-HM QJD84-HV
Software revision right-to-copy	QJD76-HZ	QJD84-HZ
Documentation only	QJD76-GZ	QJD84-GZ
Source Code and Materials Options:		
Source license and sources distribution	QJD76-ED QJD76-EM	QJD84-ED QJD84-EM
Source license and sources listings	QJD76-FR	QJD84-FR
Sources distribution	QJD76-ND QJD76-NM	QJD84-ND QJD84-NM

Micro/RSX 3271 Protocol Emulator

The Micro/RSX 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/RSX 3271 PE distribution; application programmers use an application program interface (API) provided as part of the Micro/RSX 3271 PE product.

Prerequisite Hardware

- Any system with 512 Kbytes of memory, and
- one DPV11 synchronous communications device. Note: Maximum line speed supported is between 2400 and 4800 b/s.

Prerequisite Software

Micro/RSX V3.0

Follow the guidelines described in the Software Product Description regarding prerequisite support and the customer's responsibility for installation of this product.

Table 3.53
Micro/RSX 3271 Protocol Emulator Order Code

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license with limited warranty, documentation, binaries on RX50	QYD84-UZ

RSX-11M-PLUS RJE/HASP Emulator

The 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.)

Prerequisite Hardware

- PDP-11/44 or PDP-11/70 with at least 128 Kwords 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 bits per second.
- One of the following Bell System modems or a modem that is *exactly* equivalent:

  201A 2,000 b/s dial-up
  201B 2,400 b/s private line
  201C 2,400 b/s dial-up
  208A 4,800 b/s private line
  208B 4,800 b/s dial-up
  209A 9,600 b/s private line
  19,200 b/s current Bell

  For host system compatibility, consult SPD 10.48.

Prerequisite Software

RSX-11-PLUS operating system.

Table 3.54
RSX-11M-PLUS RJE/HASP Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license only	QJS62-DZ
Sources, services	QJS62-XD QJS62-XM
Sources, NINS services	QJS62-YD QJS62-YM
Sources, no services, update	QJS63-YD QJS63-YM
Documentation only	QJS62-GZ

RSX-11M/IAS RJE/HASP Emulator

The RSX-11M/IAS 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 or IAS 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 RSX-11M/IAS RJE/HASP is fixed at assembly time. The operator can assign operating system-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.)

Prerequisite Hardware

UNIBUS PDP-11 with memory management and at least 32 Kwords of memory that is configured to support RSX-11M or IAS.

Without File Control Services (FCS) for RSX-11M only:

- At least 9 Kwords of memory allocated for RSX-11M/IAS RJE/HASP operation with one input and two output data streams (card reader, card punch, and lineprinter).
- 300 words of memory required for each additional stream without FCS.

With File Control Services (FCS):

- At least 14 Kwords of memory allocated for RSX-11M/IAS RJE/HASP operation with one input and two output streams.
- 600 words of memory required for each additional stream with FCS.
- One of the following synchronous communications line controllers:

  DP11, DU11, or DUP11 for line speeds up to 4,800 bits per second.
- One of the following Bell System modems or a modem that is exactly equivalent:

  201A 2,000 b/s dial-up
  201B 2,400 b/s private line
  201C 2,400 b/s dial-up
  208A 4,800 b/s private line
  208B 4,800 b/s dial-up
  209A 9,600 b/s private line
  19,200 baud current Bell option (PDP-11/34 processors or slower should run 19,200 b/s standalone.)

Required Hardware

A KG11-A communications arithmetic unit

For host system compatibility, refer to SPD 10.51.

Prerequisite Software

Either the RSX-11M or IAS operating system

Table 3.55
RSX-11M/IAS RJE/HASP
Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	QJS60-DZ
Materials and Service Options:	
Software revision right-to-copy	QJS60-NZ
Source Code and Materials Options:	
Sources distribution and services	QJS60-XD QJS60-XH QJS60-XM QJS60-XQ QJS60-XT QJS60-XV
Sources distribution and no services	QJS60-YL QJS60-YH QJS60-YM QJS60-YQ QJS60-YT QJS60-YV
Sources distribution and update	QJS60-ND QJS60-NH QJS60-NM QJS60-NQ QJS60-NT QJS60-NV

TOPS-10 and TOPS-20 2780/3780 Emulator-Terminator

The TOPS-10 or TOPS-20 2780/3780 Emulator-Terminator (E/T) software products perform both emulation to IBM hosts and termination to remote job entry stations that communicate via 2780 and 3780 protocols. In performing emulation, the TOPS-10 or TOPS-20 system appears to a host computer as a remote job entry station employing 2780 or 3780 protocol. In performing termination, the TOPS-10 or TOPS-20 system functions as a Digital TOPS-10 or TOPS-20 host to a remote job entry station employing 2780 or 3780 protocol.

Features

- In termination mode, allows TOPS-10 or TOPS-20 batch jobs to be transferred from a remote station to a TOPS-10 or TOPS-20 system where they are executed under the control of Galaxy; the output is returned to the remote station printer. In emulation mode, IBM batch jobs are transferred from TOPS-10 or TOPS-20 system to an IBM-type host; log files and output are transferred back to the TOPS-10 or TOPS-20 system.

- Provides simultaneous support of both emulation and termination of 2780 and 3780 protocols in any combination of up to six lines. The TOPS-10 or TOPS-20 system can support a mix of remote station types and can concurrently transfer batch jobs to several IBM-type host systems.
- Interfaces to the TOPS-10 or TOPS-20 operating system and is unified into an integrated system along with other batch and spooling functions. In addition, a standardized operator interface enables TOPS-10 or TOPS-20 2780/3780 E/T and its remote connections to be controlled as an integral part of the TOPS-10 or TOPS-20 environment.

Prerequisite Hardware

For TOPS-10 systems:

- Single or dual KL10-based DECsystem-10.
- DN20-MC/MD, DN20F-MC, DN87, or DN87S communication front-end with at least one synchronous line interface (DN20-BA or DN20F-BA for DN20).

For TOPS-20 systems:

- KL10-E/R-based DECSYSTEM-20.
- DN20-MA/MB or DN20F-MA communication front-end with at least one synchronous line interface (DN20-BA or DN20F-BA).

Prerequisite Software

TOPS-10 or TOPS-20 operating system (with Galaxy, Version 4.2).

Table 3.56
TOPS-10/TOPS-20
2780/3780
Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**TOPS-10**	**TOPS-20**
Single-use sources license, sources, documentation, support services on 9-track 1,600 b/in magnetic tape	QH603-XM	QT042-XM
Single-use license only, no sources, no documentation, no support services on 9-track 1,600 b/in magnetic tape	QH603-DZ	QT042-DZ
Update/Unsupported Options:		
Sources, documentation	QH603-NM	QT042-NM
Right-to-copy for single-use, no sources, no documentation	QH603-NZ	QT042-NZ
Additional Services:*		
The following post-warranty software product services for this software product are available to licensed customers: Self-maintenance, Basic service and DECsupport service.* The *prerequisite* being the purchase of the equivalent level TOPS-10 or TOPS-20 software product service.		

*Customers should contact their local Digital office for additional information on the availability of these services.

Digital TOPS 2780/3780/HASP Products

The Digital TOPS 2780/3780/HASP software products performs both emulation to IBM hosts and termination to remote job entry stations that communicate via 2780, 3780, and HASP Multileaving protocols. In performing emulation, the TOPS system appears to a host computer as a remote job entry station employing 2780, 3780, or HASP Multileaving protocol. In performing termination, the TOPS system functions as a Digital TOPS host to a remote job entry station employing 2780, 3780, or HASP Multileaving protocol. Digital offers three TOPS 2780/3780/HASP products: TOPS-10 2780/3780/HASP, TOPS-20 2780/3780/HASP, and TOPS-20 2780/3780/HASP for 2020.

Features

- In termination mode, allows TOPS-10 or TOPS-20 batch jobs to be transferred from a remote station to a TOPS-10 or TOPS-20 system where they are executed under the control of Galaxy; the output is returned to the remote station printer. In emulation mode, IBM batch jobs are transferred from the TOPS-10 or TOPS-20 system to an IBM-type host; log files and output are transferred back to the TOPS-10 or TOPS-20 system.
- Provides simultaneous support of both emulation and termination of 2780, 3780, and HASP Multileaving protocols in any combination limited by configuration guidelines. The TOPS-10 or TOPS-20 system can support a mix of remote station types and can concurrently transfer batch jobs to several IBM-type host systems.
- Interfaces to the TOPS-10 or TOPS-20 operating system and is unified into an integrated system along with other batch and spooling functions. In addition, a standardized operator interface enables TOPS 2780/3780/HASP products and their remote connections to be controlled as an integral part of the TOPS-10 or TOPS-20 environment.

Prerequisite Hardware

For TOPS-10 2780/3780/HASP, TOPS-10 system configuration with:

- Single or dual KL10-based DECsystem-10.
- DN20-MC/MD, DN20F-MC, DN87, or DN87S communication front-end with at least one synchronous line interface (DN20-BA or DN20F-BA for DN20).

For TOPS-20 2780/3780/HASP, TOPS-20 system configuration with:

- KL10-E/R-based DECSYSTEM-20.
- DN20-MA/MB or DN20-MA, communication front-end with at least one synchronous line interface (DN20-BA or DN20F-BA).

For TOPS-20 2780/3780/HASP for 2020, TOPS-20 system configuration with:

- KS10-based system.
- DN20-BA or DN20F-BA (one synchronous line interface).
- Synchronous null modem (modem eliminator).
- DN22-AA/AB.

Prerequisite Software

TOPS-10 operating system (with Galaxy, Version 4.1), or TOPS-20 operating system (DECSYSTEM 2020, 2040, or 2060) with Galaxy, Version 4.2.

Table 3.57
Digital TOPS 2780/3780/HASP Order Codes

Option	Order Code		
License Options: *(A license is required for each CPU.)*	**TOPS-10**	**TOPS-20**	**TOPS-20 for 2020**
Single-use sources license, sources, documentation, support services on 9-track 1,600 b/in magnetic tape	QH062-XM	QT052-XM	
Single-use license only, no sources, no documentation, no support services	QH062-DZ	QT052-DZ	
Upgrade Options:			
Single-use sources license, sources, documentation, support services	QH065-XM	QT054-XM	
Single-use license only, sources, no documentation, no support services	QH065-DZ	QT054-DZ	
Update Options:			
Sources, documentation	QH062-NM	QT052-NM	QT053-NM
Right-to-copy for single-use, no sources, no documentation	QH062-NZ	QT052-NZ	QT053-NZ
Additional Services:*			
The following post-warranty software product services for this software product are available to licensed customers: Self-maintenance, Basic service and DECsupport service.			
The *prerequisite* being the purchase of the equivalent level TOPS-10 or TOPS-20 software product service.			

*Customers should contact their local Digital office for additional information on the availability of these services.

Digital-to-Univac Communications Software

VAX NTR Protocol Emulator

VAX NTR is a software package that allows a VAX/VMS system to communicate with a UNIVAC 1100 series or other computer systems using UNIVAC NTR protocol. The software operates under the VAX/VMS operating system to permit batch input/out. Start-up, Shut-down and host queue interrogation by the emulator can be controlled from any one terminal; i.e., the control terminal, connected to the VAX/VMS operating system.

Features

- Batch input can be from any input device supported by the VAX/VMS operating system and can be submitted for transmission whether or not the connection to the host is active.
- Batch output can be sent to any output device supported by the host operating system; batch output to line printers can be spooled using the VAX/VMS system spooling mechanism.
- Batch input can be stored on disk by the emulator for later transmission to the host enabling improved line usage; batch input from punched cards can be in DEC-026, DEC-029, FIELDATA or EBCDIC code.

The emulator control terminal can be used to:

- Start and stop the emulator.
- List the host queues.
- Select and change the output device for data received from the host.
- Start and stop transmission of individual input streams to the host.

Prerequisite Hardware

VAX/VMS system configuration with:

- DUP11 synchronous communications interface.
- 100 Kbytes of memory to accommodate the emulator.
- 100 Kbytes of memory (minimum user job space).
- Number of disk blocks used: 1,000.

VAX-11/730 Systems

An R80/RL02 configuration is required for VAX-11/730 systems.

Prerequisite Software

VAX/VMS operating system.

Table 3.58
VAX NTR Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**VAX-11/750**	**VAX-11/780 VAX-11/782★ VAX-11/785**
Single-use license	QD710-UZ	QE710-UZ
VAXcluster license	QD710-QZ	QE710-QZ
Materials and Service Options:		
Distribution and documentation	QD710-HG	QE710-HY
Software revision right-to-copy	QD710-HZ	QE710-HZ
Documentation only	QD710-GZ	QE710-GZ

★For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.

Digital-to-CDC Communications Software

MUX200/VAX Protocol Emulator

The MUX200/VAX Protocol Emulator is a VAX-based software package that provides communication with a CDC 6000, CYBER series, or other computer systems using 200 UT Mode 4A communications protocol.

Any VAX interactive terminal can be used to control remote job entry or to communicate at command level with the host system. Input files can be sent from and output files received onto any VAX supported mass storage, unit record, or terminal device.

MUX200/VAX communicates with the host using the Mode 4A communications protocol as defined in CDC publication No. 82128000. The software package can be configured to support either the ASCII or the external BCD versions of the protocol.

MUX200/VAX provides for one synchronous communication circuit to a host computer system. The product supports a single switched or dedicated leased line two- or four-wire common carrier facility.

MUX200/VAX enables several users to communicate simultaneously with a host system over a single line. The VAX/VMS system, while using a single physical drop, appears to the host as a number of multidrops and terminals on the circuit. The maximum number of simultaneous users supported by the MUX200/VAX system is 16. However, this may be limited to a lower figure by host hardware or software.

Features

- Output received from the host system can be spooled to the line printer upon detection of a text string predefined by the user.
- Up to eight VAX/VMS files can be specified for transmission to the host in a single command.
- VAX/VMS terminals can be detached for other use while the software package is operating. Data received from the host directed to a terminal is saved from printout until the terminal is reattached.

Prerequisite Hardware

VAX-11/750 or VAX-11/780 system configuration with a DUP11 synchronous communications interface.

Prerequisite Software

VAX/VMS operating system.

Table 3.59
MUX200/VAX
Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**VAX-11/750**	**VAX-11/780**
Single-use license	QD070-UZ	QE070-UZ
VAXcluster license	QD070-QZ	QE070-QZ
Materials and Service Options:		
Distribution and documentation	QD070-HG	QE070-HY
Software revision right-to-copy	QD070-HZ	QE070-HZ

Digital-to-UNIX™ Communications Software

IP/TCP

This product is currently not available in Europe.

IP/TCP is a software communications product developed by The Wollongong Group and available through Digital's Distributed Software (DDS) program. IP/TCP software under VMS or MicroVMS contains the network protocols required in exchanging messages between various systems connected to an TCP/IP network. The package supports various hardware interfaces to the following networks: ARPANET, Ethernet, MILNET, Defense Data Network (DDN), Point-to-Point Networks, custom-designed networks. The DEUNA and DEQNA Ethernet controllers are supported and may be shared by the IP/TCP package, DECnet, and LAT (terminal server protocols). The DMC/DMR-11 is also supported.

DECnet-ULTRIX as an alternative solution

IP/TCP is a suitable solution for a single VAX/VMS node in a large UNIX™ environment. However, DECnet-ULTRIX also solves the problem of communications between the VMS and ULTRIX environments using DECnet instead of the TCP/IP protocols. DECnet-ULTRIX bridges both environments by supporting the co-existence of the DECnet and TCP/IP protocols. Co-existence 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 co-existence 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 IP/TCP 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.

Table 3.60 IP/TCP Order Codes

Option	Order Code
IP/TCP (commercial)	QAX74-CM
IP/TCP (educational installations)	QAX75-CM
IP/TCP MicroVMS (commercial)	QAXX1-C3
IP/TCP MicroVMS (educational)	QAXX2-C3

Digital-to-WANG™ Communications Software

EDE-W Document Exchange

EDE-W Document Exchange is a software application that utilizes the VAX 2780/3780 Protocol Emulator to give VAX users of ALL-IN-1 or DECdx/VMS the ability to send documents to a suitably equipped WANG OIS system. WANG OIS users can transfer documents to VAX system using WANG's telecommunications software, which includes WANG's equivalent 2780/3780 protocol emulator. WANG OIS systems can be connected to a VAX system either by dedicated lines or through dial-up connections.

WANG documents being transferred are first converted from WANG Word Processing System Code to EBCDIC code by the WANG software and then transferred to the VAX system. The VAX 2780/3780 Protocol Emulator receives the document from the WANG system and EDE-W transforms the document from the WANG format to DECdx format, then stores the converted documents in the user's DECdx or ALL-IN-1 filing cabinet. For transfers from the VAX system to the WANG OIS system, the process is reversed.

Operation of the EDE-W Document Exchange is initiated through an easy-to-use menu interface, which can be added to the ALL-IN-1 Office Menu, or, when used with DECdx/VMS, invoked from the DCL system prompt. The user interface for operating the document transfer functions are compatible with Digital standard user interface requirements for office products. On-line help capability is included with the product.

Refer to Software Product Description 26.37 for more information.

Prerequisite Hardware

Any valid VAX system.

Prerequisite Software

- ALL-IN-1 V2.0 or DECdx V1.1
- VAX 2780/3780 Protocol Emulator V1.5
- VMS V4.0 or 4.1

Table 3.61
EDE-W Document Exchange Order Codes

Option	Order Code		
License Options: *(A license is required for each CPU.)*	**VAX-11/750**	**VAX-11/780 VAX-11/782[1] VAX-11/785**	**VAX 8600**
Single-use license	QD760-UZ	QE760-UZ	QK760-UZ
VAXcluster license	QD760-QZ	QE760-QZ	QK760-QZ
Materials and Service Options:			
Distribution and documentation	QD760-HG QD760-HM	QE760-HM QE760-HY	QK760-HM
Installation service	QD760-IG QD760-IM	QE760-IM QE760-IY	QK760-IM
U.S. Software Product Service Agreements:[2]			
DECsupport service	QD760-9G QD760-9M	QE760-9M QE760-9Y	QK760-9M
Basic service	QD760-8G QC760-8M	QE760-8M QD760-8M	QK760-8M QE760-8Y
Self-maintenance service	QD760-3G QD760-3M	QE760-3M QE760-3Y	QK760-3M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] For Non-U.S. service agreements, consult local Digital Sales Representative.

Packetnet Communications Software

A 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—packets. The network dynamically interweaves the packets of many users over shared transmission facilities and routes the packets to their destinations.

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 products' manual sets.

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 Packet-Switched Data Networks (PSDNs). The currently available products are VAX P.S.I. and VAX P.S.I. Access, RSX-11 P.S.I./M, RSX-11 P.S.I./M-PLUS, the TOPS-20 P.S.I. Gateway, and the DECnet Router/X.25 Gateway. These interfaces allow certain suitably configured Digital systems to connect to packet-switched data networks that conform to the CCITT Recommendation X.25. CCITT is the Consultive Committee International Telegraph and Telephone which is an advisory committee established under the United Nations to recommend worldwide standards. For VAX P.S.I., International Standards 7776 and 8208, which standardize the protocols described in the CCITT recommendations, are also supported.

For connections to private networks other than those conforming to the ISO 7776/8208 standards, Digital requires that its P.S.I. software be specially configured. Consult the local Digital sales representative for details.

Table 3.62
Currently Supported Public PSDNs by Country and Product

Country	Public PSDN	VAX P.S.I.	RSX P.S.I.	X.25 Gateway	TOPS-10 P.S.I.	TOPS-20 P.S.I.
Australia	Austpac	yes	no	no	no	no
Austria	Datex-P	yes	no	no	no	no
Belgium	DCS	yes	no	no	no	no
Brazil	Renpac	yes	no	no	no	no
Canada	Datapac[1]	yes	yes	yes	no	no
Denmark	DATAPAK	yes	no	no	no	no
Finland	DATAPAK	yes	no	no	no	no
France	Transpac	yes	yes	yes	yes	yes
W. Germany	Datex-P	yes	yes	yes	no	no
Holland	Datanet-1	yes	no	no	yes	yes
Hong Kong	INTELPAK	yes	yes	no	no	no
	DATAPAK	yes	no	no	no	no
Ireland (Eire)	Eirpac	yes	yes	no	no	no
Italy	ITAPAC	yes	no	no	no	no
Malaysia	Maypac	yes	no	no	no	no
Norway	DATAPAK	yes	no	no	yes	yes
Portugal	Telepac	yes	no	no	no	no
S. Korea	DACOM-NET	yes	no	no	no	no
Singapore	Telepac	yes	no	no	no	no
Spain	IBERPAK	yes	no	no	no	no
Sweden	DATAPAK	yes	no	no	no	no
Switzerland	Telepac[2,3]	yes	yes	yes	no	no
Taiwan	Pacnet	yes	yes	no	no	no
United Kingdom	PSS	yes	yes	yes	yes	yes
United States	ACCUNET	no	no	no	yes	yes
	AUTONET	yes	no	no	no	no
	INFONET	yes	no	no	no	no
	Mark*net Extended	yes	no	no	no	no
	Telenet	yes	yes	yes	yes	yes
	Tymnet	yes	yes	yes	yes	yes

[1] CCITT 1976
[2] CCITT 1978
[3] CCITT 1980

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 recommendation 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 X.25 protocols.

VAX P.S.I.

VAX P.S.I. allows a standard VMS system configuration to function as one of the following:

- Packet-mode DTE connected to a PSDN
- Packet-mode DTE connected to a DCE conforming to the ISO standards DIS7776 and ISO8208
- Packet-mode DCE connected to a DTE conforming to the ISO standards DIS7776 and ISO8208
- Combination of the above modes, chosen on a per-line basis (except in the case of the KMS11-B multiline device, where all lines must use the same mode of operation and connect to the same PSDN).

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 gateway 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 product on VAX/VMS and MicroVMS, 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 Digitals VOTS product and OSI applications).

For all the above uses, VAX P.S.I. provides accounting, security, and P.S.I. Mail.

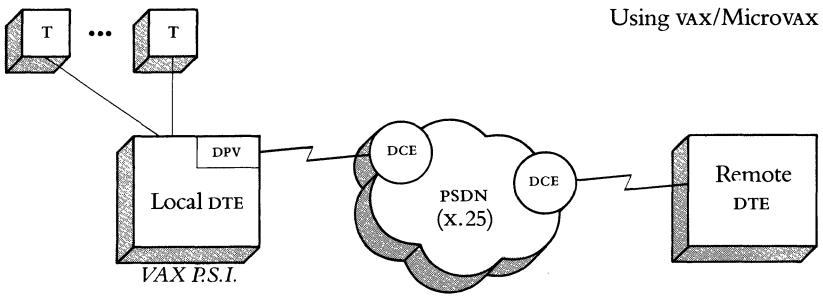


Figure 3.9
VAX P.S.I. Native Mode of Operation

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..
- A DECnet Router/X.25 Gateway product (see SPD 30.41); in this case several features and options will not be available.

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 multihost connector 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 PSDN(s) accessible from those connector nodes. During installation of VAX P.S.I. ACCESS, one of these several connector nodes/PSDN combinations is established as the default DTE/DCE connection which 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 switching 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.

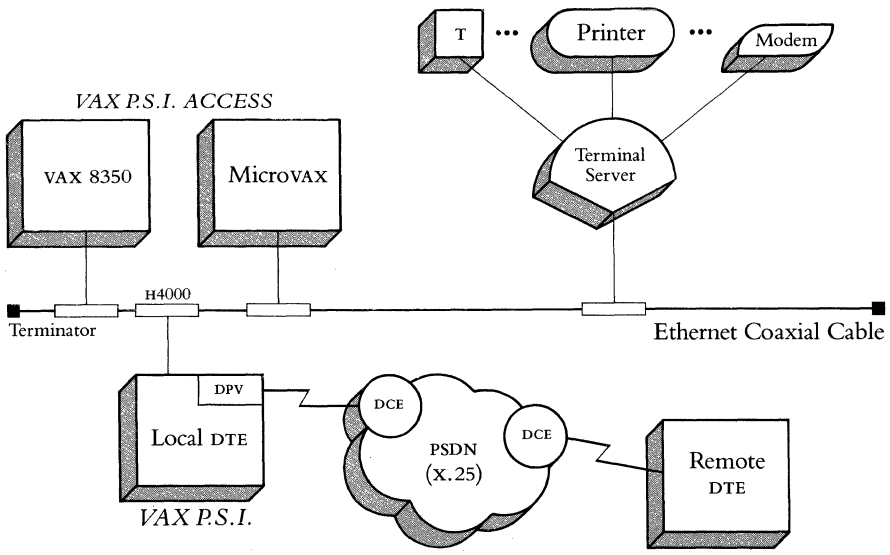


Figure 3.10
VAX P.S.I. Multihost Mode of Operation

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. These last two features provide an interface to third-party CPUs that have X.25 connection capability, and require high performance.
- Co-residency 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.
- PSImail—Users of the VAX/VMS 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.

Features (Continued)

- Accounting—The Accounting utility, PSIACCOUNTING, enables the system manager to obtain information on P.S.I. and 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 P.S.I. and access to the network by the P.S.I. user community.
- Network Management—VMS provides a Network Control Program (NCP) for management of DECnet-VAX, the 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, such as DMF32 (UNIBUS), DMB32 (BI-BUS), KMS1P-A, KMS1P-B, KMS11-B (UNIBUS), and KMV1A (Q-BUS). VAX P.S.I. and VAX P.S.I. ACCESS also support DUP11 (UNIBUS) and DPV11 (Q-BUS). Refer to the SPD to clarify the devices that VAX P.S.I. can use on the various CPUS, 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.

For additional prerequisite hardware and software, refer to Software Product Description 25.40.

Table 3.63
VAX P.S.I. and VAX P.S.I. ACCESS Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**VAX P.S.I.**	**VAX P.S.I. ACCESS**
Single-use license	Q*071-UZ	Q*061-UZ
VAXcluster license[1]	Q*071-QZ	Q*061-QZ
Materials and Service Options:		
Distribution and documentation	Q*071-H#	Q*061-H#
Software revision right-to-copy	Q*071-HZ	Q*061-HZ
Documentation only	QL071-GZ	QL061-GZ
Installation	Q*071-I#	Q*061-I#
U.S. Software Product Service Agreements:[2]		
DECsupport Service	Q*071-9#	Q*061-9#
Basic Service	Q*071-8#	Q*061-8#
Self-maintenance service	Q*071-3#	Q*061-3#

MicroVAX I: * = N; # = 3	VAX 8250: * = 5; # = 3 or M
MicroVAX II: * = Z; # = 3 or 5	VAX 8300: * = 7; # = 3 or M
MicroVAX 2000:[3] * = 3; # = 3 or 5	VAX 8350: * = 7; # = 3 or M
VAXstation II: * = 4; # = 3 or 5	VAX 8500: * = 9; # = M
VAXstation 2000:[3] * = 8; # = 3 or 5	VAX 8530: * = 9; # = M
VAX-11/750: * = D; # = G or M	VAX 8550: * = 2; # = M
VAX-11/780: * = E; # = M or Y	VAX 8600: * = K; # = M
VAX-11/782:[4] * = E; # = M or Y	VAX 8650: * = K; # = M
VAX-11/785: * = E; # = M or Y	VAX 8700: * = 2; # = M
VAX 8200: * = 5; # = 3 or M	VAX 8800: * = M; # = M

[1] Not available on MicroVAXs and VAXstations
[2] For non-U.S. service agreements, consult a local Digital sales representative.
[3] Available on VAX P.S.I. ACCESS only.
[4] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.

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 Switching 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, and FORTRAN-77. RSX-11 P.S.I. products support task-to-task and incoming 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 private leased lines or switched telephone networks. For details, refer to SPD 10.75 and 10.66.

The communications discipline used is the CCITT Recommendation X.25. Specifically, the product supports EIA-RS232-C/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

- 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).
- 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.
- 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

- PDP-11/24 through PDP-11/70, or PDP-11/84 UNIBUS processor with one of the following communications devices supporting one line:

  DUP11 low-speed synchronous interface.

  DPV11 low-speed synchronous interface.

  KMS11-BD/BE medium-speed synchronous interface.

  KMS11-PX and PY (KMS1P) medium-speed 1-line synchronous interfaces.
- PDP-11/23-PLUS, or PDP-11/73 processor with one DPV11 low-speed synchronous interface.

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.

Table 3.64
RSX-11 P.S.I.
Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**RSX-11M**	**RSX-11M-PLUS**
Single-use license	QJD91-UZ	QJD92-UZ
Materials and Service Options:		
Distribution and documentation	QJD91-HD	QJD92-HD
	QJD91-HH	QJD92-HH
	QJD91-HM	QJD92-HM
	QJD91-HQ	
	QJD91-HT	
	QJD91-HV	QJD92-HV
Software revision right-to-copy	QJD91-HZ	QJD92-HZ
Documentation only	QJD91-GZ	QJD92-GZ

DECnet Router/X.25 Gateway

The DECnet Router/X.25 Gateway is a variant of the DECnet Router Server. It supports both DECnet lines (leased, dial-up, and hardwired) and international standard X.25 lines in the same server. Digital systems can connect through the DECnet Router/X.25 Gateway to the remote Digital systems or to other-vendor systems. In addition, remote terminals can dial up a PAD (Packet Assembler/Disassembler) on a single PSDN (Packet-Switched Data Network) and connect to VAX hosts on an Ethernet through the Router/X.25 Gateway.

The DECnet Router/X.25 Gateway provides its services network-wide, handling X.25 protocol conversion. (Note that the X.25 function can also be provided by P.S.I. software, a potentially more cost-effective solution when connecting only one system.)

Two software packages are available for the DECnet Router/X.25 Gateway:

1. The base software that resides in the gateway, which provides:

- All the features of the DECnet Router, excluding Level 2 (Area) Routing, up to 6 lines (using DDCMP). V.35 line cards are not supported.
- DECnet-to-DECnet communication over the PSDN to another remote node running DECnet and with X.25 capability. This communication becomes available to all DECnet nodes on the Ethernet network. Functions supported by DECnet, such as file transfer and task-to-task communication, can take place across the PSDN. This feature requires that the PSDN support sub-addressing.
- The ability to support X.25/X.29 traffic from the PSDN to any DECnet node running P.S.I. Access.

At least one Phase IV DECnet-VAX host system on the network must have a copy of this software. The host system down-line loads the software into the gateway.

2. VAX P.S.I. Access software, which resides on VAX nodes on the Ethernet, allows for non-DECnet (X.25/x.29) communication via the gateway and over the PSDN, to remote Digital or non-Digital nodes or X.29 asynchronous terminals. Hosts which make use of these capabilities must have this VAX P.S.I. Access software and must provide applications programs or other utility software to make use of the data transferred across the PSDN.

The DECnet Router/X.25 Gateway supports the following public data networks:

Datapac (Canada)
Transpac (France)
Datex-P (Germany)
PSS (United Kingdom)
Telenet (United States)
Tymnet (United States)
Telepac (Switzerland)

Features

- Allows communication between applications running on Digital VAX systems and those running on non-Digital systems.
- Allows an X.25-compatible PSDN to be used as the communications medium for both DECnet, non-DECnet, and Digital-to-non-Digital data traffic.
- Permits remote terminal connection to VAX hosts on the Ethernet using the X.3/X.28/X.29 protocols via a PAD.
- Shares the PSDN access among all systems on the Ethernet. (In a homogeneous DECnet environment, the VAX P.S.I. Access Software is not required, therefore *all* systems use the PSDN to access the other DECnet nodes to which connection is configured.) For process-to-process communication between non-DECnet systems, and support for X.29 terminal access, the VAX P.S.I. Access Software is required for each VAX system accessing the Gateway from the Ethernet.

Figure 3.11
DECnet Router/X.25 Gateway Configuration (Digital-to-non-Digital Host)

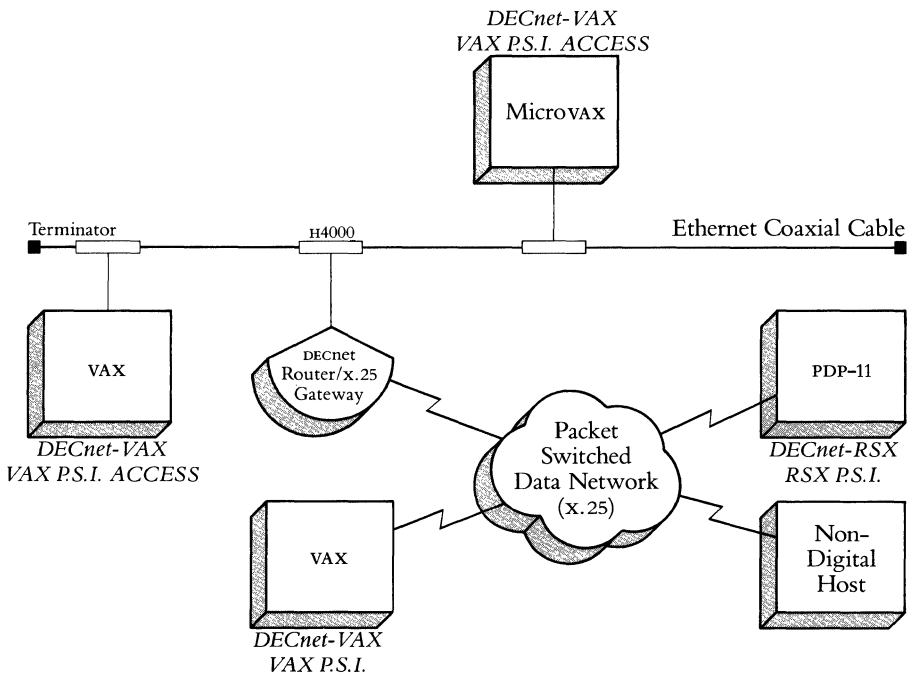
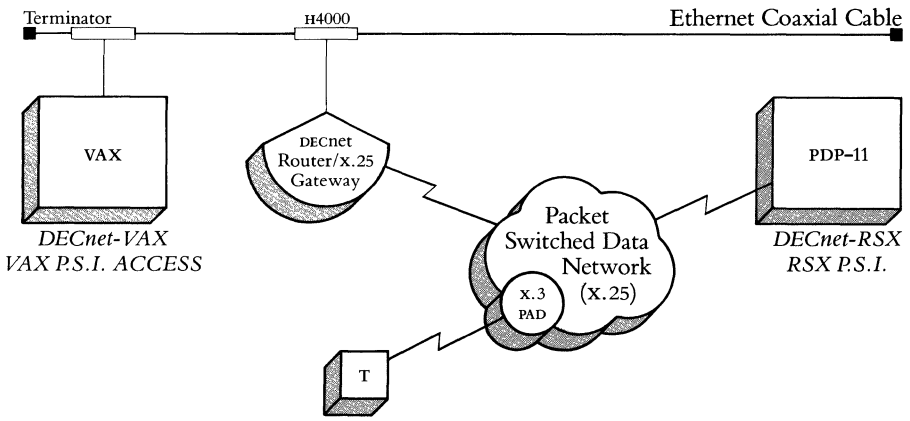


Figure 3.12
X.25/X.29 Terminal Access Configuration



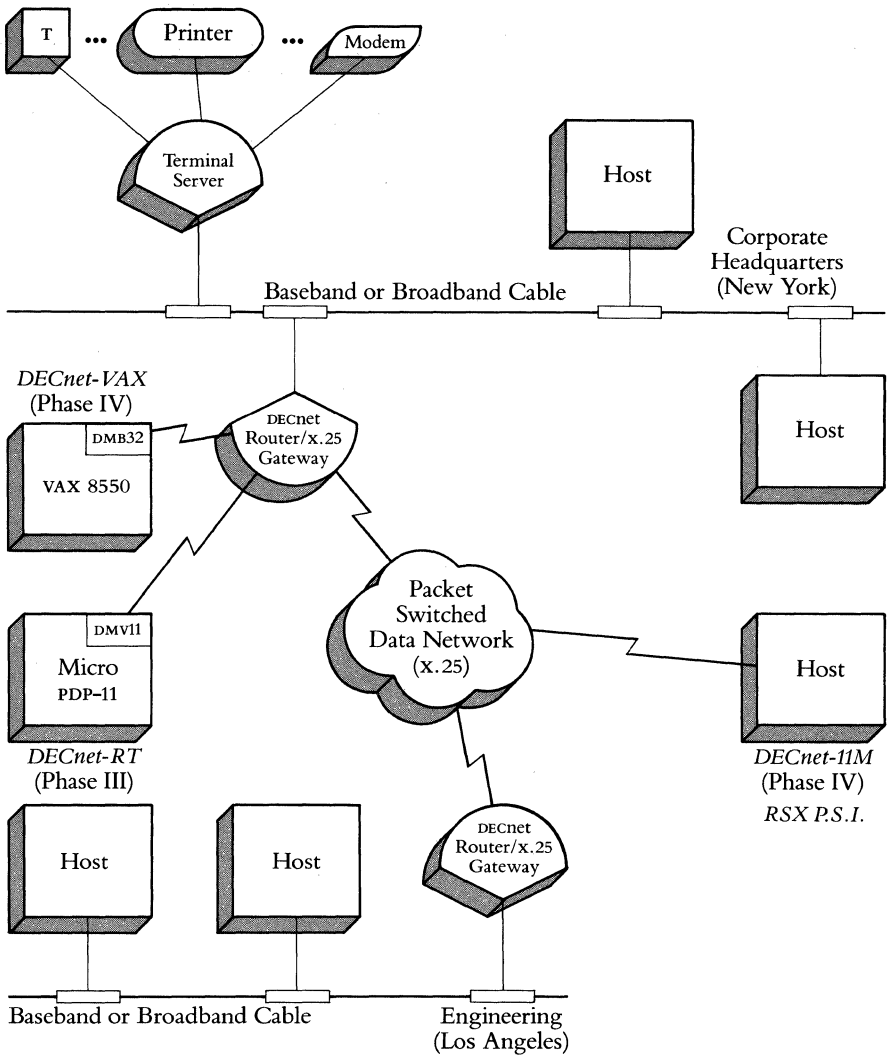


Figure 3.13 DECnet Router/X.25 Gateway Configuration (DECnet-to-DECnet)

Two lines on each DECnet Router/X.25 Gateway are reserved for configuration as X.25 lines. These lines are the first two in each server box.

Prerequisite Hardware

- DECnet Router/X.25 Gateway hardware (DECSA-EA).
- All Ethernet physical channel hardware (for example, coaxial cable and terminators).
- An H4000 Transceiver (or a DELNI) and a transceiver cable.

Prerequisite Software

The DECnet Router/X.25 Gateway requires a Phase IV DECnet-VAX host to support downline software loading.

Table 3.65 DECnet Router/X.25 Gateway Hardware Order Code

Option	Order Code
DECnet Router/X.25 Gateway unit and one-line synchronous EIA RS-232-C/CCITT V.28 line card (DCSAX-LA)	DECSA-EA

Table 3.66
DECnet Router/X.25 Gateway Software Order Codes

Option	Order Code	
License Options: *(A license is required for each CPU.)*	**VAX-11/750**	**VAX-11/780 VAX-11/782* VAX-11/785**
Single-use license	QD727-UZ	QE727-UZ
Materials and Service Options:		
Distribution and documentation	QD727-HH QC727-HM	QE727-HM QD727-HM
Software revision right-to-copy	QD727-HZ	QE727-HZ
Documentation only	QD727-GZ	QE727-GZ

* For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.

VAX P.S.I. ACCESS Software Order Codes

Refer to VAX P.S.I. and VAX P.S.I. ACCESS in this section for VAX P.S.I. ACCESS order codes.

Cable Selection

For local EIA RS-232-C/CCITT V.28 connections to the DECnet Router/X.25 Gateway, order BC17D null modem cables. For remote connection, order BC17C extension cables for DCSAX-LA EIA RS-232-C/CCITT V.28 line cards. When ordering cables, be sure to specify the length, for example, BC17C-25. Refer to *Communications Cable Order Codes* in Section 4 for all cable order codes. All line card cables are fully shielded to comply with FCC RFI/EMI specifications.

Caution: The connectors on the Digital-supplied cables are designed to attach to the handle on each line card. For those customers who choose to use other cables with a server, be advised that there is a restriction on the size and construction of the cable connector housing as follows:

- Maximum height of the connector housing is .610 inches.
- Connectors with housings that extend beyond the face of the connector cannot be used.

Should customers elect to use cables which violate the restrictions above, the BC17L cable, a 4-foot adapter cable, is available for attaching to the DCSAX-LA line cards with EIA RS-232-C/CCITT V.28 interfaces.

DECnet Router/X.25 Gateway Country Kits

Every DECnet Router/X.25 Gateway requires a country kit. Each country kit contains a power cord, hardware manuals in English, and labels with the front panel display in the appropriate national language.

Table 3.67 DECnet Router/X.25 Gateway Country Kit Order Codes

Country	Order Code
Canada (English)	DECSK-AA
Canada (French)	DECSK-AC
England	DECSK-AE
France	DECSK-AP
Germany	DECSK-AG
United States	DECSK-AA

DECnet Router/X.25 Gateway Options

There are four variations of maximum number of add-on cards. Only one variation may be used at a time.

- Add seven DCSAX-LA cards (for point-to-point or X.25 PSDN connections).

The following variations apply only to point-to-point DECnet Router connections. They cannot be used for packet-switched data network connection, nor can they be used concurrently with X.25 operation.

- Add 6 DCSAX-LB cards at 56,000 bits per second each if the DCSAX-LA line card included with the server hardware is discarded.
- Add two DCSAX-LB cards at 250,000 bits per second each if the DCSAX-LA line card included with the server hardware is discarded.
- Add one DCSAX-LB card at 500,000 bits per second each if the DCSAX-LA line card included with the server hardware is discarded.

Table 3.68 DECnet Router/X.25 Gateway Line Card Order Codes

Option	Order Code
One-line synchronous EIA RS232-C/CCITT V.28 line card at speeds up to 19.2 Kb/s (FDX)	DCSAX-LA
One-line synchronous CCITT V.35 line card at speeds up to 500 Kb/s (FDX)	DCSAX-LB

TOPS-10 and TOPS-20 P.S.I. Gateways

TOPS-10 and TOPS-20 P.S.I. Gateways enable suitably configured TOPS-10 and TOPS-20 systems in DECnet networks to connect to Packet Switching Data Networks (PSDNs) which conform to CCITT Recommendation X.25 (June 1980). The TOPS-10 or TOPS-20 P.S.I. Gateway consists of TOPS-10 or TOPS-20 and front-end components. It resides partly in the central processor and partly in a dedicated communications front-end, the DN20/DN20F.

Features and Benefits

- Includes MACRO-10 or MACRO-20 and FORTRAN-10 or FORTRAN-20 interfaces that enable application programs to use the CCITT X.25 Packet Level Functions.
- Allows remote asynchronous terminals connected to a Packet Assembly/Disassembly (PAD) facility to connect to a TOPS-10 or TOPS-20 system.
- Provides the same network management interface that is provided by DECnet-10 or DECnet-20.
- Supports EIA-RS-232-C/CCITT V.24 (TOPS-10 P.S.I. Gateway) or V.28 (TOPS-20 P.S.I. Gateway) over point-to-point, four-wire, synchronous, full duplex lines at transmission rates up to 9,600 bits per second.

Prerequisite Hardware

For TOPS-10 P.S.I. Gateway, a DECsystem-1090/1091/1095 configuration with

- One DN-20-MX or DN-20F-MX communications front-end processor.
- One DN20-BA or DN20F-BA low-speed synchronous interface (KMC11/DUP11).

Note: KS10 systems are not supported by this product.

For TOPS-20 P.S.I. Gateway, a DECSYSTEM-2040/2060 configuration with:

- One DN20-MX or DN20F-MX communications front-end processor.
- One DN20-BA or DN20F-BA low-speed synchronous interface (KMC11/DUP11).

Prerequisite Software

TOPS-10 P.S.I. Gateway: TOPS-10 Operating System and DECnet-10.

TOPS-20 P.S.I. Gateway: TOPS-20 operating system, V5.1 and DECnet-20, V3.0.

Table 3.69
TOPS-10/TOPS-20 P.S.I. Gateway Order Codes

Option	Order Code			
License Options: *(A license is required for each CPU.)*	**TOPS-10 P.S.I. (users with DECnet-10)**	**DECnet-10/ TOPS-10 P.S.I. (users requiring DECnet-10)**	**TOPS-20 P.S.I. (users with DECnet-20)**	**DECnet-20/ TOPS-20 P.S.I. (users requiring DECnet-20)**
Single-use license, binaries, documentation, support services	QH228-AM	QH229-AM	QT228-AM	QT229-AM
Single-use license only, no binaries, no documentation, no support services	QH228-DZ	QH229-DZ	QT228-DZ	QT229-DZ
Update/Unsupported Options: (refer to SPD 8.63)				
Binaries, documentation	QH228-HM	QH229-HM	QT228-HM	QT229-HM
Right-to-copy for single-use, no binaries, no documentation	QH228-HZ	QH229-HZ	QT228-HZ	QT229-HZ

Open Systems Interconnection (OSI) Products

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 comunications. The Digital Network Architecture (DNA) is based on the OSI Reference Model. Refer to Section 1 for a brief overview of OSI and DNA.

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 Ethernet IEEE 802.3 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 provides mail, messaging, and document interchange services at the Application Layer.

Table 3.70
Digital's OSI Products

Layer Number	ISO Layers	DNA Layers	Digital OSI Products		
7	Application	User	(Customer written application)	Message Router/ X.400 Gateway	VAX DEC/MAP
		Network management			
6	Presentation	Network application			
5	Session	Session control	OSAK		
4	Transport	End-to-end communications	VOTS		
3	Network	Routing			
2	Data Link	Data Link	VAX P.S.I. or VAX P.S.I. ACCESS	IEEE 802.3 Products	IEEE 802.4 Products★
1	Physical link	Physical link			

★ Available from Concord Communication Inc.

The following five Open Systems Interconnection Products are presently available:

- VAX DEC/MAP
- Message Router X.400 Gateway V1.0
- VAX OSI Applications Kernel (OSAK) V1.0
- VAX OSI Transport Service (VOTS) V1.1
- VAX P.S.I. (Refer to Packetnet Communications Software in this section.)

VAX DEC/MAP

VAX DEC/MAP is a multivendor, broadband, local area network 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 Interconnect (ISO/OSI) network reference model.

VAX DEC/MAP V1.0 consists of both software and hardware. The hardware consists of the KMS1P, firmware, and appropriate cables. The software is a layered product on the VMS operating system.

The MAP network architecture specifies the protocols and services for the Physical, Data Link, Network, Transport, Session, Presentation and Application Layers, layers 1 thru 7 respectively. VAX DEC/MAP V1.0 software implements the Network Layer through the Application Layer (Layers 3 through 7). The Presentation Layer, Layer 6, is null as specified by MAP V2.1. The Physical and Data Link Layers, Layers 1 and 2, are implemented in hardware from Concord Communication Inc. (CCI), and are not included in the VAX DEC/MAP V1.0 product. 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), and a software interface at Transport Layer 4.

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.

Table 3.71
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
▪ NBS Phase I FTAM	Based on ISO FTAM DP2	
▪ MAP CASE V2.1	ISO based and defined in Service Definition and Protocol Spec. (7/85)	
▪ MAP V2.1 MMFS	Conformance class 0	
▪ Directory Service/CSA	MAP V2.1	
Presentation	Undefined in MAP V2.1, therefore NULL layer	Presentation
Session	ISO Session Standard (ISO/IS 8326, 8327) Only Kernal 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

Interoperability and conformance testing are issues being addressed by the MAP/TOP Users Group. Various independent testing facilities, such as Industrial Technological Institute, are in the process of implementing a testbed to resolve some of these issues.

Digital guarantees the operation of the VAX DEC/MAP product between Digital nodes *only,* with the prerequisite hardware supplied by Concord Communication Inc. The conformance and interoperability test tools needed to test all vendors products against the MAP V2.1 specification are *not complete.*

Required Hardware

VAX DEC/MAP software is a layered product, supported on VMS. This product requires 6,500 blocks (3.3 Mbytes) of system disk space for installation and 5,500 blocks (2.8 Mbytes) of system disk space for permanent use.

This product is a packaged system. The customer can not purchase software separate from hardware.

Minimum Hardware Specification

- Any valid VAX and UNIBUS compatible configuration, including the BI-bus machines, which require a UNIBUS adapter.
- Broadband cable plant
- CCI headend remodulator, 10 Mbps (part number L5-R051-2100)
- CCI MapServer/Plus, (TIM), 10 Mbps (part number L0T051-0820)

Note: The CCI MapServer/Plus must be purchased through Concord Communication Inc. (CCI).

Prerequisite Software

VAX/VMS Operating System.

Table 3.72
VAX DEC/MAP
Order Codes

Option	Order Code						
License Options: *(A license is required for each CPU.)*	**VAX-11/750**	**VAX-11/780 VAX-11/782 VAX-11/785[1]**	**VAX 8600**	**VAX 8200**	**VAX 8300**	**VAX 8500 VAX 8700[3]**	**VAX 8800**
Single-use license (with hardware)[2]	DTUND-AA DTUND-AC	DTUNE-AA DTUNE-AC	DTUNK-AA DTUNK-AC	DTUN5-AA DTUN5-AC	DTUN7-AA DTUN7-AC	DTUN*-AA DTUN*-AC	DTUNM-AA DTUNM-AC
VAXcluster license (with hardware)[2]	DTUND-AA DTUND-AC	DTUNE-AA DTUNE-AC	DTUNK-AA DTUNK-AC	DTUN5-AA DTUN5-AC	DTUN7-AA DTUN7-AC	DTUN*-AA DTUN*-AC	DTUNM-AA DTUNM-AC
Materials and Service Options:							
Distribution and documentation	QDZAU-HM	QEZAU-HM	QKZAU-HM	Q5ZAU-HM Q5ZAU-H3	Q7ZAU-HM Q7ZAU-H3	Q*ZAU-HM	QMZAU-HM
Software revision right-to-copy	QDZAU-HZ	QEZAU-HZ	QKZAU-HZ	Q5ZAU-HZ	Q7ZAU-HZ	Q*ZAU-HZ	QMZAU-HZ
Documentation only	QLZAU-GZ	QLZAU-GZ	QLZAU-GZ	QLZAU-GZ	QLZAU-GZ	QLZAU-GZ	QLZAU-GZ
Installation service	QDZAU-IM	QEZAU-IM	QKZAU-IM	Q5ZAU-IM Q5ZAU-I3	Q7ZAU-IM Q7ZAU-I3	Q*ZAU-IM	QMZAU-IM
DECsupport service	QDZAU-IM	QEZAU-IM	QKZAU-IM	Q5ZAU-9M Q5ZAU-93	Q7ZAU-9M Q7ZAU-93	Q*ZAU-9M	QMZAU-9M
Basic service	QDZAU-8M	QEZAU-8M	QKZAU-8M	Q5ZAU-8M Q5ZAU-83	Q7ZAU-8M Q7ZAU-83	Q*ZAU-8M	QMZAU-8M
Self-maintenance	QDZAU-3M	QEZAU-3M	QKZAU-3M	Q5ZAU-3M Q5ZAU-33	Q7ZAU-3M Q7ZAU-33	Q*ZAU-3M	QMZAU-3M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] The suffix added to the ordering information in this section is defined as such: -AA refers to a FCC compliant cabinet; -AC refers to a non-FCC compliant cabinet.
[3] * = 9 for VAX 8500, 2 for VAX 8700.

VAX OSI Transport Service (VOTS)

The VAX OSI Transport Service V1.1 is an implementation of the Open System Interconnection (OSI) Transport and Internet Network Services, as defined by the International Standards Organization (ISO) in International Standards ISO 8072, ISO 8073 and ISO 8473.

Transport Service—VAX OSI Transport Service, in conjunction with Ethernet IEEE 802.3 LAN or VAX P.S.I., provides the lower four layers of the seven layer OSI model. The Transport Layer is Layer 4 in the OSI seven-layer model. It provides reliable end-to-end transfer of data between cooperating user programs residing in separate systems. The OSI Transport Service is dependent on the services provided by the three lower OSI Layers.

VAX OSI Transport Service provides and supports many of the options stated in the Transport Protocol Specification, International Standard ISO 8073.

Network Service—The VAX OSI Transport Service includes the Internet Protocol specified in the International Standard ISO 8473. The Internet protocol allows for communication between Transport Service Providers residing on the same network, even though they may be in different subnetworks, as defined in the ISO documents. However, in VAX OSI Transport Service, the Internet Protocol is implemented as an End System only, and does not provide Internet Routing capabilities, that is, the ability to forward data from one subnetwork to another.

Packet Switching Network Support—VAX OSI Transport Service, in conjunction with Digital Ethernet IEEE 802.3 LAN products and Digital Packet Switching products, can be connected into a network through an IEEE 802.3 local area subnetwork, or through multiple X.25 based Packet Switching Data subnetworks. In addition, VAX OSI Transport Service allows access to both these network services concurrently.

VOTS is an End System, implemented in accordance with the International Standard ISO 8473 for the Internet Protocol, and supports many of the options provided for in the specification. Specifically, VOTS supports the following Internet services: Header Format Analysis, PDU Lifetime Control, Route PDU Function, Error Reporting, and PDU Header Error Detection.

Required Hardware

VAX OSI Transport Service requires any valid VAX/VMS or MicroVAX/VMS system configuration with:

- At least 60K bytes of non-paged dynamic pool for the VAX OSI Transport Service software and data storage;
- At least 1.5K bytes of non-paged dynamic pool for each concurrent Transport Connection;
- An R80/RL02 configuration is required for VAX-11/730 Systems.
- Block Space requirements (Block Cluster Size = 1):
  2000 Blocks of disk space (1M bytes) required for installation.
  2000 Blocks of disk space (1M bytes) required permanent use.
- When used in a Local Area Network environment, VAX OSI Transport Service requires a DEUNA or DELUA for operation on a UNIBUS based VAX, or DELQA for operation on a Q-bus based VAX, and sufficient Ethernet Transceiver cable to connect the controller to a tap on the Local Area Network.

Prerequisite Software

- VAX/VMS operating system for VAX systems
- MicroVMS operating system for MicroVAX and VAXstation systems. Both the MicroVMS Extended Base and the MicroVMS Program Development components are required.
- MicroVMS Workstation Software for VAXstation systems.
- For Packetnet (X.25) communications, VAX P.S.I. or VAX P.S.I. ACCESS, V4.0.

Table 3.73
VAX OSI Transport Service Order Codes

Option	Order Code						
License Options: *(A license is required for each CPU.)*	**MicroVAX II**	**VAXstation II**	**VAX-11/750**	**VAX-11/780 VAX-11/782[2] VAX-11/785**	**VAX 8200 VAX 8300[3]**	**VAX 8600 VAX 8650**	**VAX 8800**
Single-use license	QZ129-UZ	Q4129-UZ	QD129-UZ	QE129-UZ	Q★129-UZ	QK129-UZ	QM129-UZ
VAXcluster license			QD129-QZ	QE129-QZ	Q★129-QZ	QK129-QZ	QM129-QZ
Materials and Service Options:							
Distribution and documentation	QZ129-H3 QZ129-H5	Q4129-H3 Q4129-H5	QD129-HG QD129-HM	QE129-HM QE129-HY	Q★129-H3 Q★129-HM	QK129-HM QK129-HM	QM129-HM
Software revision right-to-copy	QZ129-HZ	Q4129-HZ	QD129-HZ	QE129-HZ	Q★129-HZ	QK129-HZ	QM129-HZ
Documentation only	QL129-GZ	QL129-GZ	QL129-GZ	QL129-GZ	QL129-GZ	QL129-GZ	QL129-GZ
Installation service	QZ129-I3 QZ129-I5	Q4129-I3 Q4129-I5	QD129-IG QD129-IM	QE129-IM QE129-IY	Q★129-I3 Q★129-IM	QK129-IM	QM129-IM
Software Product Service Agreements:[1]							
DECsupport service	QZ129-93 QZ129-95	Q4129-93 Q4129-95	QD129-9M QD129-9G	QE129-9M QE129-9Y	Q★129-9M Q★129-93	QK129-9M	QM129-9M
Basic service	QZ129-83 QZ129-85	Q4129-83 Q4129-85	QD129-8M QD129-8G	QE129-8M QE129-8Y	Q★129-8M Q★129-83	QK129-8M	QM129-8M
Self-maintenance	QZ129-33 QZ129-35	Q4129-33 Q4129-35	QD129-3M QD129-3G	QE129-3M QE129-3Y	Q★129-3M Q★129-33	QK129-3M	QM129-3M

[1] For Non-U.S. service options, consult local Digital Sales Representative.
[2] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[3] ★ = 5 for VAX 8200; 7 for VAX 8300.

VAX OSI Applications Kernel (OSAK)

The VAX OSI Applications Kernel V1.0 (OSAK) is an implementation of the Open System Interconnection (OSI) Session Layer, as defined by the International Standards Organization (ISO) in International Standards ISO 8326 and ISO 8327. VAX OSI Applications Kernel operates at the Session Layer (Layer 5) of the seven-layer ISO Reference Model. It provides a reliable connection for end-to-end communication between cooperating user programs residing in separate systems. The OSI Session Service is dependent upon the services provided by the OSI Transport Service (VOTS).

The VAX OSI Applications Kernel software is a privileged sharable image, which can be linked with VMS users' programs. OSAK provides the higher-level services that allow inter-process communication over an OSI network to one or more remote systems. The remote systems may or may not be another VAX/VMS system, but must also support corresponding OSI protocols. The VAX OSI Applications Kernel is layered on top of VAX OSI Transport Service (VOTS).

Prerequisite Hardware

- Any valid VAX/VMS system configuration.
- Block Space requirements (Block Cluster Size = 1):
  700 Blocks disk space required for installation and for permanent use.

Prerequisite Software

- VAX OSI Transport Service (VOTS) V1.1
- VAX/VMS operating system for VAX systems
- MicroVMS operating system for MicroVAX and VAXstation systems. Both the MicroVMS Extended Base and the MicroVMS Program Development components are required.
- MicroVMS Workstation Software for VAXstation systems.

Table 3.74
VAX OSI Application Kernel Order Codes

Option	Order Code						
License Options: *(A license is required for each CPU.)*	**MicroVAX II**	**VAXstation II**	**VAX-11/750**	**VAX-11/780 VAX-11/782[2] VAX-11/785**	**VAX 8200 VAX 8300[3]**	**VAX 8600 VAX 8650**	**VAX 8800**
Single-use license	QZZ02-UZ	Q4Z02-UZ	QDZ02-UZ	QEZ02-UZ	Q★Z02-UZ	QKZ02-UZ	QMZ02-UZ
VAXcluster license			QDZ02-QZ	QEZ02-QZ	Q★Z02-QZ	QKZ02-QZ	QMZ02-QZ
Materials and Service Options:							
Distribution and documentation	QZZ02-H3 QZZ02-H5	Q4Z02-H3 Q4Z02-H5	QDZ02-HG QDZ02-HM	QEZ02-HY QEZ02-HM	Q★Z02-H3 Q★Z02-HM	QKZ02-HM	QMZ02-HM
Software revision right-to-copy	QZZ02-HZ	Q4Z02-HZ	QDZ02-HZ	QEZ02-HZ	Q★Z02-HZ	QKZ02-HZ	QMZ02-HZ
Documentation only	QLZ02-GZ	QLZ02-GZ	QLZ02-GZ	QLZ02-GZ	QLZ02-GZ	QLZ02-GZ	QLZ02-GZ
Installation service	QZZ02-I3 QZZ02-I5	Q4Z02-I3 Q4Z02-I5	QDZ02-IG QDZ02-IM	QEZ02-IY QEZ02-IM	Q★Z02-I3	QKZ02-IM	QMZ02-IM
Software Product Service Agreements:[1]							
DECsupport service	QZZ02-93 QZZ02-95	Q4Z02-93 Q4Z02-95	QDZ02-9M QDZ02-9G	QEZ02-9M QEZ02-9Y	Q★Z02-9M Q★Z02-93	QKZ02-9M	QMZ02-9M
Basic service	QZZ02-83 QZZ02-85	Q4Z02-83 Q4Z02-85	QDZ02-8M QDZ02-8G	QEZ02-8M QEZ02-8Y	Q★Z02-8M Q★Z02-83	QKZ02-8M	QMZ02-8M
Self-maintenance	QZZ02-33 QZZ02-35	Q4Z02-33 Q4Z02-35	QDZ02-3M QDZ02-3G	QEZ02-3M QEZ02-3Y	Q★Z02-3M Q★Z02-33	QKZ02-3M	QMZ02-3M

[1] For Non-U.S. service options, consult local Digital Sales Representative.
[2] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[3] ★ = 5 for VAX 8200; 7 for VAX 8300.

File Transfer and Terminal Emulation Products

Professional Host Communications Software

The Professional Host Communications Software is an integral part of the software environment of Micro/RSX, RSX-11M, RSX-11M-PLUS operating systems, and the VAX/VMS operating system running VAX-11 RSX. It is the means of transferring files between a Professional 300 Series computer and a Micro/RSX, RSX-11M, RSX-11M-PLUS, or a VAX/VMS host system. The software is initiated by a Professional running PRO/Communications in terminal emulation mode. After the Professional Host Communications facility is started, the Professional switches from terminal emulation to file transfer mode. The files can then be transferred between the Professional and the host system.

Prerequisite Hardware

Host System—one of the following:

- PDP-11 configuration with at least 256 Kbytes of memory.
- VAX system configuration with at least 512 Kbytes of memory (R80/RL02 configuration is required for VAX-11/730 systems.).

Target System—one of the following:

- P/OS Hard Disk system configuration with an RCD50 hard disk.
- P/OS Diskette system configuration with an RX50 diskette unit. Supports any mass storage, unit record, or terminal device supported by the prerequisite software.

Prerequisite Software

Host System—one of the following:

- RSX-11M, RSX-11M-PLUS, or VAX/VMS operating system running VAX-11 RSX.

Target System—one of the following:

- for Hard Disk Systems: P/OS Hard Disk, or PRO/Communications for Hard Disk.
- for diskette systems: P/OS Diskette, or PRO/Communications for Diskette.

CX/DX/AX (WPS-8 To Host Utility)

The CX/DX/AX (WPS-8 To Host Utility) is a software package that executes on the RSTS/E, RSX-11M, and VAX/VMS systems enabling them to act as host systems to a current WPS-8 Word Processing System. The systems communicate over an asynchronous terminal interface. The WPS-8 system appears to the host applications software to be a normal terminal. Communications between the WPS-8 system and the host system uses the DX error-correcting message protocol.

The utility links distributed, standalone WPS-8 systems and the host system for better system use and data sharing. The package includes utility programs that convert host files stored in word processing format to host files stored in ASCII format and vice versa.

The utility is available in the following configurations:

- DX/RSTS for RSTS/E operating systems.
- DX/VMS for VAX/VMS operating systems.
- DX/11M for RSX-11M operating systems.

Features and Benefits

- Stores word processing-format files on a host system and later retrieves them. This reduces storage and storage media costs.
- Uses the host system's high-speed printer to print rough drafts of documents not requiring letter-quality printing while maintaining the formatting of the word processor.
- Creates host system source language and data files on the WPS-8 system using the WPS-8 editor and then transmits the files to the host system for processing.

Prerequisite Hardware and Software

For DX/RSTS, refer to Software Product Description 10.95.xx.

For DX/VAX, refer to Software Product Description 26.36.xx.

For DX/11M, refer to Software Product Description 10.96.xx.

Table 3.75 DX/RSTS and DX-11M Order Codes

Option	Order Code	
License Options: *A license is required for each CPU.*	**DX/RSTS**	**DX-11M**
Single-use license	QJ703-DZ	QJ704-DZ
Materials and Service Options:		
Distribution and documentation	QJ703-HD	QJ704-HD
	QJ703-HM	QJ704-HM
	QJ703-HQ	QJ704-HQ
	QJ703-HT	QJ704-HT
	QJ703-HV	QJ704-HV
Software revision right-to-copy		QJ704-HZ

Table 3.76
DECdx/VMS Order Codes

Option	Order Code	
	VAX-11/750	VAX-11/780 VAX-11/782* VAX-11/785
Single-use license, binaries documentation, support services	QD708-AG	QE708-AY
Single-use license-only option, no binaries, no documentation, no support services	QD708-DZ	QE708-DZ
Update/Unsupported Options:		
Users of DECdx/VMS whose specified support category warranty has expired may order under license the following software option as an update to an earlier version. The option may also be purchased for use on a second or subsequent CPU, in conjunction with a single-use license-only option. Options are distributed in binary form on the appropriate medium and include no installation or other services unless specifically stated.	QD708-HG	QE708-HY
Right-to-copy for single-use, no binaries, no documentation	QD708-HZ	QE708-HZ
Upgrade Options:		
Customers who are currently licensed users of DX/VMS may obtain this new product by purchasing a license to an upgrade kit for use on the same CPU as their previous license.	QD712-AG	QE712-AY
Single-use license-only option, no binaries, no documentation	QD712-DZ	QE712-DZ
Miscellaneous Options:		
Documentation-only kits	QD708-GZ	QE708-GZ

* The VAX-11/782 is a multiprocessor that is considered a single CPU for binary licensing purposes.

poly-COM for the Rainbow Family

The poly-COM™ software has VT100 terminal emulation capabilities and provides flexible and easy-to-use file transfer between the Rainbow personal computer and a variety of hosts and operating systems. With this software, users can share data, programs, and peripherals.

Features

- Transmits to and from the Rainbow personal computer's video screen and floppy disks, and to the Rainbow's optional printer.
- Communications characteristics can be changed by simply loading a terminal settings file.
- Files containing binary (nonprintable) ASCII characters can be transmitted between systems running poly-COM or poly-XFR.
- Checks the integrity of each block of data to ensure secure transfer, and counts data blocks to make sure that none are lost.
- The SWITCH component of the software allows the user to run applications on the Rainbow personal computer from another system or terminal.

poly-COM software allows the Rainbow personal computer to communicate with the following systems:

- Rainbow 100 CP/M-86/80 or MS-DOS
- DECmate CP/M-80
- RT-11
- RSTS/E
- RSX-11M
- RSX-11M-Plus
- VAX/VMS

These systems must run the poly-XFR CP/M communications package in order to communicate with poly-COM on the Rainbow 100.

Refer to SPD A3.23 for additional systems supported.

Prerequisite Hardware and Software

- CP/M-86/80, V2.0 and MS-DOS V2.05.

Table 3.77
poly-COM (Polygon Asynchronous Software) Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
poly-COM Local and Host Systems:	
V1.2 for Rainbow	QA193-C3
poly-XFR Local and Host Systems:	
V1.0 for DECmate II systems	QA202-C3
poly-XFR Host System Only:	
V2.0 for RT-11 host systems	QA140-CD QA140-CH QA140-CY
V2.0 for VAX/VMS systems	QA142-CG QA142-CM QA142-CY

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 like EDT, TECT, WORD11, and EMACS transfering text and binary files between the PC and the host.

Features

- Plus compatible with DEC 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
- Set up 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 which 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.

poly-COM 220 Features

- Plus compatible with DEC 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 VT200 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
- Set up 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 Saver function which blanks the PC screen after an inactive time period that is user definable.

poly-COM 240 Features

- Plus compatible with DEC 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 VT200 8 bit terminal control
- Status display line on screen
- Instantaneous horizontal shift for 132 character display
- Set up 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.

Table 3.78
VTERM II, poly-COM 220, and poly-COM 240 Order Codes

Option	Order Code
VTERM for IBM PC with 96K	QAX97-C3*
poly-COM 220 for IBM PC with 192K	QAX98-C3
poly-COM 240 for IBM PC with 256K	QAX99-C3

*Host source included

Table 3.79
Host Software for poly-COM Package Order Codes

Option	Order Code
poly-XFR, RSX	QA139-CD (H)*
poly-XFR, RT-11	QA140-CY (H, D)*
poly-XFR, RSTS	QA141-CD
poly-XFR, VMS	QA142-CY (G, M)*

*Optional media

Rainbow Office Workstation

The Rainbow Office Workstation is a software product that provides a simple menu interface to access both VAX and Rainbow applications and resources. With this software, the hard-disk based Rainbow performs easy data exchange between Rainbow and host: files, VAX DATATRIEVE extracts, Electronic Mail, hard disk backups and terminal sessions. It also provides a high-speed user interface to Rainbow's local applications and utility functions.

The software links the Rainbow personal computer applications to the applications, data and resources of the VAX. This frees the user from routine computing tasks. The Rainbow Office Workstation menus are compatible with those provided by the ALL-IN-1 Office Information System for maximum transparency and consistency within an ALL-IN-1 environment. ALL-IN-1, however, is not prerequisite software on the host VAX.

Note: The current version of Rainbow Office Workstation is only available in English (menus, screen messages, etc.)

Features

- Menu-driven user shell has familiar menus for reduced learning time, extremely fast response, and free movement between all menus for painless growth from novice to expert usage.
- Transparent communications to the VAX:
  - User can automatically connect to host and log in.
  - Invokes ALL-IN-1 Office Information Systems as a terminal.
  - Invokes DATATRIEVE as a terminal for access to shared information stored on the VAX system or across a network.
  - Transfers text files, documents, and other binary files.
  - Extracts DATATRIEVE collections and transfers them to the Rainbow in a number of formats by Rainbow applications.
  - Protects security of host accounts by encrypting passwords stored in Rainbow.
- Electronic Mail System routinely and automatically transfers incoming and outgoing mail between Rainbow and VAX.
- Routinely and automatically backs-up MS-DOS files created or modified since last back-up.
- Instantly loads user choice of MS-DOS industry standard business applications and includes simple commands for organizing and accessing files and directories.
- Allows up to five individuals to share one Rainbow (one at a time) and organize their files; separate profiles contain each user's encrypted VAX password, choice of user applications, electronic mail header, etc.

Prerequisite Hardware

PC100 Personal Computer configured with:

- A 5 MB or 10 MB hard disk.
- At least 256 KB of memory with additional memory requirements depending on choice of local application. Users must configure their system to satisfy the condition requiring the greatest amount of memory.

Condition	Memory required
ROW using mail without a text editor	256 KB
ROW using mail with text editor word processing package	160 KB and database memory requirement
ROW with spreadsheet	160 KB and spreadsheet memory requirement
ROW with word processing	160 KB and WP memory requirement
ROW with business application	160 KB and business application memory requirement

Prerequisite Software

Minimum software required on the Rainbow:

- MS-DOS V2.11 Operating System.

Minimum software required on the VAX:

- VAX Rainbow Office Workstation V1.0
- VAX/VMS Operating System 4.1
- Poly-XFR Communications for VAX/VMS host.

Table 3.80
Rainbow Office Workstation Order Codes

Option	Order Code	
Rainbow Office Workstation	QVA28-A3	
License Options: *(A license is required for each CPU.)*	**VAX-11/750**	**VAX-11/780**
Single-use license	QD935-UZ	QE935-UZ
Materials and Service Options:		
Distribution and documentation	QD935-HG QC935-HM	QE935-HY QC935-HM

Network and System Management Products

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 NMCCDECnet Monitor is designed to assist in three key areas of network management: availability, performance, and planning.

The NMCC/DECnet Monitor availability may differ outside the United States. Contact the local Digital representative for availability.

Features

- Facilitates the management of complex networks by collecting, analyzing, and displaying information about the network.
- Graphically depicts the state of the network.
- Supplies a database of available information.
- Looks at a large sample over a long period of time to discover trends.
- Provides standard and customized reports.
- Reduces management costs by allowing managers to frequently evaluate, redesign, and tune the network.
- Enables a manager to detect problems early thus avoiding poor service and lengthy downtime.
- Allows the user to define thresholds. When they are approached or exceeded, the problem area is highlighted by a change of color on the network map (if the user has an optional color monitor).

Prerequisite Hardware

- VAX 11/730 to 8600 processor or MicroVAX II (Note: R80/RL02 configuration is required for VAX-11/730 system.)
- VT240, VT241, VT330, VT340 terminal, or VT100 or VT220 (for tabular representation)
- Storage device of 30 Megabytes

Prerequisite Software

- VMS operating system V4.4 or later
- DECnet/VMS V4.4 or later
- Full or runtime license for VAX GKS
- Development license for VAX RDB/VMS

Table 3.81
NMCC/DECnet Monitor Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license MicroVAX II, VAX-11/750, VAX-11/780, VAX-11/782, VAX-11/785, VAX 8500, VAX 8550, VAX 8600, VAX 8650	QSP41-UZ
Migration option from OBSERVER V1.X	QSP42-UZ
Software revision right-to-copy MicroVAX II, VAX-11/750, VAX-11/780, VAX-11/782, VAX-11/785, VAX 8600	QSP41-HZ
Materials and Service Options:	
NMCC startup service	QSP41-SZ
Distribution and documentation	
TU-58: VAX-11/750	QSP41-HG
RX01: VAX-11/780, VAX-11/782, VAX-11/785	QSP41-HY
RX50: MicroVAX II	QSP41-H3
1600 BPI magtape: VAX-11/750, VAX-11/780, VAX-11/782, VAX-11/785, VAX 8500, VAX 8550, VAX 8600, VAX 8650	QSP41-HM
Documentation only	QSP41-GZ
Installation service	QSP41-IG QSP41-IY QSP41-IM
U.S. Software Product Service Agreements:*	
DECsupport service	QSP41-9G QSP41-9M QSP41-9Y QSP41-93
Basic service	QSP41-8G QSP41-8Y QSP41-8M QSP41-83
Self-maintenance service	QSP41-3G QSP41-3Y QSP41-3M QSP41-33

*For Non-U.S. service agreements, consult local Digital Sales Representative.

NMCC/VAX ETHERnim (Ethernet Network Integrity Monitor)

NMCC/VAX ETHERnim is a network management tool that aids in fault isolation and topology management of extended local area networks. NMCC/VAX ETHERnim utilizes Phase IV DECnet software on a system configured as either a full-function DECnet node or a DECnet end node. It runs as a layered product on the VAX/VMS Operating System. 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 recognizes non-DECnet Ethernet addresses, and gives the network manager the capability of maintaining a large amount of information about each node via an editable database. It can be operated from local terminals (VT125, VT240, VT241) using REGIS graphics for graphic representations of the network under test. Refer to SPD 26.96.XX for more information.

Features

- Builds a permanent database containing basic information about each node that it detects directly connected to the Ethernet cable.
- 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.
- Provides a means of determining the VAX processor type for VMS DECnet nodes on the Ethernet.

Prerequisite Hardware

- Any valid VAX configuration with Ethernet controller. (Note: VAX-11/730 systems require an R80/RL02.) Refer to SPD 26.96 for more information.
- VT125, VT240, or VT241 graphics terminal.

Prerequisite Software

VAX/VMS Operating System V4.6 or later and DECnet-VAX.

Table 3.82
NMCC/VAX ETHERnim
Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q⋆514-UZ
VAXcluster license	Q⋆514-QZ[1]
Initial license (primary & cluster)	Q⋆514-1P[2]
Monthly availability: primary	Q⋆514-JP[2]
Monthly availability: cluster	Q⋆514-JZ[2]
Materials and Service Options:	
Distribution and documentation	Q⋆514-H#
Software revision right-to-copy	Q⋆514-HZ
Documentation Only	QL514-GZ
Installation	Q⋆514-I#
U.S. Software Product Service Agreements:[3]	
DECsupport service	Q⋆514-9#
Basic service	Q⋆514-8#
Self-maintenance service	Q⋆514-3#

MicroVAX II: ⋆ = Z; # = 3 or 5	VAX 8300: ⋆ = 7; # = 3 or M
MicroVAX 2000: ⋆ = 3; # = 3 or 5	VAX 8500: ⋆ = 9; # = M
VAX-11/750: ⋆ = D; # = M	VAX 8600: ⋆ = K; # = M
VAX-11/780: ⋆ = E; # = M	VAX 8650: ⋆ = K; # = M
VAX-11/785: ⋆ = E; # = M	VAX 8700: ⋆ = 2; # = M
VAX 8200: ⋆ = 5; # = 3 or M	VAX 8800: ⋆ = M; # = M

[1] Not available on MicroVAX II or MicroVAX 2000
[2] Not available on MicroVAX, VAX-11, or VAX 86xx processors.
[3] For non-U.S. service agreements, consult a local Digital Sales Representative.

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 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 Ethernet to access the traffic data.

The LTM collects statistics on all Ethernet 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 Ethernet 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 Ethernet 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 Ethernet and provides data based on nodes, addresses and/or protocol types.
- Provides performance measurements allowing for the optimum configuration and operation of the Ethernet LAN.
- Simplifies analysis of Ethernet 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.

Required Hardware

LAN Bridge 100 (DEBET) with minimum revision level E

Prerequisite Software

VMS V4.4 or subsequent version

DECnet-VAX V4.4 or subsequent version on the host processor

Optional Software

RBMS V1.1 for remote management of downline load feature in LAN Bridge 100.

Table 3.83
LAN Traffic Monitor
Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q★ZF3-UZ
VAXcluster license	Q★ZF3-QZ[1]
Initial license (primary & cluster)	Q★ZF3-1P[2]
Monthly availability: primary	Q★ZF3-JP[2]
Monthly availability: cluster	Q★ZF3-JZ[2]
Materials and Service Options:	
Distribution and documentation	Q★ZF3-H#
Software revision right-to-copy	Q★ZF3-HZ
Documentation only	QLZF3-GZ
Installation	Q★ZF3-I#
U.S. Software Product Service Agreements:[3]	
DECsupport service	Q★ZF3-9#
Basic service	Q★ZF3-8#
Self-maintenance service	Q★ZF3-3#

MicroVAX II: ★ = Z; # = 3 or 5	VAX-11/785: ★ = E; # = M
MicroVAX 2000: ★ = 3; # = 3 or 5	VAX 8200: ★ = 5; # = 3 or M
VAXstation II: ★ = 4; # = 3 or 5	VAX 8300: ★ = 7; # = 3 or M
VAXstation 2000: ★ = 8; # = 3 or 5	VAX 8500: ★ = 9; # = M
VAX-11/750: ★ = D; # = M	VAX 8600: ★ = K; # = M
VAX-11/780: ★ = E; # = M	VAX 8700: ★ = 2; # = M
VAX-11/782:[4] ★ = E; # = M	VAX 8800: ★ = M; # = M

[1] Available on VAX-11/700 series, VAX 8200, VAX 8300, VAX 8500, VAX 8600, VAX 8700, and VAX 8800.
[2] Available on VAX 8200, VAX 8300, VAX 8500, VAX 8600, VAX 8700, and VAX 8800.
[3] For non-U.S. service agreements, consult a local Digital Sales Representative.
[4] For software licensing purposes, a VAX-11/782 is considered a single CPU.

Remote System Manager

Remote System Manager (RSM) is a VMS-layered software product which allows a single system manager to perform software installation, backup, and update tasks typically performed at individual VAXstation II, VAXstation II/GPX, and MicroVAX II systems. The Remote System Manager environment consists of a number of VMS or MicroVMS systems configured with DECnet on an Ethernet Local Area Network. One system is the server (and may run VMS or MicroVMS) and the others are clients (which run MicroVMS). The server provides services to suitably configured clients which have been defined in the server's registration and network databases, and which are connected to the same Ethernet. The Remote System Manager provides services over a single Ethernet but does not restrict communications with other nodes in the network. Client files may be spooled (transferred transparently) to the server for printing on a shared printer.

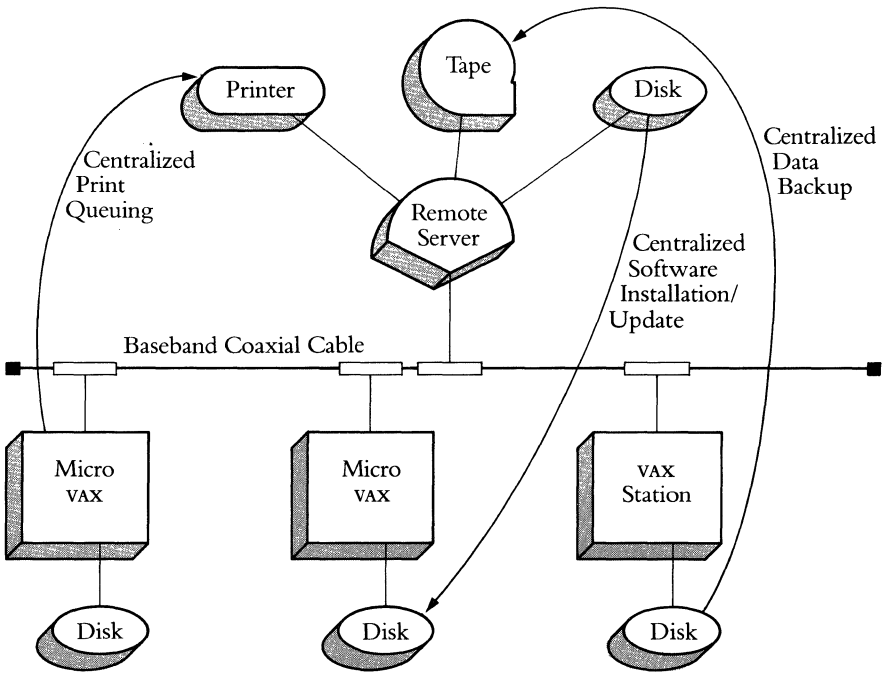
The Remote System Manager Server software is comprised of a menu interface and a set of management tools. The User Interface consists of two main menus: an installation menu and a management menu. The installation menu is used to perform the initial registration and software installation of clients. The management menu is used to perform ongoing, repetitive management tasks. The Management Tools perform such functions as initial software installation, application management, file backup, file restoration, print queue management, distribution of RSM logical names, RSM symbols and the DECnet database, and remote execution of single DCL commands.

Remote System Manager Client software is required for each client in the network. Refer to Software Product Descriptions 27.32.xx and 27.33.xx for supported configurations and additional information.

Features

- Centralized software installation and updating relieves users of system management responsibilities and ensures access to current versions of applications and tools.
- Centralized file backup relieves users of file backup at the workstation.
- Centralized queueing and print services allow client systems to share printers.
- Central distribution and updating of RSM logical names and symbols, and of the DECnet database, ensure accurate access to network resources.

Figure 3.14
Remote System Manager Configuration



Required Hardware

The Server System may be one of the following:

- MicroVAX II with the following minimum mass storage combination: TK50, RD52 and RD53.
- VAX-11/78X, VAX 8200, VAX 8300, VAX 86XX, or VAX 8800.

The Client Systems may include the following:

- VAXstation II.
- VAXstation II/GPX.
- MicroVAX II with RD5X system disk.

Prerequisite Software

VAX/VMS or MicroVMS V4.2 operating system or later and DECnet-VAX.

Table 3.84
Remote System Manager Server Order Codes

Option	Order Code
License Options: *(A license is required for each CPU.)*	
Single-use license	Q*B13-UZ
VAXcluster license	Q*B13-QZ[1]
Initial license (primary & cluster)	Q*B13-1P[2]
Monthly availability: primary	Q*B13-JP[2]
Monthly availability: cluster	Q*B13-JZ[2]
Materials and Service Options:	
Distribution and documentation	Q*B13-H#
Software revision right-to-copy	Q*B13-HZ
Documentation only	QLB13-GZ
Installation	Q*B13-I#
U.S. Software Product Service Agreements:[3]	
DECsupport service	Q*B13-9#
Basic service	Q*B13-8#
Self-maintenance service	Q*B13-3#
MicroVAX II: * = Z; # = 3 or 5 VAX-11/750: * = D; # = M VAX-11/78x: * = E; # = M VAX 8200: * = 5; # = 3 or M VAX 8300: * = 7; # = 3 or M	VAX 8500: * = 9; # = M VAX 8550: * = 2; # = M VAX 86x0: * = K; # = M VAX 8700: * = 2; # = M VAX 8800: * = M; # = M

[1] Not available on MicroVAX II.
[2] Not available on MicroVAX II, VAX-11, or VAX 86XX.
[3] For non-U.S. service agreements, consult a local Digital Sales Representative.

Table 3.85
Remote System Manager Client Order Codes

Option	Order Code	
License Options: *(A license is required for each client system.)*	**MicroVAX II**	**VAXstation II**
Single-use license	QZB14-UZ	Q4B14-UZ
Materials and Service Options:		
Distribution and documentation	QZB14-H3	Q4B14-H3
	QZB14-H5	Q4B14-H5
Installation service	QZB14-13	Q4B14-13
	QZB14-15	Q4B14-15
U.S. Software Product Service Agreements:		
DECsupport service	QZB14-93	Q4B14-93
	QZB14-95	Q4B14-95
Basic service	AZB14-83	Q4B14-83
	QZB14-85	Q4B14-85
Self-maintenance service	QZB14-33	Q4B14-33
	QZB14-35	Q4B14-35

Remote Bridge Management Software (RBMS)

Remote Bridge Management Software (RBMS) is an optional product used with the LAN Bridge 100. RBMS significantly enhances the Bridge's operation by allowing the user, at a VAX or MicroVAX host, to observe and control any LAN Bridge 100 in the network. With RBMS, users can disable selected Bridges or block traffic at selected Bridges to isolate traffic on a segment of an extended network.

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 functionality needed to support the actual control and observation of the LAN Bridge 100.

Features

- Displays counters, statistics, characteristics and the forwarding data base.
- Allows the user to change the operational state, characteristics and forwarding data base.
- Enables the user to remotely downline load LAN Bridge 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 on-line help.
- Allows remote troubleshooting of hardware through the Bridge Self Test feature.

Prerequisite Hardware

- A valid VAX or MicroVAX system configuration with a Digital Ethernet Controller connected to an Ethernet/IEEE 802.3 network which contains at least one LAN Bridge 100.
- One of the following Digital terminals: VT100 or VT200 series, LA12, LA34, LA35, LA36, or LA38.

Prerequisite Software

- VAX/VMS version 4.4 or later; or
- MicroVMS version 4.4 or later.
- DECnet-VAX version 4.0 or later.

Table 3.86
Remote Bridge Management Software Order Codes

Option	Order Code						
License Options: *(A license is required for each Bridge.)*	**Micro VAX II[1]**	**VAX station II[1]**	**VAX 11/750**	**VAX 11/780 VAX 11/782[2] VAX 11/785**	**VAX 8200 VAX 8300 VAX 8500[3]**	**VAX 8600 VAX 8650**	**VAX 8800**
Single-use license	QZ036-UZ	Q4036-UZ	QD036-UZ	QE036-UZ	Q★036-UZ	QK036-UZ	QM036-UZ
VAXcluster license				QE036-QZ	Q★036-QZ	QK036-QZ	QM036-QZ
Initial license (primary and cluster)					Q★036-1P		QM036-1P
Monthly availability							
▪ primary					Q★036-JP		QM036-JP
▪ cluster					Q★036-JZ		QM036-JZ
Materials and Service Options:							
Distribution and documentation	QZ036-H3 QZ036-H5	Q4036-H3 Q4036-H5	QD036-HG QD036-HM	QE036-HM QE036-HY	Q★036-H3 Q★036-HM	QK036-HM	QM036-HM
Software revision right-to-copy	QZ036-HZ	Q4036-HZ	QD036-HZ	QE036-HZ	Q★036-HZ	QK036-HZ	QM036-HZ
Documentation only	QL036-GZ	QL036-GZ	QL036-GZ	QL036-GZ	QL036-GZ	QL036-GZ	QL036-GZ
Installation service	QZ036-I3 QZ036-I5	Q4036-I3 Q4036-I5	QD036-IG QD036-IM	QE036-IM QE036-IY	Q★036-I3 Q★036-IM	QK036-IM	QM036-IM
U.S. Software Product Service Agreements:[4]							
DECsupport service	QZ036-93 QZ036-95	Q4036-93 Q4036-95	QD036-9G QD036-9M	QE036-9M QE036-9Y	Q★036-93 Q★036-9M	QK036-9M	QM036-9M
Basic service	QZ036-83 QZ036-85	Q4036-83 Q4036-85	QD036-8G QD036-8M	QE036-8M QE036-8Y	Q★036-83 Q★036-8M	QK036-HM	QM036-8M
Self-maintenance service	QZ036-33 QZ036-35	Q4036-33 Q4036-35	QD036-3G QD036-3M	QE036-3M QE036-3Y	Q★036-33 Q★036-3M	QK036-3M	QM036-3M

[1] For Micro VAX I and VAXstation I order codes, refer to SPD 26.71.XX
[2] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[3] ★ = 5 for VAX 8200, 7 for VAX 8300, 9 for VAX 8500.
[4] For Non-U.S. service agreements, consult local Digital Sales Representative.

Terminal Server Manager

The Terminal Server Manager/VMS (TSM) is a software tool which allows a user at a VAX host to remotely observe and control terminal servers anywhere in the extended local area network. With TSM the user can monitor the availability and modify the characteristics of all Digital terminal servers on the network including the DECserver 100, DECserver 200, Ethernet Terminal Server and MUXserver 100.

TSM simplifies management of terminal server networks through improved operating procedures and reduced demand for trained personnel. Operating procedures are improved with the ability to centrally show and set terminal server parameters through the use of command files. The need for trained personnel at remote sites is reduced with the ability to centrally manage Digital's entire family of terminal servers.

Features

- Provides a directory database containing basic information about each terminal server on the network allowing easy access to all servers by name rather than their Ethernet address.
- Automatically detects and adds all new terminal servers to the directory through the use of a simple command.
- Expedites troubleshooting by allowing centralized testing of all terminal servers in the directory through the use of a single command.
- Improves productivity by enabling a single user to manipulate all terminal server parameters and characteristics from a central location.
- Allows terminal server characteristics to be maintained on the central host simplifying the addition and replacement of any server.
- Improves fault management capabilities by providing centralized access to all status indicators and error counters in the terminal servers.
- Increases efficiency by allowing the creation of command files of commonly used TSM commands.

Prerequisite Hardware

For VAX systems, an Ethernet Controller (DELUA or DEQNA)

Block space requirements (Block Cluster Size = 1):
2000 blocks of disk space required for installation
800 blocks of disk space required for permanent use.

Prerequisite Software

DECnet VAX Version 4.4 (or subsequent version) is required on the host processor.

Depending upon configuration of terminal servers to be managed by TSM, the following versions of terminal server software are required:

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

Table 3.87
Terminal Server Manager
Order Codes

Option	Order Code							
License Options: *(A license is required for each CPU.)*	**MicroVAX II**	**VAXstation II**	**VAX-11/730**	**VAX-11/750 VAX-11/780 VAX-11/782 VAX-11/785[1]**	**VAX 8200 VAX 8300[2]**	**VAX 8500 VAX 8700[3]**	**VAX 8600**	**VAX 8800**
Single-use license	QZZ42-UZ	Q4Z42-UZ	QCZ42-UZ	Q★Z42-UZ	Q#Z42-UZ	Q+Z42-UZ	QKZ42-UZ	QMZ42-UZ
VAXcluster license				Q★Z42-QZ	Q#Z42-QZ	Q+Z42-QZ	QKZ42-QZ	QMZ42-QZ
Initial license (primary and cluster)					Q#Z42-1P	Q+Z42-1P		QMZ42-1P
Monthly availability:								
▪ primary					Q#Z42-JP	Q+Z42-JP		QMZ42-JP
▪ cluster					Q#Z42-JZ	Q+Z42-JZ		QMZ42-JZ
Materials and Service Options:								
Distribution and documentation	QZZ42-H3 QZZ42-H5	Q4Z42-H3 Q4Z42-H5	QCZ42-HM	Q★Z42-HM	Q#Z42-H3 Q#Z42-HM	Q+Z42-HM	QKZ42-HM	QMZ42-HM
Software revision right-to-copy	QZZ42-HZ	Q4Z42-HZ	QCZ42-HZ	Q★Z42-HZ	Q#Z42-HZ	Q+Z42-HZ	QKZ42-HZ	QMZ42-HZ
Installation service	QZZ42-I3 QZZ42-I5	Q4Z42-I3 Q4Z42-I5	QCZ42-IM	Q★Z42-IM	Q#Z42-I3 Q#Z42-IM	Q+Z42-IM	QKZ42-IM	QMZ42-IM
U.S. Software Product Service Agreements:[4]								
DECsupport service	QZZ42-93 QZZ42-95	Q4Z42-93 Q4Z42-95	QCZ42-9M	Q★Z42-9M	Q#Z42-93 Q#Z42-9M	Q+Z42-9M	QKZ42-9M	QMZ42-9M
Basic service	QZZ42-83 QZZ42-85	Q4Z42-83 Q4Z42-85	QCZ42-9M	Q★Z42-8M	Q#Z42-83 Q#Z42-8M	Q+Z42-8M	QKZ42-8M	QMZ42-8M
Self-maintenance service	QZZ42-33 QZZ42-35	Q4Z42-33 Q4Z42-35	QCZ42-3M	Q★Z42-3M	Q#Z42-33 Q#Z42-3M	Q+Z42-3M	QKZ42-3M	QMZ42-3M

[1] ★ = D for VAX-11/750, E for VAX-11/780, 782, 785
[2] # = 5 for VAX 8200, 7 for VAX 8300
[3] + = 9 for VAX 8500, 2 for VAX 8700
[4] For Non-U.S. service agreement codes consult local Digital Sales Representative.

PBX/Facilities Management System (P/FM)

PBX/Facilities Management System (P/FM) V2.2 is a software application package that tracks and helps control telecommunications costs and produces billing for second party users. The system gives owners of telecommunications switches (PBXs) the ability to price telecommunications services in a customized fashion using industry standard rate tables which may be ordered as a separate option with P/FM. Invoices may also include charges for non-telecommunications items and transactions such as building services or equipment rentals.

P/FM can be used with multiple PBXs (Private Branch Exchanges) of mixed types. The P/FM software considers each PBX to be a separate entity, keeping the data in separate nodes (data bases) and controlling which users can access them. P/FM can support up to eighty-nine nodes from a single-licensed system. Refer to Software Product Description A4.38.02 for detailed information about P/FM.

The PBX/Facilities Management System is not available in Europe.

Required Hardware

- Any valid VAX or MicroVAX II based system configuration with VT100 series with AVO or VT200 series terminals.
- A minimum of 3MB of memory for a single PBX node system.
- Each additional PBX node supported requires an additional 1MB of memory and an appropriate amount of disk space to store the data.

Prerequisite Software

- VAX/VMS Operating System, V4.2 or MicroVMS Operating System, V4.2, or later
- VAX DATATRIEVE, Version 3.1, or later
- VAX Common Data Dictionary, Version 3.1, or later
- FMS Forms Driver, Version 2.2, or later

Table 3.88
P/FM
Order Codes

Option	Order Code		
License Options: *A license is required for each CPU.*	**Micro VAX II**	**VAX-11/7xx Systems**	**VAX 8600 VAX 8650**
Single-use license	QAFU5-UZ	QA870-UZ	QAAF6-UZ
Materials and Service Options:			
Distribution and documentation	QAFU5-H5	QA870-HH QA870-HM	QAAF6-HM
Software revision right-to-copy	QAFU5-HZ	QA870-HZ	QAAF6-HZ
Installation/orientation service	QAFU5-I5	QA870-IH QA870-IM	QAAF6-IM
Basic service	QAFU5-85	QA870-8H QA870-8M	QAAF6-8M
Self-maintenance service	QAFU5-35	QA870-3H QA870-3M	QAAF6-3M
P/FM Rate Table Option:			
Single-use license, binaries, documentation, no warranty	QAAT9-C5	QAAT9-CH QAAT9-CM	QAAT9-CM
Self-maintenance service	QAAT9-35	QAAT9-3H QAAT9-3M	QAAT9-3M

Cable/Facilities Management System (C/FM)

Cable/Facilities Management System (C/FM) is a VAX/VMS layered software application product which manages the twisted pair cabling of voice and data communications sytems. C/FM automates cable management, Private Branch Exchange (PBX) cable database administration, switch capacity planning, and work order functions.

The functional components of C/FM include: Cable Management, Station Software Features, PBX Common Equipment, Inventory, and Work Order Entry. The C/FM cable management function tracks the connections of cables and cable pairs so that a cable path can be traced from the PBX to a telephone jack. Features of a user's telephone may be entered into the C/FM database and displayed. The C/FM database may also be used for keeping track of a switch's installed PBX common equipment. The inventory function helps to keep track of available equipment within various stock rooms. With the C/FM work order entry function, a telecommunications staff may generate work order requests for telephone service installation, deinstallation, repairs and moves.

The Cable/Facilities Management System is not available in Europe.

Refer to Software Product Description 27.48.xx for detailed information about C/FM.

Required Hardware

- Any valid VAX or MicroVAX II based system configuration.
- A minimum of 3MB of memory for a single PBX node system.

Prerequisite Software

- P/FM (PBX/Facilities Management) V2.2
- VAX/VMS Operating System, V4.2 or MicroVMS Operating System, V4.2, or later
- VAX DATATRIEVE, Version 3.1, or later
- VAX Common Data Dictionary, Version 3.1, or later
- FMS Forms Driver, Version 2.2, or later

Table 3.89
C/FM Order Codes

Option	Order Code					
License Options: *(A license is required for each CPU.)*	**MicroVAX II**	**VAX-11/750**	**VAX-11/780 VAX-11/782[1] VAX-11/785**	**VAX 8200 VAX 8300 VAX 8500 VAX 8700[2]**	**VAX 8600 VAX 8650**	**VAX 8800**
Single-use license	QZZ41-UZ	QDZ41-UZ	QEZ41-UZ	Q*Z41-UZ	QKZ41-UZ	QMZ41-UZ
Cluster license		QDZ41-QZ	QEZ41-QZ	Q*Z41-QZ	QKZ41-QZ	QMZ41-QZ
Materials and Service Options:						
Distribution and documentation	QZZ41-H5	QDZ41-HH QDZ41-HM	QEZ41-HH QEZ41-HM	Q*Z41-HM	QKZ41-HM	QMZ41-HM
Software revision right-to-copy	QZZ41-HZ	QDZ41-HZ	QEZ41-HZ	Q*Z41-HZ	QKZ41-HZ	QMZ41-HZ
Installation service	QZZ41-I5	QDZ41-IH QDZ41-IM	QEZ41-IH QEZ41-IM	Q*Z41-IM	QKZ41-IM	QMZ41-IM
Basic service	QZZ41-85	QDZ41-8H QDZ41-8M	QEZ41-8H QEZ41-8M	Q*Z41-8M	QKZ41-8M	QMZ41-8M
Self-maintenance service	QZZ41-35	QDZ41-3H QDZ41-3M	QEZ41-3H QEZ41-3M	Q*Z41-3M	QKZ41-3M	QMZ41-3M

[1] For software licensing purposes, a VAX-11/782 is a multiprocessor that is considered a single CPU.
[2] * = 5 for VAX 8200, 7 for VAX 8300, 9 for VAX 8500, 2 for VAX 8700.

Additional Software Products

VAX Public Access Communications (VAXPAC)

VAX Public Access Communications (VAXPAC) lets VAX/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.

VAXPAC runs on MicroVAX II, MicroVAX 2000, and VAXstation 2000 systems. The remote system may be any system that accepts and displays data using an asynchronous interface compatible with RS-232C, RS-422, or RS-423.

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 on-line 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 Mbyte internal memory, TK50 or dual RX50 drive, one DZQ11 or DHV11, one RD52, and a VT100- or VT200-series terminal
- Any MicroVAX 2000 or VAXstation 2000

Plus one or more modems if using telephone connections: DF224 (Scholar), DF03-compatible, or Hayes Instruction Set compatible.

Prerequisite Software

One of the following:

- All components of MicroVMS, V4.4 or later
- VAX/VMS, V4.4 or later

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Table 3.90
VAXPAC
Order Codes

Option	Order Code		
License Options: *(A license is required for each CPU.)*	**MicroVAX II**	**MicroVAX 2000**	**VAXstation 2000**
Single-use license	QZZB1-UZ	Q3ZB1-UZ	Q8ZB1-UZ
Materials and Service Options:			
Distribution and documentation	QZZB1-H3 QZZB1-H5	Q3ZB1-H3 Q3ZB1-H5	Q8ZB1-H3 Q8ZB1-H5
Software revision right-to-copy	QZZB1-HZ	Q3ZB1-HZ	Q8ZB1-HZ
Documentation only	QLZB1-GZ	QLZB1-GZ	QLZB1-GZ
Installation service	QZZB1-I3 QZZB1-I5	Q3ZB1-I3 Q3ZB1-I5	Q8ZB1-I3 Q8ZB1-I5
U.S. Software Product Service Agreements:			
DECsupport service	QZZB1-93 QZZB1-95	Q3ZB1-93 Q3ZB1-95	Q8ZB1-93 Q8ZB1-95
Basic service	QZZB1-83 QZZB1-85	Q3ZB1-83 Q3ZB1-85	Q8ZB1-83 Q8ZB1-85
Self-maintenance service	QZZB1-33 QZZB1-35	Q3ZB1-33 Q3ZB1-35	Q8ZB1-33 Q8ZB1-35

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's PC-DOS Version 2.10, 3.0 or 3.10.

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, matrixes 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 KB of memory
- A minimum of two 5¼ inch, 362 KB floppy drives; or one 5¼ 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

Table 3.91
WPS-PLUS/PC Order Codes

Option	Order Code
Single-use license, binaries, documentation, warranty	
Quantities 1–9	QBA72-AI
Quantities 10–24	QBA73-AI
Quantities 25–99	QBA74-AI
Quantities 100 plus	QBA75-AI
Installation Service Option	QBA72-II
Basic Service Option	QBA72-8I
Single Product Update Service Option	QBA72-3I

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.

Table 3.92
Software Development Tools
Order Codes

Option	Order Code
VMS	
KCT32 development tools★	Q★128
RSX-11S, RSX-11M, RSX-11M PLUS	
KMV1A-M development tools	QJS98
MicroVMS	
KMV1A-M development tools★	QZZ36-xx
KMV1A-M MicroVMS driver	QZZ35-xx

★ 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 multi-vendor environments and in applications requiring proprietary protocols. The KMS11-BD/BE Framing Software can also be configured for Bisync (BSC) Framing.

Table 3.93
HDLC/BSC Framing Software Order Codes

Option	Order Code
VMS	
KMS11-BD HDLC/BSC framing software	Q*920
RSX-11S, RSX-11M	
KMV1A-M HDLC framing software	QJS32
RSX-11M PLUS	
KMV1A-M HDLC framing software	QJS39

X.25 Link Level Software

Digital offers X.25 Link Level software for the KMS11-BD/BE, KMS1P-M, and the KMV1A-M. These packages provide point-to-point communication between host processors, making them particularly useful in a multi-vendor environment. These packages operate in full-duplex mode, and implement the CCITT 1980 recommendations for X.25 LAPB Link Level Protocol.

Table 3.94
X.25 Link Level Software Order Codes

Option	Order Code
VMS	
KMS11-BD/BE	Q*757
MicroVMS	
KMV1A-M MicroVMS driver	QZZ35
KMV1A-M Micro VMS X.25 link level	QZZ37
RSX-11S, RSX-11M	
KMS11-BD/BE, KMS1P-M	QJ757
KMV1A-M	QJS97
RSX-11M-PLUS	
KMS11-BD/BE, KMS1P-M	QJ770
KMV1A-M	QJS97

Section 4

Communications
Hardware Products

Hardware

Section 4

Communications Hardware Products

Overview

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. Different transmission methods, or protocols, are used for asynchronous connections than for synchronous connections.

Asynchronous transmission, a character-oriented protocol, is primarily used 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. Note that although Digital's terminal-to-computer connections are asynchronous, IBM and many other vendors use synchronous terminal-to-computer interconnects.

When data is sent across most telephone lines, the digital signals of computers 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 RS-232-C/CCITT V.28, EIA RS-422/CCITT V.11, EIA RS-423/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. Since 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, configuring and ordering information for Digital's asynchronous, synchronous, and asynchronous/synchronous hardware communications products, modems, statistical multiplexers, and matrix switches. For information on Digital's Ethernet hardware and software products, refer to Section 2.

Communications Option Ordering Information

Options are available for use with both the old style unshielded cabinets and with the new style shielded cabinets designed to reduce potential EMI/RFI emissions. The following subsection explains how to order communications options.

Options and Cabinet Kits

To order a communications device, order both the base option module and the specific cabinet kit required to install the module on your system. A cabinet kit includes the appropriate cabling, filter assembly, and any bracket hardware required to install the option in a specific cabinet or enclosure. Several cabinet kits are available for each option because various length internal cables and various mounting brackets are required for different system cabinets.

UNIBUS communications options can be mounted in Digital's older, non-shielded cabinets by ordering a cabinet kit that includes an adapter bracket. To determine whether a cabinet is shielded or not, examine the back of it. A shielded cabinet will have metal panels with I/O connection panel inserts or blank metal plates mounted in the spaces between the panels. An unshielded cabinet may have other devices mounted in the back. However, the CPU box and disk enclosures will be visible from the back of an unshielded cabinet.

Example: If a 16-line multiplexer option for a VAX 11/780 system is needed, order the following option and cabinet kit—DHU11-M (base option) and a CK-DHU11-AD (cabinet kit to install a DHU11 on a VAX 11/780 system). Figure 4.1, Table 4.1, and Table 4.2 explain the hardware order code designations.

Figure 4.1 Parts of a Cabinet Kit Order Code

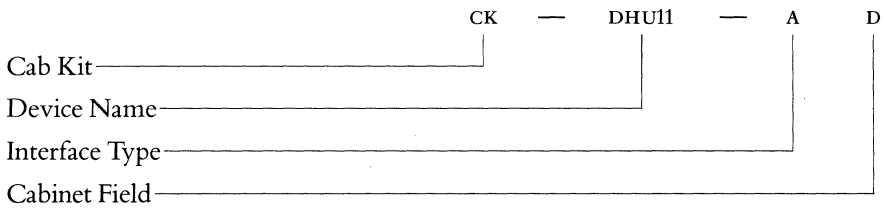


Table 4.1 Interface Type Designations for Cabinet Kits

Char	Electrical Mechanical Interface
A	RS232 (with full modem control)
B	V.35
C	Integral modem
D	RS232 (with limited modem control)
E	RS422/449
F	RS423/449
H	20 Ma.
J	Fiber optic
K	Ethernet
L	Multifunction device (see Device User's Guide for detailed description)
M,N	Base options designations
R	CCITT V.11
S	CCITT X.21
U	50 pin multi-interface support, (see Device User's Guide for detailed description)
1 –> 9	Multiple interface types in a single option, for example; half synchronous and half asynchronous

Table 4.2
Cabinet Field Designations for Cabinet Kits

Char	Shielded Cabinets	Cable
A	BA123 box	21 inches
B	BA23 box	12 inches
C	11/23+ system	30 inches
D	PDP-11, DEC-20, VAX-11/750 expanded cabinet, VAX-11/780 systems	10 feet
E	PDP-11/84, VAX-11/730 systems, VAX-11/750 kernal	7 feet
F	VAX-11/725, 5 panel, PDP-11/84 box, MicroPDP-11/83 cab, MicroVAX II cab	3 feet
J	DMB32 (8500, 8800)	5 feet
L	VAX-11/725, 2 panel,	4 feet
M	DEUNA and DMB32 (VAX 8200/8300 systems)	8 feet
W	DMB32 (8800 expansion cabinet)	15 feet
Y	All VAX system expanded cabinets for DMZ32 only	10 feet
Char	**Non-Shielded Cabinets**	
1	10′ Cable/Mount in H9544-SJ or 74-27292-01 (Depends on option)	
2	10′ Cable	
3	25′ Cable	

Options for Europe

U.S. and European options are now ordered using the same order codes.

Cables for U.S. and Europe

Table 4.42 contains all the order codes for external cables required by the communications devices in this section. When ordering cables, be sure to specify the length (-xx), for example, BC22D-25.

Asynchronous Communications Controllers

Table 4.3 summarizes the features of Digital's currently available asynchronous communications hardware products.

Table 4.3
Asynchronous Communications Controllers

	DLVJ1	DZQ11	DHQ11	KCT32	KMV1A	CXA16	CXB16
Bus	Q-bus	Q-bus	Q-bus	UNIBUS	Q-bus	See footnote[8]	See footnote[8]
Number of lines	4	4	8	2	1	16	16
DMA[1]	NO	NO	YES	YES	YES	YES	YES
Maximum speed[5] (consult SPD)	1 line @ 38.4 Kb/s[4], 2 lines @ 19.2 Kb/s, 4 lines @ 9.6 Kb/s[4]	9.6 Kb/s[4]	38.4 Kb/s	2 lines @ 64 Kb/s, 1 line @ 160 Kb/s	64 Kb/s	38.4 Kb/s	38.4 Kb/s
Software support	DECnet-RT, DECnet-RSX, DECnet-Micro/RSX	DECnet-RSX, DECnet-VAX, DECnet-Micro/RSX, ULTRIX-32m	DECnet-VAX DECnet-RSX DECnet-Micro/RSX MicroPower/ Pascal	VAX-11 KCT 32	RSX-11M-PLUS Software Tools, MicroVMS Software Tools, Micro/RSX Software Tools	DECnet-11M-PLUS, DECnet-Micro/RSX, DECnet-VAX	DECnet-11M-PLUS, DECnet-Micro/RSX, DECnet-VAX
Operating system support	RSX-11M-PLUS	RSX-11M-PLUS, Micro/RSX, MicroVMS, ULTRIX-32, ULTRIX-32m RSTS/E Micro/RSTS	MicroVMS, RSX-11M-PLUS, Micro/RSX, ULTRIX-32m, RSTS/E VAXELN	VMS	RSX-11M, RSX-11M-PLUS, RSX-11S, Micro VMS, Micro/RSX	RSX-11M-PLUS, Micro/RSX, VMS	RSX-11M-PLUS, Micro/RSX, VMS
MultiCPU access[2]	NO	NO	NO	NO	NO	NO	NO
Modem control[3]	LIMITED	LIMITED	FULL	FULL	FULL	NO	NO
Primary buying reason	Lowest Price; FDX	Dual height module with limited modem control; FDX	High performance; low power consumption; dual height module with full modem control	Low cost for custom applications; user programmable (sync or async) interface on VAX systems	High performance for bit stuff protocols	DEC 423 asynchronous communications (data only)	RS422 asynchronous communications (data only)

Table 4.3
Asynchronous Communications Controllers (Continued)

	CXY08	DMZ32	DHU11	DMB32	DMF32	DN25	DC20F
Bus	See footnote[8]	UNIBUS[6]	UNIBUS	VAXBI	UNIBUS[6]	UNIBUS	UNIBUS
Number of lines	8	24	16	8	8	8	16
DMA[1]	YES	YES	YES	YES	YES	YES	YES
Maximum speed[5] (consult SPD)	38.4 Kb/s	19.2 Kb/s[7]	38.4 Kb/s[4]	38.4 Kb/s[4]	19.2 Kb/s	9.6 Kb/s	9.6 Kb/s
Software support	DECnet-11M-PLUS, DECnet-Micro/RSX DECnet-VAX	DECnet-VAX	DECnet-VAX	DECnet-VAX	DECnet-VAX	Tops-10/ Tops-20	Tops-10/ Tops-20
Operating system support	RSX-11M-PLUS, Micro/RSX, VMS	VMS, ULTRIX-32	VMS, RSX-11M, RSX-11M-PLUS, ULTRIX-32, ULTRIX-32m, RSTS/E	VMS	VMS	Tops-10	Tops-10
MultiCPU access[2]	NO	NO	NO	NO	NO	YES	NO
Modem control[3]	FULL	FULL (Optional)	FULL	FULL	FULL (2 lines) NONE (6 lines)	LIMITED (Depends on the version.)	FULL
Primary buying reason	RS232 asynchronous communications; full modem control	DMA Performance with full modem control; remote distribution panel	DMA Performance with full modem control; lowest price per line	Interface to VAXBI systems; 1 synchronous line; 1 printer port	DMA Performance; 1 synchronous line; 1 line-printer port	Interface to DECsystem-10s and DECSYSTEM-20s	Interface to DECsystem-10s and DECSYSTEM-20s

[1] DMA (Direct Memory Access) is the ability to move multi-character messages between a communication line and CPU memory without interrupting the CPU. This capability yields higher performance.

[2] MultiCPU Access refers to the ability to send a message directly to two or more CPU without routing the message through another CPU.

[3] Modem Control refers to the number of signals available to control modem functionality on U.S. and European modems. Full modem control includes nine to eleven signals. Limited modem control is five signals and no modem control means only send and receive signals are present for each line.

[4] Supports connectivity @ 38.4 Kbits. Actual line speed is dependent on current DEC operating system limitations and system configuration.

[5] Actual device speed and throughput is dependent on current DEC operating system limitations, system configurations, and applications in use.

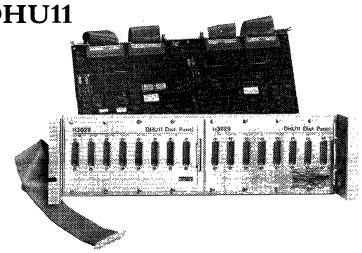
[6] VAX systems only.

[7] Limited to 4.8 Kbs when connected to non-Digital switches.

[8] For use on IPDP and IVAX computers only.

UNIBUS Asynchronous Devices

DHU11



The DHU11 is a 16-line asynchronous communications controller with direct memory access (DMA) that provides local and remote interconnection between UNIBUS PDP-11 and VAX systems and EIA-RS-232-C/CCITT V.28 or EIA-RS-423-A/CCITT V.10 terminals, modems, serial printers, and data switches. The DHU11 supports operating speeds up to 38.4 Kbps. Actual communications speed and throughput is dependent on current DEC operating systems and system configuration. Full modem control is available on all 16 lines.

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
- RS232-C and RS423-A compatibility

Software Support

The DHU11 is supported by VMS, ULTRIX-32, RSX-11M, RSX-11M PLUS, RSTS/E, and ULTRIX-11.

Specifications

Mounting Code: 1 hex slot

Power Requirements:
DC amps drawn at +5V: 6.0
DC amps drawn at +15V: 0.4
DC amps drawn at −15V: 0.4

Bus Loads: AC 2.2, DC 1.0

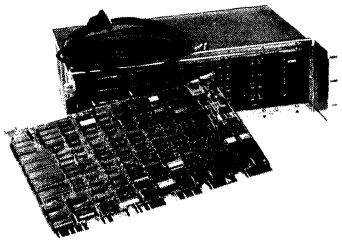
I/O Connection Panel Inserts: 8 panel units

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

Table 4.4
DHU11
Order Codes

Option	Order Code
EIA RS-232-C/CCITT V.28 and EIA RS-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:	
EIA RS-232-C/CCITT V.28 and EIA RS-423-A/CCITT V.10 cabinet kit. For general purpose expander cab utilized with the VAX-11/780, PDP-11/24, PDP-11/44, plus the expander cab for the VAX-11/750.	CK-DHU11-AD
For kernel cab 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

DMZ32



The DMZ32 is a 24-line asynchronous terminal interface for UNIBUS VAX computers running VMS or ULTRIX-32 operating system. It provides RS232-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 5000 feet from the VAX computer system. Terminals can be located where needed, up to 5000 feet from the VAX computer, without affecting the RS232-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.

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 120V 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 RS232 data cables to the individual VT100/200 or compatible terminals.

Cabinet Kits

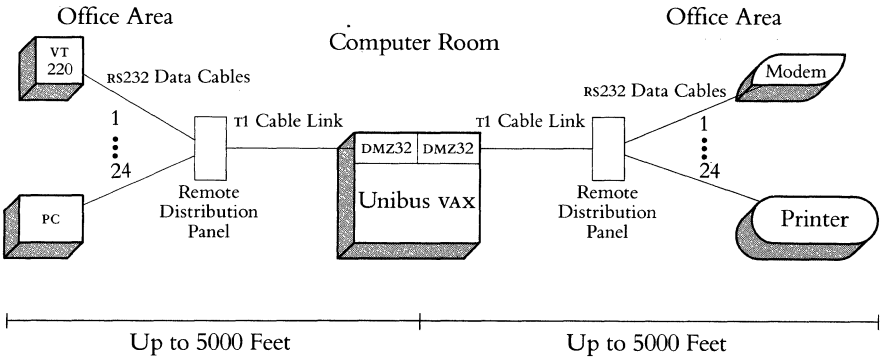
The DMZ32 can be purchased with or without modem control by selecting the appropriate cabinet kit. The cabinet kit includes 15 feet of T1 cable with optional 1000 foot lengths available. Refer to the DMZ32 Ordering Code Table for information.

Features

- Twenty-four 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 5000 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.

The following diagram illustrates a DMZ32 configuration where terminals, personal computers, modems, and serial printers are connected to a local UNIBUS VAX computer system:

Figure 4.2
DMZ32
Typical Configuration



Specifications

Mounting Code: 1 hex slot

Power Requirements:

Module
DC amps drawn at +5V: 9.0 A
DC amps drawn at +15V: 0.1 A

Distribution Panel
1.1A at 120 VAC
0.6A at 220–240 VAC

Bus Loads: AC 6.0, DC 1.5

I/O Distribution Panel Insert:
8 panel units (when mounted in the cabinet mentioned above)
1 additional panel unit for bulkhead cable connector
1 panel unit (if remote, for bulkhead cable connector)

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

Table 4.5
DMZ32
Order Codes

Option	Order Code
24-line DMA terminal interface	DMZ32-M
Cabinet Kits: Include 15 feet of T1 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
1000 ft PVC T1 cable	BC18L-LO
1000 ft Teflon T1 cable	BC18M-LO

Q-bus Asynchronous Communications Controllers

DLVJ1

The DLVJ1 is a four-line asynchronous communications controller that provides local or remote interconnection between Q-bus systems and EIA RS-232-C/CCITT V.28, EIA RS-422/CCITT V.11, and EIA RS-423/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 (1 line at 38.4 Kb/s, 2 lines at 19.2 Kb/s, or 4 lines at 9.6 Kb/s). Limited modem control is included. Split-speed transmit and receive rates are supported on each line making more efficient use of communications facilities by 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.

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.
- RS232-C, RS422-A and RS423-A compatible.

Specifications

Mounting Code: 1 double slot

Power Requirements:
DC amps drawn at +5 V: 1.25
DC amps drawn at +12 V: 0.25

Bus Loads: AC 1, DC 1

I/O Connection Panel Insert: Size B

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

Table 4.6 DLVJ1 Order Codes

Options	Order Code
EIA RS-232-C/CCITT V.28 interface. Includes base module only.	DLVJ1-M
For system installation select external cables and one of the following cabinet kits:	
For use with BA123 (MicroVAX II) and BA11-MA(MB) (PDP-11/23-S) boxes.	CK-DLVJ1-LA
For use with BA23 box (MICRO/PDP-11, MicroVAX).	CK-DLVJ1-LB
For use with Dual cab (PDP-11/83, MicroVAX II)	CK-DLVJ1-LF
EIA RS-442/CCITT V.11 interface. Includes base module only.	DLVJ1-M
For system installation select external cables and one of the following cabinet kits:	
For use with BA123 (MicroVAX II) and BA11-MA(MB) (PDP-11/23-S) boxes.	CK-DLVJ1-EA
For use with BA23 box (MICRO/PDP-11)	CK-DLVJ1-EB
For use with Dual cab (PDP-11/83, MicroVAX II)	CK-DLVJ1-EF

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.

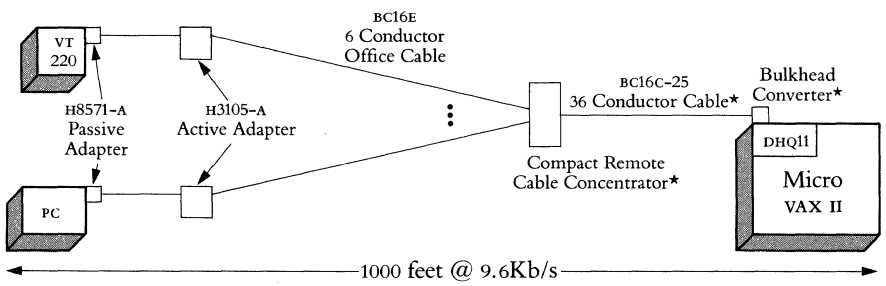
The DHQ11 provides RS232-C or DEC423 (RS232/RS423) signalling to externally connected terminal devices through a choice of distribution panels, referred to as cabinet kits. RS232 cabinet kits supply eight 25-pin connectors to support full modem control; DEC423 (a superset of RS423) cabinet kits supply 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/second (10 bit characters: 8 data, 1 stop, no parity). This throughput is ideal for graphics and videotext applications.
- Compact, dual-size module leaves more backplane space available for additional communications devices.
- Low power consumption with RS232 cabinet kit requires only 1.4 Amps from the CPU +5V power supply; DEC423 cabinet kit requires only 2.0 Amps. This leaves 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.
- Automatic XON/XOFF flow control manages data flow in either direction on a per line basis without program intervention.
- Modem control with RS232 cabinet kit provides full modem control for full and half duplex, point-to-point communications.
- DEC423 cabinet kit with Electrical Overstress/Electrostatic Discharge (EOS/ESD) supports local RS232-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 1000 feet from the CPU with the H3105-A active and H8571-A passive adapters. (Refer to Figure 4.3 and to Section 5, *DEC423/RS423 Signalling with EOS/ESD Protection* for more information.)
- On-board self-test executes an extensive test of DHQ11 circuitry at each power-up or device reset. Also, a background monitor program continually tests the DHQ11 when it is not engaged in other tasks.

Figure 4.3
DHQ11 Configuration with DEC423 Cabinet Kit



*Items contained in DHQ11 DEC423 cabinet kit

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, MicroVMS, ULTRIX-32m, and VAXELN. It is also supported by MicroPower/Pascal.

Specifications

Mounting code: One dual slot

Power Requirements:

DC amps drawn at +5V: 1.4 with RS232 cabinet kit
2.0 with DEC423 cabinet kit

DC amps drawn at +12V: 0.23

Bus Loads: AC 3.2, DC 0.5

I/O Connection Panel Inserts: 2 Size B (RS232)
1 Size B (DEC423)

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

Table 4.7
DHQ11
Order Codes

Option	Order Code
Asynchronous Q-bus communications controller. Includes base module only.	DHQ11-M
Cabinet Kits for RS232 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″ cable for BA123 box	CK-DHQ11-AA
12″ cable for BA23 box	CK-DHQ11-AB
36″ cable for H9642 cab	CK-DHQ11-AF
Cabinet Kits for DEC423 Connection: contain one 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″ cable for BA123 box	CK-DHQ11-WA
12″ cable for BA23 box	CK-DHQ11-WB
36″ cable for H9642 cab	CK-DHQ11-WF

DZQ11

The DZQ11 is a four-line asynchronous communications controller that provides local or remote interconnection between PDP-11 and VAX Q-bus systems and EIA RS-232-C/CCITT V.28 and EIA RS-423-A/CCITT V.10 terminals, modems, or other systems. The DZQ11 operates at program-selectable speeds up to 9,600 bits per second at full-duplex with limited modem control on each line.

Note: DZQ11 is the replacement product for DZV11.

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
- RS232-C and RS423-A compatible

Specifications

Mounting Code: 1 dual slot

Power Requirements:
DC amps drawn at +5V: 1.0
DC amps drawn at +12V: 0.36

Bus Loads: AC 1.4, DC 0.5

I/O Connection Panel Insert: Size B

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

Table 4.8
DZQ11
Order Codes

Option	Order Code
Includes base module only.	DZQ11-M
For system installation 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 cab (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 RS232 or RS423 devices.	CK-DZQ11-D3

CX Communications Controllers

The CX communications controllers provide asynchronous communications for the Industrial VAX (IVAX) and Industrial PDP (IPDP) computers that utilize the BA200 series system enclosures. The controllers operate at speeds up to 38.4 Kb/s per line, and transmit data using either Direct Memory Access (DMA) or programmed output.

Three CX communications controllers are available: the CXY08, CXA16, and CXB16.

CXY08

The CXY08 provides eight RS232-C communications lines to terminals, modems, or serial printers. All lines support full modem control, which permits point-to-point dial-up or leased-line operation.

CXA16

The CXA16 provides 16 DEC423 lines for data-only connections (no modem control) using the DECconnect modular plug connectors.

DEC423, a superset of RS423, supports local RS232 terminal-to-host communications at 9.6 Kb/s up to distances of 200 feet with the H8571-A passive adapter. RS232 terminals that utilize the H8571-A and H3105-A active adapters can take advantage of DEC423 Electrical Overstress and Electrostatic Discharge (EOS/ESD) protection, as well as increased distances of up to 1000 feet at 9.6 Kb/s.

VT300 series terminals provide integral DEC423 compatibility, which allows connection to the CXA16 at operating distances of 1000 feet at 9.6 Kb/s, without the need of a passive or active adapter.

CXB16

The CXB16 provides 16 RS422 communications lines for data-only connections (no modem control).

The RS422 standard offers a high immunity to line noise, important in harsh factory, industrial, and military applications. It allows for line lengths of up to 4,000 feet at all supported line speeds. (The CXB16 is used only with RS422-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/sec; CXA16 and CXB16 total throughput is 100,000 char/sec (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 on-board 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. Physical connections from the module to the external equipment are supplied by a 25-foot extension cable that connects to a compact remote cable concentrator, which provides eight DECconnect modular jack connectors. The CXA16 and CXB16 include two extension cables and two concentrators; the CXY08 includes one extension cable and one concentrator.

Features (Continued)

- EOS/ESD protection with on-board EOS/ESD circuitry significantly reduces the chance that computer equipment will be damaged by static discharge, lightning, or AC power impulses.
- 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.
- Full modem control with CXY08 permits point-to-point dial-up or leased line modem operation on all eight lines.

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

Specification	CXY08	CXA16	CXB16
Number of lines	8	16	16
Electrical Interface Standards	RS232-C	DEC423	RS422
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 +5V	1.5	1.4	1.6
DC amps drawn at +12V	0.22	0.0	0.0
DC loads	0.5	0.5	0.5
AC loads	3.0	3.0	3.0

Table 4.9
CX Order Codes

Option	Order Code
Order the following with the purchase of an IVAX or IPDP system:	
8-line RS232-C asynchronous controller with modem control for IVAX and IPDP systems	CXY08-AA
16-line DEC423 asynchronous controller (data only) for IVAX and IPDP systems	CXA16-AA
16-line RS422 asynchronous controller (data only) for IVAX and IPDP systems	CXB16-AA
Order the following as add-ons to previously shipped IVAX or IPDP systems:	
Add-on 8-line RS232-C asynchronous controller with modem control for IVAX and IPDP systems	CXY08-AF
Add-on 16-line DEC423 asynchronous controller (data only) for IVAX and IPDP systems	CXA16-AF
Add-on 16-line RS422 asynchronous controller (data only) for IVAX and IPDP systems	CXB16-AF

TOPS-10/TOPS-20 Asynchronous Communications Controllers

DC20/DC20F

The DC20/DC20F is an 8- to 16-line asynchronous communications controller (DH11) that provides interconnection between DECSYSTEM-20s (2040, 2060), DECsystem-10s (1090, 1091, 1095), and other computer systems with EIA RS-232-C/CCITT V.28 interfaces. The DC20/DC20F operates at speeds up to 9,600 bits per second in DMA mode with full modem control.

For more detailed U.S. information, please refer to the *LSM Product Summary.*

Table 4.10
DC20/DC20F
Order Codes

Option	Order Code
Basic 8-line asynchronous interface (DH11-AD) expandable to 16 lines with the addition of the DC20-DA.	DC20-AA
8-line asynchronous expansion interface (a maximum of one DC20-DA per DC20-AA). *Prerequisite:* DC20-AA.	DC20-DA
Distribution cabinet (required for configuration between 32 and 128 lines). *Prerequisite:* DC20-AA, DECSYSTEM-20.	DC20-CC
Distribution cabinet (required for configuration between 32 and 128 lines.) *Prerequisite:* DC20-AA, DECsystem-10.	DC20-CD
Communications expansion cabinet for over 32 lines which includes one DC20-AA (can accommodate up to three additional DC20-AAs). *Prerequisite:* DC20-CD, DECsystem-1091.	DC20-EB
Communications expansion cabinet for over 32 lines which includes one DC20-AA (can accommodate up to three additional DC20-AAs). *Prerequisite:* DC20-CC, DECSYSTEM-20.	DC20-ED
FCC compliant basic 16-line asynchronous interface.	DC20F-AD
FCC compliant communications expansion cabinet for over 32 lines which includes one DC20F-AD. Expandable with up to five additional DC20F-ADs. *Prerequisite:* DECsystem-1091.	DC20F-EA
FCC compliant communications expansion cabinet for over 32 lines which includes one DC20F-AD (can accommodate up to five additional DC20F-ADs). *Prerequisite:* DECSYSTEM-20.	DC20F-EC

DN25

The DN25 is an 8-line asynchronous communications controller (DZ11) that provides interconnection between DECsystem-10s and EIA RS-232-C/CCITT V.28. The DN25 operates at speeds up to 9,600 bits per second in DMA mode with limited modem control (depends on the version).

For more detailed U.S. information, please refer to the *LSM Product Summary.*

Table 4.11
DN25
Order Codes

Option	Order Code
8-line asynchronous line multiplexer and controller (expandable to 16 lines with the addition of a DN25-BA) for DECsystem-10s.	
Prerequisite: DN25-AB, DN200.	DN25-AA
8-line asynchronous multiplexer with distribution panel (expandable to 16 lines with the addition of a DN25-BA) for DECsystem-10s.	
Prerequisite: DN25-A/D/E.	DN25-AB
8-line asynchronous expansion multiplexer for DECsystem-10s.	
Prerequisite: DN25-A/D/E.	DN25-BA
Asynchronous expansion drawer including one 8-line multiplexer (expandable to 16 lines with the addition of a DN25-BA) for DECsystem-10s.	DN25-DA
Prerequisite: DN25-E.	DN25-DB
Asynchronous expansion cabinet and first drawer including one 8-line multiplexer for DECsystem-10s.	DN25-EC
Prerequisite: DN20-MC(MD).	DN25-ED

Synchronous Communications Controllers

The following table summarizes the features of Digital's currently available synchronous communications hardware products. For information about Ethernet Communications Controllers, refer to Section 2.

NOTE: These products do not support the use of internal clocking.

Table 4.12
Synchronous Communications Controllers

	DPV11	DMV11	KMV1A	DMB32	DMF32	KCT32
Bus	Q-bus	Q-bus	Q-bus	VAXBI	UNIBUS	UNIBUS
Number of lines	1	1	1	1	1	2
DMA[1]	NO	YES	YES	YES	YES	YES
Maximum speed (consult SPD)	56 Kb/s 9.6 Kb/s for IBM Interconnect	56 or 19.2 Kb/s (Depends on the version.)	64 Kb/s (19.2 Kb/s with VAX P.S.I.)	64 Kb/s (HDLC, SDLC) 19.2 Kb/s (DDCMP) 9.6 Kb/s (other)	19.2 Kb/s	2 lines @ 64 Kb/s, 1 line @ 160 Kb/s
Software support	DECnet-RT; DECnet-RSX; RSX P.S.I.;[4] DECnet-Micro/RSX VAX P.S.I.[4] VMS/SNA	DECnet-RT; DECnet-RSX; DECnet/E; DECnet-Micro/RSX; DECnet-VAX	HDLC framing; X.25 Link Level Products; Software Tools; VAX P.S.I.[4]	DECnet-VAX, DMB32 Synchronous Device Driver (prerequisite) VAX P.S.I.[4]	DECnet-VAX VAX P.S.I.[4]	VAX 11 KCT 32
Operating system support	MicroVMS; RSX-11S; RSX-11M; RSX-11M-PLUS; Micro/ RSX-11S; Micro/ RSX-11M; Micro/RSX-11M-PLUS	RSX-11M; MicroVMS	RSX-11S; RSX-11M; RSX-11M-PLUS; Micro VMS; MicroRSX	VMS	VMS	VMS
MultiCPU access[2]	NO	YES	NO	NO	NO	NO
Modem control[3]	FULL	FULL	FULL	YES	YES	FULL
Primary buying reason	Low cost	DECnet point-to-point configurations across phone lines	High performance for bit stuff protocols	Interface to VAXBI systems; 8 asynchronous lines; 1 synchronous line; 1 printer port	Low cost	Low cost for custom applications; user programmable (sync or async) interface on VAX systems

[1] DMA (Direct Memory Access) is the ability to move multi-character messages between a communication line and CPU memory without interrupting the CPU. This capability yields higher performance.

[2] Multi-CPU Access refers to the ability to send a message directly to two or more CPUs without routing the message through another CPU.

[3] Modem Control refers to the number of signals available to control modem functionality on U.S. and European modems. Full modem control includes nine to eleven signals. Limited modem control is five signals and no modem control means only send and receive signals are present for each line.

Table 4.12
Synchronous Communications Controllers (Continued)

	DMR11	PCL11	KMS11	DUP11	KMS1P	DN20/DN21
Bus	UNIBUS	UNIBUS	UNIBUS	UNIBUS	UNIBUS	UNIBUS
Number of lines	1	Parallel Bus	8	1	1	1–4/1
DMA[1]	YES	YES	YES	NO	YES	YES
Maximum speed (consult SPD)	1 Mb/s	1 Mb/s	4 lines @ 56 Kb/s; 8 lines at 19.2 Kb/s	9.6 Kb/s	64 or 19.2 Kb/s (Depends on the version.)	19.2 Kb/s/ 1 Mb/s
Software support	DECnet-RT; DECnet-20; DECnet-10; DECnet/E; DECnet-VAX; DECnet-RSX; DECnet-10; DECnet-20	DECnet-RSX	VAX X.25 Link Level; RSX X.25 Link Level; VAX HDLC/ BSC Framing; VAX P.S.I.[4] RSX P.S.I.[4]	IBM Internets;[5] RSX P.S.I.; VAX P.S.I.;[4] DECnet-RT; DECnet-RSX	VAX P.S.I.;[4] RSX X.25 Link Level; RSX P.S.I.[4]	DECnet-20; DECnet-10; TOPS-20 P.S.I. Gateway/ DECnet-20 DECnet-10
Operating system support	VMS; RSX-11M; RSX-11M-PLUS; RSX-11S; RSTS/E TOPS-10 TOPS-20	RSX-11M-PLUS	VMS; RSX-11M; RSX-11M-PLUS; RSX-11S	RSX-11M; RSX-11M-PLUS; RSX-11S; VMS (for VAX P.S.I.)	VMS; RSX-11M; RSX-11M-PLUS	TOPS-10; TOPS-20
MultiCPU access[2]	NO	YES	NO	NO	NO	YES
Modem control[3]	FULL	N/A	FULL	FULL	FULL	FULL
Primary buying reason	DECnet interface across phone lines	High performance; local inter-CPU bus	Multiple line X.25 support; high performance	Low cost; host programmable protocols	Single line X.25 support; high performance	Interface to DECsystem-10s and DECsystem-20s

[4] Can be integrated with DECnet. P.S.I. must be present.

[5] IBM Internets include the following protocol emulators: VAX 2780/3780, VAX 3271, RSX-11 2780/3780, RSX-11 3271.

UNIBUS Synchronous Communications Controllers

DMR11

The DMR11 is a high performance microprocessor-controlled single-line synchronous communications controller that provides local or remote interconnection between PDP-11 and VAX UNIBUS systems and other computer systems with EIA RS-232-C/CCITT V.28, CCITT V.35, EIA RS-423/RS-449, or EIA RS-422/RS-449 interfaces. 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

Mounting Code: 2 hex slots (all versions)

Power Requirements:
DC amps drawn at +5 V: 12.0 (all versions)
DC amps drawn at +15 V: 0.08 (DMR11-A, -C), 0.11 (DMR11-B, -E, -F)
DC amps drawn at −15 V: 0.19 (DMR11-A, -C), 0.20 (DMR11-B, -E, -F)

Bus Loads: AC 1 (all versions), DC 1 (all versions)

I/O Connection Panel Inserts:
1 panel unit (DMR11-A, -B, -C, -E)
2 panel units (DMR11-F)

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

Table 4.13
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:	
RS232-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 interconnection. This option must be ordered with the system in which it is to be installed. Supports switch-selectable speeds over the following distances:	
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
RS422/RS449 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
RS423/RS449 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

Frequency	Distance (Max)	Cable
1 MB's	6,000 ft (1,830 m)	BC55S
500 KB's	7,000 ft (2,135 m)	BC55S
250 KB's	8,000 ft (2,440 m)	BC55S
56 KB's	16,000 ft (4,800 m)	BC55T

DUP11

The DUP11 is a high performance single-line synchronous programmable communications controller that provides remote interconnection between PDP-11 and VAX UNIBUS systems and other computer systems with RS-232-C/CCITT V.28 interface. It operates at speeds up to 9,600 bits per second 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

Mounting Code: 1 hex slot

Power Requirements:
DC amps drawn at +5 V: 3.6
DC amps drawn at +15 V: 0.08
DC amps drawn at −15 V: 0.08

Bus Loads: AC 1, DC 1

I/O Connection Panel Insert: 1 panel unit

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

Table 4.14 DUP11 Order Codes

Option	Order Code
Includes only base module.	DUP11-M
For system installation, select one of the following cabinet kits:	
For use with (PDP-11/24 and -11/44) 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

KMS11

The KMS11 is an eight-line synchronous intelligent front-end that provides up to eight lines of interconnection between UNIBUS PDP-11 and VAX systems and other devices with EIA RS-232-C/CCITT V.28 or CCITT V.35 (with optional hardware module) interfaces. The KMS11 operates at speeds up to 56,000 bits per second in half- or full-duplex with full modem control (V.35 is required for 56 Kbps). The KMS11 supports direct memory access data transfers, X.25 Link Level, and HDLC/BSC Framing Software.

Maximum line speed is dependent on the software application. The X.25 link level software is currently warranted for four lines at 56,000 bits per second (using V.35) or eight lines at 19,200 bits per second.

Specifications

Mounting Code: 2 SUs (KMS11-BD), 3 hex slots (KMS11-BE)

Power Requirements:
DC amps drawn at +5 V: 12.5
DC amps drawn at +15 V: 1.5
DC amps drawn at −15 V: 0.5

Bus Loads: AC 7, DC 2

I/O Connection Panel Inserts: 8 panel units

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

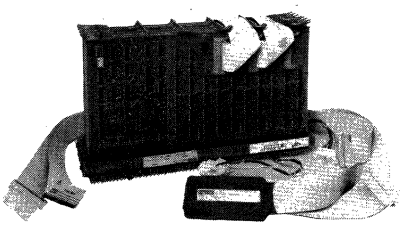
Table 4.15
KMS11 Optional Software Order Codes

Option	Order Code
VAX X.25 link level	Q*757
RSX-11M X.25 link level	QJ757
RSX-11M-PLUS X.25 link level	QJ770
VAX HDLC/BSC framing	Q*920

Table 4.16
KMS11 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

KMS1P



The KMS1P is a one-line intelligent synchronous communications controller that provides interconnection between PDP-11 and VAX UNIBUS systems with EIA RS-232-C/CCITT V.28, EIA RS-423-A/CCITT V.10, CCITT V.35, or RS-422-A/CCITT V.11 interfaces. The microprocessor-based device operates at speeds up to 19.2K b/s (V.28 option) or 64K b/s (V.35 option) in half- or full-duplex with 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

Mounting Code: 2 hex slots

Power Requirements:
DC amps drawn at +5 V: 10.5
DC amps drawn at +15 V: .15
DC amps drawn at −15 V: .20

Bus Loads: AC 5, DC 1

I/O Connection Panel Insert: 1 panel unit

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

Table 4.17
KMS1P Optional Software Order Codes

Option	Order Code
VAX P.S.I.	Q*071-xx
RSX-11 P.S.I./M	QJD91-xx
RSX-11 P.S.I./M-PLUS	QJD92-xx
RSX-11M X.25 link level	QJ757-xx
RSX-11M-PLUS X.25 link level	QJ770-xx

Table 4.18
KMS1P Order Codes

Option	Order Code
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. X.25, EIA RS-232-C/CCITT V.28 interface	CK-KMS1P-AD
Unshielded cabinet kit. X.25, EIA RS-232-C/CCITT V.28 interface	CK-KMS1P-A1
Cabinet kit. X.25, CCITT V.35 interface	CK-KMS1P-BD
Unshielded cabinet kit. X.25, CCITT V.35 interface	CK-KMS1P-B1
Cabinet kit. X.25, EIA RS-422/CCITT V.11 interface	CK-KMS1P-ED
Unshielded cabinet kit. X.25, EIA RS-422/CCITT V.11 interface	CK-KMS1P-E1
Cabinet kit. X.25, EIA RS-423/CCITT V.10 interface	CK-KMS1P-FD
Unshielded cabinet kit. X.25, EIA RS-423/CCITT V.10 interface	CK-KMS1P-F1

PCL11

The PCL11 is a parallel communications link that provides multipoint interconnection of up to 16 processors in a local distributed network. The PCL11 operates at speeds up to one mbyte per second using direct memory access at full duplex. The speed depends on the bus length. Maximum bus length is 91 meters (300 feet). BC17U and BC17T cables are included. Refer to *Communications Cables* at the end of this section for all cable order codes.

Specifications

Mounting Code: 2 SUs

Power Requirements:
DC amps drawn at +5 V: 14.0
DC amps drawn at +15 V: 0.0
DC amps drawn at −15 V: 0.5

Bus Loads: DC 1.5

I/O Connection Panel Inserts: 4 panel units

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

Table 4.19
PCL11
Order Code

Option	Order Code
PCL11 multiple link	PCL11-B

Q-bus Synchronous Devices

DMV11

The DMV11 is a microprocessor-controlled single-line synchronous communications controller that provides local or remote interconnection between Q-bus systems and other computer systems with EIA-RS-232-C/CCITT V.28, CCITT V.35, or RS-423/RS-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 from 2.4 Kb/s to 56 Kb/s (depending on the version selected) at half- or full-duplex. Note: 19.2 Kb/s is the maximum speed for RS232 connection.

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 other DMV11s, DMC11s, DUP11s, DPV11s, DMR11s, or DMP11s.

The DMV11 is compatible with Digital's family of modems and with 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)
- DMA input/output optimizes communication throughput
- Full modem control supports full or half-duplex communications
- RS232-C, RS423/RS449, or V.35 compatible depending on version selected

Specifications

Mounting Code: 1 quad slot (all versions)

Power Requirements:
DC amps drawn at +5 V: 4.7 (DMV11-A, -B, -F), 4.4 (DMV11-C)
DC amps drawn at +12 V: 0.4 (DMV11-A, -B, -F), 0.26 (DMV11-C)

Bus Loads: AC 2, DC 1 (all versions)

I/O Connection Panel Inserts:
Size B (DMV11-A, -F),
Size A (DMV11-B, -C)

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

Table 4.20
DMV11
Order Codes

Option	Order Code
EIA RS-232-C/CCITT V.28 or EIA RS-423/RS-449 interfaces. Includes base module only.	DMV11-M
For system installation select the appropriate external cable and one of the following cabinet kits:	
EIA RS-232-C/CCITT V.28 cabinet kit. 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 (MICRO/PDP-11).	CK-DMV11-AB
For use with H9642 Micro cab (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
EIA RS-423/RS-449 cabinet kit. 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 (MICRO/PDP-11).	CK-DMV11-FB
For use with H9642 Micro cab (MicroVAX II, MicroPDP-11).	CK-DMV11-FF
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-F3
CCITT V.35 and integral modem interfaces.	
Select the appropriate external cables and one of the following cabinet kits:	DMV11-M
CCITT V.35 cabinet kit. 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 cab (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
Integral modem cabinet kit. 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 (MICRO/PDP-11).	CK-DMV11-CB
For use with H9642 Micro cab (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
Base module only.	DMV11-N

DPV11

The DPV11 is a low-cost single-line synchronous programmable interface that provides local or remote interconnection between Q-bus systems and other computer systems with EIA RS232-C/CCITT V.28 or EIA RS232-C/CCITT V.11 interfaces. It operates 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.

The DPV11 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
- RS232-C compatible

Specifications

Mounting Code: 1 double slot

Power Requirements:
DC amps drawn at +5 V: 0.9
DC amps drawn at +12 V: 0.3

Bus Loads: AC 1, DC 1

I/O Connection Panel Insert: Size A

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

Table 4.21
DPV11
Order Codes

Option	Order Code
Includes base module only.	DPV11-M
For system installation 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

TOPS-10/TOPS-20 Synchronous Devices

DN20/DN20F

The DN20/DN20F is a one-to-four-line synchronous line controller (KMC11/DUP11) that provides interconnection between DECSYSTEM-20s (2040, 2060) and DECsystem-10s and other computer systems with EIA-RS-232-C/CCITT V.28 interfaces. The DN20/DN20F operates at speeds up to 19,200 bits per second in direct memory access mode with full modem control.

For more detailed information, please refer to the *LSM Product Summary.*

Table 4.22
DN20/DN20F
Order Codes

Option	Order Code
One-to-four line synchronous line controller. Data communications universal front end with 128K words of MOS memory. Requires the addition of DN20-XX or DMR11-XX options for synchronous operations. *Prerequisite:* DECSYSTEM-20.	DN20-MB
Data communications universal front end with 128K words of MOS memory which requires the addition of DN20-XX, DMR11-XX, or DN25-XX options for synchronous and asynchronous operations. *Prerequisite:* DECsystem-10.	DN20-MD
DN20-MB and QTD04-AM *Prerequisite:* DECSYSTEM-20.	DN20-MF
DN20-MD and QH683-AM *Prerequisite:* DECsystem-10.	DN20-MJ
Upgrade kit which can expand memory from 32K words core to 128K words MOS. *Prerequisite:* DN20-CX.	DN20-MU
FCC compliant data communications universal front end with 128K words of MOS memory. Requires the addition of DN20F-BX or DMR11-XX options for synchronous operations. *Prerequisite:* DECSYSTEM-20.	DN20-MA
FCC compliant data communications universal front end with 128K words of MOS memory which requires the addition of DN20F-BX, or DMR11-XX options for synchronous operations. *Prerequisite:* DECsystem-10.	DN20F-MC
DN20F-MA and QTD04-AM *Prerequisite:* DECSYSTEM-20.	DN20F-ME
DN20F-MC and QH683-AM *Prerequisite:* DECsystem-10.	DN20F-MH
Synchronous expansion drawer including one low-speed line interface (KMC11/DUP11) expandable to four lines with the addition of the DN20F-BA. *Prerequisite:* DN20F-BA.	DN20-DA DN20-DB
FCC compliant low-speed synchronous line controller including one low-speed line interface (KMC11/DUP11) expandable to four lines with the addition of DN20F-BBS. *Prerequisite:* DN20-M or DN20F-M.	DN20F-BA
FCC compliant low-speed synchronous line interface (DUP11) for speeds between 2.4 Kb and 19.2 Kb baud (EIA RS-232-C/CCITT V.28 modem interface). *Prerequisite:* DN20F-BA or DN20-DA or DN20-BA.	DN20F-BB

Asynchronous/Synchronous Communications Controllers

DMB32

The DMB32 is a high performance DMA intelligent communications controller for the VAXBI family of computer systems. It provides 10 communication lines—8 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 per 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.

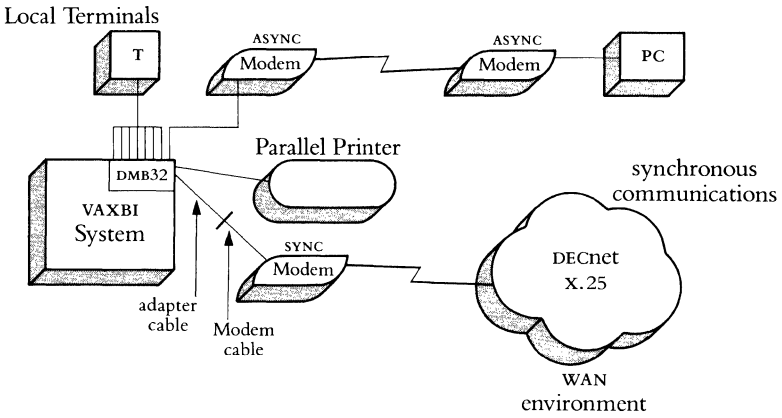
The one synchronous line supports message framing, and CRC generation and verification with full modem control for the HDLC, SDLC, BISYNC, DDCMP, and GEN BYTE protocols. It is capable of operating at speeds up to 64 Kb/s for HDLC and SDLC protocols, and 19.2 Kb/s for DDCMP. Other protocols are supported 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 LN01, LP25, LP26, LP27, LXY12, LXY22, and LG01 parallel printers.

Features

- Asynchronous communications:
  - Eight communication lines, RS232 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 RS232-C, RS422-A, RS423-A, and V.35 compatability.
  - 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 LN01, 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 on or reset.

Figure 4.4
DMB32 Typical Configuration



Synchronous Device Driver

A device driver for the synchronous line, which supports point-to-point communications, must be ordered separately. Refer to the DMB32 Software Order Code Table for ordering information.

Adapter Cables

The appropriate two foot adapter cable must be ordered to connect the DMB32 50 pin D-subminature connector to the selected 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.

Specifications

Mounting Code: One VAXBI module (T1012)—9.18 in × 8.00 in
One Distribution panel (H3033)—4 panel width

Power Requirements:
DC amps drawn at +5 V: 6.75 A
DC amps drawn at +12 V: 300 mA
DC amps drawn at −12 V: 425 mA

Environmental Class: C

Required Software

- VAX/VMS Operating System V4.4 or later.
- DMB32 Synchronous Device Driver V1.0.

Required Hardware

- A VAXBI system configuration. (Refer to the DMB32 Software Order Code Table for a list of supported processors.)
- A minimum of 17 KB of nonpaged pool memory for the driver and additional non-paged pool for application dependent buffer requirements
- 100 blocks of system disc space for installation and permanent use
- Adapter cable for synchronous line.

Table 4.23
DMB32 Software Order Codes
(DMB32 Synchronous Device Driver)

Option	Order Code			
License Options: *A license is required for each CPU.*	**VAX 8200 VAX 8250**	**VAX 8300 VAX 8350**	**VAX 8500 VAX 8530 VAX 8550**	**VAX 8700 VAX 8800**
Single-use license	Q5Z03-UZ	Q7Z03-UZ	Q*Z03-UZ	Q*Z03-UZ
VAXcluster license	Q5Z03-QZ	Q7Z03-QZ	Q*Z03-QZ	Q*Z03-QZ
Materials and Service Options:				
Distribution and documentation	Q5Z03-HM Q5Z03-H3	Q7Z03-HM Q7Z03-H3	Q*Z03-HM	Q*Z03-HM
Software revision right-to-copy	Q5Z03-HZ	Q7Z03-HZ	Q*Z03-HZ	Q*Z03-HZ
Documentation only	QLZ03-GZ	QLZ03-GZ	QLZ03-GZ	QLZ03-GZ
U.S. Packaged Service Options:				
DECsupport service	Q5Z03-9M Q5Z03-93	Q7Z03-9M Q7Z03-93	Q*Z03-9M	Q*Z03-9M
Basic service	Q5Z03-8M Q5Z03-83	Q7Z03-8M Q7Z03-83	Q*Z03-8M	Q*Z03-8M
Self-maintenance service	Q5Z03-3M Q5Z03-33	Q7Z03-3M Q7Z03-33	Q*Z03-3M	Q*Z03-3M

* = 9 for VAX 8500 and 8530, 2 for 8550 and 8700, M for 8800.

Table 4.24
DMB32 Hardware Order Codes

Option	Order Code
Includes base module only.	DMB32-M
For system installation, select the appropriate external cables and one of the following cabinet kits:	
For use with shielded cabinets (VAX 8500, VAX 8800).	CK-DMB32-LJ
For use with shielded cabinets (VAX 8200, VAX 8300).	CK-DMB32-LM
For use with expansion cabinets (VAX 8800).	CK-DMB32-LN
Synchronous line adapter cable:	
For use with CCITT V.35	BC19F-02
For use with CCITT V.24/RS-232	BC19D-02
For use with RS-422	BC19B-02
For use with RS-423-A	BC19E-02

DMF32

The DMF32, a multifunction communications controller, provides interconnection between modems and 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 VAX/VMS operating system, DECnet-VAX networking software, and VAX PSI communications software.

The eight-line asynchronous multiplexer operates at speeds up to 19,200 bits per second at full-duplex in either DMA mode or SILO (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 19,200 bits per second in DMA mode with full modem control and supports both bit- and byte-oriented protocols. The general purpose parallel interface operates with either a line-printer (in DMA mode) or a user-specific device (DMA mode or SILO 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
  - RS232-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
  - RS232-C compatible
- Parallel printer line supports LP27 generic specifications
- Comprehensive self-test
- Software support for VMS and ULTRIX-32

Specifications

Mounting Code: 1 hex slot

Power Requirements:
DC amps drawn at +5 V: 8.0
DC amps drawn at +15 V: 0.5
DC amps drawn at −15 V: 0.5

Bus Loads: AC 6, DC 1

I/O Connection Panel Inserts: 4 panel units

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

Table 4.25
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 bracket included.	CK-DMF32-LI

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 RS-232-C/CCITT V.28, EIA RS-422/CCITT V.11, or RS-423/CCITT V.10 and V.35 interfaces for networking or custom communications applications. The KCT32 operates at speeds up to 64,000 bits per second for two lines, and 160,000 bits per second 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

Mounting Code: 1 hex slot

Power Requirements:
DC amps drawn at +5 V: 6.0

Bus Loads: AC 4.5, DC 1

I/O Connection Panel Insert: 1 panel unit

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

Table 4.26
KCT32 Optional Software Order Code

Option	Order Code
VAX KCT32 software tools	Q*128-xx

Table 4.27
KCT32 Order Codes

Option	Order Code
Two-lines provide asynchronous or synchronous communications between VAX systems and other devices with CCITT V.35. Includes M7099 CCITT V.35 interface quad board, H3004 CCITT V.35 interface panel and H3250-00 test connector	KCT32-AB
EIA RS-422/CCITT V.11 version with basic system unit, H3002, EIA RS-422/CCITT V.11 interface panel and H3251-00 test connector	KCT32-AE
EIA RS-232-C/CCITT V.28 version with basic system unit, H3001, EIA RS-232-C/CCITT V.28 interface panel, and H3251-00 connector modem test	KCT32-FA
EIA RS-423/RS-449 version with basic system unit, H3003 EIA RS-423/RS-449 interface panel and H3251-00, EIA RS-423/RS-449 test connector	KCT32-FF

KMV1A

The KMV1A is a high performance direct memory access single-line programmable communications controller that provides interconnection between Q-bus systems with EIA RS-232-C/CCITT V.28, EIA RS-422/CCITT V.11, and EIA RS-423/CCITT V.10 interfaces. It is capable of communications speeds up to 64,000 bits per second. Used on the PDP-11/23, PDP-11/23-PLUS, MicroVAX II, 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, RSX-11M-PLUS, and Micro/RSX systems. Software support is available for VAX PSI, X.25 Link Level, and Development Tools on a MicroVAX II.

Specifications

Mounting Code: 1 quad slot

Power Requirements:
DC amps drawn at +5 V: 2.6
DC amps drawn at +12 V: 0.2

Bus Loads: AC 3, DC 1

I/O Connection Panel Insert: PDP-11/23, MicroPDP-11, MicroVAX II = Size B
PDP-11/23-PLUS = Size C

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

Table 4.28
KMV1A Optional Software Order Codes

Option	Order Code
RSX KMV software tools	QJS98-xx
RSX X.25 link level	QJS97-xx
RSX-11M HDLC framing	QJS32-xx
RSX-11M-PLUS HDLC framing	QJS39-xx
VAX PSI	QZ071-xx
KMV1A MicroVMS driver	QZZ35-xx
KMV1A MicroVMS software tools	QZZ36-xx
KMV1A MicroVMS X.25 link level	QZZ37-xx

Table 4.29
KMV1A
Order Codes

Option	Order Code
Single-line, direct memory access, programmable communications controller. Controller module only.	KMV1A-M
For system installation, select one of the following cabinet kits.	
RS-232 for PDP-11/23S and BA123	CK-KMV1A-AA
RS-232 for BA23	CK-KMV1A-AB
RS-232 for PDP-11/23-PLUS	CK-KMV1A-AC
RS-232 for MicroVAX II System 5	CK-KMV1A-AF
RS-422 for PDP-11/23S and BA123	CK-KMV1A-EA
RS-422 for BA23	CK-KMV1A-EB
RS-422 for PDP-11/23-PLUS	CK-KMV1A-EC
RS-422 for MicroVAX II System 5	CK-KMV1A-EF
RS-423 for PDP-11/23S and BA123	CK-KMV1A-FA
RS-423 for BA23	CK-KMV1A-FB
RS-423 for PDP-11/23-PLUS	CK-KMV1A-FC
RS-423 for MicroVAX II System 5	CK-KMV1A-FF

KXT11-AB

The KXT11-AB is a 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.

Specifications

Mounting Code: one double slot

Power Requirements:
DC amps drawn at +5 V: 2.8 A maximum
DC amps drawn at +12 V: 1.1 mA maximum

Bus Loads: AC 2.7 unit loads; DC .5 unit load

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

Table 4.30
KXT11-AB
Order Codes

Option	Order Code
SBC-11/21 single-board, 16-bit processor with 16 Kbytes of static RAM	KXT11-AB

KXT11-CA

The KXT11-CA is a PDP-11 (T11) 16-bit, single-board processor that can operate as a standalone processor or a peripheral processor.

Applications for the KXT11-CA may 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.XX for RT-11, SPD 13.25.XX for RSX, SPD 18.48.XX for Micro/RSX, and SPD 28.29.XX for MicroVMS.

Features

- PDP-11 (T11) 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
- twenty-bit programmable parallel port (4 control lines and 16 data lines)

Specifications

Mounting Code: one quad slot

Power Requirements:

DC amps drawn at +5 V: 4.0 A maximum

DC amps drawn at +12 V: 0.4 A maximum

Battery backup at +5 V: 20 mA maximum

Bus Loads: AC 2.0 unit loads; DC 1.0 unit load

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

Table 4.31
KXT11-CA Order Codes

Option	Order Code
Single-board PDP-11 (T11) 16-bit processor	KXT11-CA

KXJ11-CA

The KXJ11-CA is a PDP-11 (J11) 16-bit, single-board processor that can act as a realtime processor, co-processor, 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 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.XX for RT-11, SPD 13.25.XX for RSX, SPD 18.48.XX for Micro/RSX, and SPD 28.29.XX for MicroVMS.

Features

- PDP-11 (J11) processor with Q-bus compatibility
- 512 Kbytes 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
- twenty-bit programmable parallel port (4 control lines and 16 data lines)

Specifications

Mounting Code: one quad slot

Power Requirements:

DC amps drawn at +5 V: 6.0 A maximum

DC amps drawn at +12 V: 2.0 A maximum

Bus Loads: AC 3.0 unit loads; DC 0.5 unit load

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

Table 4.32
KXJ11-CA Order Codes

Option	Order Code
Single-board PDP-11 (J11) 16-bit processor	KXJ11-CA
KXJ11-CA User's Guide	EK-KXJCA-UG

Modems

This product set is currently not available in all countries. Refer to Tables 4.35 and 4.36 for availability.

Ordering Information

To order modems, refer to the selection charts in Tables 4.33 and 4.34, then turn to the specific product description for the appropriate order codes.

100 Series modems are available in desktop and rackmount options. The DF224 "Scholar" is available only in the desktop option.

Table 4.33
Dial-up Line Modem Chart

Asynchronous Communications

	Full Duplex			Half Duplex
Data Rate	2400bps (1200bps) (300bps)	2400bps (1200bps)	1200bps (300bps)	2400bps (1200bps)
Functional Compatibility	CCITT V.22bis BELL 212A	CCITT V.22bis BELL 212A	 BELL 212A	DEC DF126
DEC Modem	**DF224***	**DF124**	**DF112**	**DF126**

Synchronous Communications

	Full Duplex			Half Duplex
Data Rate	1200bps	2400bps (1200bps)	2400bps (1200bps)	2400bps (1200bps)
Functional Compatibility	 BELL 212A	CCITT V.22bis BELL 212A	CCITT V.22bis BELL 212A	 BELL 201-C
DEC Modem	**DF112**	**DF124**	**DF224***	**DF126**

*Desktop only

If more information is required, customers may call the Add-on Consulting Center: 800-343-4040 Ext. 535 (in New Hampshire, 1-884-7990).

Table 4.34
Private/Leased Line
Modem Chart

Synchronous Communications

	Full Duplex					Half Duplex
Data Rate	9600bps (7200bps) (4800bps)	4800bps (2400bps)	2400bps (1200bps)	2400bps (1200bps)	1200bps	4800bps (2400bps)
Functional Compatibility	CCITT V.29	CCITT V.27	BELL 201B	CCITT V.22bis BELL 212A	DEC DF112 Only	CCITT V.27
DEC Modem	**DF129**	**DF127**	**DF126**	**DF124**	**DF112**	**DF127**

Asynchronous Communications

	Full Duplex			Half Duplex
Data Rate	2400bps (1200bps)	1200bps	2400bps (1200bps)	
Functional Compatibility	CCITT V.22bis BELL 212A	DEC DF112	DEC DF126	
DEC Modem	**DF124**	**DF112**	**DF126**	

All DF100 Series modems are available in desktop and rack mount options.

DF100 Series

The DF100 series of modems provides remote interconnection between Digital systems. DF100 series modems operate in either asynchronous or synchronous mode at half- or full-duplex at speeds ranging from 300/1,200 bits per second to 9,600 bits per second, depending on the version selected. They support standard EIA RS-232-C and EIA RS-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/ITN) in the U.S. and Canada.

The DF100 series of modems was designed to utilize three different standard enclosures: one for standalone desktop modem applications (DF100-DT), one for multiple modem (rack mount) applications (DF100-RM), and one for the DFM series of statistical multiplexers.

The *DF112* is a 300 or 1,200 bit-per-second dual speed full-duplex dial-up PSTN asynchronous/synchronous modem with integral autodialer. It replaces the existing DF03 series of modems. The DF112 was designed for use in both standalone modem and multiple (RACK) modem environments. The DF112 is compatible in operation to Bell 103/212A modems. Note: The DF112 replaces the DF01, DF02, and DF03 modems.

The *DF124* is a 2400 or 1200 bit-per-second full duplex asynchronous and synchronous modem for dial-up and leased line telephone networks. It has an integral auto-dialer and is designed to support desktop, multiple (rack) modem, and DFM statistical multiplexer configurations. The DF124 is compatible in operation to CCITT V.22bis, CCITT V.22 and Bell 212A modems.

The *DF126* is a 2400 bps synchronous/asynchronous half-duplex dial-up line and full duplex leased line modem. It can also be used in leased line multi-point communication environments. It includes an asynchronous integral auto-dialer 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 modems.

The *DF127* is a 4800 bps 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. It is compliant with worldwide PTT requirements.

The *DF129* is a 9600 bit per second synchronous, full duplex, leased line modem that is CCITT V.29 compatible. It is capable of fall back speeds of 7200 and 4800 bits per second. The DF129 is designed for use in desktop, multiple modem (rack), and DFM statistical multiplexer configurations. It is compliant with worldwide PTT requirements.

Specifications

Physical Size for DF112-AA, DF124-AA, 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 lbs, 13 oz)

Physical Size for DF112-AM, DF124-AM, DF126-AM, DF127-AM, DF129-AM:
Height: 25.4 mm (1 in)
Width: 203 mm (8 in)
Depth: 264 mm (10.4 in)
Weight: .55 kg (1 lb, 4 oz)

Power Requirements:

Product	DC amps drawn at: +5V	+12V	−12V
DF112-AM	0.15	0.15	0.45
DF124-AM	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

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

Table 4.35 DF100 Series Order Codes

Option	Order Code
DF112 desktop modem for U.S./Canada	DF112-AA
DF112 modem module for U.S./Canada	DF112-AM
DF124 desktop modem for U.S./Canada	DF124-AA
DF124 modem module for U.S./Canada	DF124-AM
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

* Also available in Holland.

DF224

The DF224, "Scholar," is a low profile desktop modem with external wall mount power supply. It operates at 2400, 1200, and 300 bps full duplex over dial-up (PSTN) lines. The DF224 asynchronous and synchronous integral autodialer stores up to 15 telephone numbers, which may also be identified by an ID name of 6 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.22bis, CCITT V.22 and Bell 103/212A modems.

Specifications

Physical Size for DF224-AA:
Height: 30.3 mm (1.19 in)
Width: 152.4 mm (6.00 in)
Depth: 219.0 mm (8.62 in)
Weight: .539 Kg (1.19 lbs) including power supply

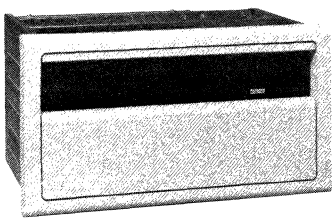
Power Requirements:
DC amps drawn at +5V: 0.80
DC amps drawn at +12V: 0.10
DC amps drawn at −12V: 0.10

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

Table 4.36
DF224 Modem Order Code

Option	Order Code
2400/1200/300 FDX desktop modem "Scholar" for U.S. and Canada	DF224-AA
2400/1200/300 FDX desktop modem "Scholar" for Japan	DF224-AJ

Multiple Modem (Rack Mount) Enclosure



The multiple modem (rack mount) enclosure provides on-line 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 on-line users. The enclosure connects to either dial-up or leased telephone lines. For dial-up communications, RJ21X telephone service is required, and for leased line communications, either 2 or 4 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 6 Amp integral power supply.

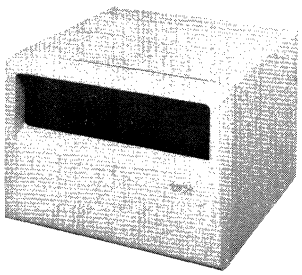
Table 4.37
Multiple Modem Enclosure Order Code

Option	Order Code
6 amp multiple modem enclosure for U.S./Canada	DF100-RM

Statistical Multiplexers

This product set is currently available in the U.S., Canada, Holland, England, and Germany only.

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 sixteen EIA RS232C data channels over a single high speed communication link. These data channels interface to terminals, personal computers, workstations, modems, and computer ports.

The DFM Series has been designed with multi-microprocessor 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 4 to 16 channels with and without integral 4.8 and 9.6 K/bps modems.

DFM Series
(Continued)

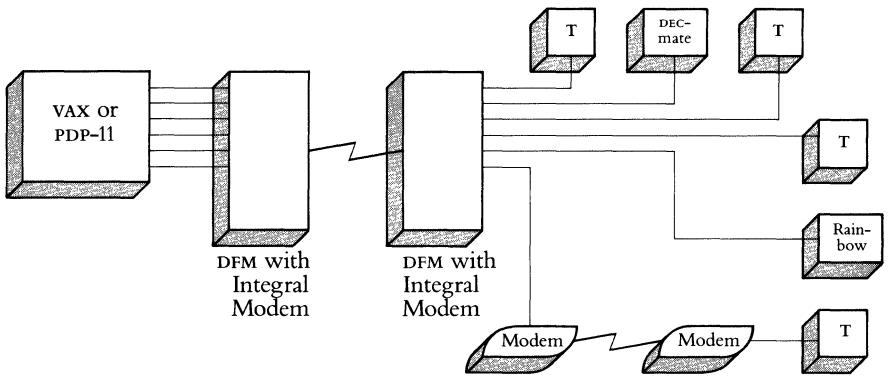
Channel switching and contention features provide the flexibility required in the rapidly changing data communication environments. Any switched channel end can be connected to any other authorized switched channel in the network. The contention feature allows a DFM at one end of the network to be connected 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 conventional terrestrial link facilities, as well as microwave, fiber optics or satellite components. 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. DFM's are available for sale in the U.S., Canada, Holland, and England. They may be purchased bundled with data cables designated by the SX order code. Call the CSS Sales Support Team at 800-832-6277 for further information. Add on options with an VAX order code do not include cables. Cables may be purchased separately from the DECdirect Catalog. Verify with specific countries for particular options available.

Features

- Asynchronous and synchronous data channels
- Network control and management
- Channel switching
- Port contention with queueing
- Modem control, all channels
- Network diagnostics
- Optional 4.8/9.6 K/bps integral modems
- Automatic speed detection
- Speed conversion
- Flow control conversion
- Local and remote echo
- Easy expansion from 4 lines to 16 lines

Figure 4.5
DFM Statistical Multiplexer Configuration



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

Table 4.38
DFM Series
Order Codes

Option	Order Code
4-channel DFM with no modem and:	
With 5 Cables	DFM04-SA
With No Cables	DFM04-AA
4-channel DFM with 4.8K bps integral modem and:	
With 5 Cables	DFM04-SB
With No Cables	DFM04-AB
4-channel DFM with 9.6K bps integral modem and:	
With 5 Cables	DFM04-SC
With No Cables	DFM04-AC
8-channel DFM with no modem and:	
With 9 Cables	DFM08-SA
With No Cables	DFM08-AA
8-channel DFM with 4.8K bps integral modem and:	
With 9 Cables	DFM08-SB
With No Cables	DFM08-AB
8-channel DFM with 9.6K bps integral modem and:	
With 9 Cables	DFM08-SC
With No Cables	DFM08-AC
12-channel DFM with no modem and:	
With 13 Cables	DFM12-SA
With No Cables	DFM12-AA
12-channel DFM with 4.8K bps integral modem and:	
With 13 Cables	DFM12-SB
With No Cables	DFM12-AB
12-channel DFM with 9.6K bps integral modem and:	
With 13 Cables	DFM12-SC
With No Cables	DFM12-AC
16-channel DFM with no modem and:	
With 17 Cables	DFM16-SA
With No Cables	DFM16-AA
16-channel DFM with 4.8K bps integral modem and:	
With 17 Cables	DFM16-SB
With No Cables	DFM16-AB
16-channel DFM with 9.6K bps integral modem and:	
With 17 Cables	DFM16-SC
With No Cables	DFM16-AC
4-channel expansion line card for DFM08 option	DFMXX-4E
8-channel expansion line card for DFM08 option	DFMXX-8E
2.4K bps integral modem for all DFM models	DF126-AM
4.8K bps integral modem for all DFM models	DF127-AM
9.6K bps integral modem for all DFM models	DF129-AM

Packet Assembler/Disassembler

DFM X.25 PAD

The DFM X.25 PAD (Packet Assembler/Disassembler) is a freestanding concentrator that connects asynchronous devices to X.25 Public and Private Packet Data Networks. With the same enclosure as the DFM satistical multiplexer, the DFM X.25 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 DFM X.25 PAD's channel expansion cards (DFMXX-4E or DFMXX-8E) are available for field upgradable expansion in increments of 4 and 8 channels.

The DFM X.25 PAD concentrates the asynchronous data from four, eight, twelve or sixteen terminals or host computer ports onto a single high speed synchronous X.25 leased access line. The DFM X.25 PAD is compatible with 1980 X.25 industry standards recommended by the international standards committee (CCITT). Video terminals and personal computers connected to the local DFM X.25 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 via the PSDN.

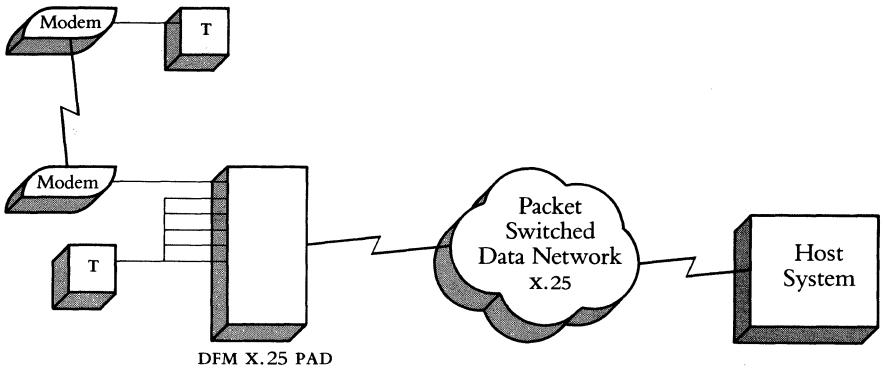
The DFM X.25 PAD supports a single synchronous access line to the PSDN at speeds ranging from 2400 bps up to 64K bps. Most public applications will provide, as part of the basic service, the pair of leased line modems and the leased telephone line to access the X.25 network. However, in private applications, Digital's two optional integral modems may be used to access the X.25 network: the DF127-AM operates at 4800 bps and the DF129-AM operates at 9600 bps.

The DFM X.25 PAD is certified for connection to TYMNET and TELENET networks in the United States and the DATAPAC network in Canada.

Features

- Fully compatible with 1980 CCITT recommendations 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 upgradable 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 64K bps.
- Dedicated supervisory channel and user friendly self prompting software commands allow independent configuring of system, channel and link parameters in non volatile memory.

Figure 4.6
DFM X.25 PAD
Terminal to Host
Application



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

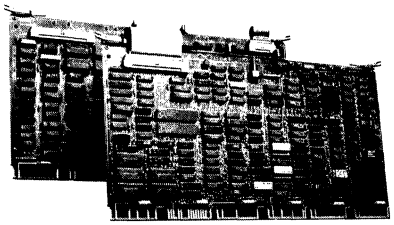
Environmental Class: Class B (Refer to Appendix B for details.)

Table 4.39
DFM X.25 PAD
Order Codes

Option	Order Code
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	DFX25-CM
Channel Expansion Modules:	
4 channel expansion module for DFX08	DFMXX-4E
8 channel expansion module for DFX04 and DFX08	DFMXX-8E
Integral Modems:	
4800 bps synchronous modem	DF127-AM
9600 bps synchronous modem	DF129-AM

Computer-to-PBX Interface

CPI32



This product is currently available only in the U.S. and Canada.

CPI32 is a 1.54 megabit per second, 24-channel asynchronous multiplexed link that provides local and remote interconnection between UNIBUS VAX systems and a compatible interface at a voice/data Private Branch Exchange (PBX). CPI32 implements the Computer-to-PBX Interface (CPI) specification developed jointly by Digital and Northern Telecom Inc. CPI32 channels operate at program-selectable speeds up to 19,200 bits per second. It uses T1 carrier technology to permit direct copper wire connection up to 400 meters (1310 feet) between PBX and VAX systems. CPI32 is a low-cost and efficient means of connecting a VAX to an advanced voice/data PBX. A compatible interface on the PBX side is sold by Northern Telecom Inc. for their Meridian SL-1 PBX models. CPI32 is supported only on UNIBUS VAX systems. It is not currently supported on the BI-based VAX systems (VAX 8200, 8300, 8500, 8550, 8700, 8800) either through the UNIBUS adapter or in native mode. Call 1-800-832-6277, extension CPI, for further information.

Features and Benefits

- Reduced complexity—CPI32 simplifies configuration requirements because it eliminates the need for data access modules and associated cabling between the PBX and VAX.
- Lower costs—Through reduced hardware needs (e.g. DAMs, cabling, etc.), the customer's PBX-to-VAX connection cost is reduced substantially.
- LAN/WAN interconnection—CPI32 allows a customer to integrate voice and data communications through a PBX to a VAX and utilize the communication facilities on a VAX such as ETHERNET and DECnet.
- Transparent Integration—Digital and Northern Telecom will attempt to make the support and service of two different products (the computer and the PBX) as transparent to the customer as is reasonable.
- Compatibility with existing applications—CPI uses standard VMS V4.x and a standard DMF32 driver. The entire PBX system becomes invisible to the application, and data coming into the VAX appears as if it is coming from directly connected terminals.

Specifications

Mounting Code: 2 hex slots

Power Requirements:
M7883-DC amps drawn at +5V: 6.5, +15V: 0.1
M7884-DC amps drawn at +5V: 6.5

Bus Loads: DC 1

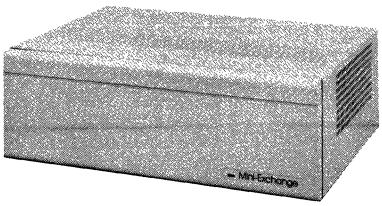
I/O Connection Panel Inserts: 2 panel inserts

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

Table 4.40
CPI32
Order Code

Option	Order Code
24-channel UNIBUS-to-PBX asynchronous multiplexer for use with asynchronous terminals. Includes intermodule, M7883-to-I/O panel ribbon cables.	
Required cabling is two, twisted, shielded wire pairs specified for T1 use. Provision/installation of T1 cabling between the PBX and VAX systems and a 15-pin, D sub-miniature, male connector (Cannon ITT DAU-15P or equivalent) is the joint responsibility of the customer and the PBX vendor.	CPI32-A

Mini-Exchange Personal Computer Port Selector



The Mini-Exchange is a microprocessor-based, standalone, asynchronous circuit switch designed for local connection of up to eight of Digital's personal computers (DECmate II, Rainbow personal computer, and Professional 300 series). It operates at speeds of up to 19,200 bits per second. Modem control is offered on line eight only. The Mini-Exchange offers DCS product support for file transfer operations to IBM PC/XT, Apple II and III, and TRS-80 systems.

The Mini-Exchange is the least costly method of connecting personal computers and associated devices within a 60 meter (200 foot) area. It provides flexibility in designing local hardware configurations and allows asynchronous communications to other Mini-Exchanges for host systems over modems.

Specifications

Physical Size:
Height: 10.16 cm (4.0 in)
Width: 22.86 cm (9.0 in)
Length: 31.75 cm (12.5 in)
Weight: 2.7 kg (6 lbs)

Power Requirements:
120 V, 60 Hz: 92 W
240 V, 50 Hz: 92 W

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

Table 4.41 Mini-Exchange Order Code

Option	Order Code
Asynchronous circuit switch for local connection of up to eight-lines. Mini-Exchange circuit switch	DFMSA-AA
Associated Cables:	
The Mini-Exchange circuit switch requires standard EIA (BCC04 type) cables.	

Communications Cables

Table 4.42 lists the order codes and the available lengths (designated by the extension) for all the 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.

Table 4.42
Communications Cables
Order Codes

Order Code	Description	Where Used	Length
BC04R-10	Round, 6-wire, general purpose module termination cable assembly	20mA I/O devices (DZ11)	3.05 m (10 ft)
BC04R-12			3.66 m (12 ft)
BC04R-15			4.57 m (15 ft)
BC04R-18			5.49 m (18 ft)
BC04R-25			7.62 m (25 ft)
BC04R-50			15.24 m (50 ft)
BC04R-60			18.29 m (60 ft)
BC04R-75			22.86 m (75 ft)
BC04R-A0			30.48 m (100 ft)
BC04R-A5			45.72 m (150 ft)
BC04R-B0			60.98 m (200 ft)
BC04R-C0			91.46 m (300 ft)
BC04R-D0			121.95 m (400 ft)
BC05F-15	Round, 6-wire, male 8-pin connector	20mA I/O devices (DL11)	4.6 m (15 ft)
BC05F-50			15.2 m (50 ft)
BC05F-A0			30.5 m (100 ft)
BC16C-10	36 position, straight-to-right angle, male to male, shielded, 18 twisted pair cable assembly.	DECconnect, DEC423 Q-bus products	3.05 m (10 ft)
BC16C-25			7.62 m (25 ft)
BC16D-10	36 position, right angle-to-right angle, male to male, shielded, 18 twisted pair extension cable.	DECconnect, DEC423 Q-bus products	3.05 m (10 ft)
BC16D-25			7.62 m (25 ft)
BC16D-50			15.24 m (50 ft)
BC16D-150			45.7 m (150 ft)
BC16E-02	Terminated six-conductor cable for terminal interconnection (DEC Office Cable)	DECconnect standard terminal interconnect cable	
BC16E-10			3.1 m (10 ft)
BC16E-25			7.6 m (25 ft)
BC16E-50			15.2 m (50 ft)
BC16K-02	ThinWire patch cord	Patches ThinWire patch panel to DEMPR	0.6 m (2 ft)
BC16K-10			3.05 m (10 ft)
BC16M-06	RG58 C/U-type ThinWire Ethernet PVC cable with connectors and boots	ThinWire Ethernet Products	1.8 m (6 ft)
BC16M-15			4.6 m (15 ft)
BC16M-30			9.2 m (30 ft)

Table 4.42
Communications Cables
Order Codes (Continued)

Order Code	Description	Where Used	Length
BC16N-10	36 pin to 8-25 pin adaptor cable	DECconnect products, connects patch panel to DSRVA in Satellite Equipment Room	3.05 m (10 ft)
BC17C-10	Full EIA RS-232-C/CCITT V.28 modem cable, round, 25-wire, fully-shielded, male to female molded connectors	Ethernet Communications Servers (DCSAX-LA line cards)	3.1 m (10 ft)
BC17C-25			7.6 m (25 ft)
BC17C-35			10.7 m (35 ft)
BC17C-50			15.2 m (50 ft)
BC17C-75			22.9 m (75 ft)
BC17C-A0			30.5 m (100 ft)
BC17C-B0			61.0 m (200 ft)
BC17C-B5			76.2 m (250 ft)
BC17D-02	EIA RS-232-C/CCITT V.28, fully-shielded, null modem, 10-wire, female to female molded connectors	Ethernet Communications Servers (DCSAX-LB line cards)	0.6 m (2 ft)
BC17D-10			3.1 m (10 ft)
BC17D-25			7.6 m (25 ft)
BC17D-50			15.2 m (50 ft)
BC17D-A0			30.5 m (100 ft)
BC17E-25	CCITT V.35, fully-shielded, modem cable (Note: This cable has a RS-449 connector on the CPU end, and a V.35 connector on the modem end.)	Ethernet Communications Servers (DCSAX-LB line cards), DMR	7.6 m (25 ft)
BC17E-50			15.2 m (50 ft)
BC17E-A0			30.5 m (100 ft)
BC17E-A5			45.7 m (150 ft)
BC17E-B0			61.0 m (200 ft)
BC17E-B5			76.2 m (250 ft)
BC17L-04	EIA RS-232-C/CCITT V.28, 25-wire, fully-shielded, male to female connectors adapter cable	Ethernet Communications Servers (DCSAX-LA or DCSAX-LC line cards)	1.22 m (4 ft)
BC22D-10	Null modem cable, round, 6-wire, fully shielded, EIA RS-232-C/CCITT V.28, female to female molded connectors	Local connection of asynchronous terminals	3.1 m (10 ft)
BC22D-25			7.6 m (25 ft)
BC22D-35			10.7 m (35 ft)
BC22D-50			15.2 m (50 ft)
BC22D-75			22.9 m (75 ft)
BC22D-A0			30.5 m (100 ft)
BC22D-A5			45.7 m (150 ft)
BC22D-B0			61.0 m (200 ft)
BC22D-B5			76.2 m (250 ft)

Table 4.42
Communications Cables
Order Codes (Continued)

Order Code	Description	Where Used	Length
BC22E-10	Modem cable, round, 16-wire, fully shielded, EIA RS-232-C/CCITT V.28, male to female molded connectors	Connection of asynchronous modems	3.1 m (10 ft)
BC22E-25			7.6 m (25 ft)
BC22E-35			10.7 m (35 ft)
BC22E-50			15.2 m (50 ft)
BC22E-75			22.9 m (75 ft)
BC22E-A0			30.5 m (100 ft)
BC22E-A5			45.7 m (150 ft)
BC22E-B0			61.0 m (200 ft)
BC22E-B5			76.2 m (250 ft)
BC22F-10	Full, EIA RS-232-C/CCITT V.28 modem cable, round, 25-wire, fully shielded, male to female molded connectors	Connection of synchronous and asynchronous modems	3.1 m (10 ft)
BC22F-25			7.6 m (25 ft)
BC22F-35			10.7 m (35 ft)
BC22F-50			15.2 m (50 ft)
BC22F-75			22.9 m (75 ft)
BC22F-A0			30.5 m (100 ft)
BC22F-A5			45.7 m (150 ft)
BC22F-B0			61.0 m (200 ft)
BC22F-B5			76.2 m (250 ft)
BC55D-10	RS-423/RS-449 interface connectors	Connection of DMR, DMP, DMV options	3.1 m (10 ft)
BC55D-25			7.6 m (25 ft)
BC55D-50			15.2 m (50 ft)
BC55S-25	Integral modem, triaxial cable with BNC connectors	Connection of current, fully-shielded DMR, DMP, DMV options	7.6 m (25 ft)
BC55S-50			15.2 m (50 ft)
BC55S-75			22.9 m (75 ft)
BC55S-A0			30.5 m (100 ft)
BC55S-B5			76.2 m (250 ft)
BC55S-E0			152.4 m (500 ft)
BC55S-L0			304.9 m (1000 ft)
BC55S-YA			1,067 m (3500 ft)
BC55T-25	Integral modem, twinaxial cable with BNC connectors	Used to connect current, fully-shielded DMR, DMP, DMV options	7.6 m (25 ft)
BC55T-50			15.2 m (50 ft)
BC55T-75			22.9 m (75 ft)
BC55T-A0			30.5 m (100 ft)
BC55T-B5			76.2 m (250 ft)
BC55T-E0			152.4 m (500 ft)
BC55T-L0			304.9 m (1000 ft)
BC55T-YA			1,067 m (3500 ft)

Table 4.42
Communications Cables
Order Codes (Continued)

Order Code	Description	Where Used	Length
BC56A-02	Male to male BC55S to BC55M adapter cable	Used to connect current, 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	Used to connect current, fully-shielded DMR, DMP, DMV options to old options using CPC plastic connectors	0.6 m (2 ft)
BC56D-02	Male to male BC55T to BC55N adapter cable	Used to connect current, 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	Used to connect current, fully-shielded DMR, DMP, DMV options to old options using CPC plastic connectors	0.6 m (2 ft)
BN25B-15	General purpose fiber-optic cable	Used to connect Ethernet remote repeaters (DEREP-RA/RB) and with fiber-optic LAN BRIDGE 100	15 m (49.2 ft)
BN25B-30			30 m (98.4 ft)
BN25B-60			60 m (196.8 ft)
BN25B-90			90 m (295.2 ft)
BN25B-A5			150 m (492 ft)
BN25B-C0			300 m (984 ft)
BN25B-E0			500 m (1640 ft)
BN25B-H5			750 m (2460 ft)
BN25B-L0			1000 m (3280 ft)
BNE2A-MA	Teflon-insulated coaxial cable	Ethernet	23.4 m (76.8 ft)
BNE2A-MB			70.2 m (230.3 ft)
BNE2A-MC			117 m (383.9 ft)
BNE2A-ME			500 m (1640.4 ft)
BNE2B-MA	PVC-insulated coaxial cable	Ethernet	23.4 m (76.8 ft)
BNE2B-MB			70.2 m (230.3 ft)
BNE2B-MC			117 m (383.9 ft)
BNE2B-ME			500 m (1640.4 ft)
H8244-A	Teflon-insulated ThinWire cable spool	ThinWire Ethernet products	300 m (1000 ft)
H8243-A	PVC-insulated ThinWire cable spool	ThinWire Ethernet products	300 m (1000 ft)
BNE3A-05	Straight angle PVC-insulated transceiver cable	Ethernet	5 m (16.4 ft)
BNE3A-10			10 m (32.8 ft)
BNE3A-20			20 m (65.6 ft)
BNE3A-40			40 m (131.2 ft)
BNE3B-05	Right angle PVC-insulated transceiver cable	Ethernet	5 m (16.4 ft)
BNE3B-10			10 m (32.8 ft)
BNE3B-20			20 m (65.6 ft)
BNE3B-40			40 m (131.2 ft)

Table 4.42
Communications Cables
Order Codes (Continued)

Order Code	Description	Where Used	Length
BNE3C-05	Straight angle Teflon-insulated transceiver cable	Ethernet	5 m (16.4 ft)
BNE3C-10			10 m (32.8 ft)
BNE3C-20			20 m (65.6 ft)
BNE3C-40			40 m (131.2 ft)
BNE3D-05	Right angle Teflon-insulated transceiver cable	Ethernet	5 m (16.4 ft)
BNE3D-10			10 m (32.8 ft)
BNE3D-20			20 m (65.6 ft)
BNE3D-40			40 m (131.2 ft)
BNE3H-05	Straight angle PVC-insulated transceiver cable	IEEE 802.3	5 m (16.4 ft)
BNE3H-10			10 m (32.8 ft)
BNE3H-20			20 m (65.6 ft)
BNE3H-40			40 m (131.2 ft)
BNE3K-05	Right angle PVC-insulated transceiver cable	IEEE 802.3	5 m (16.4 ft)
BNE3K-10			10 m (32.8 ft)
BNE3K-20			20 m (65.6 ft)
BNE3K-40			40 m (131.2 ft)
BNE3L-05	Straight angle Teflon-insulated transceiver cable	IEEE 802.3	5 m (16.4 ft)
BNE3L-10			10 m (32.8 ft)
BNE3L-20			20 m (65.6 ft)
BNE3L-40			40 m (131.2 ft)
BNE3M-05	Right angle Teflon-insulated transceiver cable	IEEE 802.3	5 m (16.4 ft)
BNE3M-10			10 m (32.8 ft)
BNE3M-20			20 m (65.6 ft)
BNE3M-40			40 m (131.2 ft)
BNE4C-02	Office Transceiver Cable with PVC insulation, straight connector	IEEE 802.3	2 m (6.6 ft)
BNE4C-05			5 m (16.4 ft)
BNE4D-02	Office Transceiver Cable with PVC insulation, right-angle connector	IEEE 802.3	2 m (6.6 ft)
BNE4D-05			5 m (16.4 ft)

Additional Hardware Product

DT07

The DT07 is a family of UNIBUS switches designed to connect a section of UNIBUS and associated peripherals to any one of up to four PDP-11 and/or VAX-11 processors. Switching may be accomplished manually or under program control to permit dynamic reconfiguration of UNIBUS peripherals for resource sharing or high-availability applications. The DT07 includes a watchdog timer that can be used to sense when the processor owning the switched section has halted or is executing an invalid program. When this occurs, the switched UNIBUS is automatically disconnected from the failing CPU and connected to the backup processor. A separate cabinet is recommended for the BA11-K switched UNIBUS box.

Specifications

Mounting Code: 1 hex slot

Power Requirements:
DC amps drawn at +5 V:3.5–4.5
DC amps drawn at +15 V:0.015
DC amps drawn at −15 V:0.05

Bus Loads: DC 1

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

Table 4.43
DT07
Order Codes

Option	Order Code
4-port radial package (120/240 VAC)	DT07-DV/DW
3-port radial package (120/240 VAC)	DT07-DT/DU
2-port isolated loop package (120/240 VAC)	DT07-BR/BS
2-port radial package (120/240 VAC)	DT07-DR/DS
2-port isolated loop component	DT07-BX
Dual control panel	DT07-FF
Mounting box (120/240 VAC)	BA11-KU/KV

Section 5
DECconnect
Communications System

DECconnect

Section 5

DECconnect Communications System

Overview

DECconnect communications includes the full family of Digital products from network electronics to cabling and connections. DECconnect provides access to corporate computer networks, telephone communications, and a video network.

DECconnect provides a simple, cost-effective cabling system that brings both high-performance baseband Ethernet and enhanced terminal interconnection to offices and work areas. Through specialized office wiring radiating from a faceplate to a centralized equipment area called the Satellite Equipment Room, DECconnect cabling allows a customer to connect terminals, PCs, and workstations to each other. And with standard Ethernet as a backbone, the customer has access to the data center and large mainframe resources throughout a company.

DECconnect combines four separate communications technologies into one cohesive networking solution:

- High-speed local area network (LAN) at 10Mb/s ThinWire Ethernet communications for PCs, workstations and departmental systems.
- Unshielded twisted-pair terminal communications (up to 19.2 Kb/s).
- Unshielded twisted pair cable connection for telephone systems.
- Standard broadband connection for video applications.

Separate cables are used for low speed data, high speed data, telephone, and, if required, video communications technologies. These cables follow standard industry wiring patterns and use radial topology from a centralized Satellite Equipment Room (SER) to a faceplate in the local work area. (The voice communications feature of the DECconnect Communications System does not apply in all European countries.)

As a central communications hub, the Satellite Equipment Room (SER) houses the active communications components. From the SER, communications cables radiate to the DECconnect faceplate in each office in the area.

The network cohesiveness is most apparent at the DECconnect faceplate, which provides plug-in connections for all four communications technologies. Each technology is immediately available to every user. Users can plug their terminals, personal computers, workstations, or departmental systems into the DECconnect faceplate as easily as they would plug in their telephones.

This section provides an overview of the DECconnect Communications System and component products. For a complete discussion of all aspects of DECconnect, refer to the DECconnect publications listed in Apendix D.

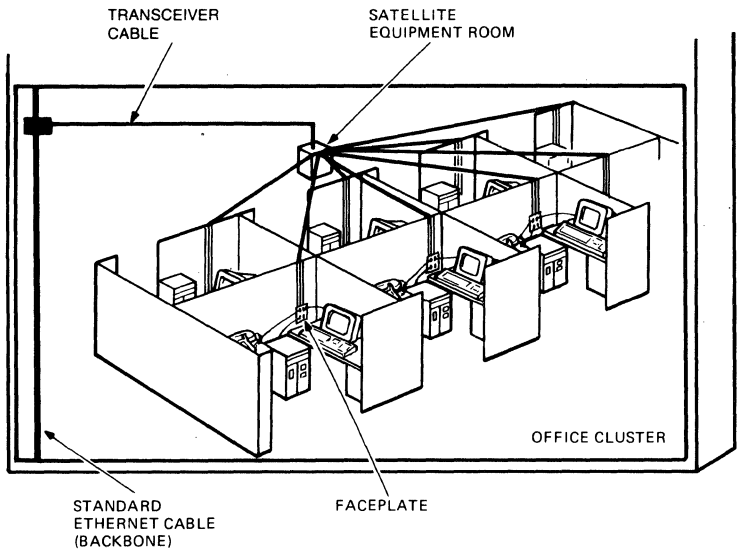
The DECconnect Communications System has the following features:

- DECconnect Faceplate
- Satellite Equipment Rooms (SER)
- ThinWire Ethernet Cabling (IEEE 802.3 compliant)
- DEC423—RS423 Signalling with EOS/ESD Protection
- Terminal Interconnect Support
- Ethernet/IEEE 802.3 Support
- DECsite Planning and Installation

Radial Topology

Cables are pulled in a radial topology with two easily accessible points: an office wall faceplate and a satellite equipment room (SER). A radial topology combines maximum office space coverage with ease of network management and maintenance. Figure 5.1 illustrates DECconnect's radial topology.

Figure 5.1
DECconnect Radial Topology



DECconnect Faceplate

The single connection point for all network services in the office or work area is the H3111 faceplate. There are two types of faceplates, one for mounting flush to a standard electrical box and one for mounting on modular furniture. The user's terminal, personal computer or workstation, telephone, and video equipment plug into four outlets on the same faceplate. This faceplate features connection points for the following services:

- ThinWire Ethernet Cable for high speed data transmission (10 Mbit/second)
- DEC423 Cable (4 unshielded twisted pair) for terminal data transmission
- Standard unshielded twisted-pair cable from Digital or the PBX vendor of choice for voice communication
- Video coaxial cable connection for video transmission

Satellite Equipment Room

The second connection point is the satellite equipment room.

Digital recommends that a satellite equipment room serve up to 64 users and 15,000 to 20,000 square feet of floor space. Unshielded twisted pair cables run from faceplates in the work areas to a terminal server in the satellite equipment room. The ThinWire cables for personal computer or workstation connections run from faceplates to a ThinWire Ethernet Multiport Repeater (DEMPR) in the satellite equipment room. Telephone cables run from faceplates to cross-connect wires in the satellite equipment room. The Digital faceplate will accommodate AT&T, Rolm, Northern Telecom, and other PBXs.

ThinWire Ethernet Cabling

ThinWire Ethernet enables the configuration of low-cost local area networks in the work area by the use of inexpensive coaxial cable and BNC connectors. ThinWire delivers 10 Mb/s Ethernet performance at a lower cost than standard Ethernet.

In the DECconnect System, ThinWire cable runs from a multiport repeater (DEMPR) in a satellite equipment room to H3111 faceplates in a local work area. From the faceplates, desktop systems such as personal computers, workstations, and low-end systems are connected. Non-ThinWire devices are connected to ThinWire Ethernet using the ThinWire Station Adapter (DESTA). Disk and print servers can also be connected to ThinWire cable. (Most Digital Ethernet devices connect to ThinWire cable via adapters; some Digital Ethernet devices connect directly.)

The DEMPR can be used in two configurations: standalone, or connected to a backbone Ethernet. In a standalone configuration, the DEMPR links desktop systems in several offices in a resource sharing network. In standard Ethernet configurations, the DEMPR gives users access to all the systems on the network.

DEC423—RS423 Signalling with EOS/ESD Protection

DEC423 is an RS423-based interface for low speed terminal interconnection. DEC423 provides all the improved signalling benefits of RS423 interconnection. RS423 was chosen as the signalling standard due to its much improved performance over the current RS232 standard and its backwards compatibility with existing RS232 equipment. With DEC423, Digital supports terminal-to-CPU distances of 1000 feet compared with the RS232 standard of 50 feet. RS423 is also fully compatible with all existing RS232 installations making major equipment changes unnecessary. Digital provides adapters which enable the physical connector changes required for RS232 terminals to plug into DEC423 communications controllers. DEC423 has the following features:

- RS423 signalling benefits, including CPU to terminal distances of up to 1000 feet at 19.2 Kb/s.
- 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 future DEC423 devices.
- Improved cabling capabilities due to the use of unshielded cables while still meeting full FCC certification.

Digital asynchronous devices with DEC423 signalling capabilities have the enhancement of Electrical Over Stress/Electro Static Discharge (EOS/ESD) protection. This enhancement improves equipment reliability and availability by protecting it from EOS damage due to static discharge, lightning, or AC power surges, while still being 100% compliant with the RS423 standard..

Terminal Interconnect Support

Digital's DECconnect System moves the user from RS232 to DEC423 signalling, cables, connectors and office products. To provide transition between these new products, Digital has developed adapters, connectors and cables.

These products allow customers to install the DECconnect system without having to replace existing computing 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 DEC423 cabinet kits or to Digital faceplates. The new standard cable is the DEC OFFICE CABLE (BC16E), an unshielded 6-conductor flat cable that is flexible and easy to coil. The BC16E cable alleviates many current problems, such as cables which require special shielding, cables with critical length restrictions, and confusion regarding which cables to use in a given situation.

Refer to Terminal Interconnect Products in this section for more information.

Ethernet/IEEE 802.3 Standard Support

All Digital second generation Ethernet products support the IEEE 802.3 LAN standard, which is technically very similar to Ethernet. 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.

DECsite Planning and Installation

Digital offers a complete line of planning and installation services for the DECconnect Cabling System under the DECsite program. Refer to Field Service Network Services in Section 7 for more information.

ThinWire Ethernet Products

ThinWire Ethernet delivers 10 Mb/s Ethernet to the desk, work area, and local area systems for connection of PCs, workstations, and computing systems.

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

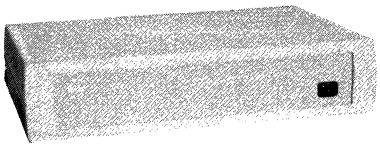
ThinWire cable is a thin, flexible, and easy to install coaxial cable that is compatible with standard Ethernet cable. These qualities make it very suitable for horizontal interconnections of devices on a work area floor, and for connecting local work areas to satellite equipment rooms.

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

ThinWire has the following characteristics:

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

ThinWire Ethernet Multiport Repeater (DEMPR)



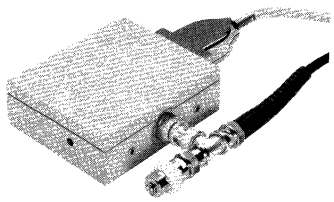
The DEMPR is a multiport repeater that provides eight ports for connection of eight ThinWire Ethernet segments, and one port for connection to a transceiver. It can be used as a standalone device, called a local DEMPR configuration, or connected to a standard Ethernet, called a global DEMPR configuration. 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 Ethernet network.

Each ThinWire segment can be up to 185 meters in length (600 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 connection of up to 1,023 stations (Ethernet limit). This configuration, in turn, can be used either in a standalone network, or connected to a standard Ethernet. An H4000-BA transceiver is required for connecting the DELNI in this configuration to a standard Ethernet cable. (A kit is available to convert an H4000 transceiver to an H4000-BA.)

For DEMPR specifications and order codes, refer to *ThinWire Ethernet Products* in Section 2.

ThinWire Ethernet Station Adapter (DESTA)



The DESTA allows connection of a single Ethernet station to ThinWire cabling. The Station Adapter can be attached to standard-cable Ethernet controllers, allowing UNIBUS, Q-bus, VAXBI, DECsystem-20, and PRO 350/380 devices to connect to ThinWire. It also allows Digital's Ethernet Communications 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 Ethernet station, and a second port for connection to the ThinWire cable. It contains Ethernet transceiver (IEEE 802.3) circuitry and provides transceiver functionality. DESTA is very compact, and is powered from the controller, like the H4000.

For DESTA specifications and order codes, refer to *ThinWire Ethernet Products* in Section 2.

DECconnect ThinWire Configurations

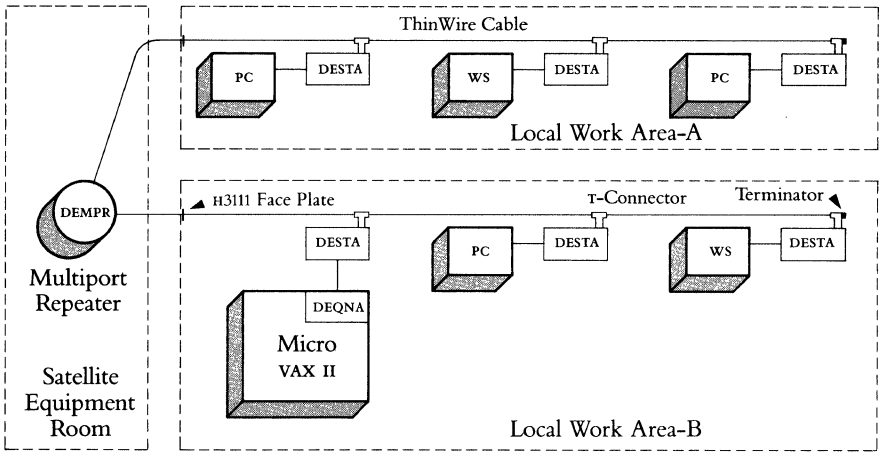
The DECconnect Communications System recommends an installation that includes ThinWire coaxial cable, two twisted-pair cables (one for DEC423 and one for the telephone), and (in some applications) video coaxial cable distributed in a radial topology from a local work area to a satellite equipment room. 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 furthest work area device is 185 meters. DECconnect ThinWire configurations are described below.

Standalone (Local) Configurations

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 interconnects devices from up to eight local work areas in this configuration. The DEMPR will also isolate faults in a segment, keeping the rest of the segments in operation. Figure 5.2 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.

Figure 5.2
DECconnect ThinWire Standalone Configuration (Local DEMPR Configuration)



Connected Global Configurations

In connected or global configurations, multiple standalone configurations are connected to a standard Ethernet coaxial cable. A DEMPR with up to eight ThinWire segments attached can be connected to the Ethernet cable using an H4000 Transceiver. This configuration provides standard Ethernet service for up to eight local work areas. A maximum of two repeaters (DEREP or DEMPR) may be connected between two stations.

A DELNI with up to eight attached DEMPRs must be connected to the Ethernet cable using an H4000-BA Transceiver. This configuration provides standard Ethernet service for up to 64 local work areas.

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

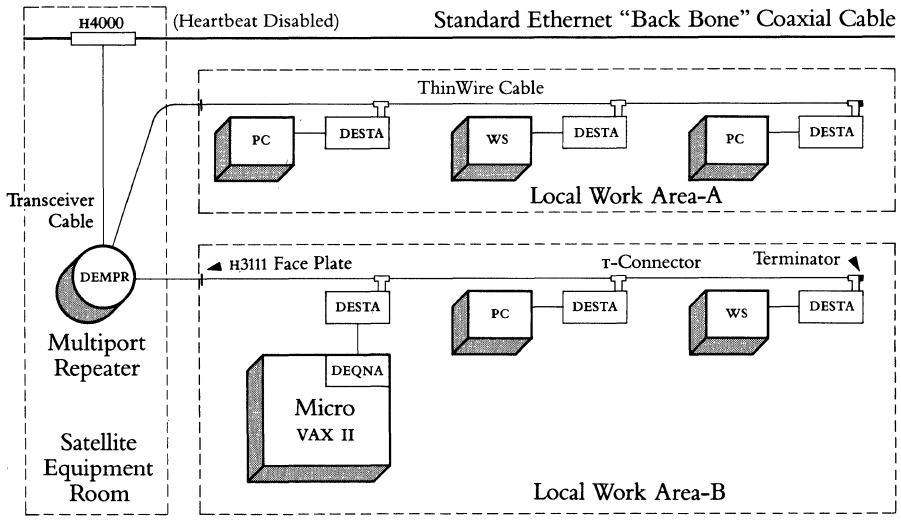
- The standard segment must be less than 300M.
- Connection to other standard Ethernet segments must be made using a LAN Bridge (DEBET) only.

Both of the above configurations are suitable for installations that require both local resource sharing and access to more powerful or remote computing resources located on the standard Ethernet.

When connected to the standard Ethernet, the DEMPR will count as a repeater in the standard Ethernet configuration restrictions.

Figure 5.3 illustrates a DECconnect ThinWire connected configuration.

Figure 5.3
DECconnect ThinWire
Connected Configuration



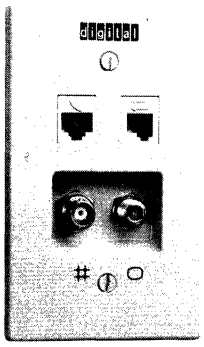
ThinWire Configuration Guidelines

For more information about ThinWire Ethernet configuration guidelines, refer to Ethernet Configuration Guidelines in Section 2.

Faceplate Products

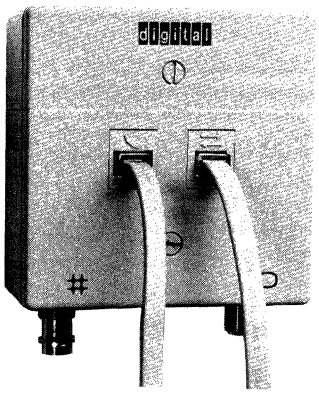
DECconnect Faceplate Products can be used both in new installations or as replacement products. The H3111-A and H3111-B faceplates have punch out jack covers which can be removed for the installation of the proper connectors.

Flush Mount Faceplate



The H3111-B is a flat faceplate which provides connection to standard receptacle boxes that have been installed in the wall. It mounts with two screws (included) to the pre-installed wallbox after installation of the appropriate cables.

Surface Mount Faceplate



The H3111-A is an alternate faceplate, self-enclosed for mounting to the walls of modular furniture installations. It is cabled in a similar fashion to the H3111-B except that 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).

Both faceplates come with plugs to cover any unused openings. The desired connectors are chosen separately. The MJ and MMJ are the same size and a customer may use two telephones or two data connectors, rather than one of each.

To install the faceplates, a tool kit (H8242) is required. The tool kit includes the following equipment to install a faceplate of either type:

- A crimp tool which is used to attach the coaxial cable to the back of the BNC connector
- A stripping tool to prepare the ThinWire before attaching the BNC connector
- A punch down tool which is used to attach the unterminated twisted pair cable to the back of the MMJ and MJ jacks
- A socket wrench which is used 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 that at least one tool kit be ordered for each 100–120 faceplates installed. This is based on the design center for the facility and not on the life expectancy of the tool.

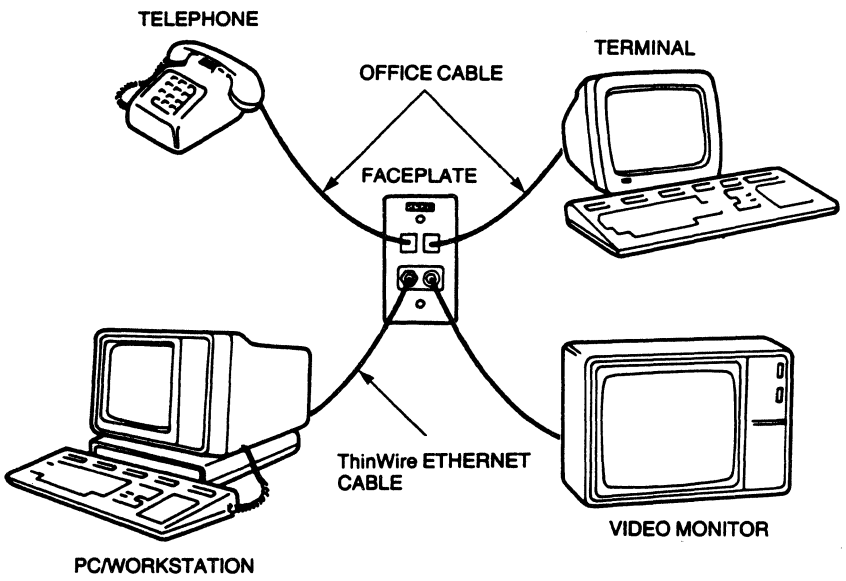
Faceplate Jacks and Connectors

DECconnect jacks and connectors are used to customize the faceplate to provide essential network connections to office or other work areas. Several jacks and connectors are available to customize the network to meet specific needs. Jacks and connectors are available for four connection possibilities:

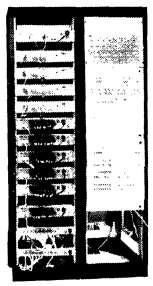
- High speed data over ThinWire Ethernet using a BNC connector (H3114) for use with the H3111-A or H3111-B Faceplates (set of eight)
- Low speed data with DEC423 signalling using a modified modular jack (H3113-A) for use with H3111-A or H3111-B Faceplates (set of eight)
- Voice connection combined with 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-B Faceplates (set of eight)
- Video connection using a standard F video connector (H3115) for use with the H3111-A or H3111-B Faceplates (set of eight)

The H3112-A jack supports AT&T wiring, the H3112-B jack supports a Northern Telecom PBX or a Rolm PBX, and the H3112-D is a universal 8-pin modular jack which can accommodate other PBXs. They can be snapped into the faceplate, along with the H3113 for DEC423 wiring depending on PBX requirements.

Figure 5.4
Office Faceplate Configuration



Satellite Equipment Room Products



Satellite Equipment Room Products provide the necessary equipment to construct and outfit a Satellite Equipment Room. The H3120 SER Rack Package provides the racks, frames, and additional hardware required to mount the patch panels and construct the SER.

Two patch panels are available for use in the Satellite Equipment Room with low and high speed communications lines. The H3107-A Patch Panel is used to patch twisted pair cable to a cable concentrator for low speed communications. The H3107-B patch panel is used to patch ThinWire Ethernet cable to the ThinWire Ethernet Multiport Repeater (DEMPR) for high speed communications. Both the H3107-A and the H3107-B are designed for 16 users.

Adapter kits provide components to adapt Ethernet terminal servers for use within the SER. The H3104-B DECserver 200 Adapter Kit is designed for eight users and provides cable and a cable concentrator.

Two cable kits are also available for use with the SER. The H3117 Terminal Interconnection SER Cable Kit provides 16 BC16E terminal patch cables. The H3118 ThinWire SER Cable Kit provides 16 BC16K DEMPR connection cords and 16 BC16P ThinWire patch cables.

The DECserver 200/DL and ThinWire Ethernet Multiport Repeater (DEMPR) are available in rackmount versions for use within the SER. Refer to *Section 2* and *ThinWire Ethernet Products* in this section for product descriptions.

Figure 5.5
Satellite Equipment Room Configuration

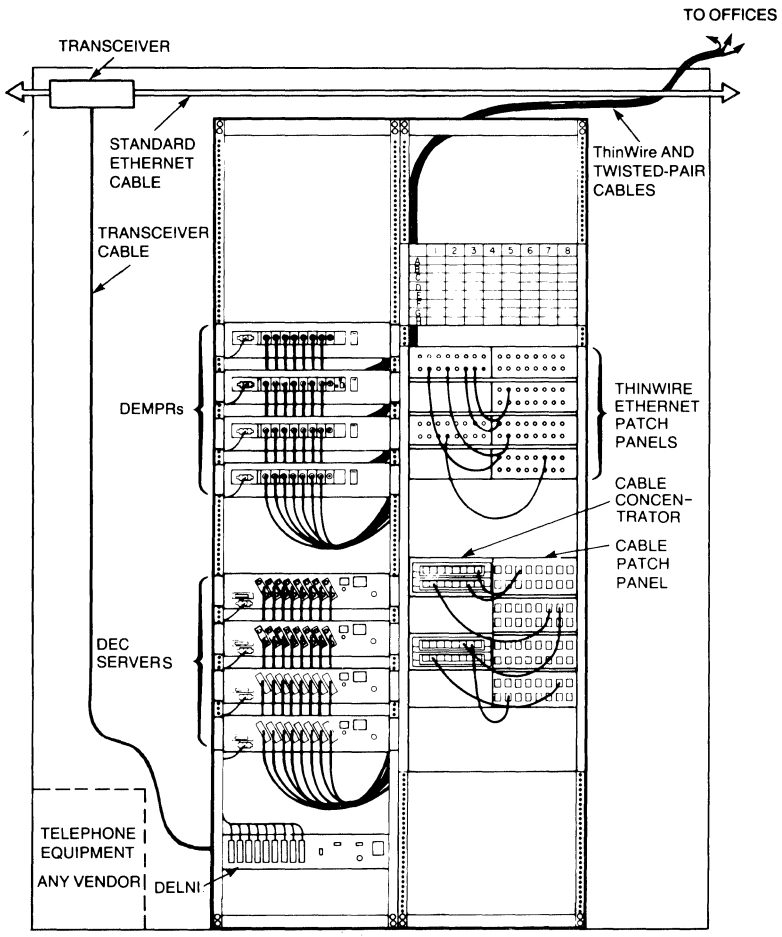


Table 5.1
Faceplate and SER Product Order Codes

Option	Order Code
DECconnect faceplate (surface mount)	H3111-A
DECconnect faceplate (flush mount)*	H3111-B
Modular jack (AT&T connection)*	H3112-A
Modular jack (Northern Telecom, Rolm PBX connection)*	H3112-B
Modular jack (universal phone connection)*	H3112-D
Modified modular jack, RS423 signalling	H3113-A
Modified modular jack, spare SER only	H3113-B
Thinwire Ethernet BNC connector	H3114
Video connector, F style	H3115
Faceplate installation tool kit	H8242
1000′ spool of ThinWire PVC cable	H8243-A
1000′ spool of ThinWire Teflon cable	H8244-A
DECconnect Twisted Pair PVC cable	H8245-A
DECconnect Twisted Pair Teflon cable	H8246-A
SER starter, racks, power strip, cable managers, cable trays, patching frame, and miscellaneous hardware	H3120
DECserver 200 adapter kit	H3104-B
PATCH PANEL used to patch office wiring for low speed data to two terminal servers (16 users)	H3107-A
PATCH PANEL used to patch RG58 ThinWire Ethernet for high speed data to two multiport repeaters (16 users)	H3107-B
Package of low speed patch cords (16 users)	H3117
Package of high speed patch cords (16 users)	H3118
DECserver 100/200 mounting brackets*	H3119

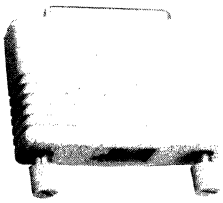
*Package of eight.

Terminal Interconnection Components

DECconnect terminal interconnection components are the cable, connectors, and adapters used to link terminals, terminal servers, and computer hosts within the DECconnect System. Low speed terminal communication in the DECconnect System is based on the RS423 signalling standard. The Digital RS423-based products (DEC423) enhance the industry standard RS232 performance by

- improving transmission speed
- increasing the distance that terminals can be located from host computers, and
- incorporating EOS/ESD protection. Digital offers the following DEC423 products to interconnect devices using the RS423 signalling standard and to adapt devices from RS232 signalling to RS423 signalling:

Office Components



H8571A

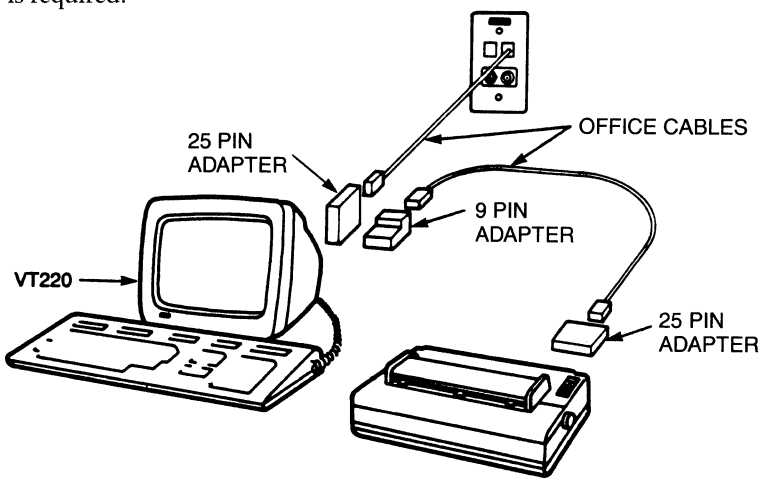
BC16E—The DEC423 standard cable is the DEC OFFICE Cable (BC16E), an unshielded 6-conductor flat cable. The BC16E cable is terminated with a modified modular plug (MMP), which has an offset key to prevent it from being accidentally plugged into the phone jack.

The *MMP* is the DEC423 standard connector. To connect MMPs into existing terminals and printers, passive physical adapters are required. Passive adapters allow both RS232 and RS423 signalling to pass through. However, when RS423 devices are connected to RS232 wiring they are limited to RS232 signalling parameters. Each passive adapter has a modified modular jack (MMJ) to receive the MMP.

For terminal connection, the *H8571-A Adapter* (25-pin D subminiature) is required. For printer connection, the *H8571-B Adapter* (9-pin D subminiature) is required.

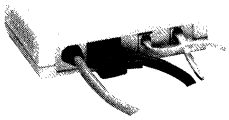
Figure 5.6
Office Configuration with Passive Adapters

H8571B

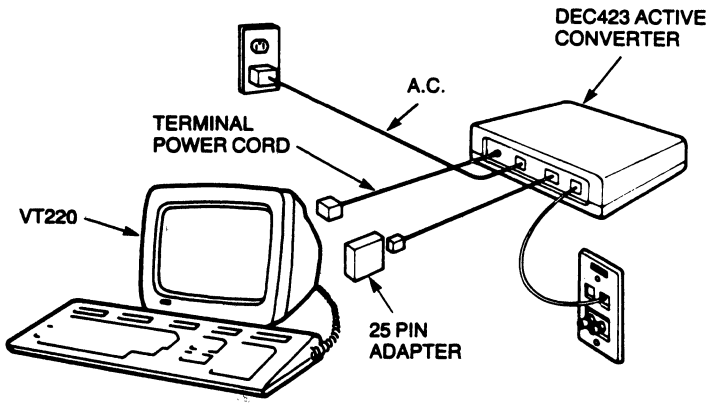


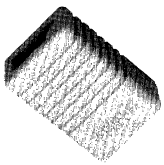
DEC423 also offers the *H3105 Active Converter* which transforms the signal from an RS232 interface to the signal for a DEC423 interface, thus allowing full DEC423 implementation.

Figure 5.7
Office Configuration with Active Converter



H3105





H8572

The *H8572 Cable Extender* (6-conductor) is available, which can be used to extend the length of two MMP pre-terminated cables.

SER Components

Terminal Servers—The *DECserver 200/DL* may be used in the SER. The DECserver 200 supports DEC423 signalling and is packaged as a desktop unit which can be easily adapted for use in the SER. The DECserver 200/DL requires the *H3104-B Adapter Kit,* which contains a cable concentrator, loopback connector, and BC16C-10 cable.

The following two cables are also available for use with the DECconnect System:

- *BC16C/D*—A PVC 36-conductor cable used in conjunction with the 36-pin conductor on the H3104 cable concentrator. The BC16C has one right-angle 36-pin D-connector and one straight 36-pin D-connector. The BC16D has two right-angle 36-pin D-connectors.

The *H3106 Adapter* adapts BC16C/D/H/J cable to 25-pair (50-conductor) trunk wiring. Both sides of the adapter are female connectors.

Two loopback connectors are used with the DECconnect System. The *H3101 Loopback Connector* has one female and one male 36-pin connector (only one used at a time). The coupler is used to loopback BC16C/D cable or any other 36-pin component. The *H3103 MMJ Loopback Connector* is used to loopback SER-to-faceplate data lines in the SER. This is done during line testing and line certification.

A cable concentrator is used in the SER to concentrate the BC16E terminal cables for connection to terminal servers or host computers. The *Cable Concentrator* (sold in the H3104-A or H3104-B) has eight female 8-pin modified modular plugs that accept BC16E cables. These connections are physically converted into a single female 36-pin connection that accepts a BC16C/D 36-conductor cable.

BC16E cable supports data only connections. Modems must still be used via RS232 connections. RS232 will continue to be available to support modems and other devices that require full control signalling, using the currently available 25-pin connectors.

An alternate to specifying pre-terminated lengths of cables is to allow the installer to field terminate unterminated cable with the required MMPs. This is accomplished with an *H8241 CRIMP TOOL* which is used to crimp *Loose MMPs (H8220)* on unterminated cable *(H8240)*. For configuration information about terminal interconnection components, consult the *DECconnect System Planning and Configuration Guide* (EK-DECSY-CG).

Table 5.2
Terminal Interconnection Products Order Codes

Option	Order Code
36-conductor cable, right angle-to-straight D-connectors	BC16C
36-conductor cable, right angle-to-right angle D-connectors	BC16D
36-pin Loopback Connector	H3101
36-pin Cable Coupler	H3102
MMJ Loopback Connector	H3103
DECserver 200 Adapter Kit	H3104-B
25-pin Active Converter (110V)	H3105-A
25-pin Active Converter (220/240V)	H3105-B
36-pin to 50-pin Adapter	H3106
Package of 50 MMP	H8220
1000 foot spool of unterminated, 6-conductor cable	H8240
Crimp tool for 6-conductor cable	H8241
25-pin Passive Adapter	H8571A
9-pin Passive Adapter	H8571B
6-conductor Cable Extender	H8572

Section 6
Standard Network Packages

SNP

Section 6

Standard Network Packages

Introduction

The Standard Network Packages are available only in the United States.

Digital has developed a set of Standard Network Packages to make it easier for customers to configure and order network solutions. Each of the Standard Network Packages represents a basic network building block that includes the major communications hardware, cabling, and in some cases, software required to implement that specific network solution. This modular approach to network design and ordering can be effectively utilized by customers whose networking requirements vary from a small standalone work group to a large multiple site installation. This can be accomplished by purchasing the appropriate Standard Network Packages individually, or in combination with other packages to form larger networks.

The Standard Network Packages have been designed to work with existing Digital equipment in current system installations. All Digital computer systems having DECnet capability can be used with the Standard Network Packages.

The hardware and software products contained in the Standard Network Packages are described in Section 2: Ethernet Local Area Networks and Section 5: DECconnect Communications System.

The packages are organized into four categories, based on typical customer requirements. Three of the categories are based on geographic considerations. The fourth provides the capability to integrate another vendor's network into the Digital network.

The four categories of Standard Network Packages are:

- Local Area Work Group Interconnection
- Extended Local Area Interconnection
- Wide Area Interconnection
- Multivendor Interconnection

Local Area Work Group Interconnection

Local Area Work Group Interconnection provides connectivity among users that are typically involved in related activities and are located on the same floor. There are four Local Area Work Group Interconnection Packages:

- The DECconnect Integrated Communications Package—provides integration and full access to the communication technologies commonly used in the office: low speed data, high speed data, voice (telephone), and video. This system uses a simple faceplate at the user locations to provide easy "plug in" access to the desired communications technologies.
- The Low Speed Work Group Package—provides network access for areas where the equipment used in work groups includes terminals, printers, and personal computers in terminal emulation mode.
- The High Speed Work Group Package—is used in areas where the equipment is primarily PCs and/or workstations, and the applications require rapid transfer of large amounts of data.
- The IBM PC Interconnection Package—is a special application of the High Speed Work Group Package in which IBM personal computers are being used at the customer site. This package allows full utilization of the Digital network using IBM PCs.

Extended Local Area Interconnection

Extended Local Area Interconnection links individuals, groups, or departments in geographically distinct work areas that are relatively close to each other. There are three Standard Network Packages in this category:

- The Building Package—links all, or selected, floors of a building together in one common network. It is used to connect separate departments or work groups.
- The Site Package—connects multiple buildings in a site, such as a university campus or an office complex.
- The Computer Room Package—efficiently connects up to eight computers in one location to the network through one interface. Each of the computers may, in turn, support its own local area network.

Wide Area Interconnection

Wide Area Interconnection provides for network access between sites that are geographically remote from one another. A typical application links a headquarters operation with all of its manufacturing plants, sales offices, and distribution centers. There are two Wide Area Interconnection Packages:

- The Wide Area Gateway Package—connects a local area network at one site with a local area network at another site.
- The Remote Site Interconnection Package—allows organization members at a geographically remote site to gain access to the organization's local area network via a leased line, when there is no computer/network in operation at the remote site.

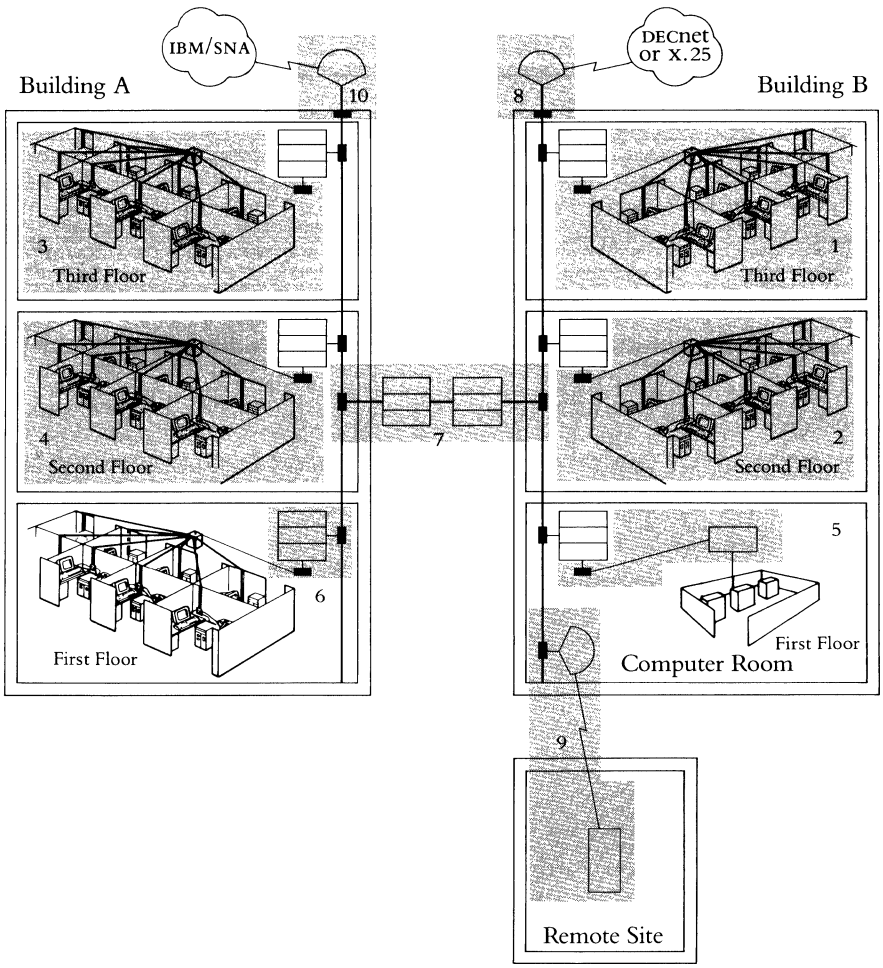
Multivendor Interconnection

Multivendor Interconnection allows information to be transferred between a Digital network and the network of another vendor, and enables the information to be used on either system. There is one Multivendor Interconnection Package:

- The DECnet/SNA Gateway Package—allows communication between an IBM SNA network and a DECnet network. Users may send and retrieve information or perform specific functions on IBM host systems connected to the SNA network.

The relationship of the standard network packages in a large network is illustrated in Figure 6.1. The network configuration is greatly simplified in the diagram in order to clearly indicate the purpose of each package.

Figure 6.1
Relationship of Standard Network Package in a Large Network



[1] DECconnect Integrated Communications Package
[2] Low Speed Work Group Package
[3] High Speed Work Group Package
[4] IBM PC Interconnection Package
[5] Computer Room Package
[6] Building Package
[7] Site Package
[8] Wide Area Gateway Package
[9] Remote Site Interconnection Package
[10] DECnet/SNA Gateway Package

Service Solutions

Digital's service solutions are an important part of an ongoing commitment to meet the customer's needs. Digital can tailor a service solution to meet requirements for designing, implementing, or operating a Digital network. The services available include network design consulting, network installation (for hardware, software, and cabling), ongoing maintenance and remedial support, and network management tools and support. Refer to Section 7: *Network Services* for more information.

All hardware products sold in Standard Network Packages include a one-year warranty from Digital.

Ordering Standard Network Packages

Each Standard Network Package consists of one or two product areas:

- Network hardware products (required for all packages)
- Network software products (required for many packages)

A product description and ordering table for each Standard Network Package is contained in the following pages. *The exact ordering requirements for these products must be followed.* This ensures that all the appropriate hardware and software necessary to implement the desired network solution are ordered. The installation of standard Ethernet backbone cable, to which the electronic hardware connects, is not included in the Standard Network Packages. Digital custom designs and installs the backbone cable as needed, to meet specific customer requirements.

In addition to the products that are required for each base package, there may be the need to order additional network hardware, software, and/or services to provide the desired network solution. The need for these optional products and services vary according to customer requirements of such things as number of offices, type of equipment requiring connection, physical facility layouts, and existing customer software. The optional products can also be ordered to expand an existing network installation, where the customer already has many of the required base package components. The most common of these optional products are listed in the ordering tables of each Standard Network Package.

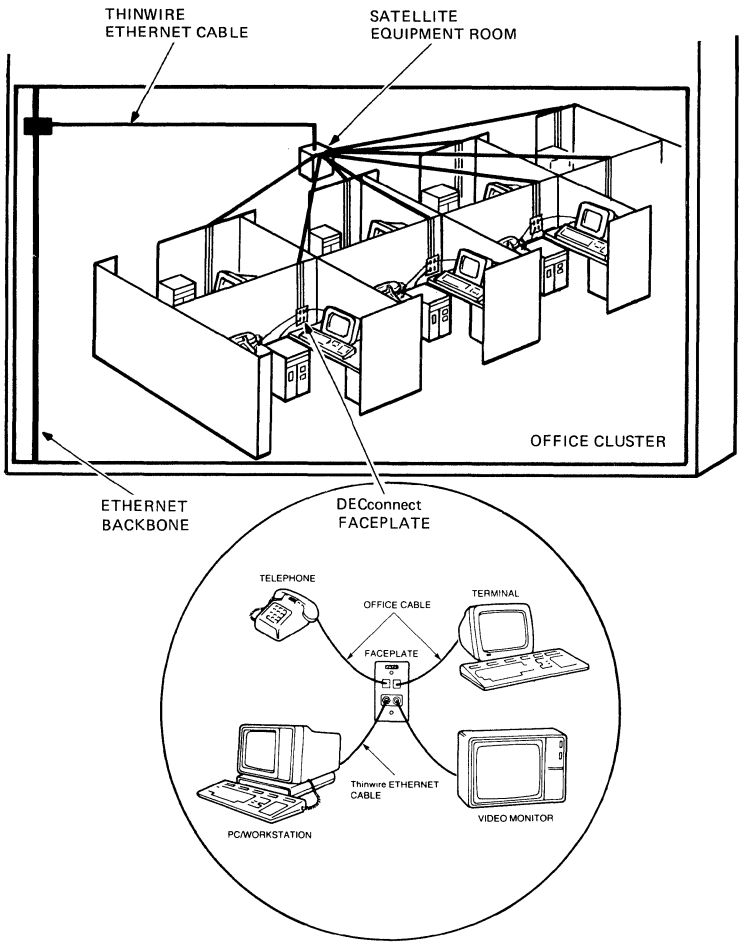
Local Area Work Group Interconnection

Local Area Work Group Interconnection provides connectivity among users that are typically involved in related activities and are located on the same floor. Local Area Work Group Interconnection enhances work communications, allows effective and efficient sharing of computer resources, and provides information consistency through a common database.

DECconnect Integrated Communications Package

The DECconnect Integrated Communications Package includes all of the hardware and software necessary to establish a Local Area Network using Digital's DECconnect strategy. The DECconnect solution utilizes Satellite Equipment Rooms (SER) as the centralized location for the required electronic hardware and wiring connections. The required cables radiate from the SER to each office/user location, where a DECconnect faceplate provides convenient user access to low speed (terminal), high speed (work system), and voice (telephone) communications. Figure 6.2 illustrates the DECconnect configuration in an office environment. Refer to Section 5 for additional information on the DECconnect system.

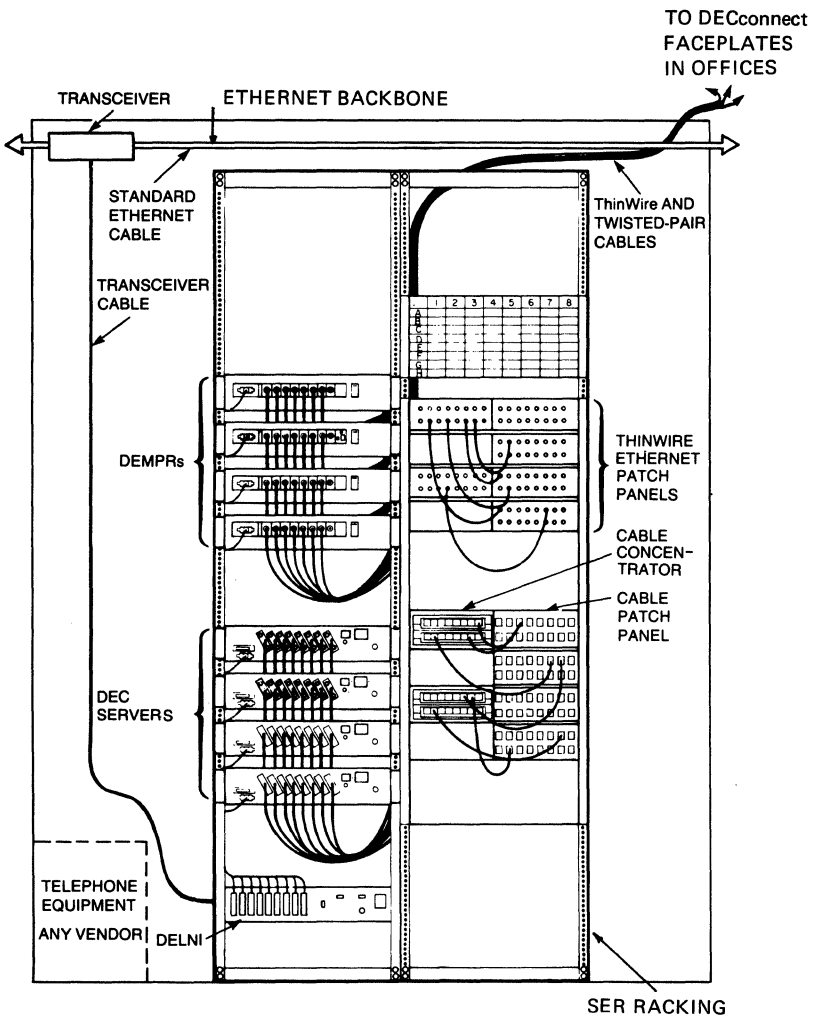
Figure 6.2
DECconnect System



The number of offices (users) and type of devices (low speed/high speed) that are connected on the local area network largely determines the number of required Satellite Equipment Rooms and hardware products. The physical office layout on the floor is another important consideration when designing the appropriate DECconnect solution. Wiring of the backbone Ethernet cable in the building (for connection to the SER) is not part of the DECconnect Package. Digital performs this function on a custom basis to meet individual customer needs.

Figure 6.3 illustrates the set up and hardware configuration of a typical Satellite Equipment Room in a network that requires both low speed and high speed connections.

Figure 6.3
Satellite Equipment Room Configuration



Ordering Guidelines for the DECconnect System

The configuration guidelines and ordering rules in this section provide a methodology for selecting the appropriate number of DECconnect package components to meet various networking needs.

To determine the appropriate quantity of hardware and software products required to implement the network, follow these steps:

- Order one Satellite Equipment Room rack (DEPKF-S1) for each 64 offices, or part thereof. Additional Satellite Equipment Rooms may be required if physical distances between offices are large, or if a high proportion of offices utilizes low and high speed connections simultaneously.
- Determine the number of required low speed and high speed connections in total for all offices (for each SER). Refer to the following sections on Low Speed and High Speed Work Group Packages for additional detail. Find the appropriate letter in Table 6.1 (Low Speed/High Speed Connections), corresponding to the connection requirements.
- Using Table 6.2 (DECconnect Ordering Matrix), find the letter selected from Table 6.1 in the previous step. Read across the row to determine the quantity of hardware, software, and service product components to order. Repeat these steps for each multiple of 64 offices to be connected or portion thereof. Add together the quantities of similar components to determine the total order requirements for the DECconnect installation.
- Use Table 6.3 (DECconnect Order Codes) to fill in the cumulative totals of each component in the quantity column next to the corresponding order code. All quantities were determined previously from Table 6.2. The above steps must be followed to ensure that all necessary products are ordered to complete the desired network solution.
- Digital recommends the use of a network management product with local area networks. If network management is required, order either NMCC/VAX ETHERnim or NMCC/DECnet Monitor. Refer to Network and System Management Products in Section 3 for product descriptions. Order codes for both the software license and media/documentation are required.

Table 6.1
Low Speed/High Speed Connections

No. of Required High Speed Connections	No. of Required Low Speed Connections								
	0	1–8	9–16	17–24	25–32	33–40	41–48	49–56	57–64
0	—	A	B	C	D	E	F	G	H
1–8	I	J	K	L	M	N	O	P	Q*
9–16	R	S	T	U	V	W	X	Y*	Z*
17–24	A2	B2	C2	D2	E2	F2	G2*	H2*	N/A
25–32	I2	J2	K2	L2	M2	N2*	O2*	N/A	N/A
33–40	P2	Q2	R2	S2	T2*	U2*	N/A	N/A	N/A
41–48	V2	W2	X2	Y2*	Z2*	N/A	N/A	N/A	N/A
49–56	A3	B3	C3*	D3*	N/A	N/A	N/A	N/A	N/A
57–64	E3	F3*	G3*	N/A	N/A	N/A	N/A	N/A	N/A

*In Floor Package configurations with over 64 connections, up to a maximum of 80 can be supported within the standard rack; a slot is available for an additional DECserver 200 or DEMPR. In these cases two base packages must be ordered.

Table 6.2
DECconnect Ordering Matrix

Selected Letter From Table D	Required Package Component Order No.				
	DEPKL-01	DEPKL-A1	DEPKH-01	DEPKH-A1	Q*Z06-UZ
A	1				1
B	1	1			2
C	1	2			3
D	1	3			4
E	1	4			5
F	1	5			6
G	1	6			7
H	1	7			8
I			1		
J		1	1		1
K		2	1		2
L		3	1		3
M		4	1		4
N		5	1		5
O		6	1		6
P		7	1		7
Q*	1	7	1		8
R			1	1	
S		1	1	1	1
T		2	1	1	2

Table 6.2
DECconnect Ordering Matrix (Continued)

	DEPKL-01	DEPKL-A1	DEPKH-01	DEPKH-A1	Q*Z06-UZ
U		3	1	1	3
V		4	1	1	4
W		5	1	1	5
X		6	1	1	6
Y*	1	6	1	1	7
Z*	1	7	1	1	8
A2			1	2	
B2		1	1	2	1
C2		2	1	2	2
D2		3	1	2	3
E2		4	1	2	4
F2		5	1	2	5
G2*	1	5	1	2	6
H2*	1	6	1	2	7
I2			1	3	
J2		1	1	3	1
K2		2	1	3	2
L2		3	1	3	3
M2		4	1	3	4
N2*	1	4	1	3	5
O2*	1	5	1	3	6
P2			1	4	
Q2		1	1	4	1
R2		2	1	4	2
S2		3	1	4	3
T2*	1	3	1	4	4
U2*	1	4	1	4	5
V2			1	5	
W2		1	1	5	1
X2		2	1	5	2
Y2*	1	2	1	5	3
Z2*	1	3	1	5	4
A3			1	6	
B3		1	1	6	1
C3*	1	1	1	6	2
D3*	1	2	1	6	3
E3			1	7	
F3*	1		1	7	1
G3*	1	1	1	7	2

Table 6.3
DECconnect Integrated
Communications Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Satellite equipment room	SER rack	DEPKF-S1	_____
Low speed products (Refer to Table 6.5 for contents)	Low speed base package	DEPKL-01	_____
	Low speed add-on	DEPKL-A1	_____
	DECserver 200 software license	Q★Z06-UZ	_____
	DECserver 200 software media and documentation (order one per load host computer)	Q★Z06-H#	_____
High speed products (Refer to Table 6.7 for contents)	High speed base package	DEPKH-01	_____
	High speed add-on	DEPKH-A1	_____

★Refer to Section 2: *DECserver 200 Software Order Codes* for a list of supported processors and distribution media.

Low Speed Work Group Package—Terminal Interconnection

The Low Speed Work Group Package links devices operating at speeds between 75 b/s and 19.2 Kb/s (terminals, printers, and personal computers in terminal emulation mode) to a local area network. The preconfigured base package supplies the products required to connect up to eight terminals to the Ethernet backbone of the network.

Network Hardware Products

The Low Speed Base Package includes the following products:

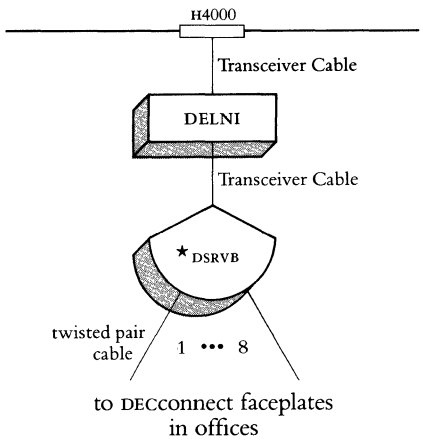
- One baseband Ethernet transceiver (H4000)
- One Local Network Interconnect (DELNI)
- One DECserver 200/DL Terminal Server (DSRVB-BA)
- One DEC423 Cable Kit (H3104-B)
- Two baseband Ethernet transceiver cables

Network Software

- DECserver 200 software media and documentation (1 per load host)
- DECserver 200 software license (1 per DECserver 200)

Figure 6.4 details the hardware configuration of the network products provided in the Low Speed Base Package. Add-on packages allow for the connection of up to 56 additional terminals, in multiples of 8, to the base network connection outlined above.

Figure 6.4
Low Speed Work Group Package—Terminal Interconnection Configuration



★DECserver 200/DL

Ordering Guidelines for Low Speed Work Group Package

Use Table 6.4 to determine the quantity of products required to satisfy each terminal interconnection (low speed) situation. The table should be used each time a distinct work group and/or a work group of more than 64 offices is connected to the network backbone. To use the table:

- List all of the distinct work groups and the number of users within each work group.
- If a distinct work group has more than 64 users, divide it by 64 and round up to the next whole number. For ordering purposes in using the table, the one large work group is treated as several different work groups. (As an example, assume that there are two work groups consisting of 14 users and 80 users. The second work group of 80 would be treated as two groups, since 80 divided by 64 rounds up to two.)
- Use Table 6.4 once for each work group by reading down the appropriate column corresponding to the number of low speed connections in that work group to determine the exact quantity of each package component listed on the left, for example, DEPKL-01 or DEPKL-A1. (In the above example, the matrix would be used once for the first work group of 14 users and two more times for the larger work group of 80. The breakdown of the larger work group into two groups should consider relative office locations and future expansion requirements. In this example, the larger group could become two groups of 40 each, one group of 64 and one group of 16, or other combinations totaling 80.)
- After using the matrix for each work group, add together the quantities of each package component to find the total order requirements for each component.
- Use Table 6.5 (Low Speed Work Group Package Order Codes) to compile the complete order by filling in the quantities that were determined above. Follow all Product/Order Requirements exactly.

Table 6.4
Low Speed Work Group Package Ordering Matrix

Required Package Component Order No.	Number of Terminal Connections Per Work Group							
	1–8	9–16	17–24	25–32	33–40	41–48	49–56	57–64
DEPKL-01	1	1	1	1	1	1	1	1
DEPKL-A1	—	1	2	3	4	5	6	7
Q★Z06-UZ	1	2	3	4	5	6	7	8
Q★Z06-H#	1 per load host computer**							

**Typically one per local area network

Table 6.5
Low Speed Work Group Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	**Base package** One H4000 transceiver One DELNI One DECserver 200/DL Terminal Server One DEC423 Cable Kit (H3104-B) Two transceiver cables (BNE3L-05)	DEPKL-01	_____
	Add-on One DECserver 200/DL Terminal Server One transceiver cable (BNE3L-05)	DEPKL-A1	_____
Network software[1]	DECserver 200 software license (One required per DECserver 200)	Q*Z06-UZ	_____
	DECserver 200 software media and documentation (One required per load host computer)	Q*Z06-H#	_____

* Refer to Section 2: *DECserver 200 Software Order Codes* for a list of supported processors and distribution media.
[1] The level of software service contract must be the same for both the CPU operating system and the DECserver 200 software. Refer to Software Product Description 27.53.xx.

High Speed Work Group Package—Work System Interconnection

The High Speed Work Group Package links workstations, personal computers, and low-end systems operating at speeds greater than 19.2 Kb/s to a local area network. The preconfigured base package supplies the products required to connect up to eight work systems to the Ethernet backbone of the network.

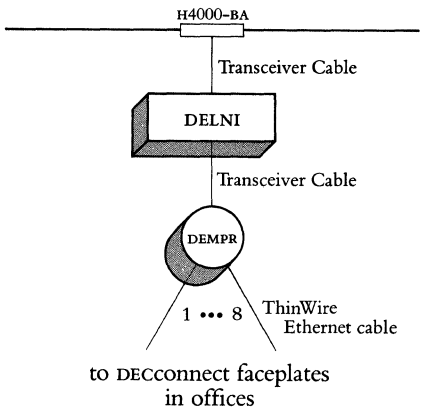
Network Hardware Products

The High Speed Base Package includes the following products:

- One baseband Ethernet transceiver (H4000-BA)
- One Local Network Interconnect (DELNI)
- One ThinWire Ethernet Multiport Repeater (DEMPR)
- Two baseband Ethernet transceiver cables

Figure 6.5 details the hardware configuration of the network products provided in the high speed base package. Add-on packages allow for the interconnection of up to 56 additional work systems, in multiples of 8, to the base network connection outlined above.

Figure 6.5
High Speed Work Group Package—Work System Interconnection Configuration



Ordering Guidelines for High Speed Work Group Package

Use Table 6.6 to determine the quantity of products and services required to satisfy each work system interconnection (i.e. high speed) situation. The matrix should be used each time a distinct work group and/or a work group of more than 64 offices is connected to the network backbone. To use the ordering matrix:

- List all the distinct work groups and the number of users within each work group.
- If a distinct work group has more than 64 users, divide it by 64 and round up to the next whole number. For ordering purposes in using the matrix, one large work group is treated as several smaller work groups. (As an example, assume that there are two work groups consisting of 14 users and 80 users. The second work group of 80 would be treated as two groups, since 80 divided by 64 rounds up to two.)
- Use Table 6.6 once for each work group by reading down the appropriate column corresponding to the number of high speed connections in that work group to determine the exact quantity of each package component that is listed on the left, for example, DEPKH-01 or DEPKH-A1. (In the above example, the matrix would be used once for the first work group of fourteen users, and two more times for the larger work group of 80. The breakdown of the larger work group into two groups should consider relative office locations and future expansion requirements. In this example, the larger group could become two groups of 40 each, one group of 64 and one group of 16, or other combinations totaling 80.)
- After using the table for each work group, add together the quantities of each package component to find the total order requirements for each component.
- Use Table 6.7 (High Speed Work Group Package Order Codes) to compile the complete order by filling in the quantities that were determined above. Follow all Product/Order Requirements exactly.

Table 6.6
High Speed Work Group Package Ordering Matrix

	Number of Work System Connections Per Work Group							
Required Package Component Order No.	**1–8**	**9–16**	**17–24**	**25–32**	**33–40**	**41–48**	**49–56**	**57–64**
DEPKH-01	1	1	1	1	1	1	1	1
DEPKH-A1	—	1	2	3	4	5	6	7

Table 6.7
High Speed Work Group Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	**Base package**	DEPKH-01	_____
	One H4000-BA transceiver		
	One DELNI		
	One DEMPR		
	Two transceiver cables (BNE3L-05)		
	Add-on	DEPKH-A1	_____
	One DEMPR		
	One transceiver cable (BNE3L-05)		

IBM PC Interconnection Package

The IBM PC Interconnection Package provides the hardware and software products necessary to connect up to eight IBM PCs to the Digital network. This is accomplished through the use of an Ethernet controller in each of the IBM PCs, which enables communication on the network. The IBM PCs connect to the Ethernet backbone through a multiport repeater (DEMPR) which consolidates the eight connections through one transceiver.

Network Hardware

The IBM PC Interconnection Base Package includes the following products:

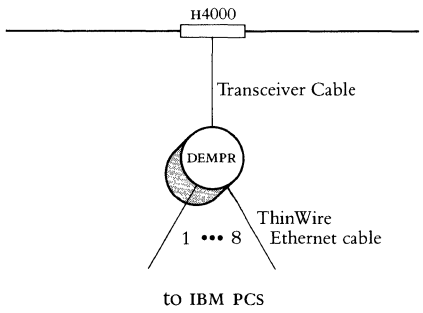
- One baseband Ethernet transceiver
- One baseband Ethernet transceiver cable
- One ThinWire Ethernet Multiport Repeater
- Eight Ethernet controller boards with software licenses for DECnet-DOS and VAX/VMS Services for MS-DOS Client software

Network Software

- One DECnet-DOS software media and documentation (one required per network)

Figure 6.6 details the hardware configuration of the network products provided in the IBM PC Interconnection Package. This configuration is appropriate when up to eight IBM PC connections are required. (When more than eight IBM PC network connections are required from the same transceiver, refer to *Ordering Guidelines for More Than Eight IBM PCs.)*

Figure 6.6
IBM PC Interconnection Package



Ordering Guidelines for Eight or Less IBM PCs per Work Group

Use Table 6.9 (IBM PC Interconnection Package Order Codes) to compile the complete order by filling in the quantities determined:

- Order one hardware base package for each eight IBM PC connections in a distinct office area. (If there are more than eight users in the same work group, up to 64 IBM PCs in total, refer to *Ordering Guidelines for More than Eight IBM PCs per Work Group.)*
- Order the DECnet-DOS software media and documentation (QVA05-HI). Only one of these order codes is required per network. When there are many IBM PC users connected to the network, it may be desirable to order additional software media and documentation kits.

Ordering Guidelines for More than Eight IBM PCs per Work Group

When there are more than eight IBM PCs per work group, use the High Speed Work Group Package Order Codes as well as IBM PC Add-on Order Codes as follows:

- Follow the Ordering Guidelines for the High Speed Work Group Package to determine the number of High Speed Hardware Base and High Speed Add-on Packages needed.
- For every eight IBM PCs (or portion thereof), order one IBM PC Add-on Package from Table 6.9. (The IBM PC Add-on Package consists of eight IBM PC Ethernet controller boards.)
- Order the DECnet-DOS software media and documentation (QVA05-HI). Only one of these order codes is required per network. When there are many IBM PC users connected to the network, it may be desirable to order additional software media and documentation kits.

Table 6.9
IBM PC Interconnection Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	**Base package** One H4000 transceiver One transceiver cable (BNE3L-05) One DEMPR Eight Ethernet controller boards with DECnet-DOS and VAX/VMS Services for MS-DOS Client software licenses (DEPCA-BA)	DEPKP-01	_____
	Add-on Eight Ethernet controller boards with DECnet-DOS and VAX/VMS Services for MS-DOS Client software licenses (DEPCA-BA)	DEPKP-A1	_____
Network software	One DECnet-DOS software media and documentation (one required per network)	QVA05-HI	_____

Extended Local Area Interconnection

Extended Local Area Interconnection links individuals, groups, or departments in geographically distinct work areas that are relatively close to each other. Extended Local Area Interconnection enhances communication between individuals and departments that are not easily accessible to each other, facilitates better decision-making through more timely and accurate information flow, and provides effective and efficient use of computing power and support resources.

Computer Room Package

The Computer Room Package provides the base network hardware necessary to link up to eight computers within a computer room environment to an existing Ethernet backbone. Any systems with Digital Ethernet communication controllers and DECnet software can be used with this package. Depending on internal cabling, computers may be located up to 40 meters from the transceiver in this package.

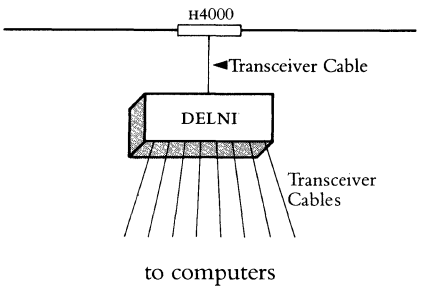
Network Hardware Products

The Computer Room Package includes the following products:

- One Local Network Interconnect (DELNI)
- One baseband Ethernet transceiver (H4000)
- One baseband Ethernet transceiver cable

Figure 6.7 details the hardware configuration of the network products provided in the Computer Room Package. Note that, due to variations in distance between the Local Network Interconnect (DELNI) and computers being connected to the network, the transceiver cables are available only on a custom basis.

Figure 6.7 Computer Room Package Configuration



Computer Room Package Ordering Guidelines

Use Table 6.10 (Computer Room Package Order Codes) to compile the complete order by filling in the quantities that are determined below.

- Order one base network hardware package for each group of eight computers in the computer room.
- Digital can provide the required cabling and installation to connect each computer to the DELNI on a custom basis.
- For customers who are new to network concepts and operation, order the NETstart Plus Network Startup Package (QSC34-SZ).
- Digital recommends the use of a network management product with local area networks. If network management is required, order either NMCC/VAX ETHERnim or NMCC/DECnet Monitor. Refer to Network and System Management Products in Section 3 for product descriptions. Order codes for both the software license and media/documentation are required.

Table 6.10 Computer Room Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	One DELNI One H4000 transceiver One transceiver cable (BNE3L-05)	DEPKC-01	_____
Optional Network service	NETstart Plus Network Startup Package	QSC34-SZ	_____

Building Package

The Building Package provides the capability to connect different floors of a building to a local area network (LAN). The Building Package allows a customer to isolate traffic within an Ethernet segment and to extend Ethernet LANs beyond the usual 2,800 meter limitation. This package delivers 10 Mb/s Ethernet capability in either of two configurations: Package A connects two floors of a building, up to 100 meters apart, for use with coaxial Ethernet cable (not included); Package B connects two floors of a building, up to 1000 meters apart, for use with fiber optic cable (not included).

The Building Package includes the following products:

Network Hardware Products

Order one of the following packages:

- Package A—For economical, local connection to the Ethernet coaxial cable between floors of a building, up to 100 meters:

  One standard LAN Bridge 100
  Two Baseband Ethernet transceivers (H4000)
  Two Baseband Ethernet transceiver cables

- Package B—For local connection to the Ethernet fiber optic cable between floors of a building, up to 1000 meters:

  One Remote Ethernet Repeater
  One Fiber Optic LAN Bridge 100
  Two baseband Ethernet transceivers (H4000)
  Two baseband Ethernet transceiver cables

Figures 6.8 and 6.9 detail the hardware configuration of the network products provided in each of the two Building Package alternatives.

Figure 6.8
Building Package A
Configuration

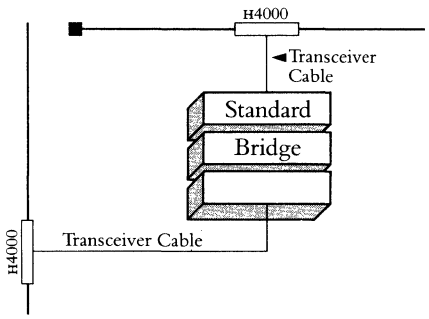
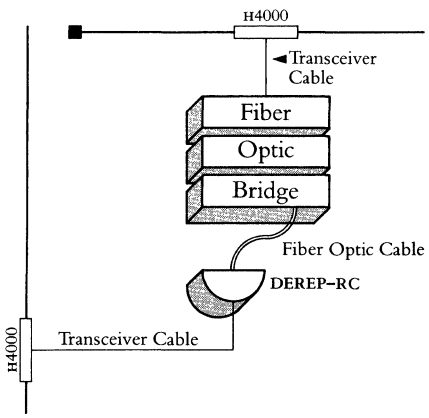


Figure 6.9
Building Package B
Configuration



Building Package Ordering Guidelines

Use Table 6.11 (Building Package Order Codes) to compile the complete order by filling in the quantities determined:

- Determine the base network hardware package required to interconnect the floors and/or buildings in the network. Order one hardware package for each Building Package.
- For customers who are new to network concepts and operation, order one NETstart-Plus Network Startup Package (QSC34-SZ) per building.
- For customers who require long-range network planning, order one Network Planning and Design Package (QSNET-SZ) per building.
- Digital recommends the use of a network management product with local area networks. If network management is required, order either NMCC/VAX ETHERnim or NMCC/DECnet Monitor. Refer to Network and System Management Products in Section 3 for product descriptions. Order codes for both the software license and media/documentation are required.

Digital can provide the design and installation of coaxial and fiber optic cabling on a custom basis. They are not included in the Building Package.

Table 6.11 Building Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	**Package A** (local coaxial connections) One LAN Bridge 100 (DEBET-AA) Two H4000 transceivers Two transceiver cables (BNE3L-05)	DEPKB-B1	_____
	Package B (local fiber optic connections) One Remote Ethernet Repeater (DEREP-RC) One Fiber Optic LAN Bridge 100 (DEBET-RC) Two H4000 transceivers Two transceiver cables (BNE3L-05)	DEPKB-B2	_____
Optional Network services	NETstart Plus Network Startup Package	QSC34-SZ	_____
	Network Planning and Design Service	QSNET-SZ	_____

Site Package

The Site Package provides the capability to extend the LAN between buildings that are in close proximity, such as a university campus or office complex. Hence, the Site Package allows a customer to extend Ethernet LANs beyond the usual 2,800 meter limitation. This package delivers 10 Mb/s Ethernet capability between buildings within an extended local area, up to 2000 meters using fiber optic cable (not included).

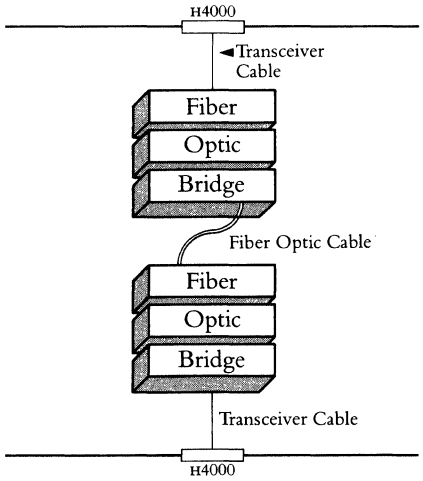
Network Hardware Products

The Site Package includes the following products:

- Two Fiber Optic LAN Bridge 100s
- Two baseband Ethernet transceivers (H4000)
- Two baseband Ethernet transceiver cables

Figure 6.10 details the hardware configuration of the network products provided in the Site Package.

Figure 6.10 Site Package Configuration



Site Package Ordering Guidelines

Use Table 6.12 (Site Package Order Codes) to compile the complete order by filling in the quantities determined:

- Determine the base network hardware package required to interconnect the floors and/or buildings in the network. Order one hardware package for each Site Package.
- For customers who are new to network concepts and operation, order one NETstart-Plus Network Startup Package (QSC34-SZ) per building.
- For customers who require long-range network planning, order one Network Planning and Design Package (QSNET-SZ) per building.
- Digital recommends the use of a network management product with local area networks. If network management is required, order either NMCC/VAX ETHERnim or NMCC/DECnet Monitor. Refer to Network and System Management Products in Section 3 for product descriptions. Order codes for both the software license and media/documentation are required.

Table 6.12 Site Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	Two Fiber Optic LAN Bridge 100s (DEBET-RC) Two H4000 transceivers Two transceiver cables (BNE3L-05)	DEPKB-B3	_____
Optional Network services	NETstart Plus Network Startup Package	QSC34-SZ	_____
	Network Planning and Design Service	QSNET-SZ	_____

Wide Area Interconnection

Wide Area Interconnection provides for network access between sites that are geographically remote from one another. A typical application links a headquarters operation with all of its manufacturing plants, sales offices, and distribution centers. Wide Area Interconnection facilitates better management control through more accurate and timely information gathering, processing, and reporting. It provides immediacy and uniformity for information updates to field operations in areas such as pricing, policy, and product availability. And it enables an organization to coordinate its efforts in response to market conditions.

Wide Area Gateway Package

The Wide Area Gateway Package provides the capability for customers with a local Digital network to connect to remote Digital networks or systems. Communication can be accomplished via either private or public data networks. The Wide Area Gateway Package can be used with any standard systems or CPUs with Digital Ethernet communication controllers and DECnet software. Digital can provide individual site survey and installation plans to ensure proper routing of cable and placement of electronics. Digital can also quote materials and labor necessary to route and install the appropriate cabling. The following products are included in the Wide Area Gateway Package:

Network Hardware Products

- One baseband Ethernet transceiver (H4000)
- One baseband Ethernet transceiver cable
- One DECnet Router Server hardware (DECSA-EA)
- One DECSA U.S. Country Kit (DECSK-AA)

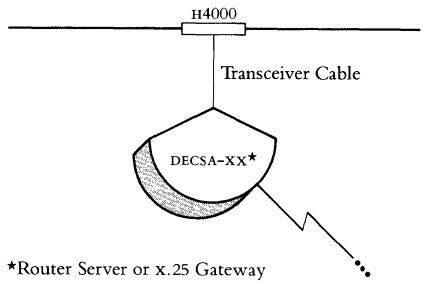
Network Software

Order one of the following:

- DECnet Router Server software (Q*725-XX), or
- DECnet Router/X.25 Gateway software (Q*727-XX)

Figure 6.11 details the hardware configuration of the network products provided in the Wide Area Gateway Package.

Figure 6.11
Wide Area Gateway Package Configuration



Wide Area Gateway Ordering Guidelines

Use Table 6.13 (Wide Area Gateway Package Order Codes) to compile the complete order by filling in the quantities determined below.

- Order one base network hardware package (DEPKR-01) for each Wide Area Gateway Package.
- Order one of the following software packages for each Wide Area Gateway Package (* refers to the CPU that will downline-load the software, # refers to the type of media)

  DECnet Router Server License (Q*725-UZ) and Media and Documentation (Q*725-H#), or

  DECnet Router/X.25 Gateway License (Q*727-UZ) and Media and Documentation (Q*727-H#)

  Note: The level of software service contract must be the same for both the CPU operating system and the DECnet Router Server or DECnet/X.25 Gateway software. Refer to SPD 30.34.XX or SPD 30.41.XX.
- For customers who are new to network concepts and operation, order one NETstart Plus Network Startup Package (QSC34-SZ) per building.
- For customers who require long-range network planning, order one Network Planning and Design Package (QSNET-SZ) per building.
- Digital recommends the use of a network management product with local area networks. If network management is required, order the NMCC/DECnet Monitor. Refer to Network and System Management Products in Section 3 for a product description. Order Codes for both the software license and media/documentation are required.

Table 6.13
Wide Area Gateway Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	One H4000 transceiver One transceiver cable (BNE3L-05) One DECSA DECnet router server One DECSA U.S. Country Kit	DEPKR-01	_____
Network software[1]	DECnet Router Server software license (one per package only)	Q★725-UZ	_____
	DECnet Router Server software media and documentation (one per package)	Q★725-H#	_____
	or		
	DECnet Router/X.25 Gateway software license (one per package only)	Q★727-UZ	_____
	DECnet Router/X.25 Gateway software media and documentation, (one per package)	Q★727-H#	_____
Optional Network services	NETstart Plus Network Startup package	QSC34-SZ	_____
	Network Planning and Design Service	QSNET-SZ	_____

★Refer to Section 2: *DECnet Router Software Order Codes* and Section 3: *DECnet Router/X.25 Gateway Software Order Codes* for a list of supported processors and distribution media.

[1]The level of software service contract must be the same for both the CPU operating system and the DECnet Router Server or DECnet Router/X.25 Gateway software. Refer to the appropriate Software Product Descriptions.

Remote Site Interconnection Package

The Remote Site Interconnection Package links terminals, printers, and personal computers (in terminal emulation mode) in a remote site to an Ethernet local area network via one leased phone line. The products in this package combine terminal server and statistical multiplexing techniques to enable remote site connection.

The Base Package supplies the products and services required to connect up to eight remote devices over a leased phone line to a local Ethernet. The base package plus the Add-on Package connects up to 16 devices from one remote site over a leased phone line to a local Ethernet. External modems that run at 9.6 Kb/s are used in this package to connect over the leased phone line.

Network Hardware Products

The Remote Site Base Package includes the following products:

- One baseband Ethernet transceiver (H4000)
- One baseband Ethernet transceiver cable
- One MUXserver 100 (DSRZA-BA)
- One DECmux II (DFMZA-BA)
- Two 9600 b/s synchronous modems (DF129-AA)
- Two modem cables

Network Software

- MUXserver 100 software media and documentation (one per load host)
- MUXserver 100 software license (one per MUXserver 100)

Figure 6.12
Remote Site Interconnection Configuration

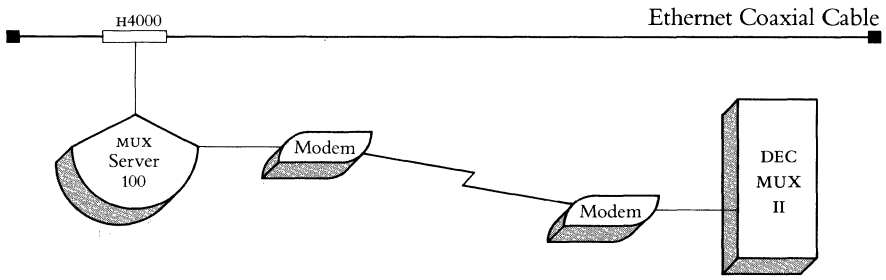


Table 6.14
Remote Site Interconnection
Package Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	**Base Package:** One H4000 transceiver One transceiver cable (BNE3L-05) One MUXserver 100 (DSRZA-BA) One DECmux II (DFMZA-BA) Two 9.6 Kb/s synchronous modems (DF129-AA) Two modem cables (BC22F-10)	DEPKM-01	_____
	Add-On Package: One DECmux II (DFMZA-BA) One connection cable (BC17D-10)	DEPKM-A1	_____
Network software[1]	MUXserver 100 software license (one required per MUXserver 100)	Q*ZAW-UZ	_____
	MUXserver 100 software media and documentation (one required per load host)	Q*ZAW-H#	_____

* Refer to Section 2: *MUXserver 100/DECmux II Remote Terminal Server* for a list of supported processors and distribution media.

Multivendor Interconnection

Multivendor interconnection allows information to be transferred between a Digital network and the network of another vendor, and enables the information to be used on either system. Multivendor interconnection protects a company's investment in existing equipment, and provides freedom of choice for future equipment decisions.

DECnet/SNA Gateway Package

The DECnet/SNA Gateway Package allows communication with an IBM SNA network using the Ethernet-based DECnet/SNA Gateway and the DECnet/SNA Gateway Access Routines. DECnet/SNA Access Routines are software packages, residing on a VAX or MicroVAX host, that allow users to perform specific functions on IBM host systems connected to the SNA network.

Three DECnet/SNA Access Routines are included in the DECnet/SNA Package as listed below. For detailed product descriptions of all DECnet/SNA Gateway Access Routines, refer to *Digital-to-IBM Communications Software* in Section 3.

The following products are included in the DECnet/SNA Gateway Package:

Network Hardware

- One baseband Ethernet transceiver (H4000)
- One baseband Ethernet transceiver cable
- One Ethernet-based DECnet/SNA Gateway (DECSA-FA)
- One Ethernet-based DECnet/SNA Gateway U.S. Country Kit (DECSK-AA)

Network Software

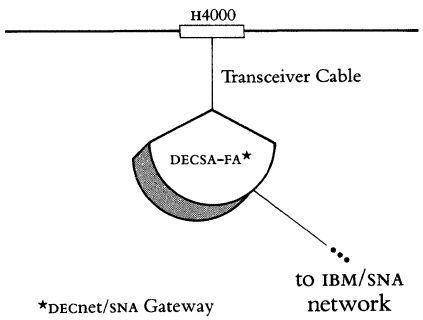
- DECnet/SNA Gateway software (Q*545-XX)
- DECnet/SNA VMS Gateway Management (Q*452-XX)
- DECnet/SNA VMS 3270 Terminal Emulator (Q*454-XX)
- DECnet/SNA VMS Remote Job Entry (Q*453-XX)

Network Service

- DECnet/SNA Gateway Software Installation and Orientation (QSF01-SZ)

Figure 6.13 details the hardware configuration of the network products provided in the DECnet/SNA Gateway Package.

Figure 6.13
DECnet/SNA Gateway Package Configuration



DECnet/SNA Gateway Package Ordering Guidelines

Use Table 6.15 (DECnet/SNA Gateway Package Order Codes) to compile the complete order by filling in the quantities that are determined below.

- Order one base network hardware package for each DECnet/SNA Gateway Package (DEPKS-01)
- Order the DECnet/SNA Gateway software, license, and documentation (Q*545-UZ, Q*545-H#)
- Order all the required DECnet/SNA Access Routines. Both a software license code and a media/documentation code are required for each Access Routine. Refer to the order code table.

  Note: The level of software service contract must be the same for both the CPU operating system and the DECnet/SNA Gateway software. Refer to SPD 30.15.xx.
- Order one DECnet/SNA Gateway Software Installation and Orientation Service (QSF01-SZ) for each DECnet/SNA Gateway Package.
- For customers who are new to network concepts and operation, order one NETstart Plus startup service (QSC34-SZ) per building.
- For customers who require long-range network planning, order one Network Planning and Design Package (QSNET-SZ) per building.
- Digital recommends the use of a network management product with local area networks. If network management is required, order the NMCC/DECnet Monitor. Refer to *Network and System Management Products* in Section 3 for a product description. Order codes for both the software license and media/documentation are required.

Table 6.15
DECnet/SNA Gateway Package
Order Codes

	Product Description	Order Code	Quantity (Fill in)
Network hardware	One H4000 transceiver One transceiver cable (BNE3L-05) One DECnet SNA Gateway One DECnet/SNA Gateway U.S. Country Kit	DEPKS-01	_____
Network software[1]	**License**		
	DECnet/SNA VMS Gateway software (one each per package)	Q★545-UZ	_____
	DECnet/SNA VMS Gateway management	Q★452-UZ	_____
	DECnet/SNA VMS 3270 Terminal Emulator	Q★454-UZ	_____
	DECnet/SNA VMS Remote Job Entry	Q★453-UZ	_____
	Media and documentation		
	DECnet/SNA Gateway software (one each per package)	Q★545-H#	_____
	DECnet/SNA VMS Gateway Management	Q★452-H#	_____
	DECnet/SNA VMS 3270 Terminal Emulator	Q★454-H#	_____
	DECnet/SNA VMS Remote Job Entry	Q★453-H#	_____
Network service	Software installation and orientation	QSF01-SZ	_____
Optional Network services	NETstart Plus Network Startup Package	QSC34-SZ	_____
	Network Planning and Design Service	QSNET-SZ	_____

★ Refer to Section 3: *DECnet/SNA Gateway* and *DECnet/SNA Access Routines* for a list of supported processors and distribution media.

[1] The level of software service contract must be the same for both the CPU operating system and the DECnet/SNA Gateway software. Refer to Software Product Description 30.15.xx.

Section 7
Network Services

Services

Section 7

Network Services

Digital provides services to help customers with planning, designing, implementing, and operating local and wide area networks. Digital's Network Services are provided through its Customer Services organizations, including Educational Services, Field Service, Software Services, and the Computer Special Systems group.

Digital's Network Services 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. In addition, for complex network projects, program management resources are available from the service organizations to help plan and manage the delivery of all the network services needed throughout the network life cycle.

This section describes the following:

- Network Planning and Design Services
- Network Implementation and Startup Services
- Network Operations and Growth Services
- Related Network Services
- Computer Special Systems (CSS)

Although Digital's Network Services are developed for worldwide availability, packaging and delivery models as well as service availability may differ initially outside the United States. Check with the local Digital service organizations to determine the services available in your area. Specific differences that exist in the European network services are noted in this section.

Services for the Planning and Design Phase

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 Service specialists 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 specialists 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.

NETplan/Design Analysis assists the customer in selecting a recommended network design based on an in-depth 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 alternate 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 is a Professional Software Services (PSS) offering that assists customers with distributed application design. The service 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 vendor's hardware and software. This assistance is currently limited to Digital's DECnet/SNA Gateway set of products to facilitate communication between applications on VAX systems and IBM mainframes.

This service is a Professional Software Services (PSS) offering 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

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, which are targeted toward network planners and managers, include:

- Open Systems Interconnection, 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-to-IBM Interconnect Strategy, 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.

Services for the Implementation and Startup Phase

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 on-time completion 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 interim testing required. 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.

NETstart/Certification

Digital Field Service conducts broadband network certification tests to ensure that the network meets or exceeds all design specifications.

Channel Certification

Field Service conducts certification of Digital's broadband Ethernet channel prior to installation of Digital's broadband Ethernet products (DECOM and DEFTR). This channel certification insures successful product connectivity and qualifies the customer's network products for on-site 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 start-up 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 is a Professional Software Services (PSS) offering to assist customers in distributed application development and implementation. The service is tailored to meet 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 vendor's hardware and software. This assistance is currently limited to Digital's DECnet/SNA Gateway product set to facilitate communications between VAX systems and IBM mainframes.

This Professional Software Services (PSS) offering 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 is 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.

Services for the Operations and Growth Phase

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 and include multivendor equipment, non-Digital protocols, and integrated voice/data networks.

NETsupport/Maintenance Management provides five major service elements: maintenance planning, configuration management, fault isolation, fault resolution management, and predictive maintenance. Digital Support Centers provide fault isolation and diagnosis, fault resolution management, maintenance planning, technical assistance, vendor relations, and reporting. Configuration management is performed at the customer site.

NETsupport/Maintenance Management includes the installation on the customer's network of a Digital Service processer with network management software tools. This processor acts as Digital's "tool box" containing network fault isolation tools. The service processor is accessible from the Digital Support Centers and serves as the network remote diagnostic console.

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. This service is currently limited to the NMCC/DECnet Monitor. Assistance is provided in planning, implementation, and startup.

In the United States, this service is provided as the NMCC/DECnet Monitor Startup 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 specialist assists in selecting the operating parameters and options that best address customer network management goals. The Digital software specialist 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 are:

- A Digital network specialist assists in defining the various aspects of monitoring and analysis, and establishes a base of software tools, parameters, and data structures that are used in the monitoring activity.
- The customer receives on-site orientation in the use of the principal monitoring tool (NMCC/DECnet Monitor).
- Digital provides two consulting reports per year that analyze the network performance and capacity characteristics, and interpret the traffic data.
- The customer can also use the monitoring tool (NMCC/DECnet Monitor) and the associated prerequisite software (RDB Relational Database and GKS Graphic software).
- Digital provides support on 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 pro-active 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.

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 in the areas of:

- VAX and PDP-11 Data Communications
- Network Troubleshooting
- Digital Ethernet Hardware Maintenance
- Network Management
- DECnet Programming and Internals

The courses are designed for network managers, system managers with network responsibilities, maintenance engineers, technicians, data communications specialists, and network programmers.

Related Network Services

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:

- Software installation services for network and communications products
- Maintenance services for the network hardware and software products
- Network tools
- DECsite and DECmove services

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 back-up services, and facility management services.

Related Educational Services Training Courses

Digital Educational Services has worldwide education centers in the United States, Japan, Canada, Mexico, Europe, and Australia. They offer basic concept courses such as Data Communications Fundamentals and Packet-Switching Concepts; courses for programmers to teach them Digital's Network Architecture and to help them design and implement applications on the network; courses that teach a specific implementation of the Digital Network Architecture, such as DECnet-RSX or DECnet-VAX; and advanced courses for network designers that examine design alternatives based on price and performance needs and include the latest developments and trends in networks.

Digital Educational Services also offers the following self-paced courses:

- Manager's Introduction to Data Communications
- Introduction to Networks
- Introduction to Data Communications Concepts
- Data Communications Fundamentals
- Network Concepts
- Networking: Design and Implementation of Computer Communications Networks
- Digital Network Architecture
- DECnet-RT
- Packet Switching Concepts
- RSX P.S.I. User/Manager
- VAX P.S.I. User/Manager

A complete list of the courses offered by Educational Services is available in the Educational Services Digest.

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:

DECnet Router/X.25 Gateway
Micro/RSX 2780/3780 Emulator
Micro/RSX 3271 Protocol Emulator
MUX200/VAX
NMCC/DECnet Monitor
NMCC/VAX Ethernim
RSX-11/P.S.I./M
UN1004/RSX
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 the DECnet/SNA Gateway 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 the appropriate SPD for more information about installation services.

Ongoing Maintenance

Field Service provides the full range of on-site and off-site 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 on-site 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.

Basic Service

For 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.

Cableplant Maintenance Service

Cableplant Maintenance Service for broadband networks is available to customers with DECservice or Basic Service agreements, with a Cableplant Maintenance Service to match the service agreement level. The cableplant must have the same coverage as the most critical Digital-serviced hardware attached to it. Scheduled preventive maintenance is provided according to equipment standards as specified by Digital and component manufacturers. Cableplant realignment is performed approximately six months after the precontract inspection. Preventive maintenance, including a recertification, is performed annually thereafter. For European options, contact the local Digital sales office.

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 selected non-Digital communications software products. (Refer to the 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 highly responsive answers to questions or 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

Network Tool: NMCC/VAX ETHERnim

NMCC/VAX ETHERnim, an addition to the Network Management Control Center (NMCC), is a network maintenance application program for Ethernet. It runs as a layered product on VMS and is designed to test the local area network (LAN) communications path using the Ethernet protocol and DECnet. NMCC/VAX ETHERnim has the ability to gather system information for its database from remote VMS and RSX nodes by invoking remote command files. In addition, the program utilizes Phase IV DECnet software on a system configured as a DECnet router. (Refer to *Network and System Management Products* in Section 3 for more information.)

In Europe, NMCC/VAX ETHERnim is currently available on request to customers whose network nodes are covered by a Digital Field Service contract.

Network Tool: NMCC/DECnet Monitor

NMCC/DECnet Monitor is Digital's network monitoring software product for a Network Management Control Center (NMCC). This VMS layered software product can monitor all the Phase III and Phase IV DECnet systems in a network. No additional hardware or software is required.

NMCC/DECnet Monitor utilizes simple commands to control network monitoring activity and to request on-line displays or reports from a central database. Screen displays present traffic data, error statistics, and status information using text and color graphics to highlight important network conditions. (Refer to *Network and System Management Products* in Section 3 for more information.)

In Europe, the NMCC/DECnet Monitor is provided to customers under the NETmon Traffic Monitoring and Consulting Service.

DECsite Services

DECsite Services are available when customers require professional help to prepare new space for new equipment, or to move equipment to a new site. A project to meet these needs falls into three phases: decision, design, and delivery. DECsite Services are structured to meet customer needs in each phase and allow customers to control the extent of Digital's involvement and the pace of the project.

Features

- Modular services to plan, design, and build new, expanded, or renovated computer sites for Digital customers.
- Three levels of service—DECsite I, II, and III—and five forms of agreement let customers choose the extent of Digital's involvement. Customers control financial and timing commitments for the project.
- Digital brings a professional understanding of cost effectiveness to computer site projects.
- All necessary physical elements are included: space allocation, power service, air conditioning, data wiring, fire security, access security, and materials.
- Digital provides professional project management and computer-site design knowledge during the decision and design phases, and uses experienced, Digital-qualified subcontractors for the delivery phase.

In Europe, DECsite services include the network physical design and installation services described elsewhere in this section.

DECsite I

In DECsite I, the decision phase, Digital professionals analyze the customer's computer environmental needs from the perspectives of operations, equipment complement, available space, building services, and future expansion. Digital provides the engineering analysis and budget estimates needed to determine building requirements.

DECsite II

In DECsite II, the design phase, Digital provides detailed construction drawings, specifications, and wire lists. DECsite II design documents can be used by the customer to build the facility using internal or contracted resources with confidence that the design will meet planned data processing needs. If customers elect to build their own facilities, construction phase consultations are available.

DECsite III

In DECsite III, the delivery phase, Digital provides the finished facility. At the end of the design phase (DECsite II), Digital presents a price and schedule quote for customer approval. The advantage of choosing DECsite III is that a coordinated design/build project is usually the quickest way to complete construction, and Digital's DECsite professionals serve as the single source for the entire project. Only Digital-qualified building subcontractors are hired, and the DECsite professionals apply Digital's knowledge and experience to computer-related issues, thus providing complete project management. The customer can work with the Digital construction manager throughout the project instead of having to manage several vendors. Digital will complete the project to the customer's satisfaction and guarantee workmanship and materials for one year.

DECmove Service

DECmove provides a comprehensive solution to the problems of moving computer equipment from one site to another. With the DECmove service, Digital handles all aspects of moving computer equipment, from qualifying movers to coordinating the moving schedule.

Features

- Management of all aspects of the customer's move, including selecting and qualifying movers, and defining the type of moving equipment and transportation required. When necessary, Digital arranges for temporary storage of customer's equipment.
- Handling of all aspects of deinstallation and reinstallation. Digital verifies equipment operation prior to dismantling and runs diagnostics after reinstallation to ensure that the equipment runs properly.
- Insuring the equipment against all risks except war and nuclear disaster. Damaged equipment manufactured or supported by Digital is repaired or replaced on a priority-one basis (bypassing normal manufacturing queues). Damaged equipment not manufactured or supported by Digital is replaced as promptly as possible.
- Coordinating the schedule of the move to minimize the impact on the customer's operations.
- Surveying the customer's new site to ensure that all the appropriate environmental and power conditions are optimized for efficiency and availability.
- Preparing a fixed price quote for the entire move. This prevents any hidden expenses and lets the customer handle Digital's moving services with a single purchase order.

Eligibility

DECmove is available only for equipment covered by a DECservice or Basic Service Agreement.

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

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. There are three principal service offerings: Service Bureau Services, Disaster Back-up Services, and Facility Management Services.

Service Bureau Services

These services are accessed locally and delivered remotely from Digital's Computer Services Centers:

- 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, PDP, and DECSYSTEM 20 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, PDP, and DECSYSTEM 20 computing resources and associated software to support Software Services consulting projects.
- Incremental Computer Resources—VAX, PDP, and DECSYSTEM 20 computing resources are provided to meet special customer needs such as peak load processing. Timesharing access is also available for pre-delivery software development and peak load processing.

A telephone support service offering a 24-hour-a-day, 365 day-a-year hotline staffed by Digital software experts is also available.

Disaster Backup 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 Backup 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

Digital's Computer Special Systems (CSS) group offers design and manufacturing services for developing and supplying special function hardware, firmware, and software networking products to meet custom requirements. Typically, these services are available to provide:

- Digital to non-Digital host and terminal interconnect
- Links to public and private networks
- Network bridges
- High performance, intelligent front end communications processors

Through CSS, Digital can provide efficient network performance and flexible network configurations that meet custom needs with full Digital hardware, software, and service support.

Appendices

Appendix A

Performance Guidelines

Terminal Server Performance Guidelines

Terminal Server performance is characterized best by the following metrics:

- Host CPU interrupt load (for protocol messages)
- Server system throughput
- Average response time
- Ethernet utilization

These metrics are constrained by the terminal workload on the host. Obviously, a large number of EDT users 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.

The LAT protocol is an Ethernet-based virtual circuit protocol. Since LAT buffers characters from many terminals into 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 terminals connected directly through a DMF32 device. LAT terminals may provide some savings in the character interrupt load of DZ11 terminals.

The DECserver 200 V1.0 can process an aggregate output throughput of over 14,000 characters per second, and an aggregate input throughput of over 12,000 characters per second for 8 terminals running at 19,200 bits per second.

The average response time is 45–125 milliseconds, depending whether the terminal driver or the applications program on the host performs character echoing. Expect the response time to approximate 45–50 milliseconds when the terminal driver handles echoing.

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 Ethernet. The higher the value, the lower this overhead becomes. However, this will increase the response times. For the above information, the circuit timer default of 80 milliseconds is assumed.

DECrouter 200 Performance Guidelines

The process of properly configuring the DECrouter 200 is based on an understanding of 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. The DECrouter 200 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 Ethernet, and a network buffer size of up to 1,482 bytes.

Communication Line Characteristics

It is important to note that 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 Ethernet-to-asynchronous and asynchronous-to-Ethernet traffic in an office environment, the respective maximum values can be averaged to a value of 175 packets per 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.

Table A.1
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

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 the Software Product Description (SPD 27.72.xx).

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.

DECnet Router V1.2 Performance and Configuration Information

Configuring the DECnet Router node is based primarily on tradeoffs of cost and performance while satisfying the user's application requirements. It can be expected that network applications will range from low-speed situations (for example, connecting few remote nodes over low speed communications lines) to those of relatively high performance (for example, connecting two Ethernets). Primarily, the performance of a given DECnet Router node is a function of the expected network traffic and normal workload. Thus Router performance depends on several factors:

- Communication line characteristics
- System throughput characteristics
- Server memory characteristics

All three factors must be considered when configuring a DECnet Router node.

Communication Line Characteristics

It is important to note that the rate at which user data can be transmitted (throughput) 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 application(s), as well as the factors cited in this section.

The table below describes the physical hardware configurations (number of communications lines) supported by the DECnet Router server.

	Maximum Line Speed (Kilobits/sec)				
Line Card Type	**9.6**	**19.2**	**56**	**250**	**500**
DCSAX-LA (FDX/HDX)	16	16	N/A	N/A	N/A
DCSAX-LB (FDX/HDX)	N/A	N/A	8	2	1
DCSAX-LC (FDX/HDX)	16	16	N/A	N/A	N/A

Note that the maximum number of lines supported by the hardware unit is thirty-two, and that the aggregate line throughput cannot exceed 500 kilobits per second. You can mix the line card types within the same system as long as you adhere to the aggregate bandwidth restriction. Total system throughput (below) must also be considered when configuring the DECnet Router Server.

The Router software supports dynamic hardware configuration while the system is running, with the following restrictions:

- You cannot use line slots which do not have a line card in place when the system is loaded.
- If you want to run one line at 500 kilobits, you may only have one line card in the unit when the system is loaded.
- If you want to run two lines at 250 kilobits or four lines at 125 kilobits, you must have the line cards in consecutive order in slots 1–4 of the unit. None can be in slots 5–8.
- After the system is loaded, you may not swap incompatible line cards.

In order to achieve a viable configuration, the user and/or a Digital software specialist should perform a level of application analysis which addresses the factors above. In the preceding table, the following definition applies: Maximum line speed—the fastest clock rate at which the number of line cards specified can be driven under the DECnet Router Server. The actual maximum data throughput can not be calculated by multiplying the number of lines by the line speed, since many factors already discussed in this section will reduce the actual throughput.

System Throughput Characteristics

Having determined that the line card limitations are not exceeded, the processing power of the DECnet Router Server must be taken into consideration. The DECnet Router Server is able to route a maximum of 140 packets per second. Care must be taken when designing a viable configuration that the average route-through packet-per-second rate does not exceed this value. Determining the average packet-per-second rate requires an understanding of the types of applications which generate data routed by the DECnet Router Server in the overall network.

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 upon the types and amounts of different traffic. The average can be computed from an existing router by examining the various circuit counters for that router and using the following equations:

total packets = (Transit Packets Sent + Transit Packets Received
+ Originating Packets Sent + Terminating Packets Received)

total bytes = (Bytes received + Bytes sent)

Average Packet Size = [(total packets) / (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 that router and using the following equation:

Average transit packets =
[(Transit Packets Sent + Transit Packets Received) / 2]

Average Packets per Second =
[(Average transit packets) / (seconds since counters were last cleared)]

Note that the "Transit Packet" counters should contain values much larger than the "Originating Packets" or the "Terminating Packets" counters. If not, then the circuit under investigation is not being used for route-through traffic. Note also that the counters being used for these computations should accumulate statistics for as long as possible in order to make the results of the equation as accurate as possible.

Computing Packet Per Second Rate From Line Speeds

An alternate metric is the maximum possible packet delivery rate possible for any particular line. This value is computed as follows:

characters per second = [(line speed) / (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.

Max packets per second = [(characters per second) / (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 which will be delivered to the DECnet Router Server can be determined, then this value should be used to assure that the maximum of 140 packets per second is not exceeded.

If the actual packet per second rate cannot be determined ahead of time, then the computation of the maximum packet per second rate based upon the line speed should be used, and the total of the maximum packet per second rates for all the proposed lines should be kept below the 140 packet per second limit. By using this technique to configure the DECnet Router Server, it is very possible that the resulting configuration is overly restrictive. After the DECnet Router Server has been run for some time and the actual packet per second rate has been determined, it may be possible to add more lines based upon the actual packet per second rate measured.

In configurations where the DECnet Router Server is used to link large sections of your network (such as linking two large Ethernet segments with DECnet Router Servers), 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 DECnet Router Servers are the focus of traffic for many nodes on both sides of the large network sections.

In configurations where the DECnet Router Server is used to couple a small network section, or a series of endnodes, to the Ethernet, it is expected that the actual packet per second rate may not approach the maximum packet per second rate as computed based upon line speed. This is because individual nodes generally do not saturate the communications lines in both directions for extended periods of time.

Also, note that configuring the DECnet Router Server as the "designated" router will reduce the amount of processing power available to be used for routing packets. It is desirable in many configurations to configure the DECnet Router Server 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 DECnet Router Server into a viable configuration. Typically, configuring the DECnet Router Server as the "designated" router will reduce the maximum packet per second rate from 140 to 120 packets per second.

Router Server Memory Configuration

The DECnet Router Server has a fixed amount of memory to use for storing routing databases. The number of nodes within an area supported by the DECnet Router Server is determined by the number of other Routing nodes on the same Ethernet segment as the DECnet Routing Server, and by the number of lines configured into the DECnet Routing Server. Note that the other routing nodes on the Ethernet segment can be any Phase IV routing node. The relationship between these is described as follows:

Number of lines in the image is determined by which DECnet Router Server system image is to be used. If there are 8 or less synchronous lines to be used, and no asynchronous lines, then the number of lines in the image is 8. Otherwise, if [number of asynchronous lines + (2 * [number of synchronous lines])] is less than or equal to 16, then the number of lines in the image is 16. If neither of these two cases apply, the number of lines in the image is 32.

Using the following relationship, the number of lines, the number of routers on the same Ethernet segment, and the maximum node address supported can be traded off against each other. Note that the number of Ethernet Routers is defined as the number of Level 1 routers which are on the same Ethernet segment and in the same area as the DECnet Router Server being configured. An Ethernet segment is defined as containing the DELNI or Coax Ethernet cable to which the DECnet Router Server is directly connected, and any DELNIS or Coax Ethernet cable segments directly connected or connected via a DEBET or a DEREP.

[(Maximum Nodes) * (3.5 + (Number of lines in the image) + Ethernet routers)] must be less than or equal to 24500.

DECnet Router/X.25 Gateway Performance Guidelines

Configuring the DECnet Router/X.25 Gateway node is influenced primarily by tradeoffs of cost and performance while satisfying the user's application requirements. It can be expected that network applications will 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 Ethernets). 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.

Primarily, the performance of the DECnet Router/X.25 Gateway is a function of the expected network traffic and resultant processing. The following factors should be taken into consideration when reviewing DECnet Router/X.25 Gateway performance:

- Communications line characteristics
- Buffer size
- Quantity and frequency of route-through traffic
- Total number of Data Link Mapping circuits
- Concurrent use of DECnet routing with native-mode X.25 operations such as incoming/outgoing X.29 terminal traffic

It is important to note that the rate at which user data can be transmitted (throughput) over a communications line will approach, but never reach, the actual line speed. The actual throughput is a function of many factors, including the line quality, protocol overhead, topology, and network application(s).

The DECnet Router/X.25 Gateway supports six lines at 56.0 Kb/s, eight lines at 9.6 Kb/s, seven lines at 19.2 Kb/s, two lines at 250 Kb/s, and 1 line at 500 Kb/s. Two lines are reserved for X.25 communications with a total line speed of 19.2 Kb/s, (either 19.2 Kb/s on one line or 9.6 Kb/s on two lines). If one or both of the X.25 lines are used, the other six lines are limited to a maximum speed of 19.2 Kb/s.

The DCSAX-LB line card (for connection to CCITT V.35 lines) cannot be used when the DECnet Router/X.25 Gateway has been configured for X.25 communications. It may be used only for point-to-point DDCMP connections, and then only when no concurrent connections to an X.25 PSDN are required. The maximum number of DCSAX-LB line cards that can be configured for X.25 PSDN connection is two, with the remaining six slots available for DCSAX-LA line cards for point-to-point DDCMP communications.

Note that the total number of line cards supported by the hardware unit is eight, and that the aggregate line throughput cannot exceed 500,000 bits per second. Line card types can be mixed within the same system as long as the user adheres to the line card restriction defined above, and this aggregate bandwidth restriction.

The DECnet Router/X.25 Gateway software supports dynamic hardware reconfiguration while the system is running, with the following restrictions:

- Line slots that do not have a line card in place when the system is loaded cannot be used.
- In order to run one line at 500 Kb/s, only one line card can be in the unit when the system is loaded.
- In order to run two lines at 250 Kb/s or four lines at 125 Kb/s, the line cards must be in consecutive order in slots 1–4 of the unit. No line cards can be in slots 5–8.
- After the system is loaded, DCSAX-LB and DCSAX-LA line cards cannot be swapped.

In order to achieve a viable configuration, the user or a Digital software specialist should perform a level of application analysis which addresses these factors.

DECnet Performance Guidelines

A major performance enhancement to DECnet-VAX V3.1 or later is support for the DEUNA at the datalink layer. The port (device) driver in VAX/VMS interfaces directly to the DEUNA Ethernet controller and provides a datalink that can transmit user data faster and with less host system load than a 1 megabit DMR11. Other performance enhancements in DECnet-VAX allow higher-level layers of software access to over 90% of port driver bandwidth. VAX/VMS V.3.4 permits users to access the DEUNA's QIO interface for other protocols of their own invention while simultaneously using the DECnet protocols. Access to this driver interface is standard in VAX/VMS; users need not purchase a DECnet-VAX license for this purpose although it is highly recommended for network management.

Several major enhancements have been made to the End-to-End Communications layer of DECnet. One of these changes reduces the number of messages exchanged between nodes during a data transfer. With this new "flow control" algorithm, less network latency is experienced—an important issue for satellite communication or multihop routing traffic. Furthermore, since fewer messages are exchanged, this algorithm reduces host system loading. Another enhancement is the inclusion of a feature called "transmitter pipelining" that facilitates multibuffering within the End-to-End Communications layer. Because of "transmitter pipelining," applications now incur fewer delays waiting for communications transmissions.

The third major enhancement in the End-to-End Communications layer is an optimization called "one hop logical links." (A hop is the logical distance between two adjacent nodes in a network.) VAX/VMS using the algorithm "one hop logical links" to transfer data between VAX/VMS systems that are connected to the same Ethernet. This algorithm is actually an option that users can enable or disable. It allows a pair of nodes that are "one hop" away from one another to negotiate the use of large buffers (more than the typical 576 bytes) for the datagrams used between them. By using larger buffers for functions such as file transfer, fewer interrupts are generated to transfer the same amount of data; consequently, there is less overhead and performance tends to increase. The "one hop logical links" algorithm is optional for the following reason: when a pair of nodes agree on a large buffer size, they disable the use of adaptive routing for those logical links between them that are using the "one hop logical link" algorithm. Therefore, if two nodes using the "one hop logical links" algorithm start a file transfer and the line between them drops, the file transfer will stop (even though ordinarily the nodes would use adaptive routing to reroute the data packets via other DECnet physical links). At the moment, DECnet-VAX V3.1 supports "one hop logical links" only between two routing nodes.

At the Session layer, DECnet-VAX V3.1 uses a new method for activating network processes. This new technique helps to reduce the time it takes to establish a logical link by reusing an active network process, called NETSERVER, instead of creating a new one whenever a logical link is initiated. As a result, link creation time is reduced to 1.4 seconds on VAX-11/780s (versus 2.6 seconds in previous releases).

Finally, at the Network Applications layer, RMS and FAL, and the File Access Listener, have been modified to use a larger buffer (up to 4 Kbytes). This permits up to eight disk blocks in block mode file transfers to be sent in one QIO request. It also increases the maximum record size to 4,096 bytes. In addition, FAL now uses a multiblocking algorithm that greatly reduces the number of disk accesses required to store or retrieve a file. Consequently, FAL's CPU usage is reduced by over 50%. The net effect of these changes greatly improves file transfer throughput.

These enhancements will improve performance for all users. The new network process creation and "flow control" techniques will apply to everyone running DECnet-VAX. The other enhancements are targeted more at Ethernet customers than at users of slower-speed links.

DECnet Performance Data

Tables A.2 and A.3 are some actual performance measurements including the magnitude of the improvements in DECnet-VAX V3.1. Note that during these measurements, DECnet was the only application on the system. Task-to-task data was obtained with no computation involved in generating the message content. For file transfer testing, large (1,024 block) files were used. Other parameters were set to typical values for all tests. All measurements were taken with a line buffer size of 576 bytes except where "one hop logical links" were used. In those cases, the algorithm permitted the use of 1,498-byte buffers.

Table A.2
Maximum Task-to-Task Data Transfer Rates

	1 MG DMRs			Ethernet	
DECnet Version	2.0	3.0	3.1	3.1 without 1 hop log. link optimization	3.1 with 1 hop log. link optimization
	Bytes			**Bytes**	
User buffer size	512	4096	4096	*4096	2920
	Kbits/s			**Kbits/s**	
VAX-11/780	500	660	800	800	1300
VAX-11/750	320	530		600	1200
VAX-11/730		200			

Table A.3
Maximum File Transfer Data Rates

	1 MG DMRs			Ethernet	
DECnet Version	2.0	3.0	3.1	3.1 without 1 hop log. link optimization	3.1 with 1 hop log. link optimization
	Kbits/s			**Kbits/s**	
VAX-11/780	105	140	340	420	500
VAX-11/750				350	390
VAX-11/730	N/A		185	225	

DECnet-RSX Phase IV Performance Guidelines

The following paragraphs provide performance guidelines for file transfer and task-to-task communication for DECnet-RSX-11M-PLUS V3.0. DECnet-RSX Phase IV performs like DECnet-RSX Phase III (within 10%), with an increased capability due to Ethernet support.

The performance of a network can be affected by several different factors. One major consideration is the type of processor used. The CPU can be a limiting factor in terms of performance.

Another factor to consider in determining network performance is the communication devices used. Those with a low line speed can bottleneck a configuration, so 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.

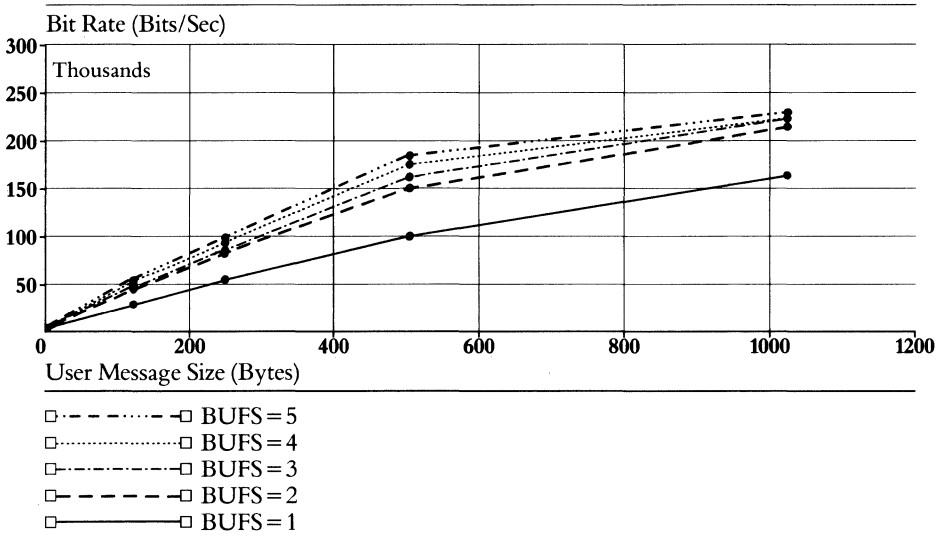
The buffering level of task-to-task communication has an impact on the bit transfer rate. Multibuffering uses more of the available network buffers than single-buffering. In a small memory machine, multibuffering could degrade system performance. The increased difficulty in programming with multibuffering and the increased possibility of system performance degradation must be weighed against improved network performance. With this performance tradeoff, it is necessary to evaluate and determine how the user's needs will be best satisfied.

Throughput Data

When writing programs for task-to-task communications there are tradeoffs to consider. It is much 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.

Figure A.1 illustrates (1) how an increase in the buffering rate improves the bit rate and (2) the dramatic increase in throughput as the buffering level increases from 1 to 2. In a typical situation, one could expect results of 150 Kb to 400 Kb for multibuffering.

Figure A.1
Effects of Multibuffering on Bit Rate



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. 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 to 200 Kb.

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. For a PDP-11/24, the user could expect CPU utilization to peak between 58% and 78%.

File Transfers

The time required to transfer a file can be divided into two categories, either connection time or transfer time. There is a fixed amount of connection time required to execute start-up functions (ie: 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 Ethernet. The results from the NFT task are shown in Table A.4.

Table A.4
Network File Transfer Over Ethernet

Configuration	Connection Time (secs)	Blocks/second Transferred
11/24→11/24	4	23.3
11/44→11/44	2.3	36.1
11/44→11/750	3.7	36.7

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 an 11/44 and 11/24 node can route each second are 314 and 167, respectively. Note that these numbers will decrease if routing updates are required, system activity increases, and network activity increases. The number of milliseconds required to transmit a packet through an 11/750, 11/44, and 11/24 are 3.9, 3.2, and 6.0, respectively. Note too, that as the factors mentioned above increase, these will also.

DECnet/SNA Data Transfer Facility

Configurations and Methods

All measurements were conducted on standalone systems. Only the tasks necessary for measuring were running on the VMS V4.5 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 used by the application will be consistent.

Figure A.2
Test Configuration Using MicroVAX II or VAX 8200 as Server and Client

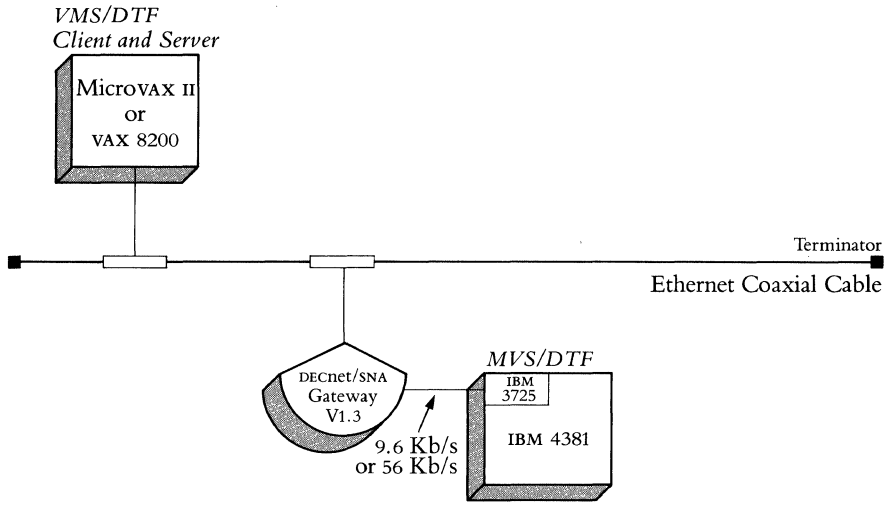


Figure A.3
Test Configuration Using One MicroVAX II as Server and One as Client

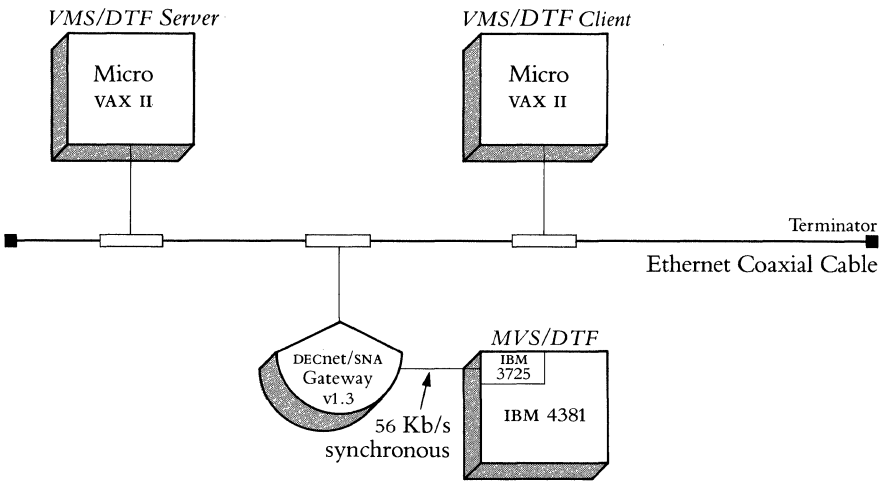
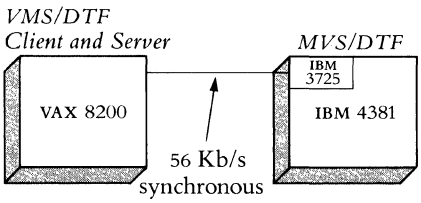


Figure A.4
Test Configuration Using VMS/SNA on VAX 8200



The file transfer measurements were designed to transfer a variety of file sizes, 1 to 1000 blocks, 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, 512 ad 4096 bytes were transferred using a Request Unit (RU) of 512, 1024, 2048 or 4096 bytes. The frame sizes were 521 bytes on the 9.6 Kb/s line and 1417 bytes on the 56 Kb/s line. The pacing is set to 4 for all measurments. Measurements included the CPU utilization of the application, the response time for transferring the file, and the synchronous line utilization, since the synchronous line was the gating factor in most of the measurements.

Results

The optimal RU size is 1024 or 2048 bytes considering response time inbound and outbound as well as CPU and line utilization. This is true for all configurations studied.

Note: The operating system used for all VMS nodes is VMS V4.5. Increased funtionality in subsequent versions of VMS may impact performance. VMS V4.6 handles the establishment of logical links between nodes differently. With increased functionality, this leads to longer connect times.

When using the configuration in Figure A.2 with the MicroVAX II as the local node, the maximum throughput is 45.3 Kb/s (11.1 blocks/second) with a line utilization of 80.97% of the 56 Kb/s line. The following table gives the maximum observed throughput for varying RU and record sizes over the 56 Kb/s line (outbound, 1000 blocks).

RU	REC SIZE (bytes)	RESPONSE TIME (seconds, V4.5)	THROUGHPUT bits/sec	blocks/sec	MB/hr
512	80	92.7	44201	10.8	19.9
	512	98.7	41513	10.1	18.9
	4096	103.0	39766	9.7	17.9
1024	80	96.3	42519	10.4	19.1
	512	94.3	43420	10.6	19.5
	4096	93.0	44043	10.8	19.8
2048	80	93.0	44043	10.8	19.8
	512	90.3	45343	11.1	20.4
	4096	90.7	45176	11.0	20.3
4096	80	100.0	40960	10.0	18.4

The throughput on the 9.6 Kb/s line is limited by the line speed. The maximum observed throughput was 8.5 Kb/s for an 89% line utilization. This is true also for 1000 blocks outbound with RU 1024 bytes and record size of 512.

Some of the measurements were taken when transferring files without data translation. It was observed that the response time was 13% longer on the average if data translation takes place.

When a VAX 8200 is used as the local node, as shown in Figure A.2, the throughput is increased about 12%. The following is a list of maximum throughputs observed with RU set to 1024 bytes over a 56 Kb/s line.

RU	REC SIZE (bytes)	RESPONSE TIME (seconds, V4.5)	THROUGHPUT bits/sec	blocks/sec	MB/hr
1024	80	94.0	43574	19.6	15.6
	512	90.7	45176	20.3	16.2
	4096	90.3	45343	20.4	16.3

In the configurations shown in Figures A.2 and A.4, the DTF/VMS client and server software are resident in the same node. In the configuration shown in Figure A.3, the client and server are in separate MicroVAX IIs, each running VMS V4.5 operating system. The test file was sent from the client node to the server node to the DECnet/SNA Gateway, then over the synchronous line to the IBM system. The following table compares the CPU utilization of a file transfer on a single DTF/VMS client/server node to the utilization on separate client and server nodes.

RU	2048 bytes
File size	1000 blocks
Record size	80 bytes

	Single Node	Separate Client/Server
Response time	93.0 seconds	96.3 seconds
Throughput	44.0 Kb/s	42.5 Kb/s
CPU utilization (%)	55.9%	client: 18.2% server: 34.8%

The client CPU utilization is record-size dependent: the larger the record size, the less CPU time used per block.

The configuration shown in Figure A.4 uses VMS/SNA V1.1 software on the VAX 8200 node as a connection to the IBM system rather than the DECnet/SNA Gateway. The CPU utilization on the VAX 8200 generally increases 22% when transferring files of 50 blocks or less when using VMS/SNA V1.1 as a gateway. The user may see an increase of 30% in the CPU utilization when transferring files with small (80 byte) records. The increase in CPU load is due to the VMS/SNA software residing on the sending node. The maximum throughput in this configuration is 45.2 Kb/s observed when transferring 1000 blocks outbound from IBM with the RU size set to 2048 bytes and a file record of 512 bytes. The outbound throughput will be similar to throughput using the DECnet/SNA Gateway V1.3 for large files (over 100 blocks). When transferring files inbound or small files outbound, the throughput is an average of 30% less using VMS/SNA V1.1 than DECnet/SNA Gateway V1.3.

BISYNC Emulators Performance Guidelines

This subsection presents guidelines and examples of test results of performance measurements 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.

Issues for 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, VAX/VMS V3.4, and a 9,600 bits per second synchronous line using a modem eliminator. Note that 9,600 bits per second is the highest possible 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 three.

The following configuration was used to test the RSX 3271 Protocol Emulator: PDP-11/70, RSX-11M (no extended memory support), and a 9,600 bits per second 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 ten 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.

Issues for 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 9,600 bits per second line on a VAX-11/750 with a DUP11 device uses about ten 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 one-half.

Typically, a 9,600 bits per second line using a modem eliminator on a PDP-11/70 also uses about ten 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 (ten percent CPU usage) can be extrapolated to 20 percent CPU use for the VAX-11/730. The results for the PDP-11/70 configuration (ten 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 (ten percent CPU use) can be extrapolated to seven percent CPU use for the VAX-11/780.

DECnet-DOS and DECnet-Rainbow File Transfer Performance Guidelines

Software testing for file transfer performance was conducted on standalone systems connected by unshared transmission media. Only those machines under test are on the network at the time of the tests, and the remote node is 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, since most hosts and networks have multiple users contending for the available resources.

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. Since the IBM PC/AT is a faster processor then the IBM PC/XT, it has a shorter startup time, a faster overall response time, and a higher throughput.

With the Ethernet, 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.

Table A.5
DECnet-DOS Startup Times and Transfer Costs

Processor	Startup Time	Transfer Cost per Block
9600 baud line		
100+ → MVAX	5.12	0.61
PC/XT → MVAX	6.53	0.75
PC/AT → MVAX (6 MHz)	4.26	0.61
PC/AT → MVAX (8 MHz)	4.64	0.60
Ethernet line		
PC/XT → MVAX	4.96	0.104
PC/AT → MVAX (6 MHz)	3.25	0.039
PC/AT → MVAX (8 MHz)	3.05	0.031

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 a Rainbow 100+ to a MicroVAX II over a 9600 baud line:

(blocks ★ transfer cost per block) + startup time = response time

(1000 ★ 0.61) + 5.12 = 615 seconds

Ethernet Performance

In an Ethernet configuration, maximum throughput using DECnet-DOS for file transfer on the 6 MHz IBM PC/AT is 95 Kbaud, on the 8 MHz IBM PC/AT is 117 Kbaud, while the maximum on the PC/XT is 36 Kbaud. 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 effect network performance if the remote node is multi-tasking and highly utilized.

LAN Bridge 100 Performance Guidelines

The LAN Bridge 100 is a very high performance device which connects two Ethernet segments. The bridge receives frames from both Ethernet segments. When a frame is transmitted, the LAN Bridge 100 determines which segment contains the destination node. If the destination node for the frame is not on the same Ethernet segment as the source node, the bridge transmits the frame to the other segment. If the destination node of a frame is on the same segment as its origin, the bridge discards the frame.

Factors affecting the performance of the LAN Bridge 100 include the latency that 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 Ethernet frame spends in the bridge, i.e. time to process and transmit an incoming Ethernet frame. Maximum throughput is the rate at which the bridge can receive frames on one Ethernet segment and forward them to the other Ethernet segment.

The latency introduced by the bridge is very small. The Bridge introduces a latency of approximately 107 microseconds for minimum length (64-byte) frames.

The LAN Bridge 100 is designed with a high throughput capability. Under test conditions, the bridge can forward bursts of frames at full Ethernet bandwidth. However at "steady state" (continuous steady stream of Ethernet frames), the bridge can forward 13,397 minimum size packets, and 811 maximum size Ethernet packets per second.

Appendix B

Environmental Specifications

Detailed site preparation information is provided in the individual site preparation guide for the specific products. The environmental information in this section is provided to help you plan for installation when ordering products.

Hardware products are classified and tested according to one of the classes of temperature/humidity environments shown in Table B.1.

Table B.1
Environment Classes

Class	Temperature	Relative Humidity		
		%	Max Wet Bulb	Min Dew Point
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 or less to 95	32°C (90°F)	2°C (36°F)

Appendix C

Software Product Description Listing

Software Product	SPD	Version
Networks and Communications Software		
DECnet-11M	10.75.xx★	4.2
DECnet-11M-Plus	10.66.xx	3.0
DECnet-Micro/RSX	18.27.xx	1.1
DECnet-11S	10.74.xx	4.2
DECnet-VAX	25.03.xx	4.4
PRO/DECnet	40.09.xx	2.1
DECnet/E	10.73.xx	4.0
DECnet-RT	10.72.xx	2.1
DECnet-10	08.60.xx	4.0
DECnet-20 (DECSYSTEM 2020)	23.20.xx	2.1
DECnet-20 (DECSYSTEM 2040/2060)	23.02.xx	4.0
DECnet-ULTRIX	26.83.xx	1.1
DECnet-Rainbow	50.14.xx	1.2
DECnet-DOS	50.15.xx	1.2
DECnet-VAXmate	55.05.xx	1.0
VAX/VMS Services for MS-DOS™	30.50.xx	1.0
PCSA/PC Client	55.07.xx	1.0
PC ALL-IN-1	28.39.xx	1.0
Ethernet Communications Servers		
DECserver 200 for VMS and MicroVMS	27.53.xx	1.0
DECserver 200 for 11M-PLUS/Micro/RSX	15.72.xx	1.0
DECserver 200 for ULTRIX	27.54.xx	1.0
DECserver 200 for TOPS-10/20	30.49.xx	1.0
MUXserver 100/DECmux II	28.45.xx	2.0
DECnet Router Server	30.34.xx	1.1
DECrouter 200	27.72.xx	1.0
VAX Print Server 40 Client	27.67.xx	1.0
VAX Printer Server 40 Supporting Host	27.68.xx	1.0

★"xx" designates the current SPD version number.

Appendix C
Software Product Description Listing
(Continued)

Software Product	SPD	Version
Internet Communications Software		
DECnet/SNA Gateway	30.15.xx	1.3
DECnet/SNA VMS Gateway Management	30.15.xx	1.3
DECnet/SNA VMS DDXF	26.72.xx	1.2
DECnet/SNA VMS DHCF	26.71.xx	1.1
DECnet/SNA DTF	27.85.xx	1.0
DECnet/SNA PrE	26.70.xx	1.1
DECnet/SNA 3270 TE	26.84.xx	1.3
DECnet/SNA VMS RJE	26.85.xx	1.2
DECnet/SNA VMS API	26.86.xx	2.1
DECnet/SNA VMS APPC/LU6.2	26.88.xx	1.1
DECnet/SNA VMS 3270 DS	26.87.xx	1.2
EDE with IBM DISOSS	26.92.xx	1.1
EDE-W Document Exchange	26.37.xx	1.1
VMS/SNA	27.01.xx	1.0
VIDA	27.25.xx	1.0
WPS-PLUS/PC	30.75.xx	1.0
RSX-11/3271 Protocol Emulator	10.88.xx	3.1
VAX 3271 Protocol Emulator	25.21.xx	2.3
RSX-11 2780/3780 Emulator	10.01.xx	4.1
RSX-11M/M-PLUS RJE/HASP Emulator	10.48.xx	1.3
VAX 2780/3780 Protocol Emulator	25.07.xx	1.5
RSX-11M/IAS RJE/HASP Emulator	10.51.xx	1.1
TOPS-20 2780/3780 Emulator-Terminator	30.23.xx	2.1
TOPS-20 2780/3780/HASP	30.24.xx	1.1
TOPS-20 2780/3780/HASP for 2020	23.07.xx	1.1
TOPS-10 2780/3780 Emulator-Terminator	30.23.xx	4.0
TOPS-10 2780/3780/HASP	30.24.xx	1.0
VAX NTR Protocol Emulator	25.68.xx	1.1
MUX200/VAX Protocol Emulator	25.02.xx	2.0
Message Router VMSmail Gateway	26.33.xx	2.1
Packetnet System Interfaces		
RSX-11 P.S.I./M	10.42.xx	2.1
RSX-11 P.S.I./M-PLUS	10.43.xx	2.1
VAX P.S.I. and P.S.I. ACCESS	25.40.xx	4.0
DECnet Router/X.25 Gateway	30.41.xx	1.2
TOPS-20 P.S.I. Gateway	21.22.xx	1.1

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Software Product Description Listing
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Software Product	SPD	Version
File Transfer and Terminal Emulation		
Professional Host Communications	30.29.xx	1.7
poly-COM	A3.23.xx	1.2
Network and System Management Products		
NMCC/DECnet Monitor	26.91.xx	1.1
Remote System Manager	27.32.xx	1.0
NMCC/VAX ETHERnim	26.96.xx	1.0
LAN Traffic Monitor	27.80.xx	1.0
Remote Bridge Management Software	26.71.xx	1.0
Terminal Server Manager	27.64.xx	1.0
P/FM (PBX/Facilities Management System)	A4.38.xx	2.2
C/FM (Cable/Facilities Management System)	27.48.xx	1.0
Additional Software Products		
KMV11-A HDLC Framing Software	14.22.xx	1.0
KMV11-A Development Tools	13.41.xx	1.0
VAX KMS11-BD/BE X.25 Link Level Software	25.80.xx	1.2
VAX KMS11-BD/BE HDLC/BSC Framing Software	26.55.xx	1.1
KMS11 RSX X.25 LAPB Link Level Software (UNIBUS)	13.42.xx	2.0
KMV11 RSX X.25 LAPB Link Level Software (Q-BUS)	13.43.xx	1.0
KMV11 MicroVMS Driver	28.23.xx	1.0
KMV11 MicroVMS Software Tools	28.24.xx	1.0
KMV11 MicroVMS X.25 Link Level	28.25.xx	1.0
VAX KCT32	26.04.xx	1.0
VAX Public Access Communications (VAXPAC)	28.51.xx	1.0
Open System Interconnection Products		
VAX DEC/MAP	27.66.xx	1.0
VAX OSI Transport Service (VOTS)	27.14.xx	1.1
VAX OSI Applications Kernel (OSAK)	27.47.xx	1.0
Message Router X.400 Gateway	27.50.xx	1.0

Appendix D

Related Documentation

Document	Order Code
Networks and Communications Handbooks	
Introduction to VAX-11 PSI	AA-L067C-TE
Introduction to RSX-11 PSI	AA-M369B-TC
The DECconnect Communications System Handbook	EB-28987-42
Digital's Networks: An Architecture With A Future	EB-26013-42
Digital Network Architecture and Personal Computing: The DECnet-DOS Family of Software	EJ-28958-42
Architecture Specifications*	
DECnet-DNA Network Management Functional Specification V4.0	AA-X437A-TK
DECnet-DNA Routing Layer Functional Specification V2.0	AA-X435A-TK
DECnet-DNA Ethernet Node Product Architecture Specification V1.0	AA-X440A-TK
DECnet-DNA Ethernet Data Link Functional Specification V1.0	AA-Y298A-TK
DECnet-DNA Maintenance Operations Functional Specification V3.0	AA-X436A-TK
DECnet-DNA NSP Functional Specification V4.0	AA-X439A-TK
DECnet-DNA General Description	AA-N149A-TC
Ethernet Specification V2.0	AA-K759B-TK

*Order architecture specifications through DECdirect.

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Document	Order Code
DECconnect System Documentation	
The DECconnect Communications System Handbook	EB-28987-42
DECconnect System General Description	EK-DECSY-GD
DECconnect System Requirements Evaluation Workbook	EK-DECSY-EG
DECconnect System Planning and Configuration Guide	EK-DECSY-CG
DECconnect System Installation and Verification Guide	EK-DECSY-VG
Additional Documents	
PDP-11 Systems and Options Catalog	ED-29413-41
VAX Systems and Options Catalog	ED-29414-46
PDP-11 Software Source Book	EB-27333-41
Microsystems Handbook	EB-26085-41
Professional Series Handbook	EB-26251-55
ALL-IN-1 Office and Information Systems	EB-26203-52
DECmate Family Handbook	EB-26272-60
Rainbow Handbook	EB-26204-69

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