DECrouter 2000 Management Guide

Order No. AA-JH79A-TN

SUPERSESSION/UPDATE INFORMATION:	This is a new manual
OPERATING SYSTEM AND VERSION:	VAX/VMS V4.4 or later MicroVMS V4.4 or later ULTRIX-32 V1.2 or later ULTRIX-32m V1.2 or later
SOFTWARE VERSION:	DECrouter 2000 V1.0

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Manual Objectives

This manual explains how to manage the DECrouter 2000 software.

Intended Audience

This manual is for network managers who are familiar with networking concepts and the DECnet product. The network manager is responsible for maintaining the configuration databases and managing the DECrouter 2000.

This manual assumes that you understand and have some experience of:

- Local Area Networks (LANs)
- Wide Area Networks (WANs)
- Installation of software products on VAX/VMS or ULTRIX systems
- DECnet-VAX (if using a VAX/VMS load host)
- DECnet-ULTRIX (if using an ULTRIX load host)

Structure of the Manual

The manual has three chapters, one appendix and a glossary.

Chapter 1 introduces the DECrouter 2000.

Chapter 2 describes the DECrouter 2000 configuration databases.

Chapter 3 describes how to manage the DECrouter 2000.

Appendix A consists of a summary of commands used with the DECrouter 2000.

Appendix B lists recommended configuration parameters.

The Glossary contains a list of networking terms used with the DECrouter 2000.

Associated Manuals

For more information on the DECrouter 2000, refer to:

- *DECrouter 2000 Installation Procedures*
- *DECrouter 2000 Problem Solving Guide*

You may also find the *Routing and Networking Overview* useful in explaining routing concepts and terminology.

All three of these manuals are in the same binder as this manual.

The following provide information about the hardware used with the DECrouter 2000 software:

- *Installing the DEC MicroServer*
- *DEC MicroServer Systems Configuration Card*

If a VAX/VMS system is being used as a load host, you are expected to be familiar with the following manuals:

- *VAX/VMS Networking Manual*
- *VAX/VMS Network Control Program Reference Manual*
- *Guide to VAX/VMS Software Installation*

If an ULTRIX system is being used as a load host, you are expected to be familiar with the following manuals:

- *ULTRIX-32 System Manager's Guide* or the *ULTRIX-32m System Manager's Guide*
- The DECnet-ULTRIX documentation set, in particular the *DECnet-ULTRIX Guide to Network Management* and the *DECnet-ULTRIX User's and Programmer's Guide*

Manual Conventions

<*xxx*>	This one- to three-character symbol indicates that you press a key on the terminal; for example: <RET> indicates the RETURN key <ESC> indicates the ESCAPE key
<CTRL/*x*>	This symbol indicates that you press the CTRL key at the same time as you press another key; for example, <CTRL/C>, <CTRL/Y>, and so on.
Red print	indicates commands and data that you enter.
Italics	indicate variable information.

All values are decimal integers unless stated otherwise.

1
Introduction

1.1 What is the DECrouter 2000?

The DECrouter 2000 is a communications product which provides a routing service for your Local Area Network (LAN). This allows you to communicate with nodes outside the LAN within a Wide Area Network (WAN). By using a DECrouter 2000, the routing load on the other Ethernet nodes can be reduced, releasing these resources for other applications.

The DECrouter 2000 is connected directly to the Ethernet and up to four remote nodes in a WAN by means of modems attached to up to four synchronous lines. Thus the DECrouter 2000 provides an interface for communication between nodes on the local Ethernet and remote nodes within the network.

Within your LAN, you may have both DECnet Phase IV end nodes and routing nodes connected to the same Ethernet as the DECrouter 2000. The DECrouter 2000's synchronous lines may be connected to remote Phase IV or Phase III routing or end nodes. Refer to the *Routing and Networking Overview* for full details of routing concepts.

1.2 DECrouter 2000 Capabilities

In a Phase IV DECnet network, there are two types of routing node:

- **Level 1 routers** are DECnet nodes of type **ROUTING IV** which can route data within their own area of the network. This process is called intra-area routing.
- **Level 2 routers** are nodes of type **AREA** which can route data to and from other areas of the network. This process is called inter-area routing. Level 2 routers also act as level 1 routers within their own areas.

The DECrouter 2000 operates as a routing node within a single area (as a level 1 router) and can also route between areas (as a level 2 router). All routers in a multi-area network can route data within their own area.

When used in a multi-area DECnet network, the DECrouter 2000 provides a routing service for up to 62 other areas, each containing up to 1023 nodes. Refer to Section 1.2.1 for details on area routing.

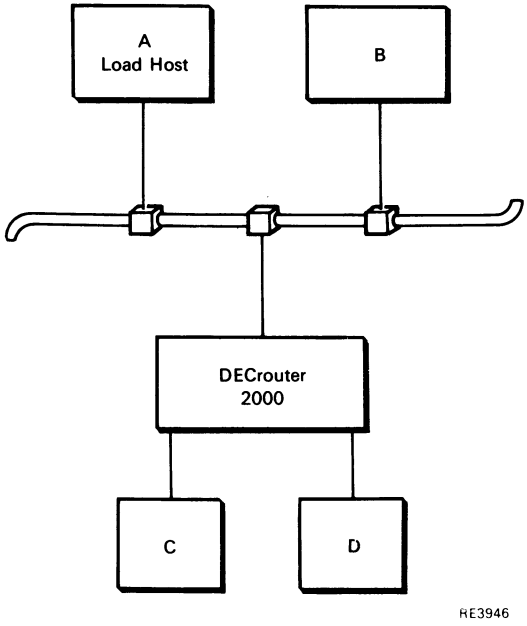

Figure 1-1: Ethernet, load host and DECrouter 2000 topology

In Figure 1-1, the DECrouter 2000 uses Node A as its load host node (a load host is a node which provides loading services for another node), and acts as a level 1 router for Nodes A and B on the Ethernet, and for Nodes C and D which are attached to the DECrouter 2000 over synchronous lines.

By using a DECrouter 2000 on an Ethernet, you can communicate with network nodes that are not directly connected to the Ethernet. End nodes on an Ethernet can communicate directly with the other nodes on the same Ethernet, but use the DECrouter 2000 to communicate with nodes outside the LAN.

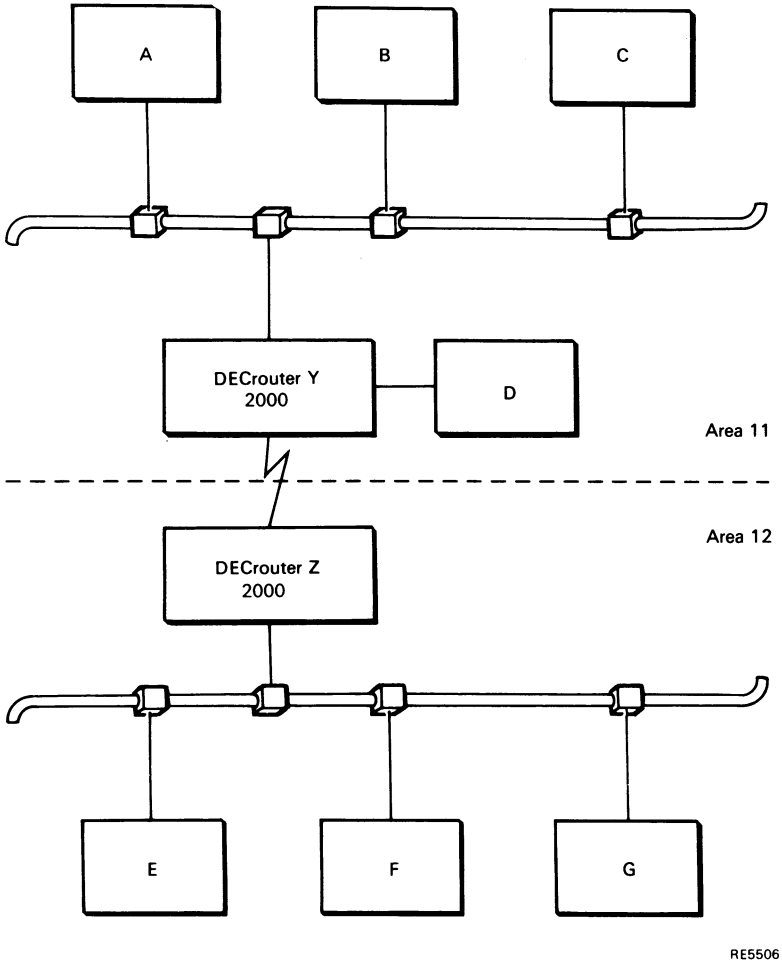

Figure 1-2: Area Router topology

In Figure 1-2, DECrouter 2000 Y is on the same Ethernet as Nodes A, B, and C. DECrouter 2000 Y acts as a level 1 router for routing data between Nodes A, B and C and for routing data between these Ethernet nodes and nodes remote from the local

Ethernet, such as Node D. The DECrouter 2000 also acts as a level 2 router and routes data between areas 11 and 12 to DECrouter 2000 Z. This allows Nodes A, B, C and D to communicate with Nodes E, F and G.

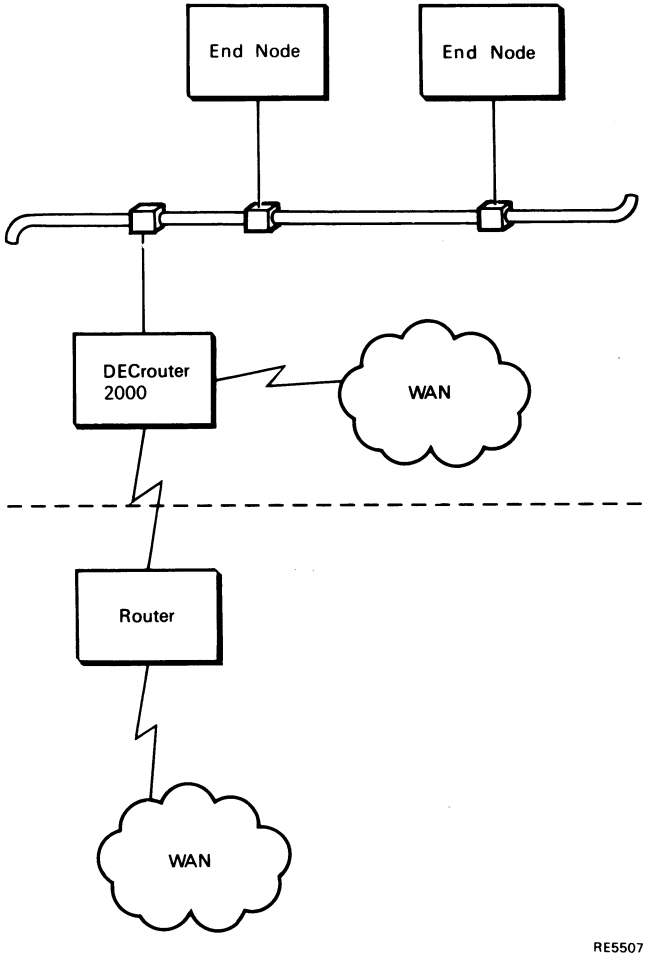

Figure 1-3: Example DECnet Configuration

In Figure 1-3, the DECrouter 2000 is connected to a WAN and provides a routing service for the nodes within the WAN. The DECrouter 2000 also provides a level 2 service, allowing nodes within the WAN to communicate with nodes in other areas.

1.2.1 Area Routing

If the destination node for data is in another area, level 1 routing sends the data to the nearest level 2 routing node. Level 2 routing forwards the data to a level 2 router in the destination area. The level 2 router in the destination area uses level 1 routing to forward the data to the destination node. If the two areas are not directly connected, the data is forwarded from one level 2 router to the next until it reaches the destination area. Within their own area, level 2 routers also act as level 1 routers.

Each area within the network is assigned an area number, and each node within an area has its own node number. A node is identified by its area number, a period and its node number, and this forms the node address. For example, node 14 in area 12 is identified as node 12.14. In an area, each node has a unique number, but a particular node number may be repeated in more than one area. If an area number is not specified when addressing a remote node, the node is assumed to be in the same area as the local node. Table 1-1 explains routing terminology.

Table 1-1: Routing Terminology

Term	Definition
Hop	The path between two adjacent nodes.
Path	The route data takes from one node to another involving one or more hops.
Path length	The number of hops along a path between two nodes; this is the number of circuits data travels across to reach the destination node.
Cost	A value assigned to a circuit between two adjacent nodes. Each circuit has a separate cost.
Path cost	The sum of the circuit costs along the path between two nodes. Data is sent along paths with the least cost. You can specify the maximum path cost for the network. For a multi-area network, you can set the maximum cost for a path within an area, and for a path between areas.
Reachable node	A destination node which the DECrouter can access by a usable path.
Maximum visits	The maximum number of nodes through which data can be routed before arriving at the destination node.

The **DECrouter 2000 database** is maintained on the DECrouter 2000 and contains information, such as the **cost** and **hops** involved in sending data to other nodes and other areas. The data is routed to the destination node over the path with the lowest cost.

1.3 Ethernet Connections and the DEC MicroServer Unit

Nodes linked together on the Ethernet form a local area network (LAN). A LAN is a high speed data communications network that covers a limited geographical area such as an industrial complex. The DECrouter 2000 is connected to an Ethernet and provides a routing service for nodes within the LAN.

The DECrouter 2000 software runs on a DEC MicroServer hardware unit. Refer to *Installing the DEC MicroServer* for details of the unit and the cables used. This hardware unit is attached to the Ethernet in the same manner as the other nodes on the Ethernet. Refer to Figure 1-4 for details.

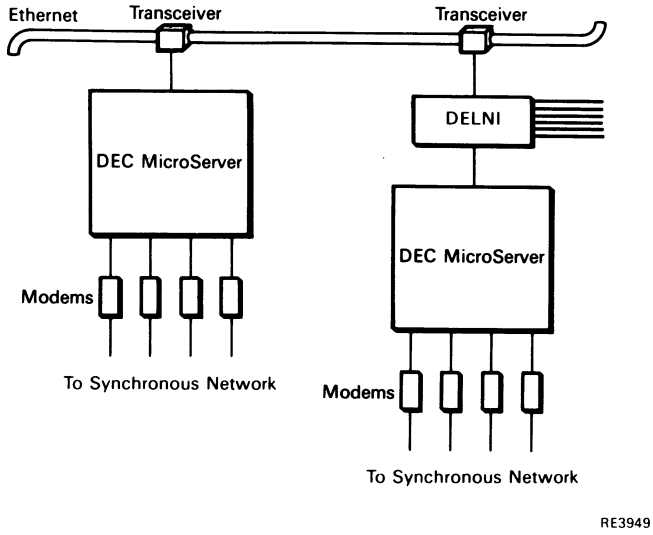

Figure 1-4: Ethernet Connection to the DEC MicroServer

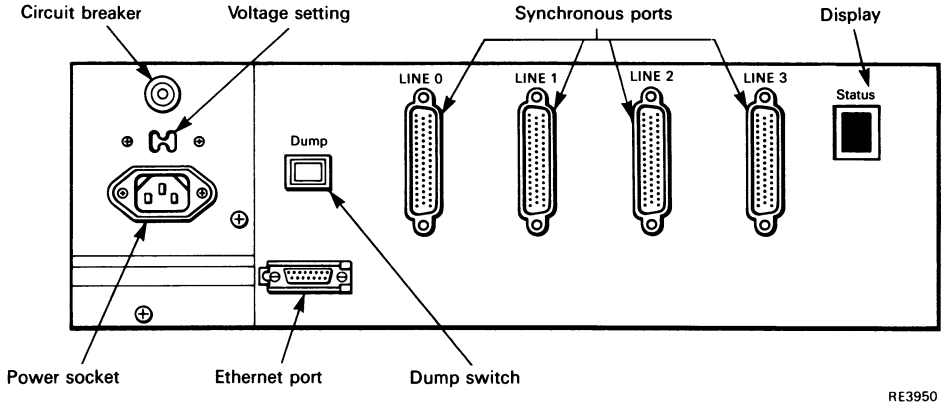

Figure 1-5: The DEC MicroServer Unit - Back Panel

Figure 1-5 shows the rear panel of the DEC MicroServer hardware unit. The seven-segment display indicates the state of the DEC MicroServer unit. This display panel may help to determine the cause of any problems that may occur when using

the unit. Refer to the *DECrouter 2000 Problem Solving Guide* for further details. The dump switch is used to dump the DECrouter 2000 software on to a load host. Refer to *Installing the DEC MicroServer* for full details of the hardware unit.

The Ethernet controller in the hardware unit provides the interface between the DEC MicroServer and the Ethernet. The DEC MicroServer unit contains four synchronous communications ports which connect the DECrouter 2000 to other nodes using synchronous lines. Refer to Section 1.3.1 for details of which ports to use with each line.

1.3.1 Synchronous Ports and Line Configurations

Table 1-2: Line Configurations

Maximum Number of Lines	Maximum Line Speed (bits per second)	Ports Used
2	256 K	0, 1
4	64 K	0, 1, 2, 3

The DEC MicroServer unit can support two speed bands. Within each band, you can use certain ports. For speeds of up to 256 K bits per second for each line, use only ports 0 and 1. For speeds of up to 64 K bits per second for each line, use ports 0, 1, 2 and 3.

1.4 DECrouter 2000 Management

The DECrouter 2000 software is loaded and managed from a **host node**. This host node can be any VAX node in the same LAN as the DECrouter 2000 provided it has suitable storage for the DECrouter 2000 software. When the DECrouter 2000 software is installed, it is first loaded on to a host node (this node is called the **load host**), and then down-line loaded on to the DECrouter 2000.

You can use any VAX/VMS V4.4 or later, or ULTRIX-32 V1.2 or later node on your Ethernet LAN as a load host, provided the node is running Phase IV of DECnet. Refer to the *DECrouter 2000 Installation Procedures* for details of installing the DECrouter 2000 software. If you wish, you can install the software on more than one load host. Then, if one load host is not available, the software can be down-line loaded from one of the other load hosts.

Any node that can act as a load host can also receive up-line dumps in the event of software failure. DECnet events generated by the DECrouter 2000 during the course of normal operation may be directed to any Phase IV DECnet node.

When you decide which node you want to use as your load host, make sure that there is enough storage on the host node to store the DECrouter 2000 software and to receive up-line dumps from the DECrouter 2000. Refer to the *DECrouter 2000 Installation Procedures* for details of how much space is required.

Using the Network Control Program (NCP), you can issue commands for execution on the DECrouter 2000 from any node that is on the same Ethernet as the DECrouter 2000. This allows you to display status and network information and to reconfigure the DECrouter 2000 (for example, to alter the lines and circuits that you are using). You can also use the configurator program (ROUPERM) to modify the DECrouter 2000's configuration. Chapter 2 has full details of how to modify the configuration of the DECrouter 2000, and Chapter 3 gives details on managing the DECrouter 2000.

1.4.1 DECrouter 2000 Addresses

In order to communicate with nodes on your LAN (including the DECrouter 2000), you need to understand how the Ethernet node addresses are used.

The DECrouter 2000 responds to one of two types of Ethernet addresses:

- Ethernet hardware address

  Each Ethernet node is identified by its unique **Ethernet hardware address**. This address consists of twelve hexadecimal digits, which are written as six pairs of two digits, each pair being separated by a hyphen (for example 08-00-2B-02-11-21). This address is used to identify the node before DECnet software is loaded on to the node.

  The Ethernet hardware address for the DECrouter 2000 must be present in the database of the load host so that it can recognize load requests. However, you will normally use the DECnet node name rather than the Ethernet physical address to identify the DECrouter 2000.

- Extended DECnet node address

  Once the DECnet software has been loaded on to the node, the **extended DECnet node address** is used to identify the Ethernet node. This address is set up once the DECrouter 2000 software is loaded by appending four hexadecimal digits representing the DECnet node address to a constant eight-digit (hexadecimal) number (AA-00-04-00). The four digits for the extended DECnet node address are calculated as follows:

  (area number x 1024) + node number

The bytes of the hexadecimal representation are then reversed. For example:

If node KANGA is 12.59

12 x 1024 + 59 = 12347 (to base 10) = 303B (to base 16)

Therefore the extended DECnet address for node KANGA is AA-00-04-00-3B-30.

You may see either address displayed in event messages reporting the progress of loading or dumping.

2
The DECrouter 2000 Configuration Databases

2.1 Configuration Databases

Configuration and management information is stored in the load host and DECrouter 2000 databases. The **load host database** contains information needed in order for the host to load the DECrouter 2000 software and to receive dumps from the DECrouter 2000. The load host database is set up by running the ROUCONFIG procedure during the installation of the DECrouter 2000 software. Refer to the *DECrouter 2000 Installation Procedures* for further details of this procedure and the load host database.

Information about how the DECrouter 2000 is configured is contained in the **DECrouter 2000 permanent and volatile databases.**

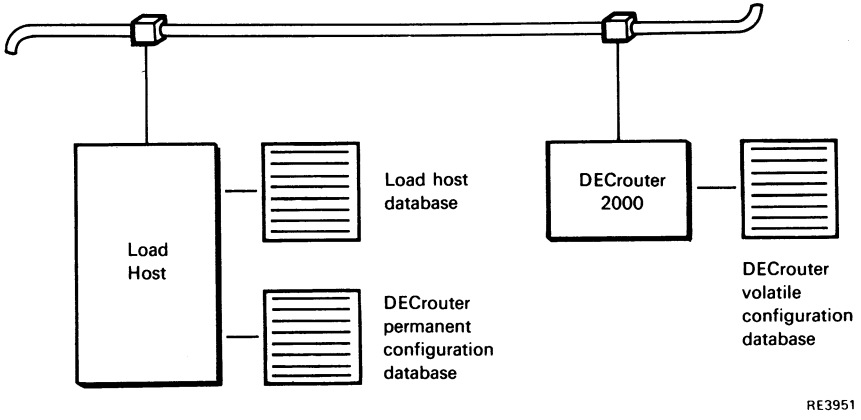

Figure 2-1: Configuration Databases

Figure 2-1 shows the databases used by the DECrouter 2000. The **load host database** is a file on the load host node. The **DECrouter 2000 permanent configuration database** is also stored as a file on the load host. A copy of this permanent database is transferred to the DECrouter 2000 when the system is loaded. This copy forms the **DECrouter 2000 volatile configuration database** which contains the configuration of the running system.

The permanent database defines the initial contents of the volatile database. Any changes made to the volatile database are only effective until either the database is modified again, or the DECrouter 2000 is reloaded.

The DECrouter 2000 permanent database is set up as part of the installation procedures when you run ROUSETUP. Refer to the *DECrouter 2000 Installation Procedures* for details of this command procedure.

If you wish to modify the permanent database to your specific networking requirements, run the configurator program, ROUPERM and reload the DECrouter 2000. Refer to Section 2.2 for details of this program. You can modify the volatile database while the DECrouter 2000 is running by issuing NCP commands from the load host, or from any other node on the same Ethernet as the DECrouter 2000. Guidelines for using NCP are given in Section 2.3.

2.1.1 Contents of the DECrouter 2000's Databases

The permanent and volatile databases contain information about components of the following types:

1. LINE

   For each synchronous port you wish to use on the DECrouter 2000, you need to create a LINE. The line associated with the Ethernet port is automatically defined. Each line has a set of parameters associated with it. Line parameters control:

   - Operation of the DDCMP protocol. For example: point-to-point, multipoint tributary, full-or half-duplex operation and the value of the protocol timers.
   - The number of buffers allocated for data reception.

2. CIRCUIT

   For each synchronous LINE, you need to create a CIRCUIT. The circuit associated with the Ethernet line is automatically defined. Each circuit has a set of parameters associated with it. Circuit parameters control:

   - The routing operation. For example: circuit costs and timer values.
   - Operation of the DDCMP protocol. For example: circuit state and tributary address.
   - The priority assigned to the DECrouter 2000 for selecting the designated router on the Ethernet circuit.

3. EXECUTOR

   The executor node component contains information about the DECrouter 2000 and the characteristics of your network including:

   - The type of routing to be performed by the DECrouter 2000. (ROUTING IV for routing within the local area only, AREA for routing within the local area and between areas).
   - The maximum number of nodes in your local area.
   - The maximum number of areas in your network - this only applies if your DECrouter 2000 is an AREA router.
   - The maximum number of routing and non-routing nodes on the Ethernet.

4. NODE

   Each node component contains information about a remote node (any node within the network except the DECrouter 2000). For remote nodes, you can define:

   - A name to use to refer to the node
   - Passwords to be used during routing initialization to verify the identity of the remote node

5. LOGGING

   You can create a logging component for each node that you want to receive the event messages logged by the DECrouter 2000.

   You can use the event logging facility to monitor network events. By default, only events caused by a failure to read the permanent configuration database are logged. These events are sent to the load host. If you wish, you can cause additional events to be logged to the load host or another node. Refer to the *DECrouter 2000 Problem Solving Guide* for guidelines on setting up event logging and a list of events that may be displayed when using the DECrouter 2000.

6. OBJECT

   You may wish to restrict access to the following DECrouter 2000 management facilities:

   - Network Management
   - Loopback Mirror
   - DECnet Test Receiver
   - Tracing

   Each facility is associated with an OBJECT component, access to which is controlled by a username and password.

Table 2-1 contains a list of the parameters that be can used with each component, the default values, and the range of values you can use for an entry. A more detailed description of the parameters can be found in Appendix A.

Table 2-1: DECrouter Configuration Database

Component/Parameter	Default Value	Range
CIRCUIT (All Circuits)		
COUNTER TIMER	CLEARED	1-65535, CLEARED
COST	5 (DDCMP) 4 (ETHERNET)	1-63
HELLO TIMER	15	1-8191
LINE	None	1-16 characters
CIRCUIT (DDCMP)		
BABBLE TIMER (DDCMP TRIBUTARY or HALF DUPLEX only)	6000	1-65535
MAXIMUM TRANSMITS	8	1-255
TRIBUTARY - DDCMP TRIBUTARY only	CLEARED	1-255
STATE	OFF	ON or OFF
VERIFICATION	DISABLED	ENABLED, DISABLED
CIRCUIT (ETHERNET)		
ROUTER PRIORITY	32	0-127
STATE	ON	Cannot be changed
EXECUTOR		
AREA MAXIMUM COST (TYPE = AREA)	1022	1-1022
AREA MAXIMUM HOPS (TYPE = AREA)	30	1-30
BROADCAST ROUTING TIMER	40	1-65535
BUFFER SIZE	576	246-5000
COUNTER TIMER	CLEARED	1-65535, CLEARED
DELAY FACTOR	80	1-255
DELAY WEIGHT	5	1-255
IDENTIFICATION	Software Identification	1-32 characters, CLEARED
INACTIVITY TIMER	60	1-65535
MAXIMUM ADDRESS	1023	1-1023
MAXIMUM AREA (TYPE = AREA)	63	1-63

Table 2-1: DECrouter Configuration Database (Cont.)

Component/Parameter	Default Value	Range
MAXIMUM BROADCAST NONROUTERS	1022	1-1022
MAXIMUM BROADCAST ROUTERS	32	1-1022
MAXIMUM BUFFERS	500	50-1000
MAXIMUM COST	1022	1-1022
MAXIMUM HOPS	30	1-30
MAXIMUM PATH SPLITS	1	1-4
MAXIMUM VISITS	63	MAXIMUM HOPS - 63
RETRANSMIT FACTOR	10	1-65535
ROUTING TIMER	600	1-65535
SEGMENT BUFFER SIZE	576	246-BUFFER SIZE
TYPE	ROUTING IV	ROUTING IV, AREA
LINE (All lines)		
COUNTER TIMER	CLEARED	1-65535, CLEARED
LINE (DDCMP)		
CLOCK	EXTERNAL	INTERNAL, EXTERNAL
CONTROLLER	NORMAL	NORMAL, LOOPBACK
DEVICE	NONE	SYN-0, SYN-1, SYN-2 or SYN-3
DUPLEX	FULL	FULL, HALF
PROTOCOL	DDCMP POINT	DDCMP POINT, DDCMP TRIBUTARY
RECEIVE BUFFERS	64	2-256
RETRANSMIT TIMER	3000	1-65535
SERVICE TIMER	20000	1-65535
STATE	OFF	ON or OFF
LINE (ETHERNET)		
CONTROLLER	NORMAL	Cannot be changed
DEVICE	LNA-0	Cannot be changed
PROTOCOL	ETHERNET	Cannot be changed
RECEIVE BUFFERS	64	2-128
STATE	ON	ON

Table 2-1: DECrouter Configuration Database (Cont.)

Component/Parameter	Default Value	Range
LOGGING		
EVENT	KNOWN EVENTS	Any event listed in the *DECrouter 2000 Problem Solving Guide*
SINK NODE	Host Node	Any node
NODE		
COUNTER TIMER	CLEARED	1-65535, CLEARED
NAME	CLEARED	1-6 characters, CLEARED
RECEIVE PASSWORD	CLEARED	1-8 characters, CLEARED
TRANSMIT PASSWORD	CLEARED	1-8 characters, CLEARED
OBJECTS		
USER	CLEARED	1-16 characters, CLEARED
PASSWORD	CLEARED	1-16 characters, CLEARED

There are certain the parameters in the database that can only be altered by running the configurator program, ROUPERM - they cannot be altered by modifying the volatile database. These are:

1. The username and password associated with an OBJECT.
2. The path splitting option which allows you to divide up the data traffic and send it over different paths of equal cost from the DECrouter 2000 to the remote node.
3. The optional receive and transmit passwords which are used to communicate with the nodes adjacent to the DECrouter 2000 during the routing initialization procedure. The transmit password is sent to the adjacent node, and the receive password is sent from the adjacent node to the DECrouter 2000 during initialization.

2.2 Configurator Program

You can modify the permanent database by running the configurator program. In order to run this program you must have the correct privileges. If you are using a VAX/VMS system, you should run ROUPERM from the system manager's privileged account. If you are running ROUPERM on an ULTRIX system, you should be logged in as superuser.

If you are using a VAX/VMS host, issue the following command to start the configurator program.

```
$ RUN SYS$SYSTEM:ROUPERM
```

Alternatively, you can execute a single ROUPERM command by using a DCL string assignment statement. For example:

```
$ ROUPERM =="$ROUPERM"
$ ROUPERM DECrouter SHOW KNOWN CIRCUITS
```

where *DECrouter* is the node name of the DECrouter 2000. ROUPERM will execute the command SHOW KNOWN CIRCUITS and return the DCL prompt. If you specify the DECrouter 2000 node-name without a following command, the program displays the ROUPERM prompt.

If you are using an ULTRIX load host, issue the following command to start the configurator program.

```
csh# /usr/lib/dnet/rouperm
```

Alternatively, you can execute a single rouperm command as follows:

```
csh# /usr/lib/dnet/rouperm DECrouter show known circuits
```

where *DECrouter* is the node name of the DECrouter 2000. rouperm will execute the command show known circuits and return the csh prompt. If you specify the DECrouter 2000 node-name without a following command, the program displays the rouperm prompt.

When you start the configurator program, you are asked for the name of your DECrouter 2000 node name as follows:

```
Enter Server node name:
```

Enter the node name for your DECrouter 2000. The configurator program will start and the following prompt is displayed.

```
ROUPERM>
```

The prompt is in lower-case if you are running the program on an ULTRIX system.

Enter commands at the ROUPERM> prompt to modify the database. Table 2-2 lists the commands you can use with the configurator program.

Table 2-2: ROUPERM Commands

Command	Function
@ *file-name*	Executes the commands in the specified file and returns the ROUPERM prompt when complete.
CLEAR/PURGE	Used to remove entries from the database.
<CTRL/Z> or EXIT for VMS, <CTRL/D> or EXIT for ULTRIX	Exits the program and retains the modified database.
HELP	Displays HELP text on ROUPERM commands.
QUIT	Exits from the program without saving the modified database.
SET/DEFINE	Defines entries in the permanent database.
SET VERIFY/NOVERIFY	Allows you to enable/disable the display of the commands as they are executed.
SHOW/LIST	Displays the contents of the permanent database.
SHOW ALL [TO] [*file-name*]	Displays the contents of the current configuration to the specified file-name. If no file-name is given, the contents are displayed on your terminal.

2.2.1 Using ROUPERM

The CLEAR/PURGE, SET/DEFINE and SHOW/LIST commands have the same format as NCP commands, that is, they have a command verb, a component name and parameter(s), and/or qualifiers. You can use CLEAR and PURGE, SET and DEFINE, and SHOW and LIST interchangeably when running the configurator program.

The command verbs SET and DEFINE are used to create and/or modify entries within the database, CLEAR and PURGE are used to delete entries or, for certain entries, to reset them to their default values, while SHOW and LIST are used to display entries. Section 2.3 provides guidelines for using NCP.

The SHOW ALL command displays the contents of the current configuration in the permanent database. Specify a file name with this command in order to create a record of the configuration. The SHOW ALL command allows you to check that the current configuration is correct.

The @ *file-name* command allows you to execute a series of commands within a command file in order to modify the database.

When you create or modify components in the database, ROUPERM checks for consistency within the database so that the database will load correctly. For example, ROUPERM checks that the specified parameter value is within the correct range for the component being modified.

Database components must be created and removed in the correct order. For example, if you try and set up a circuit using a non-existent line, ROUPERM will fail and issue an error message.

2.2.2 Configurator Messages

While you are running the configurator program, ROUPERM produces messages which are displayed on your terminal. The messages inform you of any problems that may occur as ROUPERM modifies the database including what the problem is. Secondary messages may be displayed which give you extra information on the problem.

Messages have the following format:

```
ROUPERM-%-string, message
```

where % is a single character indicating the severity of the message and string is an abbreviation of the message text.

Messages are listed according to severity. There are three severity classes:

-F- Fatal messages which terminate the configurator program.

-E- Error messages indicate that the command cannot be executed due to incorrect input, but that the program will continue running.

-I- Information messages indicate that the program has performed your request.

2.2.2.1 Fatal Messages —

ROUPERM-F-FILCHKSM, invalid configuration file format

The configuration file has an incorrect format. The file has been corrupted or an error has occurred while writing to the file. Delete this file, and run ROUPERM again.

ROUPERM-F-FILCLO, error closing configuration file

The permanent database file was not closed properly after writing to the file. Run ROUPERM again.

ROUPERM-F-FILCRE, error creating configuration file

Run ROUPERM again. You may not have the correct privileges to create the file.

ROUPERM-F-FILOPEN, error opening configuration file

Run ROUPERM again. You may not have the correct privileges to open the file.

ROUPERM-F-FILREAD, error reading from configuration file

Check your process resources and run ROUPERM again.

ROUPERM-F-FILWRI, error writing to configuration file

Check your process quota and run ROUPERM again.

ROUPERM-F-MEMALL, memory allocation error

There is a problem with process resources. Check your process resources, before restarting ROUPERM.

2.2.2.2 Error Messages —

ROUPERM-E-CPTREF, component in use

The component you have specified is being used by another component. For example, you cannot set up a circuit over a line, if another circuit is already using the line.

This message will be returned if you attempt to clear the Ethernet line or circuit that are permanently resident in the database.

ROUPERM-E-DEVALL, device allocated

The device you have specified is already allocated. Specify another device.

ROUPERM-E-EXISTS, component already exists

The component you have specified already exists. This applies to nodes, and occurs when you specify a node name that is already in use.

ROUPERM-E-FIL, file operation error

An error has occurred when using a command file or when issuing a SHOW ALL or component TO *file-name* command.

ROUPERM-E-ILLCOM, illegal parameter combination

You have specified an illegal combination of parameters. For example: specifying the Ethernet protocol when creating a synchronous line.

ROUPERM-E-INVALPARAM, invalid parameter

The parameter value is invalid. Respecify the parameter with the correct value.

ROUPERM-E-INVID, invalid identifier

The parameter name is invalid. Respecify the parameter according to what is given in the secondary message.

ROUPERM-E-IVDEVNAM, invalid device name

Specify a valid device name. For example: SYN-0, SYN-1.

ROUPERM-E-LOGEXEC, no logging to executor

Events cannot be logged to the executor.

ROUPERM-E-MAXEXC, maximum value exceeded

Specify a smaller value for the parameter or increase the maximum parameter value.

ROUPERM-E-PARCON, parameter constraint violated

The parameter is either out of range or violates constraints imposed by other parameters. For example, the EXECUTOR MAXIMUM HOPS parameter must be less than or equal to the EXECUTOR MAXIMUM VISITS parameter.

ROUPERM-E-PARMAN, specify parameter value

Repeat the command, ensuring that you specify the parameter value.

ROUPERM-E-PARNA, parameter not valid for this component

This parameter has no meaning for the component that you are modifying.

ROUPERM-E-PARNCLR, parameter cannot be cleared

You cannot clear the specified parameter. This parameter must always have a value.

ROUPERM-E-PARRO, parameter cannot be modified

Parameter is read only. Once the component has been cleared from the database, you can recreate the component and specify a new value for this parameter.

ROUPERM-E-PARTYP, illegal parameter change

You have attempted an illegal parameter change. For example: you cannot change a synchronous line's protocol from DDCMP POINT to ETHERNET.

ROUPERM-E-SYN, syntax error

There is a syntax error in the command. Repeat the command making sure that the syntax is correct according to the secondary error message.

ROUPERM-E-UNRECCPT, unrecognized component

This component was not found in the database.

2.2.2.3 Information Messages —

ROUPERM-I-FILNEW, new configuration file created

You have successfully created the new file.

```
ROUPERM-I-FILUPD, configuration file updated
```

You have successfully created an updated version of the file. On VMS systems the old versions of the file are not purged or deleted. On ULTRIX systems the file is overwritten.

```
ROUPERM-I-NEWRTR, this is a new DECrouter
```

No previous records for this node exist.

2.3 Using NCP

You can alter the volatile database by using the following NCP commands: CLEAR, SET, and SHOW.

The command verb SET is used to create components or modify their parameters, CLEAR is used to remove components or reset parameters, while SHOW is used to display components and their parameters.

When you issue an NCP command, you must provide the command verb, the name of the component, and the parameter(s) and/or qualifiers that you wish to modify. For example:

```
NCP>SET CIRCUIT circuit-name STATE ON COST 3
```

The command verb is SET, the component type is CIRCUIT, the parameters are STATE and COST and the parameter values are ON and 3.

If you wish to modify the volatile database, you need to start NCP. To start NCP on a VAX/VMS host node, issue the following command:

```
$ RUN SYS$SYSTEM:NCP
```

The following prompt appears:

```
NCP>
```

Enter the appropriate command at this prompt. To exit from NCP, type EXIT or <CTRL/Z>.

To start NCP on an ULTRIX host node, issue the following command:

```
% ncp
```

The following prompt appears:

```
ncp>
```

Enter the appropriate command at this prompt. To exit from ncp, type exit, quit or <CTRL/D>.

Refer to Table 2-1 for details of the default values and the range of values you can use for the entries in the database.

NOTE

Only the NCP commands documented in this manual are supported for this product.

If you are running the configurator program to modify the permanent database, simply enter the commands at the ROUPERM> prompt. For example:

```
ROUPERM> SET LINE line-name STATE OFF
```

Commands to be executed on the DECrouter 2000 can be issued at the load host by telling NCP to use a different executor node. An executor node is the node on which the NCP commands are executed -the DECrouter 2000. If you only want to issue one NCP command on the DECrouter 2000, use the following command:

```
NCP> TELL DECrouter command
```

If you want to issue a series of NCP commands on the DECrouter 2000, first set the executor node to be the DECrouter 2000 as follows:

```
NCP> SET EXECUTOR NODE DECrouter
```

Then issue the NCP commands as required.

When you have finished entering NCP commands on the DECrouter 2000, enter the following command to return to your load host:

```
NCP> CLEAR EXECUTOR NODE
```

If you exit from NCP, you will need to issue another SET EXECUTOR NODE command when you restart NCP, in order to execute commands on the DECrouter 2000.

3
Managing the DECrouter

This chapter explains the modifications you may wish to make to the DECrouter 2000. The DECrouter 2000 is managed by modifying the permanent and volatile databases. Refer to Chapter 2 for full details of the databases and how to modify them.

3.1 Changing the Configuration of the DECrouter 2000

If you want to define a new synchronous connection in the DECrouter database, use the SET LINE and SET CIRCUIT commands to create new line and circuit components. The line and circuit names can be up to 16 characters long. Both names can be the same as the device name, or you can choose different names. The device name is the name of the port on the DEC MicroServer unit that you are using with the line. However, you must explicitly state the relationship between the device (port), the line and the circuit.

For the Ethernet communications device, line and circuit, the parameters are already set. Appendix A gives details of which commands you can use with the Ethernet device.

The values required for the MAXIMUM TRANSMITS circuit parameter, and the RETRANSMIT TIMER and RECEIVE BUFFERS line parameters will depend on the speed of the link you are using. Refer to Table B-1 for details.

3.1.1 Creating a Line

You may need to define the following parameters that control the operation of the line:

- CLOCK

  This value represents the hardware clock mode for the line device. The values for clock-mode are:

  - INTERNAL

    For loopback testing, this causes the device to supply a clock signal so that all transmitted messages can be looped back from outside the device. You will need to specify CLOCK INTERNAL only if you do not use the supplied 50-way loopback.

  - EXTERNAL

    For normal clock operating mode, when the clock signal is external to the DECrouter and is usually provided by a modem. This is the default value.

- CONTROLLER

  This parameter allows testing of the synchronous ports by looping back transmitted data within the hardware unit. The values are NORMAL (the default) and LOOPBACK (data is looped internally within the hardware unit).

- COUNTER TIMER

  When this timer expires, the line counters are logged. The counters are then zeroed and the timer is reset. The default value is CLEARED.

- DEVICE

  This is the name of the synchronous communications port that you want to use.

  - SYN-0
  - SYN-1
  - SYN-2
  - SYN-3

- DUPLEX

  This defines the type of line connected to the port. The two possible modes are FULL (full-duplex line, the default value) and HALF (half-duplex line).

- PROTOCOL

  This is the protocol type for the line and can be DDCMP POINT, or DDCMP TRIBUTARY. The default value for DDCMP lines is DDCMP POINT.

- RECEIVE BUFFERS

  You need to reserve a set of buffers to receive data. The default value for DDCMP lines is 64.

- RETRANSMIT TIMER

  This timer represents the number of milliseconds before the Data Link retransmits a block on the line. The default value for this timer is 3000 (3 seconds). For full duplex stations, this timer represents the length of time for which the Data link will wait for an acknowledgment of a data message before retransmitting it. For a half duplex station, this represents the selection timer. This is the length of time the local station will wait for a remote station to respond to a message.

- SERVICE TIMER

  This represents the amount of time a data link will wait for a loop message which it has sent, to be returned by the other end.

- STATE

  This is the line's operational state. Set the line to ON in order to use the line.

For example:

```
NCP> SET LINE ROUTER DEVICE SYN-2 PROTOCOL DDCMP POINT
```

This command creates a new line called ROUTER on the synchronous device SYN-2 using DDCMP POINT protocol.

3.1.2 Creating a Circuit

When you create a circuit, you may need to specify the following:

- BABBLE TIMER

  This timer represents the number of milliseconds a half duplex station is allowed to hold the line. The default value for this timer is 6000 (6 seconds).

- COST

  This value represents the routing cost of the circuit. Routing routes messages along the path between two nodes having the smallest cost. Specify a decimal integer in the range 1-63; the default value is 5 for DDCMP circuits, and 4 for ETHERNET circuits.

- COUNTER TIMER

  When this timer expires, the circuit counters are logged. The counters are then zeroed and the timer is reset. The default value is CLEARED.

- HELLO TIMER

  This value determines the frequency of routing hello messages sent to the adjacent node on the circuit. Specify a decimal integer in the range 1-8191; the default value is 15 seconds.

- LINE

  This is the line you want to use with the circuit.

- MAXIMUM TRANSMITS

  This specifies the maximum number of data messages that can be transmitted without an acknowledgment. The default value is 8.

- STATE

  This is the circuit's operational state. Set the circuit to ON in order to use the circuit. The default is OFF.

- TRIBUTARY

  This defines the data link physical tributary address of the circuit. This applies only to DDCMP TRIBUTARY circuits. The default is CLEARED.

- VERIFICATION

  This controls whether or not the remote node has to send its routing initialization password to the DECrouter. The default is DISABLED.

The circuit name can be the same as the line name. You can use any name of up to 16 characters for the line and circuit names. If you do not specify a name for the line that a named circuit is associated with, it is assumed that the line and circuit names are the same.

For example:

```
NCP> SET CIRCUIT ROUTER LINE SYN-0 COST 4
NCP> SET CIRCUIT ROUTER HELLO TIMER 15
```

Refer to Appendix A for details of the parameters and qualifiers you can use.

3.2 Defining the Network Characteristics

Use the SET EXECUTOR command to modify your network configuration.

The EXECUTOR parameters you may need to change are:

- BROADCAST ROUTING TIMER

  This value determines the maximum time allowed between routing updates on Ethernet circuits. The default value for this timer is 40 seconds. You are advised to leave this parameter set at the default value.

- BUFFER SIZE

  This is the maximum size of messages that the DECrouter 2000 can forward to other nodes. The default value is 576. You are advised to leave this parameter set at the default value.

- DELAY FACTOR

  This number is used to calculate the transmission timer. The estimated round trip delay to a remote node is divided by 16, and multiplied by the delay factor. The result is the value used for the transmission timer. The default value is 80. You are advised to leave this parameter set at the default value.

  DELAY WEIGHT

  This number is used when updating the estimated round trip delay to a remote node. The number represents a weighting value applied to the current round trip delay estimate. The default value is 5. You are advised to leave this parameter set at the default value.

- IDENTIFICATION

  This is a text string which identifies the DECrouter 2000.

- INACTIVITY TIMER

  This is the maximum duration of inactivity (no data in either direction) on a logical link before the node checks to see if the logical link still works. The default value is 60 seconds. You are advised to leave this parameter set at the default value.

- MAXIMUM ADDRESS

  This is the largest node number known to the DECrouter within the local area. The default value is 1023. You are advised to leave this parameter set at the default value.

- MAXIMUM BROADCAST NONROUTERS

  This is the maximum number of nonrouters the DECrouter 2000 can have on its Ethernet circuit. The default value is 1022. You are advised to leave this parameter set at the default value.

- MAXIMUM BROADCAST ROUTERS

  This is the maximum number of routers the DECrouter 2000 can have on its Ethernet circuit. The default value is 32. You are advised to leave this parameter set at the default value. If you have more than 16 routers on the same Ethernet, there may be a loss in performance. You are recommended to have no more than 16 routers on your Ethernet.

- MAXIMUM BUFFERS

  This is the maximum number of transmit buffers that routing may use for all circuits. The default value is 127. You are advised to leave this parameter set at the default value unless there is congestion.

- MAXIMUM COST

  This is the maximum cost allowed for a path from the DECrouter to any other node in the area. The default value is 1022.

- MAXIMUM HOPS

  This is the maximum number of routing hops permitted from the DECrouter to any other node in the area. This value determines whether or not the remote node is reachable. The default value is 30.

- MAXIMUM VISITS

  This is the maximum number of nodes a packet can visit. The default value is 63.

- RETRANSMIT FACTOR

  This is the maximum number of times the DECrouter's End Communication layer will restart its retransmission timer when it expires. The default value is 10. You will not normally need to alter this parameter.

- ROUTING TIMER

  This is the maximum time allowed between routing updates on non-Ethernet circuits. The default value is 600 seconds. You will not normally need to alter this parameter.

- SEGMENT BUFFER SIZE

  This is the size of an end-to-end segment. This should be the same as the BUFFER SIZE. The default value is 576.

- TYPE

  This is the type of routing node required and is either ROUTING IV or AREA. The default type is ROUTING IV.

If you are using your DECrouter as a level 2 router, then you may need to specify the following:

- AREA MAXIMUM COST

  This is the maximum total path cost allowed by the DECrouter to any other level 2 router. The default value is 1022.

- AREA MAXIMUM HOPS

  This is the maximum number of routing hops allowed from the DECrouter to any other level 2 router. The default value is 30.

- MAXIMUM AREA

  This is the largest area number known to the DECrouter. The default value is 63. You are advised to leave this parameter set at the default value.

The CIRCUIT parameter you may want to alter is:

- ROUTER PRIORITY

  The priority that this DECrouter 2000 is to have in selecting a designated router for the Ethernet. The default value is 32.

3.2.1 Path Splitting

The path splitting option allows you to divide up the data traffic and send it over different paths of equal cost from the DECrouter to the remote node. Path splitting reduces network congestion and provides better utilization of network resources as lines are not left idle.

To enable path splitting, you should assign circuit costs in such a way as to establish two or more paths to the remote node of equal cost. Then set the EXECUTOR MAXIMUM PATHSPLITS parameter on the DECrouter node to the maximum number of paths you want to use.

When you use path splitting, the remote node may receive packets out of the correct order. Therefore, all nodes that are reachable through a router that uses path splitting must support out-of-order packet caching (this is also known as out-of-order packet reassembly). If the remote node does not support out-of-order packet caching, then the MAXIMUM PATHSPLITS parameter should be set to 1 on routers that have multiple paths to this node. This disables path splitting.

The MAXIMUM PATHSPLITS parameter can only be modified by using the configurator program.

3.2.2 Defining Node Names

When the DECrouter is loaded, only two node names are defined: that of the DECrouter and that of the load host.

A node name does not have to be defined in order for the DECrouter 2000 to route to it.

If you want to refer to any other nodes by name rather than by address, you can define the name by using the following command:

```
SET NODE node-address NAME node-name
```

For example:

```
SET NODE 12.51 NAME WOMBAT
SHOW NODE WOMBAT
```

This will define node 12.51 to be known as WOMBAT in the database. The node name does not have to be defined in order for the DECrouter 2000 to route packets to or from nodes.

3.3 Event Logging

If you want the DECnet events to be logged, you need to specify a sink node that will receive the messages.

Issue the following command to set up a sink node:

```
NCP> SET LOGGING MONITOR SINK NODE node-name KNOWN EVENTS
```

This command sets up *node-name* to receive the event messages. You can use the node address rather than the node name when setting up event logging.

You can also control which types of messages are logged. Refer to Appendix A for details of the commands you can use with the logging facility. The *DECrouter 2000 Problem Solving Guide* gives full details of event logging.

The command procedure ROUSETUP.COM which is run as part of the installation will automatically issue the following commands to enable logging of selected events on the load host:

```
NCP> SET LOGGING MONITOR EVENT 0.0-9
NCP> SET LOGGING MONITOR EVENT 2.0-1
NCP> SET LOGGING MONITOR EVENT 4.2-13,16,19
NCP> SET LOGGING MONITOR EVENT 5.0-21
```

A
NCP/Configurator Commands

This Appendix contains information on the commands you can use when modifying the DECrouter 2000's databases. The commands are listed in alphabetical order.

NOTE

Only the commands documented in this manual are supported for this product.

The command verbs CLEAR, SET, and SHOW apply to the volatile database and are used within NCP.

PURGE, DEFINE, and LIST can be used interchangeably with CLEAR, SET, and SHOW when running the configurator program (ROUPERM) to modify the permanent database. Refer to Chapter 2 for details of this program.

Unless stated otherwise, the commands in this Appendix apply to both the volatile and the permanent database. If a command does not apply to the configurator program, this is indicated within the command or parameter description.

The command verbs SET and DEFINE are used to create components or modify their parameters, PURGE and CLEAR are used to remove components or reset parameters, while SHOW and DISPLAY are used to display components and their parameters.

When you issue a command, you must provide the command verb, the name of the component and the parameter(s) and/or qualifiers that you wish to modify. For example:

```
SET CIRCUIT circuit-name STATE ON COST 3
```

The command verb is SET, the component type is CIRCUIT, the parameters are STATE and COST and the parameter values are ON and 3.

CLEAR *circuit-component parameter* [...]

Circuit Components

KNOWN CIRCUITS
CIRCUIT *circuit-id*

Command Parameters

ALL

BABBLE TIMER
This resets the timer to its default value.

COUNTER TIMER
When this timer expires, the circuit counters are logged.

MAXIMUM TRANSMITS
This resets the number to its default value.

Examples

```
CLEAR CIRCUIT BEAN ALL
```

All parameter entries for circuit BEAN will be removed from the database. As a result, the circuit no longer exists for the local DECnet software.

```
CLEAR CIRCUIT PEA COUNTER TIMER
```

The COUNTER TIMER parameter for circuit PEA will be removed from the database.

CLEAR/PURGE EXECUTOR

CLEAR EXECUTOR *parameter* [...]

Command Parameters

COUNTER TIMER
When this timer expires, the executor counters are logged.

IDENTIFICATION
This is a text string that identifies the DECrouter 2000.

Examples

```
CLEAR EXECUTOR IDENTIFICATION
```

The identification string will be removed from the database.

```
CLEAR EXECUTOR COUNTER TIMER
```

The executor's counter timer will be removed from the database.

CLEAR *line-component parameter* [...]

Line Components

KNOWN LINES
LINE *line-id*

Command Parameters

ALL

COUNTER TIMER
When this timer expires, the line counters are logged.

Examples

```
CLEAR LINE BEAN ALL
```

Line BEAN will be removed from the database.

```
CLEAR KNOWN LINES COUNTER TIMER
```

This will reset the counter timers for all known lines in the database. The parameter is reset to its default value.

CLEAR/PURGE LOGGING EVENTS

CLEAR *logging-component parameter* [...]

Logging Components

KNOWN LOGGING
LOGGING CONSOLE
LOGGING FILE
LOGGING MONITOR

Command Parameters

EVENTS *event-list*
This set of values indicates the types and classes of events to be recorded at the sink-node. Event-list consists of event class.event type(s). The types are specified in ranges using hyphens, in lists using commas, or a combination of both. Refer to the *DECrouter 2000 Problem Solving Guide* for full details of events generated by the DECrouter 2000.

Examples of event-lists are:

```
3.0-2
4.1-4,8,10
6.1,3,5
```

Wild card notation indicates all types of events for a particular class. For example:

```
3.*
```

The keywords KNOWN EVENTS can replace EVENTS event-list in the command. KNOWN EVENTS implies all events known to the DECrouter.

SINK NODE *node-id*
This parameter identifies the sink node (receiving node) to which the command applies. The default sink node is the load host. Node-id is either a node name or a node address.

Examples

```
CLEAR LOGGING FILE EVENTS 2.* SINK NODE WOMBAT
```

This will clear logging of all class 2 events to node WOMBAT's LOGGING FILE.

```
CLEAR LOGGING CONSOLE KNOWN EVENTS
```

This will clear logging of all events to the load host's LOGGING CONSOLE.

CLEAR/PURGE NODE

CLEAR *node-component parameter* [...]

Node Components

KNOWN NODES
NODE *node-id*

Command Parameters

ALL

NAME
Removes the name associated with the node.

RECEIVE PASSWORD *password*
This is received from the remote node during routing initialization. The password consists of 1-8 characters. If CLEARED, no routing initialization password is expected from the remote node. **This parameter only applies to the configurator program (ROUPERM).**

TRANSMIT PASSWORD *password*
This is sent to the remote node during routing initialization. The password consists of 1-8 characters. If CLEARED, no routing initialization password is sent to the remote node. **This parameter only applies to the configurator program (ROUPERM).**

Examples

```
CLEAR NODE KANGA ALL
```

This will remove all parameter entries for node KANGA in the database.

```
CLEAR NODE 12.14 NAME
```

This command disassociates any name from node 12.14.

```
CLEAR NODE KANGA RECEIVE PASSWORD
```

This will remove the receive password from the record for node KANGA in the database.

This command only applies to the configurator program (ROUPERM).

CLEAR OBJECT *object-component parameter* [...]

Object Components

KNOWN OBJECTS
OBJECT *object-name*

Command Parameters

USER
The username required to control certain management facilities.

PASSWORD
The password required to control certain management facilities.

If user and password are cleared, no access control information is required to obtain full control of the management facility corresponding with the object.

Examples

```
CLEAR OBJECT USER user-name
```

This will remove the user parameter entry from the database.

LOOP CIRCUIT

This command does NOT apply to the configurator program (ROUPERM).

LOOP *circuit-component* [*parameter*] [...]

Circuit Component

CIRCUIT *circuit-id*

Command Parameters

ASSISTANT PHYSICAL ADDRESS *E-address*
This is the node used as a loopback assistant for passing loopback data between the DECrouter and the remote node. This parameter only applies to Ethernet circuits.

ASSISTANT NODE *node-id*
This is the node (identified by name) used as a loopback assistant for passing loopback data between the DECrouter and the remote node. This parameter only applies to Ethernet circuits.

COUNT *number*
The COUNT parameter is used to specify the number of messages sent during a test.

HELP *help-type*
The HELP parameter allows you to specify the form of assistance you require. This parameter only applies to Ethernet circuits. There are three forms of help-type:

TRANSMIT — The assistant node relays request data to the remote node which replies directly to the DECrouter.

RECEIVE — The DECrouter sends request data to the remote node, which relays the reply to the assistant node for transmission to the DECrouter.

FULL — The assistant node relays the request and reply data between the DECrouter and the remote node.

LENGTH *number*
The LENGTH parameter is used to specify the length of each message sent (in bytes).

NODE *node-id*
This identifies the destination node you want to use for testing the specified Ethernet circuit. This parameter only applies to Ethernet circuits.

PHYSICAL ADDRESS *E-address*
This identifies the destination node you want to use for testing the specified Ethernet circuit. This parameter only applies to Ethernet circuits.

WITH *data-type*
The WITH parameter is used to specify the type of binary information sent during the loopback testing. You can specify three types of binary information:

ONES	All binary ones
ZEROS	All binary zeros
MIXED	An alternating sequence of ones and zeros

Examples

```
LOOP CIRCUIT BEAN COUNT 5 LENGTH 20
```

This will initiate a circuit-level loopback test over circuit BEAN. The software loops five messages, 20 bytes in length, with mixed binary information.

```
LOOP CIRCUIT ETHERNET PHYSICAL ADDRESS AA-00-04-00-FF-04
```

This will initiate an Ethernet circuit-level loopback test with a node whose Ethernet physical address is AA-00-04-00-FF-04.

```
LOOP CIRCUIT ETHERNET NODE 224
```

This will initiate an Ethernet circuit-level loopback test with a node whose address is 224. In this example, the NODE parameter with a node-id value of 224 was used in place of the PHYSICAL ADDRESS parameter.

LOOP NODE

This command does NOT apply to the configurator program (ROUPERM).

LOOP *node-component* [*parameter*] [...]

Node Component

NODE *node-id*

Command Parameters

ACCOUNT *account*
This is the user's account for access control verification at the remote node.

COUNT *number*
This specifies the number of messages to be sent during the test. Specify a value in the range 1-65535. The default is 1

LENGTH *number*
This specifies the length (in bytes) of each message to be sent during the test. Specify a value in the range 1-65535. The default is 40.

PASSWORD *password*
This is the user's password for access control verification at the remote node.

USER *user-id*
This is the user's identification for access control verification at the remote node.

WITH *data-type*
The WITH parameter is used to specify the type of binary information sent during the loopback testing. You can specify three types of binary information:

ONES	All binary ones
ZEROS	All binary zeros
MIXED	An alternating sequence of ones and zeros

Example

```
LOOP NODE TESTER
```

This command runs a logical link loopback test from the node where the command is given to node TESTER.

SET *circuit-component parameter* [...]

Circuit Components

KNOWN CIRCUITS
CIRCUIT *circuit-id*

Command Parameters

BABBLE TIMER *milliseconds*
This timer represents the number of milliseconds a half duplex station is allowed to hold the line. Specify a value in the range 0-65535. The default value for this timer is 6000 (6 seconds).

COUNTER TIMER *seconds*
When this timer expires, the circuit counters are logged. The counters are then zeroed and the timer is reset. Specify a value in the range 1-65535. The default value is CLEARED.

COST *cost*
This value represents the routing cost of the circuit. Routing routes messages along the path between two nodes having the smallest cost. Specify a value in the range 1-63; the default value is 5 for DDCMP circuits, and 4 for ETHERNET circuits.

HELLO TIMER *seconds*
This value determines the interval between routing hello messages sent to the adjacent node on the circuit. Specify a value in the range 1-8191; the default value is 15 seconds.

LINE *name*
This is the line you want to use with the circuit.

MAXIMUM TRANSMITS *number*
This specifies the maximum number of data messages that can be transmitted without an acknowledgment. Specify a value in the range 1-255. The default value is 8.

ROUTER PRIORITY *number*
The priority that this router is to have in selecting a designated router for the Ethernet. Specify a value in the range 0-127; the default value is 32.

STATE *circuit-state*
This value represents the circuit's operational state. The ETHERNET circuit is always in the ON state; DDCMP circuits may be ON or OFF.

TRIBUTARY *tributary-address*
For a circuit operating as a DDCMP tributary station, this value represents the Data Link physical tributary address of the circuit. Specify a value in the range 1-255 for such a circuit.

VERIFICATION *option*
This controls whether or not the remote node has to send its routing initialization password to the DECrouter 2000. VERIFICATION may be ENABLED or DISABLED. The default is DISABLED. **This parameter only applies to the configurator program (ROUPERM).**

Example

```
SET CIRCUIT BEAN COST 4 STATE ON LINE PEA
```

This will set the circuit STATE to ON and the circuit cost to 4 for circuit BEAN on line PEA.

SET EXECUTOR *parameter* [...]

Command Parameters

AREA MAXIMUM COST *number*
This parameter is used for level 2 routing (TYPE AREA) nodes. The value represents the maximum total path cost allowed from the executor to any other level 2 routing node through the level 2 network. Specify a value in the range 1-1022. The default value is 1022.

AREA MAXIMUM HOPS *number*
This parameter is used for level 2 routing (TYPE AREA) nodes. The value represents the maximum number of routing hops allowed from the executor to any other level 2 routing node through the level 2 network. Specify a value in the range 1-30. The default is 30.

BROADCAST ROUTING TIMER *seconds*
This value determines the maximum time allowed between routing updates on Ethernet circuits. If this timer expires before a routing update occurs, a routing update is forced. The update produces a routing configuration message for each node in the area to each adjacent node. Routing also uses this timer to enforce a minimum delay between routing updates. Specify a value in the range 1-65535; the default is 40.

BUFFER SIZE *bytes*
This parameter value determines in bytes the maximum size of a Routing message and therefore determines the maximum size of the message that can be forwarded. There is one buffer size for all circuits. Specify a value in the range 246-5000; the default value is is 576. The SEGMENT BUFFER SIZE must always be less than or equal to the BUFFER SIZE. Normally (and by default) the two parameters are equal.

COUNTER TIMER *seconds*
When this timer expires, the executor counters are logged. The counters are then zeroed and the timer is reset. Specify a value in the range 1-65535. The default value is CLEARED.

DELAY FACTOR *number*
This number is used to calculate the transmission timer. The estimated round trip delay to a remote node is divided by 16, and multiplied by the delay factor. The result is the value used for the transmission timer. Specify a number in the range 1-255; the default value is 80. You should not normally have to alter this value.

DELAY WEIGHT *number*
This number is used when updating the estimated round trip delay to a remote node. The number represents a weighting value applied to the current round trip delay estimate. Specify a number in the range 1-255; the default value is 5. You should not normally have to alter this value.

IDENTIFICATION *string*
This is a text string that identifies the DECrouter 2000. The string is up to 32 characters of any type. If the string contains blanks or tabs, you must enclose the string in quotation marks.

INACTIVITY TIMER *seconds*
This value represents the maximum duration of inactivity (no data in either direction) on a logical link before the node checks to see if the logical link still works. If no activity occurs within the minimum number of seconds, artificial traffic is generated to test the link. Specify a value in the range 1-65535; the default value is 60. You should not normally have to alter this value.

MAXIMUM ADDRESS *number*
This value represents the largest node number and, therefore, the number of nodes that can be known about by the executor node's home area. Specify a value in the range 1-1023; the default value is 1023. You are advised to leave this parameter set to its default value, unless other routers in your area have a lower value set for this parameter.

MAXIMUM AREA *number*
This parameter is only used for AREA type nodes. The value represents the largest area number and, therefore, the number of areas that can be known about by the DECrouter. Specify a value in the range 1-63; the default value is 63. You are advised to leave this parameter set to its default value, unless other routers in your area have a lower value set for this parameter.

MAXIMUM BROADCAST NONROUTERS *number*
The value represents the maximum number of nonrouters the DECrouter 2000 can have on its Ethernet circuit. Specify a value in the range 1-1022; the default value is 1022.

MAXIMUM BROADCAST ROUTERS *number*
The value represents the maximum number of routers the executor node can have on its Ethernet circuit. Specify a value in the range 1-1022; the default value is 32.

MAXIMUM BUFFERS *number*
This value represents the maximum number of transmit buffers that routing may use for all circuits. Specify a value in the range 50-1000; the default value is 500.

MAXIMUM COST *number*
The value represents the maximum path cost allowed from the DECrouter 2000 to any node within an area. The path cost is the sum of the cost of each circuit cost along the path between the two nodes. This parameter defines the point where the DECrouter declares another node unreachable because the cost of the least costly path to the other node is excessive. For correct operation, this parameter must not be less than the total path cost to all nodes that you wish to communicate with. Specify the MAXIMUM COST number as a number in the range 1-1022; the default value is 1022. You are advised to leave this parameter set at the default value.

MAXIMUM HOPS *number*
This value represents the maximum number of routing hops allowed from the DECrouter 2000 to any other reachable node within its own area. (A hop is the logical distance over a circuit between two adjacent nodes.) This parameter defines the point where the DECrouter 2000 declares another node unreachable because the length of the shortest path between the two nodes is too long. For correct operation, this parameter must not be less than the number of hops between the two nodes separated by the largest number of intermediate routers. Specify the MAXIMUM HOPS number as a number in the range 1-30; the default value is 30. You are advised to leave this parameter set at the default value.

MAXIMUM PATHSPLITS *number*
The path splitting parameter allows you to divide up the data traffic and send it over different paths of equal cost from the DECrouter to the remote node. Specify a value in the range 1-4; the default value is 1. **This parameter only applies to the configurator program (ROUPERM).**

MAXIMUM VISITS *number*
The maximum number of nodes that a message will have visited before entering the executor node. If the message is not for this node and the MAXIMUM VISITS number is exceeded, the message is discarded. The MAXIMUM VISITS parameter defines the point where the DECrouter discards a packet that has traversed too many nodes. For correct operation, this parameter must not be less than the maximum path length of the network. Specify the MAXIMUM VISITS number as a value in the range MAXIMUM HOPS to 63; the default value is 63. You are advised to leave this parameter set at the default value.

RETRANSMIT FACTOR *number*
This value represents the maximum number of times the DECrouter End Communication layer will restart the retransmission timer when it expires. If the number is exceeded, the logical link is disconnected. Specify a value in the range 1-65535; the default value is 10. You are advised to leave this parameter set at the default value unless you have a problem with noise on the line. If this occurs, then raise the value.

ROUTING TIMER *seconds*
This value determines the maximum time allowed between routing updates on non-Ethernet circuits. When this timer expires before a routing update occurs, a routing update is forced. Specify a value in the range 1-65535; the default value is 600. You are advised to leave this parameter set at the default value.

SEGMENT BUFFER SIZE *bytes*
This parameter value determines the maximum size in bytes of an end-to-end segment. Specify a value in the range 246 to BUFFER SIZE. The default value is equal to the BUFFER SIZE if one is specified, otherwise the default is 576 (see BUFFER SIZE). You are advised to leave this parameter set at the default value.

TYPE *node-type*
This parameter may be set to indicate the routing functions to be performed.

The node-type is one of the following:

- ROUTING IV
- AREA

A routing node has full routing capability. An area node additionally routes between areas.

Example

```
SET EXECUTOR MAXIMUM VISITS 63
```

This will set the MAXIMUM VISITS parameter to 63.

SET *line-component parameter* [...]

Line Components

KNOWN LINES
LINE *line-id*

Command Parameters

CLOCK *clock-mode*
This value represents the hardware clock mode for the line device. The values for clock-mode are:

- INTERNAL

  For loopback testing, this causes the device to supply a clock signal so that all transmitted messages can be looped back from outside the device. You will need to specify CLOCK INTERNAL only if you do not use the supplied 50-way loopback connector.

- EXTERNAL

  For normal clock operating mode, when the clock signal is external to the DECrouter and is usually provided by a modem. This is the default value.

CONTROLLER *controller-mode*
This parameter allows testing of the synchronous ports by looping transmitted data within the hardware unit.

- NORMAL

  For normal controller operation. This is the default value.

- LOOPBACK

  All transmitted messages are looped back from within the hardware unit.

COUNTER TIMER *seconds*
When this timer expires, the line counters are logged. The counters are then zeroed and the timer is reset. Specify a value in the range 1-65535. The default value is CLEARED.

DEVICE *device-specification*
The device specification represents the Physical Link device used on the line. Once a line has been created, this parameter cannot be changed. The devices used with the DECrouter are:

- SYN-0 - port 0
- SYN-1 - port 1
- SYN-2 - port 2
- SYN-3 - port 3

DUPLEX *duplex-mode*
This defines the type of line connected to the port. The possible values are:

- FULL Full-duplex (default value)
- HALF Half-duplex

PROTOCOL *protocol-name*
This value represents the Data Link protocol to be used on the line. The protocol-name values which are valid for DDCMP lines are:

- DDCMP POINT

  This line is one end of a point-to-point DDCMP connection. You can only have one circuit associated with this line.

- DDCMP TRIBUTARY

  This line is a tributary end of a DDCMP multipoint group. You can only have one circuit associated with this line.

RECEIVE BUFFERS *number*
This value represents the number of receive buffers reserved for the line. The recommended value depends on the speed of the line. For synchronous lines of up to:

- 19.2 Kb per second, use a value of 8.
- 64 Kb per second, use a value of 32.
- 256 Kb per second, use a value of 64.

Specify a number in the range 2-256; the default value for DDCMP lines is 64. Set the number of Ethernet RECEIVE BUFFERS to be the sum of the RECEIVE BUFFERS for each of the synchronous lines.

RETRANSMIT TIMER *milliseconds*
This timer represents the number of milliseconds before the Data Link retransmits a block on the line. The default value for this timer is 3000 (3 seconds). For full duplex stations, this timer represents the length of time for which the Data link will wait for an acknowledgment of a data message before retransmitting it. For a half duplex station, this represents the selection timer.

The value of this parameter must be large enough to allow for the transmission of the largest message, its reception at the remote node and the transmission of the acknowledgment from the remote node. Specify a value in the range 1-65535. If not set, the default value of 3000 (3 seconds) is used.

SERVICE TIMER *milliseconds*
This represents the amount of time a data link will wait for a loop message which it has sent to be returned. Specify a value in the range 1-65535. The default value is 20000 (20 seconds).

STATE *line-state*
This value represents the line's operational state. For the ETHERNET line, the only legitimate value is ON. For DDCMP lines the state may be ON or OFF, the default is OFF.

Examples

```
SET LINE SYN-0 DUPLEX FULL STATE ON
```

This will set line SYN-0 to the ON state in full duplex mode.

```
SET LINE SYN-0 PROTOCOL DDCMP POINT
```

This will set the line protocol to DDCMP POINT for line SYN-0.

SET/DEFINE LOGGING EVENTS

SET *logging-component parameter* [...]

Logging Components

KNOWN LOGGING
LOGGING CONSOLE
LOGGING FILE
LOGGING MONITOR

Command Parameters

EVENTS *event-list*
This set of values indicates the types and classes of events to be recorded at the sink-node. Event-list consists of event class.event type(s). The types are specified in ranges using hyphens, in lists using commas, or a combination of both. Refer to the *DECrouter 2000 Problem Solving Guide* for full details of events generated by the DECrouter 2000.

Examples of event-lists are:

```
3.0-2
4.1-4,8,10
6.1,3,5
```

Wild card notation indicates all types of events for a particular class. For example,

```
3.*
```

The keywords KNOWN EVENTS can replace EVENTS event-list in NCP commands. KNOWN EVENTS implies all events known to the DECrouter.

SINK NODE *node-id*
This parameter identifies the sink node (receiving node) to which the command applies. The default sink node is the load host. Node-id is either a node name or a node address.

Examples

```
SET LOGGING MONITOR KNOWN EVENTS
```

This will cause all events to be logged to the load host.

```
SET LOGGING CONSOLE KNOWN EVENTS SINK NODE KANGA
```

This will cause all events generated locally to be logged to the logging console on remote node KANGA.

SET/DEFINE NODE

SET *node-component parameter* [...]

Node Components

KNOWN NODES
NODE node-id

Command Parameters

COUNTER TIMER *seconds*
When this timer expires, the node counters are logged. The counters are then zeroed and the timer is reset. Specify a value in the range 1-65535. The default value is CLEARED.

NAME *node-name*
This is the node name associated with the node identification.

RECEIVE PASSWORD *password*
This is received from the remote node during routing initialization. The password consists of 1-8 characters. If CLEARED, no routing initialization password is expected from the remote node. **This parameter only applies to the configurator program (ROUPERM).**

TRANSMIT PASSWORD *password*
This is sent to the remote node during routing initialization. The password consists of 1-8 characters. If CLEARED, no routing initialization password is sent to the remote node. **This parameter only applies to the configurator program (ROUPERM).**

Example

```
SET NODE 12.14 NAME KANGA
```

This will set the node name of node 12.14 to KANGA.

This command only applies to the configurator program (ROUPERM).

SET OBJECT *object-component parameter* [...]

Object Components

KNOWN OBJECTS
OBJECT *object-name*

Command Parameters

USER *user-name*
The username required to gain access to certain management facilities.

PASSWORD *password*
The password required to gain access to certain management facilities.

The DECrouter 2000 software is supplied without a username or password, so any user within the network has full access to the following facilities:

- Network Management
- Loopback Mirror
- DECnet Test Receiver
- Tracing

You can restrict access to these facilities by defining a username and password with DECnet Object that is associated with the facility. The correct username and password must be specified in order to use the facility.

The following table gives details of the objects and facilities.

Table A-1: Facilities and Objects

Facility	Object Name	Action with correct username and password	Action with no username and password
Network Management	NML	Full access	SHOW only
Loopback Mirror	MIRROR	Full access	No access
DECnet Test Receiver	DTR	Full access	No access
Tracing	NETTRACE$	Full access	No access

Example:

```
SET OBJECT NML USERNAME dolphin PASSWORD whale
```

This sets up the username and password for the NML object.

This command only applies to the configurator program (ROUPERM).

Use this command to enable or disable the display of commands as they are executed whilst running ROUPERM.

Example

```
SET VERIFY

SHOW EXECUTOR CHARACTERISTICS
```

The display will echo the SHOW EXECUTOR CHARACTERISTICS command before executing the command.

SHOW ALL

This command only applies to the configurator program (ROUPERM).

SHOW ALL [TO] [*file-name*]

Qualifier

TO *file-spec*
Allows you to write the display to a file.

If the qualifier is not specified, the current configuration is displayed on your terminal.

Example

```
SHOW ALL TO ROUTER.TXT
```

will copy the current configuration in the permanent database to the file called ROUTER.TXT.

This command does NOT apply to the configurator program (ROUPERM), and only displays information if the DECrouter 2000 is a level 2 router.

SHOW *area-component parameter* [*qualifier*]

Area Components

ACTIVE AREAS
AREA *area-id*
KNOWN AREAS

Command Parameters

STATUS
This displays status information about the area.

SUMMARY
This displays a summary of information about the area.

Qualifier

TO *file-spec*
Allows you to write the display to a file.

Interpreting the Display

CIRCUIT *circuit-id*
This is the name circuit connected to the remote area.

COST *cost*
This is the total cost involved to reach the remote area.

HOPS *hops*
This is the number of hops involved to reach the remote area.

NEXT NODE *node-id*
This is the name of the next node on the circuit which is used to reach the remote area.

STATE *state*
This indicates the state of the area, REACHABLE or UNREACHABLE.

Examples

```
SHOW KNOWN AREAS STATUS

Known Area Volatile Status as of 15-AUG-1987 09:50:34

  Area    State       Cost   Hops    Circuit         Next node to area

  12      reachable    5      1       BEAN            12.11 (KOALA)
  22      reachable    4      1       PEA             22.5 (KANGA)
```

This example displays status information for all known areas in the network.

```
SHOW AREA 12 SUMMARY

Known Area Volatile Summary as of 15-AUG-1987 11:16:44

  Area    State          Circuit          Next node to area

  12      reachable       BEAN               22.9 (ROO)
```

This example displays only the most useful information for area 12 in the network.

SHOW *circuit-component parameter* [*qualifier*] [...]

Circuit Components

ACTIVE CIRCUITS
KNOWN CIRCUITS
CIRCUIT *circuit-id*

Command Parameters

CHARACTERISTICS
This displays the characteristics of the circuit.

COUNTERS
This displays the circuit counters.

STATUS
This displays status information about the circuit.

SUMMARY
This displays a summary of information about the circuit.

Qualifiers

ADJACENT NODE *node-id*
This restricts the display to the circuits leading to the specified adjacent node.

TO *file-spec*
Allows you to write the display to a file.

Interpreting the Display

ADJACENT NODE *node-id*
This read-only value indicates an adjacent node on the circuit. For Ethernet circuits there can be many adjacent nodes. When displaying a list of circuits, this parameter can be used to indicate that the display should be restricted to circuits which lead to the specified adjacent node.

BLOCK SIZE *number*
This read-only parameter is the block size that was negotiated with the adjacent routing layer during routing initialization over a particular circuit. This parameter is qualified by ADJACENT NODE.

DESIGNATED ROUTER *node-id*
This read-only value is the routing layer identification of the node that is used for routing between nodes on the Ethernet.

LISTEN TIMER *seconds*
This read-only value determines the maximum time allowed to elapse before routing receives some message (either a hello message or a user message) from the adjacent node on the circuit.

MAXIMUM ROUTERS ALLOWED *number*
This indicates the maximum number of routers on the Ethernet circuit.

SUBSTATE *state*
This indicates the substate of the circuit.

- Looping - The circuit is sending maintenance messages from the remote node to a loopback node.
- Reflecting - The circuit is looping back maintenance messages sent from the local node to the remote node.
- Starting - Data link synchronization complete, routing initialization in progress.
- Synchronizing - Data link initialization in progress.

TYPE *name*
This is the circuit type, and can be Ethernet, DDCMP point or DDCMP tributary.

Refer to the SET CIRCUIT command for full details of the other parameters that may be displayed. Refer to the *DECrouter 2000 Problem Solving Guide* for an explanation of the counters displayed.

Examples

```
SHOW KNOWN CIRCUITS STATUS

Known Circuit Volatile Status as of 15-AUG-1987 15:39:04

  Circuit          State                    Loopback      Adjacent  Block
                                              Name          Node    Size

  BEAN             on                            12.5  (KANGA)     576
  PEA              on       -starting
  ETHERNET         on                            12.22 (ROO)       576
```

This will display status information for all known circuits connected to the local node.

```
SHOW KNOWN CIRCUIT CHARACTERISTICS

Known Circuit Volatile Characteristics as of 13-AUG-1987 10:33:29

Circuit = C0

Adjacent node              = 12.81 (POSSUM)
Block size                 = 576
Cost                       = 5
Hello timer                = 15
Listen timer               = 30
Line                       = L0
Type                       = DDCMP point
Babble timer               = 6000
Maximum transmits          = 4
Verification               = disabled

Circuit = C1

Cost                       = 5
Hello timer                = 15
Line                       = L1
Type                       = DDCMP point
Babble timer               = 6000
Maximum transmits          = 4
Verification               = disabled


Circuit = C2

Adjacent node              = 12.296 (KANGA)
Block size                 = 576
Cost                       = 5
Hello timer                = 15
Listen timer               = 30
Line                       = L2
Type                       = DDCMP point
Babble timer               = 6000
Maximum transmits          = 4
Verification               = disabled
```

```
Circuit = C3

Cost                    = 5
Hello timer             = 15
Line                    = L3
Type                    = DDCMP point
Babble timer            = 6000
Maximum transmits       = 4
Verification            = disabled

Circuit = ETHERNET

Adjacent node           = 12.302 (R00)
Designated router       = 12.302 (R00)
Block size              = 1498
Cost                    = 4
Maximum routers allowed = 32
Router priority         = 32
Hello timer             = 15
Listen timer            = 45
Line                    = ETHERNET
Type                    = Ethernet
```

This will display the characteristics for all known circuits connected to the local node.

SHOW EXECUTOR *parameter* [*qualifier*]

Command Parameters

CHARACTERISTICS
This displays the characteristics of the executor.

COUNTERS
This displays the executor counters.

STATUS
This displays status information about the executor.

SUMMARY
This displays a summary of information about the executor.

Qualifier

TO *file-id*
Allows you to write the display to a file.

Interpreting the Display

ACTIVE LINKS *number*
This is the number of active logical links from the executor node.

MANAGEMENT VERSION *n.n.n*
This is the version number of the Network Management layer.

MAXIMUM LINKS *number*
This is the maximum number of active logical links

NSP VERSION *n.n.n*
This is the version number of the End Communication layer.

PHYSICAL ADDRESS *E-address*
This is the Ethernet address of the executor.

ROUTING VERSION *n.n.n*
This is the version number of the Routing layer.

Refer to the SET EXECUTOR command for full details of the other parameters that may be displayed. Refer to the *DECrouter 2000 Problem Solving Guide* for an explanation of the counters displayed.

Examples

```
SHOW EXECUTOR CHARACTERISTICS

Node Volatile Characteristics as of  4-AUG-1987 15:41:15

Executor node = 12.99 (WOMBAT)

Identification            = DECrouter 2000 V1.0 BL4
Management version        = V4.2.0
Host                      = 12.98 (KANGA)
NSP version               = V4.1.0
Maximum links             = 512
Delay factor              = 80
Delay weight              = 5
Inactivity timer          = 60
Retransmit factor         = 10
Routing version           = V2.0.0
Type                      = routing IV
Routing timer             = 600
Broadcast routing timer   = 40
Maximum address           = 1023
Maximum cost              = 1022
Maximum hops              = 30
Maximum visits            = 63
Max broadcast nonrouters  = 64
Max broadcast routers     = 32
Maximum buffers           = 127
Buffer size               = 576
Segment buffer size       = 576
```

This displays the executor characteristics.

```
SHOW EXECUTOR COUNTERS

Node Counters as of 13-AUG-1987 11:02:14

Executor node = 12.21 (KANGA)

       59625  Seconds since last zeroed
       67816  Bytes received
      100241  Bytes sent
        2187  Messages received
        2290  Messages sent
          72  Connects received
          67  Connects sent
           0  Response timeouts
           0  Received connect resource errors
           5  Maximum logical links active
           1  Aged packet loss
           0  Node unreachable packet loss
           0  Node out-of-range packet loss
           0  Oversized packet loss
           0  Packet format error
           0  Partial routing update loss
           0  Verification reject
```

This displays the executor counters and provides information on traffic flow over the node.

```
SHOW EXECUTOR STATUS

Node Volatile Status as of 13-AUG-1987 11:02:29

Executor node = 12.21 (KANGA)

State                     = on
Physical address          = AA-00-04-00-15-30
Active links              = 3
```

This displays the status of the executor.

SHOW/LIST LINE

SHOW *line-component parameter* [*qualifier*]

Line Components

ACTIVE LINES
KNOWN LINES
LINE line-id

Command Parameters

CHARACTERISTICS
This displays the characteristics of the line.

COUNTERS
This displays the line counters. **This parameter does not apply to the configurator program (ROUPERM).**

STATUS
This displays status information about the line.

SUMMARY
This displays a summary of information about the line.

Qualifier

TO *file-id*
Allows you to write the display to a file.

Interpreting the Display

HARDWARE ADDRESS *E-address*
This is the Ethernet address of the hardware unit.

SUBSTATE *state*
This indicates the substate of the line. (DDCMP lines only).

- Looping - The line is sending maintenance messages from the remote node to a loopback node.
- Reflecting - The line is looping back maintenance messages sent from the local node to the remote node.
- Synchronizing - Data link initialization in progress.

Refer to the SET LINE command for full details of the other parameters that may be displayed. Refer to the *DECrouter 2000 Problem Solving Guide* for an explanation of the counters displayed.

Examples

```
SHOW LINE L0 COUNTERS

Known Line Counters as of  4-AUG-1987 15:47:20

Line = L0

        6522  Seconds since last zeroed
           0  Data errors inbound
           0  Remote process errors
           0  Local process errors


SHOW KNOWN LINE CHARACTERISTICS

Known Line Volatile Characteristics as of 13-AUG-1987 12:16:51

Line = L0

Device                  = SYN-0-0
Receive buffers         = 64
Controller              = normal
Duplex                  = half
Protocol                = DDCMP point
Clock                   = external
Service timer           = 20000
Retransmit timer        = 3000
```

```
Line = L1-T

Device                  = SYN-0-1
Receive buffers         = 64
Controller              = normal
Duplex                  = full
Protocol                = DDCMP tributary
Clock                   = external
Service timer           = 20000
Retransmit timer        = 3000

Line = ETHERNET

Device                  = LNA-0
Receive buffers         = 64
Controller              = normal
Protocol                = Ethernet
Hardware address        = 08-00-2B-03-8D-CE
```

```
SHOW KNOWN LINE STATUS

Known Line Volatile Status as of 13-AUG-1987 12:17:19

   Line            State

  L0               on
  L1-T             on
  ETHERNET         on
```

SHOW *logging-component parameter* [*qualifier*] [...]

Logging Components

ACTIVE LOGGING
KNOWN LOGGING
LOGGING CONSOLE
LOGGING FILE
LOGGING MONITOR

Command Parameters

CHARACTERISTICS
This displays the logging information.

EVENTS
This displays the event information.

STATUS
This displays the logging information

SUMMARY
This displays a summary of logging information.

Qualifiers

KNOWN SINKS
This displays the logging information for all known sinks.

SINK NODE *node-id*
This identifies the sink node for which the information is displayed.

TO file-spec
Allows you to write the display to a file.

Interpreting the Display

Refer to the SET LOGGING command for full details of the parameters that may be displayed. Refer to the SET NODE command for details of other parameters that may be displayed. Refer to the *DECrouter 2000 Problem Solving Guide* for an explanation of the counters displayed.

Examples

```
SHOW LOGGING CONSOLE CHARACTERISTICS SINK NODE KANGA

Logging Volatile Characteristics as of 15-AUG-1987 13:36:54

Logging sink type = console

Sink Node          = 12.5 (KANGA)
Events             = 4.0-5,8-10
Events             = 5.0-5.3
```

This will display logging console characteristics for logging to that component on remote node KANGA. This format displays the sink node for which the events apply and those events that are set for the logging console component at the local node.

```
SHOW LOGGING FILE EVENTS KNOWN SINKS

Logging Volatile Events as of 15-AUG-1987 13:40:54

Logging sink type = file

Sink node          = 12.5 (KANGA)
Events             = 4.0-5

Logging sink type = file

Sink node          = 12.9 (ROO)
Events             = 0.0-7
Events             = 2.0-1
Events             = 5.0-4
```

This will display events being logged to the logging file component as specified for all known sinks.

SHOW *node-component parameter* [*qualifier*]

Node Components

ACTIVE NODES
This component does not apply to the configurator program (ROUPERM).
ADJACENT NODES
This component does not apply to the configurator program (ROUPERM).
KNOWN NODES
NODE *node-id*

Command Parameters

CHARACTERISTICS
This displays the node characteristics.

COUNTERS
This displays the node counters. **This parameter does NOT apply to the configurator program (ROUPERM).**

STATUS
This displays the nodes's status.

SUMMARY
This displays a summary of the node information.

Qualifier

TO *file-spec*
Allows you to write the display to a file.

Interpreting the Display

ACTIVE LINKS *number*
This parameter shows the number of logical links active to the remote node.

CIRCUIT *circuit-id*
This is the name circuit connected to the remote node.

COST *cost*
This is the total cost involved to reach the remote node.

DELAY *seconds*
This is the average round trip delay from the executor node to the remote node.

HOPS *hops*
This is the number of hops involved to reach the remote area.

NEXT NODE *node-id*
This is the name of the next node on the circuit which is used to reach the remote area.

STATE *state*
This indicates the state of the node, REACHABLE or UNREACHABLE.

TYPE *node-type*
This parameter may be set to indicate the routing functions to be performed.

The node-type is one of the following:

- ROUTING IV
- AREA

A routing node has full routing capability. An area node additionally routes between areas.

Examples

```
SHOW NODE KANGA COUNTERS

Node Counters as of 15-AUG-1987 15:15:14
Remote node = 12.5(KANGA)

     1765 Seconds since last zeroed
    34749 Bytes received
    95850 Bytes sent
    44930 Messages received
    40500 Messages sent
       72 Connects received
       67 Connects sent
        0 Response timeouts
        0 Received connect resource errors

SHOW NODE 12.21 STATUS

Node Volatile Status as of 13-AUG-1987 15:06:05

Node       State      Active  Delay  Type          Cost  Hops  Circuit
                      Links

12.21       reachable  1         4   routing IV       4     1  ETHERNET

Next node to destination = 12.56 (POSSUM)
```

SHOW/LIST OBJECT

This command only applies to the configurator program (ROUPERM).

SHOW *object component parameter* [*qualifier*]

Object Components

KNOWN OBJECTS
OBJECT *object-name*

Command Parameter

CHARACTERISTICS
This displays the object characteristics.

Example

```
SHOW OBJECT NML CHARACTERISTICS

Object = NML

User     = Dolphin
Password = *Set*
```

This command does NOT apply to the configurator program (ROUPERM).

ZERO *circuit-component* COUNTERS

Circuit Components

KNOWN CIRCUITS
CIRCUIT *circuit-id*
ACTIVE CIRCUITS

Example

```
ZERO KNOWN CIRCUITS COUNTERS
```

This will reset all circuit counters for all known circuits.

ZERO EXECUTOR

This command does NOT apply to the configurator program (ROUPERM).

ZERO EXECUTOR COUNTERS

Example

```
ZERO EXECUTOR COUNTERS
```

This will reset all counters for the executor node.

This command does NOT apply to the configurator program (ROUPERM).

ZERO *line-component* COUNTERS

Line Components

KNOWN LINES
LINE *line-id*
ACTIVE LINES

Examples

```
ZERO KNOWN LINES COUNTERS
```

This will reset all line counters for all known lines.

```
ZERO LINE SYN-0 COUNTERS
```

This will reset line counters for the line SYN-0.

ZERO NODE

This command does NOT apply to the configurator program (ROUPERM).

ZERO *node-component* COUNTERS

Node Components

KNOWN NODES
NODE *node-id*

Example

```
ZERO NODE KANGA COUNTERS
```

This will reset all node counters maintained on the executor node for remote node KANGA.

B
Configuration Parameters

This appendix provides guidelines on certain circuit and line parameter settings. The values you use for these parameters will depend on what kind of link you are using between your DECrouter 2000 and remote nodes. Table B-1 gives suggested values for circuit and line parameters.

Table B-1: Recommended Parameter Values

Link type	Circuit Parameters	Value	Line Parameters	Value
Satellite - 64K bits per second	Maximum transmits	32	Retransmit timer	5000 ms
			Receive buffers	64
9.6 to 64K bits per second	Maximum transmits	8	Retransmit timer	5000 ms
			Receive buffers	32
Less than 9.6K bits per second	Maximum transmits	4	Retransmit timer	10000 ms
			Receive buffers	8

The RETRANSMIT TIMER parameter value must be large enough to allow for the transmission of the largest message, its reception at the remote node and the transmission of the acknowledgment from the remote node.

Glossary

Active Component

Any component which is not in the state OFF.

Adjacent Node

A node next to the local node and attached by a physical line. In routing terms, this node is one hop away.

Aged Packet

A packet that has exceeded the maximum number of visits.

Area

An independent group of nodes within a network.

Area Router

A level 2 router.

Area Routing

The forwarding of packets from one area within a network to another area using level 2 routers.

Broadcast Addressing

This is multicast addressing when all the nodes receive the message.

Broadcast Circuit

A circuit to which more than one node is connected. Along this circuit, a message can be transmitted to the connected nodes.

Carrier Sense, Multiple Access with Collision Detect (CSMA/CD)

A link management procedure used by the Ethernet which allows multiple nodes to access the broadcast channel at will; it avoids conflict by detecting collisions and retransmitting the message.

Characteristics

Information about a component kept in either the volatile or the permanent database. Use the SHOW and LIST commands to see the characteristics and the SET and DEFINE commands to alter them.

Circuit

The virtual communications path between nodes which operates over a physical line.

Component

The element within the network that can be controlled and monitored using NCP. For example: LINES, CIRCUITS, NODES, AREAS and LOGGING.

Configuration Database

The permanent database consisting of information about the DECrouter and its components.

Congestion Loss

A condition which occurs when packets are lost due to traffic volume.

Cost

A value assigned by the network manager to a circuit between two adjacent nodes. Packets are routed on paths with the least total cost. Nodes at either end of a circuit can assign different costs to the same circuit.

Counters

A facility which allows the performance and error statistics for a component to be collected.

Datagram

A unit of data sent over the network and handled independently from all other data. The datagram becomes a packet once the route header is added.

Designated Router

A routing node on an Ethernet which provides a routing service for the end nodes.

Dial-up Line

A switched circuit connection.

Downline Load

The loading of software images on to an unattended node from another node.

End Node

A node that can receive packets addressed to it and send packets to other nodes, but cannot route packets to other nodes. End nodes are also known as nonrouting nodes.

Ethernet

A local area network which uses the CSMA/CD access method.

Event

A network phenomenon which can be recorded using the logging facility.

Event Class

A set of events concerned with the same section of network management, for example routing layer events.

Event Type

A particular form of event which is unique within the event class.

Executor Node

The node where the NCP command executes.

Flow Control

A protocol which controls the flow of data between applications, prevents data loss and reduces communication overheads.

Hardware Address

The unique Ethernet physical address associated with the communications controller.

Hop

The path between two adjacent nodes.

Host Node

A node which provides services for another node, for example the load host for the DECrouter.

Known Component

The classification for one or more of the same components. It includes all active and inactive versions of the component.

LAN

See Local Area Network.

Level 1 Router

A router that can forward packets to other nodes within the local area network.

Level 2 Router

A router that can forward packets to other nodes within the local area and between areas. Also known as an area router.

Line

The physical path between nodes.

Load Host

A node which provides loading services for another node.

Local Area Network

A Local Area Network (LAN) is a high speed data communications network that covers a limited geographical area, such as an industrial complex.

Local Node

The node where you are located.

Logical Link

The connection between two processes.

Logging

The management facility that collects network events to a logging sink, such as a file or console.

Logging Console

A logging sink that receives events; this is usually a terminal or file.

Logging File

A logging sink that receives events for later reference.

Logging Monitor

A logging sink (such as a terminal) that receives events as they occur.

Logging Sink

A console, file or program on a node which receives events.

Loopback Connector

A device used to loop information for testing purposes.

Loop Node

A local node associated with a specified circuit and used for loopback testing.

Maximum Cost

A value at which routing decides a node is unreachable. This occurs when the cost of the least costly path to that node is too high. In order to ensure correct network operation, this value must not be less than the maximum path cost for the network.

Maximum Hops

A value at which routing decides a node is unreachable. This is due to the length of the shortest path between the two nodes being too long. In order for correct network operation, this value must not be less than the network diameter.

Maximum Path Cost

The value of the path cost between the two nodes in the network with the greatest routing cost. The routing cost is the least costly path between two nodes.

Maximum Path Length

The greatest routing distance between two nodes in the network. The routing distance is the length of the least costly path between the two nodes.

Maximum Visits

The maximum number of nodes through which a packet can be routed before arriving at the destination node. If a packet exceeds the maximum number of visits, the packet is dropped.

Message

The unit of information sent from the source node to the destination node.

Multicast Addressing

An addressing method which sends the message to a group of nodes, such as all the nodes on an Ethernet.

Multicast Group Address

An address, associated with a group of nodes on an Ethernet, which is used to send a message to all nodes in the group in a single transmission.

Network

A collection of nodes linked by lines.

Network Diameter

The maximum reachability distance in the network. The reachability distance is the length of the shortest path between the two nodes.

Node

A network component on which networking software is installed.

Node Address

The unique numbers identifying a specific node within the network.

Node Name

The alphanumeric string associated with a specific node.

Nonrouting Node

An end node which can receive packets addressed to it and send packets to other nodes, but cannot route packets to other nodes.

Packet

The unit of data sent from a source node to a destination node.

Parameter

A network component entry in the volatile or permanent database.

Path

The route a packet takes from one node to another.

Path Cost

The sum of the circuit costs along the path between two nodes. You can specify the maximum path cost for the network. For a multi-area network, you can set the maximum cost for a path within an area, and for a path between areas.

Path Length

The number of hops along a path between two nodes. This is the number of circuits a packet travels across to reach the destination node.

Permanent Database

A file containing information about a node configuration.

Physical Address

The unique address belonging to a system on an Ethernet circuit.

Point-to-Point Circuit

A circuit which connects two nodes over a single physical line.

Protocol

A set of rules governing communication between nodes.

Reachable Node

A destination node which the DECrouter can access.

Remote Node

Any node in the network, other than the local node.

Router

A node that can send and receive packets, and forward packets to other nodes.

Routing

A network facility which determines the path along which data travels to the destination node.

Routing Node

A router.

Service Circuit

The circuit used for loading and dumping.

Sink Node

A node used to receive logged events.

State

The status of a network component.

Substate

An intermediate circuit or line state.

Summary

The default display for SHOW and LIST commands which shows the status and characteristics of a network component.

Synchronous Transmission

A method of sending data between two devices which are transmitting continuously and are controlled by the same clock.

Target Node

The node that receives the message, or that loops back a test message.

Unreachable Node

A node to which the cost of the least costly path exceeds the maximum cost for the network, or the length of the least costly path exceeds the maximum hops for the network.

Upline Dump

A facility that allows an unattended node to dump its memory to a file on another node.

Volatile Database

A memory image containing information about network components.

WAN

See Wide Area Network.

Wide Area Network

A Wide Area Network (WAN) is a data communications network that covers a wide geographical area, such as a country.

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