

# **TOPS-10 DECnet and PSI System Manager's and Operator's Guide**

AA-L413B-TB

**April 1986**

This manual describes the operation, control, and monitoring functions of DECnet-10 and the TOPS-10 PSI products. These products, together with TOPS-10, provide the DECsystem-1090/1091/1095 computers running TOPS-10 with a communications interface to DIGITAL's corporate network, DECnet, and to Public Packet Switching Networks, PPSNs.

This manual supersedes the *TOPS-10 DECnet-10 System Manager's and Operator's Guide*, order number AA-L413A-TB, and the *TOPS-10 PSI System Manager's and Operator's Guide*, order number AA-CK83A-TB.

<b>OPERATING SYSTEM:</b>	TOPS-10 V7.03
<b>SOFTWARE:</b>	DECnet-10 V4.0
	GALAXY V5.1
	Network Management V4.0
	PSI Gateway V1.0

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## PREFACE

This manual describes the operation, control, and monitoring functions of TOPS-10 DECnet-10 Version 4.0 and PSI Version 1.0. It includes both tutorial and reference information.

The audience addressed is:

- o The DECnet-10/PSI-10 System Manager
- o The user with local or remote system privileges who is engaged in network management and operational tasks under the direction of the system manager

This manual assumes that its readers are experienced in TOPS-10 operations and familiar with computer networks. Previous experience with DECnet is not assumed. However, if you have not yet read the manual, Introduction to DECnet, do so before continuing with this manual.

## MANUAL ORGANIZATION

This manual contains two parts as follows:

PART I, INTRODUCTION, contains two chapters.

Chapter 1, SYSTEM OVERVIEW, briefly describes the DIGITAL Network Architecture (DNA) that is the model used to design networks of DIGITAL computers. This chapter emphasizes the relationships between the Network Management Layer (NML) and other functional layers, and describes the DECnet-10 implementation of DNA.

Chapter 2, NETWORK CONCEPTS, defines the basic network concepts in relation to the operation of the DECnet-10 network.

PART II, DECnet OPERATION, contains six chapters.

Chapter 3, RUNNING DECnet-10, includes the minimum information needed by operators responsible for keeping the network up and running. This chapter explains procedures and gives examples for such tasks as manual loading of the DN20 front end, controlling line states, monitoring the network, recognizing potential problems, and running the FAL program.

Chapter 4, THE NETWORK CONTROL PROGRAM, is a tutorial on NCP, the control language that is the operator's and manager's interface to the network control program, NML.

Chapter 5, NCP COMMANDS PROCESSED BY OPR, describes the syntax and function of NCP commands processed by OPR.

Chapter 6, NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM, describes the syntax and function of NCP commands processed by the local node's NML.

Chapter 7, NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER, describes the syntax and function of NCP commands processed by the local node's NML and the remote node's Network Management Program.

Chapter 8, NETWORK MANAGEMENT PACKET SWITCHING INTERFACE, describes X.25 NCP commands for using Public Packet Switching Networks (PPSns) as part of the Packetnet System Interface (PSI) Version 1.0 software option.

Seven appendixes complete the manual.

Appendix A, DECnet PARAMETER SUMMARY, summarizes all parameters included in the Network Management V4.0 NCP commands. There is a separate table for each of the entities: AREA, NODE, CIRCUIT, LINE, MODULE, and LOGGING. Event parameters are listed in a separate table. Applicability and restrictions are presented both as defined by Digital Network Architecture and thus relevant to all DIGITAL systems, and as implemented specifically for DECnet-10 V4.0.

Appendix B, DECnet COUNTER SUMMARY, summarizes the entity counters that can be displayed and zeroed by appropriate NCP commands.

Appendix C, NETWORK RELATED MESSAGES, describes all messages related to the execution of NCP commands and the state of the network: output responses, informational messages, and error messages.

Appendix D, X.29 CONFIGURATION FILE, describes the information to maintain access to the system through the Public Packet Switching Network. This appendix explains X29SRV commands and gives examples for configuring X29SRV.

Appendix E, BIBLIOGRAPHY, is a bibliography of suggested network-related readings.

Appendix F, DECnet LINE DEVICES, is a table of currently recognized DECnet line devices.

Appendix G, GLOSSARY, is a glossary of network terms.

## MANUALS REFERENCED

Depending on your experience and responsibilities, you may need to refer to one or more of the following manuals, which contain more detailed information on procedures or programs related to DECnet-10 Version 4.0 and PSI Version 1.0.

### TOPS-10 DECnet and PSI Installation Guide

This manual describes the configuration of DECnet-10 nodes in a DECnet network and details all generation, verification, and installation steps. It describes the DECnet-10 configuration tools, the procedures to generate the DN20 subsystem, the NETGEN (NETwork GENERation) and NIPGEN (Network Installation Procedure GENERator) programs. This manual also provides a sample system configuration.

### TOPS-10/TOPS-20 SPEAR Manual

This manual describes the SPEAR program, a library of functions that analyzes and reports on error and significant event information recorded by the operating system in the ERROR.SYS file. DECnet-10 operating systems record entries for loads, dumps, and startups as well as errors. You use the SPEAR program's functions RETRIEVE and SUMMARIZE to produce reports of errors and events recorded for DECnet-10.

### TOPS-10 PSI User's Guide

This manual contains information on the following:

- o Writing FORTRAN-10 and MACRO-10 programs that use the TOPS-10 X.25 software to access a PPSN.
- o Using the TOPS-10 X.29 software to connect a terminal - through a PPSN - to a TOPS-10 host.

The PSI Network-Specific Information cards, which include the following:

PSI NSI PSS Card	AV-N804A-TE
PSI NSI DATANET-1 Card	AV-N805B-TK
PSI NSI TRANSPAC Card	AV-N806B-TK
PSI NSI TELENET Card	AV-N807B-TK
PSI NSI DATEXP Card	AV-N808A-TE
PSI NSI TYMNET Card	AV-X573A-TK

You should also refer to the following non-DIGITAL publications for the PSI software option:

CCITT publications that contain complete information on recommendation X.3 (PAD) parameters. (See Appendix E for a list of CCITT publications.)

Documentation provided by the user's PPSN (TELENET, for example).

## EFFECTIVE USE OF THIS MANUAL

The following suggestions are offered for your effective use of this manual:

- o Beginning with Chapter 4, after you have read each chapter, take the manual to your terminal and enter the commands given in examples, adjusting parameters as needed to conform to your site's implementation and conventions. The NCP command language has many features that make it easy to use, including the "?" feature, command recognition mode, and command abbreviation mode (see Chapter 4).

With the exception of the NCP SHOW commands, any command that changes parameter values has the potential for interfering with the network activities of another network user. When possible, practice under supervision and always work within the guidelines set by the system manager. You can avoid conflicts by using the OPR command SEND to inform one or all network users of your intentions. Such messages as the following will be helpful to others on the network:

```
15:47:40 From Operator Terminal 23:  
=>Reloading DN20 in 5 minutes
```

```
16:30:25 From Operator Terminal 25:  
=>Restarting Galaxy in 5 minutes
```

You can also use the monitor SEND command to produce messages in the following format:

```
;;TTY51 - Restarting NML...
```

- o System managers and operators using NCP commands to monitor and control all nodes should read the entire manual. If your network includes DIGITAL operating systems other than TOPS-10, you should also read the appropriate manuals for those operating systems. If you are a central operator in the operations room, you will require a working knowledge of all procedures in Chapter 3. Reading the remainder of the manual is optional.

## CONVENTIONS USED IN THIS MANUAL

The following conventions are used in this manual in command descriptions and in examples of dialogue:

<b>UPPERCASE BOLD PRINT</b>	indicates what you type in a command string.
lowercase letters	indicate an input variable type in a command string. For example, if the command description specifies "seconds," you might type "2" to indicate "2 seconds."
[ ]	indicate optional input. (Do not include brackets when you type the command.)
{ }	indicate that one of several enclosed parameters is applicable. (Do not include braces when you type the command.)
<RET>	means press the key labelled RETURN or CR.
<ESC>	means press the key labelled ESC, ALT, or SEL.
<CTRL/x>	means hold the CTRL key and press character key "x" at the same time.
numbers	All numeric values that appear in this manual are decimal numbers, unless otherwise noted.

The following abbreviations are used in this manual:

DLL	Data Link Layer
DNA	DIGITAL Network Architecture
IPCF	Inter Process Communications Facility
LAT	Local Area Transport
MCB	Multifunction Communication Base
NCP	Network Control Program
NICE	Network Information and Control Exchange protocol
NML	Network Management Layer
NSP	Network Services Protocol
PSI	Packetnet System Interface
PPSN	Public Packet Switching Network

## REVISION HISTORY

This revision supercedes the TOPS-10 DECnet-10 System Manager's and Operator's Guide, order number AA-L413A-TB, and the TOPS-10 PSI System Manager's and Operator's Guide, order number AA-CK83A-TB.

The TOPS-10 PSI gateway software was released after TOPS-10 Version 7.02 (DECnet V3.0), thus the TOPS-10 PSI System Manager's and Operator's Guide was created. The TOPS-10 PSI gateway software is available for TOPS-10 7.03 (DECnet V4.0), thus the information in the PSI manual was merged into this revision, the TOPS-10 DECnet and PSI System Managers's and Operator's Guide.

In addition to the PSI information, this revision includes the features of DECnet-10 Version 4.0, which include:

- o The Ethernet device NIA20, which provides multi-access connections between nodes on the same Ethernet circuit
- o Phase III compatibility
- o The AREA and MODULE entities
- o Phase IV routing nodes and Ethernet non-routing nodes
- o Area routing
- o New upline dump/downline load procedures
- o Multiple FAL streams

**PART I**  
**INTRODUCTION**

## CHAPTER 1

### SYSTEM OVERVIEW

#### 1.1 DIGITAL NETWORK ARCHITECTURE AND DECnet

DIGITAL Network Architecture (DNA) is a model by which DIGITAL computer networks can be built. DNA presents a layered structure, each layer corresponding to a major network function. A well-defined set of interfaces allows each layer to communicate with its adjacent layers; protocols provide rules and conventions for exchange of information between corresponding layers in communicating nodes. See Figure 1-1.

DECnet-10 Version 4.0 is the fourth generation (Phase IV) of implementations based on the DNA model. The following general description of DNA will be helpful to both system managers and operators with network management responsibilities.

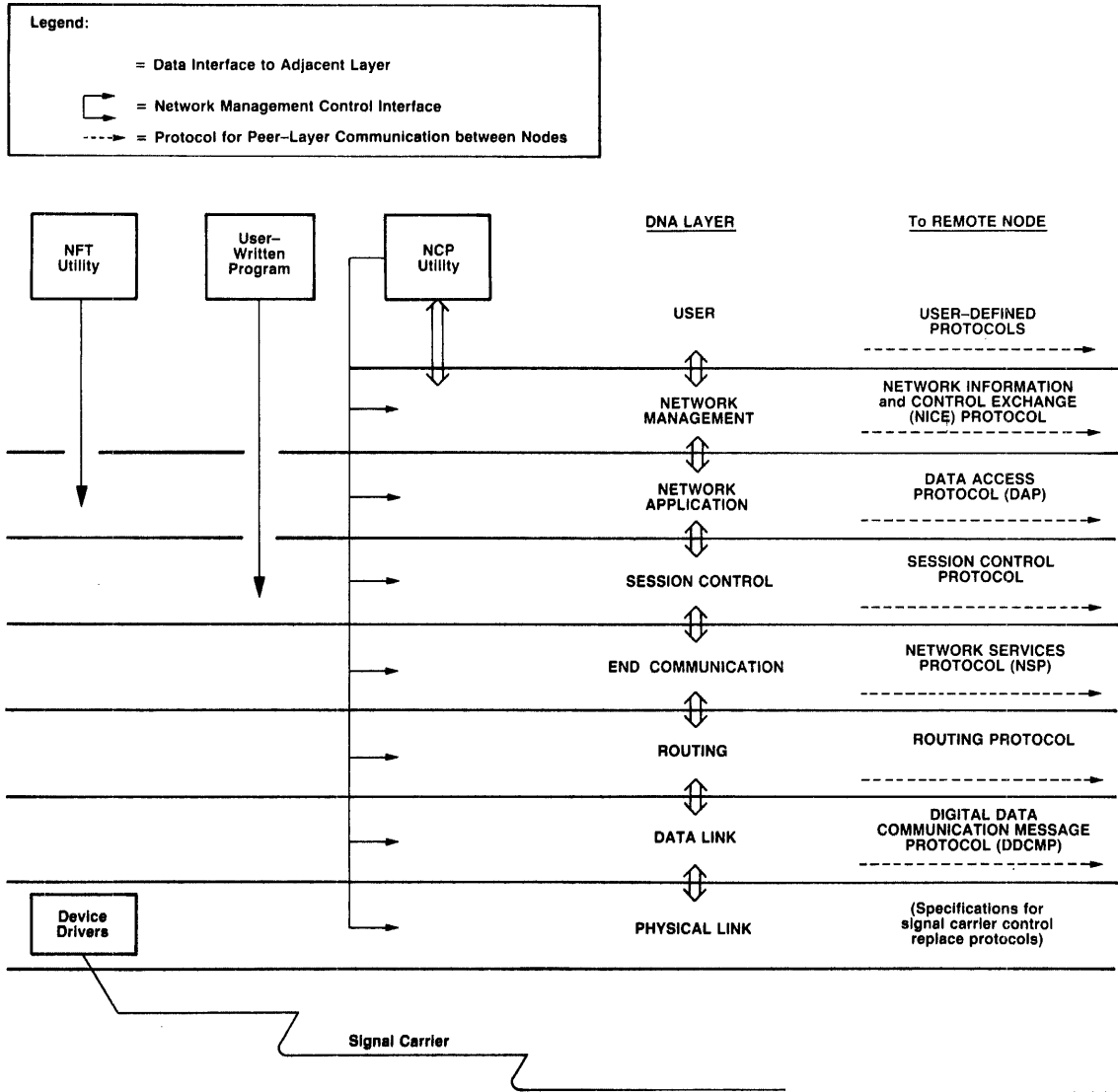
#### NOTE

TOPS-10 systems can also contain ANF-10 networks. ANF-10 and DECnet-10 are totally independent networks that can coexist in a TOPS-10 system.

The DNA model specifies functions to be carried out in software modules that implement each layer. How the functions are implemented, and which functions are implemented depends on the operating system. For example, an operating system with a small amount of memory may choose to implement only the minimum subset of Network Management functions; an operating system with a communications front end (DN20) may choose to implement all Network Management functions. If you know the functions that each node in your network implements, you can save time and effort. This information is available in the manuals for the various DIGITAL operating systems. Personal contact with the system managers of all nodes in your network is highly recommended.



# SYSTEM OVERVIEW



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**Figure 1-1: Communication Between Adjacent and Equivalent Layers of the Digital Network Architecture**

## SYSTEM OVERVIEW

The major features of DNA are:

- o Transparency. In the context of the network, the system manager or operator is the "user" of a DECnet utility, the Network Control Program (NCP). Once NCP is invoked, the "user" is the module or routine that uses the capabilities of the layer beneath it in the functional hierarchy. After you type a command, all processing and routing of your request depends on the system. You receive responses informing you of success or failure.
- o Local autonomy. The node that is to execute an NCP command retains the right to refuse to do so. A refusal is accompanied by a reason in the DECnet-10 V4.0 implementation. The nature of the reason determines whether or not you should repeat the command at a later time.
- o Flexibility. The modular orientation of the layered structure lends itself well to the inclusion of new modules and new layers. (See Section 1.2.)
- o Upward compatibility. Each new DECnet phase is compatible with the previous phase. For example, a Phase IV node can communicate with a Phase III node, but not with a Phase II node.
- o Adaptability to the needs of individual operating systems. Within the limits set by Phase IV minimum requirements, each operating system implements only those functions appropriate to that operating system.
- o Distributed or central management capability. The Network Management Layer of each DECnet-10 V4.0 node has access to all other NMLs through the Network Information and Control Exchange (NICE) protocol. Thus, operators at any node can control network management functions at any node in the network, given the required willingness and capability on the part of the remote node. When desired, a single node can perform centralized management of the entire network.

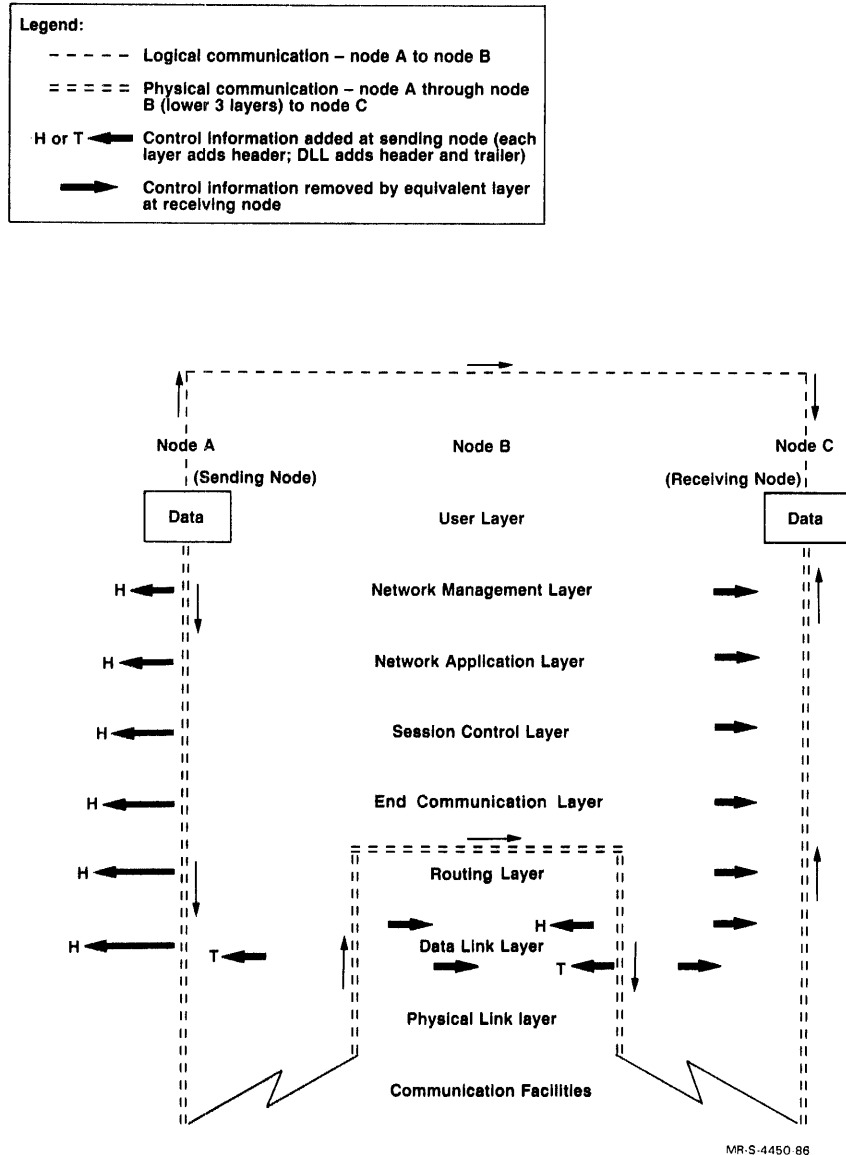
### 1.2 THE LAYERED STRUCTURE OF DNA

The layered structure of DNA provides an easily upgraded product. Adding new functions, and consequently new layers and modules, is easily accomplished during product development.

The User Layer, Application Layer, and Network Management Layer carry out user functions; the Session Control Layer, the End Communication Layer, and the Routing Layer carry out network functions; and the Data Link Layer and Physical Link Layer carry out the physical aspects of communication.

A brief description of each of the DNA layers, as implemented for DECnet-10 V4.0, follows. (See Figures 1-1 and 1-2.)

# SYSTEM OVERVIEW



**Figure 1-2: Logical Communication and Physical Path of Routed Data**

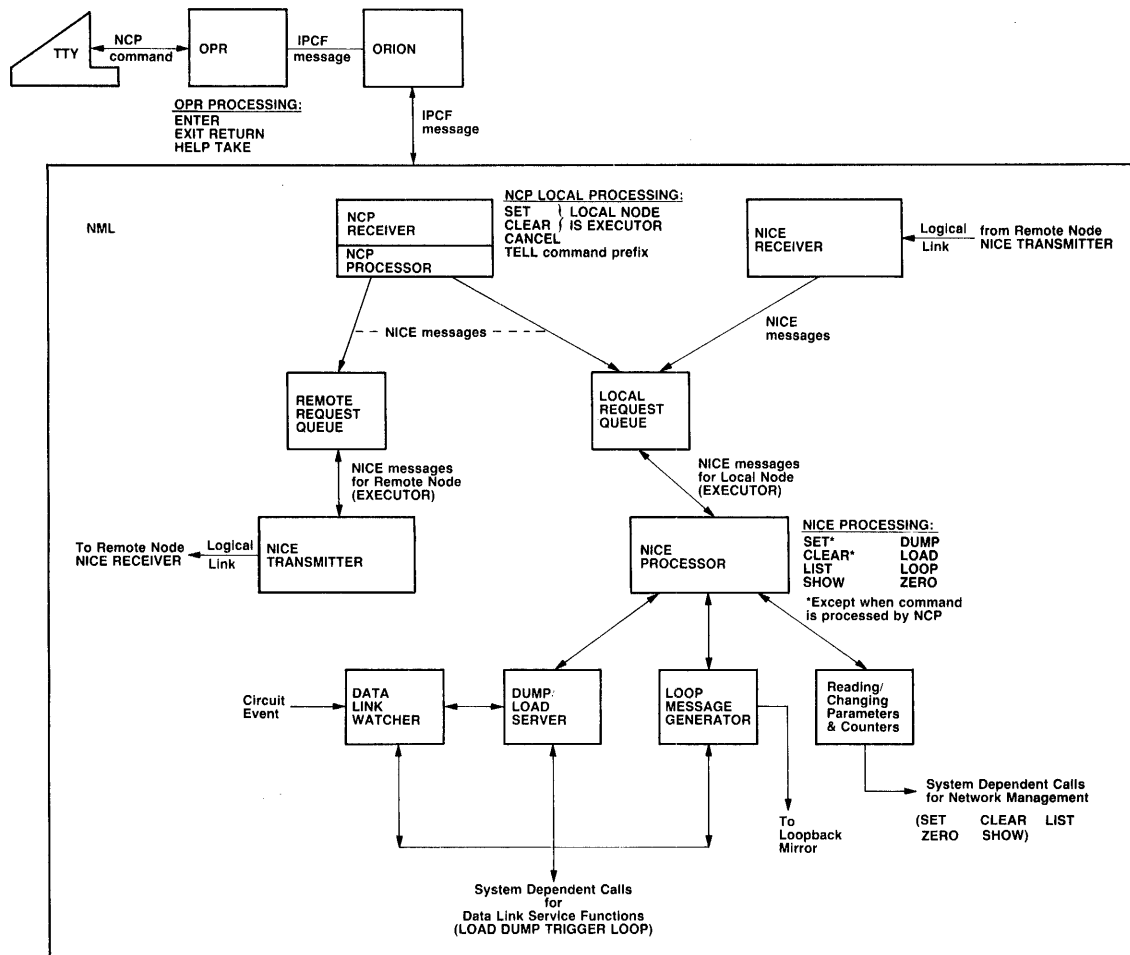
## 1.2.1 The User Layer

The User Layer supports user services and programs. NCP, the command set of the Network Control Program, is in this layer. User-written programs (MACRO programs using DECnet monitor calls) also reside in this layer.

## SYSTEM OVERVIEW

### 1.2.2 The Network Management Layer

NCP commands allow operators at any node in the network to control the network management functions of any other available node in the network, as well as of the local node. The Network Management Layer (NML), unlike other architectural layers that interface only with adjacent layers, has interfaces to every other layer. Refer to Figure 1-3 as you read the following description of NCP command processing. All of the action described is transparent to you. If your duties as an operator require only that you enter NCP commands, you do not need to understand transparent processing, but the system managers and operators who are also systems analysts will find such knowledge helpful if they have responsibility for diagnosis and maintenance.



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Figure 1-3: OPR/NCP/NML Logical Processing Flow in DECnet-10 V4.0

## SYSTEM OVERVIEW

The Operator Command Language program, OPR, parses all NCP commands. Correctly formatted commands that can be processed by OPR (when no action by NML is necessary) are processed and executed immediately. All other NCP commands, whether to be executed by the local node or by a remote node, are passed to the NCP Receiver in NML. Commands that already have access to required data are processed and executed immediately. All other commands are translated from NCP to NICE message format and placed in the Request Queue.

The Request Queue also receives input from a NICE Receiver. The NICE Receiver receives these NICE messages from a remote node for processing at the local node. All NICE messages for processing by the local node pass from the Request Queue to the local NML processor. The local NML Processor directs these messages to appropriate routines that process local functions. NICE messages in the Request Queue for processing by a remote node pass to the NICE Transmitter, which sends them to the remote node.

All NCP commands that are translated into NICE messages receive a response. Commands that are processed before reaching the Request Queue do not require a response. There is little delay and the timely execution of the command at the local node serves as adequate response. Note that there are two paths for responses from the NML processor.

If the local node is both the command node and the EXECUTOR, the response is from the local node and to the local node. If you type the command at your local node but set the EXECUTOR to a remote node, the response is from the remote node to the local node. The response to a command typed at a remote node for processing at the local node is displayed at the remote node where the command is entered.

Other processes within the Network Management Layer are:

The Data Link Watcher monitors the Data Link Layer (DLL). This module detects a service request on a line from an adjacent node. The Data Link Watcher reads the request (a MOP protocol message) and either services the request itself or passes an appropriate request to the Upline Dumper or Downline Loader process. This service request is generated by the monitor in response to a protocol crash. In DECnet-10 the Data Link Watcher is in the KL10 processor only (not in DN20 processor). In the TOPS-10 KL10 node, the Data Link Watcher services load and dump requests from both MCB and Ethernet nodes.

The Event Receiver receives remotely-generated event messages and checks these messages for proper syntax. Syntactically correct messages are sent to the Event Recorder.

The Event Recorder determines which sink to send messages to and distributes the messages to the indicated event sinks. (DECnet-10 only supports the FILE sink and CONSOLE sink to OPR jobs, and messages are logged in the SYS:ERROR.SYS file.)

The Event Processor processes event messages, and sends the processed event messages, along with a date and time stamp, to either the local Event Recorder or to an Event Transmitter for transmission to a remote Event Receiver.

The Event Transmitter uses a logical link to transmit event messages to the Event Receiver of the remote node (the sink node).

## SYSTEM OVERVIEW

The Loop Message Generator is responsible for all loop functions (used for testing and maintenance), both those associated with a CIRCUIT or LINE and those associated with a NODE. Node loopback data is dispatched to the Loopback Mirror. The primary function of the Loopback Mirror is to reflect back to the Loopback Message Generator either the test message or an appropriate error message. CIRCUIT or LINE loopback is accomplished with or without hardware assistance. In a DECsystem-1090/1091/1095, there is a Loopback Mirror in both the KL10 and the DN20 processors.

The Downline Loader, using the MOP protocol, loads an adjacent DN20 or Ethernet node from the KL10 host.

The Upline Dumper acts as a receiver of a dump from an adjacent DN20 or Ethernet node. The dump is stored in a file in the host node.

### 1.2.3 The Network Application Layer

This layer supports I/O devices and file access. Modules within this layer include the Loopback Mirror, Network File Access, and the File Access Listener.

### 1.2.4 The Session Control Layer

This layer defines a mechanism that allows a program in one node to communicate with a program in another node, regardless of either program's location in the network. This mechanism is called a logical link, and modules in the User Layer, the Network Management Layer, and the Network Application Layer can use it.

### 1.2.5 The End Communication Layer

The End Communication Layer was referred to as the Network Services Layer in previous DECnet-10 versions. Modules in this layer, using the Network Services Protocol (NSP), control the system-independent aspects of communications that use the logical link. These include connection management, data flow control, end-to-end error control, and segmentation/reassembly of user messages. Logical links provide the network's primary user-to-user communication. It is the End Communication Layer that guarantees delivery of all transmitted data in proper sequence.

### 1.2.6 The Routing Layer

The Routing Layer was referred to as the Transport Layer in previous DECnet-10 versions. This layer provides routing-related processing. The Routing module first determines if the target node is "reachable," that is, whether there is a path from the sending node to the specified receiving node. If there is not, you receive an appropriate message. If there is, a table lookup is performed. The message is directed to the first node along the least-cost path. (Routing concepts are explained in more detail in Section 2.4.)

## SYSTEM OVERVIEW

### 1.2.7 The Data Link Layer

This layer controls message sequencing and data integrity for communications between adjacent nodes, whether they are connected by an X.25 link, an Ethernet link, or a DDCMP link. It does not guarantee delivery, but it does ensure error-free communication between adjacent nodes once communication is established.

#### NOTE

In all nodes in your network, the Data Link Block Size must be the same. If you do not follow this rule when a node is added to the network, the new node may lose data when communicating with the other nodes in your network.

### 1.2.8 The Physical Link Layer

This layer defines the way that device drivers and communications hardware (such as modems and lines) are used to move data over a transmission line.

## 1.3 THE DECnet-10 VERSION 4.0 IMPLEMENTATION

DECnet-10 Phase IV runs on a KL10-based or KS10-based system. Both the KL10 and KS10 support a subset of Network Management V4.0.

On KL10 systems, the DN20 communications front end with 128K words of memory is a DECnet Phase III node. Although the KL10 and the DN20 are two separate nodes, they work together as a system. The KL10 can utilize the DN20 capabilities to communicate with Phase III nodes, but not with Phase IV nodes. To communicate with Phase IV nodes, the KL10 requires an Ethernet port.

KS10 systems support Phase IV directly over KDP lines.

DECnet-10 does not have a modifiable permanent data base and therefore does not support the NCP commands DEFINE, PURGE, and LIST. Data base values established during network generation are read from command files at system startup and become the initial parameter values in the volatile data base.

Appendix A summarizes all possible parameters and describes both DNA and DECnet-10 applicability ("applies to EXECUTOR only", for example) and restrictions ("display only", for example).

## SYSTEM OVERVIEW

### 1.4 DECnet-10 V4.0 HARDWARE

The KS10 (2020) processor running TOPS-10 allows direct Phase IV connection by means of KDP (KMC/DUP-11) lines. The system can have one or two DECnet lines.

On KL10 (DECsystem-1090/1091/1095) systems, the basic hardware configuration contains:

- o The KL10 Central Processing Unit running TOPS-10 software. The KL10 is a full DECnet-10 Phase IV node.
- o The console front end running RSX-20F. This front end assists the CPU by handling the operator's console, terminal communications, unit record peripherals, and diagnostics.
- o The communication front end (DN20) running the Multifunction Communication Base (MCB) software. MCB software includes the V3.0 DECnet-10 functions. The DN20 is a full DECnet-10 Phase III node.
- o The DTE hardware interfaces between the main processor and the two front ends.
- o The NIA20 provides multi-access connections between nodes on the same Ethernet circuit. Ethernet messages are sent over the Ethernet as datagrams, which means messages can be lost because of errors. DECnet-10 provides for automatic retransmission of lost messages; therefore data integrity is guaranteed. The Ethernet device allows multiple users of the device at the same time. Up to one NIA20 per CPU is supported, but only one Ethernet.
- o Communication devices as required.

A single KL10 can support up to three DN20 communications front ends for DECnet-10. Multi-CPU systems can support up to three on each CPU.

The PSI Version 1.0 software option restricts the basic hardware configuration. See the Software Product Description (SPD) for more information.

#### NOTE

Although a KL10 processor can support three DN20s, only one PSI Gateway is supported per system.



## SYSTEM OVERVIEW

### 1.5 DECnet IMPLEMENTATIONS

A DECnet network can consist of nodes running various DIGITAL operating systems, each with its own implementation of DECnet. The concepts underlying the implementation are the same, but the functions implemented may differ.

DECnet-10 V4.0 implements a subset of the NCP commands in the Phase IV DNA Network Management V4.0 Specification. Not all the parameters that can be formatted and interpreted are supported. You receive no "action response" if you use a command not implemented at the receiving end. The response you receive is usually:

#### Unsupported Function or Option

DECnet implementations provide the ability to send commands to a remote node for execution at the remote node. Because it is a Central Management node, the DECnet-10 host node can format and send commands supported by other DIGITAL hosts, even though the commands are not supported locally.

### 1.6 DECnet-10 CAPABILITIES

DECnet-10 capabilities are available to the nonprivileged terminal user, the programmer, and the system manager or operator. The TOPS-10 Operating System Commands Manual describes the DECnet functions available to nonprivileged terminal users and programmers. The TOPS-10 DECnet and PSI System Manager's and Operator's Guide is specific to the operational, control, and monitoring functions that are normally the responsibility of the system manager or operator.

The system manager and operator use the NCP commands to control and monitor the network. It is the system manager's responsibility to inform the staff of critical commands that should be used by only designated operators, or used during off-hours only. Chapters 4 through 7 describe the NCP command set in detail. Chapter 4 summarizes the general functions and features of NCP. Chapters 5, 6 and 7 describe the specific function of each command and the meaning of allowed arguments.

DECnet-10 capabilities include:

- o Adaptive path routing. Permits messages to be routed through the network over the most cost-effective path; messages are re-routed automatically if the circuit is disabled. Routing nodes can send and receive messages by routing through intermediate nodes. When a line or system failure occurs, and an alternate path exists, the alternate path is chosen. Adaptive path routing is transparent to the user. The system manager or delegated operator can change a routing path indirectly with an NCP command.
- o Heterogeneous network command terminals. A user at one node can log into the system at another node in the network if both systems are running DECnet Phase IV and the CTERM protocol.
- o Support of nodes of varying capabilities and configurations. DECnet-10 allows end nodes (nodes that can send and receive but not forward) to coexist on the network within the restrictions described in Section 2.5.1.

## SYSTEM OVERVIEW

- o Because DECnet-10 Version 4.0 nodes are Central Management Nodes, the Network Management modules understand the complete command set for DECnet Phase III and DECnet Phase IV. Thus, using the TELL command prefix, you can direct NCP commands not supported locally to other Phase III or Phase IV nodes on your network. A DECnet-10 V4.0 node can format any command that a remote DECnet Phase III or DECnet Phase IV node can execute. This includes multipoint commands.
- o Extensive network management capability. Using NCP, the system manager and operator can control and monitor network activity from one or multiple nodes in the network. You can change entity states and characteristics in the volatile data base (also in the permanent or temporary data base using the TELL command prefix to nodes that support it). You can also display both current and recent network activity. Loopback tests, downline loading and upline dumping are available through NCP commands.
- o Logging of significant events. You can reset and display activity counters (see Appendix B for details). Certain events and errors (start-ups, dumps, hardware detected errors, for example) are also entered in the file ERROR.SYS. You can use the SPEAR program to create reports according to the specifications you select. You can also log events to the CONSOLE sink.
- o File transfer operation. You can copy, delete, or display a file from and to a remote node; you can obtain a directory from a remote node; you can submit a batch control file to a remote node.

### 1.7 OVERVIEW OF NCP COMMAND KEYWORDS

The command keyword specifies the action you request. The command keyword is always the first part of the command that you type. Command keywords may or may not be followed by an entity (a controllable network element such as a node or circuit) and one or more parameters (values indicating characteristics or status of an entity). Most commands to remote nodes include both entity and parameter(s). Commands addressed to the local node can have entity or parameter or both implied. Thus, a complete command can consist of the command keyword, the entity, and the parameter.

Each of the commands illustrated below is complete.

Command keyword only:

```
NCP>EXIT  
NCP>HELP
```

Command keyword and entity:

```
NCP>SHOW EXECUTOR
```

Command keyword, entity, and parameter:

```
NCP>SET EXECUTOR NODE nodeid  
NCP>ZERO CIRCUIT cktid COUNTERS
```

A complete list of NCP command keywords follows. The order is alphabetic for ease of reference. Refer to the section indicated for a more specific description of function.

SYSTEM OVERVIEW

Table 1-1: NCP Command Keywords

Command	Function	Complete Description
CANCEL	Removes a command from the Request Queue before processing begins.	Section 6.6
CLEAR	Removes a value previously entered in the volatile data base.	Section 6.3 (EXECUTOR) Section 7.6 (All entities)
DEFINE	Enters a value in the permanent data base.	Section 6.2 (EXECUTOR) Section 7.5 (All entities)
DUMP	Stores a copy of a target node's memory image in a dump file at the host node.	Section 7.8.1
ENTER	Accesses a subset of OPR commands when typed to the OPR prompt.	Section 5.1
EXIT	Terminates an NCP session and returns control to TOPS-10 monitor level.	Section 5.1
HELP	Returns the function and major keywords for all NCP commands.	Section 6.8
LIST	Displays on the user's terminal information from the permanent data base.	Section 7.7
LOAD	Allows the executor node to load the system image file to a remote node adjacent to the executor.	Section 7.8.2
LOOP	Requests a node-level loopback test.	Section 7.8.3
PURGE	Removes a value or values from the permanent data base.	Section 6.4 (EXECUTOR)
PUSH	Changes control from NCP to TOPS-10 command level.	Section 5.1

## SYSTEM OVERVIEW

**Table 1-1: NCP Command Keywords (Cont.)**

Command	Function	Complete Description
RETURN	Switches OPR from the NCP command set to the standard OPR command set.	Section 5.1
SET	Enters a value or values in the volatile data base.	Section 6.1 (EXECUTOR) Section 7.5 (All entities)
SHOW	Displays on the user's terminal information from the volatile data base.	Section 6.5 (SHOW QUEUE) Section 7.7 (SHOW entity)
TAKE	Retrieves and executes a file of NCP commands.	Section 5.1
TELL (prefix)	Directs the command that follows to a remote node for execution.	Section 6.7
TRIGGER	Requests the target node to send a load request.	Section 7.8.4
WAIT	Used in batch programs, delays processing the next command for the specified number of seconds.	Section 5.1
ZERO	Logs counters and then zeroes them.	Section 7.9



## CHAPTER 2

### NETWORK CONCEPTS

#### 2.1 NODES AND DATA LINKS

Nodes and data links are the two fundamental elements in the network. As used in this document, a network node is a computer processor that can pass data, using DECnet, to one or more remote nodes. Network nodes are classified in several ways. One basic classification divides nodes into local and remote. For typing NCP commands, the local node is usually (could be SET HOSTed) the node where your terminal is located (the TOPS-10 node in DECnet-10). All other nodes, including the MCB front end, if any, are remote.

In the DECnet software, the local node is the node acting as EXECUTOR; this is usually, but not always, the node at which you type the command. Any active node in the network is remote to any other active node in the network. Thus, by definition, the central processor is remote to its connected MCB front end. An adjacent node is one that is physically connected to the node that it is termed "adjacent to." For example, on KL10 based systems, the MCB front end is adjacent to the KL10 central processor.

Nodes are also classified according to their network function. In descriptions of network functions, you will frequently see the terms command (or control) node, executor node (or EXECUTOR), target node, and host node. The command node is the node where you type a command. The executor is the node where the command is executed. The target node is the node where the action requested by the command takes place. The host node is the node where resources for processing the command exist (storage space for files, for example). These functional classifications are not mutually exclusive. For example, a node can serve as executor, command, host node, and target node. See Figure 3-2.

Data links are actual physical connections between nodes; Logical links are logical connections. A physical link connects node A to node B, for example; a logical link connects Marcia at one terminal to George at a remote terminal, or connects a user process at one node to a utility process at another node. The logical link encompasses the end-to-end transmission of data. Lines are the physical media for logical links. In a logical link from node A to node C by way of node B, there is one logical link but there are two physical links. The term "circuit" is synonymous with a logical point-to-point connection. Section 7.3.4 describes circuits in more detail.

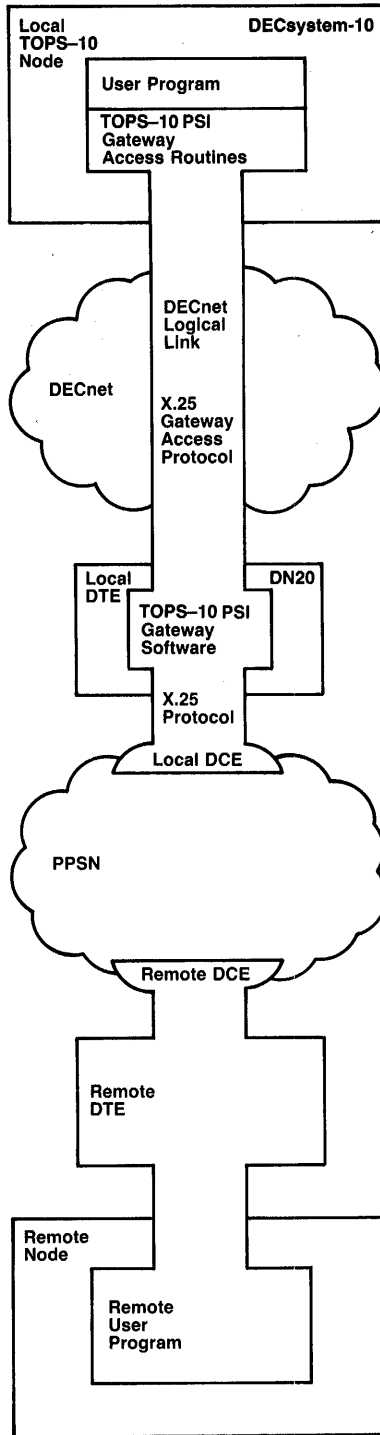
## NETWORK CONCEPTS

### 2.2 THE PSI GATEWAY

The PSI Gateway interfaces a DECnet network to an X.25 Public Packet Switching Network (PPSN) over a leased data communications line. The internationally recommended protocol for such an interface has been defined by CCITT Recommendation X.25. The Gateway's main responsibility is to generate and interpret the protocol messages necessary to communicate with the X.25 node at the opposite end of the data link which connects the DN20 to the PPSN.

The PSI option also includes software to permit access to the Gateway, and thus the X.25 network, from a TOPS-10 DECnet Version 4.0 node. These software units include the Gateway Access Library and the X.29 Server. Figure 2-1 illustrates the placement of the TOPS-10 PSI Gateway Access Library Routines and the TOPS-10 Gateway Software in the central (TOPS-10) processor and the communications processor (DN20).

# NETWORK CONCEPTS



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Figure 2-1: TOPS-10 PSI Gateway Software Components

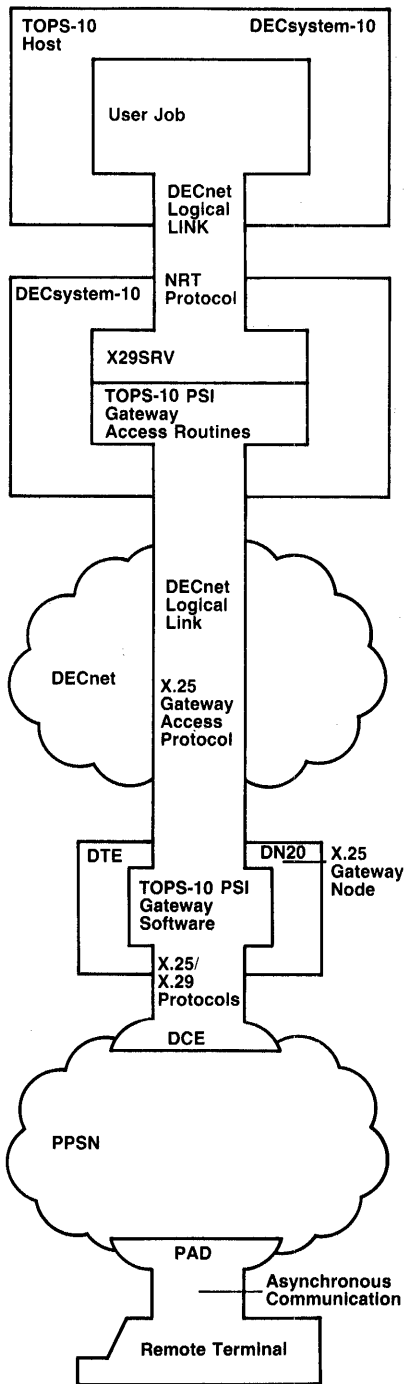


## NETWORK CONCEPTS

The Gateway Access Library is a collection of subroutines that the user can use to write programs and applications that perform X.25 functions (see the TOPS-10 PSI User's Guide). These routines are linked with the user's software to form a single-job image. The routines allow communication with the Gateway by using the Gateway Access Protocol over a DECnet logical link. This permits user programs to directly manipulate the X.25 protocol at the Gateway's interface to the X.25 network, even though the user may be on a DECnet node that is geographically distant from that interface.

The X.29 feature permits a user at an asynchronous terminal to log in to a TOPS-10 system that has access to an X.25 network. The terminal is connected to a Packet Assembly/Disassembly (PAD), either through a direct asynchronous connection or a modem. The X.29 Server uses the X.29 protocol to control the terminal session through communication with the PAD. The X.29 Server uses the Gateway Access Protocol to communicate with the Gateway. It communicates with the NRT Server in the TOPS-10 host using the Network Remote Terminal Protocol (NRTP). Figure 2-2 illustrates the components needed for such a connection.

NETWORK CONCEPTS



MR-S-3729-84

Figure 2-2: X.29 Terminal Access to a TOPS-10 Host

## NETWORK CONCEPTS

### 2.3 ENTITIES

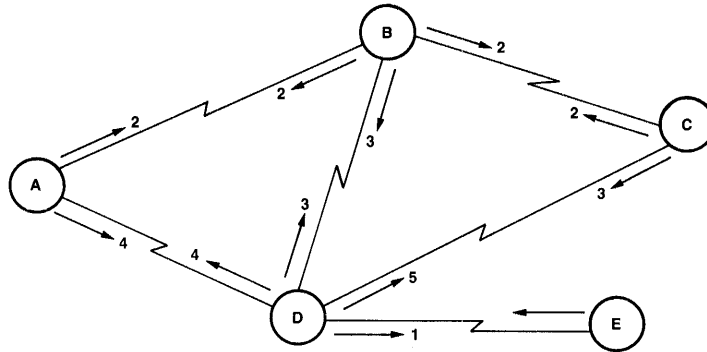
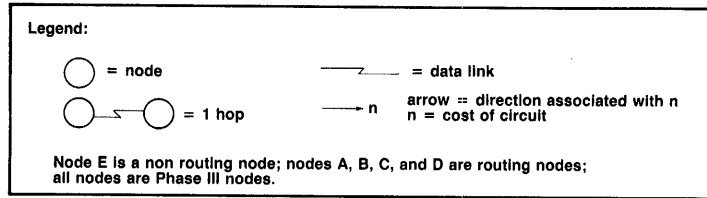
The term "entity" is used in reference to NCP commands. An entity is the element on which the command is to act: for example, in the command SET NODE nodeid HOST hostname, NODE nodeid is the entity; or in the command SHOW ACTIVE LINES COUNTERS, ACTIVE LINES is the entity. An entity in the singular form is one of: AREA, CIRCUIT, LINE, LOGGING, MODULE and NODE. ACTIVE and KNOWN preceding AREAS, CIRCUITS, LINES, LOGGING, MODULES and NODES permit plural forms. NODE has two other forms, LOOP NODES and ADJACENT NODES. Chapter 7 describes entities in detail.

The MODULE entity is provided for users of the TOPS-10 X.25 software (discussed in Chapter 8) and for maintenance of the Ethernet. The MODULE entity for X.25 takes one of three forms: MODULE X25-ACCESS, MODULE X25-PROTOCOL, and MODULE X25-SERVER.

### 2.4 ROUTING CONCEPTS

Routing, the primary function of the Routing Layer, is the determination of the physical path that packets follow between nodes. This path is determined at each node. At each intermediate node, the Routing module reads the header of an incoming packet to determine its destination, then reads the routing table to determine the least-cost path. Within the limits set by the configuration, the routing table is automatically updated when a path is no longer an acceptable choice. The system manager or operator can also change the path using the appropriate NCP command (SET CIRCUIT cktid COST cost). See Figure 2-3.

## NETWORK CONCEPTS



	From Node	To Node	Path	Path Cost	Least Cost Path	Path Length
All links up	B	D	B→D	3	B→D	1
			B→A→D	6		2
			B→C→D	7		2
Link between B and D down	D	B	D→B	3	D→B	1
			D→A→B	6		2
			D→C→B	7		2
Link between B and D down	B	D	B→A→D	6	B→C→D	2
			B→C→D	5		2
Link between B and D down	D	B	D→A→B	6	D→A→B	2
			D→C→B	7		2

NCP Commands for Control:

**FOR CIRCUIT**

SET CIRCUIT DMR-0 COST 3  
 SET CIRCUIT KDP-0-2 COST 4  
 SET CIRCUIT DTE -1-3

**FOR EXECUTOR**

SET EXECUTOR MAXIMUM COST 30  
 SET EXECUTOR MAXIMUM HOPS 4  
 SET EXECUTOR MAXIMUM VISITS 8

MR-S-3531-84

Figure 2-3: Routing for DECnet-10 V4.0

## NETWORK CONCEPTS

### 2.4.1 Node Routing Types

DECnet-10 Version 4.0 routing supports two major types of nodes: routing nodes and Ethernet nonrouting nodes (end nodes). The characteristics and capabilities of the two major types of nodes follow.

#### o Routing Nodes

Routing nodes (routers) allow communication between nodes that are not adjacent.

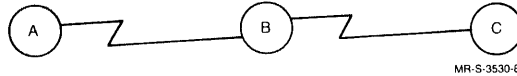


Figure 2-4: Routing Node

Routers can have one or more circuits. Routers regularly receive and maintain information about other nodes. They perform the routing operation by associating a circuit with the destination node for the packet and transmitting that packet over that circuit. Routers can use DDCMP, Ethernet, or X.25 circuits as their data links.

In Figure 2-4, neither A nor C is aware of B's participation in the routing above the DNA Routing level. Thus, the operator perceives the connection as a direct A to C connection. If all nodes in the network are routing nodes, then each node can communicate with every other node in the network.

#### o Nonrouting Nodes

Nonrouting nodes (end nodes) contain a subset of network software that permits them to send packets or receive packets addressed to them, but not to route packets to other nodes. In DECnet-10, only Ethernet nodes can be end nodes. End nodes have a single circuit, ETH-0, connecting them to the rest of the network. They do not send or receive information about network configurations. If two end nodes are connected by a nonbroadcast circuit, these nodes constitute the entire network.

On an Ethernet, if there are two or more routers, one router is designated the router to provide message routing services for end nodes on the Ethernet. If no routers are available, Ethernet end nodes can communicate with each other directly, by sending a packet out over the Ethernet and then waiting until the timeout for a reply. However, routers are the only Ethernet nodes that can route messages to nodes not on the Ethernet.

## NETWORK CONCEPTS

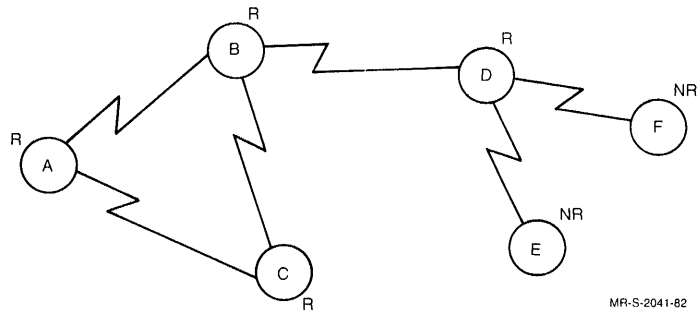


Figure 2-5: Nonrouting Nodes

In Figure 2-5, nodes A, B, C, and D are routing nodes; nodes E and F are nonrouting nodes. E can send messages to A, B, C, D, F, and itself, and can receive messages from each of them. Similarly, F can communicate with A, B, C, D, E, and itself. As long as each node in the path from E or F to the destination node is a routing node, messages can continue through the network for a maximum of six hops. Messages from any node to E or F can also continue in this manner.

The placement of the nodes diagrammed suggests that D does more communicating with E and F than with A, B, and C. Note that if B goes off line, D (and E and F) cannot send to or receive from A, B, or C. The network shown also suggests that A, B, and C expect to communicate with each other more than with D. Note that each of these nodes has a direct path to each of the others: one direct one-line or "hop" path; and one two-hop path: for example, A to B and A to B through C.

In planning your network, the number of routing nodes should be kept down because of the overhead associated with routing. You should try to minimize the use of routers and maximize the use of end nodes. Although end nodes are less flexible than routers, they require less memory and have less system overhead. Often, by using fewer routing nodes, you can get better system performance.

### 2.4.2 Area Routing

Phase IV DECnet supports the configuration of very large, as well as small, networks by dividing the network into areas. In a single-area network, a maximum of 1023 nodes is possible, but the optimum number of nodes is much less (approximately 200 to 300 nodes, depending on the topology). Area routing techniques permit configuration of very large networks, of up to 63 areas, each containing a maximum of 1023 nodes. In a multiple-area network, nodes are grouped into separate areas, each functioning as a sub-network. DECnet supports routing within each area and a second, higher level of routing that links the areas. Nodes that perform routing within a single area are called level 1 routers; those that perform routing between areas as well as within areas are called level 2 routers (or area routers).

## NETWORK CONCEPTS

DECnet-10 does not perform level 2 routing. However, a DECnet-10 system can use the services of systems that support level 2 routing to participate in area-organized networks. For more information on configuring area networks, refer to the DECnet manuals for operating systems that support this function.

Area routing offers the following advantages:

- o Permits configuration of very large networks of more than 1023 nodes.
- o Requires less routing traffic, restricting routing overhead between areas to the level 2 routers. Level 1 routers exchange routing information about nodes in their own area only.
- o Allows different organizations to manage their nodes separately within a large network.
- o Makes the merging of existing networks easier.

A DECnet-10 system connected to the network by the Ethernet can communicate with all nodes in an area network (with a level 2 router), whereas a system connected by a DN20 can only communicate with at most 255 nodes in that system's area. In particular, the DN20 can only communicate with nodes whose node address is less than 256 (such as, nodes 1-255) in the same area as the DN20.

### 2.4.3 Level 1 and Level 2 Routers

DECnet-10 nodes cannot perform area routing, however they can participate in area configurations that use non-DECnet-10 nodes as area routers.

An area can contain many level 1 routers and end nodes, and must contain at least one level 2 router to provide the connection to other areas. A level 1 router acts as a standard routing node. It keeps information on the state of nodes within its own area. Level 1 routing nodes and end nodes obtain access to nodes in other areas through a level 2 router residing in their own area.

A level 2 router keeps information on the state of nodes in its own area and also information on the cost and hops involved in reaching other areas. (The logical distance between adjacent level 2 nodes is one hop.) The level 2 router always routes packets over the least cost path to a destination area. Level 2 routers have the following characteristics:

- o Level 2 routers connect areas together.
- o Level 2 routers also act as level 1 routers within their own area.
- o Each level 2 router in a network must be physically connected to at least one other level 2 router.
- o A level 2 router serves as a level 1 router when it is not physically connected to another level 2 router.
- o All level 2 routers must be connected in such a way that they create a network of their own.

## NETWORK CONCEPTS

- o Level 2 routers exchange level 2 routing messages among themselves.
- o In any given area, there can be more than one level 2 router.

### 2.4.4 Ethernet Routers and End Nodes

Two special concepts are involved in routing over an Ethernet circuit: the designated router and end node caching.

**2.4.4.1 Ethernet Designated Routers** - The function of the designated router is to route messages over the Ethernet on behalf of end nodes. A designated router is elected even if there are no end nodes currently on the Ethernet.

If there are two or more routers on the same Ethernet, one of them is elected as the designated router. By convention the router with the highest numerical priority (set with the command SET CIRCUIT ROUTER PRIORITY) is elected router for the circuit. In case of a tie, the node with the highest address is elected as the designated router.

The designated router broadcasts messages telling end nodes that it is available for routing. End nodes transmit multicast hello messages, so that routers know of their presence on the Ethernet.

End nodes keep no information about the network configuration, except that they are permitted to keep a cache of nodes within their area that they may address directly on the Ethernet, rather than going through a router (see the description of Ethernet end node caching below). Thus an end node may send a packet directly to another Ethernet end node, if the address has been cached, or it may send a packet to the designated router for forwarding.

Note that end nodes can exist on an Ethernet without a router. When an end node on the Ethernet wishes to communicate with another end node, and notes that no designated router exists, it will always send the packet directly to the addressed node. If the addressed node is active, the sender will receive a reply; if the addressed node is not available, a timeout will occur.

**2.4.4.2 Ethernet End Node Caching** - End nodes normally send packets by means of a router. To minimize the space and time overhead involved in the routing function on Ethernet circuits, a caching mechanism is available that takes advantage of the fact that nodes on an Ethernet are logically one hop away from each other (one hop is the distance between two adjacent nodes).

When a designated router is present and an end node is ready to send a packet to a node for the first time, the end node sends the packet to the designated router. When there is no designated router on the circuit, the end node sends the packet directly, in expectation that the other node is there. If a response is received, the end node examines the received packet to see if the "on-Ethernet" bit is set (the bit is checked even if the first packet went to the designated router). If the bit is not set, no action is taken; if the bit is set, the next packet can be sent directly, rather than by means of the designated router.



## NETWORK CONCEPTS

An end node's cache contains the addresses of end nodes that the node has communicated with within the last minute. When a minute has passed without receiving a message from the node, the node's address is removed from cache.

The buffer size to be used in a connection is negotiated during the connect process. This process can occur directly between two end nodes or with the assistance of a designated router. Once the buffer size is negotiated, it cannot be changed.

The cache time limit can cause links to be aborted when different buffer sizes are assigned to end nodes and routers. For example, a designated router with a buffer size of 576 bytes initiates a direct connection between two end nodes using a buffer size of 1467 bytes. (This succeeds because the first packet sent to the router is small, always under 576 bytes.) A pause in communications between the two end nodes occurs that causes the destination node's address to be removed from the sender's cache. The sender attempts to resume communications by sending a 1467 byte packet through the designated router's 576 byte buffer, forcing the link to be aborted. Therefore, the designated router should have the largest buffer size used in the network.

### 2.4.5 The Adaptive Least-Cost Routing Algorithm

Routing and related functions are accomplished in the Routing Layer of the KL10 or KS10 node and of the DN20 communications front end. Although routing is transparent, you, as the system manager or operator can, through the NML interface to Routing, obtain information about and control the routing operation. Therefore, you need to understand how routing is determined. More specifically, you need to understand the significance of parameter changes in the NCP commands that you use. The "Routing language" includes a few common terms with routing-specific meanings. Figure 2-3 is designed to define these terms and, at the same time, provide you with a basic understanding of the DECnet-10 routing algorithm.

### 2.4.6 Congestion and Packet Delivery

The Routing Layer attempts to keep network traffic through its node at a manageable level. It accomplishes this through stringent assignment of buffers. When buffer resources are exhausted, the Routing Layer refuses packets from NSP and discards packets from other nodes.

If the data link remains open, NSP guarantees eventual delivery (once it accepts the message from the user) between nodes in a network. Timely delivery occurs under normal traffic loads.

## NETWORK CONCEPTS

### 2.5 SUMMARY OF PHASE III/PHASE IV COMPATIBILITY

The following types of nodes can exist in a Phase IV network:

Phase IV Router - This node sends messages to and receives messages from other nodes, and routes messages from other source nodes to other destination nodes. A Phase IV Router can use one of the following circuits: Ethernet, DDCMP, or X.25. In an area network configuration, Phase IV routers exist at two routing levels:

- o The level 1 router, which performs routing within a single area. The node type is ROUTING-IV.
- o The level 2 router, which performs routing within its own area and to and from other areas. The node type is AREA-ROUTER. DECnet-10 does not perform level 2 routing. However, a DECnet-10 system can use the services of systems that support level 2 routing.

#### Phase IV Nonrouting Node (end node)

This node sends messages to, and receives messages from, other nodes, but does not route messages. A Phase IV nonrouting node can be connected through Ethernet or through DDCMP circuits. For DECnet-10, it can be connected only through Ethernet. The node type is NONROUTING-IV.

#### Phase III Router

This node sends messages to and receives messages from other nodes, and routes messages from other source nodes to other destination nodes. It uses DDCMP, and X.25 circuits, but does not support Ethernet circuits. The node type is ROUTING-III.

#### Phase III Nonrouting Node (end node)

This node sends messages to and receives messages from other nodes, but does not route messages. This node cannot support the Ethernet. The node type is NONROUTING-III.

#### Phase II Node

This node can send messages to an adjacent Phase III router or to an adjacent Phase II node. However, a Phase II node can send messages only in point-to-point configurations. In addition, a Phase III node cannot communicate with a Phase II node through another Phase III node. A Phase II node cannot communicate with a Phase IV node. This node can never be on the Ethernet.

#### 2.5.1 Topological Restrictions

The following types of nodes can be configured adjacent to each other:

- o Phase II/Phase II
- o Phase II/Phase III
- o Phase III/Phase III
- o Phase III/Phase IV
- o Phase IV/Phase IV

## NETWORK CONCEPTS

Phase IV nodes can communicate with Phase III nodes. Certain restrictions apply, however, in a mixed Phase III/Phase IV network:

- o A Phase III node should not be included in a path between Phase IV nodes.
- o A Phase III node in a Phase IV multiple-area network should not be linked with nodes outside its own area.
- o Routing initialization passwords are required when a Phase III node is initialized in a Phase IV network.

The following restriction applies to the placement of end nodes:

- o An end node must be adjacent to a routing node.

### 2.6 OPERATOR FUNCTIONS AND RESPONSIBILITIES

An "operator," in the context of this manual, is any terminal user with the privileges to run the OPR program, and who is responsible for entering NCP commands or running system or network-related programs (requiring these privileges) for monitoring or controlling the network.

An operator's duties can consist of well-defined, simple, and repetitive tasks, or can consist of complex tasks that cannot be predefined. Some operators have responsibilities that combine both types of duties. Because of the many variations in personnel and site management, your responsibilities as an operator may be quite different from those of another operator. However, whatever these responsibilities are, it is important that you:

- o Have a clear idea of what your responsibilities are.
- o Have (or gain) both the software and hardware knowledge needed to perform your assigned tasks.
- o Consult with the system manager, or someone designated by the system manager, whenever you are in doubt about a procedure.

A few NCP commands have the potential for disrupting the entire network. Several commands will, if formatted with valid but ill-chosen parameters, at least disrupt your own node's performance. Never enter an NCP command without a complete understanding of the probable effect of the command. Do not make changes in the permanent data base of a remote node without consulting the system manager at the remote node. All commands to change either the volatile or permanent data base of a remote node must include the required USER and PASSWORD parameters.

A list of functions commonly performed by operators follows. As an operator, you may be responsible for any of the following functions:

- o Starting the network automatically
- o Starting the network manually
- o Loading the DN20 manually (the DECnet-10 communication front end on KL10-based systems) if required
- o Starting up software or devices needed by the network (GALAXY, printer, for example)

## NETWORK CONCEPTS

- o Loading and starting adjacent nodes
- o Monitoring local and remote nodes
- o Securing a dump after a crash
- o Changing parameters in the volatile data base
- o Shutting down a node or all network operation
- o Changing the state of network entities
- o Changing the routing path indirectly by changing the circuit cost
- o Gathering (and possibly analyzing) statistics (events, errors, performance)
- o Running SPEAR for reports on network events and errors
- o Using network command files and possibly creating command files to be executed at scheduled intervals
- o Testing network application programs
- o Recognizing potential problems (long response time, high error rate, for example)
- o Using diagnostic tools
- o Keeping all network-related logs and forms up-to-date

Once you have a clear idea of your responsibilities, concentrate first on the sections of this manual that describe the functions you need.

### 2.7 SYSTEM MANAGER FUNCTIONS AND RESPONSIBILITIES

The DECnet-10 System Manager has final responsibility for the total functioning of the DECnet-10 node in the network. The tasks that the manager performs depend on several factors. The principal factors are:

- o The degree to which the management of the network is distributed. (Will there be standards and procedures from a central management node? Is the local node responsible for some or all of the control of other nodes in the network?)
- o The complexity of the network of which the local node is a member. (Are there non-DECnet-10 nodes in the network? What and where are available resources?)
- o The knowledge and experience of the Manager's staff. (How can responsibilities best be allocated? What training is needed and how can it best be achieved?)

## NETWORK CONCEPTS

Ideally, a system manager concentrates on activities that call for planning and require a high degree of knowledge and expertise. Actually, however, you may frequently have to perform some of the operator duties described in the previous section. Listed below are the functions that are the peculiar responsibility of a system manager in a "typical" DECnet-10 environment.

- o Generating and installing the DECnet-10 software. A DIGITAL Software Specialist performs the original generation and installation of the DECnet software. You should, however, follow the procedure and read the appropriate manual (see the TOPS-10 DECnet and PSI Installation Guide). The network may grow in number of nodes and other physical resources. As the system manager, you may need to repeat some of the steps followed in the original generation and installation in the future. Some of the parameters established during system generation may require change due to changes in resources.
- o Assigning personnel to specific duties. For reasons of security, as well as efficiency, operators should be aware of those functions they must not perform, as well as those for which they have responsibility. For example, certain NCP commands have the potential for disrupting services, and should be restricted in use.
- o Providing appropriate documentation to all operators who will use Network Management functions.
- o Scheduling network services. To the extent possible, network startup and shutdown should be set up automatically at the times dictated by the nature of the node's needs. At least until operators become proficient in their use of the network, the manager should consider a schedule of stand-alone time for demonstrations and practice. Initial schedules should attempt to avoid extremes of traffic, but the ideal schedule cannot be built until you have analyzed traffic patterns.
- o Handling of physical resources. The manager should provide both hard copy and on-line sources of information on the node locations of processors, terminals, peripherals, network application programs, remote stations, and any other facilities used in the network. The manager should provide information to all operators on the use of all facilities. All resources should be analyzed for performance. Error and performance data should be kept for maintenance engineers and specialists, as well as for site planning and scheduling.
- o Checking the surveillance log periodically. Whenever OPR is running and you have typed "ENTER NCP," the system automatically records all network activity. This log includes the terminal number where the NCP command was entered and contains the command itself. The current log has the file name SSL:OPERAT.LOG[3,3]. When ORION is started or restarted, this file is copied to SSL:OPERAT.nnn[3,3] (for example, OPERAT.001[3,3], OPERAT.002[3,3]), where nnn is the next highest generation number. This is the file you can examine to observe all NCP activity by date and time. (Use the DIRECT monitor command to find the date and time you wish to observe because frequently there are multiple files.)

## NETWORK CONCEPTS

- o As the system manager, you should at all times be aware of the operational status of the network - both nodes and devices used in your network activities. Functions you may have to perform include: adjust line cost to achieve new routing paths, shut down network components or circuits, send messages to all network operators, and analyze errors and failures.
- o Bringing new devices, circuits, and users on line.
- o Gathering statistics on network use, traffic congestion, errors, and failures.

You can delegate many of your responsibilities, but you are a key person in the success or failure of your network. You can ensure success by closely monitoring both the system and the manner in which your staff performs.



**PART II**  
**DECnet OPERATION**



## CHAPTER 3

### RUNNING DECnet-10

#### 3.1 DECnet STARTUP PROCEDURES

To run DECnet on a DECSYSTEM-2020 running TOPS-10, you need only bring up the TOPS-10 monitor generated with DECnet.

On the DECsystem-1090/1091/1095 with a DN20 DECnet front end, you must also load the communications front end with the MCB software. This normally occurs automatically when TOPS-10 is loaded. It can also be done manually any time after TOPS-10 is loaded.

##### 3.1.1 Automatic DECnet-10 Startup

When TOPS-10 is loaded, the INITIA program automatically uses the FRCLIN functionality of the TOPS-10 monitor to process the commands in the file SYS:SYSJOB.INI. Following these commands, INITIA starts up major system programs, such as ORION, QUASAR and LPTSPL.

The ORION program does an automatic TAKE of SYSTEM.CMD, which can then schedule a TAKE of NCP.CMD. (See the TOPS-10 Operator's Guide for information on GALAXY and OPR.)

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Mount the SYSTEM disk pack on drive 0. Press the ENABLE rocker switch while pressing the DISK rocker switch on the console front end.

RSX-20F VE15-31 10:30 24-May-85

```
[SY0: redirected to DB0:]
[DB0: mounted]
KLI -- VERSION VA15-50 RUNNING
KLI -- ENTER DIALOG [NO,YES,EXIT,BOOT]
KLI>
KLI -- KL10 S/N: 2476., MODEL B, 60 HERTZ
KLI -- KL10 HARDWARE ENVIRONMENT:
        MCA25 CACHE PAGER
        EXTENDED ADDRESSING
        INTERNAL CHANNELS
        CACHE
```

```
KLI -- MICROCODE VERSION 2.0[411] LOADED
KLI -- ALL CACHES ENABLED
```

```
LOGICAL MEMORY CONFIGURATION.
  ADDRESS  SIZE  INT  TYPE CONTROLLER
  00000000 1536K   4   DMA20  4
```

```
KLI -- CONFIGURATION FILE WRITTEN
KLI -- BOOTSTRAP LOADED AND STARTED
BOOT V3(47)
```

```
BOOT>DSKA:RL171B.EXE[1,4]
[Loading from DSKA:RL171B.EXE[1,4]]
```

```
RL171B DEC10 Development 05-15-85
Date: 15-JUN-85
Time: 10:34
```

Startup option: Q

```
[Initializing CI network]
%% Node NOVA(31) up at 10:34:57
%% Node JUBLEE(2) up at 10:34:58
```

```
[CCPWFD Waiting for file daemon to start]
```

```
.LOGIN 1,2
```

Figure 3-1: Startup Dialogue for TOPS-10 Version 7.03 DECnet-10 Version 4.0 on a KL1090 System

RUNNING DECnet-10

RL171B DEC10 Development 10:34:59 CTY system 1026/1042  
Connected to Node KL1026(26) Line # 361

.R OPSER  
[OPRPAF Processing auto command file]

[KNLRLD Reloading NI-0 with microcode version 1(167)]  
%% Node SPIRIT(30) up at 10:34:58  
%% Node NEXT(27) up at 10:34:58  
%% Node COMET(70) up at 10:34:59  
%% Node CTCH22(22) up at 10:35:00

[KNLRLD Reloading NI-1 with microcode version 1(167)]  
%%TTY STOMPER - Starting

OPR	8	1,2	SL	00:00:02	L	O
FAL	7	1,2	RN	00:00:00	L	O

10:37:11(6)

! [RP20 microcode %3(1) loaded on CPU0, RH20 550, DX20 0 on 14-Jun-85  
10:40:42]

Figure 3-1: Startup Dialogue for TOPS-10 Version 7.03 DECnet-10  
Version 4.0 on a KL1090 System (Cont.)

### 3.1.2 Manual Startup of DECsystem-1090/1091/1095 Communication Front End

The TOPS-10 and the MCB Operating Systems may crash independently. When TOPS-10 fails, it attempts an automatic restart. If this restart is successful, the Network Management Program running under TOPS-10 checks to see if the MCB system is running. If the MCB has also failed, it is loaded; if it has not failed, there is no action. Therefore, a manual startup is only required when normal automatic procedures fail.

You can use the following sequence of commands if the DN20 communications front end fails to come up when the TOPS-10 KL10 node comes up, or following a crash that is not followed by an autoload. Normally, the first step loads the front end. If the load fails, continue with the next sequence of commands. You must have system operator privileges to use these commands.

Step 1: Type the following at your terminal:

```
.R OPR
OPR>ENTER NCP
NCP>SET CIR DTE-0-1 STATE ON
NCP>SET CIR DTE-0-1 SERVICE ENABLED
NCP>LOAD NODE BOSTON
```

The circuit identification, DTE-0-1 (DTE number 1 on CPU 0), represents the DTE number connecting the MCB, node BOSTON, to the KL10.

## RUNNING DECnet-10

Step 2: If the load fails, enter NCP and type an NCP SET NODE command for each of the required parameters, inserting the values appropriate for your MCB DN20 node. Include as the last command, SET CIRCUIT DTE-0-1 SERVICE ENABLED. The value DTE-0-1 identifies the circuit over which the load occurs. Use the command file example in the next section to check format. "BOSTON" in the example is the name of the network front end.

When loading the communications front end, you must provide values for the following parameters:

```
Secondary Loader
Tertiary Loader
Service Circuit
CPU = PDP11
Load File
Dump File
Secondary Dumper
Host
Service Node Version
```

You can now repeat:

```
NCP>LOAD NODE BOSTON
```

### 3.1.3 Manual Startup with Command Files

It is helpful to use command files for procedures that are often repeated. You save unnecessary typing, avoid such errors as misspelling, and ensure against errors of omission. You will probably find it helpful to keep a set of command files in your own directory. The following is an example of a command file, BOSTON.CMD, for loading the front end named BOSTON:

```
CLEAR EXECUTOR NODE
SET NODE BOSTON CPU PDP-11
SET NODE BOSTON SERVICE CIRCUIT DTE-0-1
SET NODE BOSTON SERVICE NODE VERSION 0
SET NODE BOSTON SECONDARY LOADER SYS:DTEMPS.SYS
SET NODE BOSTON TERTIARY LOADER SYS:DTEMPT.SYS
SET NODE BOSTON LOAD FILE SYS:BOSTON.SYS
SET NODE BOSTON SECONDARY DUMPER SYS:DTEDMP.SYS
SET NODE BOSTON DUMP FILE XPN:BOSTON.DMP
SET NODE BOSTON HOST KL1036
SET CIR DTE-0-1 STATE ON
SET CIR DTE-0-1 SERVICE ENABLED
LOAD NODE BOSTON
```

The above command set includes all information needed by the system for a manual load. However, when the system is brought up, several of the commands shown above are processed when the OPR.ATO file is executed. Normally, only the last two commands are required.

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Assume the TOPS-10 system is running. Before using the network, you check the status of the communications front end and receive the following:

```
NCP>SHOW NODE BOSTON STATUS<RET>
NCP>
 9:24:09          NCP
Request # 253; Show Node Status Completed
  Node          State      Active Delay Type      Cost Hops Circuit
                   Links
7.129 (Boston) Reachable      1   Routing IV          DTE-0-1
Next node = 7.94(PYTHON)
```

If you do not receive output in a few minutes informing you that the load was successful, you can TAKE the file Boston.CMD after returning to monitor level. Input and output follow:

```
.send all Will use a .CMD file to load front end in 5 minutes
;;TTY51: - Will use a .CMD file to load front end in 5 minutes
```

```
.R OPR
OPR>DISABLE OUTPUT-DISPLAY (OF) ALL-MESSAGES<RET>
OPR>
9:59:51          --Output display for OPR modified--
OPR>ENTER NCP<RET>
NCP>TAKE BOSTON.CMD<RET>
```

·  
·  
·

```
NCP>SHOW NODE BOSTON<RET>
NCP>
10:02:26        NCP
Request # 271; Show Node Summary Completed

  Node          State      Active Delay  Circuit Next Node
                   Links
7.129 (Boston) Reachable      0   DTE-0-1
NCP>
```

The first command to the OPR program disables the display of all messages. This allows you to use the network facilities without interruption by numerous messages about such things as batch programs, tape mount requests and reports printed. You will receive all NCP responses and messages.

### 3.2 DECnet-10/PSI-10 RESTART PROCEDURES

Section 3.2.1 describes the restart procedure for the ORION process, and Section 3.2.2 describes the restart procedure for NML.

#### 3.2.1 Restart Procedure for the ORION Process

If the ORION process fails while you are entering NCP commands, the following message appears on your terminal:

```
--- ORION not running ---
```

You can restart the ORION process with the following command sequence from a [1,2] job terminal:

```
.SYSTAT
.
.   (get job number for ORION)
.
.ATTACH JOB-NUMBER [1,2]
.HALT
.GET SYS:ORION
.CSTART
.DETACH or attach to old job-number
```

The ATTACH command re-attaches to the detached ORION program. The HALT command stops its execution. GET obtains a new copy of ORION. CSTART restarts execution, and DETACH detaches the job.

If the restart is successful, the next step is to restart NML, the Network Management program containing the NCP module among other control modules (see Section 3.2.2). This is necessary because the new copy of ORION has no knowledge of NML's location. When NML is loaded, the initialization routine identifies itself to ORION. If the communication front end has also crashed, you will also need to follow the procedures in Section 3.1.2.

#### 3.2.2 Restart Procedure for NML

If the OPR program cannot communicate with NML, you receive the following message when you type an NCP command:

```
--- NCP is not running ---
```

This message can occur when ORION cannot communicate with NML (as when ORION is restarted without restarting NML). NML must be restarted.

If you receive no response from an NCP command within a few minutes, enter the NCP command SHOW QUEUE. If NML refuses to respond to an NCP command, it may simply be busy loading a node. If there is no response to SHOW QUEUE, assume NML has stopped running. (Alternatively, you can use your normal procedure for determining the state of a program.) If NML is hung, then you should take a dump of NML and, if possible, note a description of the environment.

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You can restart the NML program with the following command sequence from a [1,2] job terminal:

```
.SYSTAT
.
. (get job number for NML)
.
.ATTACH JOB-NUMBER [1,2]
.HALT
.GET SYS:NML
.CSTART
.DETACH or attach to old job-number
```

NML should be successfully restarted.

When NML is restarted, the volatile data base is lost. Therefore, the procedure to restart NML includes TAKing the NCP.CMD file. The NCP.CMD file sets the node names and addresses (numbers) for the network and sets the values for the TOPS-10 Network Management volatile data base. Use the following commands:

```
.R OPR
OPR>TAKE SYS:NCP.CMD
OPR>EXIT
```

Once you restart NML, you are ready to continue network activity.

### 3.2.3 Restart Procedure for X29SRV

Use the following command sequence to restart the X29SRV program from a [1,2] job terminal:

```
.SYSTAT
.
. (get job number for X29SRV)
.
.ATTACH JOB-NUMBER [1,2]
.HALT
.GET SYS:X29SRV
.CSTART
.DETACH or attach to old job-number
```

X29SRV should be successfully restarted.

### 3.2.4 Restart Procedure for PSITSB

If the background process PSITSB is not running when you run the PSITST program, it displays a message similar to the following before halting:

```
Encountered IPCF Error
PSITST Partner Process Does Not Exist
.
```

This message occurs when PSITST cannot communicate with PSITSB.

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PSITSB must be restarted, and you can restart the program with the following command sequence from a [1,2] job terminal:

```
.SYSTAT
.
. (get job number for PSITSB)
.
.ATTACH JOB-NUMBER [1,2]
.HALT
.GET SYS:PSITSB
.CSTART
.DETACH or attach old job-number
```

PSITSB should be successfully restarted.

### 3.3 CONTROLLING NODE, CIRCUIT, DTE, AND LINE STATE

DECnet-10 does not support the setting of node state using the NCP command:

```
SET NODE nodeid STATE { OFF
                       ON
                       SHUT
                       RESTRICTED }
```

You can, however, control the state of the circuits connected to your node. Using the OFF parameter in the following NCP command, if there is no alternate path, causes the adjacent node to become UNREACHABLE. The circuit is nonoperational for network traffic. Therefore, when you use this command you must consider the position of the node to be set. If the node is a full-routing node, you can disrupt network traffic between several nodes.

```
SET CIRCUIT cktid STATE { OFF
                        ON }
```

You may wish to set a circuit OFF if errors over the circuit become excessive, or if performance over the circuit becomes unacceptable.

For the PSI option, you can control X.25 access with the following command:

```
SET MODULE X25-PROTOCOL STATE { OFF } { DTE dte-address }
                              { ON } { KNOWN DTES }
                              { SHUT }
```

You may wish to turn the DTE off to terminate access to the PPSN.

You can also control lines with the following command:

```
SET LINE lineid STATE { OFF
                      ON }
```

Certain NCP commands require that a line be in the OFF state for execution of the command.

With DECnet-10, you cannot set circuit or line state to SERVICE or CLEARED.



### 3.4 MONITORING NETWORK ACTIVITY

DECnet-10 software continually monitors both static and dynamic characteristics and accumulates statistics for nodes, circuits, and lines. These statistics are available to you in two major ways:

- o with selected NCP commands
- o with the SPEAR program

Considerable data is collected automatically. As a system manager, you are responsible for planning the "how" and "when" of collecting, organizing, and analyzing network data. If you take full advantage of the system's automatic monitoring facilities, the network will run more smoothly. Traffic patterns, hardware, and your site's needs can change in time. Parameters can be changed more efficiently when based on observations of actual statistics and characteristics.

Periodic analysis also helps you prevent problems before they disrupt the network. For example, you can make desirable routing changes by adjusting the COST parameter before performance becomes unacceptable. Before and after comparisons can aid in evaluating the effect of new applications or additions to hardware. Observing traffic peaks may suggest helpful changes in scheduling.

It is suggested that you run the SPEAR program daily (see Section 3.4.2 for details). The interval between the monitoring of other display types depends upon local activity and can only be decided after some experience with your network. Because counters are zeroed when the node where they are located goes down, some data may be lost at that time. How much is lost depends upon when data was last captured. Using command or control files saves time and effort.

As a user with system operator privileges, you are responsible for providing the input according to plan and schedule. This requires a knowledge of the following:

- o the format of the appropriate NCP commands
- o an understanding of display types
- o familiarity with the specific items displayed according to entity, display type, and arguments and keywords used
- o an understanding of the SPEAR program

#### 3.4.1 NCP Commands for Network Monitoring - Local and Remote

You can use NCP commands that display current attributes and statistics to monitor both the local node and remote nodes that have implemented the commands. To obtain output from a remote node, use either of the following procedures:

Procedure 1

```
NCP>SET EXECUTOR NODE MRVAX
```

(Wait for Set Node Complete message)

```
NCP>SHOW EXECUTOR CHARACTERISTICS
```

(Output follows)

Procedure 2

NCP>TELL MRVAX SH EX CHAR

The NCP commands for monitoring the local node and its communications front end are described in Section 7.7.

NOTE

Using the NCP commands in this manual to communicate between DECnet-10 V4.0 nodes and other nodes on the network requires that the other nodes have implemented Network Management Version 3.0 or later.

3.4.2 Using the SPEAR Program for Network Monitoring

All network errors and significant events are written by the system into the file SYS:ERROR.SYS. The SPEAR program can be used to read these entries. You do not need privileges to run SPEAR. However, check any files that SPEAR uses for input or output. If accessing a file requires certain conditions, these should be met before you run the SPEAR program.

When the prompt SPEAR> appears on the terminal, you type the mode of the SPEAR program you wish to run. You will probably find "RETRIEVE" and "SUMMARIZE" modes most useful for monitoring the network. SPEAR next asks for specific information. Each request is followed by a default answer in parentheses. To take the default, you press the RETURN key.

SPEAR allows you to select only network-related events by specifying the "Selection type" as ERROR. You can then select one of the following network-related event types:

NETWORK	all network errors
NI	all NI related entries
COMM	all communication device entries

The output of NETWORK can be restricted to specified event classes, for example:

3	all class 3 events
1,4	all class 1 and 4 events

The output of NI can be restricted with these options:

EBUS  
 MBUS  
 CRAM-PARITY  
 CHANNEL-ERROR

When SPEAR finishes selecting data as you have directed, SPEAR informs you that retrieval is complete. If you select the output default (DSK:RETRIE.RPT for the RETRIEVE mode and DSK:SUMMAR.RPT for SUMMARY mode), you can now type the report on your terminal, or print it.

The SPEAR program creates the appropriate output file (RETRIE.RPT or SUMMAR.RPT). The next time you run SPEAR you overwrite any existing file. Rename the previous file if you wish to save it.

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The runtime for the same SPEAR report can vary from a few minutes to over an hour depending on filesize or system load. Runtime is greatly increased when you allow records to accumulate in the ERROR.SYS file. Runtime is somewhat longer when the system is busy. Use CTRL/T to check both the runtime and the fact that SPEAR is still running during the retrieval interval.

When you have many thousands of records to search, runtime may become excessively long. Copying the ERROR.SYS file to tape every 30, 60, or 90 days may not ensure a satisfactory runtime: fairly minor problems with network or system hardware or software can result in a proliferation of records sent to ERROR.SYS. As system manager, you or a delegated operator should monitor the file to prevent time-consuming SPEAR reports. Both the disk block count of the ERROR.SYS file (use the TOPS-10 DIRECT command) and the record sequence of retrieved entries will help you determine when you should copy the ERROR.SYS file to tape.

You should keep all ERROR.SYS records on disk (current) or tape (historical). (This complete copy is in addition to the regular system backup copy.)

Example:

The following example shows the SPEAR program, which selects a full report of network events in classes 3 and 4 occurring in the past two days:

```
.R SPEAR<RET>
Welcome to SPEAR for TOPS-10, Version 2(1137)
Type "?" for help.
```

```
SPEAR> RETRIEVE<RET>
```

RETRIEVE mode

```
-----
Event or packet file (SYS:ERROR.SYS):<RET>
Selection to be (INCLUDED):<RET>
Selection type (ALL): ERROR<RET>
  Category (ALL): NETWORK<RET>
    Event class and type (ALL):3,4<RET>
  Next category (FINISHED):<RET>
Time from (EARLIEST): -2<RET>
Time to (LATEST): <RET>
Output mode (ASCII):<RET>
  Report format (SHORT): FULL<RET>
Output to (DSK:RETRIE.RPT):<RET>
```

```
Type <cr> to confirm (/GO):<RET>
```

```
INFO - Retrieving selected entries from SYS:ERROR.SYS
```

```
INFO - Retrieval Complete                Total Entries = 100.
```

```
SPEAR> EXIT<RET>
```

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SPEAR allows you to select between two output formats SHORT and FULL. Because runtime depends primarily on search time for user-selected records, the short form saves little time and has certain disadvantages. If you need any of the following information, select the long form:

- o Detail on reason for error, if event was an error  
Example: "Line synchronization lost"  
for "circuit down, circuit fault"
- o Identification of the data link associated with an error  
Example: "Circuit = KDP-0-1" for "circuit  
down" and "circuit up"
- o For a "circuit up" event, the node at the remote end of the  
circuit  
Example: "Circuit = KDP-0-0"  
NODE = Area.number

The short form is useful because of its simpler format for locating specific events. Once found, you can then limit your "selected window" for the full report.

For definitions of DECnet events, see Appendix C.

For help in interpreting the SPEAR output, see the TOPS-10/TOPS-20 SPEAR Reference Manual.

### 3.5 DECNET-10 HOST SERVICES

DECnet-10 can act as host node in performing the following services for unattended systems.

- o Downline loading of an unattended system: transferring a copy of an operating system file image from a TOPS-10 node to a target node.
- o Upline dump of memory from an unattended system: transferring a copy of a memory image from an unattended target node to your TOPS-10 host.
- o Connect to a remote console permitting a TOPS-10 terminal to act as the console for certain unattended systems, such as the DECserver-100.

These operations are described in the following sections.

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### 3.5.1 DOWNLINE LOADING

DECnet-10 allows you to downline load an operating system image. Downline loading is the transferring of a copy of the system image file of a remote node's operating system from a TOPS-10 node to an unattended target node. For example, DECnet-10 lets you load an MCB image file from you DECnet-10 host node downline to a DN20 remote node. Downline loading can be initiated by a DECnet-10 operator or by the remote node.

Following is a description of the nodes involved in the loading sequence. In the node descriptions, the command node and the executor node can be the same or different nodes, but cannot be the target node. See Figure 3-2.

- o **Command Node.** An operator-initiated downline load request originates at the command node. You can use either the NCP LOAD or TRIGGER command to initiate this request.
- o **Executor Node.** The executor node actually performs a downline load or trigger operation. It must be adjacent to the target node because the downline load uses circuit-level access.
- o **Target Node.** The target node is the node that receives the bootstrap loaders and the system image file.

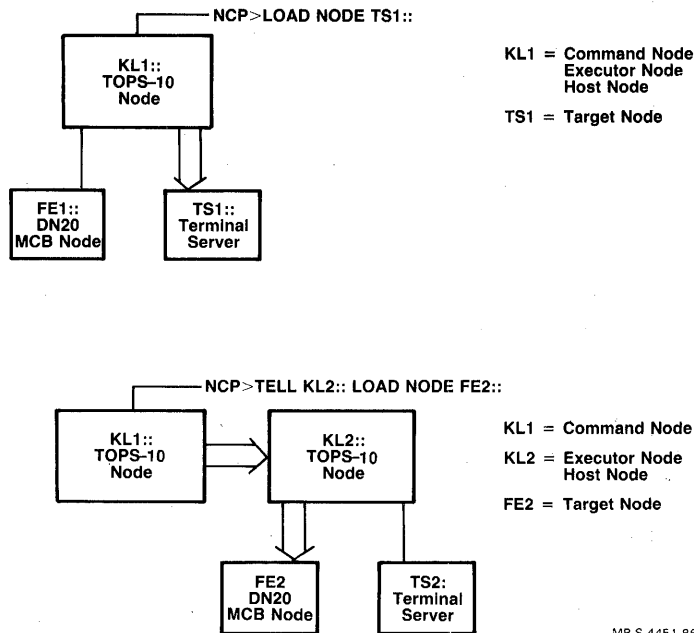


Figure 3-2: Types of Nodes by Network Function

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Downline loading is initiated in one of two ways:

- o Target-initiated. The target node initiates the operation by triggering its bootstrap ROM and sending a program load request to the executor node.
- o Operator-initiated. An operator on the executor node initiates the operation with the NCP LOAD or TRIGGER command.

**3.5.1.1 Target-initiated Downline Loading** - If the load is target-initiated and the circuit is a non-Ethernet circuit, the Routing layer process detects Low Level Maintenance Operation Protocol (LLMOP) messages coming over the circuit and calls the Data Link Watcher (DLW).

If the target on an Ethernet circuit does not have a specific host node from which to request a program load (for example, if the target's host node crashes, or if the load is initiated by means of the BOOT button on the target), the target proceeds as follows:

1. The target node sends a program load request message to the Ethernet load assistance multicast address AB-00-00-01-00-00. This message is a request for any node on that Ethernet to perform the load.
2. The nodes on the Ethernet whose Ethernet circuits are enabled for service operations check their own node databases for a remote node entry whose Ethernet hardware address matches that of the target node. This determines if they can downline load the target. If so, they send to the target the secondary loader (if the target is requesting the secondary loader), or a message volunteering to do the load (if the target is requesting the tertiary loader or operating system).
3. The target chooses the node responding first to continue the loading sequence. It does not send a message to any other node. The loading sequence continues normally from there.

**3.5.1.2 Operator-initiated Downline Loading** - An operator-initiated load uses NCP directly to perform the load operation. The target node's primary bootstrap may or may not have to be triggered depending on the state of the target. The target node is triggered primarily to put it into a known state and to force it to supply program request information.

Use the NCP LOAD or TRIGGER command to perform an operator-initiated downline load. The TRIGGER command allows you to directly trigger the remote node's bootstrap ROM (if the device supports this), which causes the target node to load itself in whatever manner the primary loader is programmed to operate. The programs to be loaded may come from a disk file local to the target node, another adjacent node, or the executor node.

Note that the TRIGGER command may or may not initiate a downline load. One of the functions of this command is to simulate the operation that occurs when the BOOT button on the target node is pushed. A bootstrap operation from a local disk may result.

When you use the LOAD command, the executor node proceeds with the load operation according to the options specified in the initial load request. Any required information that has been defaulted is obtained from the host node's volatile database. With this information, the executor is thereby able to control the load sequence.

Chapter 7 describes the TRIGGER and LOAD commands.

### 3.5.2 LOAD Sequence

The first program to run at the target node is the primary loader. Typically, this program is either executed directly from the target node's bootstrap ROM, or it is in the microcode of the load device (DMC, DMR, DMP, DMV, NI). Once the target node's primary loader is triggered, the target node sends a REQUEST PROGRAM LOAD message to the executor node requesting a program load. Usually, the primary loader requests a secondary loader program, which, in turn, may request a tertiary loader. The final program to be loaded is the operating software. In this sequence, each program requests the next one until the operating software is loaded.

The secondary loader is small (400-600 bytes) and is always sent as a single MEMORY LOAD WITH TRANSFER message. The secondary loader is always loaded into the lower 36K words of memory and operates without memory management. The secondary loader requests the tertiary loader, which is sent in multiple MEMORY LOAD messages followed by a MEMORY LOAD WITH TRANSFER ADDRESS message.

The tertiary loader is much larger (1-3K bytes) and uses memory management to relocate itself to the top of memory before requesting the operating system. For this reason any operating system to be loaded must not use the top 3K bytes of memory or the tertiary loader would be forced to overwrite itself and the load would not be successful. The operating system is sent in multiple MEMORY LOAD messages followed by a PARAMETER LOAD WITH TRANSFER ADDRESS message, which supplies the start address of the image just loaded and contains extra values for the node identification and the host identification.

### 3.5.3 Downline Load Requirements

Before attempting a downline load operation, you must ensure that the nodes, lines, and circuits involved in the downline load meet the following requirements:

- o The target node must be connected directly to the executor node. This is necessary because the executor node uses circuit-level access to load the target system; no routing information is used.
- o The proper bootstrap must be present at the target node. This bootstrap must be capable of recognizing TRIGGER messages if the node is to be operator-initiated downline loaded or, be able to send program requests if the load is target-initiated.
- o The physical hardware devices must be set up correctly to support the load.
- o The executor node must have access to the load files. The location of the files can either be specified in the load request or defaulted by the remote node database.

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**3.5.3.1 Downline Load Bootstraps** - The downline load sequence is started by a primary loader. This primary loader is contained in the target node's bootstrap ROM or in the microcode of the target node's load device. In either case, you must ensure that you have the proper ROM support for the downline load to be initiated. Following is a list of the types of bootstrap supported by each device:

- o Power-on boot. This device can be used when the bootstrap will be invoked by a power-on condition.
- o Remote trigger detect boot. This device can be used for operator-initiated downline loads because it responds to the TRIGGER message.
- o Console boot. When a power-on boot cannot be used, the target's console can be used to start the downline load sequence. If this is the only type of boot supported, the target system cannot operate entirely unattended.

**3.5.3.2 Setting Up the Downline Load Devices** - If the sequence is to function correctly, the devices involved in the downline load operation must be configured properly. In all cases the host node device is set up in a normal manner (see the Operations Manual for the device being used).

Whenever possible you should conduct a loopback test to verify the operation of the Ethernet target's (and the host's) downline load device before trying the downline load.

**3.5.3.3 Set Up the Host Circuit** - The host circuit must be in the ON or SERVICE state; an Ethernet circuit must be in the ON state. For example, the following command readies circuit DMC-0 for downline loading an adjacent node:

```
NCP>SET CIRCUIT DMC-0 SERVICE ENABLED
NCP>SET CIRCUIT DMC-0 STATE ON
```

**3.5.3.4 Establish Default Information** - The most convenient method of downline loading is to set up default information in the volatile database. You can use the SET NODE command to establish default information for the target node in the volatile database. For example,

```
NCP>SET NODE 1.124 NAME KL2001
```

**3.5.3.5 Trigger the Bootstrap Mechanism** - Use the NCP TRIGGER NODE or TRIGGER VIA command to trigger the bootstrap mechanism of a target node, which causes the node to request a downline load. Because the system that is being booted is not necessarily a fully functional network node, the operation must be performed over a specified circuit. For example,

```
NCP>TRIGGER NODE JUPITE VIA DMC-0
```



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### NOTE

If you use the TRIGGER NODE command and do not specify a loading circuit, the executor node obtains the circuit identification associated with the target node from its volatile database.

If you use the TRIGGER VIA command, which indicates the loading circuit but not the node identification, the executor node uses the default target node identification in its remote database.

**3.5.3.6 Overriding Default Parameters** - If you choose to override the default parameters that were set up in the remote node's database using NCP SET NODE command, you can change the following aspects of the TRIGGER sequence. (See Chapter 7 for a detailed description of the following parameters.)

- o The physical address of the target node:

PHYSICAL ADDRESS ethernet-address

- o The service password needed to trigger the target's load device:

SERVICE PASSWORD password

- o (For TRIGGER NODE only) The service circuit used for the downline load:

VIA circuit-id

Once the target node is triggered, it will then load itself in whatever manner its primary loader is programmed to operate. The target node could request a downline load from either the executor node that just triggered it or another adjacent node, or the target node could load itself from its own mass storage device.

**3.5.3.7 Load the Target Node** - Use the NCP LOAD NODE or LOAD VIA commands to load the software downline to a target node. The LOAD NODE command requires the identification of the service circuit over which to perform the load operation. If you do not explicitly specify a service circuit in this command, the executor node uses the SERVICE CIRCUIT from the remote node database entry for the target node. Use the SET NODE command to enter the SERVICE CIRCUIT in the database.

Alternatively, you can use the LOAD VIA command to specify the circuit over which to perform the downline load. For example, to load using circuit DMC-0 connected to the executor node, issue the command:

```
NCP>LOAD VIA DMC-0
```

**3.5.3.8 Procedure if the LOAD Fails** - If the load fails, enter NCP and define default parameters for downline loading. Each target system to be loaded has a separate set of defaults. Use the SET NODE command to set up the database. To remove node parameters from the database, use the CLEAR NODE command.

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### NOTE

Some parameters have a different keyword associated with them depending on whether the parameter is being specified in the SET NODE command or in one of the LOAD or TRIGGER commands.

The downline load parameters that you can define for each target in the database include:

- o A service circuit parameter for the executor node:

SERVICE CIRCUIT circuit-id

- o Parameters that pertain to the target node:

NODE node-id  
NAME node-name  
SERVICE NODE VERSION phase  
SERVICE DEVICE device-type  
SERVICE PASSWORD password  
HARDWARE ADDRESS eth-address (Ethernet nodes only)  
HOST node-id

- o Parameters that specify load files:

CONSOLE LOAD FILE file  
CONSOLE SECONDARY LOADER file  
LOAD FILE file  
SECONDARY LOADER file  
TERTIARY LOADER file  
DIAGNOSTIC FILE file (Ethernet Communications Server Only)

All these parameters are described in Chapter 7.

### NOTE

For a downline load request to be successful, you must specify at least the SERVICE CIRCUIT, NODE, NAME, and LOAD FILE parameters either in the LOAD command or by previously defined defaults. For Ethernet nodes, the HARDWARE or PHYSICAL ADDRESS must also be specified.

When the appropriate values have been defined for the parameters listed above, you can re-enter the LOAD command, for example:

```
NCP>LOAD NODE LAT100
```

**3.5.3.9 Host Identification** - At the end of the load sequence, the target receives a message with the name of the host and places that name in its volatile database. The target can then use the HOST node-id for downline task loading applications. The host may be the executor node or any other reachable node except for the target itself. Use the SET NODE command to specify a default host node where the target will find the files used to load tasks downline. For example, the command below sets node BANGOR's host to node NYC:

```
NCP>SET NODE BANGOR HOST NYC
```

You can override any default information by using the HOST parameter for the LOAD command.

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**3.5.3.10 Load File Identification** - The load files are those files to be loaded downline to the target node. These files may consist of a secondary loader, a tertiary loader, and an operating system image. If the node is a communications server with an operator console, the files may also consist of a console loader and a console secondary loader. You can specify default load file names in the volatile database with the SET NODE command. Load files default to SYS:nodename.SYS. DECnet-10 does not support remote files for downline loading or dumping.

The following sequence of NCP commands loads the target node AURORA over a DTE circuit:

```
NCP>SET EXECUTOR NODE BOSTON
NCP>SET CIRCUIT DTE-0-1 STATE ON
NCP>LOAD NODE AURORA FROM SYS:AURORA.SYS
```

If the secondary and tertiary file names are not included in the LOAD command or as entries in the volatile database for the target node, the load will not occur.

The default secondary and tertiary loader files for DECnet-10 are the following:

Device Type	Secondary Loader	Tertiary Loader
DTE	DTEMPS.SYS	DTEMPT.SYS
QNA	SECQNA.SYS	TERQNA.SYS
UNA	SECUNA.SYS	TERUNA.SYS

If you include the secondary and tertiary file names as entries in the volatile database for the target node, they can override the default loader files described above. By using the SET NODE command, you can select your own special load files for a particular target node. If you do not specify the load files, you can change the service device type at the target node without changing the target node's database entry at the executor node.

The system image file entry in the host node's volatile database serves as the default file name for the operating system to be downline loaded. This file name is required when the target node is to be loaded, but it can be supplied by the LOAD command.

**3.5.3.11 Software Type** - Along with identifying load files, you can specify the file types to be used for the initial load. For example, if the target node is already running a secondary loader program, you may only want to load the tertiary loader and operating system downline. To do this, you use the SOFTWARE TYPE parameter with the LOAD command. For example, to load the tertiary loader file, which in turn would load the operating system image, use the following command:

```
NCP>LOAD NODE BANGOR SOFTWARE TYPE TERTIARY-LOADER
```

Use the SET NODE command to specify default software type information for the target node entry in the volatile database. If no software type information is specified in the volatile database, the default type is the secondary loader.

3.5.3.12 CPU and Software Identification - The software identification is the default program name of the operating system to be loaded downline. Use the SOFTWARE IDENTIFICATION parameter to specify a software-id of up to 16 alphanumeric characters. For example, the following command specifies the default operating system to be loaded downline:

```
NCP>SET NODE BANGOR SOFTWARE IDENTIFICATION SYS:RSX11S.SYS
```

3.5.3.13 Service Device Identification - The service device is the controller on the target node end of a service circuit. The service device handles downline loading in a variety of ways, depending on the device used. In particular, this device influences the type of files suitable for downline loading. Default load file names are selected according to the service device for the target node.

The SERVICE DEVICE parameter identifies the default secondary and tertiary loaders for the load operation. This parameter is required for any downline load if the secondary and tertiary load files are not specified in the volatile database of the target node. SERVICE DEVICE is also required if the program load requests from the target node do not specify the secondary and tertiary load file names. Use the SET NODE command to specify the service device type in the volatile database. For example, the command below identifies the service device as an NI device controller.

```
NCP>SET NODE BANGOR SERVICE DEVICE UNA-0
```

By using the SERVICE DEVICE parameter for the LOAD command, you can override the default service information.

3.5.3.14 Service Circuit Identification - In terms of the executor, the service circuit is a circuit connecting the executor node with an adjacent target node. When you issue the LOAD and TRIGGER commands, you must specify or default to a circuit over which the load operation is to take place. Use the VIA parameter to explicitly identify the circuit when issuing those commands. If specifying an Ethernet circuit in the LOAD VIA command, you must include the PHYSICAL ADDRESS parameter in the command.

If you do not specify a circuit, this information defaults to the circuit specified in the target node's volatile database. To set a service circuit in the volatile database, use the SET NODE command.

3.5.3.15 Service Passwords - When defining nodes for downline loading in the local volatile database, the system manager can specify a default service password. This password may be required to trigger the primary bootstrap mechanism on the target node. If a user issues a LOAD or TRIGGER command without a service password, then this default parameter will be used if the target node requires one. To set a service password in the volatile database, use the SET NODE command. This password must be a hexadecimal number in the range 0 to FFFFFFFFFFFFFFFF.

For example, to load node BANGOR use the following commands:

```
NCP>SET NODE BANGOR SERVICE PASSWORD FEFEFEFE
NCP>LOAD NODE BANGOR
```

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3.5.3.16 Diagnostic File - Once the target node is loaded downline, it can request diagnostics. Use the DIAGNOSTIC FILE parameter in the SET NODE command to identify (in the volatile database) the diagnostics file that the target node can read.

### 3.5.4 Downline Loading a Communications Server

The following example show the procedure for downline loading a terminal server called LAT4 over the Ethernet.

```
NCP>CLEAR NODE 13.204 NAME
NCP>CLEAR NODE 13.204 ALL
NCP>SET NODE 13.204 NAME LAT4
NCP>SET NODE LAT4 SERVICE CIRCUIT ETH-0
NCP>SET NODE LAT4 SECONDARY LOADER SYS:PLUT02.SYS
NCP>SET NODE LAT4 TERTIARY LOADER SYS:PLUT03.SYS
NCP>SET NODE LAT4 LOAD FILE SYS:PLATOT.SYS
NCP>SET NODE LAT4 DUMP FILE XPN:LAT4.DMP
NCP>SET NODE LAT4 SERVICE PASSWORD 0
NCP>SET NODE LAT4 HARDWARE ADDRESS AA0003012F99
NCP>SET NODE LAT4 HOST ETHER
NCP>SET CIRCUIT ETH-0 SERVICE ENABLED
NCP>LOAD NODE LAT4
```

### 3.5.5 Downline Loading the DN20

A manual load of the DN20 may be indicated in the following circumstances:

- o The DN20 was not powered up when the KL10 was loaded
- o The DN20 became "UNREACHABLE" after being loaded and must be reloaded

If one of the above conditions exists, TOPS-10 should execute an automatic reload of the system. If the automatic reload does not occur, try to load by using the appropriate command file (see Section 3.1.3) or by typing the necessary NCP commands on your terminal (see Section 3.1.2).

The following example shows the procedure for downline loading a DN20 communications front end:

```
NCP>SET NODE D2102A CPU PDP-11
NCP>SET NODE D2102A SERVICE CIRCUIT DTE-0-1
NCP>SET NODE D2102A SERVICE NODE VERSION 0
NCP>SET NODE D2102A SECONDARY LOADER SYS:DTEMPS.SYS
NCP>SET NODE D2102A TERTIARY LOADER SYS:DTEMPT.SYS
NCP>SET NODE D2102A LOAD FILE SYS:D2102A.SYS
NCP>SET NODE D2102A DUMP FILE XPN:D2102A.DMP
NCP>SET NODE D2102A SECONDARY DUMPER SYS:DTEDMP.SYS
NCP>SET NODE D2102A HOST KL2102
NCP>SET CIRCUIT DTE-0-1 STATE ON
NCP>SET CIRCUIT DTE-0-1 SERVICE ENABLED
```

Note that since the DN20 is a Phase III node, this procedure includes the command:

```
SET NODE 2102A SERVICE NODE VERSION 0
```

which identifies the target as a Phase III node.

### 3.5.6 UPLINE DUMPING

You can include certain SET NODE parameters in the volatile database that allow an adjacent unattended node to dump its memory into a file on your TOPS-10 system. This procedure is called upline dumping, and it is a valuable tool for crash analysis. Programmers can analyze the dump file and determine why the unattended system failed. When an unattended system detects an impending system failure, that system requests an upline dump; for example, the DN20 may request an upline memory dump to the KL10 system.

For upline dump operations, the local KL10 node is referred to as the executor and the adjacent unattended node as the subordinate. A subordinate can be a DN20 or an Ethernet Communications Server.

**3.5.6.1 Upline Dump Procedures** - This section describes the procedures for an upline dump initiated by a subordinate node. DECnet uses the maintenance operation protocol (MOP) to perform an upline dump operation. MOP is a subset of the DIGITAL Data Communications Message Protocol (DDCMP), which sends messages used for circuit testing, triggering, downline loading, and upline dumping. See the Maintenance Operation Protocol Functional Specification for a more complete discussion.

There are four steps involved in the upline dump process. The actual dump takes place by repeating step 3.

1. When a subordinate node senses a system failure, it sends a memory dump request to the KL10 host node. On the Ethernet, it sends requests to a dump assistance multicast address if an Ethernet host is not available. The request is a MOP request dump service message. This message might contain information about the subordinate's memory size (DUMP COUNT) and the upline dump device type at the subordinate.
2. If the message from the subordinate includes a DUMP COUNT value, the host node uses it. Otherwise, the host node checks the subordinate node's entry in its volatile database for the DUMP COUNT, the target address from which to start dumping (DUMP ADDRESS) and the file where the memory will be stored for the subordinate. (If no entry exists for DUMP ADDRESS, the value defaults to 0. If no entry exists for DUMP FILE, the file defaults to XPN:node-name.DMP.) The host node, which can now be considered the executor, sends a MOP request memory dump message to the subordinate with the starting address and the buffer size values.
3. Using the values it received from the executor, the subordinate returns the requested block of memory in a MOP memory dump data message. The executor receives the block of dump data, places it in the DUMP FILE, increments the DUMP ADDRESS by the number of locations sent, and sends another request memory dump message to the subordinate. This sequence is repeated until the amount of memory dumped matches the DUMP COUNT value. The executor then sends a MOP Dump Complete message to the target.
4. Once the upline dump is completed, the executor node automatically attempts to downline load the subordinate system. It initiates the downline load by sending a TRIGGER message to the subordinate.

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If the target node is on an Ethernet circuit, the target will attempt to perform an upline dump to the node that originally loaded it downline. If that node is not available, the target node proceeds as follows:

1. The target node sends a memory dump request to the Ethernet dump assistance multicast address AB-00-00-01-00-00. This message is a request for any node on the Ethernet to receive an upline memory dump.
2. The nodes on the Ethernet whose circuits are enabled to perform service functions check their own databases to determine if they can accept an upline dump. If so, they respond to the target node. The target chooses the node responding first to continue the dumping sequence. The target does not send a message to any other node. The loading sequence continues normally from there. Note, however, that you may have to look for event 0.3 in the event logs for all nodes on the Ethernet to determine which node received the dump.

**3.5.6.2 Upline Dump Requirements** - Prior to attempting an upline dump operation, you must ensure that the nodes, lines, and circuits meet the following requirements:

1. The subordinate node must be directly connected to the executor node by a physical line. The executor node provides the line- and circuit-level access.
2. The subordinate node must be capable of requesting the upline dump when it detects a system failure. If the dumping program does not exist on the subordinate, upline dumping cannot occur.
3. The circuit involved in the dump operation must be enabled to perform service functions. It must also be in the ON state. For example, the following command readies circuit ETH-0 for upline dumping:

```
NCP>SET CIRCUIT ETH-0 SERVICE ENABLED
NCP>SET CIRCUIT ETH-0 STATE ON
```

4. If the subordinate does not supply the DUMP FILE name; the executor must have this entry in its volatile database.

**3.5.6.3 Manual Upline Dump of the DN20 MCB** - This section applies only to a MCB node adjacent to the KL10 host node. If the DN20 crashes, Network Management software in the KL10 node senses that communication has been lost. Using dump-related parameter values for the DN20, the KL10 initiates a dump of the entire contents of the DN20's memory. This is automatic and normally occurs whenever communication between the TOPS-10 and the DN20 is lost. A reload normally follows the dump.

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If it appears that the automatic dump/reload is not going to occur (you do not get a load node complete message), type an NCP SHOW QUEUE command. If there is no response to SHOW QUEUE, wait 30 seconds. (NCP cannot respond if it is in the process of dumping or loading.) Because the system load has a significant effect on execution time, you must judge wait-time by experience.

If the DN20 is still not online, use the following command with the TOPS-10 KL as executor:

```
NCP>SET CIRCUIT DTE-x-y SERVICE ENABLED
```

where DTE-x-y identifies the SERVICE CIRCUIT over which the dump and load is to occur.

You should eventually receive the load node complete message. If you don't receive the message, follow the procedures in Section 3.2.2 (Restart Procedure for NML).

### 3.5.7 Connecting to a Remote Console

DECnet-10 allows you to set up a logical connection between your TOPS-10 node and the console interface on certain unattended nodes, in effect permitting your terminal to act as the console for the remote system. For example, your terminal can act as the console for the DIGITAL Ethernet Communications Server (DECSA) hardware and its resident software, such as the DECnet Router software and the DECserver-100 Terminal Server.

You can set up the logical connection to the console using the RMTCON facility. Both your host node and the target node (that is, the server node) must be on the same Ethernet.

For more information on using RMTCON, type HELP at the RMTCON> prompt.

## 3.6 TESTING THE NETWORK

In addition to using the SPEAR program, you can use loopback testing and CHK11 output as diagnostic tools to help determine whether the network is operating properly. These tests let you exercise network software and hardware by sending data through various network components and then returning that data to its source. After you have started DECnet-10, you may want to run some of these tests. CHK11 output goes to SYS:ERROR.SYS.

### 3.6.1 Using Loopback Tests

DECnet-10 supports the NCP commands LOOP NODE and LOOP CIRCUIT. The LOOP LINE command is supported in the MCB for DECnet-10 PSI (LAPB lines only).

LOOP NODE exercises all DECnet layers in the DN20 and in the remote node when the loop is executed from a local node to remote node. Normal network activity continues with the appropriate protocols and with the normal updating of counters at each level. The LOOP CIRCUIT command, however, does not exercise all levels. It uses the MOP Protocol, and does not result in the incrementing of counters.



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You can use the LOOP NODE command to loop messages at a running remote node, at the device controller, or at a turnaround connector (loopback connector) on a physical line. The following examples demonstrate these three uses. The first example is best executed first: if it succeeds there is no need to test further.

The LOOP NODE procedure that loops at a remote node requires that the remote node is running Network Management V3.0 or later.

Example 1:

LOOP NODE - Local to Remote

```
.R OPR<RET>
OPR>ENTER NCP<RET>
NCP>SHOW NODE D1037A<RET>
NCP>
10:27:04   NCP
Request # 263; Show Node Summary Completed

Node           State      Active  Delay  Circuit  Next Node
              Links
123 (D1037A)  Reachable  0       1     DTE-0-1
NCP>LOOP NODE D1037A COUNT 10 LENGTH 20<RET>
NCP>
10:27:46   NCP
Request # 264 Accepted
10:27:53   NCP
Request # 264; Loop Node Completed
NCP>EXIT<RET>
```

Example 2:

LOOP NODE - Using Device Controllers DMR and KDP (MCB only)

In this example, a circuit is established over which the messages will travel, a loop name is established, and the controller is set to loopback mode. This example is for the MCB only.

For DMR: (system output not shown)

```
NCP>SET EXECUTOR NODE D1036A USER OPERATOR PASSWORD SECRET
NCP>SET CIRCUIT DMR-0 STATE OFF
NCP>SET LINE DMR-0 STATE OFF
NCP>SET NODE FOO:: CIRCUIT DMR-0
NCP>SET LINE DMR-0 CONTROLLER LOOPBACK
NCP>SHOW LINE DMR-0 CHARACTERISTICS
NCP>SHOW CIRCUIT DMR-0 STATUS
NCP>SET LINE DMR-0 STATE ON
NCP>SET CIRCUIT DMR-0 STATE ON
NCP>LOOP NODE FOO:: COUNT 10 LENGTH 20
NCP>
```

```
*** This controller-loopback test is completed. ***
*** Procedure for restoring normal network ***
*** conditions follow. ***
```

```
NCP>SET CIRCUIT DMR-0 STATE OFF
NCP>SET LINE DMR-0 STATE OFF
NCP>SET LINE DMR-0 CONTROLLER NORMAL
NCP>CLEAR NODE FOO:: CIRCUIT
NCP>SET LINE DMR-0 STATE ON
NCP>SET CIRCUIT DMR-0 STATE ON
NCP>SHOW LINE DMR-0 CHARACTERISTICS
```

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```
NCP>SHOW LINE DMR-0 STATUS
NCP>SHOW CIRCUIT DMR-0 STATUS
NCP>CLEAR EXECUTOR NODE
```

For KDP (MCB only):

This test differs from the test using the DMR in just one respect. For the KDP controller loopback, you must set the CLOCK to INTERNAL. This test is for the MCB only. (System output not shown)

```
NCP>SET EXECUTOR NODE D1036A USER OPERATOR PASS SECRET
NCP>SET CIRCUIT KDP-0-0 STATE OFF
NCP>SET LINE KDP-0-0 STATE OFF
NCP>SET LINE KDP-0-0 CONTROLLER LOOPBACK
NCP>SET LINE KDP-0-0 CLOCK INTERNAL
NCP>SET NODE FOO:: CIRCUIT KDP-0-0
NCP>SHOW LINE KDP-0-0 CHARAC
NCP>SET LINE KDP-0-0 STATE ON
NCP>SET CIRCUIT KDP-0-0 STATE ON
NCP>LOOP NODE FOO:: COUNT 10 LENGTH 20
```

```
*** This controller-loopback test is completed. ***
*** Procedure for restoring normal network ***
*** conditions follow. ***
```

```
NCP>SET LINE KDP-0-0 STATE OFF
NCP>SET CIRCUIT KDP-0-0 STATE OFF
NCP>CLEAR NODE FOO:: CIRCUIT
NCP>SET LIN KDP-0-0 CONTROLLER NORMAL
NCP>SET LINE KDP-0-0 CLOCK EXTERNAL
NCP>SET LINE KDP-0-0 STATE ON
NCP>SHO LIN KDP-0-0 CHARAC
NCP>SET CIRCUIT KDP-0-0 STATE ON
NCP>CLEAR EXECUTOR NODE
```

Example 3:

LOOP NODE - Loopback Connector on Cable

This procedure is similar, but not identical, to controller loopback. The LOOP NODE command is used again to do the testing. Messages are looped back at a manually installed (and later removed) loopback connector. Thus, the controller is not placed in loopback mode.

For DMR: (system output not shown)

```
NCP>SET EXECUTOR NODE D1036A PASS SECRET USER OPERATOR
NCP>SET CIRCUIT DMR-0 STATE OFF
```

```
*** Install loopback connector ***
```

```
NCP>SET NODE FOO:: CIRCUIT DMR-0
NCP>SET CIRCUIT DMR-0 STATE ON
NCP>LOOP NODE FOO:: COUNT 10 LENGTH 20
NCP>CLEAR NODE FOO:: CIRCUIT
NCP>SET CIRCUIT DMR-0 STATE OFF
```

```
*** Remove loopback connector ***
*** Restore network connection ***
```

```
NCP>SET CIRCUIT DMR-0 STATE OFF
NCP>CLEAR EXECUTOR NODE
```

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For KDP (MCB only):

This procedure is similar to that for the DMR with a loopback connector. However, the KDP test requires that you set the line parameter CLOCK to INTERNAL. Hence, you turn both line and circuit OFF before and ON after making parameter changes SET LINE and SET NODE. This procedure is for the MCB only. (System output not shown)

```
NCP>SET EXECUTOR NODE D1036A PASS SECRET USER OPERATOR
NCP>SET CIRCUIT KDP-0-0 STATE OFF
NCP>SET LINE KDP-0-0 STATE OFF
NCP>SET LIN KDP-0-0 CLOCK INTERNAL
```

\*\*\* Install loopback connector \*\*\*

```
NCP>SET NODE FOO:: CIRCUIT KDP-0-0
NCP>SET LIN KDP-0-0 STATE ON
NCP>SET CIRCUIT KDP-0-0 STATE ON
NCP>LOOP NODE FOO:: COUNT 10 LENGTH 20
NCP>SET LIN KDP-0-0 STATE OFF
NCP>SET CIRCUIT KDP-0-0 STATE OFF
```

\*\*\* Remove loopback connector \*\*\*  
 \*\*\* Restore network connection \*\*\*

```
NCP>CLEAR NODE FOO:: CIRCUIT
NCP>SET LIN KDP-0-0 CLOCK EXTERNAL
NCP>SET LIN KDP-0-0 STATE ON
NCP>SET CIRCUIT KDP-0-0 STATE ON
NCP>CLEAR EXECUTOR NODE
```

You can also use the LOOP CIRCUIT command from your local node to an adjacent remote node, using controller loopback, and with a loopback connector. The procedure would follow the appropriate node loopback procedure except that the loopback node, FOO, would not be set. (The node loopback procedure is recommended.)

Example 4:

LOOP LINE - Loopback Connector on Cable (PSI option only)

This procedure is for the KDP only. (System output not shown)

```
NCP>SET EXECUTOR NODE MRX25
NCP>SET LINE KDP-0-0 STATE OFF
```

\*\*\* Install loopback connector \*\*\*

```
NCP>SET LINE KDP-0-0 CLOCK INTERNAL
NCP>SET LINE KDP-0-0 SERVICE ENABLED
NCP>SET LINE KDP-0-0 STATE ON
NCP>LOOP LINE KDP-0-0 COUNT 120 WITH MIXED LENGTH 10
```

\*\*\* This controller-loopback test is completed. \*\*\*  
 \*\*\* Procedure for restoring normal network \*\*\*  
 \*\*\* conditions follow. \*\*\*

```
NCP>SET LINE KDP-0-0 STATE OFF
```

\*\*\* Remove the loopback connector. \*\*\*  
 \*\*\* Restore connection to PPSN modem \*\*\*

```
NCP>SET LINE KDP-0-0 CLOCK EXTERNAL
NCP>SET LINE KDP-0-0 SERVICE DISABLED
NCP>SET LINE KDP-0-0 STATE ON
```

### 3.6.2 Circuit Level Loopback Testing

In DECnet-10, circuit-level loopback testing is supported only for Ethernet circuits. The Network Management layer accesses the Data Link layer directly, thus bypassing intermediate DECnet layers. One advantage of the Ethernet loopback test is that it can be performed concurrently with other DECnet operations on the circuit.

DECnet-10 supports two types of looping on the Ethernet. You can loop to the multicast address, or to a specific remote node.

**3.6.2.1 Looping to a Multicast Address** - To test the NIA20 hardware use the LOOP CIRCUIT command. All DECnet nodes on the Ethernet should respond to the loop request. The loop test is successful if at least one other system responds, indicating that the executor node's NIA20 is capable of communicating with other Ethernet nodes.

To be tested, an Ethernet circuit must be in the ON state and the SERVICE parameter must be set to ENABLED. Note that, by default, the SERVICE parameter is set to DISABLED for Ethernet circuits. For example:

```
NCP>SET CIRCUIT ETH-0 STATE ON
NCP>SET CIRCUIT ETH-0 SERVICE ENABLED
```

To initiate a looping test to a multicast address, use the LOOP CIRCUIT command. For example:

```
NCP>LOOP CIRCUIT ETH-0
```

Use parameters with the LOOP CIRCUIT command to control the type of test information and the number and size of blocks sent during testing. Use the COUNT and LENGTH parameters to specify the number of blocks and the length of each block (in bytes).

```
NCP>LOOP CIRCUIT ETH-0 COUNT 10 LENGTH 300
```

Use the WITH parameter to specify the type of binary information sent during loopback testing. You can specify three types of binary information:

```
ONES      All binary ones
ZEROES    All binary zeros
MIXED     A random combination of ones and zeros
```

For example, the following command sends 10 blocks 300 bytes long, each containing all binary ones, over the circuit:

```
NCP>LOOP CIRCUIT ETH-0 COUNT 10 LENGTH 300 WITH ONES
```

**3.6.2.2 Looping to a Remote Node** - Use the LOOP CIRCUIT NODE command to test a logical link path over a circuit between the local node and a remote node. You can specify the node's physical address or node name in the LOOP CIRCUIT command. For example:

```
NCP>LOOP CIRCUIT ETH-0 PHYSICAL ADDRESS AA-00-BB-11-CC-22
or
NCP>LOOP CIRCUIT ETH-0 NODE TOSCA
```

You can also specify the COUNT, LENGTH, and WITH parameters.

### 3.6.3 Remote Loopback Tests Using a Loop Node Name

In DECnet-10, these tests can be used for DTE and Ethernet circuits.

Use the LOOP NODE command with a loop node name to test both local and remote Routing layer software operation. For example:

```
NCP>SET NODE TESTER CIRCUIT ETH-0
NCP>LOOP NODE TESTER
```

Note that you cannot assign two loop node names to the same circuit. For example, once you establish TESTER as the loop node name for circuit ETH-0, you must issue a CLEAR NODE TESTER CIRCUIT command before assigning another loop node name to ETH-0.

When a logical link connection request is made to the loop node name, all subsequent logical link traffic is directed over the associated circuit. The destination of the traffic is whatever node address is associated with the loop node name. The loop node name is necessary because, under normal operation, DECnet Routing software selects which path to use when routing information. The loop node name overrides the routing function so that information can be routed over a specific circuit. To remove the association of the loop node name with a circuit, use the CLEAR NODE CIRCUIT or CLEAR NODE ALL command, as in the following command:

```
NCP>CLEAR NODE TESTER CIRCUIT
```

A loop node name specified with the SET NODE CIRCUIT command may be used for any network traffic (for example, COPY requests or application program traffic). The loopback node name appears as a valid node name in the network for all purposes.

### 3.6.4 Manual Procedure for Observing CHK11 Output

You can use the following commands to observe CHK11 output:

```
.R DTELDR
*/TALK:nn
```

where:

nn is the two digits associated with DTE identification. For example, for DTE-0-1, type "01" for "nn".

You must run CHK11 before NML does a dump or load of the MCB, with this procedure the CHK11 output is not output to SYS:ERROR.SYS.

You can also use SPEAR to examine SYS:ERROR.SYS after CHK11 has been recorded by Network Management.

## 3.7 NODE IDENTIFICATION

When configuring the network, you must identify, in the executor configuration database, the local node and all network nodes with which the local node expects to communicate. Identifying all nodes by name as well as address permits you to reach any node by its name. This section describes node identification and NCP parameters relevant to identifying nodes.

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Either the node address or the node name can serve as a node identifier (node-id) in NCP commands; in all other network applications only the node name may be used. The node address is a decimal number assigned to the node in the configuration database. The address must be unique within the network. The node address may include, as a prefix, the area number, an integer indicating the area in which the node is grouped. In the node address, the area number and node number are separated by a period, in the following format:

area-number.node-number

For example, if node 3 is in area 7, its node address is 7.3. The area number must be unique within the network and the node number must be unique within the area. If you do not specify an area number, the area number of the executor node is used. The default area number for the executor is the number of your local area. In multiple-area networks, it is recommended that you always specify the area number.

A node name is a unique alphanumeric string that contains up to six characters including at least one alphabetic character. It must start with an alphabetic character.

Before a remote node can be accessed by name, you must specify the node name to be associated with a node address. Use the SET NODE command to specify node names and node addresses. The command below associates the node name TOSCA with the node whose address is 1.5.

```
NCP>SET NODE 1.5 NAME TOSCA
```

Once you set the executor node's address, you cannot change it unless you restart the system. For DECnet-10, the executor's node address is specified during the system build (MONGEN), and cannot be changed without rebuilding and reloading the system.

### 3.7.1 Maximum Address Parameters

The MAXIMUM ADDRESS parameter sets the highest node address, and consequently, the greatest number of nodes that can be recognized by the local node. Both the DN20 and the KL10 have maximum address parameters. The maximum address for the DN20 is set with the NETGEN command DEFINE EXECUTOR MAXIMUM ADDRESS, and the maximum address for the KL10 is set with the MONGEN dialog (see the TOPS-10 DECnet and PSI Installation Guide). The range for the DN20 is 2-255, and the default is 255. The range for the KL10 is 1-1023, and the default is 1023.

It is recommended that you set the DN20 and KL10 maximum addresses to the same number, if possible. This will insure that the same nodes can be recognized by the DN20 and the KL10. If for example, the KL10 maximum address is set to 1023 and the NIA20 goes down, communication with nodes above address 255 can not be resumed through the DN20. It is also recommended that you set these parameters to the smallest number possible to minimize overhead and memory usage.

### 3.7.2 Local Node Identification Parameter

In addition to defining a node name and address for the local node, you can also specify a descriptive quoted string of alphanumeric characters. Use the IDENTIFICATION parameter with the SET EXECUTOR command to specify this optional information:

```
NCP>SET EXECUTOR IDENTIFICATION "TOPS-10 END NODE"
```

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NCP displays this identification in the SHOW EXECUTOR command display:

```
NCP>SHOW EXECUTOR
      .
      .
      .
Identification = TOPS-10 END NODE
      .
      .
      .
NCP>
```

### 3.7.3 Using and Removing Node Names and Addresses

Once you have specified a node name and address, you can use them interchangeably whenever you need to specify a node-id in an NCP command. The local DECnet-10 software translates the node names into node addresses. For example, where node TOSCA is set to address 7.5, these NCP commands perform identical functions:

```
NCP>SHOW NODE 7.5 CHARACTERISTICS
NCP>SHOW NODE TOSCA CHARACTERISTICS
```

To remove a remote node address from the volatile database, you must remove all parameters for the node as in the command:

```
NCP>CLEAR NODE TOSCA ALL
```

On a DECnet-10 node, the CLEAR NODE ALL command removes all parameters except for the node name. To remove a remote node name from the volatile database, use the CLEAR NODE command. The following command removes the association between TOSCA and node 7.5:

```
NCP>CLEAR NODE 7.5 NAME
```

Once all parameters for a component are removed from the volatile database, the component is no longer recognized by the executor.

## 3.8 ETHERNET ADDRESSES OF NODES

Nodes on Ethernet lines are identified by unique Ethernet addresses. A message can be sent to one, several, or all nodes on an Ethernet line simultaneously, depending on the Ethernet address used. The Ethernet address of a TOPS-10 node must be changed to a format that is recognized by DECnet.

### 3.8.1 Format of Ethernet Addresses

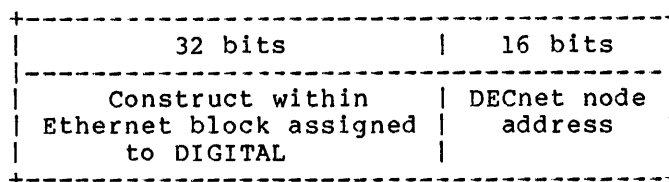
An Ethernet address is 48 bits in length. Ethernet addresses are represented by six pairs of hexadecimal digits (6 bytes), separated by hyphens (for example, AA-01-23-45-67-FF). The bytes are displayed from left to right in the order in which they are transmitted; bits within each byte are transmitted from right to left. In the example AA-01-23-45-67-FF, byte AA is transmitted first; byte FF is transmitted last.

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Xerox Corporation assigns a block of addresses to a producer of Ethernet interfaces upon application. Thus, every manufacturer has a unique set of addresses to use. Normally, one address out of the assigned block of physical addresses is permanently associated with each interface (usually in read-only memory). This address is known as the Ethernet hardware address of the interface.

DECnet-10's interface to the Ethernet is the NIA20. To be compatible with DECnet, the NIA20 must be set to a different address known as the Ethernet physical address. DECnet-10 sets the system's Ethernet address to the correct value for the operation of DECnet-10.

The Ethernet physical address is constructed by appending the 16-bit executor node address to a constant 32-bit number (AA-00-04-00) within the block of Ethernet addresses assigned to DIGITAL.



An example is a Phase IV routing node with DECnet address 1.182 (decimal), which would be set to an Ethernet physical address of AA-00-04-00-B6-04.

Once the Ethernet physical address has been set to its new value, it is reset to its original hardware address value only when a reset is issued to the NIA20 (for example, when the machine power is shut off).

The Ethernet physical address of a node includes the number of the area in which the node resides. The area number is represented by the most significant 6 bits of the 16-bit DECnet node address, while the number of the node within the area is indicated by the least significant 10 bits of the node address.

If an existing network is not divided into areas, the default area number 1 is stored in the DECnet node address of each node. Conversion of an existing network to a multiple-area network may require modification of the area number in the executor node address.

### 3.8.2 Ethernet Physical and Multicast Addresses

An Ethernet address can be a physical address of a single node or a multicast address, depending on the value of the low-order bit of the first byte of the address (this bit is transmitted first). The two types of node address are physical and multicast addresses.

The Ethernet physical address is the unique address of a single node on any Ethernet (as described previously). The least significant bit of the first byte of an Ethernet physical address is 0. (For example, in physical address AA-00-04-00-FC-00, byte AA in binary is 1010 1010 and the value of the low-order bit is 0.)



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The Ethernet multicast address is a multidestination address of one or more nodes on a given Ethernet. The least significant bit of the first byte of a multicast address is 1. (For example, in the multicast address AB-22-22-22-22-22, byte AB in binary is 1010 1011 and the value of the low-order bit is 1.) A multicast address can be either of the following:

- o Multicast group address. An address assigned to any number of nodes; this address can be used to send a message to all nodes in the group in a single transmission. The number of different groups that can be formed equals the maximum number of multicast group addresses that can be assigned.
- o Broadcast address. A single multicast address (specifically, FF-FF-FF-FF-FF-FF) that can be used to transmit a message to all nodes on a given Ethernet. (Note that the broadcast address should be used only for messages to be acted upon by all nodes on the Ethernet, since all nodes must process them.)

### 3.8.3 Values of DIGITAL Ethernet Physical and Multicast Addresses

DIGITAL physical addresses are in the range AA-00-00-00-00-00 through AA-00-04-FF-FF-FF. Multicast addresses assigned for use in cross-company communications are:

Value	Meaning
FF-FF-FF-FF-FF-FF	Broadcast
CF-00-00-00-00-00	Loopback assistance

DIGITAL multicast addresses assigned to be received by other DIGITAL nodes on the same Ethernet are:

Value	Meaning
AB-00-00-01-00-00	Dump/load assistance
AB-00-00-02-00-00	Remote console
AB-00-00-03-00-00	All Phase IV routers
AB-00-00-04-00-00	All Phase IV end nodes
AA-00-00-05-00-00 through AA-00-03-FF-FF-FF	Reserved for future use
AB-00-04-00-00-00 through AB-00-04-FF-FF-FF	For use by DIGITAL customers for their own applications

DECnet always sets up the Ethernet controller at each node to receive messages sent to any address in the above list of DIGITAL multicast addresses. Only appropriate address are set up.

### 3.9 DATA LINK CONTROL

Several local node parameters regulate various aspects of physical line operation. These are the size of NSP receive buffers and transmit buffers (segment buffers), the number of buffers used to transmit on all circuits, and the number of circuits that the local node can use as DECnet-10 communication lines. Four parameters are provided for this purpose: RECEIVE BUFFER SIZE, SEGMENT BUFFER SIZE, MAXIMUM BUFFERS, and MAXIMUM CIRCUITS. You should be careful to set the values for these parameters to a reasonable level, or system performance might suffer. The parameters all have reasonable default values.

The RECEIVE BUFFER SIZE and MAXIMUM BUFFERS parameters can only be set at system build time. The MAXIMUM CIRCUITS parameter can be set using the NCP command SET MAXIMUM CIRCUITS. The SEGMENT BUFFER SIZE cannot be changed.

#### 3.9.1 Setting the Buffer Size

The buffer size must be the same throughout the network for communication between all DIGITAL operating systems running DECnet. To accept incoming messages of all possible sizes, an executor's BUFFER SIZE should be as large as the BUFFER SIZE of the remote (sending) node. The DECnet-10 default value for BUFFER SIZE, 576 bytes, is the BUFFER SIZE most commonly used by DIGITAL systems that support DECnet Phase IV. To accommodate Routing messages, the BUFFER SIZE must be at least 290 bytes.

This value is set by the monitor symbol %DLBSZ, which is set with the MONGEN dialog when the system is built.

#### NOTE

It is strongly recommended that you use the same buffer size for all nodes in your network. Otherwise, nodes with smaller buffer sizes will drop packets when you attempt to route through them.

The maximum buffer size for the DN20 is 576 bytes. The maximum buffer size for the Ethernet is 1476 bytes. Thus, data can be transmitted faster with less processor load on the Ethernet. (The smaller the segments, the more messages have to be processed for a given data stream.)

A buffer size that is greater than 576 bytes is used only for Ethernet links; the DN20 defaults to 576. Should the Ethernet become unavailable when using a maximum buffer size that is greater than 576 bytes, the interrupted Ethernet links cannot be resumed through the DN20. Instead, the user must restart the network operation.

For example, assume two systems are connected by the Ethernet and by DN20s, that both systems are allowing large buffers (greater than 576) on the Ethernet. If the Ethernet becomes unavailable, the existing logical links are broken and not switched to the DN20. Thus, a file transfer being transmitted between the two systems over the Ethernet is aborted when the Ethernet becomes unavailable. However, the user can start the file transfer again without any intervention required.

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The buffer size value can be less than 576 bytes; however, the smaller value will be the maximum buffer size used on any link, including the Ethernet.

The maximum buffer is actually 17 bytes less than the one set or displayed. The 17 bytes are used for DECnet headers. An application can use the NSP. UUC to find the maximum buffer size, so that it can use messages that are a multiple of the buffer size for maximum efficiency.

The maximum size of the transmit buffer is specified in the SEGMENT BUFFER SIZE parameter. This parameter cannot be changed in DECnet-10. The segment buffer size is in the range of 256 to 576 bytes and is automatically set to the same value as the buffer size. However, if the buffer size is set to a value greater than 576, the segment buffer will remain at 576 bytes.

You should consider the following when selecting the buffer size value.

- o Faster lines perform better with large buffers and large user messages that reduce the processor load. (The smaller the segments, the more messages are processed.)
- o Lines that are error prone (for example, telephone lines) should use small buffers (256 bytes) to reduce both the probability and the cost of retransmissions.

**3.9.1.1 Maximum Number of Buffers** - The value that you assign determines the size of internal data structures for DECnet-10 software. For most operations, DECnet-10 will allocate only as many buffers as it needs (even if you specify a greater number than the amount needed), and will not allocate more than the number of buffers that you specify.

**3.9.1.2 Maximum Number of Circuits** - To specify the maximum number of routing circuits that can be used, use the MAXIMUM CIRCUITS parameter. This value determines the size of internal data structures for DECnet-10 software. For example, the following command establishes an upper limit of 3 circuits that the local node can use:

```
NCP>SET EXECUTOR MAXIMUM CIRCUITS 3
```

The default value is 16.

## 3.10 REMOTE FILE ACCESS - FAL

The TOPS-10 File Access Listener (FAL) provides network-level remote file access capabilities as specified in the Data Access Protocol (DAP). FAL enables remote network processes to gain access to the local TOPS-10 file system. FAL runs as a GALAXY-controlled request queue called a FAL-stream. You can have multiple FAL streams operating at the same time.

### 3.10.1 FAL Mode Operation

FAL is controlled by the OPR program. All commands are issued in OPR and all status information is output by OPR. The OPR program has the following commands for FAL:

#### o SET Command

The SET command specifies which network each individual FAL stream will talk to. The SET command format is:

```
SET FAL-STREAM stream-list NETWORK network
```

where:

stream-list is a stream number or range of stream numbers to be affected.

network is either ANF or DECnet. Specify DECnet to have the FAL stream perform Input/Output (I/O) with a DECnet network.

#### o START Command

The START command is used to start up FAL's I/O streams to allow remote file access. The START command format is:

```
START FAL-STREAM stream-list
```

where:

stream-list is the list of FAL I/O streams to be started.

The START command directs FAL to initiate an inactive I/O stream so that remote file accessors can gain entry into the local file system. The START command does not actually start any I/O, it merely enables the FAL process to receive and process remote file access requests.

#### o DEFINE Command

The DEFINE command sets parameters that apply to all FAL streams. The DEFINE command format is:

```
DEFINE FILE-ACCESS REJECTION-LIST NODE::[P,PN],...
```

All connections for NODE::[P,PN] will be rejected. PPNS can be wildcarded, for example:

```
OPR>DEFINE FILE-ACCESS REJECTION-LIST [1,2], MRVAX::[*,*]
```

DEFINE FILE-ACCESS DEFAULT-PPN [P,PN] sets the account under which all FAL accesses, without access control information, will be executed. The default is [377777,377777]. For example:

```
OPR>DEFINE FILE-ACCESS DEFAULT-PPN [2,5]
```

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o ABORT Command

The ABORT command terminates an active I/O stream request. The ABORT command format is:

ABORT FAL-STREAM stream-list

where:

stream-list is the I/O streams to be aborted.

The ABORT command immediately terminates the I/O streams specified. No warning is given to the remote 'active' accessing process. The effect on the I/O stream is the same as if the job had executed a 'RESET'; any file OPEN for input is closed, and any file OPEN for output is aborted.

o SHOW Command

The SHOW command displays the status of the current FAL I/O streams. The SHOW command format is:

SHOW STATUS FAL-STREAM  
or  
SHOW PARAMETERS FAL-STREAM

Examples:

OPR>SHOW STATUS FAL-STREAM  
OPR>

```

Fal-Stream Status:
Strm      Status Node      Connect Time Bytes
-----
  0        Idle
  1        Active KL5872   0:00::50    631
           Reading file DSKA:FAL.MEM for user [10,5535]
           Connect MRVAX
  2        Idle
  3        Idle
  4        Idle
  5        Active BOSTON   0:10:41    65102
           Writing file LPT700:QPRV2.MEM for user [60,5635]
  6        Idle
  7        Idle
  8        Idle
  9        Idle

```

OPR>

OPR>SHOW PARAMETERS FAL-STREAM

OPR>

11:36:06

--System Device Parameters--

Fal-stream Parameters:

```

Strm      Network
-----
  0        DECnet
  1        DECnet
  2        DECnet
  3        DECnet
  4        ANF-10
  5        ANF-10

```

OPR>

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### o SHUTDOWN Command

The SHUTDOWN command terminates FAL-based I/O operations in an orderly manner for a specified stream. The SHUTDOWN command format is:

```
SHUTDOWN FAL-STREAM stream-list
```

where:

stream-list is the I/O streams to be shutdown.

The SHUTDOWN command immediately aborts and terminates all dormant I/O streams selected. All currently active I/O streams selected are marked for termination when the remote active process releases control of the DAP link.

### o STOP Command

The STOP command temporarily freezes FAL I/O streams. The STOP command format is:

```
STOP FAL-STREAM stream-list
```

where:

stream-list is the list of I/O streams to be frozen.

## CHAPTER 4

### THE NETWORK CONTROL PROGRAM

#### 4.1 OPERATOR INTERFACE

The Network Control Program (NCP) commands provide the only user interface to operational controls and measurements of DECnet-10 Version 4.0. This manual uses the term NCP to refer to the application-specific subset of commands that are part of NML. NML refers to the entire program (commands, local processing routines, and dispatching of IPCF and NICE messages).

NCP commands are executed on the TOPS-10 operating system as one set of application commands available through the operator interface program OPR. In this case, the application is DECnet-10 running under TOPS-10 V7.03.

The DECnet-10 DN20 communications front end on DECsystem-1090/1091/1095 systems has no direct command interface. NCP commands to control the network or obtain network information are executed through the NCP on the DN20's host or the NCP on another network node.

#### 4.2 PROCESSING OVERVIEW

During GALAXY generation, with the GALGEN program, NCP tables are supplied to OPR. These tables provide the information needed by OPR to parse the NCP commands. A command that is syntactically correct is accepted by OPR, formatted as an IPCF packet, and sent to ORION. ORION dispatches the packet to the Network Control Program. The program acknowledges all commands received by returning an IPCF packet for output to the user's terminal. Therefore, NCP commands cannot be executed if ORION is not running.

How and where the NCP commands are processed and executed is determined by the NCP's analysis of the command. OPR/NCP generic commands, commands that can be processed locally without access to other architectural layers, commands to be processed locally that do require interlayer communication, and commands to be processed by remote nodes, all follow different paths. You can save time in recovering from abnormal situations if you know the path taken by commands. If, for example, ORION stops running when you are in the process of entering a command to be processed locally by the NCP/NML process, there is no point in looking further for the cause of the problem. The NCP request cannot be forwarded to NCP/NML until you, or another operator with that responsibility, restores ORION. Chapters 5 and 6 describe the processing path for the generic commands and the locally processed commands requiring a minimum of processing. In general, these commands are simple in format and easy to understand.

## THE NETWORK CONTROL PROGRAM

Commands requiring communication with other architectural layers in the local system and commands to remote nodes require additional parameters because of the more complex nature of interlayer and node-to-node communication. These commands are processed by routines in the NML of the local or remote node. Commands processed by NML are described in Chapter 7.

Both IPCF and NICE messages (used to communicate with NML) are internal and transparent to you as an operator entering NCP commands. As an operator, your responsibility is to type the NCP commands accurately and completely. Sections 4.4 and 4.5 will help you in typing and checking the NCP commands.

Refer to Figure 1-3 to review the processing flow described above and preview the flow to follow.

### 4.3 NCP FUNCTIONS

NCP commands perform two major functions:

- o Controlling network activity
- o Monitoring network activity

Control functions you can perform with NCP include:

- o Downline loading of a DN20 or Ethernet Communication Server (DECSA)
- o Setting and changing line, node, circuit, and logging parameters
- o Changing the network configuration
- o Modifying message-traffic patterns
- o Initiating and terminating network functions

Monitoring functions you can perform with NCP include:

- o Upline dumping of a DN20
- o Displaying information about network entities (their characteristics and/or states) and counters
- o Displaying the status of operations on the network, including operations in progress and operations that have failed
- o Measuring network performance by displaying the contents of counters and the output of the Event Logger through the SPEAR program.
- o Performing loopback tests

The planning function is served by collecting information from the day-to-day control and monitoring functions. This information, however, must be organized and saved in usable form.



## THE NETWORK CONTROL PROGRAM

### 4.4 NCP FEATURES

The NCP command language has many features that make it easy to use.

#### 4.4.1 Typing Commands at the Terminal

There are three ways to type commands:

- o Full input mode
- o Recognition mode
- o Abbreviated mode

Each of the following commands is acceptable:

Example using full input:

```
NCP>SHOW KNOWN CIRCUITS SUMMARY
```

Example using recognition:

```
NCP>SH<ESC>OW K<ESC>OWN C<ESC>IRCUITS SU<ESC>MMARY
```

Example using abbreviation:

```
NCP>sh k c su
```

#### 4.4.2 Editing Commands

You can use the following character commands to edit your input to NCP. Because of the more complex nature of the NCP commands, you may wish to add to your current use of these commands.

- o DELETE  
Moving backwards from the last character typed, deletes one character each time you press the DELETE key.
- o CTRL/U  
Deletes all characters typed since the beginning of the line.
- o CTRL/W  
Deletes back to the last punctuation character (including space).
- o CTRL/H  
Used after receiving a format-error message, retypes the command up to the point of error.
- o CTRL/R  
Used to display the current command line, omitting characters you have deleted.

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### 4.4.3 Using Comments

You can include comments on the command line or on a separate line by prefixing the comment with a semicolon or exclamation point. The semicolon causes the remainder of the line to be considered as a comment; the exclamation point causes only the text up to the next exclamation point or the end of the line to be considered as a comment.

### 4.4.4 Multiple Line Commands

A long command can be continued to the next line by simply typing the command past the end of the line onto the next line. The system allows fields of a command to be split between two lines. If you want to avoid splitting a command field, type a hyphen as the last character in the line. For example:

```
NCP>SET EXECUTOR HARDWARE ADDRESS 11 INCOMING TIMER 30 -  
STATE ON
```

### 4.4.5 Getting Help from NCP

Helpful text is output to your terminal if you type a question mark at the beginning of any field.

Note, in the example that follows, how using the question mark guides you through the correct format of a command. Assume you wish to check current network activity. You know that the command keyword for display is SHOW, but you are uncertain about the rest of the command. You proceed as shown below, checking for both possible choices and command completion. Command completion is implied when the response is "confirm with carriage return".

```
NCP>SH<ESC>OW ? one of the following:  
ACTIVE      ADJACENT    AREA        CIRCUIT     EXECUTOR    KNOWN  
LINE        LOGGING     LOOP        MODULE      NODE        QUEUE  
SIGNIFICANT  
  
NCP>SHOW K<ESC>NOWN ? one of the following:  
AREAS      CIRCUITS    LINES      LOGGING     MODULES     NODES  
  
NCP>SHOW KNOWN N<ESC>ODES ? one of the following:  
CHARACTERISTICS  COUNTERS      STATUS      SUMMARY  
  
NCP>SHOW KNOWN NODES ST<ESC>ATUS ? confirm with carriage return  
NCP>show known nodes status  
NCP>  
14:52:50          NCP  
Request # 116; Show Known Node Status Completed  
  
Node \      State      Active Delay  Type      Cost Hops Circuit  
Links  
1(TOPS20)  Unreachable  0      5  
7.2(RALPH) Unreachable  
7.3(PIONER) Reachable  
7.4(TOPS10) Reachable  0      1  Routing IV 14  5  DTE-0-1  
.  
.  
.  
  
(Output continues.)
```

## THE NETWORK CONTROL PROGRAM

### 4.5 NCP COMMAND OPERATION

The following sections describe how to use NCP commands.

#### 4.5.1 Accessing NCP Commands

The Operator Command Language program, OPR, provides the operator with one command language to communicate with TOPS-10 application programs, including the Network Control Program. To invoke NCP, run OPR and then give the command ENTER NCP:

```
.R OPR
OPR>ENTER NCP
NCP>
```

Alternatively, you can execute a single NCP command from OPR command level by typing NCP followed by the NCP command:

```
OPR>NCP SHOW KNOWN NODES
```

To return to the TOPS-10 monitor from NCP, type EXIT. The system prints the TOPS-10 prompt, ".".

#### 4.5.2 Access Control

If a node-id in a command represents a node to be connected to, you may need to enter access control information. Access control information can consist of one or any combination of the keywords USER, PASSWORD, and ACCOUNT, each keyword followed by a valid value. Access control parameters follow the node-id in the command string.

With the USER parameter, specify a project-programmer number or user-name (up to 39 characters) (for the MCB, the information specified at NETGEN). The PASSWORD parameter can contain up to 39 printable characters, and the ACCOUNT parameter can be up to 39 characters long. Systems other than TOPS-10 may require a format that differs from the TOPS-10 format. Each node in the network may limit the amount of access control data it will accept. (See Section 6.7 for more information on the access control parameters.)

#### 4.5.3 Restricting NCP Commands

As implemented on TOPS-10, using NCP requires only that you have system (.OBSOP) operator privileges. The appropriate values for these privileges are entered in ACTDAE.SYS. Your privileges are enabled by default when you log in. To set NCP parameters from a remote node, you must specify an account that has these privileges or POKE privileges. Refer to the TOPS-10 Software Installation Guide if you require additional information on accessing and setting values for privileges.

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### 4.5.4 Queued Commands

When NCP cannot immediately process a command, the command is placed in the NCP request queue. Once a request is queued, you can resume giving NCP commands. The SHOW QUEUE command lists the queued requests that are processing or waiting to be processed.

### 4.5.5 Command Input

NCP input takes the form of arguments delimited by one or more blanks or tabs.

If you type a carriage return following the NCP prompt (without typing a command), the NCP prompt is repeated.

Multiple outstanding commands are permitted. NML processes them in the order entered.

### 4.5.6 Command Output Response

The most general output content and format in response to NCP commands includes the following:

```
time          NCP
              Request #nn; Command input status

              Entity type = Entity Identification
              Requested Information or "No Information"
```

where:

time is in hours, minutes, seconds (hh:mm:ss)

Command input is a brief identification of the request you typed

status is one of:

Complete - information follows

Accepted - information follows after a brief delay

Failed - reason for failure follows and, optionally, further detail is given

Entity-type is either AREA, NODE, CIRCUIT, MODULE, LINE, or LOGGING (singular or plural form). If the entity-type is NODE, NODE will be preceded by EXECUTOR, REMOTE, or LOOP. All commands to change either the volatile or permanent data base of a remote node should include the required USER and PASSWORD parameters.

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Requested Information differs according to the action requested, the entity specified, and the arguments given.

The output "No Information" means that no parameters have been set. No failure of the command is implied.

Example 1: Request for characteristics of the TOPS-10 node:

```
.R OPR<RET>
OPR>DISABLE OUTPUT-DISPLAY (of) ALL-MESSAGES<RET>
OPR>
 9:27:41          --OUTPUT DISPLAY for OPR Modified--
OPR>ENTER NCP<RET>
NCP>SHOW NODE BOSTON CHARACTERISTICS<RET>
NCP>
 9:28:25          NCP
Request # 255; Show Node Characteristics Completed
Executor Node = 7.124 (BOSTON)
  Identification = DECnet-10 Version 4.0
  Management Version = 4.0.0
  Loop Count = 1
  Loop Length = 127
  Loop With = Mixed
  Identification = RC177B DEC10 Development
  Incoming Timer = 30
  Outgoing Timer = 60
  NSP Version = 4.0.0
  Delay Factor = 48
  Delay Weight = 10
  Inactivity Timer = 120
  Retransmit Factor = 10
  Routing Version = 2.0.0
  Type = Routing IV
  Routing Timer = 120
  Broadcast Routing Timer = 40
  Maximum Address = 255
  Maximum Cost = 100
  Maximum Hops = 28
  Maximum Visits = 30
  Maximum Broadcast Nonrouters = 64
  Maximum Broadcast Routers = 32
  Maximum Buffers = 80
  Buffer Size = 576
  Segment Buffer Size = 576
NCP>
```

Example 2: Request for status of known circuits  
(Executor is SATURN):

```
NCP>SHOW KNOWN CIRCUIT STATUS<RET>
NCP>
 9:29:16          NCP
Request # 256; Show Known Circuits Status Completed

Circuit  State  Loopback  Adjacent  Block
          Name   Node      Size
DTE-0-3  On    7.111(CHRYON)  576
DTE-1-3  On    7.252(GNOME)   576
ETH-0    On    7.58(MARTEN)  1498
ETH-0    On    7.62(DEEP)    1498

NCP>
```

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Example 3: Request for status of known circuits  
(Executor is SATURN)

```
NCP>SET EXECUTOR NODE SATURN<RET>
NCP>
  9:30:07          NCP
                   Set Executor Complete
NCP>SHOW KNOWN CIRCUIT STATUS<RET>
NCP>
  9:30:51          NCP
                   Request # 257 Accepted
NCP>
  9:30:53          NCP
Request # 257; Show Known Circuits Status Completed

Circuit   State   Loopback   Adjacent   Block
          Name   Name       Node       Size
DTE-0-1   On      7.129     7.124     576
User = Node / 7.129 / SATURN

KDP-0-0   On      7.129     7.123     576
User = Node / 7.129 / SATURN

KDP-0-1   On      7.129     7.123     576
Substate = Synchronizing
User = Node / 7.129 / SATURN

KDP-0-2   On      7.129     7.123     576
Substate = Synchronizing
User = Node / 7.129 / SATURN

KDP-0-3   On      7.129     7.123     576
Substate = Synchronizing
User = Node / 7.129 / SATURN

NCP>EXIT
```

Appendix C lists and explains, in text or by example, all messages output to the user's terminal, including the CTY or operator's console.

The general output format given in Appendix C does not apply to NCP commands processed by OPR or processed by the local NCP program. All commands translated into NICE messages follow the content of the format example for DECnet-10 V4.0. The actual order of items and their physical placement may differ for other operating systems.

### 4.5.7 Specifying the Executor

DECnet-10 V4.0 is designed to make central, fully distributed, or partially distributed control and management possible. An NCP command does not have to be executed at the node where it is typed. Therefore, the operator must determine and designate the node that is to process and execute each command. You can specify the executor by implication (allowing the default to be effective), by a SET EXECUTOR command, or by using the TELL prefix. For a detailed description of how to specify the executor, see the commands in Chapters 6 and 7.

The operator must be aware of the characteristics (and status) of all nodes in the network to effectively determine the ability of a node to act as executor for the command node.

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### 4.5.8 Specifying Files in NCP Commands

File specifications used as arguments in NCP commands for execution by DECnet-10 nodes follow TOPS-10 file specification conventions.

The full file specification for DECnet-10 is:

```
dev:filename.ext[p,pn]
```

The TOPS-10 Operating System Commands Manual describes file specifications in detail.

Example:

```
DSK:SECDMC.SYS[1,2]
```

Note that the file operations are actually performed by another job, so you cannot use job-wide logical names, or depend on search lists or paths being set up by your job. You can, however, use ersatz device names such as SYS: and SSL:, which are system wide. In the case of a load file residing on SYS:, you could use either the specification SYS:DTEMPS.SYS or SSL:DTEMPS.SYS[1,4]. However, you should avoid using DSK:DTEMPS.SYS[1,4], which depends on the search list for your job.





## CHAPTER 5

### NCP COMMANDS PROCESSED BY OPR

#### 5.1 OPR/NCP COMMANDS

Some of the OPR commands available in the NCP application subset are for general use by operators; that is, for activities other than network activities. These commands require no action by NCP. They are processed directly by OPR. These commands are:

ENTER (command subset) application-name  
EXIT (to monitor level)  
PUSH (to monitor level)  
RETURN (to operator command level)  
TAKE (commands from) fileid        /DISPLAY  
                                      /NODISPLAY  
WAIT (for) seconds

#### 5.2 EXAMPLES OF USE OF OPR/NCP COMMANDS

Because these commands are among those used frequently by operators, the description of the input/output examples is specific to network functions. Only the OPR/NCP commands appear in red so that you may identify them readily.

Assume that you are the user [20,7100] with operator privileges and that you are logged in on a DECsystem-1091 host node. First, you run OPR and disable all messages output periodically by the OPR program. These commands are never necessary, but they are helpful if you are using your terminal under timesharing and wish to avoid interruptions.

NCP COMMANDS PROCESSED BY OPR

Next, you enter NCP and check the status of the local node. The system reports that "State is On". So far, you have the following input/output:

```
.R OPR<RET>
OPR>DISABLE OUTPUT-DISPLAY (of) ALL-MESSAGES<RET>

9:37:39      --Output display for OPR modified--
OPR>ENTER NCP<RET>

NCP>SHOW EXECUTOR STATUS<RET>
NCP>
5:29:14      NCP
Request # 27 Show Executor Node Status Completed
Executor Node = 8.110 (ALPHA)
State = On
Physical Address = AA 00 04 00 8E 1C
Active Links =1
NCP>
```

You next type EXIT to return to the TOPS-10 monitor, and then you type the NETWORK/DECNET command to check for currently accessible nodes. (The NETWORK command without the /DECNET switch displays nodes from all networks in the system; it displays ANF-10 nodes as well as DECnet-10 nodes.) You type:

```
NCP>EXIT<RET>

.NETWORK/DECNET<RET>
[DECnet network: local node ALPHA, 134 reachable nodes in area 7]
ABACUS ABLE ADAM AJAX ALGOL ALIEN ALPHA ALPINE
ARSON ARUBA ARWEN ASIMOV AURORA BABEL BANZAI BAXTER
CACHE CAR CASTOR CDR CHAOS CHARLY CHIPS CHUCKL
.
.
.
WAFER WILBUR WINNIE WIZARD WOMBAT WOOKIE XENON VODA
ZEKE ZEPHYR ZEUS ZIP ZONKER ZOO
```

NCP COMMANDS PROCESSED BY OPR

You then run OPR again and ENTER NCP, as shown above. The following order of commands assumes you wish to check the number of operators with jobs on the host node. Satisfied that the system is not overloaded, you reenter NCP. Assume that you now wish to check the DTE counters. Using the SHOW EXECUTOR command, you find that the host node is the executor. You set the EXECUTOR to be the D1026A. You are called away from the terminal and repeat the SHOW EXECUTOR command when you return. Whenever you interrupt a network session, checking the EXECUTOR is desirable. Do not assume that there has been no user-activity at your terminal during your absence. Also, the EXECUTOR you previously set may have gone off-line. You have added:

NCP>RETURN<RET>

OPR>SHOW OPERATORS<RET>

OPR>

15:19:07

-- Operators --

Node	Type	Terminal	Job	User
ALPHA	system	240	7	OPERATOR [1,2]
ALPHA	system	2	46	OPERATOR [1,2]
ALPHA	system	56	65	ANDERSON [20,7100]

OPR>ENTER NCP<RET>

NCP>SHOW EXECUTOR<RET>

NCP>

15:19:49

NCP

Executor Node = 9.110 (ALPHA)

Identification = DECnet-10 Version 4.0

State = On

Active Links = 0

NCP>SET EXECUTOR NODE D1026A<RET>

NCP

15:41:33

NCP

Set Executor Complete

NCP>SHOW EXECUTOR<RET>

NCP

15:41:38

NCP

Request # 39 Accepted

NCP>

15:41:39

NCP

Executor Node = 9.121 (D1026A)

Identification = DECnet-10 Version 4.0 Release

State = On

Active Links = 1

## NCP COMMANDS PROCESSED BY OPR

In the following example, you have the SHOW COUNTERS command in a file named CNTDTE.CMD and use the TAKE command for indirect input. The /DISPLAY switch displays the command entered. At this point, you continue with whatever network activities you had planned. Finally, you use the EXIT command to return to the TOPS-10 monitor.

```
NCP>TAKE CNTDTE.CMD /DISPLAY<RET>
```

```
NCP>CLEAR EXECUTOR NODE<RET>
```

```
NCP>
```

```
15:42:10          NCP  
                  Clear Executor Complete
```

```
NCP>TELL D1026A SHOW CIRCUIT DTE-0-1 COUNTERS<RET>
```

```
15:42:15          NCP  
                  Request # 43 Accepted
```

```
15:42:16          NCP  
Request # 43; Show Circuit Counters Completed  
Circuit = DTE-0-1
```

17443	Seconds Since Last Zeroed
4059	Terminating Packets Received
4669	Originating Packets Sent
63	Terminating Congestion Loss
39842	Transit Packets Received
47361	Transit Packets Sent
3	Transit Congestion Loss
0	Circuit Downs
0	Initialization Failures
1532485	Bytes Received
2522599	Bytes Sent
43993	Data Blocks Received
52032	Data Blocks Sent

```
NCP>EXIT
```

You can now log off or continue with other activities using the TOPS-10 monitor. You have in this short terminal session used each of the OPR/NCP commands except WAIT. You have also moved efficiently among three command sets.

The format of the WAIT command is:

```
WAIT (for) seconds
```

where seconds is a number from 1 to 60.

You use the WAIT command in command files and batch control files; it attempts to ensure that the response to one command is output before the next command is processed. If you did not insert the WAIT command following an NCP command that might take a few seconds to process, it is possible for the command sequence to continue or complete before the response is output. With experience you will learn to approximate the time required for responses in your particular environment. The argument cannot exceed 60 seconds, but you can increase the wait time by repeating the WAIT command.

## CHAPTER 6

### NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM

NCP processes certain commands directly by means of an internal data path between NCP and the volatile network data base in the host node (the DECSYSTEM-1090/1091/1095 KL10 node or the DECSYSTEM-2020 KS10 node). See Figure 1-3 if you wish to review the flow of these commands. Commands processed internally by NCP/NML include:

SET EXECUTOR NODE nodeid	(Section 6.1)
DEFINE EXECUTOR NODE nodeid	(Section 6.2)
CLEAR EXECUTOR NODE	(Section 6.3)
PURGE EXECUTOR NODE	(Section 6.4)
SHOW QUEUE	(Section 6.5)
CANCEL QUEUE REQUEST requestid	(Section 6.6)
TELL nodeid [USER ppn] [PASSWORD password] NML-command-line [ACCOUNT account]	(Section 6.7)
HELP	(Section 6.8)

(TELL and its arguments form a command prefix. A command to a remote node follows. The local node processes the prefix, whereas the remote node processes the command.)

Format, function, arguments (keywords and variable data), examples, and remarks if called for, follow for each of the NCP commands (and prefix) that NCP processes locally.

#### 6.1 SET EXECUTOR

SET EXECUTOR NODE nodeid [USER userid]-  
[PASSWORD password] [ACCOUNT account]

##### Function:

The SET EXECUTOR command acts immediately to establish the node specified as the processing node for subsequent commands. The value of nodeid becomes part of the temporary data base. The node specified in the command continues to be sent commands to process until you change the executor with another SET EXECUTOR command or clear the executor with the CLEAR EXECUTOR command. If the system goes down, this value is lost. You cannot execute this command remotely.

## NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM

### Arguments:

nodeid      This can be the decimal number representing the address of the node, or the node name.

userid      These arguments provide access control information and may or may not be required. The system you specify with nodeid sets the required format for these values. On TOPS-10 systems, the userid is a ppn or user-name up to 39 characters long, the password and the account are each up to 39 characters long. For the MCB processor, the password is up to eight characters long, and the account and userid are each up to 16 characters long. (See Section 6.7 for more information on access control parameters.)

password

account

### Examples:

Example 1: To display characteristics for the DN20 node:

```
NCP>SET EXECUTOR NODE D1036A
NCP>
14:17:17            NCP
                    Set Executor Complete
```

Example 2: To change a parameter value, add access information:

```
NCP>SET EXECUTOR NODE D1037A USER OPERATOR PASSWORD SECRET
NCP>
12:28:32            NCP
                    Set Executor Complete
NCP>
```

### Remarks:

Note that commands processed locally receive an immediate response of Complete or Failed and are not assigned a request number.

If you specify values for USER and PASSWORD during the generation procedures for the DN20 MCB front end, you must specify these values in the SET EXECUTOR command if you intend to execute a command that alters the DN20's data base. (ACCOUNT is an optional parameter, but if present, it must match the value set.) If you omit these values when setting the executor, subsequent commands that set or change parameter values will fail.

### WARNING

If you have not set USER and PASSWORD values, any user at a remote node can manipulate the MCB operating system by setting the executor to your DN20 MCB node.

You do not need USER and PASSWORD values with the SET EXECUTOR command if subsequent commands are to be SHOW commands.

## NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM

### 6.2 DEFINE EXECUTOR

DEFINE EXECUTOR NODE nodeid [USER userid]-  
[PASSWORD password] [ACCOUNT account]

#### Function:

The DEFINE EXECUTOR command establishes the specified node as the processing node in the permanent data base. This is the default value for the executor. When NCP is started, the default executor is the node on which the control program is running, unless the executor node was previously defined with the DEFINE EXECUTOR command. The values in the permanent data base remain from one initialization to the next. The executor node in the permanent data base can be changed only by the DEFINE EXECUTOR or the PURGE EXECUTOR command.

#### Arguments:

The arguments are the same as those defined for the SET EXECUTOR command.

#### Remarks:

Not implemented for DECnet-10.

### 6.3 CLEAR EXECUTOR

CLEAR EXECUTOR NODE

#### Function:

The CLEAR EXECUTOR command accomplishes the reverse of the SET EXECUTOR command. It removes the value that was previously entered in the volatile data base as the executor. After this command, the executor defaults to the node on which NCP is running unless a DEFINE EXECUTOR command has previously been given. For operating systems that support a permanent data base, the value in the permanent data base is always the default taken when no value is given. For DECnet-10, the executor defaults to the TOPS-10 KL10 or KS10 node when this command is executed. The CLEAR EXECUTOR NODE command cannot be executed remotely.

#### Arguments:

The keyword NODE acts as the only argument.

## NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM

Example:

```
NCP>SET EXECUTOR NODE D1036A USER OPERATOR PASSWORD D1036<RET>
NCP>
  9:30:41          NCP
                  Set Executor Complete
NCP>SHOW EXECUTOR<RET>
NCP>
  9:30:53          NCP
                  Request # 244 Accepted
NCP>
  9:30:54          NCP
```

```
Executor Node = 7.129 (D1036A)
  Identification = DECnet-10 4.0 Release
  State = On
  Active Links = 1
```

```
NCP>CLEAR EXECUTOR NODE<RET>
NCP>
  9:31:27          NCP
                  Clear Executor Complete
NCP>SHOW EXECUTOR<RET>
NCP>
  9:31:34          NCP
```

```
Executor Node = 7.110 (KL1026)
  Identification = DECnet-10 Version 4.0
  State = On
  Active Links = 2
```

NCP>

Remarks:

This command is the simplest way to change the executor from the DN20 MCB front end to the TOPS-10 KL10 host.

### 6.4 PURGE EXECUTOR

#### PURGE EXECUTOR NODE

Function:

The PURGE EXECUTOR command accomplishes the reverse of the DEFINE EXECUTOR command. It removes the value that was previously in the permanent data base as the executor. The default executor is then the node where NCP is running.

Remarks:

Not implemented for DECnet-10.



## NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM

### 6.5 SHOW QUEUE

#### SHOW QUEUE

##### Function:

You use the SHOW QUEUE command to display the NCP-request queue. This command causes the display of either a list of NCP-requests waiting to be processed, or the message [The queue is empty]. Request numbers are assigned in order as commands are received. Therefore, request numbers are in ascending order. The numbers are consecutive when you are the only operator using NCP. To locate the command you entered, refer back to the command. The request number is printed immediately before "Accepted" and "Completed."

##### Arguments:

None. (NCP-requests is implied.)

##### Examples:

```
NCP>SHOW QUEUE<RET>
NCP>
 9:38:22      NCP
              [The queue is empty]
```

```
NCP>
```

\*\*\*\*\*

```
NCP>SHOW QUEUE<RET>
NCP>
 9:41:31      NCP
              Request # 249 Active, Remote, Executor = 7.129 (D2136A)
```

##### Remarks:

The SHOW QUEUE command is potentially helpful when you receive no response from any command within a few seconds. If there is no response from SHOW QUEUE, one of two conditions is probable: the NML program is busy loading an adjacent node, or the NML program is hung. Wait a few minutes, and if there is still no response, restart NML. (See Section 3.2.2 for NML restart procedures.)

### 6.6 CANCEL QUEUE REQUEST

#### CANCEL QUEUE REQUEST requestid

##### Function:

Use the CANCEL command to remove a request from the queue before processing begins. You can check the status of the request with the SHOW QUEUE command.

##### Argument:

requestid                      requestid is the number assigned to a command request by NML; this number is output immediately following all commands that will be translated into NICE messages (commands in Chapter 7.)

## NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM

### Remarks:

You cannot cancel commands processed locally by NCP (commands in this chapter). They are executed immediately and do not appear in the queue. Also, you cannot cancel requests that are noted as Active.

### 6.7 TELL PREFIX

TELL nodeid	[USER userid] [PASSWORD password] [ACCOUNT account]	command line
NCP command prefix	Access control keywords and parameters	NCP command to be executed by node named in nodeid

### Function:

You use the TELL nodeid prefix to designate the node that is to execute the command. The prefix is effective only for the single command that immediately follows.

The receiving node can require any combination of the three access keywords and parameters, or none of them. The receiving node can refuse to execute the command even when access parameters meet requirements. (See Remarks.)

### Arguments:

[USER userid] [PASSWORD password] [ACCOUNT account]	You must format access control parameters according to the conventions of the operating system of the node specified in nodeid.
---	---

### TOPS-10 format:

USER [p,pn] or USER user-name

where:

p is a field of up to six octal digits representing the user's project number.

pn is a field of up to six octal digits representing the user's programmer number.

user-name is any combination of ASCII characters not exceeding 39.

PASSWORD password

where:

password is any combination of ASCII characters not exceeding 39.

## NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM

ACCOUNT account

where:

account is any combination of ASCII characters not exceeding 39.

MCB format:

PASSWORD is any combination of 6-bit characters not exceeding 8.

ACCOUNT is any combination of ASCII characters not exceeding 16.

USER is any combination of ASCII characters not exceeding 16.

TOPS-20 format:

Each parameter can contain any combination of ASCII characters not exceeding 39.

Other DIGITAL operating systems:

See the documentation for that system.

Examples:

TOPS-10:

```
TELL KL1036:: USER [10,5665] PASSWORD DEC10 ACCOUNT NETWRK -<RET>
ZERO KNOWN LINE COUNTERS
```

TOPS-20:

```
TELL D2102A:: USER NISI PASSWORD DECNET ACCOUNT 341 -<RET>
ZERO KNOWN LINE COUNTERS
```

Remarks:

Using the TELL prefix is more efficient than a combination of SET EXECUTOR and CLEAR EXECUTOR commands when you need to give only one command to a node. Assume you have set the executor to node CAR for the purpose of monitoring network traffic there for an hour or more. The system manager interrupts you with a request to check the status of lines at node BAR. You can use the command TELL NODE BAR SHOW KNOWN LINE STATUS. The TELL prefix command format overrides the previous setting of the executor to node CAR, displays the status of lines at node BAR, and allows you to continue with commands to be executed at node CAR.

Before using this or any other NCP command requiring that access control parameters be sent to another node, you should have established both the values and the format that is acceptable to the remote node.

## NCP COMMANDS PROCESSED BY THE NETWORK CONTROL PROGRAM

Assuming the access control parameters are correct, the receiving node can still reject the connection for a number of reasons. For example, all logical links at the receiving node are busy, the state of a required object does not allow processing of the command, or the receiving node cannot verify parameters given by the sender. The receiving node sends the source node a reject message with a reason for the rejected connection. Depending on the reason given, you must determine the likelihood of obtaining a successful connection at a later time. A TELL command could also fail if the specified node does not respond in 60 seconds.

### 6.8 USING THE HELP COMMAND

The HELP command provides a convenient display of the function of any NCP commands. Typing HELP lists the commands; typing HELP keyword, where keyword is an NCP command keyword, lists all possible combinations of command keyword and entity keyword.

Examples:

NCP>HELP RETURN<RET>

Use RETURN to return to OPR command level.

NCP>HELP CLEAR<RET>

Use CLEAR to clear parameters of an entity from the volatile data base. Additional information available

CLEAR CIRCUIT  
CLEAR EXECUTOR NODE  
CLEAR LINE  
CLEAR LOGGING  
CLEAR MODULE  
CLEAR NODE

NCP>HELP CLEAR LINE<RET>

CLEAR LINE is used to clear the volatile line parameters for the line(s) identified in the command.

## CHAPTER 7

### NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

#### 7.1 PROCESSING OVERVIEW

The NCP commands described in this chapter are processed by routines in the Network Management Layer (NML) and involve transparent conversion of NCP commands to Network Information and Control Exchange (NICE) protocol messages. Commands to be executed by the local node are processed by the local node's NML; commands to be executed by a remote node are processed by the remote node's NML.

The NML itself contains most of the logic and data bases needed to process the NCP commands. When needed information resides in other architectural layers, NML uses its interface to the appropriate layer to read or set parameters. Both system managers and operators will find that a knowledge of the processing flow of NCP commands will increase their efficiency in using and maintaining the network.

All communication with NML that involves an exchange of data between local and remote nodes is by means of the NICE protocol. (This includes communication between the 1090/1091/1095 main processor and the DN20.) As an operator, you are not required to know the details of the NICE protocol. It may be necessary for a programmer to have a working knowledge of NICE (refer to the DECnet Digital Network Architecture Network Management Functional Specification, Version 4.0). The Network Control Program understands NICE, and given a valid NCP command, will reformat the command-content (now in an IPCF message) into a NICE message for the intended NML. There is one NICE message for each NCP command.

When the intended receiver is a remote NML, all DECnet systems use the same method of sending the NICE message. The message is sent over a logical link provided by End Communication and Session Control.

When NML receives a NICE message from a remote NML, it always sends an acknowledgement to the sender. Following the receipt of a command, the NML of the node that acted as executor sends a response to the NML of the command node. Here NCP/NML formats this response into an IPCF packet; the packet is forwarded to ORION; ORION dispatches the response to OPR; the response is displayed on the operator's terminal.

You have now followed the paths taken by various NCP commands. You may wish to refer to Figure 1-3 for a visual review. Note that your participation was restricted to entering the NCP command at the terminal and receiving an acknowledgement. Later, normally within a few seconds, you receive a response that informs you of the disposition of the command. When this response indicates no action was taken, the system, to the extent possible, gives the reason.

The examples that follow, beginning in Section 7.4, show both positive and negative responses to individual commands. Appendix C contains additional examples, including common sequences of commands.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### 7.2 DECnet-10 IMPLEMENTATION AND EXTENSIONS

DECnet-10 Version 4.0 implements a subset of the NCP commands described by DNA for Version 4.0 of Network Management. X.25-specific commands are implemented for the PSI software (see Chapter 8). DECnet-10 does not implement commands specific to DMP multipoint.

In addition, DECnet-10 contains two extensions made to accommodate the distinctive hardware characteristics of DECsystem-10. The extensions to the DNA specification are:

- o Remote permanent parameters

The communications front end (DN20) has no modifiable permanent memory. Certain MCB (DN20) data base items are set during network generation and are stored in the front-end system image. The NCP commands PURGE and DEFINE cannot affect these values after network generation.

- o Boot DN20 on failure

This facility detects that the DN20 communications software is not communicating with the KL10 processor. The DN20 is then automatically reloaded.

### 7.3 NML CONCEPTS AND ORGANIZATION OF PARAMETERS

Some of the NCP commands that NML processes have up to twenty possible parameters. Most of these parameters appear in several commands. The most commonly repeated keywords that accept other keywords as arguments (rather than specific variables like name or line identification) appear in this section. You will save yourself time if you make the required associations at this time. Until you become familiar with the command/entity/keyword/variable combinations, the following descriptions of concepts, variables, and groups of parameters common to specific entities should help you to choose the correct parameter and interpret the output when you use the "?" feature.

#### 7.3.1 Entities

The major network management keywords are those that immediately follow the command action word (such as SET or LOAD). These keywords specify the element on which the command is to act. All other keywords act as "labels" for variables to be typed or as requests to choose one of a set group of responses.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Some entities are either singular or plural. You can include only one entity in each command. The following list includes all entities in commands processed by the NML for DECnet-10 Version 4.0:

Singular	Plural
AREA	ACTIVE AREAS KNOWN AREAS
CIRCUIT	ACTIVE CIRCUITS KNOWN CIRCUITS
LINE	ACTIVE LINES KNOWN LINES
LOGGING	ACTIVE LOGGING KNOWN LOGGING
MODULE	ACTIVE MODULES KNOWN MODULES
NODE	ACTIVE NODES ADJACENT NODES KNOWN NODES LOOP NODES

### 7.3.2 Entity Identification

The plural form of an entity defines and restricts itself. (Active lines, for example, are known lines in the ON or SERVICE state.) However, you must follow each singular form of an entity by an identification in a system-specific format to indicate one specific line, circuit, or node. The identification is also referred to as the name of the entity.

#### NOTE

Devices that are similar in operations are referred to by the same mnemonic. See Appendix F for a list of mnemonic device names for devices used by DECnet-10.

**7.3.2.1 Circuit and Line Identification** - This section describes the identification of circuits and lines in NCP commands. Circuits and lines are identified in the same way, with the exception of the tributary number, which applies only to circuits.

#### DTE Identification

DTE-cpu-unit

cpu is the number of the CPU on which the DTE resides.

unit is the number of the DTE unit.

Example:

```
NCP>SET LINE DTE-0-1 STATE OFF
```

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### Ethernet Identification

ETH-channel

channel identifies the specific Ethernet channel.  
DECnet-10 supports only a single channel (ETH-0).

Example:

```
NCP>SET CIRCUIT ETH-0 STATE ON
```

### DDCMP Identification

For DECnet-10, DDCMP circuit and line identification takes one of the following formats:

device-controller  
device-controller-unit  
device-controller.tributary  
device-controller-unit.tributary

device is the device name. (See Appendix F for a list of mnemonic device names.)

controller is the device's hardware controller.

unit is the circuit or line number if the device is a multiline controller. For multipoint lines, the unit number is optional and, if specified, is always 0.

tributary is the tributary node address (for circuits only).

Example:

```
NCP>SET CIRCUIT DMC-0 STATE ON
```

**7.3.2.2 Node and Area Identification** - Either the node address or the node name can serve as a node identifier (node-id). The node address may include as a prefix the area number (area-id).

node-name  
node-number  
area-number.node-number

For example, if node 3 is in area 7, its node address is 7.3. If you do not specify an area the area number of the executor is used.

```
NCP>SHOW NODE AURORA SUMMARY  
NCP>SHOW NODE 6.12 SUMMARY
```

**7.3.2.3 Logging Identification** - The LOGGING entity is followed by an identification of the sink-type, rather than an identification of the logging entity itself. However, sinktype must always follow LOGGING in the command in the same manner that node-id follows NODE. Sinktype identifies the place where a copy of the event is recorded.



## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Sinktype must be one of the following:

- o CONSOLE
- o FILE
- o MONITOR (Not implemented for DECnet-10)

Example:

```
NCP>SHOW LOGGING FILE EVENTS
```

7.3.2.4 Module Identification - The module entity consists of the following modules:

- o CONFIGURATOR (Not implemented for DECnet-10)
- o CONSOLE (Not implemented for DECnet-10)
- o LOADER (Not implemented for DECnet-10)
- o LOOPER (Not implemented for DECnet-10)
- o X25-ACCESS (see Chapter 8)
- o X25-PROTOCOL (see Chapter 8)
- o X25-SERVER (see Chapter 8)

Example:

```
NCP>SHOW MODULE X25-ACCESS
```

### 7.3.3 The Node Entity

The node is the central entity of the network. All network control and monitoring is based on the concept of the node. From the standpoint of network management, nodes are either local or remote. The local node is the node where you log in. The Network Management Layer, the Session Control Layer, the End Communication Layer, and the Routing Layer of DNA contain node functions and parameters. Associated with nodes are several keywords that require you to choose one of several other keywords to qualify or select specific parameters for the first keyword.

NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Keywords you can use with the node entity are:

TYPE	AREA-ROUTER	A node that can route packets from one node to another within its own area and between areas. Also known as a level 2 router. A DECnet-10 node cannot be an area router.
	ROUTING-III	Full Phase III routing node.
	NONROUTING-III	Phase III node without routing capability.
	ROUTING-IV	Full Phase IV routing node.
	NONROUTING-IV	Phase IV node without routing capability.
STATE		
For EXECUTOR node:		
	ON	Allows logical links.
	OFF	Allows no new links, terminates existing links, and stops routing (not implemented for DECnet-10).
	SHUT	Allows no new links, does not destroy existing links, and goes to OFF when all logical links are gone (not implemented for DECnet-10).
	RESTRICTED	Allows no new incoming logical links from remote nodes (not implemented for DECnet-10).
For Remote nodes:		
	REACHABLE	A remote node is REACHABLE if the Routing module of the executor node believes it has a usable path to the remote node.
	UNREACHABLE	A remote node is UNREACHABLE when the path length from the executor to the remote node is longer than the maximum hops in the network.
CPU	PDP-8 PDP-11 DECSYSTEM-1020 VAX-11	Identifies the adjacent target node's CPU type for downline loading.
SOFTWARE TYPE	SECONDARY-LOADER TERTIARY-LOADER SYSTEM	Identifies initial target node program type for downline loading the adjacent node.

All other keyword responses are specific variables (one per keyword), such as number, seconds, fileid and the like.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### 7.3.4 The Circuit Entity

All circuits have the following choices for the keywords listed:

SERVICE	ENABLED	Indicates that the SERVICE functions loading, dumping, and line loopback testing, are performed automatically.
	DISABLED	Indicates that no functions will be performed automatically. In the case of a DTE, indicates NML will not detect when the DN20 goes down, and thus will not attempt to reload or dump the DN20.
STATE	CLEARED	The link cannot be used, but space is reserved for it. Link data bases and parameters are not present. (Not implemented for DECnet-10.)
	OFF	The circuit cannot be used by any network-related software. It is functionally nonexistent. Link data bases and parameters are present.
	ON	The circuit is available for normal use by its owner, with the exception of overrides for service.
	SERVICE	Applies only to the volatile data base (SET command). The circuit is available for service functions, but is not available for use by the owner (Routing). (Not implemented for DECnet-10.)

### 7.3.5 The Line Entity

Lines provide physical point-to-point connections. Functions and parameters for the line entity come from the Network Management, Data Link and Physical Link layers.

Lines have the following choices for the keywords listed:

CLOCK	INTERNAL	Clock is supplied by a device instead of a modem. Usually used for external cable loopback.
	EXTERNAL	(MCB only) For normal clock operating mode (clock signal normally supplied by the modem).

NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

CONTROLLER	LOOPBACK	Places the device to loopback internally, thus not requiring a loopback connector to turn data around.
	NORMAL	(MCB only) Can be used for modem or cable loopback.
NOTE		
See Table 7-1 at the end of this section for relationships between the above keywords and the loopback mode of the line.		
DUPLEX	FULL	Full duplex mode of the line device.
	HALF	(MCB only) Half duplex mode of the line device.
PROTOCOL	DDCMP POINT	(KS10 only) This is the line protocol for a point-to-point DDCMP connection.
	DDCMP CONTROL	This is the line protocol for the control station (master) end of a DDCMP multipoint group. (Not implemented for DECnet-10.)
	DDCMP TRIBUTARY	This is the line protocol for the tributary (slave) end of a DDCMP multipoint group. (Not implemented for DECnet-10.)
	DDCMP DMC	(MCB only) This line is in DMC emulation mode.
	LAPB	For X.25 lines.
SERVICE	ENABLED	Indicates that the SERVICE functions loading, dumping, and line loopback testing, are performed automatically.
	DISABLED	Indicates that no functions will be automatically performed. In the case of a DTE, indicates NML will not detect when the DN20 goes down, and thus will not attempt to reload or dump the DN20.

**NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER**

<b>STATE</b>	<b>CLEARED</b>	The line cannot be used, but space is reserved for it. Line data bases and parameters are not present.
	<b>OFF</b>	The line cannot be used by any network-related software. It is functionally nonexistent. Line data bases and parameters are present.
	<b>ON</b>	The line is available for normal use by its owner, with the exception of overrides for service.
	<b>SERVICE</b>	Applies only to the volatile data base (SET command). The line is available for service functions but is not available for use by the owner (the executor node implying Routing).

**Table 7-1: Relationship of Clock and Controller Parameters to Mode of Line**

Mode of Line	Clock	Controller	Operation
Normal	External	Normal	Normal operation
Normal	Internal	Normal	Device supplies clock to simulate synchronous modem
Internal loopback	Internal	Loopback	Device loops data internally
External cable loopback	Internal	Normal	Cable loopback with loopback connector
External modem loopback	External	Normal	Modem loops back data

### 7.3.6 The Logging Entity

The LOGGING entity is the network component that logs significant events that occur during operation and/or maintenance of the network. An event is defined as a network- or system-specific occurrence for which the logging component maintains a record. A partial list of significant events includes:

- o Circuit and node counter activity
- o Changes in circuit, line, and node states
- o Service requests (when a circuit or line is put in an automatic service state)
- o Passive loopback (when the executor is looping back test messages)
- o Routing performance and error counters (circuit, line, node, and data packet transmission)
- o Data transmission performance and error counters (when errors in data transmission occur)
- o Lost event reporting (when some number of events are not logged)

Events are recorded continuously by the event logger and can provide useful information for maintaining the network. In DECnet-10, you can control the logging of events. In particular, you can control the type of events to be logged, the source for these events, and the location at which these events are logged. You can also control the logging component at the local node and its operational state.

An example of an event is:

```
22:46:30          -- Message from DECnet event logger --

DECNET Event type 4.15, Adjacency up
Event came from node 7.142 (AURORA), occurred 8-JAN-1985 22:46:28

Circuit DTE-0-1

Node = 7.143 (FEAURA)
```

DECnet-10 automatically logs events to the system error file SYS:ERROR.SYS. All users have access to these recorded events by running the SPEAR program.

The logging component is the device or process that records logging events. You can select any of the following components.

- |         |  |
|---------|--|
| CONSOLE | A logging console, which is a OPR terminal that displays event messages. Set the terminal to display event messages with the OPR command ENABLE OUTPUT-DISPLAY NCP-MESSAGES. |
| FILE    | A logging file, which records events in binary format. The logging file is always the system error file SYS:ERROR.SYS.   |
| MONITOR | A logging monitor, which is a program or file supplied by the user that receives events. (Not implemented by DECnet-10.)   |

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

The sink name identifies the specific console, file, or monitor program to which events are to be logged. At the local node, you can control the operational state of the logging sink. Use the SET LOGGING STATE command to set the sink to one of the following states:

OFF	The sink is not available. Events destined for the sink are discarded.
ON	The sink is available for receiving events.
HOLD	The sink is temporarily unavailable and events are queued.

**7.3.6.1 Event Identification** - Events are defined by class and type. You can specify the kinds of events to be logged by using the following event-list format:

class.type

class Identifies the DNA or system-specific layer to which the event pertains.

type Identifies a particular form of event, unique within an event class.

For example, to specify an event in the Routing layer, you would use event class 4. The event types for this class range from 0 to 14. Event type 0 indicates aged packet loss, event type 1 indicates unreachable node packet loss, and so forth. Refer to the Appendix C for a summary of events by class and type. Use the EVENTS parameter for the SET LOGGING command to specify those events to be logged. If you want to log all event classes and types, use the KNOWN EVENTS parameter. When defining the logging component, you must specify events to be logged.

When providing an event list for the EVENTS parameter, you can specify only one class for each instance of this parameter. However, several formats can define event types for a particular class. You can specify a single event type, a range of types, or a combination of the two. The following table illustrates these formats.

Event-list	Meaning
4.4	Identifies event class 4, type 4
4.5-7	Identifies event class 4, types 5 through 7
4.5,7-9,11	Identifies event class 4, types 5, 7 through 9, and 11. Note that types must be specified in ascending order.

The commands below illustrate invalid event lists.

```
NCP>SET KNOWN LOGGING EVENTS 4.4,5.1
```

```
NCP>SET KNOWN LOGGING EVENTS 4.7,3-4,1
```

The first example specifies more than one event class. The second example specifies event types in numerically descending, rather than ascending order.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

You can use the asterisk (\*) wildcard character in an event list. This character can replace only an event type. The following example illustrates the correct use of wildcards:

```
NCP>SET KNOWN LOGGING EVENTS 2.*
```

This command identifies all event types for class 2 events.

Two invalid uses of the wildcard character are shown below.

```
NCP>SET LOGGING FILE EVENTS *.2-5
```

```
NCP>SET LOGGING FILE EVENTS 4.2-*
```

The first command specifies specific event types for all classes. Unless you use the KNOWN EVENTS parameter, you can only specify event type information for a single class. The second command uses a wildcard to specify a partial range of event types. The wildcard character denotes the entire range of event types for a given class.

**7.3.6.2 Selecting Events for Logging** - The operator or system manager can control event logging by using the NCP command SET LOGGING EVENT event-list. If you have a fairly small network, you may elect to log all events. However in a large network, it is advisable to log only significant events. For instance, a level 1 router generates event 4.15 "adjacency up" each time an Ethernet node comes on-line. With a large number of nodes on the Ethernet, numerous "adjacency up" events can make it difficult to observe more significant events.

It is recommended that you enable the Data Link Layer events (class 5). These events typically indicate a problem with the Ethernet.

Once the events to be logged have been selected and set and the logging sinks determined, the operator or manager can examine the event logger's output periodically. Several avenues that might be followed in utilizing the logged data follow. These are only suggestions. Familiarity with the network, gained in daily operations, will suggest many more ways to capitalize on the event logging feature.

- o Network application programs can be tested by setting specific counters to zero, running the application program and then examining the event output to observe how the program affected node and/or network performance.
- o Counters specific to the Routing Layer (circuit counters that monitor terminating and transit congestion loss and circuit downs, for example) can be used to identify potential problems.
- o An examination of the times and dates when potentially useful information is lost can be helpful. There are many queues and their lengths cannot be infinite. Circumstances will occur when an event will no longer fit on the queue. This will be recorded as an "event-lost" event, not as an error. All processed events are time stamped and identified as to source node and entity name, if any is indicated. On the basis of these factors certain changes can be made: the logging sink can be moved, peak loads can be adjusted by schedule changes, or particular events can be dropped from logging. Any changes so made should be evaluated by a reexamination of the same event counts that suggested the adjustment.



## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

In order to log events, you must turn logging on. (The DECnet-10 default has all events enabled for the FILE sink.) To do so, use the SET LOGGING command. Use the same command to modify any of the logging parameters. To remove any or all parameters from the volatile database, use the CLEAR LOGGING command. You must turn the logging state to OFF before attempting to use the CLEAR LOGGING command.

Table 7-2 lists all logging parameters by function, and groups them according to operational categories.

**Table 7-2: Logging Parameters and Their Function**

Parameter Function	Source-Related Parameters	Sink-Related Parameters
Identifies events	EVENTS event-list KNOWN EVENTS	
Identifies source for events	CIRCUIT circuit-id LINE line-id MODULE X25-ACCESS MODULE X25-PROTOCOL MODULE X25-SERVER MODULE X29-SERVER NODE node-id	
Determines location for logging events	SINK EXECUTOR SINK NODE node-id	
Assigns name to logging component		NAME sink-name
Sets state of logging component		STATE    HOLD OFF ON

Use the SET LOGGING EVENTS command to specify source-related events, and the SET LOGGING STATE command to specify sink-related events. To display the status of the logging sinks and the events enabled for logging, use the SHOW LOGGING command. The following command displays the status of the CONSOLE sink:

```
NCP>SHOW LOGGING CONSOLE SUMMARY
```

**7.3.6.3 DN20 (MCB) Events** - The DN20 (MCB) and KL10 generate DECnet-10 events. The DN20, since it has no logging sinks, logs its events with the KL10. The KL10-generated events selected for logging are the same events that are accepted from the DN20. The KL10 filters out all other DN20-generated events. This filtering can produce considerable overhead for the KL10. For example, if the DN20 is connected to a VAX/VMS system, the VMS system may send routing messages that are too large for the DN20 to process. This causes the DN20 to generate "Partial routing update loss" (event 4.5) events. When this occurs frequently, it is recommended that you disable the logging of class 4 events.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

DN20 events can also be controlled by disabling their generation at the DN20. For example, to disable the generation of class 4 events, issue the following command to NETGEN, then rebuild the MCB:

```
NETGEN>PURGE LOGGING FILE EVENT 4.5
```

Since the DN20 does not have a clock, it cannot supply the time of an event. DN20 events do however, include the DN20's uptime. Add the MCB uptime to the exact time that the DN20 was started to determine the time of an event.

**7.3.6.4 Logging Events at Remote Nodes** - In addition to logging events at the sinks on your node, events can be sent to remote DECnet nodes. For instance, you might select a single node to collect all the events that occur in the network. In the following example, all network management events (class 0) are sent to the logging console on node TEAL:

```
NCP>SET LOGGING CONSOLE EVENT 0.* SINK NODE TEAL::
```

### 7.3.7 The Maintenance Module Entity

The Link Management maintenance modules are responsible for handling maintenance functions on circuits and lines. These modules have implied responsibility for handling maintenance for all DDCMP and X.25 data links, and they have specific responsibility for Ethernet circuits assigned to them by the network manager.

The Link Maintenance modules provide entities that can own Ethernet circuits for link service functions such as loop testing and downline loading. The names of Link Maintenance modules are LOOPER, LOADER, CONSOLE, and CONFIGURATOR.

The LOOPER, LOADER, and CONSOLE modules are the only link maintenance modules that can be CIRCUIT owners. They each own one circuit on every Ethernet line that is to have their related service functions.

The CONFIGURATOR module is a user of the services represented by the console module. The configurator module can provide information from a single console request for system identification or can listen through the console and construct a list of systems on an Ethernet line.

**7.3.7.1 The CONFIGURATOR Module** - The Ethernet CONFIGURATOR module is not supported by DECnet-10. The Ethernet CONFIGURATOR module maintains a list of all nodes on the Ethernet. Approximately once every 10 minutes, each node on an Ethernet circuit that conforms to the DNA specifications transmits a system identification message (a hello message) to a multicast address that the configurator monitors. The configurator module listens to these messages and builds a user-accessible database of configuration information for all systems on the Ethernet.

The configurator runs as a separate process, and, once it is started, becomes available to all users on the system.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

The CONFIGURATOR module has the following states for surveillance of Ethernet circuits:

### SURVEILLANCE

ENABLED The list of Ethernet nodes is kept.

DISABLED The list of Ethernet nodes is not kept.

**7.3.7.2 The CONSOLE Module** - The CONSOLE module is not supported by DECnet-10. However, a similar function is provided by the RMTCON program.

The CONSOLE module is a logical console terminal (CTY) that is connected to a terminal server such as the DECserver 100 Terminal Server. This allows control of the terminal server from a remote node. When the console receives a message, it becomes reserved for the exclusive use of the system that sent the message. After a predefined number of seconds, if the console has not received another message for the node that reserved it, the console becomes available for reservation by another node. The RESERVATION TIMER parameter sets the number of seconds that the console will stay reserved without hearing from the remote node before being available.

**7.3.7.3 The LOADER and LOOPER Modules** - The LOADER and LOOPER Modules are not supported by DECnet-10; however, DECnet-10 NCP commands can be sent to other operating systems which support these modules.

A node can request a down-line load or loopback assistance by sending a multicast address. Of the nodes that respond to the address, one of the responding nodes is selected according to criteria defined by the operating system. For example the node might choose the first node to respond to the request. The LOOPER and LOADER modules' ASSISTANCE parameter indicates whether or not the node will respond to a request for a down-line load or loopback assistance.

The LOADER and LOOPER modules have the following choices for the ASSISTANCE keyword:

### ASSISTANCE

ENABLED The node will respond to a dump/load or loopback assistance multicast address.

DISABLED The node will not respond to a dump/load or loopback assistance multicast address.

DECnet-10 does not support the setting of this parameter. LOADER and LOOPER ASSISTANCE is always ENABLED on DECnet-10 nodes.

### 7.3.8 The Area Entity

An area is a group of nodes. The system manager can group nodes for hierarchical routing purposes. The user can identify areas in two major ways: individually and in groups. To identify an area individually, use the area number. An area number is a decimal integer in the range 1-63. Area 1 is usually used to designate a single area network and Area 0 is used when communicating with a DECnet Phase III node.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Area group identifications are as follows:

ACTIVE AREAS All areas that the executor perceives routing can reach.

KNOWN AREAS Same as ACTIVE AREAS.

### 7.4 GENERIC FORMAT OF NML/NCP COMMANDS

The generic format of NML/NCP commands is:

COMMAND ENTITY [KEYWORD] [argument]...[KEYWORD] [argument]

Although most commands will have a command entry, an entity entry, and at least one keyword/argument combination, the command itself is the only element that is always present. The [KEYWORD] [argument] fields can also take the form [KEYWORD] [KEYWORD], as in TYPE ROUTING or STATE OFF. In this form, the second KEYWORD acts as an argument for the first keyword. Under certain conditions, entity is understood. The keyword ALL acts as a pluralistic parameter: used with SET/DEFINE or CLEAR/PURGE, ALL indicates all information on the named entity.

Three pairs of commands - SET and DEFINE, CLEAR and PURGE, and SHOW and LIST - affect the same entities and accept the same arguments. Thus, except for the command itself, you type the same information in the same format. For example:

```
NCP>SET LINE KDP-0-0 CLOCK INTERNAL
```

```
NCP>DEFINE LINE KDP-0-0 CLOCK INTERNAL
```

The first command changes line parameters in the volatile data base; the second changes parameters in the permanent data base (not implemented for DECnet-10).

SET, CLEAR and SHOW refer to parameters in the volatile data base; DEFINE, PURGE, and LIST refer to parameters in the permanent data base. These three pairs are considered together in the detailed descriptions that follow. All other commands are described in separate charts. Remember that neither TOPS-10 nor MCB supports a permanent data base. Therefore, for DECnet-10 you can use only SET, CLEAR, and SHOW. All commands are given because other operating systems may implement a permanent data base.

### 7.5 CHANGING NETWORK DATA BASES: SET AND DEFINE COMMANDS

In DECnet-10 V4.0, you can establish certain initial parameter values during network generation. Command files are created that consist of NCP SET commands that use these initial values as arguments. These commands are executed at system startup and the parameter values they set become the initial volatile data base. The operator or system manager cannot change or set all parameter values.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Values displayed in response to the various SHOW commands are the values in the original data base (unless you have changed them). They have been chosen to ensure a viable network. They may not be optimal for your installation because of the many factors upon which network performance depends. However, no value should be changed without good reason and some planning. It is suggested that the system manager check performance with the SPEAR reports both before and after changes have been made. Whether you have improved or degraded the network performance is best judged by actual results.

To change a value in the volatile data base, you use the appropriate NCP SET command. Values established with the SET command are in effect for all commands following the SET command unless changed with another SET command. Volatile data base values are lost when the node is reloaded.

Access privileges are required to send a SET command to a DECnet-10 node from a remote node using the TELL prefix. The following access information must be added to the command string:

USER ppn (with or without brackets) or user-name

PASSWORD password (password used at LOGIN)

### NOTE

NCP commands that are processed by the local Network Management function are described in Chapter 6. Commands processed by the OPR program are described in Chapter 5.

#### 7.5.1 SET/DEFINE Entity ALL

Command	Entity	Keyword/Argument
{SET DEFINE}	{CIRCUIT cktid LINE lineid LOGGING sink-type MODULE module-type NODE nodeid}	ALL

#### Function:

When used with the keyword ALL, the SET command reads all known permanent parameters for the named entity into the volatile data base. Conversely, the DEFINE command reads all known volatile parameters into the permanent data base of the identified entity (not implemented by DECnet-10).

#### Arguments:

You can use the keyword ALL with the commands SET/DEFINE and CLEAR/PURGE to indicate all information on the entity identified in the command. Refer to the singular form of each entity for a complete list of all possible keywords and parameters.

NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Remarks:

DEFINE and SET commands with the keyword ALL cannot be executed by DECnet-10 executor nodes because of the lack of a modifiable permanent data base.

Before attempting to send this command to a non-DECnet-10 node, consult the documentation of that node's operating system. This command depends upon the specific implementation.

7.5.2 SET/DEFINE CIRCUIT

Command	Entity	Keyword/Argument
{SET DEFINE}	CIRCUIT cktid	ACTIVE BASE base ACTIVE INCREMENT increment BABBLE TIME milliseconds COST cost COUNTER TIMER seconds DEAD THRESHOLD count DYING BASE base DYING INCREMENT increment DYING THRESHOLD count INACTIVE INCREMENT incrmnt INACTIVE THRESHOLD count LINE lineid MAXIMUM BUFFER count MAXIMUM TRANSMITS count MAXIMUM ROUTERS number OWNER ownerid POLLING STATE polstate ROUTER PRIORITY number SERVICE srvcntl STATE cktstate TRANSMIT TIMER millisecs TRIBUTARY tribaddr

Function:

These commands set volatile and permanent circuit parameters for the circuit(s) identified in the command.

Arguments:

Arguments for all circuits:

COUNTER TIMER seconds

Seconds is a decimal integer in the range 1-65535. Counter timer is a Network Management Timer. When the seconds indicated have elapsed, the circuit counters are recorded as data in a logging event, and then zeroed. The logging begins again, and the cycle continues as long as the node remains up, or until the counter is cleared. The counter timer value must be set for circuit counters to be automatically logged.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### OWNER ownerid

Ownerid consists of an entity type and entity identification. The only ownerid currently defined is the executor node. (This implies that the circuit is actually reserved for Routing, the DECnet routing module.) Establishing an ownerid merely reserves the circuit. There is no implication as to whether the circuit is open. Network Management can always override the owner's exclusive rights to the circuit.

### STATE cktstate

Cktstate can be CLEARED, OFF, ON, or SERVICE. (See Section 7.3.4 for state definitions.)

Arguments for DDCMP circuits only:

### LINE lineid

Lineid is the Data Link layer identification of the line to be used by the circuit. (See Section 7.3.2 for format.)

### SERVICE srvcntl

Srvcntl can be ENABLED or DISABLED, indicating respectively that Network Management allows or disallows service operations on a circuit. (See Sections 7.3.4 for more detail.)

Arguments for all circuits owned by EXECUTOR:

### COST cost

Cost is a decimal number in the range 1 to 25. The COST parameter is used in the routing algorithm to determine the most cost-effective routing path. (See Section 2.3 for more information on routing concepts.)

### HELLO TIMER seconds

Seconds is a decimal number in the range 1-65535. This value determines the frequency of Routing Hello messages sent to the adjacent node on the circuit.

### LISTEN TIMER seconds

Seconds is a decimal number in the range 1-65535. This value determines the seconds that can elapse before Routing receives either a Hello message or a user message from the adjacent node on the circuit.

Arguments for Ethernet circuits:

### MAXIMUM ROUTERS number

This parameter applies to Ethernet circuits. It specifies the maximum number of routers (other than the executor node) allowed by the Routing layer for the specified circuit. Number is a decimal integer in the range 1-64. The default is 16.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### ROUTER PRIORITY number

This parameter applies to Ethernet circuits. It specifies the priority the specified router (the executor node on the circuit) is to have in the selection of a designated router for the circuit. Number is a decimal integer in the range 0-127. The default is 5.

### NOTE

The DNA Routing Layer Specification contains detailed information on the effect of changing parameter values of timers used by Routing. (See Appendix E for a complete list of DNA Specifications.)

The following arguments are not implemented for circuits in DECnet-10 V4.0. Check the documentation for the operating system of the executor to direct commands containing these arguments to a remote node.

### ACTIVE BASE base

This parameter applies to DDCMP CONTROL circuits only. The value of base represents the base priority to which a tributary is reset after each time it has been polled. This is the base priority for a tributary in the ACTIVE state. Base is a value in the range 0 to 255. If not set, the default is 255.

### ACTIVE INCREMENT incrmt

This parameter applies to DDCMP CONTROL circuits only. The value of incrmt represents the increment added to the tributary priority each time the scheduling timer expires. This increment applies to a tributary in the ACTIVE state. Incrmt is a value in the range 0 to 255. If not set, the default is 0.

### BABBLE TIMER millisecs

This parameter applies to DDCMP CONTROL circuits only. The value of millisecs represents the number of milliseconds that a selected tributary or remote half-duplex station can transmit. Millisecs is a value in the range 1 to 65535. If not set, the default is 6000 (6 seconds).

### DEAD THRESHOLD count

This parameter applies to DDCMP CONTROL circuits only. The value of count represents the number of times to poll the ACTIVE, INACTIVE, or DYING tributary before changing its polling state to DEAD because of receive timeouts. Count is a value in the range 0 to 255. If not set, the default is 8.

### DYING BASE base

This parameter applies to DDCMP CONTROL circuits only. The value of base represents the base priority to which a tributary is reset after each time it has been polled. This is the base priority for a tributary in the DYING state. Base is a value in the range 0 to 255. If not set, the default is 0.



## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### DYING INCREMENT `incrmt`

This parameter applies to DDCMP CONTROL circuits only. The value of `incrmt` represents the increment added to the tributary priority each time the scheduling timer expires. This increment applies to a tributary in the DYING state. `Incrmt` is a value in the range 0 to 255. If not set, the default is 16.

### DYING THRESHOLD `count`

This parameter applies to DDCMP CONTROL circuits only. The value of `count` represents the number of times to poll the ACTIVE, INACTIVE, or DYING tributary before changing its polling state to DYING because of receive timeouts. `Count` is a value in the range 0 to 255. If not set, the default is 2.

### INACTIVE BASE `base`

This parameter applies to DDCMP CONTROL circuits only. The value of `base` represents the base priority to which a tributary is reset after each time it has been polled. This is the base priority for a tributary in the INACTIVE state. `Base` is a value in the range 0 to 255. If not set, the default is 0.

### INACTIVE INCREMENT `incrmt`

This parameter applies to DDCMP CONTROL circuits only. The value of `incrmt` represents the increment added to the tributary priority each time the scheduling timer expires. This increment applies to a tributary in the INACTIVE state. `Incrmt` is a value in the range 0 to 255. If not set, the default is 64.

### INACTIVE THRESHOLD `count`

This parameter applies to DDCMP CONTROL circuits only. The value of `count` represents the number of times to poll the ACTIVE tributary before changing its polling state to inactive because of no data response. `Count` is a value in the range 0 to 255. If not set, the default is 8.

### MAXIMUM BUFFERS `count`

This parameter applies to DDCMP CONTROL circuits only. The value of `count` represents the maximum number of buffers the tributary can use from a common buffer pool. If not set, there is no common buffer pool and buffers are explicitly supplied by the higher level. The value of `count` is either a value in the range 1 to 255 or the keyword UNLIMITED.

### MAXIMUM TRANSMITS `count`

This parameter applies to DDCMP CONTROL circuits only. The value of `count` represents the maximum number of data messages that can be transmitted at one time. `Count` is a value in the range 1 to 255. If not set, the default is 4.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### POLLING STATE polstate

This parameter applies to DDCMP CONTROL circuits only. The value of polstate represents the state of the tributary relative to the multipoint polling algorithm. If not set, the default is AUTOMATIC. The possible states are:

AUTOMATIC - state is allowed to vary according to the operation of the polling algorithm.

ACTIVE/INACTIVE/DYING/DEAD - the tributary is locked in the specified state.

### TRANSMIT TIMER millisecs

This parameter applies to DDCMP CONTROL circuits only. The value of millisecs represents the number of milliseconds to delay between data message transmits. Millisecs is a value in the range 0 to 65535.

### TRIBUTARY tribaddr

This parameter applies to multipoint DDCMP circuits only. Tribaddr represents the Data Link physical tributary address of the circuit. Tribaddr is a value in the range 0 to 255.

### Examples:

1. Set the circuit STATE to ON for the circuit DTE-0-1.

```
NCP>SET CIRCUIT DTE-0-1 STATE ON
```

2. Set the maximum number of routers permitted on the Ethernet circuit ETH-0 to 5.

```
NCP>SET CIRCUIT ETH-0 MAXIMUM ROUTERS 5
```

Command	Entity	Keyword/Argument
{ SET DEFINE }	KNOWN CIRCUITS	{ ALL COUNTER TIMER seconds } { SERVICE srvcntl }

### Function:

SET KNOWN CIRCUITS ALL loads all permanent circuit parameter values into the volatile data base. (Not supported for DECnet-10.) Other SET KNOWN CIRCUIT commands set the specified values in the volatile data base of each circuit known to the executor. DEFINE KNOWN CIRCUITS ALL has no meaning. Other DEFINE KNOWN CIRCUIT commands set the specified parameter values in the permanent data bases of all circuits known to the executor.

### Arguments:

Same as for CIRCUIT cktid (singular). See remarks below.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### Example:

1. Disable service operations (loading and loop testing) for all circuits.

```
NCP>SET KNOWN CIRCUITS SERVICE DISABLED
```

### Remarks:

Although you can use all arguments allowed for SET CIRCUIT (described in this section) in the SET KNOWN CIRCUITS commands, many of the arguments are inappropriate for plural entities. The arguments listed are those most likely to be meaningful. The NML program processes all arguments listed under SET CIRCUIT for the plural CIRCUITS. However, you should consider the probable results carefully before using arguments not listed.

### 7.5.3 SET/DEFINE LINE

Command	Entity	Keyword/Argument
{ SET DEFINE }	LINE lineid	{ CLOCK clock-mode CONTROLLER controller-mode COUNTER TIMER seconds DEVICE device-id DUPLEX duplex-mode PROTOCOL protocol-name RETRANSMIT TIMER milliseconds SERVICE service-control SERVICE TIMER milliseconds STATE line-state  For DDCMP lines:  DEAD TIMER milliseconds DELAY TIMER milliseconds RECEIVE BUFFERS number SCHEDULING TIMER milliseconds STREAM TIMER milliseconds

### Function:

These commands set volatile and permanent line parameters for the line(s) identified in the command. SET sets volatile parameters, and DEFINE sets permanent parameters for nodes that support a permanent data base.

### Arguments:

COUNTER TIMER seconds

Seconds is a decimal integer in the range 1-65535. Counter timer is a Network Management Timer. When the seconds indicated have elapsed, the line counters are recorded as data in a logging event, and then zeroed. If no counter timer value is set, the line's counters are not automatically logged.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### DEVICE deviceid

The deviceid specifies the local hardware to be used. It consists of a device identification (dev) and a controller number (c) if the device supports a single line. For a multiple line controller, the deviceid consists of a device identification, a controller number, and a unit number (u). For example:

dev-c-u

DEVICE DMR-1  
DEVICE KDP-0-2

### PROTOCOL name

For DECnet-10, this parameter is implemented for the MCB node only and for KDP lines only. The protocol name can be DDCMP DMC for DECnet-10 lines and LAPB for X.25 lines. Other DIGITAL operating systems may permit the values DDCMP CONTROL, DDCMP TRIBUTARY, and LAPB. See the appropriate documentation. See Section 7.3.5 for definitions if needed.

### RETRANSMIT TIMER milliseconds

Milliseconds is a decimal integer in the range 1-65535. The RETRANSMIT TIMER is a Data Link timer. When the number of milliseconds specified have elapsed, a block is retransmitted. This timer is used for normal operation of the line.

### SERVICE TIMER milliseconds

Milliseconds is a decimal integer in the range 1-65535. The SERVICE TIMER is a Data Link timer that is used during service operations. Milliseconds represents the maximum amount of time allowed to elapse before a receive request is completed.

Arguments for DDCMP lines. Not implemented for DECnet-10:

### DEAD TIMER milliseconds

This value represents the number of milliseconds between polls for one of the set of dead tributaries. Milliseconds is a decimal integer in the range 1-65535. If not set, the default is 1000. (10 seconds).

### DELAY TIMER milliseconds

This value represents the minimum number of milliseconds to delay between polls. The delay timer limits the effect of a very fast control station on slow tributaries. Milliseconds is a decimal integer in the range 1-65535. If not set, there is no delay.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### RECEIVE BUFFERS number

Allocates buffers for data reception by the device driver for a particular DDCMP line. The number of buffers you set depends on throughput requirements and available memory pool. A value in the range of 2 to 4 is adequate for line speeds of less than 56K bits. For asynchronous lines, a value of at least 4 is recommended. Megabit line speeds may require eight or more buffers, depending on the observed errors.

### SCHEDULING TIMER milliseconds

This value represents the number of milliseconds between recalculation of tributary polling priorities. Milliseconds is a decimal integer in the range 50-65535. If not set, the default is 200.

### STREAM TIMER milliseconds

This value represents the number of milliseconds a tributary or half duplex remote station is allowed to hold the line. Milliseconds is a decimal integer in the range 0-65535. If not set, the default is 6000 (6 seconds).

CLOCK, CONTROLLER, DUPLEX, SERVICE, and STATE: See Section 7.3.5.

### Examples:

1. Tell a DECnet-VAX node to set line DMC-0 to the ON state in full duplex mode.

```
NCP>TELL TOSCA USER ANDERSON PASSWORD NEWBURY SET -  
LINE DMC-0 DUPLEX FULL STATE ON
```

2. Tell a DECnet-VAX node to set the line protocol to DDCMP POINT for line DMC-0.

```
NCP>TELL ALFIE SET LINE DMC-0 PROTOCOL DDCMP POINT
```

### 7.5.4 SET/DEFINE MODULE

Command	Entity	Keyword/Argument
{ SET DEFINE }	MODULE CONFIGURATOR	[CIRCUIT ckt-id] [KNOWN CIRCUITS] { ALL SURVEILLANCE control }

### Function:

This command is not implemented for DECnet-10.

Creates or modifies parameters of the Ethernet configurator module. The configurator module constructs a list of systems active on the specified Ethernet circuits.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### Arguments:

#### KNOWN CIRCUITS

Applies only to Ethernet circuits. Specifies that configurator information on all known circuits is to be stored in the volatile database.

#### CIRCUIT circuit-id

Applies only to Ethernet circuits. Specifies that configurator information on the specified circuit is to be stored in the volatile database.

#### ALL

Copies all known permanent parameters for the configurator into the volatile data base.

#### SURVEILLANCE control

This value indicates whether or not a list of active systems is to be kept for the circuit. The control values are the following:

ENABLED The list is kept  
DISABLED The list is not kept

The default value is DISABLED.

### Example:

1. Tell node AURORA to keep a list of all active systems on all known Ethernet circuits.

```
NCP>TELL AURORA SET MODULE CONFIGURATOR KNOWN CIRCUITS -  
SURVEILLANCE ENABLED
```

### Remarks:

Once the configurator ceases surveillance of all Ethernet circuits it has been monitoring, for example, if you give the command SET MODULE CONFIGURATOR SURVEILLANCE DISABLED KNOWN CIRCUITS, the list of system information is deleted.

Command	Entity	Keyword/Argument
{SET DEFINE}	MODULE CONSOLE	RESERVATION TIMER seconds

This command is not implemented for DECnet-10.

The SET MODULE CONSOLE RESERVATION TIMER sets the number of seconds that the console will stay reserved without hearing from the system that reserved it. Seconds is a decimal integer in the range 1-65535.

### Example:

Set node AURORA's console reservation timer to 10 seconds:

```
NCP>TELL NODE AURORA SET MODULE CONSOLE -  
RESERVATION TIMER 10
```

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Command	Entity	Keyword/Argument
{SET DEFINE}	{MODULE LOADER MODULE LOOPER}	{ASSISTANCE control ALL}

### Function:

These commands are not implemented for DECnet-10.

The MODULE LOADER command is for Ethernet up-line dump and down-line load. The MODULE LOOPER command is for Ethernet loopback testing.

### Arguments:

#### ASSISTANCE state

This value indicates whether or not the node responds to the dump/load assistance multicast address. The state is one of the following:

ENABLED	The node will respond
DISABLED	The node will not respond

The state of a DECnet-10 node is always ENABLED.

#### ALL

Copies configurator module information from the permanent data base into the volatile data base at the local node.

### Example:

Tell node TEAL to enable loader assistance.

```
NCP>TELL TEAL SET MODULE LOADER ASSISTANCE ENABLED
```

### 7.5.5 SET/DEFINE NODE

Command	Entity	Keyword/Argument
{SET DEFINE}	NODE nodename	CIRCUIT cktid

### Function:

This command sets the volatile or permanent address and circuit for the specified nodename. The CIRCUIT cktid parameter applies to loop nodes and nodes by name only.

### Arguments:

#### CIRCUIT cktid

Cktid is the identification of the circuit to be used for traffic to the named node, which is a loop node. For example, the command:

```
NCP>SET NODE FOOBAR CIRCUIT DTE-0-3
```

will create the loop node FOOBAR, so it can be used in LOOP NODE commands.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Command	Entity	Keyword/Argument
{ SET DEFINE }	NODE nodeaddr	NAME nodename

### Function:

This command sets the volatile or permanent parameter for the nodename to be associated with the specified address. A nodename/nodeaddr association is unique.

### Argument:

Nodename consists of one to six alphanumeric characters with at least one alpha character. A node name is associated with one, and only one, node address.

### Examples:

```
NCP>SHOW EXECUTOR<RET>
NCP>
 9:35:43      NCP
Request # 279; Show Executor Node Summary Completed
Executor Node = 7.110 (KL1026)
State = On
Identification = RC177B KL #1026/1042

NCP>SET NO 7.110 NAME ANYNAM<RET>
NCP>
 9:43:00      NCP
Request # 280; Set Node Failed, Component in wrong state
NCP>SET NO 7.129 NAME ANYNAM<RET>
 9:43:10      NCP
Request # 281; Set Node Completed
NCP>SHOW NODE 7.129<RET>
NCP>
 9:43:14      NCP
Request # 282; Show Node Summary Completed
Remote Node = 7.129 (ANYNAM)

No information
```

### Remarks:

DECnet-10 does not support the SET NODE NAME command for the executor. (The failure of Request # 280 in the example illustrates this.)

Node names are of local significance only. If used in a command addressed to the network, the node address is substituted (using a table lookup) for the name. This mapping is transparent to the user. Thus, although the network recognizes nodes by address only, the operator has the convenience of using either nodename or nodeaddress (except for the few commands where one or the other is specifically noted).



NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Command	Entity	Keyword/Argument
{ SET DEFINE }	{ NODE nodeid EXECUTOR }	{ ADDRESS node-address AREA MAXIMUM COST number AREA MAXIMUM HOPS number BROADCAST ROUTING TIMER seconds BUFFER SIZE bytes CONSOLE LOAD FILE file-id CONSOLE SECONDARY LOADER file-id COUNTER TIMER seconds CPU cputyp DELAY FACTOR number DELAY WEIGHT number DIAGNOSTIC FILE file-id DUMP ADDRESS number DUMP COUNT number DUMP FILE fileid HARDWARE ADDRESS eth-address HOST nodeid IDENTIFICATION idstring INACTIVITY TIMER seconds INCOMING TIMER seconds LOAD FILE fileid MAXIMUM ADDRESS number MAXIMUM AREA number MAXIMUM BROADCAST NONROUTERS number MAXIMUM BROADCAST ROUTERS number MAXIMUM BUFFERS number MAXIMUM COST number MAXIMUM HOPS number MAXIMUM CIRCUITS number MAXIMUM LINKS number MAXIMUM VISITS number OUTGOING TIMER seconds RETRANSMIT FACTOR number ROUTING TIMER seconds SECONDARY DUMPER file-id SECONDARY LOADER file-id SEGMENT BUFFER SIZE bytes SERVICE DEVICE devtype SERVICE CIRCUIT cktid SERIVCE NODE VERSION node-version SERVICE PASSWORD password SOFTWARE IDENTIFICATION fileid SOFTWARE TYPE sftyp STATE state SUBADDRESSES subaddress-range TERTIARY LOADER fileid TYPE nodtyp }

Function:

This command sets the volatile or permanent parameters for the node identified as nodeid or set as executor.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### Arguments:

#### ADDRESS node-address

Specifies the address of the node to which you want the database entry to refer. The format of the node address is:

area-number.node-number

where the area-number is in the range 1-63 and the node-number is in the range 1-255 for DN20 nodes and 1-1023 for Ethernet nodes.

#### AREA MAXIMUM COST number

This parameter applies only if the executor node is of type AREA.

Sets the maximum total path cost allowed from the executor to any other level 2 routing node. The value is the maximum cost of circuits on the longest path between level 2 routers. Number is a decimal in the range 1-1022.

#### AREA MAXIMUM HOPS number

This parameter applies only if the executor node is of type AREA.

Sets the maximum number of routing hops allowable from the executor to any other level 2 routing node. Number is a decimal in the range 1-30.

The AREA MAXIMUM COST and AREA MAXIMUM HOPS parameters are used to determine whether an area is reachable. In effect, AREA MAXIMUM HOPS and AREA MAXIMUM COST control the total possible path between areas in the network.

#### BROADCAST ROUTING TIMER seconds

This parameter applies to the executor node only.

Specifies the maximum amount of time allowed between routing updates on Ethernet circuits. When the timer expires before a routing update occurs, a routing update is forced. The routing update produces a routing configuration message for each adjacent node. Routing uses this timer to enforce a maximum delay between routing updates. You can specify a number in the range 1 to 65535. The default value is 40.

#### BUFFER SIZE bytes

This parameter applies to the executor node only. This means that entity must be executor or nodeid must refer to the executor. If the executor has not been specified, executor defaults to the node where NCP is running.

Sets the actual size of all circuit buffers, including protocol overhead. Size is a decimal number in the range 1-65535.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

For DECnet-10 nodes, the permitted range is 290-576 for DN20 circuits and 290-1467 for Ethernet circuits. The default is 576 bytes. This value must be 576 to support all DIGITAL operating systems. For a KL10 with a DN20 MCB, the buffer size must be equal or greater than  $2 * \text{MAXIMUM ADDRESS} + 5$ . The buffersize for all nodes in the network must be the same.

This value cannot be set for DECnet-10. It must be configured at installation (refer to the TOPS-10 DECnet and PSI Installation Guide).

### CONSOLE LOAD FILE file-id

This parameter applies to Ethernet communications servers.

Identifies the file containing the software for downline loading remote console software into an Ethernet communications server.

### CONSOLE SECONDARY LOADER file-id

This parameter applies to Ethernet communications servers.

Identifies the file containing the secondary boot loader for downline loading remote console software into an Ethernet communications server.

### COUNTER TIMER seconds

This parameter applies to all nodes except loop nodes.

Seconds is a decimal integer in the range 1-65535. Counter timer is a Network Management Timer. When the seconds indicated have elapsed, the node counters are recorded as data in a logging event, and then zeroed. The logging begins again, and the log-record-zero cycle continues as long as the remote node communicates with the local node, or until the counter is cleared. The counter timer value must be set for the circuit counters to be automatically logged.

### CPU cputyp

This parameter applies to adjacent nodes only. Identifies the node's CPU type as one of the following:

DECSYSTEM-1020  
PDP-8  
PDP-11  
VAX-11

TOPS-10 supports loading of DN20 and Ethernet nodes (executor must be the KL10 node). Refer to the appropriate manuals to determine CPU types that can be downline loaded by non-DECnet-10 nodes that are acting as executors in your network.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### DELAY FACTOR number

This parameter applies to the executor node only.

Sets the number used as a multiplier in an NSP algorithm that determines when to retransmit a message. The delay factor is multiplied by 1/16 of the round trip delay to set the retransmission timer to that node. The default value for DECnet-10 is 48. Number is a decimal number in the range 1-255. The larger the value of number, the longer the delay before retransmission.

### DELAY WEIGHT number

This parameter applies to the executor node only.

This parameter is used as a weighting factor when updating the estimated round trip delay to a node. Number is a decimal in the range 1-255. This value is initialized during network generation but can be modified by Network Management. The default for DECnet-10 is 10.

### DIAGNOSTIC FILE file-id

This parameter applies to adjacent nodes on Ethernet circuits.

Identifies the file to read from when the adjacent node is down-line loaded, and has requested diagnostics. The file-id is the name of the diagnostics file in the volatile data base that the target node can read.

### DUMP ADDRESS number

This parameter applies to adjacent nodes only.

Sets the memory address where the upline dump of an adjacent node is to begin. This parameter value is not supported for DECnet-10 nodes because a full dump is always taken.

### DUMP COUNT number

Sets the default number of memory units to upline dump from the adjacent node specified. This parameter value is not supported for DECnet-10 nodes because a full dump is always taken.

### DUMP FILE fileid

This parameter applies to adjacent nodes only.

Identifies the file to receive the upline dump.

### HARDWARE ADDRESS eth-address

Identifies the Ethernet address originally assigned to the Ethernet controller for the system. This address is necessary for communication with the system (for such purposes as down-line loading). Eth-address is a string of 12 hexadecimal digits, represented by 6 bytes separated by hyphens.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### HOST nodeid

This parameter applies to an executor node or an adjacent node.

For the executor, identifies the node from which the executor requests services. For an adjacent node, it is the node providing service. If no host is specified, the default is the executor node.

### IDENTIFICATION idstring

This parameter applies to the executor node only.

Sets the text identification string for the executor, for example, "Development System" or "Research Lab." Idstring is an arbitrary string of 1-32 characters. An idstring containing blanks or tabs must be enclosed in quotation marks; two adjacent quotation marks indicate a quotation mark within a quoted string. The default for DECnet-10 is the system name set during the installation procedure.

### INACTIVITY TIMER seconds

This parameter applies to the executor node only.

The value in seconds determines the maximum time allowed to elapse with no activity in a logical link. When the number of seconds specified have elapsed, NSP tests the link with artificial traffic. The default for DECnet-10 is 120.

### INCOMING TIMER seconds

This parameter applies to the executor node only.

Sets a timeout value for incoming connects. If the connect is not accepted or rejected by the user within the number of seconds specified, Session Control rejects it for the user. Seconds is a decimal number in the range 1-65535. The default for DECnet-10 is 30.

### LOAD FILE file-id

This parameter applies to an adjacent node only.

Sets the file identification of the file to read when the node is downline loaded. File-id is in the format required by the executor's file system.

### MAXIMUM ADDRESS number

This parameter applies to the executor node only.

Sets the largest node address and, thus determines the greatest number of nodes that can be addressed by the local node. Number is a decimal value in the range 1-1023 for Ethernet communications, and 1-255 for DN20 communications. The default is 1023. Lowering this value will decrease system memory usage, therefore use the smallest number possible.

This value cannot be set for DECnet-10. It must be configured at installation (refer to the TOPS-10 DECnet and PSI Installation Guide).

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### MAXIMUM AREA number

This parameter is not implemented for DECnet-10, and it applies only if the executor node is of type AREA.

Sets the largest area number, and thus is the number of areas that can be known about by the executor node's Routing layer. Number is an integer in the range 1-63. If this parameter is not specified, the Routing layer will recognize up to 63 areas.

### MAXIMUM BROADCAST NONROUTERS number

This parameter is the maximum number of nonrouting nodes (end nodes) that the executor node can recognize on its Ethernet circuits. Number is an integer in the range 0-65535. The default for DECnet-10 is 64.

### MAXIMUM BROADCAST ROUTERS number

This parameter is the maximum number of routers the executor node can recognize on its Ethernet circuits. Each routing node can be either a level 1 router (capable of routing within its own area, if area routing is specified) or a level 2 router (capable of routing within its own area and outside of its area). Number is an integer in the range 0-65535. The default for DECnet-10 is 32.

### MAXIMUM BUFFERS number

This parameter applies to the executor node only.

Sets the total number of buffers allocated to all circuits. Routing uses this number to determine the size of its buffer pool.

This parameter applies to the DN20 MCB node only and cannot be set by the operator or system manager. It is generated with NETGEN and can be changed only by repeating the NETGEN procedure (see the TOPS-10 DECnet and PSI Installation Guide). You can display MAXIMUM BUFFERS when you type the NCP command SHOW EXECUTOR CHARACTERISTICS when the executor is the MCB front end.

### MAXIMUM CIRCUITS number

This parameter applies to the executor node only.

Sets the maximum number of circuits that this node can support in the network. Number is a decimal number in the range 1-20. The default is 16.

This parameter applies to the DN20 MCB node only and cannot be set by the operator or system manager. MAXIMUM CIRCUITS is displayed in response to the SHOW EXECUTOR CHARACTERISTICS NCP command when the executor is the DN20 MCB node.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### MAXIMUM COST number

This parameter applies to the executor node only.

Sets the maximum total path cost allowed from the executor to any node. Path cost is the sum of the circuit costs along a path between two nodes. If the path cost is greater than the MAXIMUM COST, the node is considered unreachable. Number is a decimal in the range 1-1022. The default for DECnet-10 is 100.

### MAXIMUM HOPS number

This parameter applies to the executor node only.

Sets the maximum number of hops between any two nodes in the network. If the number of hops is greater than the MAXIMUM HOPS, the node is considered unreachable. Number is a decimal number in the range 1-30. The default for DECnet-10 is 16.

### MAXIMUM LINKS number

This parameter applies to the executor node only.

Sets the maximum allowable active logical link count for the node. Number is a decimal in the range 1-65535.

This parameter applies to the DN20 MCB node only and cannot be set by the operator or system manager. MAXIMUM LINKS is displayed in response to the SHOW EXECUTOR CHARACTERISTICS NCP command when the executor is the DN20 MCB node.

### MAXIMUM VISITS number

This parameter applies to the executor node only.

Sets the maximum number of nodes a message coming into this node can have visited. If the number specified is exceeded and the destination is not for this node, the message is discarded. Number is a decimal number that cannot be less than MAXIMUM HOPS. The upper limit is 63. The default for DECnet-10 is 20.

### OUTGOING TIMER seconds

This parameter applies to the executor node only.

Sets a timeout value for outgoing connects. If the time between the request of a connect and the acknowledgement of the request is greater than the specified seconds, Session Control returns an error. Seconds is a decimal number in the range 1-65535. The default for DECnet-10 is 60.

### RETRANSMIT FACTOR number

This parameter applies to the executor node only.

Sets the number of times the source NSP will retransmit a timed-out message. If the value of number is exceeded, NSP reports to Session Control a loss of confidence for this logical link. In DECnet-10, Session Control then aborts the logical link. The default for DECnet-10 is 10.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### ROUTING TIMER seconds

This parameter applies to the executor node only.

Sets the number of seconds between transmissions of routing messages on non-Ethernet circuits.

Routing update messages contain information about the cost and hops to each node in the network. These messages are sent automatically whenever there is a change in the information (for example, when a line goes down). In addition, routing update messages are sent periodically by the routing timer. These periodic transmissions ensure that routing tables are kept up to date in the unlikely event that a routing update message is lost.

Seconds is a decimal in the range 1-65535. The default for DECnet-10 is 600.

### SECONDARY DUMPER fileid

This parameter applies to adjacent nodes only.

Identifies the secondary dumper file to be used for upline dumping the adjacent node. See Section 4.5.8, Specifying Files.

### SECONDARY LOADER fileid

This parameter applies to adjacent nodes only.

Identifies the secondary loader file to be used for downline loading the adjacent node.

### SEGMENT BUFFER SIZE bytes

For DECnet-10, the value of this parameter is equal to the value set for BUFFERSIZE; SEGMENT BUFFER SIZE cannot be changed.

Sets the maximum size of the end-to-end segment. This size includes protocol overhead down to and including the End Communication layer, plus a constant value of 6 (for compatibility with the BUFFER SIZE parameter definition). The size does not include the Routing or Data link overhead (except for the constant value of 6).

The size is in bytes, and is a decimal integer in the range 256-576.

### SERVICE CIRCUIT cktid

This parameter applies to adjacent nodes only.

Sets the circuit to be used to the adjacent node for downline loading or upline dumping. For downline loading the NODE node parameter must be the target (adjacent) node. (See Section 7.3.2 for an explanation of cktid.)



## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### SERVICE DEVICE devtype

This parameter applies to adjacent nodes only.

Sets the service device type the adjacent node uses when in service slave mode (MOP protocol). The value typed for devtype is one of the standard line device mnemonics. The options are the following:

CI	CNA	DA	DL
DLV	DMC	DMF	DMP
DMR	DMV	DN	DP
DPV	DQ	DTE	DU
DUP	DV	DZ	ETH
KDP	KDZ	KL	KMY
KMX	NI	PCL	QNA
UNA			

See Appendix F for a description of DECnet line devices.

DECnet-10 does not require the device type before using a LOAD command; however, if devtype is set, the system verifies that the node is associated with the named device.

### SERVICE NODE VERSION node-version

Specifies the DECnet-10 software version of the node which downline loads its software to the target node. Version is the number 1 for Phase IV and 0 for previous versions. The default value is 1 (Phase IV).

### SERVICE PASSWORD password

This parameter applies to adjacent nodes only.

Sets the password required to trigger the bootstrap mechanism on the adjacent node. Password is a hexadecimal number. For DDCMP circuits, the range is 0 to FFFFFFFF; for Ethernet circuits the range is 0 to FFFFFFFFFFFFFFFF.

### SOFTWARE IDENTIFICATION softwareid

This parameter applies to adjacent nodes only.

Sets any descriptive string that will identify the software to be loaded when the adjacent node is downline loaded (example, DN20 files). Softwareid contains up to 16 alphanumeric characters.

### SOFTWARE TYPE sftyp

This parameter applies to adjacent nodes only.

Identifies the initial software to be loaded in a downline load operation as one of:

SECONDARY LOADER  
TERTIARY LOADER  
SYSTEM

NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

STATE state

For EXECUTOR node: (Not implemented by DECnet-10)

ON  
OFF  
SHUT  
RESTRICTED  
(See Section 7.3.3 for definition of these parameter values.)

For Remote nodes: (Not implemented by DECnet-10)

REACHABLE  
UNREACHABLE  
(See Section 7.3.3 for definition of these parameter values.)

TERTIARY LOADER fileid

This parameter applies to adjacent nodes only.

Identifies the tertiary loader file to be used for downline loading the adjacent node.

TYPE nodtyp

This parameter applies to the executor node only. NML parses the command, but TYPE cannot be set for DECnet-10. If a node other than a TOPS-10 node is to execute this command, consult the appropriate documentation. Type is one of:

AREA-ROUTER  
NONROUTING-III  
NONROUTING-IV  
ROUTING-III  
ROUTING-IV

Examples:

1. Set the name of node 5.14 to AURORA:

NCP>SET NODE 5.14 NAME AURORA

2. Set the default processor type to be downline loaded:

NCP>SET NODE BANGOR SOFTWARE IDENTIFICATION -  
RSX-11S-V3.2

Remarks:

As a user with operator privileges, if you change a parameter value (or several values) to improve a temporary condition or to get a response specific to your own requirements, it is usually good practice to restore the original setting before exiting from NCP. If you feel that the change should remain, consult your system manager or inform other users by message. The default parameter values that are present when the system is brought up are acceptable under normal conditions. Be sure that you understand the probable effect of any change before you make it. For example, it is strongly suggested that you refer to the NSP specification before changing DELAY FACTOR or DELAY WEIGHT.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Command	Entity	Keyword/Argument
<pre>{ SET   DEFINE }</pre>	<pre>KNOWN NODES</pre>	<pre>{ ALL   COUNTER TIMER seconds }</pre>

**Function:**

SET KNOWN NODES ALL loads all node parameter values from the permanent data base into the volatile data base (this command is not supported by DECnet-10). Other SET KNOWN NODES commands set the specified value in the volatile data base of each node known to the executor. Note that many values that can be set for one node do not apply logically to KNOWN NODES.

**Arguments:**

See SET/DEFINE NODE (singular).

**Examples:**

1. Set the node logging event for all known nodes to take place every 600 seconds:

```
NCP>SET KNOWN NODES COUNTERS 600
```

**Remarks:**

On the DN20 MCB node, setting COUNTER TIMERS for KNOWN NODES is very demanding on NML resources and should be avoided if not necessary.

### 7.5.6 SET/DEFINE LOGGING

Command	Entity	Keyword/Argument
<pre>{ SET   DEFINE }</pre>	<pre>{ LOGGING sinktype   KNOWN LOGGING }</pre>	<pre>{ ALL   EVENT eventlist [sourcequal] [sinknode]   KNOWN EVENTS [sourcequal] [sinknode]   NAME sinkname   STATE sinkstate }</pre>

**Function:**

Used to control where events are logged (event sinks) and which events get logged. (the DECnet-10 default is all events logged to SYS:ERROR.SYS.)

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### Arguments:

See Section 7.3.6 for sinktype, eventlist, and sinkstate. See Table 7-1 in the same section for the relationship between class and entity required for sourcequal.

#### NAME sinkname

Identifies the name of the console, file, or monitor program to which events will be logged:

If sinktype is CONSOLE, enter device name  
If sinktype is FILE, enter file name  
If sinktype is MONITOR, enter identification string for the monitoring program

DECnet-10 does not support the MONITOR sink.

#### sourcequal

This argument selects a specific entity according to event classes. The format is:

AREA area-id  
CIRCUIT ckt-id  
LINE line-id  
MODULE type  
NODE node-id,

#### sinknode

Specifies a node that receives events in format: SINK NODE nodeid or SINK EXECUTOR.

### Examples:

1. Cause all events generated locally to be logged to the logging console on remote node TOSCA.

```
NCP>SET LOGGING CONSOLE KNOWN EVENTS SINK NODE TOSCA
```

2. Cause all class 5 events for line ETH-0 to be logged on the CONSOLE

```
NCP>SET LOGGING CONSOLE EVENT 5.* LINE ETH-0
```

## 7.6 CHANGING NETWORK DATA BASES: CLEAR AND PURGE COMMANDS

The CLEAR command clears parameters from the volatile data base; for systems that support a permanent data base, the PURGE command clears parameters from the permanent data base. The entities are the same as the entities for the SET and DEFINE commands. However, not all parameters can be purged or cleared by executing commands that specify individual parameter values. The allowed parameter keywords are, therefore, a subset of the SET/DEFINE keywords. Except for the LOGGING entity, you need not supply values for keywords.

Refer to the arguments for the SET/DEFINE commands if you need to refresh your memory on restrictions and exact meaning of keywords. Complete information follows for only those commands that require further description.

NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Command	Entity	Keyword/Argument
{CLEAR} {PURGE}	LOGGING sinktype	{EVENT eventlist [sourcequal] [sinknode]} {KNOWN EVENTS [sourcequal] [sinknode]} {NAME sinkname}

Function:

Together with the SET/DEFINE LOGGING commands, these commands control the logging of events: both the events that will be logged and where they will be logged.

Arguments:

Refer to Section 7.3.6 for details.

Command	Entity	Keyword/Argument
{CLEAR} {PURGE}	{CIRCUIT cktid} {KNOWN CIRCUITS}	{ALL COUNTER TIMER} OWNER For systems supporting multipoint: {ACTIVE/INACTIVE/DYING BASE ACTIVE/INACTIVE/DYING INCREMENT BABBLE TIMER INACTIVE/DYING/DEAD THRESHOLD MAXIMUM BUFFERS MAXIMUM TRANSMITS TRANSMIT TIMER}
{CLEAR} {PURGE}	{LINE lineid} {KNOWN LINES}	{ALL COUNTER TIMER} For systems supporting multipoint: DEAD/DELAY/SCHEDULING/STREAM TIMER
{CLEAR} {PURGE}	{NODE nodeid} {KNOWN NODES} (EXECUTOR can be substituted for nodeid.)	{ALL CIRCUIT CONSOLE LOAD FILE CONSOLE SECONDARY LOADER COUNTER TIMER CPU DUMP ADDRESS DUMP COUNT DIAGNOSTIC FILE DUMP FILE HARDWARE ADDRESS HOST IDENTIFICATION INCOMING TIMER LOAD FILE NAME OUTGOING TIMER SECONDARY DUMPER SECONDARY LOADER SERVICE DEVICE SERVICE CIRCUIT SERVICE PASSWORD SOFTWARE IDENTIFICATION SOFTWARE TYPE TERTIARY LOADER}

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### Function:

The CLEAR and PURGE commands remove the volatile and permanent values, respectively, from the specified entity.

### Arguments:

None. (You specify the keyword only.)

### Examples:

With the exception of CLEAR EXECUTOR to change the executor from a remote node to the TOPS-10 node, and the CLEAR NODE command to remove a loopnode NAME, you will have little use for the CLEAR command. (These two uses have been shown.) It is not necessary to CLEAR a parameter value for an entity to change it. Using the SET command to establish the new value is sufficient. However, in the case of changing a node name, you must remove the node name before setting the new name, for example:

```
NCP>CLEAR NODE 255 NAME
NCP>SET NODE 255 NAME GOOSE
```

### Remarks:

DECnet-10 does not support the CLEAR command for the following parameters:

#### For CIRCUITS

```
OWNER
Multipoint parameters
X.25 parameters
```

#### For LINES

```
ALL
Multipoint parameters
X.25 parameters
```

#### For NODES

```
DUMP ADDRESS
DUMP COUNT
NAME (not for EXECUTOR)
X.25 parameters
Multipoint parameters
```

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### 7.7 MONITORING THE NETWORK: LIST AND SHOW COMMANDS

NCP provides commands to display information about network components, in the volatile and permanent database (DECnet-10 V4.0 does not support the permanent database). SHOW displays information about components for the running network. LIST performs a similar function, but lets you display and verify information in the permanent database.

The SHOW and LIST commands allow you to select components and display types. You can choose from the following display types.

CHARACTERISTICS	Includes parameters that remain constant until cleared or reset. For example, timer values and buffer sizes.
COUNTERS	Provides error and performance statistics. For example, logical links in use.
EVENTS	Includes information about events currently being logged by the logging entity. Logged events aid in detecting failures and isolating problems.  This display type is valid only for the SHOW LOGGING and LIST LOGGING commands.
STATUS	Includes dynamic information that usually reflects network operations for the running network.
SUMMARY	Includes only the most useful information from CHARACTERISTICS and STATUS display types.

If you do not specify a display type when issuing a SHOW or LIST command, SUMMARY is the default.

NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Command	Entity	Keyword/Argument	Qualifier
{LIST} {SHOW}	ACTIVE AREAS AREA area number KNOWN AREAS	{CHARACTERISTICS} {COUNTERS {STATUS {SUMMARY	
	ACTIVE CIRCUITS CIRCUIT cktid KNOWN CIRCUITS	{CHARACTERISTICS} {COUNTERS {STATUS {SUMMARY	[ADJACNET NODE nodeid]
	ACTIVE LINES KNOWN LINES LINE lineid	{CHARACTERISTICS} {COUNTERS {STATUS {SUMMARY	
	ACTIVE MODULES KNOWN MODULES EXECUTOR ACTIVE NODES KNOWN NODES LOOP NODES NODE nodeid		
	ADJACENT NODES	{CHARACTERISTICS} {COUNTERS {STATUS {SUMMARY	[CIRCUIT cktid] [KNOWN CIRCUITS]
	ACTIVE LOGGING KNOWN LOGGING LOGGING sink-type	{CHARACTERISTICS} {EVENTS {STATUS {SUMMARY	[SINK NODE nodeid] [KNOWN SINKS]
	MODULE CONSOLE	{CHARACTERISTICS} {SUMMARY	
	MODULE CONFIGURATOR	{STATUS } {SUMMARY }	[KNOWN CIRCUITS] [CIRCUIT cktid]
	MODULE LOADER MODULE LOOPER	{STATUS } {SUMMARY }	
	QUEUE		

Function:

The SHOW command displays information from the volatile data base; the LIST command displays information from the permanent data base.



NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Examples:

NCP>SHOW KNOWN CIRCUITS COUNTERS<RET>

6:32:38 NCP  
Set Executor Complete

NCP>

6:34:14 NCP  
Request # 262 Accepted

NCP>

6:34:15 NCP  
Request # 262; Show Known Circuits Counters Completed

Circuit = DTE-0-1

6423	Seconds Since Last Zeroed
7272	Terminating Packets Received
9027	Originating Packets Sent
0	Terminating Congestion Loss
6701	Transit Packets Received
7186	Transit Packets Sent
0	Transit Congestion Loss
0	Circuit Downs
0	Initialization Failures
852561	Bytes Received
510678	Bytes Sent
14361	Data Blocks Received
16220	Data Blocks Sent

Circuit = DMC-0

2468	Seconds Since Last Zeroed
0	Terminating Packets Received
0	Originating Packets Sent
0	Terminating Congestion Loss
1615	Transit Packets Received
1615	Transit Packets Sent
0	Transit Congestion Loss
1	Circuit Downs
0	Initialization Failures
17910	Bytes Received
230124	Bytes Sent
1233	Data Blocks Received
1615	Data Blocks Sent
0	Data Error Inbound
0	Data Errors Outbound
0	Remote Reply Timeouts
0	Local Reply Timeouts
0	Remote Buffer Errors
0	Local Buffer Errors
0	Selection Intervals Elapsed
0	Selection Timeouts

.  
. .  
. . .

NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Example 2:

```
.R OPR<RET>
OPR>ENTER NCP<RET>
NCP>SHOW ACTIVE NODES CHARACTERISTICS<RET>
NCP>
16:41:51 NCP
          Request # 307 Accepted
NCP>
16:42:00 NCP
Request # 307; Show Active Nodes Characteristics Completed
Executor Node = 7.123 (COURT)
  Identification = DECnet-10 Version 4.0
  Management Version = 4.0.0
  Host = 7.113 (KINGS)
  Loop Count = 1
  Loop Length = 127
  Loop With = Mixed
  Incoming Timer = 10
  Outgoing Timer = 30
  NSP Version = 4.0.0
  Maximum Links = 8
  Delay Factor = 2
  Delay Weight = 3
  Inactivity Timer = 30
  Retransmit Factor = 5
  Routing Version = 2.0.0
  Type = Routing IV
  Routing Timer = 60
  Maximum Address = 255
  Maximum Circuits = 8
  Maximum Cost = 100
  Maximum Hops = 16
  Maximum Visits = 32
  Maximum Broadcast Nonrouters = 64
  Maximum Broadcast Routers = 32
  Maximum Buffers = 66
  Buffer Size = 576
  Segment Buffer Size = 576

Remote Node = 7.113 (KINGS)

  No Information

Remote Node = 7.118 ()

  No Information

NCP>EXIT<RET>
```

Remarks:

SHOW or LIST entity with no information type (carriage return follows plural entity or entity entityid) will default to SUMMARY.

To successfully display STATE, STATUS, SUMMARY, CHARACTERISTICS, or COUNTERS for all DN20 lines and circuits, you must set the executor to the communications front end (DN20). The KL10 recognizes the DTE as the path it uses to load and dump the DN20. The characteristic needed to perform a dump or load is SERVICE ENABLED.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### 7.8 CONTROLLING THE NETWORK: DUMP, LOAD, LOOP, AND TRIGGER COMMANDS

The following section describe the commands for controlling the nodes in the network.

#### 7.8.1 DUMP

Command	Entity	Keyword/Argument
DUMP	NODE nodeid	[VIA cktid] [DUMP COUNT number] [PHYSICAL ADDRESS eth-address] [SECONDARY [DUMPER] fileid] [SERVICE DEVICE devtype] [[SERVICE] PASSWORD password] [TO dumpfileid]

#### Function:

Stores a copy of the target's memory image in a dump file at the host node.

#### Arguments:

VIA cktid

Identifies the circuit used for the dump.

TO dumpfileid

Identifies the host's file to receive the target's dump.

All other parameters and arguments are described in Section 7.5.3, the SET/DEFINE NODE nodeid command.

#### Example:

Copy the memory image of the DN20 node JAZZ to the host node.

```
NCP>DUMP NODE JAZZ<RET>
```

#### Remarks:

This command is not needed to obtain a dump when the DN20 is automatically reloaded. The dump is also automatic. However, there may be times you wish to dump the MCB front end when an automatic dump/load procedure is not indicated.

Before dumping the DN20, execute the NCP command SET CIRCUIT DTE-0-1 SERVICE ENABLED, if necessary. (The circuit you enable is the circuit connecting the host and target node.)

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

Command	Entity	Keyword/Argument
DUMP	VIA cktid	[[DUMP] ADDRESS number] [[DUMP] COUNT number] [PHYSICAL ADDRESS eth-address] [SECONDARY [DUMPER] fileid] [SERVICE DEVICE devtype] [[SERVICE] PASSWORD password] [TO dumpfileid]

Function and arguments as for DUMP NODE nodeid.

### Remarks:

The DN20 should not require this command. The SERVICE CIRCUIT for the DN20 is setup automatically when initial values are read from a command file at system startup.

The VIA cktid parameter and argument in the entity position is simply a more descriptive way of indicating the entity circuit.

DECnet-10 software normally requires no parameters; that is, the commands shown in the examples are executed under normal conditions. The node data base for the host node contains the needed dump parameter values when the system is brought up. If a needed parameter value is missing, the NCP response names the missing parameter. Use the SET NODE command to enter the missing parameter and repeat the DUMP NODE command.

### 7.8.2 LOAD

Command	Entity	Keyword/Argument
LOAD	{ NODE nodeid } { VIA cktid }	[ADDRESS nodeaddr] [CPU type] [FROM loadfileid] [HOST nodeid] [NAME nodename] [PHYSICAL ADDRESS eth-address] [SECONDARY [LOADER] fileid]  [SERVICE CIRCUIT cktid] [SERVICE DEVICE devtype] [SERVICE NODE VERSION node-version] [[SERVICE] PASSWORD password] [SOFTWARE IDENTIFICATION softwareid] [SOFTWARE TYPE type] [TERTIARY [LOADER] fileid] [VIA cktid] (Not applicable if command is LOAD VIA cktid.)

### Function:

The LOAD command allows one node in the network to load the system image file to a remote node in the network. (See Remarks for conditions and restrictions.)

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### NOTE

All parameters and arguments for the LOAD command are optional (with the exception of the PHYSICAL ADDRESS parameter, which must be specified with the LOAD VIA command). This is because the permanent data base contains values used as defaults by systems supporting a permanent data base. In DECnet-10, the values used are those initial values established as the volatile data base at system startup. You type only those keywords and values that you need to change. (For example, if you wish to load the DN20 with an alternate load file, you type an alternate filename.)

In DECnet-10, any missing parameters are indicated in an error message, and can be set at that time and the command re-tried.

### Arguments:

#### VIA cktid

Identifies the circuit over which to load.

#### ADDRESS nodeaddr

Nodeaddr is the address the target node is to use when it initializes.

#### CPU type

This is the target CPU type. See Section 7.3.3 for predefined arguments.

#### FROM loadfileid

Identifies the image file to be loaded.

#### HOST nodeid

Sends the target node the nodeid of the host node that will provide services (such as a file system) for the target node once it is loaded. Note that this may or may not be the same node as the executor. If HOST nodeid is not specified, the executor is assumed to be the host node of the target node.

#### NAME nodename

Specifies the name of the target node.

#### PHYSICAL ADDRESS eth-address

Identifies the Ethernet address. This parameter is required in the LOAD VIA command and is optional in the LOAD NODE command.

#### SECONDARY [LOADER] fileid

Identifies the secondary loader file; that is, the file to be requested by the primary loader (contained in the target bootstrap).

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### SERVICE DEVICE devtype

Identifies the target node's line controller for the service line over which the operation is to take place. The options are the following:

CI	CNA	DA	DL
DLV	DMC	DMF	DMP
DMR	DMV	DN	DP
DPV	DQ	DTE	DU
DUP	DV	DZ	ETH
KDP	KDZ	KL	KMY
KMX	NI	PCL	QNA
UNA			

See Appendix F for a description of DECnet line devices.

### SERVICE NODE VERSION node-version

This parameter is the DNA version of the adjacent node, which is used to determine the TARGET SYSTEM ADDRESS parameter in the MOP Parameter Load with Transfer Address message. Phase IV is indicated by 1, and Phase III is indicated by 0. The default is 1.

### SERVICE PASSWORD password

Identifies the password required to trigger the bootstrap mechanism on the target node. The password is a hexadecimal number. For DDCMP circuits, it is in the range 0-FFFFFFF; for Ethernet circuits, it is in the range 0-FFFFFFFFFFFFFFF. The SERVICE keyword is optional.

### SOFTWARE IDENTIFICATION software type

See Section 7.5.4, SET NODE nodeid command for descriptions of this keyword.

### SOFTWARE TYPE type

See Section 7.5.4, SET NODE nodeid command for descriptions of this keyword.

### TERTIARY LOADER fileid

Identifies the tertiary loader file (requested by the secondary loader file) for the target node.

### Examples:

See Section 3.1 for examples.

### Remarks:

See Section 3.1 for loading procedure.

NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

7.8.3 LOOP

Command	Entity	Keyword/Argument
LOOP	( NODE node-id EXECUTOR LINE line-id )	[USER user-id] [COUNT count] [ACCOUNT account] [LENGTH number] [PASSWORD password] [WITH ONES] ZEROS] MIXED]
		[ASSISTANT NODE node-id] [ASSISTANT PHYSICAL ADDRESS eth-address] [HELP help-type] [NODE node-id] [PHYSICAL ADDRESS eth-address]

Function:

This command tests a node, line, or circuit by transmitting test blocks of data.

Arguments:

Access information (USER, ACCOUNT, and PASSWORD) refers to these values for the node named in NODE nodeid. If node is remote, the conventions of the remote node are used.

COUNT count

This parameter is the number of blocks to be sent during loopback testing. The count is a decimal integer in the range 1-65535.

LENGTH number

This parameter is the length (in bytes) of blocks to be sent during loopback testing. The length is a decimal integer in the range 1-65535.

WITH ONES  
ZEROS  
MIXED

This parameter specifies the content of the test data. The default is MIXED (a combination of ones and zeroes).

Arguments for CIRCUIT

ASSISTANT PHYSICAL ADDRESS eth-address

This parameter is not supported by DECnet-10.

Identifies the Ethernet physical address of the node that will perform the role of loopback assistant for Ethernet third-party loop testing. ASSISTANT PHYSICAL ADDRESS must be specified if HELP is included in this command. The address cannot be a multicast address. Eth-address is a string of 12 hexadecimal digits, represented by 6 bytes separated by hyphens. This parameter can be used instead of the ASSISTANT NODE parameter.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### ASSISTANT NODE node-id

This parameter is not supported by DECnet-10.

Identifies the name of the node or the address of the node that will perform the role loopback assistant for Ethernet third-party loop testing. This parameter can be used instead of the ASSISTANT PHYSICAL ADDRESS parameter.

### HELP help-type

This parameter is not supported by DECnet-10.

Indicates the amount of assistance to be provided during Ethernet loopback testing by the assistant node, whose address is specified in the ASSISTANT NODE ADDRESS or node-id as specified in the ASSISTANT NODE parameter. There are three possible values of help-type:

#### TRANSMIT

The assistant node relays the request to the destination node, which replies directly to the executor node.

#### RECEIVE

The executor node sends the request directly to the destination node, which relays the reply to the assistant node for transmission to the executor node.

#### FULL

The assistant node relays the request and the reply between the executor node and the destination node.

### NODE node-id

Identifies the destination node to be used for loopback testing of the specified Ethernet circuit. Can be used instead of the PHYSICAL ADDRESS parameter.

### PHYSICAL ADDRESS eth-address

Identifies the Ethernet physical address of the destination node to be used for loopback testing of the specified Ethernet circuit. Eth-address is a string of 12 hexadecimal digits, represented by 6 bytes separated by hyphens.

### Examples:

1. Start an Ethernet circuit-level loopback test with a node whose Ethernet physical address is AA-00-04-00-FF-04.

```
NCP>LOOP CIRCUIT ETH-0 PHYSICAL ADDRESS -  
AA-00-04-00-FF-04
```



## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### Remarks:

LOOP NODE (and LOOP CIRCUIT) are described in detail in Section 3.7.1.

DECnet-10 supports the LOOP CIRCUIT command for Ethernet lines only.

If any of the three access parameters (USER, ACCOUNT, or PASSWORD) are typed, they must precede other optional parameters.

### 7.8.4 TRIGGER

Command	Entity	Keyword/Argument
TRIGGER	$\left. \begin{array}{l} \text{NODE nodeid} \\ \text{VIA cktid} \end{array} \right\}$	$\left. \begin{array}{l} [\text{PHYSICAL ADDRESS eth-address}] \\ [[\text{SERVICE}] \text{PASSWORD password}] \\ [\text{VIA cktid}] \\ \text{PHYSICAL ADDRESS eth-address} \\ [[\text{SERVICE}] \text{PASSWORD password}] \end{array} \right\}$

### Function:

The TRIGGER command attempts to cause the target node (the node to be loaded) to send a load request to the executor. The executor must be an adjacent node. Use this command to initiate the loading sequence for an unattended system.

### Arguments:

PHYSICAL ADDRESS eth-address

This parameter is the Ethernet address currently in use for the target node. It is required in the TRIGGER VIA command and optional in the TRIGGER NODE command.

[[SERVICE] PASSWORD password]

This parameter specifies the password to trigger the target node. The entire parameter with its value is optional. If included, SERVICE (for clarity) may be included or omitted as an additional keyword.

VIA cktid

Identifies the circuit over which the operation is to take place.

## NCP COMMANDS PROCESSED BY THE NETWORK MANAGEMENT LAYER

### Examples:

1. Trigger node TRMSRV to initiate a downline load.

```
NCP>TRIGGER NODE TRMSRV
```

2. Trigger Ethernet node SWIFT to initiate a downline load. The executor node uses the Ethernet physical address to address SWIFT on Ethernet circuit ETH-0.

```
NCP>TRIGGER NODE SWIFT PHYSICAL ADDRESS -  
AA-00-04-00-07-04 VIA ETH-0
```

3. Provide a service password in order to trigger node NYC to initiate a downline load over circuit ETH-0.

```
NCP>TRIGGER NODE NYC SERVICE PASSWORD -  
FEFEFEFEFEFEFEFEFE VIA ETH-0
```

### Remarks:

DECnet-10 V4.0 does not support the TRIGGER command for the DN20. Other target nodes, such as terminal servers, are supported.

### 7.9 MONITORING NODE ACTIVITY: ZERO COMMAND

Command	Entity	Keyword/Argument
ZERO	( CIRCUIT cktid KNOWN CIRCUITS EXECUTOR LINE lineid KNOWN LINES NODE nodeid KNOWN NODES KNOWN MODULES )	COUNTERS

### Function:

The ZERO command resets the counters for the specified entity on the local node.

### Arguments:

None - counters are considered as an aggregate. Individual text items, such as line down for line counters can not be addressed.

### Examples:

1. Resets all node counters maintained on the local node for node AURORA.

```
NCP>ZERO NODE AURORA COUNTERS
```

2. Resets all circuit counters for all known circuits.

```
NCP>ZERO KNOWN CIRCUIT COUNTERS
```

## CHAPTER 8

### NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

If the PSI Version 1.0 software option is included in your TOPS-10 system, your DECnet network supports the X.25 facility for using Public Packet Switching Networks (PPSNs). You can then use the X.25 NCP commands and parameters.

If the PSI software option is not included in your TOPS-10 system, your DECnet network may include nodes of DIGITAL systems that support the X.25 facility for using PPSNs. The Network Management modules understand the syntax of X.25-related commands and parameters. You can, therefore, by using the TELL node-id prefix or the SET EXECUTOR NODE node-id command, direct X.25-related commands to DECnet nodes that support a Packetnet System Interface (PSI).

This chapter contains a complete list of X.25-related NCP commands as specified by the DNA. As was true of the DECnet utility commands documented in previous chapters, the set of commands implemented, and the way in which they are implemented, is a function of the operating system of each node in the network.

#### 8.1 THE MODULE ENTITY

You have already been introduced to five possible entities (controllable objects) that are addressable in Phase IV DECnet: NODES, LINES, CIRCUITS, LOGGING, and maintenance MODULE. With the addition of the X.25 facility, another entity is provided. This is the X.25 MODULE entity. The X.25 MODULE entity takes one of three forms: MODULE X25-ACCESS, MODULE X25-PROTOCOL, and MODULE X25-SERVER. The general nature of the information contained in the data bases associated with each is as follows:

##### MODULE X25-ACCESS

The access module data base contains the information needed to connect to one or more Public Packet Switching Networks (PPSNs). The information is indexed by network name. NCP commands that reference this data base must indicate the name of the network to which the command applies unless there is only one network name in the data base. This data base resides in the TOPS-10 host node.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

### MODULE X25-PROTOCOL

The protocol module data base contains the information needed to maintain switched virtual circuits (SVCs) and permanent virtual circuits (PVCs) through the public data network.

Much of the SVC information is indexed by the local Data Termination Equipment (DTE) address. This address is assigned by the PPSN at the time the line is installed. You must include this address whenever it is a parameter in an NCP command, unless it is the only DTE address in the data base. This data base resides in the gateway node.

### MODULE X25-SERVER

The server module data base contains the information needed to map incoming calls to a DECnet process. This information is indexed by destination name. You must associate each destination name with a DECnet node and process identification and with the necessary X.25-related information to recognize the incoming call. NCP commands that reference this data base must indicate to which destination name they apply unless there is only one such name defined in the data base. This data base resides in the gateway node.

## 8.2 X.25-SPECIFIC COMMANDS

SET, CLEAR and SHOW refer to parameters in the volatile data base; DEFINE, PURGE, and LIST refer to parameters in the permanent data base. These three pairs are considered together in the detailed descriptions that follow. All other commands are described in separate charts. Remember that neither TOPS-10 nor the MCB supports a permanent data base. Therefore, only SET, CLEAR, and SHOW are used for TOPS-10 PSI. All commands are described because other operating systems may implement a permanent data base.

Command	Entity	Keyword/Argument
{ SET DEFINE }	{ CIRCUIT cktid KNOWN CIRCUITS }	{ MAXIMUM DATA bytecnt MAXIMUM WINDOW blockcnt USAGE usagtyp BLOCKING blockcnt1 NUMBER callnum MAXIMUM RECALLS recallcnt RECALL TIMER seconds CHANNEL chlnum DTE dteaddr TYPE X25 }

In addition to the parameters that are X.25-specific, the following parameters are common to both DDCMP and X.25 circuits: COUNTER TIMER, OWNER, and STATE. See Chapter 7 for definitions. (Definitions are the same except that there is no SERVICE value permitted for the STATE parameter in X.25 because X.25 circuits do not support any of the Network Management service functions.)

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

### NOTE

TOPS-10 PSI circuits are not owned by the executor, and the parameters are set at network generation time (see the TOPS-10 DECnet and PSI Installation Guide). Thus, you cannot change the following arguments with a SET/DEFINE command:

MAXIMUM BLOCK  
MAXIMUM WINDOW  
USAGE PERMANENT  
CHANNEL  
DTE  
TYPE X25

Only circuits of USAGE permanent are supported.

### Function:

These commands set volatile and permanent circuit parameters, respectively, for the circuit(s) identified by cktid.

### Arguments:

#### MAXIMUM DATA bytecnt

For Permanent Virtual Circuits (PVCs): the data link maximum X.25 block size permitted. For Switched Virtual Circuits (SVCs) owned by the executor node: the block size that routing is to request from the X.25 protocol handler module. Bytecnt is an integer in the range 1-65535. It must be less than or equal to the maximum block size allowed within the X.25 protocol handler.

#### MAXIMUM WINDOW blockcnt

For PVCs: the data link maximum number of X.25 blocks allowed to exist with outstanding acknowledgements. For SVCs owned by the executor node: the block count that routing is to request from X.25 for the circuit. Blockcnt is an integer in the range 1-255.

#### USAGE usagtyp

The value of usagtyp is one of the following:

##### INCOMING

This value is used for SVC incoming calls only and only for circuits owned by the executor node.

##### OUTGOING

This value is used for SVC outgoing calls only and only for circuits owned by the executor node.

##### PERMANENT

This value is used for all PVCs (circuits permanently connected to the same remote station).

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

### BLOCKING blockcnt1

This parameter applies to circuits owned by the executor node. The value you enter determines whether or not messages are blocked before being sent over the circuit. The possible values for blockcnt1 are:

ENABLED: Perform blocking  
DISABLED: No blocking

### NUMBER callnum

This parameter applies to outgoing X.25 circuits owned by the executor node. The value you enter in callnum is the full remote DTE address used to call out on the circuit. The address value must be an integer of one to sixteen digits.

### MAXIMUM RECALLS recallcnt

This parameter applies to outgoing X.25 circuits owned by the executor node. The value you enter determines the number of automatic call retries. Recallcnt is an integer in the range 0-255. If no value is set, there is no maximum.

### RECALL TIMER seconds

This parameter applies to outgoing X.25 circuits owned by the executor node. The value you enter determines the number of seconds between automatic retries. Seconds is an integer in the range 1-65535. If no value is set, there is no wait.

### CHANNEL chnlnum

This parameter applies to PVCs only. The value you enter for chnlnum is the channel number used in running the X.25 protocol on the circuit. The channel number is an integer in the range 0-4095.

### DTE dteaddr

This parameter applies to PVCs only. The value you enter is the data link X.25 local DTE address to which the circuit belongs. DTE address is an integer from one to sixteen digits.

### TYPE X25

For X.25 circuits, you must enter this parameter as TYPE X25. If you do not make this entry, the circuit is not usable.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

Command	Entity	Keyword/Argument
{ SET DEFINE }	MODULE X25-ACCESS	{ ALL network-qualifier network-options network-qualifier }

### NOTE

The use of SET MODULE X25-ACCESS ALL is meaningless if there is no permanent data base. Check the PSI documentation for the DIGITAL system that will execute the command. If there is a permanent data base, this SET command moves all permanent X.25 ACCESS module data base values to the volatile data base. DEFINE MODULE X25-ACCESS ALL is never meaningful with the plural entity KNOWN NETWORKS. DEFINE MODULE X25-ACCESS ALL with NODE nodeid is currently undefined.

### Function:

The SET and DEFINE MODULE X25-ACCESS command sets volatile and permanent data base parameters, respectively, needed to connect to the X.25 server for one or more networks.

### Arguments:

#### network-qualifier

Network-qualifier indicates the network name to which the command applies. If only one network is known, it is the default. Network name is the name of the PPSN: TELENET, TRANSPAC, or PSS, for example. The possible values for network-qualifier are:

KNOWN NETWORKS  
NETWORK network-name

#### network-options

Network options may be one or more of the following:

#### ACCOUNT account

The value of the access control account field to be used by the access routines in connecting to the PSI gateway. This value is used if the user does not supply an account value when calling the access routines (see the TOPS-10 PSI User's Guide for more information on access routines). If no account is set, none is included in the access control on connect by the access routines. Account is a string of one to 16 characters for TOPS-10.

#### NODE node-id

The identification of the node containing the X.25 gateway module that gives access to the associated PPSN. Node-id is a standard Network Management node identification.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

PASSWORD password

The value of the access control password field to be used by the access routines in connecting to the PSI gateway. This value is used if the user does not supply a password when calling the access routines (see the TOPS-10 PSI User's Guide for more information on access routines). If no password is set, none is included in the access control on connect by the access routines. Password is a string of one to 16 characters for TOPS-10.

USER user

The value of the access control user field to be used by the access routines in connecting to the PSI gateway. This value is used if the user does not supply a user identification when calling the access routines (see the TOPS-10 PSI User's Guide for more information on access routines). If no user is set, none is included in the access control on connect by the access routines. User is a string of one to 16 characters for TOPS-10.

### NOTE

ACCOUNT and USER are not used in DECnet-10.

### Examples:

```
NCP>SET MODULE X25-ACCESS NODE DNX25:: NETWORK TELENET
NCP>SET MODULE X25-ACCESS PASSWORD SECRET
```

### Remarks:

Consult the documentation for the operating system of the executor node. (Remember that DEFINE will be meaningless if the executor node's operating system does not support a permanent data base.)

Command	Entity	Keyword/Argument
<pre>{ SET DEFINE }</pre>	<pre>MODULE X25-PROTOCOL</pre>	<pre>ALL dte-qualifier     group-qualifier GROUP group-name     group-options CALL TIMER seconds CLEAR TIMER seconds DEFAULT DATA bytecnt DEFAULT WINDOW blockcnt MAXIMUM DATA bytecnt MAXIMUM CLEARS retrycnt MAXIMUM RESETS retrycnt MAXIMUM RESTARTS retrycnt MAXIMUM WINDOW blockcnt NETWORK network-name RESET TIMER seconds RESTART TIMER seconds dte-options dte-qualifier</pre>



## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

### Functions:

The SET and DEFINE MODULE X25-PROTOCOL commands control the parameters necessary to maintain switched and permanent virtual circuits through a public packet switching network over the assigned X.25 lines of the protocol module.

### Arguments:

ALL

Refer to NOTE for SET/DEFINE MODULE X25-ACCESS.

ALL dte-qualifier

dte-qualifier indicates the local DTE address to which the command applies. dte-qualifier may be one of:

KNOWN DTEs  
DTE dte-address

If only one DTE address is known to the X.25 protocol module, that address is the default. If more than one DTE address is known, you must give the applicable address.

ALL group-qualifier

Group-qualifier indicates the closed user group or bilateral closed user group to which the command applies. It may be one of the following:

KNOWN GROUPS  
GROUP group-name

Group name is an ASCII string of one to sixteen characters. It can have any value decided upon by the managers of the communicating systems. (See the TOPS-10 PSI User's Guide for a description of the user groups.)

ALL has the same interpretation already defined.

GROUP group-name group-options

Group-name is defined under the previous argument. Group-options is both of the following:

DTE dte-address  
NUMBER group-number  
TYPE group-type

DTE-address

The PPSN DTE address associated with the group-name.

Group-number

This is the closed user group number (defined by the PPSN). It must be an integer in the range 0-9999.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

### Group-type

If specified, the only value permitted is BILATERAL.

### CALL TIMER seconds

The value you set in seconds determines the elapsed time between receiving no response on an outgoing call from the DTE and the sending of a clear packet. (The sending of the clear packet is transparent to the user.) Seconds is an integer in the range 1-255.

### CLEAR TIMER seconds

The value you enter for seconds determines the elapsed time between retransmissions of clear packets. Seconds is an integer in the range 1-255. If no value is set, there is no retransmission.

### DEFAULT DATA bytecnt

This is the default block size for SVCs. The value you enter must be an integer in the range 1-1021, which is used when there is no negotiation for a packet size (see the TOPS-10 PSI User's Guide for more information on the flow control parameter negotiation facility).

### DEFAULT WINDOW blockcnt

This is the number of unacknowledged transmitted blocks on an SVC that can be sent before an acknowledgment is received. Once you set this value, it remains in effect until changed. The value that you enter must be an integer in the range 1-255, which is used when there is no negotiation for a window size (see the TOPS-10 PSI User's Guide for more information on the flow control parameter negotiation facility).

### MAXIMUM DATA bytecnt

The value you enter for this parameter establishes the maximum byte count for all X.25 circuits. Bytecnt must be an integer in the range 1-1021, which is the maximum value you can specify when negotiating for a packet size (see the TOPS-10 PSI User's Guide for more information on the flow control parameter negotiation facility).

### MAXIMUM CLEARS retrycnt

The value you enter for this parameter determines the maximum number of times that the X.25 protocol handler is to retry the sending of a clear packet for SVCs. The value must be an integer in the range 1-255. If you do not set a value, there is no maximum.

### MAXIMUM RESETS retrycnt

As for preceding parameter, but sets the maximum times for retrying the sending of a reset packet. If you do not set this value, there is no maximum. Retrycnt is an integer in the range 1-255.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

### MAXIMUM RESTARTS retrycnt

The value you enter for retrycnt determines the maximum number of times that the X.25 protocol handler retries the sending of a restart. If you do not set this value, there is no maximum. Retrycnt is an integer in the range 1-255.

### MAXIMUM WINDOW blockcnt

The value you enter in blockcnt determines the maximum number of unacknowledged transmitted blocks permitted on an SVC. The value of blockcnt must be an integer in the range 1-255, which is the maximum value you can specify when negotiating for a window size (see the TOPS-10 PSI User's Guide for more information on the flow control parameter negotiation facility).

### NETWORK network-name

Previously defined.

### RESET TIMER seconds

The value you enter for seconds determines the number of elapsed seconds between a transmission and a retransmission of an unacknowledged reset packet. Seconds must be an integer in the range 1-255. If no value is set, there is no retransmission.

### RESTART TIMER seconds

The value you enter for this parameter determines the elapsed seconds between transmission and retransmission of an outgoing restart packet from the local DTE. Seconds must be an integer in the range 1-255. If no value is set, there is no retransmission.

### dte-options

DTE-options, indexed by the local DTE address, include the following (not supported by TOPS-10 PSI):

#### CHANNELS list

List is one or more logical channel numbers that can be used for outgoing calls or possibly taken by incoming calls. If more than one channel number is specified, separate by commas.

#### COUNTER TIMER seconds

This is a Network Management timer. The value that you enter determines the time interval between successive recordings and zeroing of protocol module counters. If no value is set, there is no automatic logging of counters.

#### LINE lineid

Identification of the line associated with the DTE address. It cannot be set or defined by a Network Management command.

# NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

STATE dte-state

The value you enter must be one of:

- ON - DTE is allowed to operate normally
- OFF - DTE is not operating; all virtual circuits terminated immediately
- SHUT - local DTE will not allow new virtual circuits; existing virtual circuits continue

## Examples:

```
NCP>SET EXECUTOR NODE DNX25
```

```
NCP>SET MODULE X23-PROTOCOL MAXIMUM DATA 128
```

```
NCP>SET MODULE X25-PROTOCOL CHANNELS 10-1 DTE 311030301234
```

Command	Entity	Keyword/Argument
{ SET DEFINE }	MODULE X25-SERVER	{ ALL destination-qualifier COUNTER TIMER seconds MAXIMUM CIRCUITS count destination-options destination-qualifier }

## Function:

The SET/DEFINE MODULE X25-SERVER commands control the parameters related to the server module data base. Some parameter values entered provide the information needed to map incoming X.25 calls to a DECnet process; other parameters are independent of the destination name but are needed for more general functions related to incoming calls, for example, event recording.

## Arguments:

ALL

ALL has the previously defined meaning, related to the server module data base.

destination-qualifier

Indicates the destination to which the command applies. May be one of:

KNOWN DESTINATIONS - all destinations known to the server module DESTINATION destination-name

destination-name

The name of a specific destination. Name is an ASCII string of from one to sixteen characters. It is the responsibility of the system manager to assign destination names for input to his node. Because such names must be unique, this involves cooperation between managers of communicating nodes.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

### COUNTER TIMER seconds

This counter timer is the Network Management timer that determines the elapsed time between the logging of a server module logging event. Seconds is an integer in the range 1-65535.

### MAXIMUM CIRCUITS count

The value you enter for count indicates the number of circuits that the server module can have open at one time. Count must be an integer in the range 1-65535.

### destination-options

You can add new destination names at the initial reference to the destination name in an NCP SET command. You can remove old names from the data base using the CLEAR command. Parameters of an existing destination can be modified. The parameters accessed by destination name are described below. These parameters are divided into two groups:

- o Parameters that are applied to a field in the incoming call packet for the purpose of determining a match.
- o Parameters that define the DECnet characteristics necessary to initiate a logical link connect to a DECnet object.

The parameters that are applied to a field of the incoming call packet are:

CALL MASK                      hexadecimal string

This is a string of up to 32 hexadecimal characters that is used to determine the destination of the incoming call based on the content of the user call data field of the incoming call packet. This value is ANDed byte-by-byte with the user call data field of the incoming call packet. The resultant string is compared with the CALL VALUE.

CALL VALUE                     hexadecimal string

This is a string of up to 32 hexadecimal characters that is used to determine the destination of an incoming call based on the content of the user call data field of the incoming call packet. This value is compared byte-by-byte with the string resulting from the CALL MASK operation described above to determine the destination of an incoming call.

GROUP                          ascii-string

This is the closed user group or bilateral closed user group name used to determine the destination of an incoming call based on user group membership. If given, only incoming calls with this user group name will be routed to this destination.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

NUMBER	ascii-string
	This is the full remote DTE address used to determine the destination of an incoming call based on the calling DTE address in the incoming call packet. This value must be a string of digits and/or asterisks (*) from one to sixteen characters.
PRIORITY	decimal number
	This is the priority associated with a given entry in the DESTINATION data base. The highest priority is 255 and the lowest is 0. If an incoming call maps to more than one destination, the one with the highest priority is chosen. If there is more than one match with equal priority, the first is chosen.
SUBADDRESSES	range
	This is the range of the local DTE subaddresses used to identify the destination of an incoming call. If given, only those calls with the called DTE subaddresses in the specified range will be routed to this destination. A subaddress is a decimal number from 0-99.

### Examples:

```
NCP>SET EXECUTOR NODE DNX25
NCP>SET MODULE X25-SERVER CALL MASK 01 DESTINATION X29SRV
NCP>SET MODULE X25-SERVER CALL VALUE 01 DESTINATION X29SRE
NCP>SET MODULE X25-SERVER OBJECT 34 DESTINATION X29SRV
```

The following parameters are necessary to initiate a logical link connection to a DECnet destination object:

ACCOUNT	ascii-string
	This is the DECnet access control account string used when the Server module connects to the destination of an incoming call. The ascii-string can contain 1 to 16 characters.
NODE	nodeid
	This is the standard Network Management node name used when the Server module connects to the destination of an incoming call. This is a required parameter.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

**OBJECT**            objectid

This is the DECnet object identification used when the Server module connects to the destination of an incoming call. The value objectid can be one of the following:

An ASCII object name or numeric object name in quotes, of 1 to 16 characters

An object number, from 1 to 255

**PASSWORD**        ascii-string

This is the DECnet access control password used when the Server module connects to the destination of an incoming call; must be a string of 1 to 16 characters.

**USER**             ascii-string

This is the DECnet access control user identification to be used when the Server module connects to the destination of an incoming call; must be a string of 1 to 16 characters.

### Remarks:

To determine the destination for an incoming call, the information in the incoming call packet is compared with the CALL MASK, CALL VALUE, GROUP, NUMBER, and SUBADDRESSES parameters in each of the DESTINATION entries to see if there is a match. If there is a match, the ACCOUNT, NODE, OBJECT, PASSWORD, and USER parameters are used to initiate a logical link connect. If there is more than one match, the match with the highest PRIORITY is taken. If multiple matches have the same PRIORITY, the first entry in the data base is used.

If any of the fields used to identify the DECnet destination of an incoming call are missing, then no values are used for the missing fields in the identification process. It is the responsibility of the receiving node to take care of the distribution of messages with missing values in these fields (destination-options).

A match exists only if all the conditions described below are true:

1. The user call data field of the incoming packet, logically ANDed byte-by-byte with the CALL MASK, equals the CALL VALUE. If the user call data field is longer than the CALL MASK, then the strings need only be equal to the end of CALL MASK. If the CALL MASK is longer than the user call data field, a match can only be obtained if all bytes in the CALL MASK beyond the length of the user call data field are zero.
2. The GROUP parameter equals the closed user group from the incoming call packet, or no GROUP parameter is defined. If a GROUP parameter is defined and there is no group present in the incoming call packet, there is no match.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

3. The NUMBER parameter matches the calling DTE address in the incoming call packet. The match is determined by scanning both ASCII strings from left to right. The NUMBER parameter can be any combination of ASCII characters from 0 to 9 and the wildcard character "\*". A match exists if the following is true:
  - o There is no NUMBER parameter defined; or
  - o Up to the length of the shorter string, each character in the NUMBER parameter string contains an "\*" or the same decimal digit as the DTE address string; and
    - a. If the NUMBER parameter string is the shorter of the two strings, and the last character in the NUMBER parameter string is an asterisk; or
    - b. If the NUMBER parameter string is the longer of the two strings, the excess characters are all considered to be asterisks.
  - o If there is no calling DTE address, then a match can occur only if the NUMBER parameter string consists of one or more asterisks.
4. The local DTE subaddress from the incoming call packet is in the range defined by SUBADDRESSES, or there is no SUBADDRESSES range defined.

For a job to receive incoming calls, it must set itself up as a target task. The procedure for doing this is described in the TOPS-10 PSI User's Guide. Below are some examples showing the relation between the TOPS-10 target task file descriptor and the DESTINATION parameters.

You can specify two types of target tasks. The example below shows these and the values of the DESTINATION parameters required to connect to the target.

1. Specify a numbered object in the TOPS-10 program: If the user program specifies a target of the form '128', set the DESTINATION parameters:

```
OBJECT : 128
NODE : TOPS-10 node number
```

2. Specify a named object in the TOPS-10 program: If the user program specifies a target of the form 'TASK0', set the DESTINATION parameters:

```
OBJECT : TASK0
NODE : TOPS-10 node number
```

The parameters USER, PASSWORD, and ACCOUNT are optional. If the user program requires those parameters, the system manager must set them.



## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

Command	Entity	Keyword/Argument
{ SET DEFINE }	{ NODE nodeid KNOWN NODES EXECUTOR }	See Chapter 7 for all applicable parameters and values.

### Arguments:

There is one additional parameter specific to X.25:

**SUBADDRESSES range**

Previously defined (see destination-options for SET MODULE X25-SERVER). The subaddresses parameter distinguishes between calls destined for routing and calls destined for users.

All DECnet nodes in which Routing will use X.25 circuits must include the SUBADDRESSES parameter.

Command	Entity	Keyword/Argument
{ SET DEFINE }	LINE lineid	<p>Specific to LAPB (X.25 lines):</p> <p>{ HOLDBACK TIMER seconds MAXIMUM BLOCK byte-count MAXIMUM RETRANSMITS block-count MAXIMUM WINDOW block-count }</p> <p>Common to DDCMP and LAPB(X.25) lines:</p> <p>{ CLOCK clock-mode CONTROLLER controller-mode COUNTER TIMER seconds DEVICE deviceid DUPLEX duplex-mode PROTOCOL protocol-name RETRANSMIT TIMER milliseconds SERVICE service-control STATE line-state }</p>

### Arguments:

With the exception of PROTOCOL, keywords and arguments common to DDCMP and LAPB lines are adequately defined in the previous chapter. For PROTOCOL, the protocol name for lines using X.25 protocol must be LAPB.

**HOLDBACK TIMER seconds**

The value you enter for seconds determines the length of time an acknowledgement is held back to wait for a data message with which it can be included. If you do not specify a value, there is no wait. (This argument is not implemented for TOPS-10 PSI.)

**MAXIMUM BLOCK byte-count**

The value you enter determines the data link maximum byte count of the block size on the line. Byte count must be an integer in the range 1-65535.

## NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

### MAXIMUM RETRANSMITS block-count

The value you enter in block-count determines the data link maximum number of retransmissions of a block on the line. Block-count must be an integer in the range 1-255. If you do not set a value, there is no maximum.

### MAXIMUM WINDOW block-count

The value you enter for block-count determines the maximum number of unacknowledged transmitted blocks permitted on a line. Block-count must be an integer in the range 1-255.

Example:

```
NCP>TELL DNX25 SET LINE KDP-0-0 MAXIMUM RETRANSMITS 20
```

Command	Entity	Keyword/Argument
<pre>{SHOW} {LIST}</pre>	<pre>{MODULE module-name} {ACTIVE MODULES} {KNOWN MODULES}</pre>	<pre>Specific to named module; see "Arguments:" for keywords and values of each module name.  {CHARACTERISTICS} {COUNTERS} {STATUS} {SUMMARY}</pre>

### Function:

The SHOW command displays information from the volatile data base; the LIST command displays information from a permanent data base.

### Arguments:

Arguments for the entities ACTIVE MODULES and KNOWN MODULES are defined in Section 7.7. Arguments for named modules are:

Entity	Keyword/Argument
MODULE X25-ACCESS	<pre>{CHARACTERISTICS} [KNOWN NETWORKS] {COUNTERS} [NETWORKS network-name] {STATUS} {SUMMARY}</pre>
MODULE X25-PROTOCOL	<pre>{CHARACTERISTICS} [DTE dte-address] {COUNTERS} [KNOWN DTES] {STATUS} [GROUP group-name] {SUMMARY} [KNOWN GROUPS]</pre>
MODULE X25-SERVER	<pre>{CHARACTERISTICS} [KNOWN DESTINATIONS] {COUNTERS} [DESTINATION destination-name] {STATUS} {SUMMARY}</pre>

All X.25-specific parameters for named modules are previously defined in this chapter.

NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

Examples:

```
NCP>SHOW MODULE X25-ACCESS CHARACTERISTICS KNOWN NETWORKS<RET>
NCP>
15:01:11          NCP
Request # 3; Show Module Characteristics Completed
Module = X25-ACCESS

    Network = TELENET
    Node = 7.129 (MRX25)
    Password = X25-GATE

NCP>SET EXECUTOR NODE MRX25<RET>
NCP>
15:01:24          NCP
                  Set Executor Complete

NCP>SHOW MODULE X25-PROTOCOL CHARACTERISTICS KNOWN DTES<RET>
15:05:24          NCP
                  Request # 6 Accepted

NCP>
15:05:25          NCP
Request # 6; Show Module Characteristics Completed
Module = X25-PROTOCOL

    DTE = 311030300170
    Line = KDP-0-0
    Channels = 20-1
    Maximum Channels = 20

NCP>SHOW MODULE X25-PROTOCOL CHARACTERISTICS<RET>
NCP>
15:05:35          NCP
                  Request # 7 Accepted

NCP>
15:05:35          NCP
Request # 7; Show Module Characteristics Completed
Module = X25-PROTOCOL

    Network = TELENET
    Default Data = 128
    Default Window = 2
    Maximum Data = 256
    Maximum Window = 2
    Maximum Clears = 6
    Maximum Resets = 6
    Maximum Restarts = 6
    Call Timer = 180
    Clear Timer = 180
    Reset Timer = 180
    Restart Timer = 180

NCP>SHOW MODULE X25-PROTOCOL COUNTERS KNOWN DTES<RET>
NCP>
15:14:17          NCP
                  Request # 24 Accepted
```

NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

NCP>  
 15:14:18 NCP  
 Request # 24; Show Module Characteristics Completed  
 Module = X25-PROTOCOL

DTE = 311061700084  
 0 Seconds Since Last Zeroed  
 25783 Bytes Received  
 872951 Bytes Sent  
 17029 Data Blocks Received  
 28397 Data Blocks Sent  
 69 Calls Received  
 23 Calls Sent  
 0 Fast Selects Received  
 0 Fast Selects Sent  
 12 Maximum Switched Circuits Active  
 4 Maximum Channels Active  
 0 Received Call Resource Errors  
 8 Locally Initiated Resets  
 2 Network Initiated Resets  
 0 Remotely Initiated Resets  
 1 Restarts

NCP>SHOW MODULE X25-SERVER CHARACTERISTICS KNOWN DESTINATION<RET>  
 NCP>

15:16:12 NCP  
 Request # 25 Accepted

NCP>  
 15:16:15 NCP  
 Request # 25; Show Module Characteristics Completed  
 Module = X25-SERVER

Destination = X29  
 Node = 120  
 Object = 34 ()  
 Priority = 5  
 Call Mask = FF  
 Call Value = 01

Destination = KL2137  
 Node = KL2137  
 Object = 34 ()  
 Priority = 1  
 Call Mask = 01  
 Call Value = 01

Destination = X25  
 Node = 120  
 Object = 0 (X25TST)  
 Priority = 0  
 Subaddresses = 1

NCP>SHOW MODULE X25-SERVER COUNTERS<RET>

NCP>  
 15:16:37 NCP  
 Request # 26 Accepted

NCP>  
 15:16:37 NCP  
 Request # 26; Show Module Counters Completed  
 Module = X25-SERVER

0 Seconds Since Last Zeroed  
 12 Maximum Circuits Active  
 0 Incoming Calls Rejected, No Resources  
 0 Logical Links Rejected, No Resources

NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

Command	Entity	Keyword/Argument
ZERO	<pre> { MODULE X25-SERVER KNOWN MODULES MODULE X25-PROTOCOL </pre>	<pre> [COUNTERS] COUNTERS [KNOWN DTES] [DTE dte-address] </pre>

Function:

The zero command used with the module entity generates a counters zeroed event that causes counters to be logged and then zeroed. The counters zeroed are those the executor node supports for the entity that you specified, and possibly qualified, in the command.

Arguments:

All arguments previously defined in this chapter.

Remarks:

The command ZERO MODULE X25-PROTOCOL COUNTERS can be used only if there is no more than one DTE address on the executor node. If there is more than one DTE address, use the qualifier DTE dte-address, that is, ZERO MODULE X25-PROTOCOL COUNTERS DTE dte-address. You can also use the command in the form ZERO MODULE X25-PROTOCOL COUNTERS KNOWN DTES.

Examples:

```

NCP>SET EXECUTOR NODE MRX25
NCP>ZERO MODULE X25-SERVER COUNTERS
NCP>ZERO MODULE X25-PROTOCOL COUNTER KNOWN DTES

```

Command	Entity	Keyword/Argument
<pre> {CLEAR} {PURGE} </pre>	<pre> {CIRCUIT cktid} {KNOWN CIRCUITS} </pre>	<pre> {MAXIMUM RECALLS} {RECALL TIMER} </pre>

Function:

All CLEAR and PURGE commands clear parameters from the volatile and permanent data bases respectively.

Arguments:

No arguments specific to X.25. See Section 7.6

Example:

```
NCP>CLEAR CIRCUIT KDP-0-1 RECALL TIMER
```

<pre> {CLEAR} {PURGE} </pre>	<pre> {LINE lineid} {KNOWN LINES} </pre>	<pre> {ALL COUNTER TIMER HOLDBACK TIMER MAXIMUM RETRANSMITS} </pre>
------------------------------	--	---

NETWORK MANAGEMENT PACKET SWITCHING INTERFACE

Arguments:

ALL and COUNTER TIMER: see Section 7.6. HOLDBACK TIMER and MAXIMUM RETRANSMITS are X.25-specific and previously defined under SET LINE lineid in this chapter.

Example:

```

NCP>TELL MRX25 CLEAR LINE KDP-0-0 MAXIMUM RETRANSMITS
{CLEAR}      MODULE X25-ACCESS      {ALL network-qualifier}
{PURGE}                                     network-options
                                             network qualifier

```

Arguments:

network-options  
May be one or more of: ACCOUNT, PASSWORD, USER.

All arguments are previously defined. See SET/DEFINE for MODULE X25-ACCESS.

Example:

```

NCP>CLEAR MODULE X25-ACCESS PASSWORD NETWORK TELENET
{CLEAR}      MODULE X25-PROTOCOL    {ALL dte-qualifier
{PURGE}                                     group-qualifier
                                             GROUP group-name
                                             group-options
                                             CALL TIMER
                                             CLEAR TIMER
                                             MAXIMUM CLEARS
                                             MAXIMUM RESETS
                                             MAXIMUM RESTARTS
                                             RESET TIMER
                                             dte-options dte-qualifier}

```

Arguments:

All arguments previously defined in this chapter. See SET/DEFINE for MODULE X25-PROTOCOL.

Example:

```

NCP>TELL MRX25 CLEAR MODULE X25-PROTOCOL MAXIMUM CLEARS
{CLEAR}      MODULE X25-SERVER      {ALL destination-qualifier}
{PURGE}                                     COUNTER TIMER seconds
                                             destination-options
                                             destination-qualifier

```

Arguments:

Previously defined in this chapter. See SET/DEFINE MODULE X25-SERVER.

Example:

```
NCP>TELL MRX25 CLEAR MODULE X25-SERVER SUBADDR DEST KL2137
```

**APPENDIX A**  
**DECnet PARAMETER SUMMARY**

DECnet PARAMETER SUMMARY

Table A-1: Node Parameters

Digital Network Architecture				DECnet-10 V4.0 Implementation		
Param. Type No.	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
0	STATE 0 ON(Executor) 1 OFF(Executor) 2 SHUT(Executor) 3 RESTRICTED (Executor) 4 REACHABLE (Remote) 5 UNREACHABLE (Remote)	All nodes except Loop nodes		X	X	Can not be set Can be displayed
10	PHYSICAL ADDRESS	Ethernet loop nodes only	Display only	X		
100	IDENTIFICATION	EXECUTOR only		X	X	
101	MANAGEMENT VERSION Version Number ECO Number User ECO Number	EXECUTOR only	Display only			
110	SERVICE CIRCUIT	Adjacent only		X	X	
111	SERVICE PASSWORD	Adjacent only		X	X	
112	SERVICE DEVICE	Adjacent only		X	X	
113	CPU 0 PDP-8 1 PDP-11 2 DECSYSTEM-1020 3 VAX	Adjacent only		X X X X X	X X X X X	
114	HARDWARE ADDRESS	Adjacent only		X		Can not be set
115	SERVICE NODE VERSION 0 phase III 1 phase IV	Adjacent only		X		Can be displayed
120	LOAD FILE	Adjacent only		X	X	
121	SECONDARY LOADER	Adjacent only		X	X	
122	TERTIARY LOADER	Adjacent only		X	X	
123	DIAGNOSTIC FILE	Adjacent only		X		
125	SOFTWARE TYPE 0 SECONDARY LOADER 1 TERTIARY LOADER 2 SYSTEM	Adjacent only		X	X	
126	SOFTWARE IDENTIFICATION	Adjacent only				
130	DUMP FILE	Adjacent only		X	X	
131	SECONDARY DUMPER	Adjacent only		X	X	
135	DUMP ADDRESS	Adjacent only				
136	DUMP COUNT	Adjacent only				
140	HOST Node address Node name (if any)	Adjacent and EXECUTOR only	Display only	X	X	
141	HOST	Adjacent and set only EXECUTOR only		X	X	Can be set, displayed as parameter #140
150	LOOP COUNT	EXECUTOR only	Used with LOOP command only	X	X	Used with LOOP command only
151	LOOP LENGTH	EXECUTOR only	Used with LOOP command only	X	X	Used with LOOP command only
152	LOOP WITH 0 zeroes 1 ones 2 mixed	EXECUTOR only	Used with LOOP command only	X	X	Used with LOOP command only
153	LOOP ASSISTANT PHYSICAL ADDRESS	EXECUTOR only	Used with LOOP command only	X		Not implemented
154	LOOP HELP 0 transmit 1 receive 2 full	EXECUTOR only	Used with LOOP command only	X		



DECnet PARAMETER SUMMARY

Table A-1: Node Parameters (Cont.)

Digital Network Architecture				DECnet-10 V4.0 Implementation		
Param. Type No.	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
155	LOOP NODE	EXECUTOR only	Used with LOOP command only	X	X	
156	LOOP ASSISTANT NODE	EXECUTOR only	Used with LOOP command only	X		
160	COUNTER TIMER	All nodes except loop nodes		X	X	
500	NAME	All nodes except loop nodes	Special format	X	X	Can not be set for EXECUTOR, can be set for other nodes. Will be displayed in node-id
501	CIRCUIT	Loop nodes and nodes by name only		X	X	
502	ADDRESS	EXECUTOR only	Special format	X	X	Can not be set Displayed in node-id
510	INCOMING TIMER	EXECUTOR only		X	X	
511	OUTGOING TIMER	EXECUTOR only		X	X	
600	ACTIVE LINKS	All nodes except loop nodes	Display only	X	X	
601	DELAY	All nodes except EXECUTOR and loop	Display only	X	X	
700	NSP VERSION Version Number ECO Number User ECO Number	EXECUTOR only	Display only	X	X	
710	MAXIMUM LINKS	EXECUTOR only		X	X	Can not be set Can be displayed
720	DELAY FACTOR	EXECUTOR only		X	X	
721	DELAY WEIGHT	EXECUTOR only		X	X	
722	INACTIVITY TIMER	EXECUTOR only		X	X	
723	RETRANSMIT FACTOR	EXECUTOR only		X	X	
810	TYPE 0 ROUTING III 1 NONROUTING III 3 AREA 4 ROUTING IV 5 NONROUTING IV	Adjacent only	Display only	X	X	
820	COST	All nodes except EXECUTOR and loop	Display only	X	X	Can not be set in MCB Can be displayed
821	HOPS	All nodes except EXECUTOR and loop	Display only	X	X	Can not be set in MCB Can be displayed
822	CIRCUIT	All nodes except EXECUTOR and loop	Display only	X	X	Can not be set in MCB Can be displayed
830	NEXT NODE Node address Node name (if any)	All nodes except EXECUTOR and loop	Display only	X	X	
900	ROUTING VERSION Version Number ECO Number User ECO Number	EXECUTOR only	Display only	X	X	
901	TYPE 0 ROUTING III 1 NONROUTING III 3 AREA 4 ROUTING IV 5 NONROUTING IV	EXECUTOR only		X	X	Can not be set Can be displayed
910	ROUTING TIMER	EXECUTOR only		X	X	
911	SUBADDRESSES Range beginning Range end	EXECUTOR only	X.25 only		X	
912	BROADCAST ROUTING TIMER	EXECUTOR only		X X		
920	MAXIMUM ADDRESS	EXECUTOR only		X	X	
921	MAXIMUM CIRCUITS	EXECUTOR only		X	X	Can not be set in MCB

**DECnet PARAMETER SUMMARY**

**Table A-1: Node Parameters (Cont.)**

Digital Network Architecture				DECnet-10 V4.0 Implementation		
Param. Type No.	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
922	MAXIMUM COST	EXECUTOR only		X	X	Not implemented
923	MAXIMUM HOPS	EXECUTOR only		X	X	
924	MAXIMUM VISITS	EXECUTOR only		X	X	
925	MAXIMUM AREA	EXECUTOR only				
926	MAXIMUM BROADCAST NONROUTERS	EXECUTOR only		X		
927	MAXIMUM BROADCAST ROUTERS	EXECUTOR only		X		
928	AREA MAXIMUM COST	EXECUTOR only		X		
929	AREA MAXIMUM HOPS	EXECUTOR only		X		
930	MAXIMUM BUFFERS	EXECUTOR only		X	X	
931	BUFFER SIZE	EXECUTOR only		X	X	
932	SEGMENT BUFFER SIZE	EXECUTOR only		X		Can not be set in MCB Can be displayed Can not be set in MCB Can be displayed Can not be set Can be displayed

**Table A-2: DECnet-10 Specific Node Parameters**

Param. Type No.	NCP Keywords	Applicability	TOPS-10	MCB
2511	CONSOLE SECONDARY LOADER	Adjacent Ethernet Communications Servers only	X	
2512	CONSOLE LOAD FILE	Adjacent Ethernet Communications Servers only	X	

DECnet PARAMETER SUMMARY

Table A-3: Line Parameters

Digital Network Architecture				DECnet-10V4.0 Implementation		
Param. Type No.	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
0	STATE 0 ON 1 OFF 2 SERVICE 3 CLEARED	All lines		X	X	Code 2 in MCB display only
1	Substate (not a keyword) 0 STARTING 1 REFLECTING 2 LOOPING 3 LOADING 4 DUMPING 5 TRIGGERING 6 AUTOSERVICE 7 AUTOLOADING 8 AUTODUMPING 9 AUTOTRIGGERING 10 SYNCHRONIZING 11 FAILED	All lines	Display only	X	X	
100	SERVICE 0 ENABLED 1 DISABLED	DDCMP lines only			X	
110	COUNTER TIMER	All circuits		X	X	
1100	DEVICE					
1105	RECEIVE BUFFERS			X	X	Can not be set Can be displayed
1110	CONTROLLER 0 NORMAL 1 LOOPBACK			X	X	Can not be set Can be displayed
1111	DUPLEX				X	
1112	PROTOCOL 0 DDCMP POINT 1 DDCMP CONTROL 2 DDCMP TRIBUTARY 3 (reserved) 4 DDCMP DMC 5 LAPB 6 ETHERNET 7 CI 8 QP2 (DTE20)	DDCMP lines			X	Can not be set Can be displayed
1113	CLOCK 0 EXTERNAL 1 INTERNAL	All lines			X	Can not be set displayed for KDP lines only. * (state off)
1120	SERVICE TIMER	ALL DDCMP lines			X	Parameter value must be in multiples of seconds Not for DTE
1121	RETRANSMIT TIMER	All lines			X	
1122	HOLD BACK TIMER					
1130	MAXIMUM BLOCK					
1131	MAXIMUM RETRANSMITS					
1132	MAXIMUM WINDOW	X.25 only			X	Can not be set Can be displayed
1150	SCHEDULING TIMER					
1151	DEAD TIMER					
1152	DELAY TIMER					
1153	STREAM TIMER					
1160	HARDWARE ADDRESS	Ethernet lines only	Display only	X		

**DECnet PARAMETER SUMMARY**

**Table A-4: DECnet-10 Specific Line Parameters**

Param. Type No.	NCP Keywords	TOPS-10	MCB	Restrictions
2500	RECEIVE BUFFER SIZE	X		CI and NI only Can be displayed
2650	CONTROLLER REGISTER		X	DTE only Can be displayed
2651	UNIT REGISTER		X	All line devices except KDP
2655	INTERRUPT VECTOR		X	All line devices except KDP Can be displayed
2660	INTERRUPT PRIORITY		X	All line devices except KDP Can be displayed
2670	PAUSE TIMER		X	DTE only Can be displayed

None of the DECnet-10 specific line parameters can be set by the user.

**Table A-5: Circuit Parameters**

Digital Network Architecture				DECnet-10 V4.0 Implementation		
Param. Type No.	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
0	STATE 0 ON 1 OFF 2 SERVICE 3 CLEARED	All circuits	Display only	X	X	Code 2 in MCB
1	substate (not a keyword) 0 STARTING 1 REFLECTING 2 LOOPING 3 LOADING 4 DUMPING 5 TRIGGERING 6 AUTOSERVICE 7 AUTOLOADING 8 AUTODUMPING 9 AUTOTRIGGERING 10 SYNCHRONIZING 11 FAILED	All circuits	Display only	X	X	Code 3 not implemented
100	SERVICE 0 ENABLED 1 DISABLED	All circuits used for service		X	X	
110	COUNTER TIMER	All circuits		X	X	
120	SERVICE PHYSICAL ADDRESS	Ethernet Circuits only	Display only	X		
121	SERVICE SUBSTATE 0 STARTING 1 REFLECTING 2 LOOPING 3 LOADING 4 DUMPING 5 TRIGGERING 6 AUTOSERVICE 7 AUTOLOADING 8 AUTODUMPING 9 AUTOTRIGGERING 10 SYNCHRONIZING 11 FAILED		Display only			
200	CONNECTED NODE Node address Node name (if any)	X.25	Display only			
201	CONNECTED OBJECT Object number Object name		Display only			

## DECnet PARAMETER SUMMARY

**Table A-5: Circuit Parameters (Cont.)**

Digital Network Architecture				DECnet-10 V4.0 Implementation		
Param. Type No.	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
400	LOOPBACK NAME		Display only	X		
800	ADJACENT NODE		Display only	X		
	Node address					
	Node name (if any)					
801	DESIGNATED ROUTER		Display only	X		
	Node address					
	Node name (if any)					
810	BLOCK SIZE		Display only			
811	ORIGINATING					
	QUEUE LIMIT					
900	COST			X		
901	MAXIMUM ROUTERS	Ethernet node circuits only		X	X	
902	ROUTER PRIORITY	Ethernet node circuits only		X		
906	HELLO TIMER			X		
907	LISTEN TIMER	EXECUTOR node circuits only	Display only		X	
910	BLOCKING	X.25 only				
	0 ENABLED					
	1 DISABLED					
920	MAXIMUM RECALLS	X.25 only				
921	RECALL TIMER	X.25 only				
930	NUMBER	X.25 only				
1000	USER	EXECUTOR node circuits only	Display only		X	
	Entity type	Node circuits only				
	Entity name (if entity is not node)	Node circuits only				
	Node address (if entity is not node)					
	Node name (if entity is not node)					
1010	POLLING STATE					Not implemented
	0 AUTOMATIC					
	1 ACTIVE					
	2 INACTIVE					
	3 DYING					
	4 DEAD					
1011	Polling substate					Not implemented
	0 ACTIVE					
	1 INACTIVE					
	2 DYING					
	3 DEAD					
1100	OWNER					
1110	LINE					
1111	USAGE	X.25 only				Only USAGE PERMANENT is supported. Can not be set Can be displayed
	0 PERMANENT					
	1 INCOMING					
	2 OUTGOING					
1112	TYPE		Display only			
	0 DDCMP POINT					
	1 DDCMP CONTROL					
	2 DDCMP TRIBUTARY					
	3 X25					
	4 DDCMP DMC					
	5					
	6 ETHERNET					
	7 CI					
	8 QP2 (DTE20)					
	9 BISYNC					
1120	DTE	X.25 only			X	Can not be set Can be displayed
1121	CHANNEL	X.25 only			X	Can not be set Can be displayed
1122	MAXIMUM DATA	X.25 only			X	Can not be set Can be displayed
1123	MAXIMUM WINDOW	X.25 only			X	Can not be set Can be displayed
1140	TRIBUTARY					Not implemented
1141	BABBLE TIMER					Not implemented
1142	TRANSMIT TIMER					Not implemented
1145	MAXIMUM BUFFERS					Not implemented
	1-254 Number of buffers					
	255 UNLIMITED					

DECnet PARAMETER SUMMARY

Table A-5: Circuit Parameters (Cont.)

Digital Network Architecture				DECnet-10V4.0 Implementation		
Param. Type No.	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
1146	MAXIMUM TRANSMITS					Not implemented
1150	ACTIVE BASE					Not implemented
1151	ACTIVE INCREMENT					Not implemented
1152	INACTIVE BASE					Not implemented
1153	INACTIVE INCREMENT					Not implemented
1154	INACTIVE THRESHOLD					Not implemented
1155	DYING BASE					Not implemented
1156	DYING INCREMENT					Not implemented
1157	DYING THRESHOLD					Not implemented
1158	DEAD THRESHOLD					Not implemented

Table A-6: Logging Parameters

Digital Network Architecture				DECnet-10V4.0 Implementation		
Param. Type No.	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
0	STATE 0 ON 1 OFF 2 HOLD	The EXECUTOR node's logging state for the specified logging sink.		X		Implemented for logging file only.
100	NAME	The specific sink specified by the EXECUTOR as the event-receiver: device name, file name, or process identification for the sink types CONSOLE, FILE, and MONITOR.		X		For MONITOR only
200	SINK NODE Node address Node name (if any)	The node that the EXECUTOR specifies as the event-receiver				
201	EVENTS Entity type -1 no entity 0 node 1 line 3 circuit 4 module 5 area Node address (if entity type is node) Node name (if entity type is node) Identification (lineid or cktid as indicated by entity type) Entity class 0 single class 2 all events for class 3 KNOWN EVENTS Event class (if entity class is 0 or 2) Event mask (if entity class is 0)	The events at the source node to be recorded at the SINK NODE.				

## DECnet PARAMETER SUMMARY

**Table A-7: Event Parameters**

Network Management Layer Parameters – Class 0		Session Control Layer Event Parameters – Class 2 (Cont.)	
Type	Keywords	Type	Keywords
0	SERVICE 0 LOAD 1 DUMP	2	NEW STATE 0 ON 1 OFF 2 SHUT 3 RESTRICTED
1	STATUS Return code 0 REQUESTED >0 SUCCESSFUL <0 FAILED Error detail (if error) Error message (optional)	3	SOURCE NODE Node address Node name (if any)
2	OPERATION 0 INITIATED 1 TERMINATED	4	SOURCE PROCESS Object type Group code User code Process name
3	REASON 0 Receive timeout 1 Receive error 2 Line state change by higher level 3 Unrecognized request 4 Line open error	5	DESTINATION PROCESS (same as for SOURCE PROCESS)
4	Qualifier Parameter type Id string	6	USER
5	NODE Node address Node name (if any)	7	PASSWORD (0 means password set; no parameter means not set)
6	DTE	8	ACCOUNT
7	Filespec	<b>Network Services Layer Event Parameters – Class 3</b>	
8	SOFTWARE TYPE 0 SECONDARY LOADER 1 TERTIARY LOADER 3 SYSTEM	Type	Keywords
<b>Session Control Layer Event Parameters – Class 2</b>		0	MESSAGE Message flags Destination link address Source link address Data
Type	Keywords	1	CURRENT FLOW CONTROL REQUEST COUNT 0 No flow control 1 Segment flow control 2 Message flow control
0	REASON 0 Operator command 1 Normal operation	2	SOURCE NODE Node address Node name (if any)
1	OLD STATE 0 ON 1 OFF 2 SHUT 3 RESTRICTED		

DECnet PARAMETER SUMMARY

Table A-7: Event Parameters (Cont.)

Transport Layer Event Parameters - Class 4		Data Link Layer Event Parameters - Class 5	
Type	Keywords	Type	Keywords
0	PACKET HEADER (non-Ethernet) Message flags Destination node address (not for control packet) Source node address Visit count (not for control packet)	0	OLD STATE 0 HALTED 1 ISTRT 2 ASTRT 3 RUNNING 4 MAINTENANCE
0	PACKET (Ethernet) Message flags Destination area Destination subarea Destination Ethernet address Source area Source subarea Source Ethernet address Next area router Visit count Service class Protocol type	1	NEW STATE 0 HALTED 1 ISTRT 2 ASTRT 3 RUNNING 4 MAINTENANCE
1	PACKET BEGINNING	2	HEADER
2	HIGHEST ADDRESS	3	SELECTED TRIBUTARY
3	NODE Node address Node name (if any)	4	PREVIOUS TRIBUTARY
4	EXPECTED NODE Node address Node name (if any)	5	TRIBUTARY STATUS 0 Streaming 1 Continued send after timeout 2 Continued send after deselect 3 Ended Streaming
5	REASON 0 Circuit synchronization lost 1 Data errors 2 Unexpected packet type 3 Routing update checksum error 4 Adjacent node address change 5 Verification receive timeout 6 Version skew 7 Adjacent node address out of range 8 Adjacent node block size too small 9 Invalid verification seed value 10 Adjacent node listener receive  11 Adjacent node listener received invalid data 12 Call failed 13 Verification password required from Phase III node 14 Dropped by adjacent node	6	RECEIVED TRIBUTARY
6	RECEIVED VERSION Version number ECO number User ECO number	7	BLOCK LENGTH
7	STATUS 0 REACHABLE 1 UNREACHABLE	8	BUFFER LENGTH
8	ADJACENT NODE Node address Node name (if any)	9	DTE
		10	REASON 0 Operator command 1 Normal operation
		11	OLD STATE (for event 5.12) 0 ON 1 OFF 2 SHUT
		12	NEW STATE (for event 5.12) 0 ON 1 OFF 2 SHUT
		13	PARAMETER TYPE
		14	CAUSE
		15	DIAGNOSTIC
		16	FAILURE REASON 0 Excessive collisions 1 Carrier check failed 2 (obsolete) 3 Short circuit 4 Open circuit 5 Frame too long 6 Remote failure to defer 7 Block check error 8 Framing error 9 Data overrun 10 System buffer unavailable 11 User buffer unavailable 12 Unrecognized frame destination
		17	DISTANCE
		18	ETHERNET HEADER Destination address Source address Protocol type
		19	HARDWARE ADDRESS
		Physical Line Layer Parameters - Class 6	
		Type	Keywords
		0	DEVICE REGISTER
		1	NEW STATE 0 OFF 1 ON



**DECnet PARAMETER SUMMARY**

**Table A-8: Module X25-ACCESS Parameters**

Digital Network Architecture				DECnet-10V4.0 Implementation		
Parameter Number	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
320	NODE Node address Node name (if any)	Qualified parameter		X		
330	USER	Qualified parameter		X		Unused in TOPS-10
331	PASSWORD (to set) (0 means password set; no parameter means not set)	Qualified parameter	Set only	X		Can be displayed in TOPS-10
331	PASSWORD (to read) (0 means password set; no parameter means not set)	Qualified parameter	Display only			
332	ACCOUNT	Qualified parameter		X		Unused in TOPS-10
1110	NETWORK	Qualifying parameter		X		

**Table A-9: Module X25-PROTOCOL Parameters**

Digital Network Architecture				DECnet-10V4.0 Implementation		
Parameter Number	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
0	STATE 0 ON 1 OFF 2 SHUT	Qualified by DTE			X	
1	Substate (not a keyword) 0 Running 1 Sync 2 Unsync		Display only			
100	COUNTER TIMER	Qualified by DTE			X	Non-qualified parameter in MCB
1000	ACTIVE CHANNELS	Qualified by DTE	Display only		X	
1010	ACTIVE SWITCHED	Qualified by DTE	Display only		X	
1100	DTE	Qualifying parameter			X	Display only in MCB
1101	GROUP	Qualifying parameter			X	
1110	NETWORK				X	Display only in MCB
1120	LINE	Qualified by DTE			X	Display only in MCB
1130	CHANNELS range beginning range end (none if same as beginning)	Qualified by DTE			X	*(state off)
1131	MAXIMUM CHANNELS	Qualified by DTE	Display only		X	
1132	MAXIMUM CIRCUITS	Qualified by DTE				
1140	DEFAULT DATA				X	
1141	DEFAULT WINDOW				X	
1150	MAXIMUM DATA				X	
1151	MAXIMUM WINDOW				X	
1152	MAXIMUM CLEARS				X	
1153	MAXIMUM RESETS				X	
1154	MAXIMUM RESTARTS				X	

DECnet PARAMETER SUMMARY

Table A-9 Module X25-PROTOCOL Parameters (Cont.)

Digital Network Architecture				DECnet-10V4.0 Implementation		
Parameter Number	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
1160	CALL TIMER				X	
1161	CLEAR TIMER				X	
1162	RESET TIMER				X	
1163	RESTART TIMER				X	
1170	DTE	Qualified by GROUP			X	
1171	NUMBER	Qualified by GROUP			X	
1172	TYPE 1 BILATERAL	Qualified by GROUP			X	

\* Some DTE parameters can be set only when the DTE is off.

Table A-10: Module X25-SERVER Parameters

Digital Network Architecture				DECnet-10V4.0 Implementation		
Parameter Number	NCP Keywords	Applicability	Restrictions	TOPS-10	MCB	Restrictions
100	COUNTER TIMER				X	
200	ACTIVE CIRCUITS		Display only		X	
300	DESTINATION	Qualifying parameter			X	
310	MAXIMUM CIRCUITS				X	Display only in MCB
320	NODE Node address Node name (if any)	Qualified parameter			X	
330	USER user	Qualified parameter			X	
331	PASSWORD (to set) 0 Password set	Qualified parameter	Set only		X	
331	PASSWORD (to read) 0 Password set	Qualified parameter	Display only			
332	ACCOUNT	Qualified parameter			X	
340	OBJECT object number object name	Qualified parameter			X	
350	PRIORITY	Qualified parameter			X	
351	CALL MASK	Qualified parameter			X	
352	CALL VALUE	Qualified parameter			X	
353	GROUP	Qualified parameter			X	
354	NUMBER	Qualified parameter			X	
355	SUBADDRESSES Range beginning Range end (none if same as beginning)	Qualified parameter			X	

**APPENDIX B**  
**COUNTER SUMMARY**

This appendix contains the entity counters that may be zeroed or displayed by the appropriate NCP commands (ZERO and SHOW). Section B.1 lists DECnet-10 specific counters, and Section B.2 lists DECnet-10 PSI specific counters. Section B.3 describes all counters in textual detail.

**B.1 DECnet COUNTER SUMMARY**

This counter summary is specific to DECnet-10 Version 4.0. See the appropriate documentation for other DIGITAL operating systems for counter text displayed and counters zeroed.

**Table B-1: DECnet-10 Specific Counters**

ALL COUNTERS (NODE, LINE, AND CIRCUIT)	
Maintained By Network Management	Counter Text Seconds since last zeroed
NODE COUNTERS	
Maintained By Network Services	Counter Text Bytes received Bytes sent Messages received Messages sent Connects received Connects sent Response timeouts Received connect resource errors
Routing (Executor node only)	Aged packet loss Node unreachable packet loss Node out-of-range packet loss Oversized packet loss Packet format errors Partial routing update loss Verification reject

**COUNTER SUMMARY**

**Table B-1: DECnet-10 Specific Counters (Cont.)**

LINE COUNTERS (for MCB lines)	
Maintained By	Counter Text
Physical Link	Remote Process Errors Local Process Errors
CIRCUIT COUNTERS	
Maintained By	Counter Text
Routing	Terminating Packets Received Originating Packets Sent Terminating Congestion Loss Transit Packets Received Transit Packets Sent Transit Congestion Loss Circuit Downs Initialization Failures Bytes Received Bytes Sent Data Blocks Received Data Blocks Sent
Data Link	Data Error Inbound, including: NAKs Sent, Header Block Check Error NAKs Sent, REP Response Data Errors Outbound Remote Reply Timeouts Local Reply Timeouts Remote Buffer Errors Local Buffer Errors Selection Intervals Elapsed Selection Timeouts

**B.2 X.25 SPECIFIC COUNTERS**

The following tables describe X.25 specific counters for the PSI Version 1.0 software option.

The following table specifies the Data Link counters that apply to permanent X.25 circuits.

**Table B-2: Data Link Circuit Counters for Permanent X.25 Circuits**

Type Number	Bit Width	Standard Text
0	16	Seconds since last zeroed
1000	32	Bytes received
1001	32	Bytes sent
1010	32	Data blocks received
1011	32	Data blocks sent
1240	8	Locally initiated resets
1241	8	Remotely initiated resets
1242	8	Network initiated resets

## COUNTER SUMMARY

The following table specifies the Data Link counters for LAPB lines.

**Table B-3: Data Link Line Counters for LAPB Lines**

Type Number	Bit Width	Standard Text	Bit Number Standard Text
0	16	Seconds since last zeroed	
1000	32	Bytes received	
1001	32	Bytes sent	
1010	32	Data blocks received	
1011	32	Data blocks sent	
1020	8	Data errors inbound	3 Block too long 4 Block check error 5 REJ sent
1021	8	Data errors outbound	3 REJ received
1030	8	Remote reply timeouts	
1031	8	Local reply timeouts	
1040	8	Remote buffer errors	2 RNR received, buffer unavailable
1041	8	Local buffer errors	2 RNR sent, buffer unavailable
1100	8	Remote process errors	4 Invalid N(R) received 5 FRMR sent, header format error
1101	8	Local process error	2 Transmit underrun 4 Receive overrun 5 FRMR received, head format error

The following table specifies the X.25 protocol module local DTE counters.

**Table B-4: X.25 Protocol Module Counters**

Type Number	Bit Width	Standard Text
0	16	Seconds since last zeroed
1000	32	Bytes received
1001	32	Bytes sent
1010	32	Data blocks received
1011	32	Data blocks sent
1200	16	Calls received
1201	16	Calls sent
1210	16	Fast selects received
1211	16	Fast selects sent
1220	16	Maximum switched circuits active
1221	16	Maximum channels active
1230	16	Received call resource errors
1240	8	Locally initiated resets
1241	8	Remotely initiated resets
1242	8	Network initiated resets
1250	8	Restarts

## COUNTER SUMMARY

The following table specifies the X.25 server module counters.

Table B-5: X.25 Server Module Counters

Type Number	Bit Width	Standard Text
0	16	Seconds since last zeroed
200	16	Maximum circuits active
210	8	Incoming calls rejected, no resources
211	8	Logical links rejected, no resources

### B.3 COUNTER DESCRIPTIONS

Counters are listed in the same order that they appear in the NCP SHOW command.

#### B.3.1 Circuit Counters

This section contains a description of each circuit counter. (Includes the data link circuit counters for permanent X.25 circuits and counters for Ethernet and PSI operations.)

##### Seconds since last zeroed

This counter indicates the number of seconds that elapsed since the circuit counters were zeroed. This counter provides a time frame for other counter values. The software increments this counter every second and clears it when other counters are cleared. Applies also to MCB PSI operations.

##### Terminating packets received

This counter indicates the number of data packets received by the Routing layer on the local node.

##### Originating packets sent

This counter indicates the number of data packets sent by the Routing layer on the local node.

##### Terminating congestion loss

This counter indicates the number of packets intended for the node that were discarded because Routing could not buffer them.

##### Transit packets received

This counter indicates the number of data packets received over the circuit and to be routed through the local node to another node. It is maintained only on full-routing nodes.

##### Transit packets sent

This counter indicates the number of data packets sent over the circuit and being routed through the local node to another node. It is maintained only on full-routing nodes.

## COUNTER SUMMARY

### Transit congestion loss

This counter indicates the number of transit data packets discarded for congestion reasons. This counter is maintained only on full-routing nodes. If congestion loss increases, increase the MAXIMUM BUFFERS parameter for the local node.

### Circuit downs

This counter indicates the number of failures - operator or software induced - for the circuit. These failures may include any number of hardware-, software-, or operator-caused problems. This counter corresponds to events 4.7-9 (circuit down).

### Initialization failures

This counter indicates the number of times the circuit failed to initialize with remote Routing software. These failures may include any number of hardware-, software-, or operator-caused problems. This counter corresponds to events 4.11-13 (initialization failure).

### Transmit packets discarded-blocksize exceeded

This counter indicates the number of packets discarded by the local node because the packet was larger than the local node's buffer size. This occurs when the node has a buffer size that is greater than 576 bytes for Ethernet communications and the Ethernet goes down. The Router attempts to send the "Ethernet-sized" packets through a line with a small buffer size, forcing the packets to be discarded.

### Bytes received

This counter indicates the number of bytes of data received by the local node over the circuit. You can use this information together with the data blocks received counter to determine the inbound traffic load. Applies also to MCB PSI operations.

### Bytes sent

This counter indicates the number of bytes of data sent by the local node over the circuit. You can use this information together with the data blocks sent counter to determine the outbound traffic load. Applies also to MCB PSI operations.

### Data blocks received

This counter indicates the number of data blocks received by the local node. You can use this information as a statistical base when evaluating the number of inbound data errors, remote reply timeouts, and local buffer errors. Applies also to TOPS-10 PSI operations.

### Data blocks sent

This counter indicates the number of data blocks sent by the local node. You can use this information as a statistical base when evaluating the number of outbound data errors, local reply timeouts, and remote buffer errors. Applies also to Ethernet and TOPS-10 PSI operations.

## COUNTER SUMMARY

### Data errors inbound

This counter indicates the number of data errors that normally result from errors on the inbound communications channel to the local node. These errors are caused usually by a noisy communications line or a poorly functioning modem. This counter may include either or both of the following qualifiers if they contribute to two errors:

- o NAKs sent, header block check error
- o NAKs sent, data field block check error

### User buffer unavailable

This counter indicates the total number of times that no user buffer was available.

### Locally initiated resets

This counter indicates the number of resets sent over the circuit. Applies only to MCB PSI operations.

### Remotely initiated resets

This counter indicates the number of resets received over the circuit. Applies only to MCB PSI operations.

### Network initiated resets

This counter indicates the number of resets originated by the PSDN received over the circuit. Applies only to MCB PSI operations.

## B.3.2 Line Counters

This section contains a description of each line counter. (Includes the PSI data link line and counters for LAPB lines.)

### Seconds since last zeroed

This counter indicates the number of seconds that elapsed since the line counters were zeroed. This counter provides a time frame for other counter values. The software increments this counter every second and clears it when other counters are cleared.

### Blocks sent, initially deferred

This counter indicates the total number of times that a frame transmission was deferred on its first transmission attempt. Used in measuring Ethernet contention with no collisions.

### Blocks sent, multiple collisions

This counter indicates the total number of times that a frame was successfully transmitted on the third or later attempt after normal collisions on previous attempts. Applies only to Ethernet operations.



## COUNTER SUMMARY

### Blocks sent, single collision

This counter indicates the total number of times that a frame was successfully transmitted on the second attempt after a normal collision on the first attempt. Applies only to Ethernet operations.

### Bytes received

This counter indicates the number of bytes of data received over the line. Applies to Ethernet and MCB PSI operations.

### Bytes sent

This counter indicates the number of bytes of data sent over the line. Applies to Ethernet and MCB PSI operations.

### Data blocks received

This counter indicates the number of blocks received over the line. Applies to Ethernet and MCB PSI operations.

### Data blocks sent

This counter indicates the number of data blocks sent over the line. Applies to Ethernet and MCB PSI operations.

### Data errors inbound

This counter indicates the number of incoming data errors that result from faults on the channel between the local DTE and DCE. The counter can include up to three of the following qualifiers.

- Block too long
- Block check error
- Reject sent

Applies only to MCB PSI operations.

### Data errors outbound

This counter indicates the number of outgoing data errors that result from faults on the channel between the local DTE and DCE. The counter can include the following qualifier.

- Reject received

Applies only to MCB PSI operations.

### Data overrun

This counter indicates the total number of times the hardware lost an incoming frame because it was unable to keep up with the data rate.

### Multicast bytes received

This counter indicates the total number of multicast data bytes successfully received (includes bytes in Ethernet data field but not the Ethernet data link headers).

## COUNTER SUMMARY

### Send failures

This counter indicates the total number of times a transmit attempt failed. For each increment of the counter, a type of failure is recorded, as follows:

- Excessive collisions
- Carrier check failed
- Short circuit
- Open circuit
- Frame too long
- Remote failure to defer
- Transmit buffer parity (NIA20)
- Carrier detect failed

Applies only to Ethernet operations.

### Receive failures

This counter indicates the total number of blocks received with some data errors (the blocks are data frames that passed either physical or multicast address comparison). For each increment of the counter, a type of failure is recorded, as follows:

- Block check error
- Framing error
- Frame too long
- No free buffers
- Free list parity error (NIA20)

Applies only to Ethernet operations.

### Local reply timeouts

This counter indicates the number of times that a frame with a poll bit set has been received over the line; that is, the number of errors that result from faults on the line. Applies only to MCB PSI operations.

### Remote reply timeouts

This counter indicates the number of times that the retransmit timer for that line has expired. The retransmit timer can expire for any of the following reasons:

1. The line is not connected to a modem
2. The X.25 network is not responding fast enough
3. The retransmit timer is set too low

Applies only to MCB PSI operations.

### Remote buffer errors

This counter indicates the number of receive-not-ready (RNR) frames received. The counter can include the following qualifier:

- RNR received, buffer unavailable

Applies only to MCB PSI operations.

## COUNTER SUMMARY

### Local buffer errors

This counter indicates the number of receive-not-ready (RNR) frames sent. The counter can include the following qualifier:

RNR sent, buffer unavailable

Applies only to MCB PSI operations.

### Remote process errors

This counter indicates an invalid n(R) and a frame reject (FRMR) sent over the line. The counter can include the following qualifiers:

Invalid n(R) received  
FRMR sent, header format error

These errors usually indicate that the DCE is functioning incorrectly. Applies only to MCB PSI operations.

### Local process errors

This counter indicates that a frame reject (FRMR) has been received over the line or that your system is being overloaded. The counter can include the following qualifiers:

Transmit underrun  
Receive overrun  
FRMR received, header format error

The first two qualifiers usually indicate that the system is overloaded and the third usually indicates that the MCB PSI software is functioning incorrectly. Applies only to MCB PSI operations.

### Unrecognized frame destination

This counter indicates the number of times a frame was discarded because there was no portal with the protocol type or multicast address enabled. The count includes frames received for the physical address, broadcast address, or multicast address.

### B.3.3 Node Counters

This section contains a description of each node counter.

#### Seconds since last zeroed

This counter indicates the number of seconds that elapsed since the node counters were zeroed. It provides a time frame for other counter values. The software increments this counter every second and clears it when other counters are cleared.

#### User bytes received

This counter indicates the number of user data bytes received from a remote node. This includes interrupt messages, but excludes Connect, Accept, Reject, and Disconnect messages.

## COUNTER SUMMARY

### User bytes sent

This counter indicates the number of user data bytes sent to a remote node.

### User messages received

This counter indicates the number of NSP messages carrying user data that were received from a remote node.

### User messages sent

This counter indicates the number of NSP messages carrying user data that were sent to a remote node.

### Total bytes received

This counter indicates the number of user data bytes received from a remote node plus the NCP protocol bytes and the overhead bytes, including Connect, Accept, Reject, and Disconnect messages.

### Total bytes sent

This counter indicates the number of user data bytes sent to a remote node plus the NSP protocol bytes and the overhead bytes, including Connect, Accept, Reject, and Disconnect messages.

### Total messages received

This counter indicates the number of NSP (Network Services Program) messages received from a remote node including the overhead messages.

### Total messages sent

This counter indicates the number of NSP (Network Services Program) messages sent to a remote node including the overhead messages.

### Connects received

This counter indicates the number of logical link connection requests received by the local node.

### Connects sent

This counter indicates the number of logical link connection requests sent by the local node.

### Response timeouts

This counter indicates the number of times there was no response to an NSP segment within the allotted timeout period. This implies that the local node has to retransmit messages. Such retransmission can be caused either by messages being discarded in the network or by a wide variance in the round-trip delay to the node. Normally, it indicates an overload condition in the network.

## COUNTER SUMMARY

### Received connect resource errors

This counter indicates the number of inbound connect messages for which the local node did not have sufficient resources. These errors may result from dynamic memory problems or too few logical link slots; that is, the MAXIMUM LINKS parameter value is too small.

### Maximum logical links active

This counter indicates the largest number of logical link that have been active since DECnet-10 software was started or since executor counters were zeroed.

### Aged packet loss

This counter indicates the number of data packets discarded for visiting too many nodes. This usually occurs while the databases throughout the network are recovering from a disruption (for example, when a circuit or line goes down) in the former path to a destination. This counter is maintained only on full-routing nodes and corresponds to event 4.0 (aged packet loss).

### Node unreachable packet loss

This counter indicates the number of data packets lost because the destination node could not be accessed. This counter is maintained only on full routing nodes. This counter corresponds to event 4.1 (node unreachable packet loss).

### Node out-of-range packet loss

This counter indicates the number of data packets discarded because the destination node's address is greater than the maximum address defined for the local node. This counter corresponds to event 4.2 (node out-of-range packet loss).

### Oversized packet loss

This counter indicates the number of received data packets that were too large to forward because of the block size of the data link that would be used. This counter is maintained only on full-routing nodes, and corresponds to event 4.3 (oversized packet loss).

### Packet format error

This counter indicates the number of packet format errors that occur because of invalid packet control information. This counter corresponds to event 4.4 (packet format error).

### Partial routing update loss

This counter indicates the number of received routing messages that were too long to process. Part of a routing update may be lost if it contains a reachable node with an address greater than the maximum address defined for the local node. This counter is maintained only on full-routing nodes, and corresponds to event 4.5 (partial routing update loss).

### Verification reject

This counter indicates the number of received verification messages that were invalid. It corresponds to event 4.6 (verification reject).

## COUNTER SUMMARY

### B.3.4 X.25 Protocol Module Counters

This section contains a description of each X.25 protocol module counter. These counters apply only to MCB PSI operations.

#### Seconds since last zeroed

This counter indicates the number of seconds that have elapsed since the module counters were zeroed. This counter provides a time frame for other counter values. The MCB PSI software increments this counter every second and clears it when the counters are zeroed.

#### Bytes received

This counter indicates the number of bytes of data received by the local DTE. You can use this information together with the data blocks received counter to determine the total traffic load.

#### Bytes sent

This counter indicates the number of bytes of data sent by the local DTE. You can use this information together with the data blocks sent counter to determine the total traffic load.

#### Data blocks received

This counter indicates the number of data blocks received by the local DTE.

#### Data blocks sent

This counter indicates the number of data blocks sent by the local DTE.

#### Calls received

This counter indicates the number of incoming calls received.

#### Calls sent

This counter indicates the number of outgoing calls made.

#### Fast selects received

This counter indicates the number of calls received with the fast select facility specified.

#### Fast selects sent

This counter indicates the number of calls sent with the fast select facility specified.

#### Maximum switched circuits active

This counter indicates the number of switched virtual circuits that were active at any one time since the counters were last zeroed.

#### Maximum channels active

This counter indicates the maximum number of channels from the logical channels list that were active at any one time since the counters were last logged.

## COUNTER SUMMARY

These circuits are ones whose logical channel numbers appear in the channels list regardless of whether the circuits are used for incoming or outgoing calls.

### Received call resource errors

This counter indicates the number of times an incoming call has been rejected because of insufficient resources or an incorrect configuration (for example, no destination or object specified).

### Locally initiated resets

This counter indicates the number of resets sent by the local DTE.

### Network initiated resets

This counter indicates the number of resets (originated by the PSDN ) received by the local DTE.

### Remotely initiated resets

This counter indicates the number of resets (originated by a remote DTE or DTEs) received by the local DTE.

### Restarts

This counter indicates the number of times that the restart protocol procedure was used on the DTE.

## B.3.5 X.25 Server Module Counters

This section contains a description of each X.25 server module counter. These counters apply only to TOPS-10 PSI operations.

### Seconds since last zeroed

This counter indicates the number of seconds that have elapsed since the module counters were zeroed. This counter provides a time frame for other counter values. The TOPS-10 PSI software increments this counter every second and clears it when the counters are zeroed.

### Maximum circuits active

This counter indicates the number of switched virtual circuits that have been set up since the counters were last zeroed.

### Incoming calls rejected, no resources

This counter indicates the number of times the incoming call handler rejected a request to set up a virtual circuit because of insufficient resources.

### Logical links rejected, no resources

This counter indicates the number of X.25 circuits that have been set up by the TOPS-10 host system but rejected by the MCB because of insufficient resources at the Gateway.





## APPENDIX C

### NETWORK RELATED MESSAGES

When you are using NCP commands, messages related to the execution of the commands and to the condition of the network are output. Some appear on the user's terminal, and some appear on the CTY. If you are the system manager, you should check the network-related messages on the CTY, or delegate this responsibility. If you are an operator-user, you should resolve those messages output to your terminal. Only those messages output to the user's terminal are described in this appendix (see also Section 4.5.6).

#### C.1 OPR/NCP COMMAND SYNTAX MESSAGES

All NCP messages are first examined by OPR. OPR uses the NCP table to check the command syntax. The parsed command is then sent in an IPCF packet to ORION and QUASAR, where further errors or informational messages can be added. The completely checked command returns to OPR and OPR directs all messages on each command to the terminal where you type the NCP command.

The syntax messages output by OPR all begin with a question mark (?) and are in readable text only (no codes or abbreviations). In these messages the "?" does not indicate a fatal error: it questions the accuracy of your input. You correct the command by retyping up to the point of error (use CTRL/H) and substituting or adding the correct keyword or value. If you are unsure of what is required, type a question mark to get a list of possible arguments.

Possible syntax error messages follow in alphabetic order. Several examples of NCP commands with errors, showing the desired corrections, follow the alphabetic list.

- ? Ambiguous
- ? Does not match switch or keyword: "word"
- ? Filename was not specified
- ? File not found
- ? First nonspace character is not a digit
- ? Invalid character in number
- ? Invalid device terminator
- ? Invalid guide word
- ? Invalid node name

## NETWORK RELATED MESSAGES

- ? Invalid wildcard designator
- ? Negative number improper
- ? No help available for "word"
- ? No such file type
- ? Node name doesn't contain any alphabetic characters
- ? Not confirmed
- ? Null switch or keyword given
- ? Too many characters in node name
- ? Unrecognized switch or keyword: "word"

### Examples:

```
NCP>SET EXECUTOR NODE D2102A<RET>
? Unrecognized switch or keyword: "executor"
NCP>SET EXECUTOR NODE D2102A<RET>
NCP>
10:21:26          NCP
                  Set Executor Complete
```

\*\*\*\*\*

```
NCP>SET EXECUTOR INACTIVITY TIMER SECONDS 20<RET>
?First nonspace character is not a digit
NCP><CTRL/H>
NCP>SET EXECUTOR INACTIVITY TIMER20<RET>
? Unrecognized switch or keyword: "timer20"
NCP><CTRL/H>
NCP>SET EXECUTOR INACTIVITY TIMER 20<RET>
NCP>
11:35:35          NCP
                  Set Node Complete
```

## C.2 OPR/ORION/QUASAR INFORMATIONAL MESSAGES

Informational messages report major system changes: they cannot be "REFUSED" or "DISABLED." Depending on your current needs, these messages may or may not concern you, but you should read them.

Such messages are always time-stamped and have the general format:

```
NCP>
hh:mm:ss          --      text      --
```

An example of an informational message of interest to network users follows:

### Example:

```
NCP>
16:17:44          --NCP is not running--
```

## NETWORK RELATED MESSAGES

NCP commands that are syntactically correct (no errors reported through OPR) are executed immediately if they do not require use of the NICE protocol. This includes the OPR/NCP commands (described in Chapter 5) and the commands processed locally by NCP (described in Chapter 6). These commands that are not sent in NICE protocol messages receive only the messages described in Sections C.1 and C.2.

### C.3 NCP COMMAND RESPONSE MESSAGES

All commands processed by Network Management routines are assigned a request number by NCP. They are then translated into NICE messages and forwarded to NML in the central processor for local processing or to NML in the remote node for remote processing. Results of this processing return to the local NCP by means of NICE messages, which are then formatted into response messages.

The generic format of NCP command response messages is:

```
hh:mm:ss      NCP
               Request # nnn; command entity status, [error information]
```

where:

hh:mm:ss	is the time in hours, minutes, and seconds
nnn	is the request number assigned
command	is a command indicator
entity	is a specific entity
status	is one of Complete, Accepted, or Failed
error information	is displayed only if status is Failed

## NETWORK RELATED MESSAGES

### C.3.1 Status Messages

Status is reported as Complete if the command has executed successfully. Status reported as Accepted implies only that the command is semantically (and syntactically) correct; the command receives a further response of Complete or Failed when it is executed. If the status is reported as Failed, an error message follows.

Examples:

```
NCP>SH KN NO STA<RET>
NCP>
 9:37:29      NCP
Request # 96; Show Known Node Status Completed
Remote Node = 7.88 (KL2530)
  State = Unreachable
```

\*\*\*\*\*

```
NCP>CLEAR EXEC<RET>
NCP>LOA NO D2102A<RET>
NCP>
11:18:16      NCP
                Clear Executor Complete

11:18:16      NCP
                Request # 2 Accepted

11:18:19      NCP
                Request # 2; Load Node Completed
                *****
```

```
NCP>SH NO XXYZZ CH<RET>
NCP>
11:00:17      NCP
Request # 13; Show Node Failed, Unrecognized component
Entity = Node
Node = (XYZZZ)
```

### C.3.2 Error Messages from Network Management Software

When the status is Failed, an error message gives the reason for the failure. This reason is followed by detail if such detail is available. The detail, in turn, can be followed by additional explanatory text.

NCP error messages are listed below in alphabetic order. A brief explanation is given; where possible, appropriate action is suggested. The following NCP error messages are standard for most DECnet implementations. Since NICE errors only return an error code and not the error message text, the NICE return codes are also listed.

## NETWORK RELATED MESSAGES

Error Message Text	Description/Procedures
Bad loopback response NICE error code (-28)	The message returned in a loopback test did not match the message sent. Repeat the loopback test. If the error persists, use the various loopback tests to try to isolate the part of the line that is bad. Follow your site's procedures for notifying your Field Service Representative.
Component in wrong state NICE error code (-11)	There is a problem with the state of the entity to which the command applies, or to the secondary entity (line, for example, in a LOAD command). Check the state of the primary and secondary entities. Are nodes or lines ON, OFF, or in SERVICE state as required by the function being requested? Correct and try again.
File I/O error NICE error code (-18)	A hardware error occurred while trying to read or write a file required to execute the command. The error detail indicates the problem is in one of the following:  DUMP FILE LOAD FILE Permanent Data Base SECONDARY DUMPER SECONDARY LOADER TERTIARY LOADER Volatile Data Base  Repeat the command. If the error persists, follow your site's standard procedure for reporting hardware errors.
File open error NICE error code (-13)	A file needed for processing could not be opened. Error detail specifies same files as for "File I/O error." System-specific detail, if present, may suggest procedure. If no detail is given, check directory or file restrictions.
Hardware failure NICE error code (-24)	The hardware needed to satisfy the request could not perform the function requested. Try again. If the error message is repeated, check the hardware for obvious errors (not up, no paper in printer, and the like). If devices appear to be in order, follow your standard rules for contacting your Field Service Representative.

## NETWORK RELATED MESSAGES

Error Message Text	Description/Procedures
Incompatible Management version NICE error code (-7)	The function requested cannot be performed because the version skew between the NMLs in the source and destination nodes is too great. This problem cannot be solved. Make a record of the incompatibility for the future.
Invalid file contents NICE error code (-14)	<p>The error detail indicates the file that contains invalid information. The file is one of:</p> <ul style="list-style-type: none"><li>Permanent Data Base</li><li>LOAD FILE</li><li>SECONDARY LOADER</li><li>TERTIARY LOADER</li></ul> <p>Although DECnet-10 does not currently support a permanent data base, you can receive this message if you have another node acting as executor.</p> <p>If the file in error is a remote file, the system manager at the remote site should be notified. If the file is local, the user should check to be sure the filename typed is the correct file. If it was, next check the directory. The <u>TOPS-10 Operating System Commands Manual</u> describes the procedures to follow.</p>
Invalid identification NICE error code (-9)	The format of the primary or secondary entity identification is invalid. The error detail indicates identity type. Correct the error.
Invalid message format NICE error code (-2)	NML has received a message that is not properly formatted. This could indicate a problem with the software on either the transmitting or receiving end. Try the command again. If the error persists, follow procedures for a Software Performance Report (SPR).

## NETWORK RELATED MESSAGES

Error Message Text	Description/Procedures
Invalid parameter grouping NICE error code (-27)	A request to change multiple parameters included an entity parameter group that could not be changed - the command was not executed. Check all entity-parameter combinations for validity, completeness, and an in-bounds value. Are there any contradictions or duplications? DECnet-10 does not accept multiple-parameter commands. Each parameter must be in a separate command. Repeat specifying one parameter per command.
Invalid parameter value NICE error code (-16)	The error detail indicates the name of the invalid parameter. Check the range of length, size, and number values. Is the value permitted with the entity to which it refers?
Line communication error NICE error code (-10)	This error occurs only on direct use of a line such as for looping, downline load, or upline dump. The error can be in transmitting or in receiving. If further detail is given, the device may be specified. Check (or have the system operator check) the operating condition of the indicated device. If the problem remains, follow procedures for reporting to your Field Service Representative.
Line protocol error NICE error code (-17)	This error can refer to the Data Link protocol or the Service Operation protocol. The error is given only on direct use of a line (as for a line loop or downline load). Repeat the command. If the error persists, follow procedures for a Software Performance Report (SPR).

## NETWORK RELATED MESSAGES

Error Message Text	Description/Procedures
Listener link connect failed	<p>A connect to the NML NICE Listener could not be completed. Error detail will vary depending upon the operating system being connected to. Be guided by detail, if present. There are several possible conditions that could cause this error:</p> <p>The remote node name or the access control information is incorrect. Correct the error and repeat the command.</p> <p>The remote node or the local node is in the process of shutting down and will accept no more logical link connections. Try later.</p> <p>Either the local or remote node has insufficient network resources to connect the logical link. Try later.</p> <p>There is no path to the remote node. Check the status of the remote node (use the SHOW NODE nodeid STATUS command). If status is "Unreachable" wait until it is "Reachable" and try again.</p> <p>A remote node you wish to connect to may not have a Network Management</p> <p>Listener. A connection is not possible. Note for future reference. The procedure you use following this message depends on detail given. If the detail indicates an easily correctable cause, missing or invalid parameters, for example, correct and repeat the command. If the detail suggests a transient problem, wait appropriately and try again later ("appropriately" might be when a remote node comes back on line, depending on the reason for the failure to connect).</p>
Listener link disconnected	<p>A successful connection to the NML NICE Listener was made, but the logical link then failed. Both the error detail and the procedure are as described for "Listener link connect failed."</p>



## NETWORK RELATED MESSAGES

Error Message Text	Description/Procedures
Management program error NICE error code (-5)	A software error in the DECnet-10 software was detected. A system-level message may supply detail. Follow procedures for a Software Performance Report (SPR).
Mirror connect failed NICE error code (-21)	A connect to the NML Loopback Mirror could not be completed. Error detail and procedure as for "Listener link connect failed."
Mirror link disconnected NICE error code (-19)	A successful link was made to the Loopback Mirror, but the link was then disconnected. Error detail and procedure as for "Listener link connect failed."
No room for new entry NICE error code (-20)	Insufficient room exists in some data base for an entry required by the requested function.
Operation failure NICE error code (-25)	<p>A requested operation failed. NML supplies no detail; there may or may not be system-level or system-specific detail. In the absence of detail, check the following; correct if possible, and try again. If the error persists, follow procedures for contacting your Software Specialist.</p> <p>Check to see if there is a required parameter for this command that is missing or invalid.</p> <p>Check to see if the executor is in the proper state.</p> <p>Check to see if there are any helpful messages on the CTY.</p>
Oversized management command message NICE error code (-4)	A message size was too long. The NICE message was too long for the Management Listener to receive. Follow procedures for a Software Performance Report (SPR).
Parameter missing NICE error code (-29)	You failed to include a required parameter. The error detail will specify the name of the missing parameter. Repeat the command with the required parameter.

## NETWORK RELATED MESSAGES

Error Message Text	Description/Procedures
Parameter not applicable NICE error code (-22)	You have included a parameter that is not allowed with the entity to which it refers. The parameter is named in the error detail. Correct and repeat the command.
Parameter value too long NICE error code (-23)	You have included a parameter that is too long to be accepted by the implementation. The error detail identifies the parameter type. If the parameter identified is a file specification, be aware that maximum file length is system-specific (VAX/VMS, for example, allows a maximum of 64 characters for a file specification; RSX-11M allows a maximum of 34). If the executor is not your local node, you may need to refer to documentation for the executor's operating system.
Privilege violation NICE error code (-3)	You do not have, or have not enabled, the privilege required for the function you have requested.
Resource error NICE error code (-15)	A resource required to perform the requested function was not available. Repeat the command later.
System-specific Management function not supported NICE error code (-26)	System-specific functions return this message if the executor node is running an operating system other than the one for which the function was implemented.
Unrecognized component NICE error code (-8)	An entity (component) is not known to the system. The error detail indicates the entity. Usually caused by an error in typing. Try the command again.
Unrecognized function or option NICE error code (-1)	The requested function or option is not implemented by the executor.
Unrecognized parameter type NICE error code (-6)	The parameter indicated in the error detail is not implemented in the executor.

## NETWORK RELATED MESSAGES

### C.4 EVENT MESSAGES

#### C.4.1 Event Class and Type Summary

Following is a summary of NCP events in terms of their class and type. In general, event classes relate to specific layers of the DECnet architecture. The event logging components support the event classes summarized below.

Table C-1: EVENT Classes

EVENT Class	Description
0	Network Management Layer
1	Applications Layer
2	Session Control Layer
3	Network Services Layer
4	Routing Layer
5	Data Link Layer
6	Physical Link Layer
7-31	Reserved for other common classes
32-63	RSTS System specific
64-95	RSX System specific
96-127	TOPS-10/20 System specific
128-159	VMS System specific
160-191	RT System specific
192-223	CT system specific
224-255	Communication server specific
480-511	Customer specific

DECnet-10 logs events only for specific event classes and types.

If the logging console is enabled, DECnet-10 uses the OPR program to display event messages on all operator terminals enabled to received messages with the OPR command `ENABLE OUTPUT-DISPLAY NCP-MESSAGES`, which is the default.

Event messages have the following format:

```
event type class.type, event-text
from node address [(node-name)] dd-mmm-yy hh:mm:ss.ms
component-type, event-qualifiers,...
```

The event text is a standard text message as described below for each event class and type. The message format also includes the source node (address and node name, if available) and time stamp for when the event occurred. For most events, the message format includes the component type and name for which the event applies. Finally, the message format may include the cause of the event.

The following sections describe the event messages for each DECnet layer. The format is:

```
class.type      event-message-text      explanation
```

## NETWORK RELATED MESSAGES

### C.4.2 Network Management Layer Events

The following specific event classes and types are supported for each layer.

#### Ø.Ø Event records lost

Events occurred too rapidly for the event logger to buffer them.

#### Ø.1 Automatic node counters

A node counter timer expired, thus prompting this event. This message displays the name of the node for which the event applies, along with the node counters for that node.

#### Ø.2 Automatic line counters

A line counter timer expired, thereby producing this event. This message displays the name of the line for which the event applies, along with the line counters for that line.

#### Ø.3 Automatic service

An adjacent node requested an automatic circuit service operation. This message displays the name of the circuit for which the event applies, along with the service function performed (load or dump), the status of the operation (requested, successful, or failed), the node address, the file specification, and the software type. If the operation fails, this status includes an NML error message and details.

#### Ø.4 Line counters zeroed

Line counters were zeroed. This message displays the name of the line for which the event applies. The event logger logs these counters prior to the execution of a request to zero them.

#### Ø.5 Node counters zeroed

Node counters were zeroed. This message displays the name of the node for which the event applies. The event logger logs these counters prior to the execution of a request to zero them.

#### Ø.6 Passive loopback

The software initiated or terminated a passive loopback test on behalf of an adjacent node. This message displays the name of the line for which the event applies, along with the state of the operation (initiated or terminated).

## NETWORK RELATED MESSAGES

### Ø.7 Aborted service request

An adjacent node requested a service over a line connected to the local node. However, a problem prevented it from being processed at the local node. This message displays the name of the line for which the event applies, along with the reason for the failure. The reason may be one of the following:

#### Line open error

NML received an MOP message and was unable to acquire control of the line. Either NML did not have the privilege to perform the operation or it could not set the substate of the line; or the line had another owner.

#### Line state change by higher level

The line was preempted by a higher priority function. For example, you used NCP to turn the line off.

#### Operation failure

A load or dump operation was started but a failure occurred in the loading or dumping process.

#### Receive error

A line error occurred while trying to receive the request.

#### Receive timeout

The line message receive timer expired before the request could be received from the adjacent node. Either the timer was too short, the line error level was too great for any message to get through, or the adjacent node stopped requesting.

#### Unrecognized request

A message was received but was not recognizable as a request for upline dumping, downline loading, or passive loopback testing. The adjacent node may be running an incompatible version of the line service protocol.

### Ø.8 Automatic counters

A counter timer for a node, circuit, or line has expired. This message displays the name of the component for which the event applies, along with the counters for that line.

### Ø.9 Counters zeroed

Counters were zeroed for the node, circuit, or line. This message displays the name of the component for which the event applies. The event logger logs these events prior to the execution of a request to zero them.

## NETWORK RELATED MESSAGES

### C.4.3 Session Control Layer Events

#### 2.0 Local node state change

The operational state of the local node changed because of an operator command. Note, however, that the transition from SHUT to OFF also happens automatically when the last logical link is disconnected (under normal operation).

This message displays the reason for the state change (operator command or normal operation), the old state ON, OFF, SHUT, or RESTRICTED), and the new state.

#### 2.1 Access control reject

The local node rejected a connection request because of invalid access control information.

This message displays the name and address of the source node; the object type number and process ID of the source process requesting the connection; the object type number and process ID of the destination process to receive the connection request; and the invalid access control information.

### C.4.4 End Communication Layer Events

#### 3.0 Invalid message

NSP received a message that could not be interpreted. This may indicate a software malfunction in either the local or remote NSP. This message displays the NSP message that was invalid. Refer to the Network Services Functional Specification for a description of NSP messages.

#### 3.1 Invalid flow control

The remote NSP attempted to modify the local flow control value in an invalid manner. This may indicate a software malfunction in either the local or remote NSP. This message displays the current flow control value. Refer to the Network Services Functional Specification for a description of flow control.

#### 3.2 Database reused

The local node received a connection request from a node for which there is no counter block. All counter blocks have been previously used, and one of the previously used blocks is available for this new node. This results in the loss of node counters for the node that formerly occupied the database entry.

This message displays the name of the node for which the database entry was formerly used, along with the node counters for that node.

## NETWORK RELATED MESSAGES

### C.4.5 Routing Layer Events

#### 4.0 Aged packed loss

Routing discarded a packet because it had visited too many nodes. This can be a normal occurrence when the network is reconfiguring its routing databases. It can be a failure when the MAXIMUM HOPS value is set too small. This can cause the MAXIMUM VISITS value to be too small for a path that should be usable.

This message displays the name of the line for which the event applies, along with the packet header. This is information from the beginning of the packet. For non-Ethernet packets, it consists of a hexadecimal byte of flags, the decimal destination and source node addresses, and a hexadecimal byte of forwarding data. For Ethernet packets, it also includes the Ethernet address of the destination and source, the service type, and the protocol type. Refer to the Routing Functional Specification for additional information.

#### 4.1 Node unreachable packet loss

Routing discarded a packet because the local node found that the destination node was unreachable. This event provides a trace of what has happened to packets that are not reaching their destination.

This message displays the name of the line for which the event applies, along with the packet header (as described for event 4.0).

#### 4.2 Node out-of-range packet loss

Routing discarded a packet because the destination node number was greater than the maximum node number known to the local node. Typically, this results from the addition of a new node to the network without increasing the MAXIMUM ADDRESS value on the local node, yet expecting the local node to route packets to that node.

This message displays the name of the line for which the event applies, along with the packet header (as described for event 4.0).

#### 4.3 Oversized packet loss

Routing discarded the packet because it was too large to forward to the appropriate adjacent node. Typically, this occurs when the adjacent node's buffer size is too small or when the source node sends a packet that is too large.

This message displays the name of the line over which the packet was to be forwarded, along with the packet header (as described for event 4.0).

#### 4.4 Packet format error

Routing discarded a packet because of a format error in the packet header. This usually results from a programming error in the packet formatting by the adjacent node, though it could result from a line error that was not detected by the line protocol.

## NETWORK RELATED MESSAGES

### 4.5 Partial routing update loss

Routing received a routing message that contained node addresses greater than the maximum address known to the local node. Subsequently, information on these nodes was lost. This occurs when the MAXIMUM ADDRESS value on an adjacent node has been increased to accommodate more nodes, but the local node's value has not increased.

The message displays the name of the line over which this message was received, along with the packet header (as described for event 4.0) and the highest node address in the routing update that was lost.

### 4.6 Verification reject

An attempt to initialize with another node failed. The local node received an invalid password in the verification requested of the adjacent node during routing initialization over the line. Either the local node expected the wrong receive password, or the adjacent node sent the wrong transmit password.

The message displays the name of the line for which the event applies, along with the address of the adjacent node that failed to initialize.

### 4.7 Circuit down, circuit fault

An error has occurred for the circuit. This message displays the name of the circuit for which the event applies, along with the reason for the event. The reason could be one of the following:

#### Adjacent node address change

The adjacent node changed addresses without going through the normal initialization sequence. This is also logged when an adjacent node attempts to initialize with the local node, but the adjacent node's address is not in the database.

#### Adjacent node address out of range

The adjacent node's address is greater than the maximum address defined for the local node. This may be caused by an incorrectly defined node address or by a failure to update the local node's database when a new node was added.

#### Adjacent node block size too small

The line block size provided by the adjacent node is too small for normal network operation. The block size may be set incorrectly at the adjacent node.

#### Adjacent node listener receive timeout

The node has received no message over the data link within the last 30 seconds. This usually means that the remote node is not running.



## NETWORK RELATED MESSAGES

### Adjacent node listener received invalid data

A test message sent by the adjacent node contained invalid Data or corrupted data. This is most likely caused by a hardware problem.

### Call failed

An outgoing SVC call failed. This is an X.25 event.

### Data errors

The line was declared down by the local node's line protocol handler when the line exceeded an error threshold.

### Dropped by adjacent node

The adjacent node was responsible for breaking the circuit connection.

### Invalid verification seed value

A Routing initialization message sent by an adjacent node is not formatted properly. This is most likely caused by a remote network software problem.

### Line synchronization lost

The normal line protocol was restarted or terminated by the adjacent node. Either a line exceeded an error threshold, or network management initiated a line state change. DMR/DMC failures that cause a line synchronization error are as follows:

- o Threshold errors, including more than eight attempts to transmit a message, or eight Ns received in a row.
- o Start message received in the RUN state (that is, the remote system detected an error and restarted the line).
- o Maintenance requested while in the RUN state (that is, the remote system tried to perform a maintenance operation such as LOOP CIRCUIT).
- o Message was lost because no buffer was available in CPU memory.
- o Nonexistent memory error.
- o Procedure error, because of driver failure or hardware failure.
- o Timeout on request to transmit a message in 255 seconds.
- o Power failure.

### Routing update checksum error

A routing update packet failed its internal integrity test.

## NETWORK RELATED MESSAGES

### Unexpected packet type

A packet was received out of the normal protocol sequence. For example, the local node received a normal data packet when it expected a verification packet.

### Verification password required from Phase III node

A required routing initialization password was not specified before an attempt was made to initialize the Phase III node in a Phase IV network.

### Verification receive timeout

A required verification packet was not received from the adjacent node within the required response time. Either packets were lost on the line or a failure occurred at the adjacent node.

### Version skew

The routing version of the adjacent node is unacceptable to the local node. The operator may have installed incorrect software at the adjacent node.

### 4.8 Circuit down

An error has occurred for the circuit. This message displays the name of the circuit for which the event applies, along with the packet header (as described for event 4.0), the reason (as described for event 4.7), and the address of the adjacent node.

### 4.9 Circuit down, operator fault

An operator error has occurred for the circuit. This message displays the name of the circuit for which the event applies, along with the packet header (as described for event 4.0), the reason, (as described for event 4.7) and the addresses of the expected node and the adjacent node.

### 4.10 Circuit up

A remote node has initialized on one of the physical lines connected to the local node. This message displays the name of the line for which the event applies, along with the address of the newly initialized node.

Be sure to note that this event does not imply that the node is reachable. Reachability is determined by the higher-level routing algorithms.

### 4.11 Initialization failure, line fault

A remote node failed to initialize with the local node because of a physical line error. This message displays the name of the line for which the event applies, along with the reason for the event (as described for event 4.7)

## NETWORK RELATED MESSAGES

### 4.12 Initialization failure, software fault

A remote node failed to initialize with the local node because of a software error. This message displays the name of the line for which the event applies, along with the packet header (as described for 4.0) and the reason (as described for event 4.7).

### 4.13 Initialization failure, operator fault

A remote node failed to initialize with the local node because of an operator error. This message displays the name of the line for which the event applies, along with the packet header (as described for event 4.0), the reason (as described for event 4.7), and the version received from the adjacent node.

### 4.14 Node reachability change

Because of Routing operation, the reachability of a remote node has changed. This message displays the name of the node for which the event applies, along with the routing status of the node (reachable or unreachable).

### 4.15 Adjacency up

The adjacent node on the circuit is initialized. This message displays the name of the circuit for which the event applies, and the address of the adjacent node.

### 4.16 Adjacency rejected

The adjacent node on the circuit is not initialized. The message displays the name of the circuit for which the event applies, and the address of the adjacent node and the reason for the event (as described for event 4.7).

### 4.17 Area reachability change

Because of Routing operation, the reachability of an area has changed. This message displays the name of the area for which the event applies, along with the routing status of the area (reachable or unreachable).

### 4.18 Adjacency down

An error has occurred for an adjacency on the circuit. This message displays the name of the circuit for which the event applies, along with the reason (as described for event 4.7), the packet header (as described for event 4.4), and the address of the adjacent node on the circuit.

### 4.19 Adjacency down, operator fault

An adjacency on the circuit is down because of an operator error. This message displays the name of the circuit for which the event applies, along with the reason (as described for event 4.7), the packet header (as described for event 4.0), and the addresses of the expected node and the adjacent node on the circuit.

## NETWORK RELATED MESSAGES

### C.4.6 Data Link Layer Events

#### 5.0 Locally initiated state change

The line state changed because of an operator command. This message displays the name of the line for which the event applies, along with the old DDCMP state (HALTED, ISTRT, ASTRT, RUNNING, or MAINTENANCE) and the new DDCMP state. Refer to the DDCMP Functional Specification for a description of these states.

#### 5.1 Remotely initiated state change

A remote user changed the line state. This message displays the name of the line for which the event applies, with the old and new DDCMP line states (see event 5.0).

#### 5.2 Protocol restart received in maintenance mode

The remote node restarted normal operation while the local node had the line in maintenance mode. This message displays the name of the line for which the event applies.

#### 5.3 Send error threshold

Too many data transmission errors occurred. This message displays the name of the line for which the event applies, along with the line counters for that line and the address of the received station (node).

#### 5.4 Receive error threshold

Too many data reception errors occurred. This message displays the name of the line for which the event applies, along with the line counters for that line and the address of the received station (node).

#### 5.5 Select error threshold

Too many selection errors occurred. This message displays the name of the line for which the event applies, along with the line counters for that line and the address of the received station (node).

#### 5.6 Block header format error

DDCMP received an invalid block header. This message displays the name of the line for which the event applies, along with the invalid block header. Refer to the DDCMP Functional Specification for a description of the block header format.

#### 5.7 Selection address error

The wrong tributary responded in the polling process. The event occurs only for a multipoint control station when one receives a message that does not match the address of the currently selected tributary.

This message displays the name of the line for which the event applies, along with the tributary addresses of the selected tributary, the received tributary, and the previous tributary.

## NETWORK RELATED MESSAGES

### 5.8 Streaming tributary

A tributary on the line is impeding the use of that line. This message displays the name of the line for which the event applies, along with the tributary address of the received tributary and the status of the tributary. The status may be any of the following:

- o Streaming
- o Continued send after timeout
- o Continued send after deselect
- o Ended streaming

### 5.9 Local buffer too small

A local buffer is too small for receiving a block of data. This message displays the name of the line for which the event applies, along with two qualifiers---the length (in bytes) of the received block and the length (in bytes) of the buffer.

### 5.10 Restart (X.25 protocol)

A restart occurred at the frame level in the X.25 Gateway.

### 5.11 State change (X.25 protocol)

The operational state of the X.25 line changed because of an operator command or a communication loss with the packet switch network.

### 5.13 Line initialization failure

An initialization failure occurred over an Ethernet line. This message displays the name of the line for which the event applies.

### 5.14 Send failure on line \*

A data transmission attempt failed on an Ethernet line. This message displays the name of the line for which the event applies, along with the reason for the failure and the distance. Failure reasons can include excessive collisions, short or open circuits, too long a frame, a framing error, an unrecognized frame destination, a remote failure to defer, a block check error, or data overrun.

### 5.15 Receive failed on line \*

Data was not received on an Ethernet line. This message displays the name of the line for which the event applies, along with two event qualifiers---the reason for the failure (as described in event 5.14) and the Ethernet header which includes the source and destination node addresses and the protocol type.

NETWORK RELATED MESSAGES

5.16 Collision detect check failed on line

A check for collision detection failed on an Ethernet line. The message displays the name of the line for which the event applies.

5.17 DTE up

From node 7.99 (NONAME), 15-April-1984 18:36:34:04 DTE =  
311060300052

5.18 DTE down

From node 7.99 (NONAME), 15-April-1984 18:36:25:89 DTE =  
311060300052

## APPENDIX D

### X.29 CONFIGURATION FILE

#### D.1 MANAGING X29SRV

The system manager can tailor the characteristics of X29SRV to suit the requirements of the site by using variations of the DEFINE command. The commands are stored in the file SYS:X29SRV.INI and can be changed at any time. However, X29SRV processes these commands only at startup time. While X29SRV is running, the characteristics remain static.

There is, however, no need for the file SYS:X29SRV.INI to exist before X29SRV can function. X29SRV is designed to run and to interact with the remote PAD software using the CCITT X.3, X.28, and X.29 recommendations. Thus, the system manager can choose to simply install the program and let it run without any intervention.

##### D.1.1 Security Considerations

The system manager can use the DEFINE commands to determine the degree of X29SRV's user-friendliness. An example of user-friendliness is the abundance of help text, prompts, and other system messages that guide the users in accessing systems successfully. This is particularly helpful to users who are not familiar with the installation and its access procedure.

On the other hand, the system manager can choose not to provide these features to users who happen to connect to the PSI Gateway accidentally. The system manager may want to make it harder for those who are not familiar with the access procedure to gain access to any of the systems on the DECnet network. This can be done, for example, by having X29SRV disconnect the terminal after an unsuccessful attempt to connect to a system.

These options are decided by the system managers. While there are no fool-proof ways of preventing illegal break-ins of systems over the Public Network, these options provide the system manager with a means to build the first line of defense against such practices. The responsibility of maintaining a system's security rests with the systems manager and the operating system.

#### D.2 SAMPLE DIALOGUE

The following sample of initialization set-up and dialogue illustrates the normal procedure for managing the TOPS-10 PSI X.29 software and using the software to access the TOPS-10 host. The system is assumed to be connected to the TELENET network.

## X.29 CONFIGURATION FILE

### D.2.1 X29SRV.INI

The file SYS:X29SRV.INI, which contains the following commands, is created by the system manager to define the characteristics of X29SRV.

```
DEFINE DEFAULT HOST DISABLED
DEFINE HERALD Digital Equipment Corp. TOPS-10 PSI Gateway X.29 Server
DEFINE MAXIMUM CIRCUITS 8
DEFINE MAXIMUM CONNECT ERRORS 1
DEFINE NETWORK TELENET
DEFINE PROMPT "X29SRV> "
DEFINE RESPONSE VERBOSE
DEFINE REVERSE CHARGING ALLOWED
DEFINE SET DEFAULT 1:1,2:1,3:126,4:10,5:1,6:1,7:1,8:0,9:0,10:0,12:1, -
                  13:0,14:0,15:0,16:127,17:21,18:18,0:33,1:0,10:0, -
                  18:0,27:127,28:21,29:18,37:1,57:1,63:0

DEFINE SET FDX 1:1,2:0,3:0,4:1,5:1,6:1,7:1,8:0,9:0,10:0,12:0,13:4, -
              14:0,15:0,16:127,17:21,18:18,0:33,1:4,10:0,18:0, -
              27:127,28:21,29:18,37:1

DEFINE SET HDX 1:1,2:1,3:6,4:0,5:1,6:1,7:1,8:0,9:0,10:0,12:1,13:0, -
              14:0,15:1,16:127,17:21,18:18,0:33,1:0,10:0,18:4,27:127, -
              28:21,29:18,37:1

DEFINE SET KERMIT 1:1,2:1,3:0,4:1,5:1,6:1,7:1,8:0,9:0,10:0,12:0,13:4, -
                 14:0,15:0,16:127,17:21,18:18,0:33,1:4,10:0,18:0, -
                 27:127,28:21,29:18,37:1,57:0,63:0
```

### D.2.2 Dialogue

The following example shows the terminal session as seen by the user accessing the TOPS-10 system from a public access PAD on the TELENET network.

```
TELENET
617 18I

TERMINAL=D1 <RET>

@C 61772 <RET>

617 72 CONNECTED
Digital Equipment Corporation TOPS-10 PSI Gateway X.29 Server
Friday, April 13, 1984 11:06:31:AM V1.0(0) #110(00)

X29SRV> CONNECT KL1026 <RET>

RL175D DEC10 Development 11:10:47 TTY52 system 1026/1042
Connected to Node KL1026(26) Line # 52
Please LOGIN or ATTACH

.TTY NO ECHO

.<BREAK>
BREAK
X29SRV> DISC <RET>
```



## X.29 CONFIGURATION FILE

```
HOST SYSTEM DISCONNECTED
X29SRV> CONNECT KS4145 FDX <RET>
CSSE KS 4145 7.02 11:12:29
```

```
.
[ Idle line disconnected by host ]
```

```
HOST SYSTEM DISCONNECTED
X29SRV> CLEAR <RET>
```

```
DISCONNECTING .....
617 72 DISCONNECTED 00 00 00:00:01:17 30 25
```

### D.3 MANAGEMENT COMMANDS

The management commands can be used to define the characteristics of X29SRV. They are saved in the file SYS:X29SRV.INI. The commands are listed in alphabetical order in the following sections.

All of these commands can be abbreviated. For example, "DEF D H E" can be used to represent the command DEFINE DEFAULT HOST ENABLED. A long command may be entered as several text lines as follows:

```
DEFINE SET DEFAULT 1:1,2:1,3:126,4:10,5:1,6:1,7:1,8:0,9:0,10:0, -
                  12:1,13:0,14:0,15:0,16:127,17:21,18:18, -
                  0:0,1:0,10:0,18:0,27:127,28:21,29:18,37:1,57:1,63:0
```

The character "-" (dash) at the end of the first two lines indicates to X29SRV that the command is continued on the next line.

#### D.3.1 Error Conditions

If you compose a command that is syntactically incorrect, X29SRV responds with the following error message at the console when it processes the SYS:X29SRV.INI file at startup time:

```
?Illegal X29SRV command <text>
  <diagnostic>
```

where <text> is the text string that X29SRV acknowledges reading from the SYS:X29SRV.INI file and <diagnostic> is the explanation why X29SRV thinks the command is incorrect. Following are samples of X29SRV detection of syntactical errors. For example, a misspelling of the parameter "HERALD" in the command line:

```
DEFINE HERRALD Clark College Atlanta, Georgia
```

may cause the following response:

```
?Illegal X29SRV command "DEFINE HERRALD Clark College Atlanta, Georgia"
  Unrecognized switch or keyword: "HERRALD"
```

## X.29 CONFIGURATION FILE

Too much of abbreviation in the command line (for example, "C" is intended to represent CIRCUITS in this command):

```
DEF MAX C 8
```

may cause ambiguity as follows (There are two parameters that start with the character "C" -- CIRCUITS and CONNECT ERRORS):

```
?Illegal X29SRV command."DEF MAX C 8"  
Ambiguous switch or keyword: "C"
```

### D.3.2 DEFINE DEFAULT HOST Command

This command, if enabled, lets you automatically connect the X.29 terminal to the TOPS-10 host system without specifying the CONNECT command. This may be desirable if the TOPS-10 PSI Gateway services only one TOPS-10 system. If your PSI Gateway node services more than one TOPS-10 host system, and this command is used, the X.29 terminal will be connected to the system that has X29SRV running.

#### Syntax:

```
DEFINE DEFAULT HOST control
```

#### Arguments:

```
control      is one of the following:  
             1  
             DISABLED  
             ENABLED
```

#### Messages:

```
None
```

#### Remarks:

```
If control is ENABLED, the default X.3 parameter set will be used  
to define the terminal connection characteristics.
```

```
Default control is DISABLED.
```

#### Example:

```
DEFINE DEFAULT HOST ENABLED
```

## X.29 CONFIGURATION FILE

### D.3.3 DEFINE HERALD Command

This command defines the herald text to be displayed at the user's terminal at the beginning of the X.29 terminal session.

#### Syntax:

```
DEFINE HERALD text
```

#### Arguments:

text                    the herald text in the format of a list of octal representation of 8-bit bytes, quoted and unquoted strings of up to 2047 characters in length. An unquoted string is only allowed to be the last element of the list, and it must be terminated by a carriage return.

#### Messages:

None

#### Remarks:

X29SRV automatically adds a pair of carriage return and line feed characters at the end of the herald text string if none are there.

Default is no herald text.

#### Example:

```
DEFINE HERALD 15,12,"Digital Equipment Corporation ETC, Valbonne",15,12
DEFINE HERALD Clark College, Atlanta Georgia
```

### D.3.4 DEFINE MAXIMUM CIRCUITS Command

This command defines the maximum number of simultaneously active X.29 terminal connections serviced by X29SRV.

#### Syntax:

```
DEFINE MAXIMUM CIRCUITS count
```

#### Arguments:

count                    number of circuits range from 1 to 20.

#### Messages:

```
NUMBER OF MAXIMUM CIRCUITS EXCEEDED LIMIT
```

The specified number of maximum circuits that can be active simultaneously exceeded 20.

#### Remarks:

Default is 8.

#### Example:

```
DEFINE MAXIMUM CIRCUITS 16
```

## X.29 CONFIGURATION FILE

### D.3.5 DEFINE MAXIMUM CONNECT ERRORS Command

This command sets the limit of the allowed number of unsuccessful attempts to connect to a host system on the DECnet network before the connection between the PAD and the TOPS-10 PSI Gateway is terminated.

#### Syntax:

```
DEFINE MAXIMUM CONNECT ERRORS count
```

#### Arguments:

```
count          number of attempts allowed.
```

#### Messages:

```
None
```

#### Remarks:

```
Default is 1.
```

#### Example:

```
DEFINE MAXIMUM CONNECT ERRORS 3
```

### D.3.6 DEFINE NETWORK Command

This command notifies X29SRV of the PPSN that the TOPS-10 PSI Gateway software is connected to. This command is necessary only when the PPSN that your system is connected to does not provide the full implementation of CCITT X.3, X.28 and X.29 interface.

#### Syntax:

```
DEFINE NETWORK name  
NETWORK CLASS number
```

#### Arguments:

```
name          is the name of the PPSN. X29SRV recognizes the  
              following PPSN names:
```

DATEX-P	Federal Republic of Germany
PSS	The United Kingdom
TELENET	The United States
TRANSPAC	France
TYMNET	The United States

## X.29 CONFIGURATION FILE

number            The class of the PPSN. Some of the leading PPSN vendors market their network software and technology to other PPSN vendors. The network class identification is a means used by X29SRV to classify similar PPSNs with those it is familiar with.

Class	Network	Country
0	DATAPAK	Norway
	TELENET	The United States
1	TRANSPAC	France
2	DATEX-P	Federal Republic of Germany
3	DATANET-1	The Netherlands
	PSS	The United Kingdom
4	TYMNET	The United States

### Messages:

#### UNKNOWN NETWORK CLASS

The specified Network Class number is not recognized by X29SRV.

### Remarks:

If your PPSN name is not on the above network name list, contact your DIGITAL software specialist for your PPSN's network class.

### Example:

```
DEFINE NETWORK DATEX-P
DEFINE NETWORK CLASS 4
```

### D.3.7 DEFINE PROMPT Command

This command lets you define the prompt text string that is displayed at the user's terminal in X29SRV's Command Mode when it is ready to receive user's commands.

### Syntax:

```
DEFINE PROMPT text
```

### Arguments:

text            the prompt text in the format of a list of octal representation of 8-bit bytes, quoted and unquoted strings of up to 127 characters in length. An unquoted string is allowed only to be the last element of the list, and it must be terminated by a carriage return.

### Messages:

None

### Remarks:

Default is no prompt.

## X.29 CONFIGURATION FILE

Example:

```
DEFINE PROMPT 15,12,"Please, enter CONNECT host",15,12,12
DEFINE PROMPT X29SRV>
```

### D.3.8 DEFINE RESPONSE Command

This command determines the verbosity of X29SRV while servicing the remote terminals.

Syntax:

```
DEFINE RESPONSE control
```

Arguments:

control is one of the following:

```
QUIET
VERBOSE
```

Messages:

None

Remarks:

Default is QUIET.

Example:

```
DEFINE RESPONSE VERBOSE
```

### D.3.9 DEFINE REVERSE CHARGING Command

This command allows X29SRV to accept incoming calls with the reverse charge facility (such as calls that originate from public PAD facilities of the PPSN). Otherwise, those incoming calls are rejected.

Syntax:

```
DEFINE REVERSE CHARGING control
```

Arguments:

control is one of the following:

```
ALLOWED
DISALLOWED
```

Messages:

None

Remarks:

Default is ALLOWED.

## X.29 CONFIGURATION FILE

Example:

```
DEFINE REVERSE CHARGING DISALLOWED
```

### D.3.10 DEFINE SET Command

This command defines various sets of CCITT and national X.3 parameters to be requested by the users to define the characteristics of their terminal connections. The maximum number of X.3 parameter sets that can be defined is 18 (including the default parameter set DEFAULT). See Section D.4 for a description of the CCITT X.3 parameters.

Syntax:

```
DEFINE SET DEFAULT list
          name list
```

Arguments:

**name** is the text string representing the name of the X.3 parameter set of up to 6 characters in length.

**list** is the list of the CCITT and national X.3 parameters to be defined in the set. The list has the following format:

```
parameter:value [, parameter:value]
```

where parameter is the X.3 parameter number ranges from 1 to 127 and value is the associated X.3 parameter value. All values are in decimal. X29SRV will not attempt to validate the X.3 parameter values. The values however must not be greater than 255 decimal.

Messages:

NUMBER OF X.3 PARAMETER SETS EXCEEDED LIMIT

You have defined more than 17 X.3 parameter sets.

DUPLICATED NATIONAL X.3 PARAMETER DEFINITION

You have specified more than one national X.3 parameter separator (see remarks below) in the list of X.3 parameters.

X.3 PARAMETER NUMBER IS OUT OF RANGE

The value of an X.3 parameter number is outside the range of 1 to 127 decimal.

X.3 PARAMETER VALUE OCCUPIES MORE THAN ONE OCTET

The value of an X.3 parameter value is greater than 255 decimal.

## X.29 CONFIGURATION FILE

### Remarks:

The reserved X.3 parameter set name is DEFAULT, which is the default X.3 parameter set.

When you specify the list of X.3 parameters, you can include the national X.3 parameters in the list by preceding them with the X.3 separator 0:0. The national X.3 parameter numbers may range from 1 to 127. The number of defined national X.3 parameters in each set should not exceed 45. X29SRV will not attempt to validate the X.3 parameter values. However, the values must not be greater than 255 decimal.

If X29SRV encounters errors while processing the parameter definitions, the entire X.3 parameter set is discarded and the set name will be undefined.

### Example:

```
DEFINE SET DEFAULT 1:1,2:0,3:0,4:1,5:1,9:0,11:2,15:1,16:127,17:21,18:18
DEFINE SET EMACS 0:0,57:1,63:0
DEFINE SET VMS 3:2,4:0,0:0,57:1,63:0
```



## X.29 CONFIGURATION FILE

### D.4 VALUES OF THE PAD PARAMETERS

This appendix assumes that your network supports PADS that conform to the CCITT X.3 Recommendation of 1980. Table D-1 provides a summary of the PAD parameter values.

Table D-1: Summary of PAD Parameter Values

Parameter Number	Values
1	0, 1 32-126 (optional)
2	0, 1
3	0, 2, 126 6, 18 (optional)
4	0, 20, 255 1-19, 21-254 (optional)
5	0, 1
6	0, 1
7	0, 2, 8, 21 1 (optional)
8	0, 1
9	0-7
10	0, 1-255
11	0, 2, 8 1, 2, 4-7, 9-18 (optional)
12	0, 1
13	0, 1, 4, 5, 6, 7
14	0-7
15	0, 1
16	0-127
17	24 0-23, 25-127 (optional)
18	0-127

## X.29 CONFIGURATION FILE

### D.4.1 Parameter 1 - PAD Recall Using a Character

This parameter controls the action of the PAD on receipt of a DLE (<CTRL/P>) from the terminal, when the PAD is in the Data Transfer state. The parameter values are:

- 0 No escape from the Data Transfer state allowed, except with break signal (see parameter 7)
- 1 Escape from the Data Transfer state to the Waiting for Command state occurs when a DLE is received from the terminal
- 32-126 Escape from the Data Transfer state to the Waiting for Command state occurs when the graphic character specified by the ASCII code (decimal) given here is received

The preferred value of this parameter for an X.29 terminal is 1; this allows interaction with the PAD (for example, to read the values of PAD parameters).

### D.4.2 Parameter 2 - Echo

This parameter determines whether the PAD echoes characters received from the terminal. The parameter values are:

- 0 The PAD does not echo.
- 1 The PAD echoes, except when buffer space limitations cause it to ignore a character from the terminal.

### D.4.3 Parameter 3 - Selection of Data Forwarding Signals

This parameter defines which characters (received from the terminal) cause the PAD to forward the current packet to the host DECsystem-10 computer. The parameter values are:

- 0
- 2
- 6
- 18
- 126

## X.29 CONFIGURATION FILE

These values are a combination of one or more of the following:

- 0 Forwarding on receipt of the 129th character
- 1 Alphanumerics, that is, A-Z, a-z, and 0-9
- 2 <RET>
- 4 <ESC>, <BEL>, <ENQ>, and <ACK>
- 8 <DEL>, <CAN>, and <DC2>
- 16 <ETX> and <EOT>
- 32 <HT>, <LF>, <VT>, <FF>
- 64 All other control characters not in the above list.

The value 6 is the combination of 2+4, 18 is the combination of 2+16, and 126 is the combination of 2+4+8+16+32+64.

The PAD never transmits empty data packets. The PAD normally includes the forwarding character in the packet it causes to be forwarded. If the packet is full, the PAD includes the forwarding character in the next packet.

### D.4.4 Parameter 4 - Selection of Idle Timer Delay

This parameter controls whether there is data-forwarding timeout and, if so, its length. The parameter values are:

- 0 No data forwarding timeout
- 20 Data forwarding timeout of 1 second
- 255 Data forwarding timeout of 12.75 seconds
- 1-19,21-254 The data forwarding timeout length in units of 1/20 second

### D.4.5 Parameter 5 - Ancillary Device Control

This parameter enables or disables ancillary device control of the terminal by the PAD. The parameter values are:

- 0 No ancillary device control
- 1 Ancillary device control (the PAD transmits X-ON and X-OFF to the terminal)

## X.29 CONFIGURATION FILE

### D.4.6 Parameter 6 - Control of PAD Service Signals

This parameter determines whether PAD service signals are suppressed or transmitted to the terminal. The parameter values are:

- 0 PAD service signals suppressed
- 1 PAD service signals transmitted to your terminal
- 5 PAD service signals and the prompt PAD service signal transmitted to the terminal

### D.4.7 Parameter 7 - Action of PAD on Receipt of Break Signal

This parameter specifies the action to be taken by the PAD on receipt of a BREAK signal from the terminal. The parameter values are:

- 0
- 1
- 2
- 8
- 21

These values are a combination of one or more of the following:

- 0 No action on receipt of <BREAK>
- 1 The PAD sends an interrupt to the TOPS-10 system
- 2 The PAD sends a reset to the TOPS-10 system
- 4 The PAD sends an Indication Break PAD message to the TOPS-10 system
- 8 The PAD leaves the Data Transfer state and enters the Waiting for Command state
- 16 The PAD discards output to the terminal by setting parameter 8 to the value 1

where 21 is a combination of 1+4+16.

### D.4.8 Parameter 8 - Discard Output

This parameter specifies that the PAD delivers data to the terminal. The parameter values are:

- 0 Normal data delivery
- 1 No data delivery to the terminal; the PAD discards any data received from the host computer

## X.29 CONFIGURATION FILE

### D.4.9 Parameter 9 - Padding After Carriage Return

This parameter specifies the number of padding characters after a <RET>. The parameter values are:

- 0 No padding after <RET>
- 1-7 One to seven padding characters inserted after <RET>

### D.4.10 Parameter 10 - Line Folding

This parameter specifies whether or not line folding is to be performed, and, if so, it specifies the maximum length of the line. The parameter values are:

- 0 No line folding performed
- 1-225 Enables line folding and specifies the maximum line length for all data transmitted or echoed by the PAD to the terminal

### D.4.11 Parameter 11 - Speed of Start-Stop Mode Terminal

This parameter specifies the receive-transmit speed of the user terminal. The parameter values are:

- 0 110 bits/s
- 1 134.5 bits/s
- 2 300 bits/s
- 3 1200 bits/s
- 4 600 bits/s
- 5 75 bits/s
- 6 150 bits/s
- 7 1800 bits/s
- 8 200 bits/s
- 9 100 bits/s
- 10 50 bits/s
- 11 75/1200 bits/s
- 12 2400 bits/s
- 13 4800 bits/s
- 14 9600 bits/s
- 15 19200 bits/s
- 16 48000 bits/s
- 17 56000 bits/s
- 18 64000 bits/s

Note that the support of any of these values depends on the supported data transmission rates of the PAD.

Neither the terminal nor the host computer can set parameter 11. The PAD sets this parameter by detecting the line rate from the Service Request sequence from the terminal.

## X.29 CONFIGURATION FILE

### D.4.12 Parameter 12 - Flow Control of the PAD

This parameter enables or disables flow control of data between the PAD and the terminal. The parameter values are:

- 0 No flow control on
- 1 Flow control on (that is, the PAD responds to X-ON (<CTRL/Q>) and X-OFF (<CTRL/S>) transmitted by the terminal).

### D.4.13 Parameter 13 - Line Feed Insertion After Carriage Return

This parameter controls <LF> insertion after <RET>. The parameter values are:

- 0 No <LF> insertion
- 1 <LF> inserted after every <RET> transmitted (but not echoed) to the terminal
- 4 <LF> inserted after every <RET> echoed to the terminal
- 5 <LF> inserted after every <RET> transmitted and echoed to the terminal
- 6 <LF> inserted after every <RET> echoed to the terminal and transmitted to the host computer
- 7 <LF> inserted after every <RET> transmitted to your terminal, echoed to the terminal, and transmitted to the host computer

### D.4.14 Parameter 14 - Padding After Line Feed

This parameter specifies the number of padding characters after a <LF>. The parameter values are:

- 0 No padding after <LF>
- 1-7 One to seven padding characters inserted after a <LF>

### D.4.15 Parameter 15 - Editing

This parameter determines whether buffer editing is available while in the Data Transfer state. The parameter values are:

- 0 No editing in the Data Transfer state
- 1 Editing in conjunction with parameters 16, 17 and 18.

## X.29 CONFIGURATION FILE

### D.4.16 Parameter 16 - Character Delete

This parameter specifies if character deleting in the Data Transfer state is enabled and, if so, it specifies the character delete character. The parameter values are:

- Ø No character delete in the Data Transfer state
- 1-127 The decimal code of the character chosen as the Character Delete character

### D.4.17 Parameter 17 - Line Delete

This parameter specifies if line (or buffer) deleting in the Data Transfer state is enabled and, if so, it specifies the line delete character. The parameter values are:

- Ø No buffer delete in the Data Transfer state
- 1-127 The decimal code of the character chosen to be the Buffer Delete character

If parameter 4 (data forwarding timeout) is set to a low value, the PAD will forward the data before you have time to edit it.

### D.4.18 Parameter 18 - Line Display

This parameter specifies if line displaying is enabled and, if so, specifies the Line Display Character. The parameter values are:

- 1-127 The decimal code of the character chosen to be the line display character





## APPENDIX E

### BIBLIOGRAPHY

The following DIGITAL documents contain detailed information on the protocols used in DECnet. The appendix section of the Overview of Digital Networking Products contains a complete list of DECnet manuals as well as manuals pertinent to DECnet, such as Ethernet and PSI.

Each of the following subtitles is preceded by "DECnet DIGITAL Network Architecture" and followed by "Functional Specification" or (for DDCMP) "Specification" (except for Introduction to DECnet).

Introduction to DECnet

General Description

This is an overview of the architecture and provides an introduction to each of the following documents.

Data Access Protocol (DAP)

Digital Data Communications Message Protocol (DDCMP)

Maintenance Operation Protocol (MOP)

Network Management Protocol

Network Services Protocol (NSP)

Routing

Session Control

The following lists CCITT recommendations relevant to users of the TOPS-10 PSI software and the CCITT publications in which those recommendations are discussed. For more information, contact the CCITT.

## BIBLIOGRAPHY

Recommendation	Document
X.3	Document AP VII-No. 6-E
X.25	Document AP VII-No. 7
X.28, X.29	Document AP VII-No. 8

The following document contains a complete and unabridged form of the key CCITT recommendations as they appear in the Fascile VIII.2 of the Yellow Book of the Consultative Committee for International Telegraph and Telephone, 1981 edition.

The X.25 Protocol and Seven Other Key CCITT Recommendations X.1, X.2, X.3, X.21 bis, X.28, and X.29. Lifetime Learning Publications, Belmont, California, 1981

The following published books are a source of general network information. The list is both arbitrary and abbreviated and is intended to be a catalyst to stimulate the reader's interest.

Title	Author	Publisher
Application Design Handbook for Distributed Systems	Patrick, Robert L.	CBI Publishing Co.
Basics of Data Communication	Karp, ed.	McGraw-Hill
Communications Networks for Computers	Davies and Barker	Wiley and Sons
Computer Networks and Distributed Processing: Software, Techniques, and Architecture	Martin, James	Prentice-Hall
Data Communications	Doll	Wiley Interscience
Design and Strategy for Distributed Data Processing	Martin, James	Prentice-Hall
Handbook of Data Communications	Editors	National Computing Centre Publications (United Kingdom)
Introduction to Data Communications	Murphy and Kalis	DIGITAL
Introduction to Mini-Computer Networks	---	DIGITAL
Introduction to Teleprocessing	Martin, James	Prentice-Hall
Technical Aspects of Data Communication	McNamara, John E.	DIGITAL

APPENDIX F  
DECnet LINE DEVICES

Table F-1: DECnet Line Devices

Mnemonic	Multi-line	Multi-point	DECnet-10 Support	TOPS-10 PSI Support	Description
CI	No	Yes	No	No	CI20 Computer interconnect
DA	No	No	No	No	DAll-B or DAll-AL UNIBUS link
DL	No	No	No	No	DL11-C, DL11-WA, and DL11-E asynchronous line interface
DLV	No	No	No	No	DLV11-E asynchronous line interface (11/03 and 11/23 only)
DMC	No	No	Yes (MCB)	No	DMC11-DA/AR, DMC11-MA/AL, DMC11-MD/AL, DMC11-FA/AR interprocessor links
DMR	No	No	Yes (MCB)	No	DMR11-AA, DMR11-AB, DMR11-AC, DMR11-AE interprocessor links
DMF	No	No	No	No	DMF-32 synchronous line unit

DECnet LINE DEVICES

Table F-1: DECnet Line Devices (Cont.)

Mnemonic	Multi-line	Multi-point	DECnet-10 Support	TOPS-10 PSI Support	Description
DMP	No	Yes	No	No	DMP-11 multipoint synchronous line device
DP	No	No	No	No	DP11-DA synchronous line interface
DPV	No	No	No	No	DPV11-DA synchronous line interface
DQ	No	No	No	No	DQ11-DA synchronous serial line interface
DTE	No	No	Yes	Yes	DTE20 interprocessor link
DU	No	No	No	No	DU11-DA synchronous line interface (includes DUV11)
DUP	No	No	Yes (MCB)	No	DUP-11DA synchronous line interface
DV	Yes	No	No	No	DV11-AA/BA NPR synchronous line multiplexer
ETH	No	Yes	Yes	No	NIA20 multiaccess communications link
KDP	Yes	No	Yes	Yes	KMC-11/DUP-11-DA NPR synchronous line multiplexer

DECnet LINE DEVICES

Table F-1: DECnet Line Devices (Cont.)

Mnemonic	Multi-line	Multi-point	DECnet-10 Support	TOPS-10 PSI Support	Description
KDZ	Yes	No	No	No	KMC-11/DZ11 -A/B/C/D NPR asynchronous line multiplexer
KL	No	No	No	No	KL8-J serial line interface
KMV	Yes	No	No	No	KMS11-BD/BE synchronous line interface combined with X.25 level 2 microcode
KMX	Yes	No	No	No	KMS11-BD/BE synchronous line interface combined with X.25 level 2 microcode
KMY	No	No	No	No	KMS11-PX synchronous line interface combined with X.25 level 2 microcode
PCL	No	Yes	No	No	PCL11-B multiple CPU link
QNA	No	Yes	No	No	DEQNA multiaccess communications link
TT	Yes	No	No	No	DZ11-F, DZ32-F, or DZV11-D asynchronous serial line multiplexer
TX	No	No	No	No	DMF-32/DMZ-32 asynchronous line unit

DECnet LINE DEVICES

Table F-1: DECnet Line Devices (Cont.)

Mnemonic	Multi-line	Multi-point	DECnet-10 Support	TOPS-10 PSI Support	Description
NI	No	Yes	No	No	NIA20 multiaccess communications link

## APPENDIX G

### GLOSSARY

The definitions and explanations in this glossary are specific to their use in this manual.

<b>Active</b>	A designation for plural entities that limits them to those that meet an activity criterion. The criterion is defined individually for each entity.
<b>Active lines</b>	Known lines in the ON or SERVICE state.
<b>Active logging</b>	All known sink types that are in the ON or HOLD state.
<b>Active nodes</b>	All reachable nodes as perceived from the executor node.
<b>Adjacent node</b>	A node connected to the executor node by a single physical line.
<b>Aged packet</b>	A packet that has exceeded the maximum number of visits.
<b>Area</b>	A group of nodes in a network that can run independently as a subnetwork.
<b>Area router</b>	A level 2 router.
<b>Area routing</b>	A technique for grouping the nodes in a network into areas for routing purposes. Routing in a multiple-area network is hierarchical, with one level of routing within an area (called level 1 routing) and a second, higher level of routing between areas (called level 2 routing).
<b>Bilateral Closed User Group (BCUG)</b>	An optional PPSN facility that restricts a pair of DTEs to communicating with each other. The basic BCUG also prevents this pair from accessing or being accessed by other DTEs. Additions to the BCUG facility allow one or both of the DTEs to access or be accessed by DTEs outside the group. These additions are known as BCUG with Outgoing Access and BCUG with Incoming Access respectively. See also related Closed User Group.

## GLOSSARY

Broadcast addressing	A special type of multicast addressing, in which a message is sent to all nodes.
Broadcast circuit	A circuit on which multiple nodes are connected and on which there is a method for transmitting a message that will be received by multiple receivers.
CCITT	Comite Consultatif International Telegraphique et Telephonique. An international consultative committee that sets international communications usage standards.
Central Management Node	Any node that is capable of parsing all DNA NCP commands, including those that the central management node cannot or does not implement for its operating system. A central management node is capable of managing the entire network of which it is a member; it can set parameters and initiate and terminate the operation of nodes, circuits, lines, and events and alter the logical configuration of the network.
Characteristics	Parameters that are generally static values in volatile memory or permanent values in a permanent data base. A Network Management information type. Characteristics can be set or defined. Examples of characteristics are the values assigned in response to the keywords NAME, TYPE, and LOAD FILE.
Circuit	A logical point-to-point connection. A circuit is identified by device, controller, unit, and (if present) tributary. For example, KDP-2-0.1.
Closed User Group (CUG)	An optional PPSN facility that restricts two or more DTEs in the same group to communicating with each other. The basic CUG also prevents these DTEs from accessing or being accessed by other DTEs outside the group. Additions to the basic CUG facility allow one or more DTEs to access or be accessed by DTEs outside the group. These additions are known as CUG with Outgoing Access and CUG with Incoming Access respectively.
Command node	The node where an NCP command originates.
Controller	That part of a line identification that denotes the control hardware for a line. For a multiplex device, that controller is responsible for one or more units. For example, in the line identification KDP-0-1, the controller is KMC-0. (The KDP is a KMC controller with up to four DUPs.)



## GLOSSARY

Cost	An integer value assigned to a circuit between two adjacent nodes. According to the routing algorithm, packets are routed on paths with the lowest cost.
Counters	Error and performance statistics based on a node's network activity.
Datagram	A unit of data sent over the network that is handled independently of all other units of data so far as the network is concerned. When a route header is added, a datagram becomes a packet.
Data Link	A physical connection between two nodes. In the case of a multipoint line, there can be multiple data links for one physical connection.
Data Transmission	The sending of data from one computer to another over a physical link, or from one task to another over a logical link.
DCE	Data Communications Equipment (DCE) is an X.25 PPSN node to which a DTE is connected with a leased data communications line.
DDCMP	DIGITAL Data Communications Message Protocol. A formal set of conventions designed to provide error-free, sequential transmission of data over physical links.
Designated router	A routing node on the Ethernet selected to perform routing services on behalf of end nodes.
DMC11	A single line microprocessor-based interface to the network. The DMC11 is a synchronous Direct Memory Access (DMA) device.
DMR11	A single line microprocessor-based interface to the network. The DMR11 is a synchronous Direct Memory Access (DMA) device.
DN20	The DECnet-10 communication front end.
Downline Loading	Transmitting a program's memory image over a physical link to an adjacent node and starting execution of it.
DTE	Data Terminal Equipment (DTE) is a host processor or communications processor directly connected to an X.25 PPSN with a leased data communications line.
DTE20	The hardware interface between the main processor in a DECsystem-1090/10911095 and the PDP-11 processor in the DN20 communication front end.

## GLOSSARY

<b>End node</b>	A node that can receive packets addressed to it and send packets to other nodes, but cannot route packets through from other nodes. Also called a nonrouting node.
<b>Entity</b>	AREA, CIRCUIT, LINE, LOGGING, MODULE, or NODE. These are the major Network Management keywords. Each entity has its own parameters and options. CIRCUIT, LINE, and NODE have counters also. Allowed plural forms are KNOWN and ACTIVE AREAS, CIRCUITS, LINES, MODULES and NODES. NODES can also take the form LOOP NODES. Entities are components that can be displayed and controlled.
<b>Ethernet</b>	A communications concept for local communication networks, which employ coaxial cable as a passive communications medium to interconnect different kinds of computers, without requiring switching logic or control by a central computer
<b>Ethernet protocol</b>	In the data-link layer of DNA (DIGITAL Network Architecture), the protocol that implements the Ethernet data-link protocol for communication between adjacent nodes connected by an Ethernet local area network.
<b>Event</b>	A network- or system-specific occurrence for which the logging entity maintains a record.
<b>Event Class</b>	A subset of events, currently consisting of groups of events associated with each of the DNA layers or with specific operating systems.
<b>Event Filter</b>	A set of on/off states for a logging event class that indicates whether or not each event type in that class is to be recorded.
<b>Event Type</b>	A particular type of event, unique within an event class.
<b>Executor Node</b>	The node where the active Local Network Management Function is running (that is, the node actually executing the command); the active network node physically connected to one end of a line being used for a load, dump, trigger, or line loop test.
<b>Frame</b>	A unit, delimited by flags, that includes a header used by the link level to exchange data packets as well as control and error information between the DTE and DCE.

## GLOSSARY

Full-duplex	Simultaneous independent transmission in both directions.
Full Routing Node	A node that allows communication between non-adjacent nodes. If all nodes in a network are full routing nodes, then each node can communicate with every other node in the network.
Global Filter	A filter that applies to all entities within an event class and type.
Half-duplex	Transmission in either direction, but not in both directions simultaneously.
Hardware address	For an Ethernet device, the unique Ethernet physical address associated with a particular Ethernet communications controller (usually in read-only memory) by the manufacturer.
Hold State	A logging state in which the sink is temporarily unavailable and events for it should be queued.
Hop	A hop is one unit of path length. When a request is routed from node A to node C by way of Node B, two hops are involved: node A to node B is one hop; node B to node C is another hop. (See path cost.)
Host Computer	A computer at a network node that primarily provides services such as computation, data base access, special programs, or programming languages to other nodes in the network.
Host Node or Host	The node that provides services for another node (for example, the storage of files needed for a downline load).
Information Type	One of CHARACTERISTICS, COUNTERS, EVENTS, or SUMMARY. Used with the NCP SHOW command to control the type of information returned. Each entity parameter and counter is associated with one or more information types.
KDP	A DECnet term that refers to a combination of a KMC11 (controller) and one to four DUP11s. With the KMC11, a microprocessor-based system, the DUP11 functions as a direct memory access device. The interface to the network is synchronous.
KNOWN	The classification for a plural entity that includes all perceived occurrences of the entity type.

## GLOSSARY

<b>KNOWN LINES</b>	All lines addressable by Network Management in the appropriate data base (volatile or permanent) on the executor node. They may not all be in a usable state.
<b>Level 1 router</b>	A node that can send and receive packets, and route packets from one node to another, only within a single area.
<b>Level 2 router</b>	A node that can send and receive packets, and route packets from one node to another, within its own area and between areas. Also known as an area router.
<b>Line</b>	A distinct physical data path. Line is a Network Management entity.
<b>Line Cost</b>	An arbitrary positive integer value assigned to a physical path. Because the routing algorithm selects the least-cost path to a destination, an operator can dynamically affect the path to be taken by changing line costs.
<b>Line Identification</b>	The device, controller, unit and/or tributary assigned to a line. Examples are KDP-0-1, DMC-1.
<b>Line Level Loopback</b>	Testing a specific data link by sending a repeated message directly to the data link layer and over a wire to a device that returns the message to the source.
<b>Load</b>	To read data into memory.
<b>Local DTE</b>	The communications node that connects to the public network.
<b>Local Node</b>	From the user's standpoint, a relative term indicating the node at which your terminal is logged in. From Network Management's standpoint, the node at which your requested task executes. If at your local node you SET the executor to another node, that other node is the local node to Network Management and the node where your terminal is attached is a remote node.
<b>Local User</b>	A user of the User Access Module who communicates with the public network through the node running TOPS-10 PSI Gateway Software. Also called user.

## GLOSSARY

Logging	Recording information from an occurrence that has potential significance in the operation and/or maintenance of the network in a potentially permanent form. Logging is the Network Management entity that routes event data to logging sinks such as a console or file. Logging sinks can be accessed by persons and/or programs.
Logging Console	A logging sink that is to receive a human-readable record of events, for example, a terminal or printer.
Logging Event Type	The identification of a particular type of event, for example, a line restarted or a node down.
Logging File	A logging sink that is to receive a machine-readable record of events for later retrieval.
Logging Identification	The sink type associated with the logging entity (file, console, or monitor).
Logging Monitor	A logging sink that is to receive a machine-readable record of events for possible real-time decision making. Typically, the logging monitor is a user-defined program.
Logging Sink	A place where a copy of an event is to be recorded.
Logging Sink Flags	A set of flags in an event record that indicate the sinks on which the event is to be recorded.
Logging Sink Node	A node to which logging information comes.
Logging Source Process	The process that recognized an event.
Logical Connectivity	The ability of nodes to communicate with each other.
Logical Link	A node-to-node connection that is established and controlled by the Session Control, Network Services, and Routing layers.
Loopback	A mode of operation in which data transmitted by a network task is reflected at some point along the communication path and returned to the originating task.

## GLOSSARY

<b>Loopback Node</b>	A special name for a node that is associated with a line for loopback testing purposes. The SET NODE CIRCUIT command sets the loopback node name. A loopback node is treated as if it were a remote node. All traffic to the loopback node is looped over the associated line.
<b>Maximum Cost</b>	The greatest total cost the path to a node may have if the node is to be reachable. When the cost associated with transmitting a message from one node to another exceeds the maximum cost, the transmission is not made.
<b>Maximum Hops</b>	The maximum number of hops a path to a node can contain if the node is to be reachable. Currently, the maximum hops supported is 30.
<b>Maximum Visits</b>	The maximum number of nodes a message coming into this node can have visited. If the number specified as MAXIMUM VISITS is exceeded, and the destination is not this node, then the message is discarded.
<b>Maximum Node Address</b>	The largest node address with which the local node can communicate.
<b>Maximum Path Cost</b>	The greatest value assigned to the least-cost path between any two nodes in the network.
<b>Module</b>	A network management component.
<b>Multiaccess Channel</b>	A medium (for example, Ethernet) on which many transmitters contend for access.
<b>Multicast Addressing</b>	An addressing mode in which a given message packet is targeted to a group of logically related nodes.
<b>Multicast Group Address</b>	An address assigned to a number of nodes on an Ethernet and used to send a message to all nodes in the group in a single transmission.
<b>Multipoint Line</b>	A line connected to more than two nodes.
<b>Monitor Sinktype</b>	An event sink that is to receive a machine-readable record of events for possible real-time decision making.
<b>Network diameter</b>	The reachability distance between the two nodes on the network having the greatest reachability distance. Reachability distance is the length of the shortest path between a given pair of nodes.

## GLOSSARY

<b>Network Interconnect (NI)</b>	A multiaccess interconnect that allows up to 1024 different stations to communicate over the Ethernet.
<b>Network Services Protocol (NSP)</b>	A formal set of conventions used in DECnet to exchange messages over logical links. NSP also refers to the program that implements the NSP protocol. (In the text of this manual, NSP refers to the program; NSP Protocol is used to refer to the protocol.) This protocol is implemented by the End Communications Layer of the DNA architecture.
<b>Node</b>	An computer system that supports DECnet. Used alone in this manual, node implies support of Routing, NSP, and Session Control. A node that does not support these three layers is called a Phase II node. Node is a Network Management entity.
<b>Node Address</b>	The required unique numeric identification of a specific node.
<b>Node Identification</b>	Either a node name or a node address. In some cases, an address must be the node identification. In other cases, a name must be used. DECnet contains a table for converting one to the other.
<b>Node Level Loopback</b>	Testing a logical link using repeated messages that flow with normal traffic through the Session Control, Network Services, and Routing layers within one node or from one node to another and back. In some cases node level loopback involves using a loopback node name associated with a particular line.
<b>Node Name</b>	An alphanumeric identification associated with a node address in a strict one-to-one mapping. The node name must contain at least one letter and cannot be more than six characters long.
<b>Nonrouting Node</b>	An end node. It can deliver and receive packets, but cannot route messages through to other nodes.
<b>Off State</b>	Applied to a node: a state where network traffic is no longer processing. Applied to a line: a state where the line is unavailable for any kind of traffic. Applied to logging: a state where the sink is not available for receiving events; in this state any events for the sink are discarded. Applied to circuits: the state where the circuit is not in use by any network-related software.

## GLOSSARY

<b>On State</b>	Applied to a node: a state of normal network operation. Applied to a line: a state of availability for normal usage. Applied to logging: a state where a sink is available for receiving events.
<b>OPR</b>	OPR is the Operator Command Language program that provides the operator with one command language to communicate with several TOPS-10 components. OPR processes commands for syntax and passes syntactically correct commands to ORION. (See ORION.)
<b>Originating Packet</b>	A packet that originated in the Network Services layer of a node.
<b>ORION</b>	ORION is the operator control program that accepts commands from OPR and forwards the commands to the proper program for execution. ORION forwards NCP commands to the Network Control Program.
<b>Packet</b>	A group of bits, comprising data and control information, which is transmitted as a composite whole over a physical link. The data, control, and any error information are arranged in a specific format. (A packet is the basic transmission unit of DDCMP.)
<b>Path</b>	The route a packet takes from source to destination node.
<b>Path Cost</b>	The sum of the line costs along a path between two nodes. See line cost.
<b>Path Length</b>	The sum of the hops along a path between two nodes.
<b>Permanent Data Base</b>	Default information about network entities that is kept in permanent memory (for example, files). Generally established at network generation. A permanent data base can be changed with the NCP commands PURGE and DEFINE; you can change the volatile data base with CLEAR and SET commands. DECnet-10 does not support a permanent data base.
<b>Permanent Virtual Circuit (PVC)</b>	A virtual circuit always associated with the same remote DTE address. The software references a PVC by its logical channel number (LCN). The public network vendor establishes the correspondence between a PVC and its LCN.



## GLOSSARY

Physical Address	The unique address value associated with a given system on an Ethernet circuit. An Ethernet physical address is defined to be distinct from all other physical addresses on Ethernet.
Physical Connectivity	The condition of nodes being attached to each other by active lines.
Physical Link	A communication path between two adjacent nodes. This can be a dial-up line, radio, satellite link, or a channel-to-channel connector such as a DTE20.
Port	The resources required to manage a virtual circuit.
PPSN	Public Packet Switching Network.
Plural Entity	A set of entities classified as known, active, or loop (nodes only).
Point-to-point	A circuit that connects two nodes, operating over a single line.
Processed Event	An event after local processing in final form.
Protocol	A formal set of conventions or rules governing the format and relative timing of message exchange.
Reachable Node	A node to which the executor node's routing process believes it has a usable communication path.
Remote DTE	The DTE on the public network with which the local user in a DECnet network wishes to communicate. The remote DTE may give access to another network in addition to the DECnet network of the local user, and the public network with which the local user communicates.
Remote Node	A node in a network that is not your local node.
Remote Task	A task executing in a remote node.
Remote User	A user at the remote DTE with whom the local user communicates over a virtual circuit.
Restricted State	A node state where no new logical links from other nodes are allowed.
Routing	The network function that determines the path along which data travels to its destination.
Routing Node	A node that contains the full set of Routing modules, and can deliver, receive, and route through packets.

## GLOSSARY

<b>Server Task</b>	An alternate designation for a task that has declared itself willing to accept a network connection, usually to provide some system service.
<b>Service Password</b>	The password required to permit triggering of a node's bootstrap ROM.
<b>Service Slave Mode</b>	That mode where the processor is taken over and the adjacent, executor node is in control, typically for execution of a bootstrap program for downline loading or for upline dumping.
<b>Service State</b>	A line state where such operations as downline load, upline dump, or line loopback are performed. This state allows direct access to the line by Network Management.
<b>Shut State</b>	A node state where existing logical links are undisturbed, but new ones are prevented.
<b>Singular Entity</b>	A specific entity; for example, a line, a logging sink type, a node, or a circuit.
<b>Sink</b>	See logging sink.
<b>Sink Node</b>	A node where logging sink types are located.
<b>Sink Type</b>	A particular final destination for logging events, either a file or a console.
<b>Source Node</b>	The node at which the request for a connection is initiated or from which a message is transmitted.
<b>Source Task</b>	The task in which the request for a connection is initiated or from which a message is transmitted.
<b>Specific Filter</b>	A filter that applies to a specific entity within an event class and type.
<b>Status</b>	Dynamic information relating to entities, such as their state. Status is a Network Management information type. Also, a message indicating whether or not an NCP command succeeded.
<b>Substate</b>	An intermediate line state that appears as a tag on a line state display.
<b>Summary</b>	An information type meaning the most useful information for an entity; the default if no information type is requested.

## GLOSSARY

<b>Switched Virtual Circuit (SVC)</b>	A temporary logical association between two DTEs connected to a PPSN, analogous to connection by a dial-up line. An SVC is set only when there is data to transmit; the SVC is cleared when the data transfer is complete.
<b>Target Node</b>	The node that receives a memory image during a downline load, generates an upline dump or loops back a test message.
<b>Terminal Server</b>	An Ethernet node that enables a number of terminals to communicate with multiple host nodes. Terminal servers are connected to an Ethernet cable. Terminals using the terminal server can only communicate with DECnet hosts on the Ethernet cable.
<b>Terminating Packet</b>	A packet whose destination is this node.
<b>Topology</b>	The physical arrangement and relationship of interconnected nodes and lines in the network. A legal topology satisfies all DNA requirements.
<b>Transit Packet</b>	A packet arriving at this node from a source node and intended for another node.
<b>Tributary</b>	A physical termination on a multipoint line that is not a control station. Part of the line identification for a multipoint line.
<b>Unit</b>	Part of a line/circuit identification. Together with the controller, a unit forms a station. In the line identification KDP-2-0, "KDP" identifies the device (KMCl1/DUP11), "2" identifies the controller, and "0" identifies the unit.
<b>Unreachable Node</b>	A node is unreachable when the path length to that node is longer than the maximum number of hops in the network.
<b>Upline Dumping</b>	Transmitting a copy of a memory image over a line to a file at the host node.
<b>Virtual Call</b>	The process of establishing a virtual circuit between two DTEs.
<b>Virtual Circuit</b>	A logical path between the user process in a DECnet node and a cooperating process in a remote DTE. A virtual circuit is similar to a DECnet logical link.

## GLOSSARY

### Volatile Data Base

The volatile, or temporary data base consists of dynamic values currently in memory. It can contain parameters such as status, line or node state, or characteristics, such as CPU type or timer values, that remain constant until cleared or reset. Volatile data base values are lost when the system shuts down. When the system is first brought up, data from the permanent data base, if any, is read into the volatile data base. The operator can change certain of these values with the SET NCP command. Changes made to the permanent data base with the DEFINE command are not reflected in the volatile data base until the system is brought up again. DECnet-10 does not support the permanent data base.

- X.3 A CCITT recommendation that specifies the Packet Assembly/Disassembly (PAD) facility in a public data network.
- X.25 A CCITT recommendation that specifies the interface between Data Terminal Equipment and Data Circuit-terminating Equipment for equipment operating in the packet mode on public data networks.
- X.29 A CCITT recommendation that specifies procedures for the exchange of control information and user data between a packet-mode DTE and a packet Assembly/Disassembly (PAD) facility.

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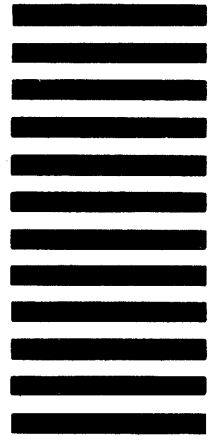


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