

Software Product Description

PRODUCT NAME: DECnet-Micro/R SX, Version 4.0

SPD 18.27.02

DESCRIPTION

DECnet-Micro/R SX allows a suitably configured Micro/R SX system to participate as a non-routing (end) node, in DECnet computer networks. Only one communication line can be configured. DECnet-Micro/R SX is a Phase IV network product and is warranted for use only with supported Phase III and Phase IV products supplied by DIGITAL.

DECnet Phase IV networks can contain up to 1023 nodes per network area given proper network planning. Phase III nodes participating in Phase III/IV networks are limited to the Phase III routing capability of 255 nodes. Phase II nodes are not supported.

DECnet-Micro/R SX offers task-to-task communications, utilities for network file operations, network command terminal support, and network resource-sharing capabilities using the DIGITAL Network Architecture (DNA) protocols. DECnet-Micro/R SX communicates with adjacent nodes over synchronous and asynchronous communication lines, and Ethernet Local Area Networks (LANs). Access to DECnet-Micro/R SX is supported for Micro/R SX user programs written in MACRO-11, Micro/R SX FORTRAN-77, Micro/R SX BASIC-PLUS-2, and Micro/R SX COBOL-81.

The functions available to a Micro/R SX user depend, in part, on the configuration of the rest of the network. Each DECnet product offers its own level of functionality and its own set of features to the user. Networks consisting entirely of DECnet-Micro/R SX nodes can have the full functionality described in this SPD. Networks that mix DECnet-Micro/R SX nodes with other DECnet products can limit the functions available to the DECnet-Micro/R SX user, because some DECnet-Micro/R SX features are not supported by all DECnet products. DECnet-Micro/R SX provides the same primary services on all systems; however, some supplied optional features require hardware configurations larger than the minimum supported systems.

The DECnet products and functions available to users on mixed networks can be determined by comparison of the SPDs for the component products.

Adaptive Routing

Adaptive routing is the mechanism by which one or more nodes in a network can route or forward messages between another pair of nodes in the same network. This routing capability will forward such messages even if no direct physical link exists between the pair of nodes apart from the sequence of physical links that includes the routing node(s).

In addition to adaptive routing, some Phase IV DECnet implementations support Area Routing. Area Routing is a method by which DECnet can send and route messages between the nodes in the same or different areas of the network. If the network manager chooses to separate the network into areas, up to 63 (Area 1 through Area 63), with up to 1023 nodes per area, may be defined. For single area networks, Area 1 is the default. Area-based DECnet networks are hierarchical networks and some restrictions apply to communications from nodes in one area to

digital
software

October 1987

BH-DF40C-TC

nodes in another. For example, Phase III nodes in area-based networks can communicate only with nodes within their own areas. Proper network planning is essential when using Area Routing or configuring large networks.

DECnet-Micro/RSX supports only end-node operation. However, with Phase IV of the DIGITAL Networking Architecture (DNA), local area networks (single area) consisting solely of end nodes may be configured using DIGITAL's Ethernet hardware interface products. The routing of messages to/from nodes off such a local area network must be handled by one of the DECnet products (such as the DECrouter 200) which supports routing operation.

Task-To-Task Communication

Using DECnet-Micro/RSX, a Micro/RSX user program written in MACRO-11, or one of the supported high level languages, can exchange messages with other network user programs. These two user programs can be on the same node, or on any other Phase IV node in the network, or Phase III node in the same area. The messages sent and received by the two user programs can be in any data format.

The DECnet-Micro/RSX software will optionally verify the access control privileges of a task requesting communication with a DECnet-Micro/RSX task. The Micro/RSX System Account File is used to determine access privileges. The results can either be passed on to the receiving task or used to reject the request by the network software.

Network Resource Access

File Transfer Utilities

Using DECnet-Micro/RSX utilities, a user can transfer sequential ASCII files between DECnet nodes. Files can be transferred in both directions between the locally supported Micro/RSX Record Management System (RMS) devices and the file systems of other DECnet nodes. Wild cards can be used for the user identification code, file name, file type, and version number for local to remote file transfers. Transfer of other file types is supported, provided the source and destination DECnet systems support the same file type. Directory listings are also a supported DECnet-Micro/RSX feature.

Additional facilities allow system command files to be submitted to a remote node, where the list of commands is in a format acceptable to the node responsible for the execution. DECnet-Micro/RSX also allows Micro/RSX command files to be received from other systems and executed as a batch job.

A utility is also provided with DECnet-Micro/RSX that allows the user to queue file operation requests for execution at a specified time. The user has the ability to monitor, list, and delete entries from this queue.

Network users must specify the appropriate user identification and password in order to access the files on a DECnet-Micro/RSX node. Access to local files using the DECnet software can be controlled through the Micro/RSX System Account File.

File Access

File access is supported to and from remote DECnet systems by explicit subroutine calls in the supported high level languages. READ, WRITE, OPEN, CLOSE, and DELETE operations can be initiated by local tasks for sequential and random access files residing on the local system or at remote DECnet systems. Other nodes supporting File Access can exercise this capability for files located on the Micro/RSX node. Fixed and variable length record formats are supported. Files accessed remotely can contain either ASCII or binary information.

Access to RMS file organizations from other DECnet products is supported by DECnet-Micro/RSX.

Network Command Terminal

DECnet-Micro/RSX supports two protocols (CTERM and LAT) which make the user's terminal appear as if it were physically connected to the target system, whether local or remote, and the operator can use the standard system and network utilities supported by that system.

DECnet-Micro/RSX supports DIGITAL's Terminal Services Architecture Command Terminal protocol (CTERM), giving the terminal user the ability to establish a virtual connection to remote Phase IV DECnet systems which provide similar support. This is particularly useful for doing remote program development, and allows terminal users on small application-oriented systems to utilize the resources of larger development-oriented systems.

Note that some functions using CTERM between VMS and non-VMS systems are not supported. Specifically, VMS-style command line editing, VMS TDMS applications and VMS FMS applications are not supported under DECnet-RSX products.

In addition, communication with DIGITAL's Local Area Transport (LAT) terminal server products is supported. LAT must be used in a Local Area Network. Application programs written using DECnet-RSX can identify a terminal server resource by specifying the terminal server name and also either a service name and/or port name. The Micro/RSX queue manager can be set up to access printers which are connected to a terminal server.

DECnet-Micro/RSX also provides an unsupported utility (RMT) that allows a terminal user to establish a virtual connection to other Phase III or Phase IV DECnet-RSX nodes. This utility may not be included in future releases of DECnet-Micro/RSX.

Down-Line System Loading

Initial memory images for RSX-11S nodes in the network can be stored on Micro/RSX file system devices and loaded into nodes across point-to-point and Ethernet links. Load requests can come from the local Micro/RSX operator or from the remote node. Generation of initial memory images of DECnet-11S systems for down-line loading is explicitly not supported by Micro/RSX.

Up-Line Dumping

Memory images of adjacent RSX-11S nodes connected by DECnet can be written onto a file on a DECnet-Micro/RSX system. This facility helps a programmer understand what may have caused the RSX-11S system to crash.

Down-Line Task Loading

Programs to be executed on DECnet-11S nodes in the network can be stored on the DECnet-Micro/RSX system and loaded on request into DECnet-11S nodes. In addition, programs already executing on DECnet-11S nodes can be checkpointed to the host file system and later restored to main memory of the DECnet-11S node. These features simplify the operation of network systems that do not have mass storage devices.

Communications Servers

DIGITAL offers several communications server products for the DECnet Phase IV network environment. These are stand-alone processor and/or software packages based upon the PDP-11/RSX architecture.

Network management, down-line system loading, and up-line dumping of these servers is the same as that described for RSX-11S nodes in the preceding paragraphs. Consult the SPD of the server product in question for details regarding availability of support on Micro/RSX.

Network Management

The Network Control Program (NCP) performs three primary functions: displaying statistical and error information, controlling network components, and testing network operation. These functions can be performed locally or executed at remote Phase III and Phase IV nodes that support this feature. In either case, the output resulting from a command can be directed to a local file or to the user's terminal.

An operator can display the status of DECnet activity at the local node and other Phase III or Phase IV nodes. The user can choose to display statistics related to both node and communication lines, including data on traffic and errors. The local console operator can also perform many network control functions such as loading and unloading DECnet components, starting and stopping lines, activating the local node, and down-line loading RSX-11S systems.

DECnet-Micro/RSX also provides local network event logging to the console device, a file, or a user written program. Logging of events to a remote node is also supported. The NCP utility can be used to enable and disable the logging of specific events as well as to enable and disable the event logging facility.

Communications

DECnet-Micro/RSX supports the DIGITAL Data Communications Message Protocol (DDCMP) for full- or half-duplex transmission in point-to-point and multi-point operation using serial synchronous or asynchronous facilities. DDCMP provides error detection/correction and physical link management facilities. In addition, an auto-answer capability is provided if supported by the modem in use.

The Ethernet bus interface, when used in conjunction with DIGITAL's Ethernet transceivers or DELNI, allows DECnet-Micro/RSX to utilize Ethernet as a data link transmission medium.

The maximum number of physical links that can be supported by a DECnet-Micro/RSX node is one.

Multi-point and auto-answer function with EIA-type devices only. Note that a DECnet-Micro/RSX node, being limited to end node operation, can act only as a multi-point tributary (slave). The following devices may be configured for multi-point tributary connection: DLVE1, DPV11, and DMV11 (multi-point communications hardware).

Direct Line Access

User-written MACRO-11 tasks will be provided with Direct Line Access (DLX) support to all supported devices (including Ethernet Controller). DLX allows direct control of the communications lines, bypassing the logical link control and transport mechanism provided by the DECnet software. User programs are required on both ends of the link in order to use this interface. DECnet-Micro/RSX is a single line system. One line cannot be used for DECnet while another is simultaneously being used for DLX. An Ethernet controller can be used simultaneously by DECnet and DLX. Direct Line Access supports both Ethernet and IEEE 802.3 packet formats in a LAN environment.

DECnet-Micro/RSX Configuration

The process of configuring a DECnet-Micro/RSX node is based primarily on trade-offs of cost, performance, and functionality, within the realm of satisfying the user's application requirements. It can be readily expected that network applications will run the full gamut from low-speed, low-cost situations to those of relatively high performance and functionality. The performance of a given DECnet node is a function not only of the expected network traffic and resul-

tant processing ("global" conditions), but also of the amount of "concurrent processing specific to that node (local conditions). Thus, node performance depends on many factors, including:

- CPU type and Memory Size
- Number of device interrupts per unit time
- Communication line characteristics
- Number and size of buffers
- Message size and frequency of transmission
- Local applications

Note that the rate at which user data can be transmitted (throughput) over a communications line may sometimes approach, but will never equal or exceed, the actual line speed. The reason is that the actual throughput is a function of many factors, such as the network application(s), topology, protocol overhead, and line quality, as well as the factors cited at the beginning of this section.

Four basic groups of communications interfaces are presented in the tables below. They differ in many respects, particularly in their effect upon CPU utilization.

- With character interrupt devices such as the DPV11, CPU cycles are required for not only the line protocol processing (DDCMP), but also for each character sent and received.
- Devices such as the DHQ11 are direct memory access (DMA) on transmit, and character interrupt on receive. While CPU cycles are consumed for line protocol processing, and for each character received, the load is reduced for messages transmitted.
- The DMV11 is a direct memory access (DMA) device, with the line protocol executed in microcode, thus off-loading the PDP-11 CPU. The only DECnet load the processor sees is completed incoming and outgoing messages.
- The DEQNA and DELQA Q-Bus-to-Ethernet controllers are high speed DMA controller supporting the CSMA/CD protocol. CPU cycles are only required for processing of incoming and outgoing messages.

The following table shows the various communications devices by category, and maximum line speed of each.

Device Groups

Device Group	Maximum Line Speed (Kilobits/sec)
Character Interrupt	
DLVE1	4.8
DPV11	4.8
DZV11/DZQ11	9.6

Device Groups (cont.)

Device Group	Maximum Line Speed (Kilobits/sec)
DMA/Character Interrupt	
DHV11	9.6
DHQ11	9.6
DMA/DDCMP	
DMV11 (RS232-C)	19.2 ¹
DMV11 (V.35 or local)	56.0
ETHERNET	
DEQNA	10000.0
DELQA	10000.0

¹Up to 56.0K bps for RS423-A interfaces.

MINIMUM HARDWARE REQUIRED

Any valid Micro/RSX system configuration with:

- The following additional memory must be available:
 - DECnet-Micro/RSX (end node) - 24KW
 - Ethernet support will add 4KW to the above memory requirement.
- The following additional disk space must be available for DECnet-Micro/RSX network software:
 - DECnet-Micro/RSX (end node capability) - 4200 blocks (2,150,400 bytes)
- PDP-11/23 PLUS or MicroPDP-11 central processor (11/23, 11/53, 11/73 and 11/83) with one of the following communications devices. Note that the KDJ11-A 11/73 option is only supported per Micro/RSX (SPD 14.28.xx).

DMV11	synchronous QBUS interface (RS232-C/RS423A, CCITT V.35/DDS, or local) ²
DLVE1	asynchronous EIA interface with full modem control ²
DZV11	multi-line asynchronous EIA interface ^{1,2}
DZQ11	multi-line asynchronous EIA interface ^{1,2}
DHQ11	multi-line asynchronous EIA interface
DHV11	multi-line asynchronous EIA interface ^{1,2}

DPV11 synchronous QBUS interface²
 DEQNA Q-BUS-to-Ethernet controller

Notes:

- 1 All lines on this interface must be dedicated as DECnet links, however only the first one may be used for network connection.
- 2 With appropriate FCC-compliant cabinet option.

OPTIONAL HARDWARE

None

PREREQUISITE SOFTWARE

Micro/RSX Operating System Base Kit (at a minimum of Version 4.0)

OPTIONAL SOFTWARE

Micro/RSX BASIC-PLUS-2

Micro/RSX FORTRAN-77

Micro/RSX COBOL-81

Micro/RSX Advanced Programmer's Kit (includes MACRO-11)

SOFTWARE WARRANTY

Warranty for this software product is provided by DIGITAL with the purchase of a license for the product as defined in the Software Warranty Addendum of this SPD.

INSTALLATION

This software product can be installed by the customer using the step-by-step documentation available for this product. Optionally, you can purchase DIGITAL Installation Services which provide for the installation of the software product by an experienced DIGITAL Software Specialist.

Courtesy Installation Service

This software product will be installed by DIGITAL at no additional charge if you purchase it concurrent with a Startup Service Package that includes installation service. Both the host operating system and this product must be installed concurrently.

Installation Service Option

DIGITAL's Installation Service is provided by a DIGITAL Software Specialist and accelerates your productive use of this product. For more information on what is included in this service, please obtain the appropriate Service Description from your local DIGITAL office.

Installation Service will be provided at no additional charge (Courtesy Installation) under the conditions described in the Installation section above.

For a fixed price a DIGITAL Software Specialist will assure that the customer's system is ready for installation, install the software, and familiarize the customer with its operation.

Installation for DECnet-Micro/RSX will consist of the following:

- Verification that all components of DECnet-Micro/RSX have been received.
- Verification that the necessary versions of the DECnet-Micro/RSX software and documentation are available
- Install DECnet-Micro/RSX software

- Modify the system's start-up command procedure including starting up DECnet-Micro/RSX network
- Verify the proper installation of DECnet-Micro/RSX by running a series of tests to show connectivity (demonstrated by the use of the post-installation checkout procedure) to a designated node.

Connectivity to all other nodes within the network is the responsibility of the customer.

ORDERING INFORMATION

Single-Use licensed software is furnished under the licensing provisions of DIGITAL's Standard Terms and Conditions of Sale, which provide, in part, that the software and any part thereof may be used on only the single CPU on which the software is first installed, and may be copied, in whole or in part (with the proper inclusion of DIGITAL's copyright notice and any proprietary notices on the software) for use on that same CPU.

You will need a separate license for each CPU on which you will be using the software product (except as otherwise specified by DIGITAL). Then, Materials and Service Options are selected to utilize the product effectively. **THE LICENSE OPTIONS ARE DESCRIBED BELOW. IF YOU ARE NOT FAMILIAR WITH THE SERVICE OPTIONS, YOU MAY OBTAIN THE APPROPRIATE SOFTWARE PRODUCT SERVICE DESCRIPTION(S) FROM YOUR LOCAL DIGITAL OFFICE.** If you are already familiar with these options, you may obtain the ordering information directly from the Software Options Chart.

LICENSE OPTIONS

Single-Use License Option

The Single-Use License is your right to use the software product on a single CPU.

For your first installation of this software product you must purchase as a minimum:

- Single-Use License Option, and
- Distribution and Documentation Option

The license gives you the right to use the software on a single CPU and the Distribution and Documentation Option provides the machine-readable software and related documentation.

To use this software product on additional CPUs, you must purchase for each CPU as a minimum:

- Single-Use License Option

In addition to the right to use, the license gives you the one-time right to copy the software from your original CPU installation to the additional CPU. Therefore, the Distribution and Documentation Option is not required, but optional.

Distribution and Documentation Option

The Distribution and Documentation Option provides the machine-readable software and the basic documentation. You must have, or order, a Single-Use License to obtain this option. You will need this option to install the software for the first time. When revised versions of this software product become available, they may also be obtained by purchasing this option again.

Software Revision Right-To-Copy Option

The Right-To-Copy Option allows a customer with multiple CPUs to copy a revised version of a software product from one CPU to another. Each CPU must be licensed for that product. You

first install the revised software on one CPU; then you can make copies for additional CPUs by purchasing the Right-To-Copy Option for each additional CPU.

Documentation-Only Option

The Documentation-Only Option provides one copy of the basic documentation.

Software Product Services

A variety of service options are available. For more information on these or other services, please contact your local DIGITAL office.

SOFTWARE OPTIONS CHART

The distribution Media Codes used in the Software Options Chart are described below. You specify the desired Media Code at the end of the Order Number, e.g. QY766-H3 = binaries on RX50 Floppy Diskette.

- 3 = RX50 Floppy Diskette
- 5 = TK50 Tape Cartridge

Z = No hardware dependency

Note: The availability of these software product options and services may vary by country. Customers should contact their local DIGITAL office for information on availability.

	ORDER NUMBER
LICENSE OPTIONS: A LICENSE IS REQUIRED FOR EACH CPU.	
Single-Use license	QY766-UZ
MATERIALS AND SERVICE OPTIONS:	
Distribution and Documentation Option	QY766-H3 QY766-H5
Software Revision Right-To-Copy Option	QY766-HZ
Documentation-Only Option	QY766-GZ
Installation Service Option	QY766-I3 QY766-I5
DECsupport Service	QY766-93 QY766-95
Basic Service	QY766-83 QY766-85
Self-Maintenance Service	QY766-33 QY766-35