Networks · Communications

DECrouter 200

Management Guide
Volume I

AA–MK12A–TE

digital

DECrouter 200

Management Guide
Volume I

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This guide explains how to maintain, monitor, manage, and test the DECrouter 200 routing server. The topics cover all the information you need to customize the permanent and operational databases of the DECrouter 200 system and to analyze problems. This guide is divided into two volumes and is for the DECrouter 200 manager.

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The postage-prepaid Reader's Comments form on the last page of this document requests the user's critical evaluation to assist us in preparing future documentation.

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Preface

This is Volume I of the *DECrouter 200 Management Guide*. The *DECrouter 200 Management Guide* tells you how to operate, maintain, monitor, test, and troubleshoot the DECrouter 200 Ethernet communications routing server. Volume II in particular shows you how to define and modify software parameters of the DECrouter 200 system.

The *DECrouter 200 Management Guide* follows a tutorial format, with some reference material including complete descriptions for all the commands you can use to manage the system. One reference chapter discusses the commands of the DECrouter 200 Configuration Program (DRCP) and another explains Network Control Program (NCP) commands. This guide also presents explanations of the error messages generated by DRCP and event messages logged by NCP's Event Logger.

The *DECrouter 200 Management Guide* primarily addresses software management. Use this guide in conjunction with the *DECrouter 200 Hardware Installation/Owner's Guide*.

Another DECrouter 200 manual that you will find helpful is the *DECrouter 200 Software Installation Guide*. See this guide for operating-system-specific information about DECnet event logging, invoking the Network Control Program, starting the DECrouter Configuration Program (DRCP), starting the Router Configuration procedure, running the Remote Monitor, and running the Node List Builder utility.

The *DECrouter 200 Management Guide, Volumes I* and *II,* assumes that you are familiar with routing and networking concepts. These concepts are briefly discussed in this guide but are treated in depth in the *Routing and Networking Overview* manual.

Intended Audience

This guide is for the **DECrouter 200 manager**, the person responsible for initializing, maintaining, managing, and troubleshooting the DECrouter 200 system.

Terminology

"Router" is used throughout this manual to mean the "DECrouter 200 hardware unit, its firmware, and its operating software."

Structure of This Manual

The *DECrouter 200 Management Guide* is divided into two volumes. Volume I covers all management tasks except customizing the router's software image on a load host. Volume II describes all the router's permanent database parameters and tells you how to customize them for your network with the DRCP utility.

Volume I has 9 chapters and 4 appendixes. Volume II has 2 chapters and 2 appendixes. Some chapters are tutorial in nature, some solely for reference, and some a combination of both.

Volume I

Chapter 1 Introduces DECrouter 200 concepts and DECrouter 200 management tasks. This chapter describes the DECrouter 200's environment and position in both a local area network and a wider network. It also summarizes the router's possible hardware configurations.

Chapter 2 Describes the router's network components and introduces routing concepts.

Chapter 3 Introduces the DECrouter 200 management tools.

Chapter 4 Explains how to configure the load host's router node database and DECnet databases.

Chapter 5 Describes the different methods you can use to initiate a down-line load of the router software image from a load host to the DECrouter 200 unit. Command examples are provided.

Chapter 6 Shows you how to use NCP to manage, monitor, and modify the operations of the running router. This chapter explains the use of NCP SHOW and SET commands, the router's DECnet counters, and DECnet event logging.

Chapter 7 Details the use of management tools for monitoring and testing router components, and for analyzing and troubleshooting problems. Nontechnical DECrouter 200 managers can use this chapter.

Chapter 8 Describes troubleshooting procedures. Nontechnical DECrouter 200 managers can use these procedures.

Chapter 9	Contains NCP command descriptions. This is a reference chapter.
Appendix A	Summarizes the syntax of the NCP commands you use to manage the running router.
Appendix B	Lists and describes the DECnet event messages generated by the router and messages about down-line loading that are generated by the router's load hosts.
Appendix C	Gives instructions for setting up each type of supported modem.
Appendix D	Summarizes some of the hardware configurations supported by the DECrouter 200 system.
Volume II	
Chapter 1	Explains how to modify router parameters in the DECrouter 200 software image stored on the load host. This chapter fully explains DRCP and helps you customize your router's permanent database by defining each router parameter.
Chapter 2	Contains DRCP command descriptions. This is a reference chapter.
Appendix A	Summarizes the syntax of all the DRCP commands.
Appendix B	Lists the status, warning, and error messages generated by DRCP, along with descriptions of their meanings and appropriate corrective actions.

Using This Manual

If you are familiar with managing Digital routers, either the DECrouter 200 system or other routers, you may first want to read Volume II, Section 1.1, which discusses all the DECrouter 200 parameters, and then go on to Volume II, Chapter 2, for descriptions of the DRCP commands you use to set these parameters. Reference the other chapters as you need to.

If you have not previously been a router manager, it is recommended that you read the chapters in this order:

1. Preface
2. Volume I Chapter 1
3. Volume I Chapter 2
4. Volume I Chapter 3
5. Volume I Chapter 4
6. Volume II Chapter 1

7. Volume I Chapter 5
8. Volume I Chapter 6
9. Volume I Chapter 7
10. Volume I Chapter 8

In particular, ensure that you understand the router's software parameters (see Volume II, Chapter 1). It is also especially important to understand down-line loading (see Volume I, Chapter 5) and the difference between changing values in the router's permanent database versus changing them in the operational database (see Volume I, Section 1.4.1).

Other DECrouter 200 Documents

You may find the following additional DECrouter 200 documentation helpful:

- *DECrouter 200 Hardware Installation/Owner's Guide*

  Explains how to install the DECrouter 200 hardware unit and verify its operation, and discusses site preparation. The *DECrouter 200 Hardware Installation/Owner's Guide* is for the hardware installer and the router manager.

- *DECrouter 200 Identification Card*

  Provides the space to record the serial number, Ethernet address, DECnet node address, and DECnet node name of the router. This card is for the use of the network manager, the software installer, and the router manager.

- *DECrouter 200 Software Installation Guide (VMS)*
- *DECrouter 200 Software Installation Guide (ULTRIX-32)*
- *DECrouter 200 Software Installation Guide (MS–DOS)*

  Each software installation guide explains how to:

  - Install the DECrouter 200 distribution software onto a DECnet Phase IV system that you want to establish as a load host.
  - Configure that system's node database for routers.
  - Verify the load host installation and the DECrouter 200 installation.
  - Invoke NCP.
  - Start DRCP.

  This guide is intended for the load host system manager and the server manager.

- *DECrouter 200 Technical Guide*

  For second-level support (Digital field service personnel), this manual provides general operating instructions, detailed hardware logical functions, and diagnostic software information.

  The manual is for training, field service, and manufacturing. The depth of technical information requires previous training or experience with Ethernet networks and with Digital VAX-11 architecture.

- *Routing and Networking Overview*

  This manual is an introduction to routing in DECnet networks. It defines basic routing terminology and concepts. This manual also describes the types of computer systems that perform routing, explains how they carry out their routing functions, and provides guidelines for configuring networks for optimal routing performance.

  This manual is intended for the network manager and other managers who participate in configuring and maintaining networks.

DECrouter 200 On-Line Documentation

- *DECrouter 200 Release Notes*

  Describes any discrepancies between the actual product and the information in the documentation set. These notes are intended for the software installer and the DECrouter 200 manager.

- DRCP On-Line Help

  Provides reference information for all commands used to customize the router software image in the permanent database on the load host. DRCP Help is intended for the DECrouter 200 manager.

Associated Documents

You should be familiar with the documentation set for each host system you use to manage the DECrouter 200, especially the host's DECnet documentation.

You also may need to refer to the manuals that describe the Ethernet hardware components to which the DECrouter 200 unit is connected, such as the H4000 or DECOM transceivers, and the DELNI.

Conventions Used in This Manual

To effectively use this manual, familiarize yourself with the following conventions:

- All numbers are decimal unless otherwise noted.
- All Ethernet addresses are given in hexadecimal.

Graphic Conventions Used in This Manual

Convention	Meaning
`Special type`	Indicates a literal example of system output or user input. System output is in black type; user input is in red type.
lowercase/ UPPERCASE	In VMS command lines, UPPERCASE indicates keywords to be entered. Note that you can type the characters in either uppercase or lowercase. You can abbreviate Command keywords to the smallest number of characters that DRCP or the host system accepts.

NOTE

Many literal and nonliteral examples, file names, and utility names in running text assume that the host (management host, load host, logging host, etc.) is a DECnet–VAX node. If, in fact, your host system is a DECnet–ULTRIX node, type the commands and names in lowercase.

bold	In nonliteral examples from DECnet–ULTRIX hosts and in running text about DECnet–ULTRIX hosts, indicates command names and options, file names, and utility names. In the command format within DRCP and NCP command descriptions, indicates the default. In running text in general, introduces new terms, which the text then defines.
italics	Indicate a variable.
{ }	Indicates that you must specify the enclosed value or, if there are several enclosed values, at least one of those values. (Do not type the braces.)
[ ]	Indicates that the enclosed value or values are optional. (Do not type the brackets.)
. . .	Indicates that not all the display text or user input is shown.

.
.
.

(*key*)	Indicates that you press the specified key.
(CTRL/*x*)	Indicates that you should hold the CONTROL key down and then press the key specified by *x*.
(RET)	Indicates the return key. Unless otherwise specified, you should end every command line by pressing (RET). If you are using an IBM personal computer, note that this key is labeled differently on various models (refer to the documentation for your particular model to determine the correct key to use as a return key).

1
Introducing DECrouter 200 Management

This chapter introduces the DECrouter 200 product and your tasks as router manager.

1.1 What Is the DECrouter 200 System?

The DECrouter 200 is an Ethernet communications routing server that connects as many as eight Digital or IBM personal computers and larger computer systems to the local area network (LAN) and to larger DECnet networks. The DECrouter 200 hardware unit has nine connectors, called **ports.** One port connects the unit directly to a baseband or broadband Ethernet LAN, a Digital Equipment Local Network Interface (DELNI), or a ThinWire Ethernet. The other eight ports are for asynchronous connections to the personal computers or other processors.

The DECrouter 200 software performs routing functions that allow the connected computers to communicate and share resources with the nodes on the LAN or within a larger DECnet network, as well as with each other. The DECrouter 200 DECnet software includes all DECnet Phase IV features, such as path splitting.

Some of the computers that you can connect to the DECrouter 200's asynchronous ports are:

- Rainbow personal computers
- The Professional series personal computers
- VAX/VMS systems

- Other DECrouter 200 units
- Any other systems running a version of DECnet software using Digital's Digital Data Communications Message Protocol (DDCMP) in asynchronous mode, including supported IBM personal computers.

These computers can be connected to the DECrouter 200 through the conventional, low-cost asynchronous wiring found within most office environments. See the *DECrouter 200 SPD* for a full list of supported computer systems.

The DECrouter 200 supports asynchronous modem control for connections to remote computer systems. With modem control, the DECrouter 200 can connect public and dedicated lines to wide area networks (WANs). The DECrouter 200 supports modems for dial-in connections. See the *DECrouter 200 SPD* for details.

The DECrouter 200 software runs on the hardware unit as a standalone system; no other software is required. The DECrouter 200's software image is down-line loaded from a DECnet Phase IV node on the Ethernet of that router. Thus, at least one DECnet Phase IV node must be set up and available on the Ethernet to act as the DECrouter 200's down-line load host. To set up a down-line load host, called the **load host,** the system manager or network manager must install the DECrouter 200 distribution software and define the DECrouter 200 node in the host's node database. (This database may also be referred to as the down-line load database.) For more information on setting up load hosts, see the *DECrouter 200 Software Installation Guide.*

As the DECrouter's manager, you need to modify the DECrouter 200's software image on the load host, assigning parameter values appropriate for your DECrouter 200 and its network components. When you power up the DECrouter 200, the load host automatically down-line loads the software image over the network to the DECrouter 200. You can also initiate the down-line load by issuing a command at any DECnet Phase IV node that can reach the DECrouter 200 node, as explained in Chapter 5.

1.2 DECrouter 200 Environments

Figure 1-1 shows how a DECrouter 200 might be used in a typical small office environment to connect a mix of small computers to an Ethernet LAN. The router also connects two personal computers located outside the local office area for dial-in modem support. One or more of the VAX nodes connected directly to the Ethernet in Figure 1-1 can serve as load hosts.

The personal computers connected to the DECrouter 200 can access and share the resources and services provided by these and other DECnet systems on the Ethernet LAN. Users of the remote personal computers can dial in on a temporary basis to exchange data with any of the other DECnet nodes connected to the DECrouter 200 or to the Ethernet in Figure 1-1.

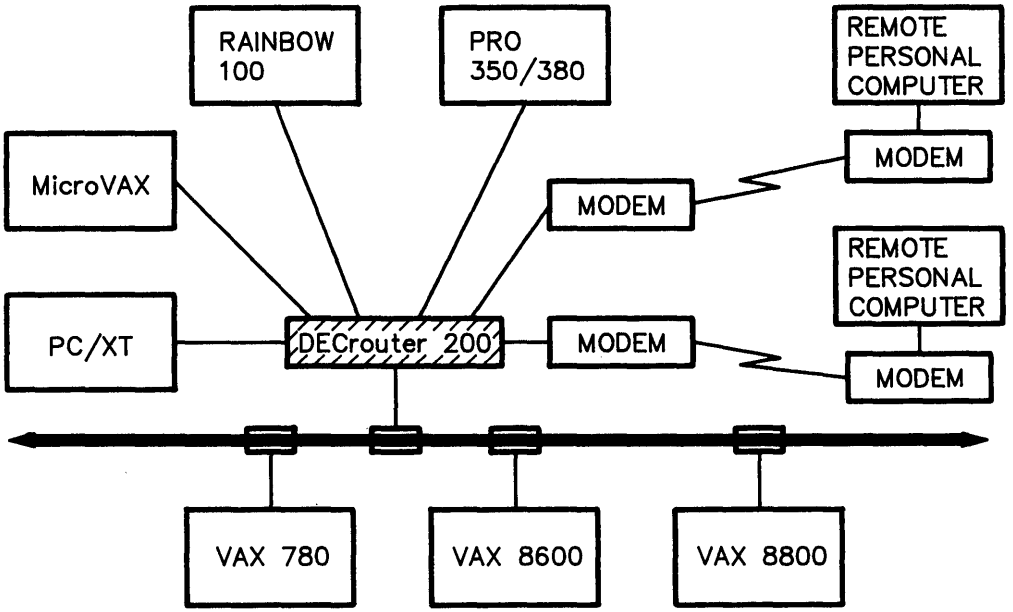


Figure 1–1: The DECrouter 200 Connecting Personal Computers to a LAN

Figure 1-2 is an example of a larger office environment where multiple DECrouter 200s serve several purposes. The DECrouter 200 named RTRDEV allows personal computers and a MicroVAX to access nodes on the Ethernet LAN. It has modem connections for two of the personal computers, which are located outside of the local area.

On the Ethernet, several nodes offer a variety of services for the personal computers. As shown, node JOSH offers disk storage, print facilities, and file services. Nodes may also provide remote virtual disks, specialized processing functions, and many other services. The DECrouter 200 named RTR2 provides low-cost connections to larger DECnet systems and to remote sites in a wide area network (WAN). The remote sites connect to the DECrouter 200 over modem-controlled lines, using the DECrouter 200's modem-control features.

Any node directly or indirectly connected to either DECrouter 200 in Figure 1-2 has full access to the entire network shown. For instance, all resources of node JOSH are accessible regardless of the type or location of the connection to the DECrouter 200s.

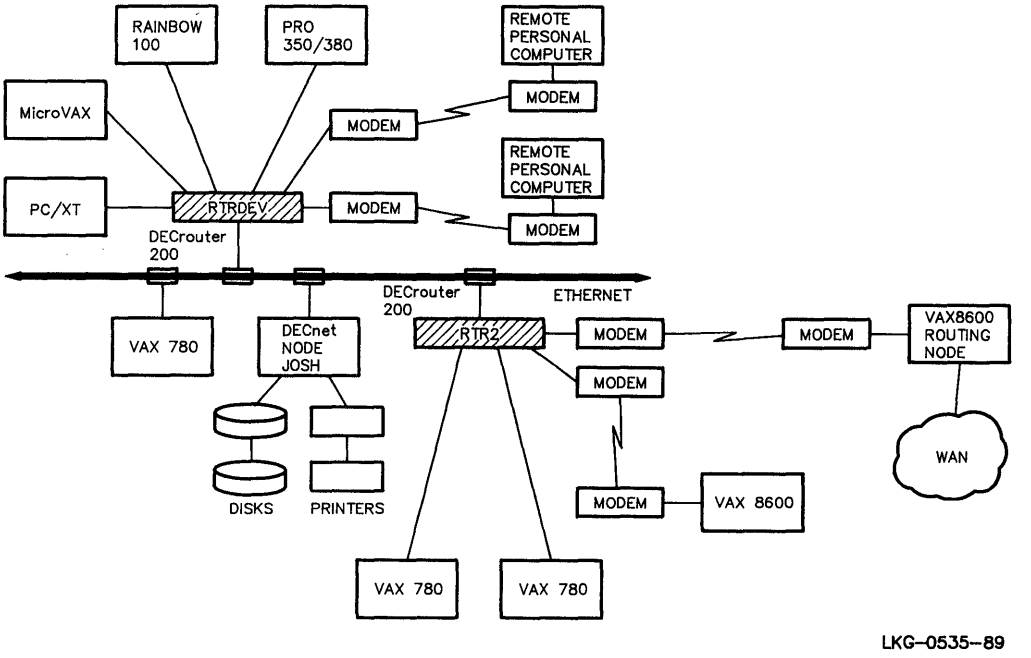


Figure 1-2: Two DECrouter 200s in a Large Office Area

The DECrouter 200 can be connected to a DELNI in a smaller office environment to provide a small number of workstations access to the office computer. The DELNI is a low-cost means for connecting an array of processors to the Ethernet. It can also serve as a LAN by itself. For example, Figure 1-3 shows a DECrouter 200 connecting four personal computers to a DELNI. The MicroVAX in this configuration is the system used to load the DECrouter 200. The MicroVAX also serves as a resource for the workstations connected to the DECrouter 200 and may include, for example, a database used by the office group. If the DELNI is connected to an Ethernet, as shown in Figure 1-3, workstations connected to the DECrouter 200 can also communicate and share resources with the nodes on the Ethernet.

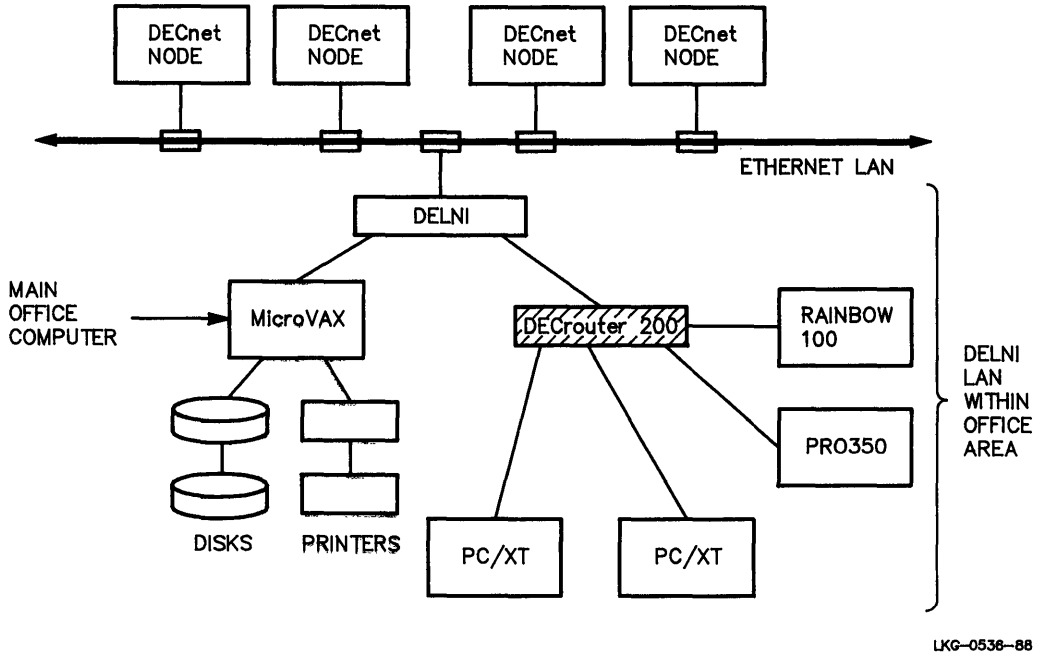


Figure 1–3: A DECrouter 200 Connecting Workstations to a DELNI

Appendix D describes some other basic network configurations supported by the DECrouter 200.

The DECrouter 200 operates in **multiple area networks** as well as in single area networks. A multiple area network is a network that is divided into subsections, called **areas.**

In a network that is not divided into multiple areas, a maximum of 1023 nodes is possible, but the optimum number of nodes is less. **Area routing** techniques permit configuration of very large networks, consisting of up to 63 areas, each with a maximum of 1023 nodes. Each area functions as a subnetwork.

DECnet supports two levels of routing:

1. **Level 1 routing,** which routes within a single area. The DECrouter 200 runs only as a level 1 router.
2. **Level 2 routing,** or area routing, which routes between areas.

Level 2 routers (area routers) can perform both levels of routing. They offload inter-area routing responsibilities from level 1 routers.

1.3 The DECrouter 200 Hardware Unit

The hardware unit is installed by the customer and easy to maintain (see the *DECrouter 200 Hardware Installation/Owner's Guide*). Figure 1-4 shows the DECrouter 200 hardware unit.

The control/indicator panel of the hardware unit contains four indicator LEDs (light-emitting diodes), labeled D1, D2, D3, and D4. These LEDs indicate the status of the software and hardware. Section 8.1 and Table 8-1 explain the meanings of the indicators on the unit. (For a full description of the DECrouter 200 controls and indicators, see the *DECrouter 200 Hardware Installation/Owner's Guide.*)

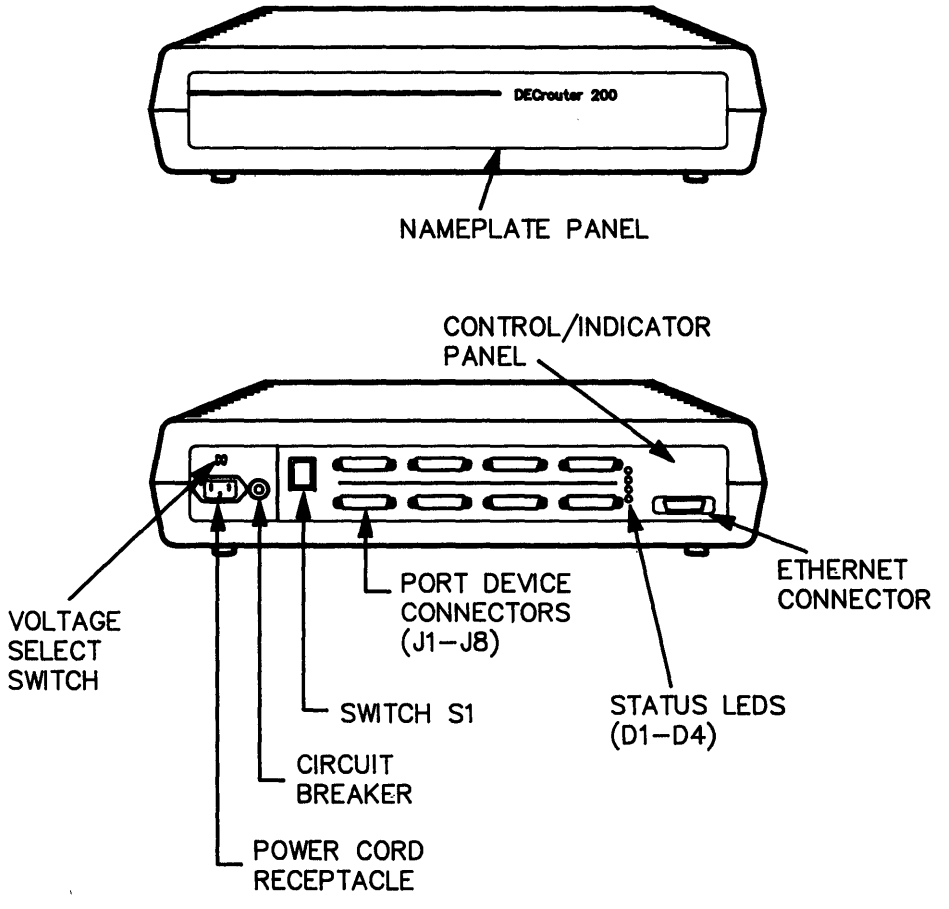


Figure 1–4: The DECrouter 200 Hardware Unit

The hardware unit is a standalone unit that can be used in any typical office or computer room. When used for connecting workstations within an office area, the unit can be placed in the wiring cabinet or on top of a desk. The workstations can be connected to it through the existing office wiring. When connecting personal computers and other processors to a larger network within a computer room, you can place the unit in the room as a standalone unit or you can rack mount it or hang it from a wall.

To differentiate your DECrouter 200 from other routers in the area, you can place a label with the router's DECnet node name and DECnet node address on the hardware unit. The best time to label units is when the distribution software is installed. Labels are provided for identifying the nodes connected to the asynchronous ports on the router.

The DECrouter 200 hardware invokes automatic self-diagnosis at startup. A self-test checks the hardware unit's connection to the Ethernet network, making sure there are no hardware faults that can prevent loading of the software image from the load host. If a problem is indicated, you can attach a console (or terminal) to the first asynchronous port (labeled "J1"). Then you can rerun the self-test. The router displays error messages that can help you isolate the source of the problem. Section 8.1.1 describes the self-test and the associated status and error indications.

NOTE

The switch labeled "S1" on the control/indicator panel has no function.

1.4 Managing the DECrouter 200: Summary

Your tasks as router manager usually begin when the router's hardware and distribution software have been installed. Coordinate with the hardware and software installers, making sure they have completed their installations and verifications.

As router manager, you have these management tasks:

- Configuring your load host's node database

  Reconfigure, as needed, your load host's node database with a command procedure that comes with the DECrouter 200 software distribution kit. This configuration procedure is called ROUCONFIG.COM for DECnet–VAX load hosts, **rouconfig** for DECnet–ULTRIX load hosts, and ROUCONFG.EXE for DECnet–DOS load hosts.

  The DECrouter 200 software installer uses this procedure, as part of software installation, to define new routers in the host's database. As router manager, you can also use the procedure to view, add, delete and modify the database entry for your DECrouter 200 unit.

  See Chapter 4 for details. In addition, Section 4.3 shows how to use an alternate method of configuring your load host's node database.

- Customizing the router's software image, which contains the router's permanent database

  Tailor the software image that was installed on the load host by using the DECrouter 200 Configuration Program (DRCP), one of the software distribution files. DRCP lets you modify certain system and network parameters. Most of the parameters affect routing. Choose parameter values to ensure optimal network routing.

  Chapter 1 of Volume II defines all the router's parameters and explains how to use DRCP to define and view these parameters. In addition, Chapter 2 of Volume II presents complete DRCP command descriptions.

- Down-line loading the router's software image

  Down-line load the customized image from a load host to the DECrouter 200 unit. Whenever you modify the router's software image, you must reload the router for your changes to take effect on the running unit.

  Chapter 5 discusses all the ways to initiate a down-line load.

- Controlling and monitoring the router's operations

  Use DECnet Phase IV network management (NCP) for monitoring and modifying the router's performance and characteristics. You can modify certain parameters in the router's operational database to control router operations or to redirect and optimize the traffic flow in your network.

  Chapter 6 explains how to use NCP to modify the operational parameters and monitor the router's operations. Chapter 9 presents complete command descriptions for the NCP commands that you need to manage the running router.

- Troubleshooting

  Use both the router's features and NCP to identify problems with the router and any of its circuits, including the Ethernet circuit. NCP can also help you diagnose possible problems of connected personal computers. Chapter 7 describes all your troubleshooting tools and Chapter 8 details troubleshooting procedures.

- Providing security

  For security, set the two types of security features offered by the router, passwords and the dial-back security check.

  Use DRCP to define, in the permanent database, a network privileged password and a network nonprivileged password for your router. These passwords prevent unauthorized users from executing NCP commands affecting the router. The router's privileged password turns these commands, if the DECnet management host supports them, into privileged operations: NCP SET, CLEAR, ZERO, and LOOP commands that execute at the router. In addition, the router's nonprivileged password makes NCP SHOW commands that execute at the router privileged operations.

To prevent unauthorized access by nodes to the router, define transmit and receive passwords. And, to protect the router from unauthorized DECnet maintenance requests, define a DECnet service password for your router. You can also set all these passwords using NCP in the router's operational database, with the exception of the service password.

Section 3.5 describes the router's security features. See Chapter 2 of Volume II for the DRCP SET command descriptions and Chapter 9 of Volume I for the NCP SET command descriptions.

1.4.1 Maintaining the Router's Two Databases

The DECrouter 200 has two databases with information about the router's components and parameters: the permanent database and the volatile (operational) database. The information in these databases determines how the router functions.

- Permanent database

  The permanent database is stored on the load host, in the software image file. When you use DRCP to modify the router's software image, you are defining parameters in the permanent database. Changes do not take effect until the next down-line load.

  When you down-line load the software image, the permanent values become the operational characteristics. These operational characteristics control the running router.

- Operational database

  Modifying the operational database provides real-time control of the running router and the network without your having to change the permanent database. Changes to the operational database take effect immediately.

  To modify and monitor the router's operational characteristics, use NCP commands at any node that can access the router. Nodes from where you can remotely enter NCP commands for execution at the router are called **network management hosts**.

  Changes to the operational database do not affect the permanent database. The changed values remain in effect only until you modify them again or as long as the current image is running. When the DECrouter 200 is reloaded, the parameters revert to the values defined in the permanent database.

  If you want to retain new values in the operational database, you must also enter them in the permanent database. The values in the permanent database survive from one down-line load to the next. Thus, you can change parameter values on a long- or short-term basis.

  Figure 1-5 shows the relationship between the DECrouter 200 databases. In this example, the load host is a DECnet–VAX node.

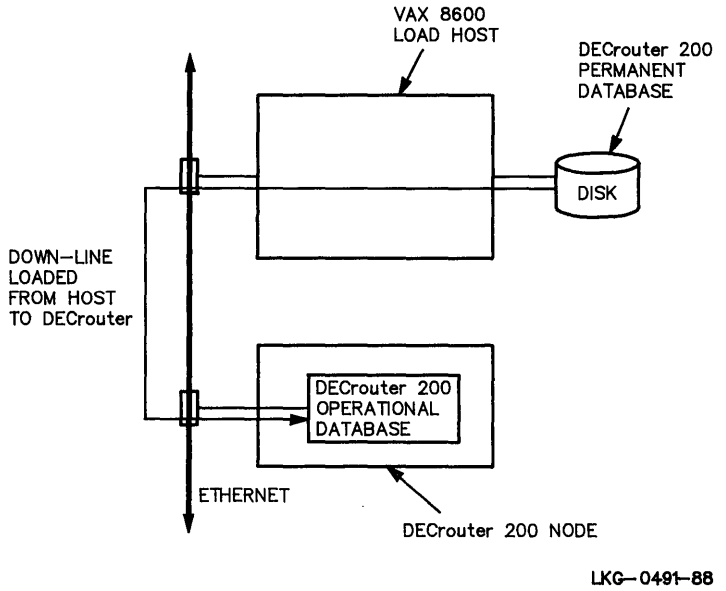


Figure 1–5: DECrouter 200 Permanent and Operational Databases

1.4.2 Using Hosts

To manage your router, use supported DECnet systems as load hosts, logging hosts, and management hosts. The extent of remote router management you can perform at a particular host is determined by the availability of DECnet NCP on that host. For example, DECnet–DOS nodes do not offer the same range of NCP commands and other management features as do the router's other supported hosts.

- Use load hosts to store, modify, and down-line load the software image and to receive up-line dumps of DECrouter 200 memory. Load hosts also store other router utilities, such as the Remote Monitor (see Section 7.3) and the Nodes List Builder (see Volume II, Section 1.10). Issue DRCP and NCP commands.
- Use logging hosts to log DECnet event messages. Issue the DRCP logging commands and NCP commands. Some of the NCP commands execute at the host and some at the router. See Section 6.4.3.
- Use management hosts to manage remotely DECrouter 200 operations. Issue NCP commands.

1.4.2.1 Load Hosts — One or more nodes can be set up as load hosts. The network manager assigns load hosts. The network manager or system manager then installs the DECrouter 200's distribution software onto the load host and modifies the host's node database to support the DECrouter 200. The following systems can be used as load hosts:

- VAX/VMS systems running DECnet–VAX
- ULTRIX-32 systems running DECnet–ULTRIX
- MS–DOS or PC DOS systems running DECnet–DOS
- RSX systems running most versions of DECnet–RSX — for example, DECnet-11M-PLUS — under special conditions. These systems can perform as load hosts only if you follow these steps:

  1. Customize the router's software image on one of the fully supported load hosts listed above. See Volume II, Chapter 1, for details.
  2. Copy the customized image file to the RSX system. See Chapter 4 for details.
  3. Set up the DECnet databases of the RSX system to support down-line loading to the router. For details, see Chapter 4 and the command description of NCP DEFINE NODE.
  4. Enable service on the Ethernet circuit of the RSX system to make down-line loading possible. For details, see Chapter 4.

Each of these systems must be running DECnet Phase IV and must be located on the same Ethernet as the DECrouter 200. For supported version numbers of DECnet software, see the Software Product Description for the DECrouter 200. The appropriate *DECrouter 200 Software Installation Guide* explains how to set up supported load hosts. (There is a different guide for each type of operating system supported.)

Digital recommends that a minimum of two load hosts be established on every LAN so that there is at least one backup load host. You should have at least one load host for every ten DECrouter 200 units on larger networks.

Besides down-line loading the DECrouter 200's software image, the load host can receive event-logging messages generated by the DECrouter 200 node and receive up-line dumps of the DECrouter 200's memory after a crash. You can choose a node other than the load host to log event messages and/or to receive dumps. With DRCP, you can define a node to be the logging host, overriding the load host as the DECrouter 200's event logger.

The event messages report the status of the DECrouter 200 (including the status of a down-line load). They also report error conditions, showing the severity of error conditions and, when appropriate, suggesting some remedial action. Each event message identifies the node that generated the event. Thus, when reading event messages at the host, you can distinguish DECrouter 200 events from events generated by other nodes.

1.4.2.2 Logging Hosts — The DECnet event-logging facility on both your load hosts and your management hosts can automatically record router activities on an ongoing basis. See Section 6.4.3.

1.4.2.3 Management Hosts — You can remotely manage the DECrouter 200 at a terminal on any DECnet Phase IV network management host connected to the DECnet network, limited only by the availablity of DECnet NCP commands on that host.

You can issue NCP commands that execute at the router or at the local node. You can display status and error information at your terminal, control the operation of the DECrouter 200, and test network operation. More specifically, you can:

- Modify parameters in the operational database
- Display operational characteristics of the DECrouter 200 and its circuits
- Monitor the activity of the DECrouter 200 and its connected circuits
- Perform loopback testing of DECrouter 200 circuit hardware and software

1.5 Installing the DECrouter 200 System: Summary

The DECrouter 200 **system installation** is fully explained in the *DECrouter 200 Software Installation Guide* and the *DECrouter 200 Hardware Installation Guide*. In some sites, installation and management tasks may be performed by the same individual. In addition, the network manager may be the same person whom this guide calls the router manager.

This summary chronologically outlines the system installation:

1. Hardware installation and first part of verification
2. Distribution software installation on at least one load host
3. Load host installation verification
4. System installation verification

It is helpful to your understanding of the router and of your management tasks to know a little about the router's combined hardware and software installation. Here are some chronological steps:

1. The software installer, usually the load host system manager, installs the **distribution files** onto the load host.
2. The system manager configures the load host's node database to include the new routers.
3. The hardware installer installs the hardware and powers it up. The router automatically runs its **diagnostic self-test**. The self-test verifies the **hardware installation**. The router requests a down-line load from any load host.
4. A load host down-line loads the router's software image with all default values to the router.
5. The load host system manager verifies that his or her system can down-line load the router. He or she reloads the router with the NCP LOAD command. This procedure is the **software installation verification** and the **load host installation verification**.
6. The load host system manager executes a few selected NCP commands to make sure that the proper software was down-line loaded and is running. This procedure is **system installation verification**.
7. The hardware installer tells you that the hardware is installed and tested.
8. The software installer informs you that the software is installed, the load host's node database is configured, the system installation verification steps are complete, and your DECrouter 200 system is fully functional.

1.6 Using DECrouter 200 Management Tools

The DECrouter 200 product provides you with several management tools to help you perform your management tasks. Some of these tools are on the router, some of them reside on the load host, where you use them, and some of them reside on network management hosts.

See Chapter 3 for a description of all the DECrouter 200 management tools.

1.7 DECrouter 200 Features

These are the DECrouter 200 product's main features:

- It offloads communications processing for other nodes on the Ethernet. As a result, these other nodes can be configured as **end nodes** (nonrouting nodes) and thus can devote more of their processing capability to applications.
- It is dedicated to routing. In contrast, if you use a time-sharing system for routing, you are less likely to realize optimal network reliability because this nondedicated system is subject to conflicting demands and variable up time.
- For connected nodes, the router offers access security with its **dial-back** feature. "Dial-back" lines are lines for which you have set up the dial-back security feature. These lines are connected by a modem that supports dial-back security. For PTT software distribution kits, PTT V.25 *bis* modems are supported.

  Table 1-1 lists the modems supported with the non-PTT software distribution kits.

Table 1–1: Modems Supported with Non-PTT Software Distribution Kits

Digital Modems	Non-Digital Modems
DF03 Digital modem	Codex 2233 modem
DF112 Digital modem	Codex 2260 modem
DF224 Digital modem (Scholar)	Hayes Smartmodem 2400

  Volume I, Appendix C, shows how to set modem characteristics.

  Whenever a node on a dial-back line sends a connection request to the router, the router breaks the connection and immediately phones the requesting node at the number stored in the router's database. Only after this second connection is routing initialized.

- For Postal, Telegraph and Telephone authorities (PTT) software distribution kits, dial-back security supports V.25 *bis* modems.
- The router is a cost-effective solution for distributed processing needs. Besides allowing end nodes to process application tasks more effectively, DECrouter 200 systems allow users to share services and resources and their costs.
- It gives DECnet Phase III and Phase IV nodes access to LAN resources.
- While offloading routing functions from other nodes, the DECrouter 200 system also provides an inexpensive means for building wide-area networks of up to 64,000 nodes. Adding lines to the unit does not increase the routing load on other routing nodes.

- When more than one path of equal cost is available to a destination, the DECrouter 200 system can split the transmission load evenly over these paths. This method, called **path splitting**, reduces the likelihood of congesting any one of the paths.

  With path splitting, you can connect from two to four low-speed lines to the same destination, while attaining a combined throughput equivalent to that attained over a high-speed line.

- The router provides the tools for the DECrouter 200 manager to easily enhance, control, monitor, and maintain DECrouter 200 operation and the operation of the lines connected to it. From a host system, the DECrouter 200 manager can:

  - Define or change parameters that set up and tune the operation of the DECrouter 200 system
  - Monitor network traffic and activity through traffic statistics, error statistics, and network event logging
  - Test the connected circuits and DECrouter 200 route-through capabilities through loopback tests

All of the router's features are described in detail in later chapters.

2
Introducing DECrouter 200 Components and Routing Concepts

To establish your DECrouter 200 as part of the DECnet network, you must define the DECrouter 200's specific network components in a permanent database. You will maintain this database, along with the DECrouter 200's operational database, changing parameters appropriately as the network configuration changes or as performance needs change. This chapter describes the major DECrouter 200 components — nodes, circuits, lines, and routing — and their characteristics.

In particular, this chapter describes many of the routing parameters that allow you to control network routing. As manager of the DECrouter 200, you can modify many of these to change the flow of traffic through the DECrouter 200 and its network. However, the default parameter values are appropriate for most networks. Many of the DECrouter 200's parameter values are established by the network manager. Therefore, you may need to confer with the network manager about these values and any changes being considered. The parameter values established by the network manager are:

- DECnet node address
- DECnet node name
- Maximum address
- Maximum broadcast nonrouters
- Maximum broadcast routers

- Maximum cost
- Maximum hops
- Buffer size
- Segment buffer size

NOTE

For your convenience, discussions of the DECrouter 200 parameters that you can modify are set apart in indented text.

This chapter also explains concepts related to multiple area networks. The DECrouter 200 functions only as a level 1 router in such networks.

2.1 Nodes

To establish a system as a node in a DECnet network, several configuration database parameters must be defined in the system's DECnet software.

The DECrouter 200's DECnet characteristics are defined in the load host's node database. They are used to down-line load the DECrouter 200's software image. For example, the installer of the DECrouter 200's software enters the DECrouter 200's DECnet node address and node name in the load host's node database.

Use DRCP to define other node parameters in the DECrouter 200's permanent database. These parameters are the "executor parameters," such as the buffer size (which determines the largest size message the DECrouter 200 can forward), the maximum address (the largest address the DECrouter 200 will recognize), and other routing parameters.

You also use DRCP to define DECnet node names for those remote nodes that you may need to identify while using certain network management commands. You can define up to 1,023 node names. You can use a time-saving tool supplied with the DECrouter 200 distribution software to automatically build a list of node names for your DECrouter 200. The tool pulls the node names from the list of node names on the DECrouter 200's load host. To change or add node names in the DECrouter 200's operational database, you can use the NCP SET NODE command.

It is important that you understand how nodes and other devices are addressed and identified on an Ethernet. You do not have to specify the Ethernet hardware address of a node to invoke normal network operations, but you may need to know it for certain service functions, such as circuit loopback tests.

To send a message to a specific node on the Ethernet, the network software uses either the node's Ethernet hardware address or its Ethernet DECnet address. The network software uses the **Ethernet hardware address** if DECnet software has not been loaded on the node yet. The Ethernet hardware address is a unique address permanently associated with each hardware interface (Digital or non-Digital) on the Ethernet. The address consists of twelve hexadecimal digits, represented in six pairs that are separated by hyphens (for example, AA-00-03-00-01-23). Your DECrouter 200's unique Ethernet hardware address is on the control/indicator panel of the hardware unit, next to the Ethernet port, and on the *DECrouter 200 Identification Card.*

The network software uses the node's **Ethernet DECnet address** (also called the "extended DNA address") after DECnet software is loaded on the Ethernet node. While DECnet software is running, the node responds only to the Ethernet DECnet address.

A node's Ethernet DECnet address is set up automatically by its Ethernet controller software. This address is computed from the node's DECnet node address (*area-number.node-number*), which consists of 16 bits. (The first six high-order bits denote the area number and the remaining ten low-order bits denote the node number.) The following steps show how the Ethernet DECnet address is computed from the DECnet node address *a.n*, where:

a = area number

n = node number

1. (*a*)(2**10) + *n* =
2. (*a*)(1,024) + *n*
3. Translate this base-10 number to a base-16 number (*wxyz*)
4. Swap the two pairs of digits (*wxyz* → *yzwx*) and append this four-digit number to the standard Ethernet 8-digit hexadecimal number AA-00-04-00 (this 8-digit number identifies all Digital Ethernet nodes): AA-00-04-00-*yz-wx*

For example, if the DECnet node address is 2.59, then the node's Ethernet address is:

1. (2)(2**10) + 59 =
2. (2)(1,024) + 59 = 2,107
3. 2,107(base-10) = 083B(base-16)
4. The node's Ethernet address is AA-00-04-00-3B-08

2.2 Circuits

Circuits are high-level, logical communications data paths between adjacent nodes. Circuits operate over physical lines, which are low-level communications paths. The DECrouter 200 supports up to eight asynchronous DDCMP point-to-point circuits and one Ethernet circuit.

Each asynchronous DDCMP circuit provides for a single connection between the DECrouter 200 and an attached node. The Ethernet circuit provides for multiple connections between the DECrouter 200 and the many nodes that may be at the other end of the Ethernet circuit.

The node directly attached to the DECrouter 200 by an asynchronous circuit is considered adjacent to the DECrouter 200. All nodes on the DECrouter 200's Ethernet are also considered adjacent to the DECrouter 200. (Each node on an Ethernet is considered adjacent to every other node on the circuit and equally accessible. Every node must have a unique node identification: an Ethernet physical address.)

Just as you specify parameters for the DECrouter 200 node, you also must specify parameters for the circuits connected to the DECrouter 200. You must identify each circuit by name and specify information that directly affects the circuit's operation. You can specify the operational state of circuits (on or off). This lets you control circuit traffic and perform service functions. The state of a circuit may ultimately affect the DECrouter 200's ability to reach an adjacent node. The DECrouter 200 lets you provide security for communications over each circuit. You can specify a circuit parameter that prevents unauthorized access to the DECrouter 200. Another circuit parameter is a timer that defines the frequency at which routing messages are sent to an adjacent node to keep it aware of the DECrouter 200's status as a reachable node (called a **hello timer**).

2.3 Lines

Lines provide physical paths over which circuits operate. Lines are the lowest level (in terms of the layered network architecture) of the communications path.

You must establish the line speed and modem connection parameters for all asynchronous lines connected to the DECrouter 200. If you want to use the dial-back security feature, you must also set values for connection type and modem. In addition, if you have a PTT software distribution kit, you must also set a value for identification number.

For non-PTT software distribution kits, additional optional parameters that control dial-back are call attempts, call setup timer, and recall timer.

2.4 Routing Functions Performed by the DECrouter 200

The DECrouter 200 is a **routing node** (router): a DECnet node that can receive and forward (route) information programs from one node to another. Routing is the network function that determines the path or route along which the data travels to its destination. (At the routing level, data is sent as **packets.**) Routers regularly exchange and maintain information about other nodes in the network. They use this information to help determine the best path to use for routing data to a destination.

The DECrouter 200 supports DECnet Phase IV routing, which includes the latest enhancements plus all the capabilities of Phase III routing. Very large network configurations are possible. With DECnet Phase IV software, the DECrouter 200 can support routing to 1022 other routing and nonrouting nodes.

The maximum number of nodes in the network that your DECrouter 200 will support for routing is determined by the value of the maximum address parameter. You define this parameter in the DECrouter 200's permanent database. Its value partly determines the routing overhead to be incurred by the DECrouter 200. Therefore, the value should be kept as low as possible.

Without routers such as the DECrouter 200, each node in the network would require a direct connection to every other node with which it communicates. This could result in very high configuration costs, especially in large networks. With networks that include personal computers, such costs could defeat the economical benefits gained by the use of personal computers. That is one major reason why the DECrouter 200 can be a valuable asset to your network: up to eight personal computers can be connected to the network at the cost of a single connection. The *Routing and Networking Overview* describes in further detail how the DECrouter 200 and other routers contribute to networking and explains how you can configure your network to bring about the best results.

2.4.1 Adaptive Routing

The DECrouter 200 does adaptive routing. To route data, it intelligently selects the best available path to each destination. The DECrouter 200 keeps a **routing database** that contains regularly updated information about the status of all destination nodes in the area, the status of the communications paths between these nodes and itself, and the paths to other areas in the network. Using the updated information in its routing database, the DECrouter 200 can automatically adapt to changing conditions in the network. For example, when a node along a path becomes unavailable, the DECrouter 200 will route messages along the next best path.

When the DECrouter 200 receives data that is to be routed, it checks its routing database and forwards the data to the destination node along the least costly path. The cost of each path is determined by the network manager, who assigns a cost value to each link (circuit) in the network. The **path cost** between a source and destination node is the sum of the costs of the circuits that comprise the path.

As manager of the DECrouter 200, you can specify costs in the DECrouter 200's permanent database for each of the DECrouter 200's circuits, including the Ethernet. This lets you control the path that data is likely to take when being routed by the DECrouter 200. When the DECrouter 200 is up and running, you also can dynamically change the cost of a circuit to a higher or lower value. By altering circuit costs, you can change the routing paths and thereby affect the use and availability of network circuits and resources.

2.4.1.1 Reachability — A destination node is **reachable** if there is a usable path between the destination node and the local node (the DECrouter 200, for example). A path is usable if its path cost and path length do not exceed the limits specified in the DECrouter 200's permanent database, described below.

The length of a path is measured in **hops.** A single hop is the distance between two adjacent nodes. The path length is the total hops from source to destination.

The parameters that define the limits for path costs and lengths are called the MAXIMUM COST and MAXIMUM HOPS parameters. These are node parameters. The values you select for these parameters influence which paths the DECrouter 200 will select for routing to a given node.

2.4.1.2 Routing Update Messages — As conditions change in the network, the reachability of certain nodes may also change. Adjacent routing nodes exchange routing messages to update their routing databases about the reachability of each node in the area. A **routing update message** is a packet that contains information about the cost and hops to each node in the area.

Whenever this routing information changes (for instance, when a node goes down), new routing messages will be sent automatically to reflect the changes. For example, if someone were to change the state of a circuit, rendering a node unreachable, this change would be reflected automatically in the routing update messages exchanged by the routing nodes.

DECnet Phase IV now differentiates between level 1 and level 2 multicast routing update messages. Before this enhancement was introduced, level 1 and level 2 routing update messages were sent to all routers. Now, level 2 update messages are sent to level 2 routers only. This relieves level 1 routers such as the DECrouter 200 from the extra processing required for these messages.

The network manager can set a timer for transmission of routing messages, controlling the intervals at which certain routing updates are transmitted (those which do not involve configuration changes). The routing timer controls the frequency of transmission of these messages on non-Ethernet circuits. The broadcast routing timer controls their frequency for Ethernet circuits. Expiration of the broadcast routing timer causes the local node to send a multicast routing configuration message to all routers on the Ethernet. If the network is relatively stable, the timers can be given larger values to reduce routing overhead.

Timers associated with the DECrouter 200 are assigned fixed values for optimal network operation. You do not modify these timers.

2.4.2 The DECrouter 200 as the Designated Router

All nodes on an Ethernet can communicate directly with each other without depending on intervening routing nodes. Initially, however, end nodes on an Ethernet do not have information about other nodes on the network. They only know about the **designated router** (if there is one) on the Ethernet, the node designated to provide message routing services for end nodes on the Ethernet. End nodes use the designated router when communicating with any node for the first time. The DECrouter 200 can be a designated router.

If there are two or more routers on the same Ethernet, the network software on all routing nodes on the Ethernet elects one of them as the designated router.

The election is made on the basis of the highest numerical priority, a number that is defined on each routing node by the Ethernet circuit ROUTING PRIORITY parameter. You can define this parameter for the DECrouter 200's Ethernet circuit. Do not assign a high priority to the DECrouter 200's circuit if you plan to take down or reload the DECrouter 200 often.

If there is a tie for the highest priority, the router with the highest node address is elected as the designated router.

The *Routing and Networking Overview* describes the function of the designated router in further detail.

To find out what is the current designated router known to the DECrouter 200, use the NCP SHOW CIRCUIT ETHER-1 STATUS command or use the Monitor utility.

2.4.3 Path Splitting

The DECrouter 200 can perform path splitting over several of its circuits, including the Ethernet. With this feature, you can configure two to four of the DECrouter 200's circuits on separate paths to the same destination and set up equal path costs for each. The DECrouter 200 will then take all traffic destined for that destination and divide it evenly among the paths to that destination. Any node that may be the destination for packets that are split over two or more paths should include the latest DECnet Phase IV enhancements (in particular, support of out-of-order packet caching); otherwise, those nodes may receive packets out of order, which can cause certain communications problems. Therefore, before enabling path splitting, be sure you understand all possible paths to the destination.

Figure 2-1 shows a simple example of path splitting. For example, costs are assigned to the circuits along the three paths between the DECrouter 200 and node ROBIN, so that the total path costs are equal (each path cost equals 2). In this way, path splitting can be enabled at the DECrouter 200 to facilitate communications between these two systems. If traffic between the two systems is heavy, path splitting can help prevent congestion. Data will flow between the nodes without congesting any one line. Note that all the nodes in this network should support out-of-order packet caching.

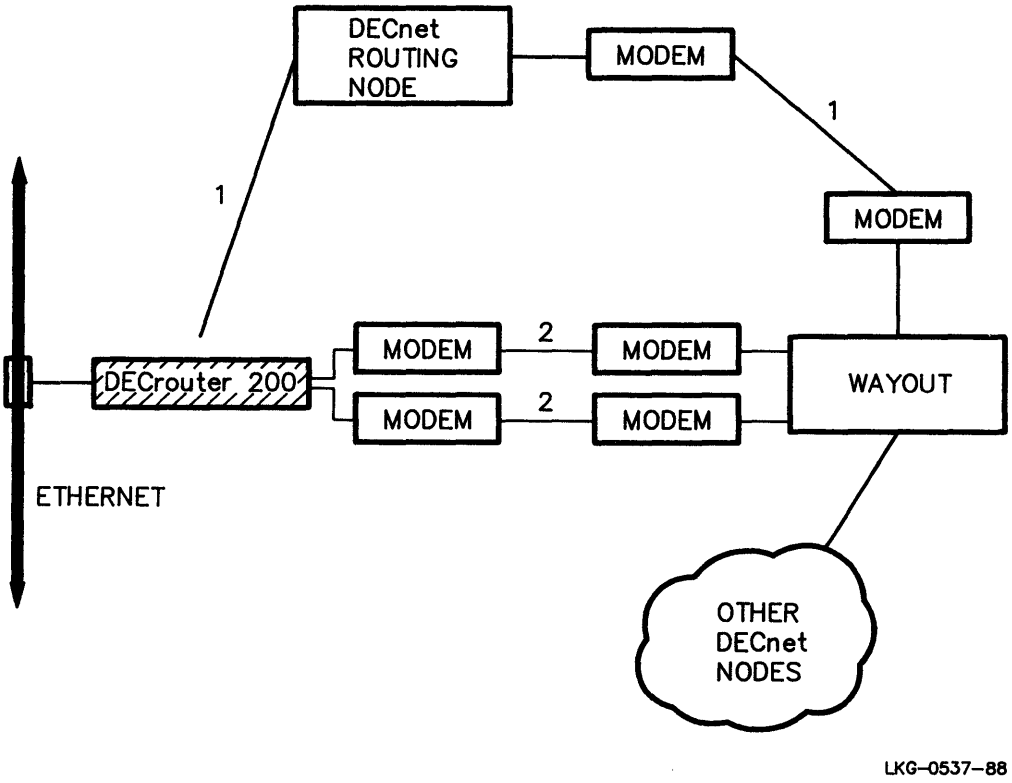


Figure 2–1: Path Splitting with the DECrouter 200

Path splitting can also be used for modem connections to remote facilities. The transmission load can be split over several low-cost, low-speed switched circuits between the DECrouter 200 and the remote facilities.

As manager of the DECrouter 200, you can define a parameter to enable load splitting (the PATHSPLITS parameter). Use DRCP to set up load splitting.

2.4.4 Congestion Control

The routing software on the DECrouter 200 and other routers with the enhanced DECnet Phase IV software uses congestion-control algorithms to maintain an efficient level of routing throughput. DECnet Phase IV flow control includes the ability to prevent the loss of data when congestion increases.

The ROUTING QUEUE THRESHOLD parameter is the maximum number of buffers that can be queued simultaneously on a circuit before dropping packets. The DECrouter 200 automatically computes this parameter for each of its asynchronous circuits to optimize throughput.

The MAXIMUM VISITS parameter controls routing throughput. The maximum visits is 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, the packet is discarded. This prevents packets from looping endlessly through the network. The benefit to routing throughput is that traffic and queuing delays are minimized. This parameter is also computed automatically by the DECrouter 200, using the following formula:

$$\text{Maximum Visits} = \frac{3\ (\text{Maximum Hops})}{2}$$

If you have a large network, you can further reduce routing traffic in your network (and the burden on routing nodes such as the DECrouter 200) by configuring your network as a multiple area network. The *Routing and Networking Overview* discusses multiple area networks in more detail.

3
Introducing the DECrouter 200 Management Tools

This chapter introduces the DECrouter 200 management tools, a combination of router features, load host features, and Network Management features, including:

- Load host configuration procedure (ROUCONFIG) — Used on a load host
- DECrouter 200 Configuration Program (DRCP) — Used on a load host
- Network Control Program (NCP) — Used on any network management host
- DECnet Event Logging — Used on a load host and on the logging host you specify
- DECrouter 200 Monitor Utility — Used on a load host or at the DECrouter 200 unit
- DECrouter 200 security features — Used on a load host and on any network management host
- Troubleshooting tools — Used on a load host and on any network management host

This chapter describes most of the DECrouter 200 management tools and your reasons for using them. See other chapters for procedural information on using these tools. For a full discussion of troubleshooting tools, see Chapter 7.

3.1 Load Host Configuration Procedure (ROUCONFIG)

ROUCONFIG helps you in several ways to manage your DECrouter 200. This tool is a configuration command procedure. The load host's node database comprises three separate databases, each of which contains an entry for your router. The entry provides information that DECnet needs to down-line load to your router and up-line dump from it.

Actually, the load host configuration procedure is called ROUCONFIG.COM on DECnet–VAX load hosts, **rouconfig** on DECnet–ULTRIX load hosts, and ROUCONFG.EXE on DECnet–DOS (or DECnet–VAXmate) load hosts.

NOTE

This guide uses the generic term ROUCONFIG for ROUCONFIG.COM, **rouconfig**, and ROUCONFG.EXE.

Use ROUCONFIG to reconfigure, when required, your load hosts' node databases. Use this management tool if:

- You are installing the DECrouter 200 distribution software for one or more new units. You probably have this responsibility if you are also the system manager of one of the assigned load hosts. For further information, see the *DECrouter 200 Software Installation Guide* for the appropriate operating system.
- You are about to run DRCP to customize one or more routers, but you are not sure of their image file names.
- The network manager asks you to change your router's DECnet node name or DECnet node address.
- Your DECrouter 200 hardware unit is replaced by another unit. (Even if you use the same DECnet node name and DECnet node address for the new unit, its Ethernet address is different.)
- The network manager assigns a new load host and asks you to configure that system to perform load-host functions.
- You or the system manager accidentally delete your router's software image file and another identical one does not exist on another load host to copy.

The ROUCONFIG command procedure is software that resides on your router's load hosts. ROUCONFIG is one of the DECrouter 200 software distribution files. In VAX/VMS kits, for example, it is named ROUCONFIG.COM (see Appendix A in the *DECrouter 200 Software Installation Guide* for the load host's operating system for the exact name of this file and all the other distribution files).

See Chapter 4 for complete information about ROUCONFIG and how to use it to configure the node database of your router's load hosts. Section 4.1.1 describes the three databases of the load host's node database.

3.2 DECrouter 200 Configuration Program (DRCP)

The DECrouter 200 Configuration Program (DRCP) is another tool that helps you manage the router. DRCP offers DRCP commands, DRCP on-line help, DRCP command files, and DRCP log files.

You use DRCP SET commands to specify the values for every DECrouter 200 parameter that determines how the router operates. When you want to enter these values in the router's permanent database, use DRCP.

These commands do not alter the router's operational database and, therefore, do not affect the router until you down-line load them. (You change the operational database with NCP commands.) In addition, DRCP SHOW commands display helpful information.

The DRCP program is one of the DECrouter 200 software distribution files. In VAX/VMS kits, for example, it is named DRCP.EXE (see Appendix A in the *DECrouter 200 Software Installation Guide* for the load host's operating system for the exact name of this file and all the other distribution files).

After complete DECrouter 200 software installation, DRCP resides on your router's load hosts. For the name of the directory, see the *DECrouter 200 Software Installation Guide* for the load host's operating system. This directory on VAX/VMS load hosts, for example, is SYS$COMMON:[DECSERVER].

NOTE

> Because several types of servers are in this directory and because the DECrouter 200 system is a routing server, the *DECrouter 200 Management Guide* calls this load host directory the **server directory**.

The host on which you run DRCP can be any one of your router's load hosts. All router load hosts must have DECnet installed, but DECnet does not have to be running while you are making changes with DRCP commands.

The DRCP SET and SHOW commands and the NCP SET and SHOW commands have a common command syntax. See Volume II, Chapter 1, for a detailed discussion of using DRCP and Volume II, Chapter 2, for complete command descriptions. See Section 3.3 for information about NCP as a DECrouter 200 management tool.

Use DRCP to tailor your router to operate efficiently within its network environment. Change the permanent database, as needed, to tune your router or to reflect the changing needs of your configuration. Chapter 2 of this guide and the *Routing and Networking Overview* manual provide guidelines.

The DECrouter 200 software image supplied by Digital defines a default network configuration. For example, it assumes a full configuration of eight asynchronous lines operating at 9600 bps each, without modems. The initial operating state of each of the asynchronous circuits is OFF.

To make your router operational, you must modify the permanent database parameters to match the needs and characteristics of your network configuration, for example:

- Enable the flow of traffic over the router's circuits by defining the operating state of those circuits.
- If the speed of a line is not 9600 bps, or if a line is connected to a modem, specify the appropriate speed for that line and enable it for modem control.
- Change the operating state of the asynchronous circuits to ON, as appropriate.
- If you want to use the router's security features, define the appropriate passwords, enable verification control for the asynchronous circuits for which you want access control, and set all the dial-back-related line and node parameters.

If crucial parameters are defined inappropriately, you may waste DECrouter 200 resources or inhibit DECrouter 200 performance. Ensure that the parameter values match the needs of your network configuration.

3.3 Network Control Program (NCP)

Another tool to help you manage the router is the Network Control Program (NCP). You can issue NCP commands at a load host or any network management host. Use these commands for the following management tasks:

- To modify the operational database of the DECrouter 200
- To display the current parameters in the operational database
- To initiate a down-line load of the DECrouter 200 software image to the DECrouter 200 unit
- To display network routing information
- To determine router or network problems and troubleshoot them

3.3.1 Modifying and Displaying the Router's Operational Database

NCP SET commands modify the values of router parameters in the router's operational database. These commands immediately affect the router but do not alter the router's permanent database. (You change the permanent database with DRCP commands.)

The NCP SET and SHOW commands and the DRCP SET and SHOW commands have a common command syntax. See Chapter 6 for a detailed discussion of using NCP and Chapter 9 for complete command descriptions.

Each NCP command for managing the router has a particular security level, either privileged or nonprivileged. See Section 6.1.2 for a discussion of router security and NCP privilege level.

3.3.2 Down-Line Loading the DECrouter 200 Software Image

NCP has two commands for down-line loading the DECrouter 200 software image to the router. These commands are LOAD NODE and TRIGGER NODE. You issue them at one of your router's load hosts. See Chapter 5 for a complete discussion of down-line loading.

3.3.3 Displaying Network Routing Information

NCP SHOW commands display routing information. See Sections 6.3 and 6.4.

3.3.4 Troubleshooting

NCP has LOOP commands for troubleshooting. NCP also aids in troubleshooting with up-line dumping. See Section 8.4 for complete information.

3.3.5 DECnet Event Logging

NCP's DECnet event logging helps you monitor down-line loads and all the router's local events. Down-line loading events are logged at the load host. The router's local events are logged at the router's logging host, which, by default, is the last load host that loaded it. You can assign another logging host.

Sections 5.4.1 and 5.6.3 cover the event logging of down-line loads. Section 6.4.3 discusses the logging of all the router's local events.

3.4 DECrouter 200 Monitor Utility

This management tool consists of the Local Monitor and the Remote Monitor. The Monitor utility is a troubleshooting tool, discussed fully in Section 7.3.

3.5 DECrouter 200 Security Features

The DECrouter 200 product has two types of security features for you to use as management tools: passwords and the dial-back feature.

3.5.1 Passwords

For security, you can enter these passwords in the router's permanent database:

- Privileged password for the router
- Nonprivileged password for the router
- DECnet service password for the router
- Transmit passwords for nodes
- Receive passwords for nodes

With the exception of the service password, you can also set and change these passwords in the router's operational database.

3.5.1.1 Privileged and Nonprivileged Passwords — The router's privileged and nonprivileged passwords protect the router's operational database from unauthorized access by NCP users.

If you define both of these passwords, all NCP commands that affect the router require a password. If you set just the privileged password, all NCP SET, CLEAR, ZERO, and LOOP commands accessing the router require the privileged password. In this case, anyone can display the information in the router's operational database.

If you set only the nonprivileged password, all NCP SHOW commands executing at the router require an exact match with this password. However, in this case, anyone can modify the database!

NOTE

It does not make sense to protect the router's database from users who may try to view it if you simultaneously allow them to change it. Digital suggests that, if you want to restrict access to the router's operational database, define:

- Both passwords for complete protection
- The privileged password for protection against changes and deletions

In addition, you must specify one of these passwords when you run the Remote Monitor.

3.5.1.2 DECnet Service Password — The DECnet service password prevents unauthorized access to the router by remote maintenance requests, for example, issuing the NCP LOAD and TRIGGER commands. If you define a DECnet service password in the router's permanent database, anyone, including you, at another node who tries to access the router by issuing a LOAD or TRIGGER command usually must include this password.

Remote maintenance activities are usually performed by the DECnet NCP utility. A load host's DECnet database contains several facts about the router, including the DECnet service password. When you or the DECrouter 200 software installer first creates the router entry in the DECnet database, the value for the DECnet service password is 0.

The router's default DECnet service password is 0. A value of 0 means that the router does not check the DECnet service password when it receives remote maintenance requests. Changing this password to anything other than 0, however, instructs the router to check that the DECnet service password in its database and the DECnet service password stored in the load host's DECnet database are identical before the router accepts any remote maintenance activity.

To illustrate, the following example initiates a down-line load from a VAX/VMS load host to a router with the DECnet node name ROBIN and whose service password is FF44:

```
NCP>LOAD NODE ROBIN SERVICE PASSWORD FF44
```

The router does the password check. If the DECnet service password on the command line is absent or if it differs from the password defined in the router's database, the router rejects the request. If the passwords are identical, the router accepts the request.

When you type a command such as the one above to specify that the DECnet service passwords in both databases are equal, you are overriding the load host's existing DECnet service password value of 0 to make the two values match.

Even if you define a DECnet service password in the router's database for security reasons, as Digital recommends, there is still a way that someone could avoid the password specification with LOAD and TRIGGER commands. Specifying the password is not required if you defined the DECnet service password in the load host's DECnet database to the same value as the DECnet service password in the router's database. In this case, they also match when the router does a password check.

Therefore, to maintain adequate security for the router, Digital strongly advises:

- In the router's database, change the default value of 0 for the DECnet service password. Define a new DECnet service password.
- Do not store the new DECnet service password in the load host's DECnet database.

3.5.1.3 Transmit and Receive Passwords for Nodes — The receive password controls access from an adjacent node connected by an asynchronous circuit and works as a security feature with the access verification feature.

The VERIFICATION parameter determines whether the router checks the receive password for the adjacent node that is requesting access. If you enable access verification, the node must send a matching transmit password to the router before communications proceed. If the node does not supply the identical password, the router rejects the connection request.

If an adjacent node connected by an asynchronous circuit has set up a receive password, the router must supply a transmit password to gain access to that node. Your router must send the transmit password you specified for this node to match the node's receive password before communications proceed.

If a node has not set up a receive password, you do not have to specify a transmit password for this node.

3.5.2 DECrouter 200 Dial-Back Feature

This is perhaps the router's most important security feature. You can define a dial-back phone number (DTEADDRESS) for a node in the router's database and you can configure lines on the router to be dial-back lines.

Whenever a node sends a connection request to the router over a dial-back line, the router immediately breaks the connection and then phones that node. The router calls the number specified in the database as that node's DTEADDRESS. If the number is correct, that node is reached and the router initializes the connection. On the other hand, if the number is not correct, the router never allows that node to connect, thus eliminating unauthorized access by possible intruders.

Nodes on dial-back lines must be connected to the router by one of the modems supporting the dial-back feature: the Digital DF03, DF112, and DF224 modems, the Codex 2233 and 2260 modems, and the Hayes Smartmodem 2400 modems for non-PTT software kits. If you have a PTT software kit, only PTT V.25 *bis* modems support the dial-back feature.

3.6 Troubleshooting Tools

The router and its hosts — both load hosts and network management hosts — provide features that help you troubleshoot problems. These features are:

- The router's hardware self-test
- The router's Monitor utility
- NCP loopback tests
- Up-line dumping
- DECnet counters
- DECnet event logging (see Section 3.3.5)

See Chapter 7 for a complete description of DECrouter 200 troubleshooting tools and how to use them.

4
Configuring the Load Host's Node Database

This chapter introduces the router's load host configuration procedure, called ROUCONFIG.COM on DECnet–VAX load hosts, **rouconfig** on DECnet–ULTRIX load hosts, and ROUCONFG.EXE on DECnet–DOS (or DECnet–VAXmate) load hosts.

NOTE

The *DECrouter 200 Management Guide* uses the generic term ROUCONFIG for ROUCONFIG.COM, **rouconfig**, and ROUCONFG.EXE.

ROUCONFIG enters information about your router in the load host's node database. The entry provides information that DECnet needs for down-line loading and up-line dumping. For complete information on ROUCONFIG's functions and step-by-step details on how to use this procedure, see the *DECrouter 200 Software Installation Guide* for the load host's operating system.

This chapter presents:

- An overview of ROUCONFIG
- Information about what to do after you run ROUCONFIG
- A discussion of the alternative method of adding router entries to the load host's node database

4.1 Overview of ROUCONFIG

One DECrouter 200 management task that you perform on the load host is configuring your load host's node database. Section 3.1 lists your possible reasons for reconfiguring the database. Your tool to perform this task is the procedure called ROUCONFIG.

The host on which you run ROUCONFIG can be any one of your router's load hosts. However, after you modify the database, you must ensure that every assigned load host has the latest entries. Coordinate running ROUCONFIG with the load host system manager because, for most load host operating systems, you need certain privileges to run this procedure.

ROUCONFIG is part of the DECrouter 200 software distribution kit. After the software installer performs the entire installation procedure described in the *DECrouter 200 Software Installation Guide*, ROUCONFIG is in the router directory of each assigned load host. The load host creates and maintains all router-related files in this directory. The DECrouter 200 software installer uses the Add option of ROUCONFIG, as part of installation, to define new routers in the database.

As router manager, you can also use ROUCONFIG to delete and modify the database entry for your DECrouter 200 unit. The act of adding, swapping, and deleting router entries is what is meant by **configuration of the load host's node database**.

4.1.1 Databases Affected by ROUCONFIG

The ROUCONFIG command procedure operates on the load host's node database. This "database" for routers actually comprises the following three separate databases:

1. Router configuration database

   This database is stored in a data file that is created, if it does not already exist, by ROUCONFIG. On DECnet–VAX load hosts, for example, this data file is called ROUCONFIG.DAT. It has the information you see when you select the List option from the ROUCONFIG menu.

2. Operational DECnet database

3. Permanent DECnet database

When you run ROUCONFIG, router information is copied from the router configuration database to the DECnet databases. It is important that these databases remain synchronized.

4.1.2 ROUCONFIG Options

With ROUCONFIG, you can:

- List all routers that are currently defined in ROUCONFIG.DAT.
- Add an entry for a new router in the load host's node database.

  Adding an entry supplies information that identifies the router on the Ethernet and, thus, establishes this system as a load host for the new router.
- Swap an existing router for a new one or redefine an existing router's DECnet characteristics.

  Swapping retains the DECnet node address of an existing router, replacing its Ethernet address with the Ethernet address of a new unit. You can also use this option to replace other DECnet characteristics, such as the DECnet node name, either for a new router or for an existing one.
- Delete an entry for an existing router.

  Deleting an entry prevents the load host from recognizing the router. Thus, it is no longer a load host for that router. Also use Delete with installations that are software upgrades.
- Restore existing routers to the load host's DECnet databases.

  Restoring routers copies entries from the router configuration database to the DECnet databases.

NOTE

This option is not available on DECnet–DOS load hosts.

Select your options from the ROUCONFIG menu.

4.1.3 Other ROUCONFIG Functions

ROUCONFIG also prepares the node as a load host by setting SERVICE on the service circuits. SERVICE must be set appropriately for down-line loading.

In addition, if the load host has an existing RTRCONFIG.DAT data file, ROUCONFIG merges its data into ROUCONFIG.DAT (see the next section for details).

4.1.4 RTRCONFIG Replaced with ROUCONFIG

The configuration utility released with DECrouter 200 V1.0, called RTRCONFIG, and its resulting database file, called RTRCONFIG.DAT, are now unsupported and superseded. ROUCONFIG and ROUCONFIG.DAT replace their old RTRCONFIG and RTRCONFIG.DAT counterparts.

NOTE

DECnet–DOS load hosts did not support DECrouter 200 V1.0. The following information about the relationship of ROUCONFIG to RTRCONFIG applies only to DECnet–VAX and DECnet–ULTRIX load hosts.

ROUCONFIG and ROUCONFIG.DAT are common to other Digital router products. When you install a combination of these products, including any DECrouter 200, be sure to use the ROUCONFIG command file from the most recently released product. Using the latest version of the procedure ensures that ROUCONFIG copies the most recent system image files for each product.

When you install routers, if a copy of RTRCONFIG.DAT exists, ROUCONFIG merges RTRCONFIG.DAT's data into the ROUCONFIG.DAT file. The procedure also renames the original RTRCONFIG.DAT file to RTRCONFIG__OLD.DAT so that you have it for reference.

Although the data from RTRCONFIG.DAT is reformatted in ROUCONFIG.DAT, the information itself is not changed. Therefore, a DECrouter 200 load file entry originally in the old data file is reformatted in ROUCONFIG.DAT but maintained as a DECrouter 200 V1.0 system image, not as a DECrouter 200 V1.1 system image.

To perform a software upgrade so that your DECrouter 200 V1.0 hardware units are loaded with and run the V1.1 software image, first delete the router's entry in the data file and then individually add each router entry.

4.2 After Running ROUCONFIG

After you make any changes with the configuration procedure, repeat the same changes at all other load hosts.

For step-by-step examples of running ROUCONFIG, see the *DECrouter 200 Software Installation Guide* for the appropriate operating system.

4.3 An Alternative to Using ROUCONFIG

ROUCONFIG automatically copies and renames the router's software image file and keeps the databases that comprise the load host's node database in synchronization.

If you manually copy the image file to another load host, identify the new image file on the new load host. Also identify a corresponding dump file. To manually enter router information in the new load host's DECnet databases, first issue the DEFINE NODE and SET NODE commands. Then, make down-line loading possible by issuing the DEFINE CIRCUIT and SET CIRCUIT commands.

NOTE

To set up RSX load hosts — for example, an RSX-11M-PLUS system running DECnet-11M-PLUS — use the DEFINE/SET NODE and DEFINE/SET CIRCUIT commands on the RSX system.

Use the DEFINE NODE command at a load host to define your router, or to modify information about it, in the permanent DECnet load database. Use the SET NODE command to modify the operational DECnet load database. To define your router node, be sure to specify these parameters:

- ADDRESS
- DUMP FILE
- HARDWARE ADDRESS
- LOAD FILE
- NAME
- SERVICE CIRCUIT

NOTE

Digital strongly suggests that you do not define the SERVICE PASSWORD parameter (see Section 3.5.1.2).

See Chapter 9 for the full DEFINE/SET NODE command description.

Next, enable service on the DECnet–RSX node's Ethernet circuit. Issue:

```
NCP> DEFINE CIRCUIT ethernet-circuit-id SERVICE ENABLED (RET)
NCP> SET CIRCUIT ethernet-circuit-id SERVICE ENABLED (RET)
```

Here, ***ethernet-circuit-id*** is the Ethernet circuit on the DECnet–RSX node. You can find the Ethernet address on the tag on your DECrouter 200 unit.

5
Down-Line Loading the Customized DECrouter 200 Software Image

This chapter explains initializing the router and down-line loading. Whenever you customize the router's software image, you must down-line load the new image for your parameter changes to take effect.

The router's software image contains its permanent database. After a down-line load, the router immediately copies the latest values in its permanent database to its operational database. The entire operating network can then use the router in the most up-to-date environment you have provided.

This chapter:

- Explains the router's initialization process, part of which is down-line loading
- Compares the different ways you can load the router
- Discusses the procedures for initiating a down-line load and provides examples
- Shows how to monitor a down-line load

NOTE

In this chapter's discussion of network management commands related to down-line loading, documentation conventions that apply to DECnet–VAX are used. If your management host is another supported DECnet node, for example, DECnet–ULTRIX, these conventions may not be appropriate. For example, type NCP commands in lowercase on DECnet–ULTRIX management hosts.

After you ensure that all the router's load hosts also have the software image file that you customized on one load host (see Volume II, Section 1.13), you can initiate a down-line load. You can do this from three locations:

- Your router's hardware unit
- A terminal connected to one of the router's load hosts
- A terminal connected to a supported network management host

5.1 The Initialization Process

Down-line loading is part of the router's initialization process. Initialization is usually a two-part process. What happens in the first step determines if there is a second step. These two steps are:

1. The router runs its diagnostic self-test.
2. The router requests a down-line load of its image from a load host.

Powering up the unit forces the router to run its self-test before asking for a down-line load.

The initialization process is this sequence of events:

1. The router discontinues all functions. (Data is not lost. The adaptive routing mechanism reroutes the packets by another path.)
2. The router runs its diagnostic self-test.
3. The router requests a load of its software image.
4. A load host down-line loads the router's unique software image to the router.
5. Control of the router is passed to the router software and the newly loaded software image.

The load process should take about two minutes. The router's LEDs give you the status of each of these steps as they occur, including any hardware or software errors. After a successful load, the first three LEDs are on. (Section 8.1 discusses the sequence of events in more detail and describes all LED indications.)

In addition, event messages logged at the load host indicate the status of the load and tell when the router is running (the "DECrouter up" message). Appendix B lists and describes all possible event messages, including those that indicate error conditions.

If the load fails, see Section 8.1.1.

5.2 The Different Ways to Initiate a Down-Line Load

You can initiate a down-line load in these ways:

- Power on the DECrouter 200 unit by plugging in the power plug.
- Issue the NCP LOAD command from a load host.
- Issue the NCP TRIGGER command from any supported management host.

Each way works somewhat differently. The best method to use depends on your location and whether you want to ensure that a particular load host loads the router.

5.2.1 How Power Up Works

If you are at the DECrouter 200 unit, plugging in the power cord is a convenient way to load the router. The initialization process starts immediately.

Plugging in the power cord has one advantage. Since you are at the DECrouter 200 unit, you can observe the LED display. Several codes show the status of the loading process. The LEDs are helpful for troubleshooting. See Section 8.1 for the meaning of each code.

The power-up method to initiate a down-line load instructs the router to multicast a MOP REQUEST PROGRAM message to all DECnet nodes on the router's Ethernet. This message requests a down-line load from any assigned load host.

This method does not ensure that a particular load host performs the down-line load, if there is more than one load host, as Digital recommends. With this method, you do not know beforehand which load host will actually down-line load the router's software image.

5.2.2 How NCP LOAD Works

You must issue the NCP LOAD command at a load host. The advantage of the NCP LOAD command is that it ensures that the load host at which you issue the command is the node that performs the down-line load. Note that the down-line load, however, may be slower than with the TRIGGER command.

You can specify parameters on the NCP LOAD NODE command line to override current parameter values in the load host's node database.

When you issue the LOAD command, the load host must have service enabled on its Ethernet circuit or it cannot perform a down-line load. The ROUCONFIG procedure automatically enables service but it may have been disabled some time after the router software installer ran ROUCONFIG. To enable service, issue this NCP command:

SET CIRCUIT *circuit-id* SERVICE ENABLED

where *circuit-id* identifies the Ethernet circuit for the host.

This is how the LOAD command works:

1. You issue the LOAD command on one of your router's load hosts.
2. The load host sends a MOP REMOTE CONSOLE BOOT message with a direct load option specified.
3. When the router receives this message, the router sends a MOP REQUEST PROGRAM message directly to that load host.
4. The load host and the router use additional MOP messages to transfer the router's software image, one block at a time, into the router's memory.

Figure 5-1 shows a router manager on load host HOST1 issuing LOAD to load router JUNIOR, over service circuit UNA-0. Figure 5-2 shows JUNIOR asking HOST1 for a down-line load. Figure 5-3 shows HOST1 down-line loading JUNIOR's software image to JUNIOR. The arrows show the message path that LOAD generates.

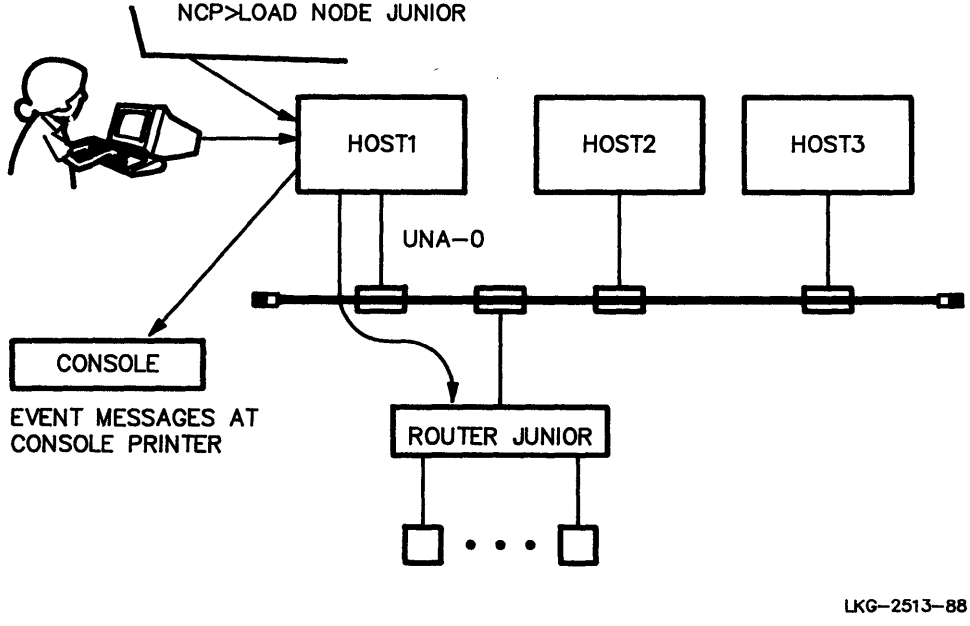


Figure 5–1: Router Manager Enters LOAD Command at HOST1

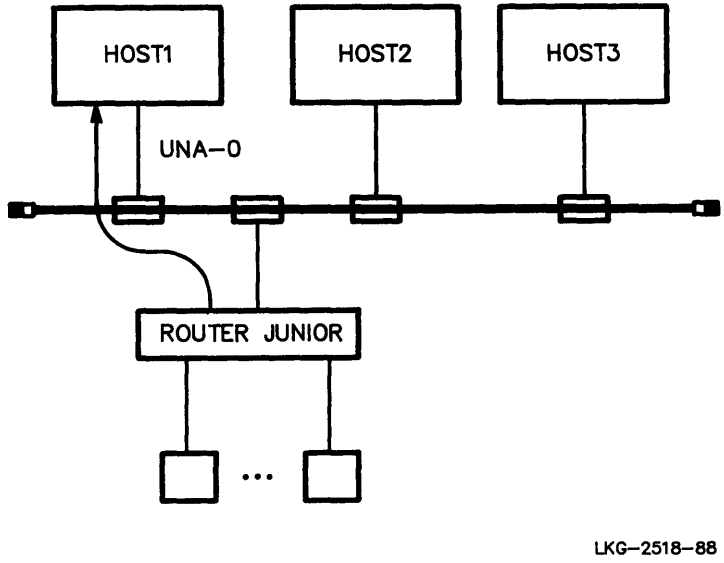


Figure 5–2: Router JUNIOR Asks HOST1 for a Down-Line Load

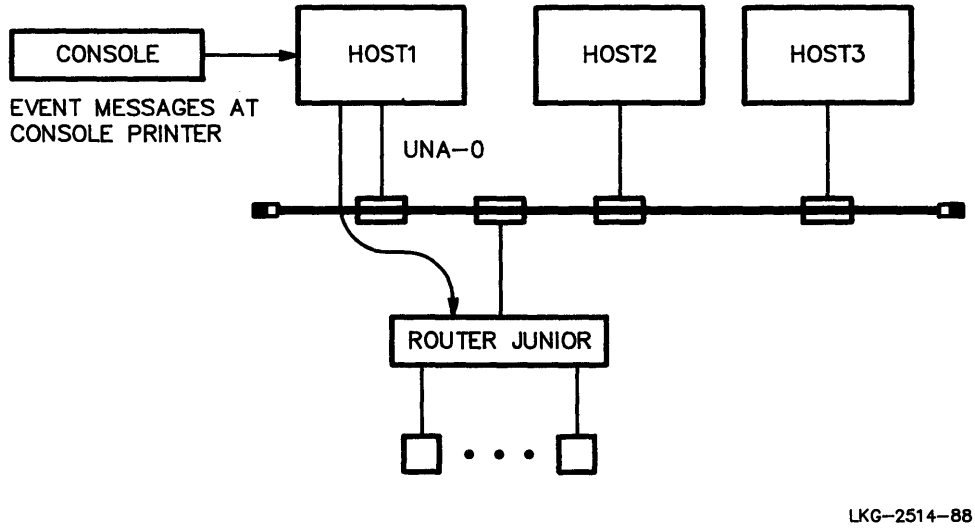


Figure 5–3: HOST1 Loads Router JUNIOR

5.2.3 How NCP TRIGGER Works

The advantage of using the NCP TRIGGER command is that you do not have to be on a load host. You can issue NCP TRIGGER from any of the router's supported management hosts. The TRIGGER command has the same effect as loading the software by an electrical power-up at the hardware unit.

In addition, depending on the load host, the down-line load is likely to be faster than with the LOAD command. TRIGGER is usually faster than LOAD because the router does not have to wait for a particular load host to respond to its request.

The TRIGGER command does not ensure that a particular load host performs the down-line load. With this method, you do not know beforehand which load host will actually down-line load the router image. An event message informs you after the load.

You can specify parameters on the NCP TRIGGER NODE command line to override current parameter values in the load host's node database.

When you issue the TRIGGER command, potential load hosts must have service enabled on their Ethernet circuits or they cannot perform a down-line load. The ROUCONFIG procedure automatically enables service, but it may have been disabled some time after the router software installer ran ROUCONFIG. To enable service, issue this NCP command:

SET CIRCUIT *circuit-id* SERVICE ENABLED

where *circuit-id* identifies the Ethernet circuit for the host.

This is how the TRIGGER command works:

1. You issue the TRIGGER command on one of the network's management hosts. This system may also be one of your router's load hosts but it is not required.
2. The management host sends a MOP REMOTE CONSOLE BOOT message with the TRIGGER option specified.
3. When the router receives this message, the router multicasts a MOP REQUEST PROGRAM message.
4. The first load host that responds and the router both use additional MOP messages to transfer the router's software image, one block at a time, into the router's memory. The router ignores other responders once the load is in progress.

Figure 5-4 shows a router manager on a management host issuing TRIGGER to load router JUNIOR. (Note that this management host is not also a load host, which is a possible condition.) Figure 5-5 shows JUNIOR multicasting a request for a down-line load. Figure 5-6 shows one of JUNIOR's load hosts responding by down-line loading the software image to JUNIOR. The arrows show the message path that LOAD generates.

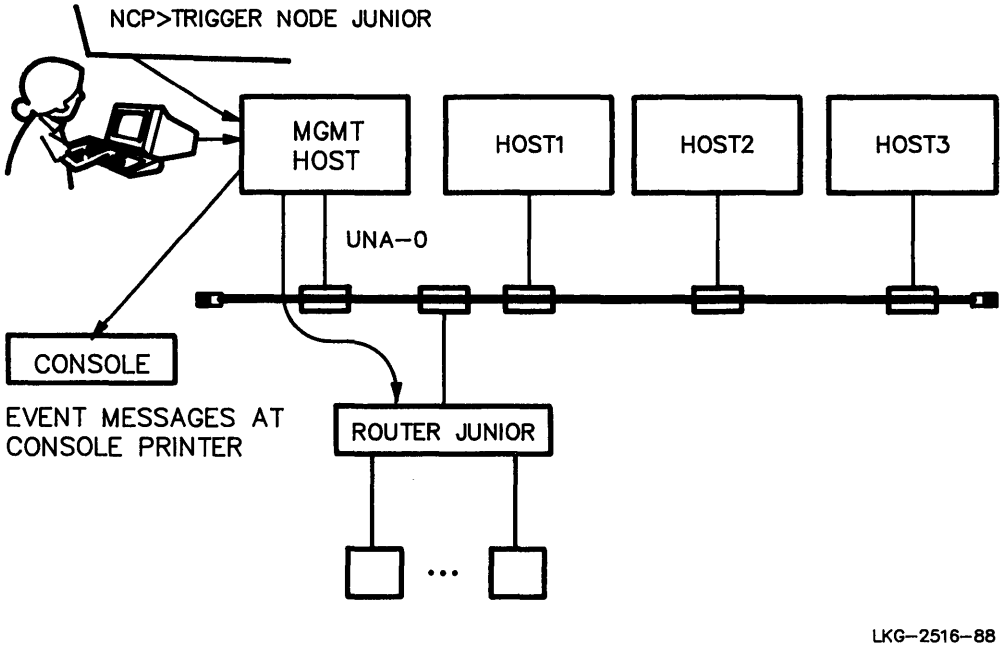


Figure 5–4: Router Manager Enters TRIGGER Command at Management Host

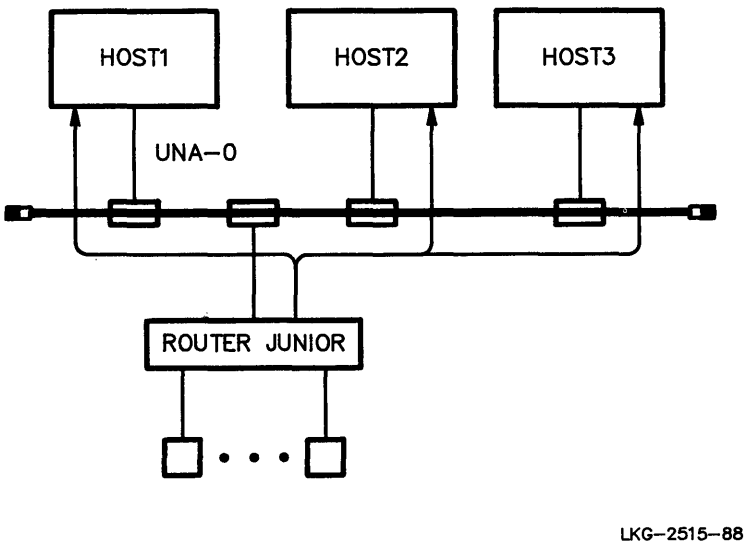


Figure 5–5: Router JUNIOR Sends Multicast Message

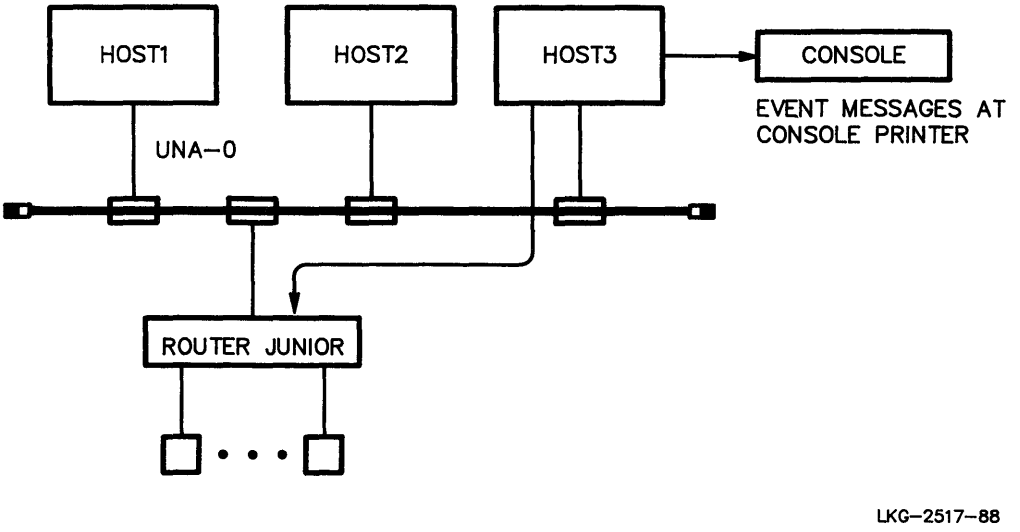


Figure 5–6: First Load Host to Respond Loads Router JUNIOR

5.3 The Different Ways to Monitor a Down-Line Load

Regardless of how you initiate it, you can monitor a down-line load in several ways:

- Read the 900-series messages. The 900-series messages are status and error messages issued from the router's read-only memory (ROM) during its self-test at start up.

  These messages report the down-line loading status to a terminal connected to the router's J1 port. This terminal must be configured to operate with a speed of 9600 bps and with a character size of 8 bits with no parity. For more information, see Section 8.1.

- Observe the LED display on the control panel of the DECrouter 200 unit. Several codes show the status of the loading process. See Section 8.1 for the meaning of each code.

- Set up DECnet event logging on load hosts and review the messages that are logged during the down-line load.

5.4 Preparing for Down-Line Loading

On the load host, all the preparatory NCP commands needed for down-line loading, such as the ones that set the Ethernet line and identify the service circuit, are done by the ROUCONFIG command procedure. These commands are automatically executed when you or the software installer runs that procedure. In addition, SERVICE must be ENABLED on the service circuit, which is also performed by ROUCONFIG. For a complete discussion of ROUCONFIG, see Chapter 4.

To prepare for down-line loading, all that is usually required is that you enable DECnet event logging at the load host. However, if the software installer did not run the ROUCONFIG command procedure, Digital strongly suggests that you do it now (see Chapter 4), or, if you choose, you can manually prepare for down-line loading. In addition, you can optionally take precautions against lost data and "disable" a particular load host.

NOTE

To use DECnet event logging efficiently, set the router's logging parameters in the permanent database with DRCP before you initiate a down-line load (see Volume II, Section 1.1.4, and the SET LOGGING command description in Volume II, Chapter 2).

5.4.1 Enabling DECnet Event Logging on Load Hosts

DECnet event-logging messages confirm that a down-line load was successful. With event logging enabled, a DECnet node usually generates a short series of messages when a load or dump sequence starts and when it completes. These messages show if the router has been successfully loaded from the load host's point of view, and they are excellent troubleshooting aids.

Use NCP commands to enable event logging at your router's load hosts. Unless you are planning to issue the LOAD command, which ensures that a particular load host performs the down-line load, Digital suggests that you enable logging at all of the router's load hosts.

In any case, it is a good idea to have logging enabled at all of the router's assigned load hosts because of unexpected down-line loads after a power failure or router failure. All methods of reloading besides the LOAD command could lead to unnecessary uncertainty about the status of the load request and the identity of the load host that responds.

The following example shows the commands that set up event logging on a VAX/VMS load host. For similar instructions on other load host systems, see the *DECrouter 200 Software Installation Guide* for that operating system. In addition, event logging is explained in the NCP documentation for each load host operating system.

```
$  MCR NCP
NCP> SET LOGGING CONSOLE EVENT 0.3
NCP> SET LOGGING CONSOLE EVENT 0.7
NCP> SET LOGGING CONSOLE STATE ON
NCP> SET LOGGING MONITOR STATE ON
NCP>
```

Event code 0.3 refers to automatic service events, including down-line loads. Event code 0.7 refers to aborted service events.

To disable event logging, see Section 5.7.

5.4.2 Manually Preparing the Ethernet Line and Circuit Interface

Using NCP commands at the load host, load the Ethernet line interface, for example, line UNA-0. Then turn on and enable the Ethernet circuit for service operations. (Service operations include down-line loading, up-line dumping, and loopback testing.) Follow these steps:

1. Issue SET LINE *dev-id* ALL

   where *dev-id* identifies the Ethernet interface. The following example from a VAX/VMS load host sets the line UNA-0 for down-line loading:

   ```
   NCP> SET LINE UNA-0 ALL (RET)
   ```

2. Issue SET CIRCUIT *dev-id* STATE ON

   and

   SET CIRCUIT *dev-id* SERVICE ENABLE

   The following example from an ULTRIX-32 load host turns on and enables the Ethernet circuit.

   ```
   ncp> set circuit qna-0 state on (RET)
   ncp> set circuit qna-0 service enable (RET)
   ```

   On some systems, a circuit must be off before you can enable it for service, for example, on VAX/VMS load hosts. The following example turns off the UNA-0 circuit, enables it for service, and turns it back on:

   ```
   NCP> SET CIRCUIT UNA-0 STATE OFF (RET)
   NCP> SET CIRCUIT UNA-0 SERVICE ENABLED STATE ON (RET)
   ```

NOTE

Turning off the Ethernet circuit may inconvenience other users on the load host.

5.4.3 Preventing Loss of Data

If you reload the router while it is running, data packets in the process of being routed may be lost. However, the DECnet network is designed to recover them and continue operations unaffected.

To prevent loss of data by a running router, you can turn off the router's circuits before reloading. Issue this NCP command:

TELL *router* SET KNOWN CIRCUITS STATE OFF

where *router* is either the DECnet node name or DECnet node address of your router.

If necessary, be sure to turn on the circuits after the reload. If the permanent database defines the state of all circuits as ON, then the circuits are turned on automatically. However, you must manually turn on all the circuits that you set to OFF in the permanent database or the router remains disconnected from the adjacent nodes on those circuits.

Turn on all the circuits with this NCP command:

TELL *router* SET KNOWN CIRCUITS STATE ON

To turn on a specific circuit, issue:

TELL *router* SET CIRCUIT *circuit-id* STATE ON

where *circuit-id* identifies the circuit.

NOTE

The state of at least one circuit must be defined in the permanent database as ON; otherwise, after the reload, you will not be able to access the router with NCP commands to turn on the circuits. If no circuit states are defined in the permanent database, then the state of the Ethernet circuit defaults to ON.

5.4.4 Preventing a Specific Load Host from Down-Line Loading

You can prevent a specific load host from performing a down-line load (and from receiving an up-line dump).

You may want to do this if a load host is overutilized or, perhaps, if you want to prevent unauthorized reloads from certain remote nodes. To prevent a load host from down-line loading (or receiving up-line dumps), use the following NCP command to clear the router's node name from the load host's DECnet database:

CLEAR NODE *node-id* CHARACTERISTICS

where *node-id* is the DECnet node name or DECnet node address of the router.

5.5 Initiating the Down-Line Load

Initiate a down-line load by powering up, issuing the NCP LOAD command, or issuing the NCP TRIGGER command.

5.5.1 Powering Up

To power up the router, insert its power plug into the appropriate power source. If this is a reload and the router is already running, first unplug the power plug and then reinsert it.

For an explanation of the accompanying LED displays, see Section 8.1.

5.5.2 Issuing the NCP LOAD and TRIGGER Commands

Issue the LOAD and TRIGGER commands at the NCP> prompt (for information on entering NCP, see the *DECrouter 200 Software Installation Guide* for the operating system of the load host). On the command line, enter either the DECnet node name or the DECnet node address of the server. The LOAD and TRIGGER commands have a similar syntax:

LOAD NODE *node-name*
TRIGGER NODE *node-name*

or

LOAD NODE *node-address*
TRIGGER NODE *node-address*

The following examples use the LOAD command to load a DECrouter 200 unit named ROBIN with a node address of 55.1008.

```
NCP> LOAD NODE ROBIN
```

or

```
NCP> LOAD NODE 55.1008
```

If you changed your router's DECnet service password from the default value of 0, you must specify this password on the LOAD and TRIGGER command lines. For example, to load the same router ROBIN with service password FF44, type:

```
NCP> LOAD NODE ROBIN SERVICE PASSWORD FF44
```

or

```
NCP> LOAD NODE 55.1008 SERVICE PASSWORD FF44
```

or

```
NCP> TRIGGER NODE ROBIN SERVICE PASSWORD FF44
```

or

```
NCP> TRIGGER NODE 55.1008 SERVICE PASSWORD FF44
```

For a discussion of the security provided by setting a DECnet service password, see Section 3.5.1.2.

You can exit from NCP in one of two possible ways. The following examples exit NCP on a VAX/VMS load host:

```
NCP> EXIT
$
```

or

```
NCP> (CTRL/Z)
$
```

See the DECnet documentation of the load host for complete information about the NCP LOAD and TRIGGER commands.

5.6 Monitoring the Down-Line Load

You can monitor a down-line load by reading the 900-series messages, noting the router's LED displays, and reviewing the DECnet event-logging messages.

5.6.1 Reading the 900-Series Messages

These messages display at a terminal connected to the router's J1 port during system initialization. See Sections 8.1.1.3 and 8.1.1.4 for information about the 900-series messages.

5.6.2 Reading the Router's LED Displays

These LEDs display on the control panel of the DECrouter 200 hardware unit. To interpret the LED displays, see Section 8.1.

5.6.3 Reading Event-Logging Messages

These messages appear on the system console terminal of one or all of the router's load hosts. Event messages identify the system that loaded the router. These messages reporting down-line loads have two parts, one that logs the router's request for the load and another that confirms the successful down-line load.

Assuming that logging is enabled for all load hosts, the location of these messages depends on how you initiate the down-line load:

- With the LOAD command, both parts of the message appear only at the load host from which you issue the command.
- With the TRIGGER command and with system power up, the first part of the message is logged at all the router's load hosts because the router multicasts the request. However, the second part of the message that confirms the load appears only at the load host that answers the request and actually performs the load.

Also check for any errors reported by NCP, if you used either the LOAD or TRIGGER command to start the load. If no errors are reported, you can assume that the load was successful. Here is an example of event-logging messages after a successful down-line load from a VAX/VMS load host:

```
DECnet event 0.3, automatic line service
From node 28.900 (ROBIN), 18-JUN-1986 01:35:20.47
Circuit UNA-0, Load, Requested, Node = 28.1002 (DOVE)
File = SYS$SYSROOT:[DECSERVER]RTRDOVE.SYS, Operating system
Ethernet address = 08-00-2B-04-AA-2B
DECnet event 0.3, automatic line service
From node 28.900 (ROBIN), 18-JUN-1986 01:43:21.14
Circuit UNA-0, Load, Successful, Node = 28.1002 (DOVE)
File = SYS$SYSROOT:[DECSERVER]RTRDOVE.SYS, Operating system
Ethernet address = 08-00-2B-04-AA-2B
```

If you do see errors in the event-logging messages, follow these steps:

1. Check the meaning of the errors in the NCP documentation of the operating system that performed the down-line load.
2. Check that your DECrouter 200 hardware unit is working satisfactorily. If there is an error indicating a problem, see Section 8.1.1. If the hardware unit is fine, the problem is probably with the load host.
3. Check the ROUCONFIG.DAT file, especially the Ethernet address of your router. At the same load host, run ROUCONFIG and select the List option.
4. Check that the router's software image is in the appropriate directory.
5. Check that DECnet is running.
6. Try again to down-line load. If it is unsuccessful, see Section 8.1.1.4 for troubleshooting procedures.

If no DECnet events have been logged, check that SERVICE is ENABLED for the DECnet service circuit over which the router software is to be down-line loaded.

5.7 After the Down-Line Load

If it is appropriate, disable event logging after the down-line load. This VAX/VMS example assumes that you want to turn off event logging:

```
NCP> CLEAR LOGGING CONSOLE EVENT 0.3 (RET)
NCP> CLEAR LOGGING CONSOLE EVENT 0.7 (RET)
NCP>
```

NOTE

In most cases, it is helpful to keep EVENT LOGGING with its STATE set to ON.

6
Managing DECrouter 200 Operations with NCP

This chapter explains how to manage the running router with your principal management tool, the DECnet Network Control Program (NCP). You can use NCP to:

- Display operational database parameters
- Set and modify operational database parameters
- Display and reset the router's DECnet counters
- Set up the logging of DECnet events
- Read DECnet event logging messages

NOTE

This chapter is tutorial in nature. It assumes you understand the router's parameters, defined and fully discussed in Volume II, Chapter 1.

Issue NCP commands at a terminal connected to a node running DECnet Phase IV. A node that supports remote management of your router is called a **network management host**. For a list of the specific DECnet systems that support DECrouter 200 management, see the *DECrouter 200 Software Product Description*.

NOTE

In this chapter's discussion of network management, documentation conventions that apply to DECnet–VAX are used. If your management host is another supported DECnet node, for example, DECnet–ULTRIX, these conventions may not be appropriate. For example, type NCP commands in lowercase on DECnet–ULTRIX management hosts.

This chapter:

- Discusses how to invoke NCP
- Describes DECrouter 200 security
- Shows how to issue NCP commands that execute at the router
- Discusses NCP on-line help
- Presents an overview of the NCP commands for router management
- Shows how to use NCP SHOW commands to view the current values of parameters
- Shows how to use NCP SHOW commands to display performance and error statistics kept by the router's DECnet counters
- Shows how to use NCP ZERO commands to reset these counters
- Shows how to use DECnet event logging to monitor the router's operations
- Discusses NCP SET and CLEAR commands that define and modify parameters

6.1 Introduction to Using NCP

With NCP, you can dynamically view and change parameters in the router's operational database with SHOW, SET, and CLEAR commands. In addition, NCP SHOW COUNTERS and ZERO commands display and reset the router's DECnet counters, while NCP LOOP commands are troubleshooting tools (see Chapters 7 and 8.)

Your changes to the operational database stay in effect only until the next down-line load. After every down-line load, the parameter values in the permanent database become the current values in the operational database as well. These are either default values or the customized values you set using DRCP (see Volume II, Chapter 1).

You cannot change all of the router's parameters in the operational database. Most parameters usually do not have to be modified on the running router. However, you can change some parameters dynamically.

When you use NCP SHOW, SET, CLEAR, and ZERO commands, issue these commands for remote execution at the router (see Section 6.1.3).

Table 6-1 summarizes the NCP commands that display and change router characteristics in the operational database.

Table 6–1: NCP Commands to Display and Change Operational Parameters

Command	Function
SET CIRCUIT SET EXECUTOR SET LINE SET LOGGING SET NODE	Modifies parameters
CLEAR EXECUTOR CLEAR LOGGING CLEAR NODE	Clears parameter values
SHOW CIRCUIT SHOW EXECUTOR SHOW LINE SHOW LOGGING SHOW NODE	Displays parameters

6.1.1 Invoking NCP

The command to enter NCP varies for each supported management host system, but once started, NCP is similar on these systems.

For the command to invoke NCP, see the DECnet network management documentation for the operating system of the management host you are on. Here is an example for a VAX/VMS host:

```
$ MCR NCP (RET)
NCP>
```

6.1.2 Using Security

The router's network management privileged password and network management nonprivileged password protect the router from unauthorized access. If no passwords are defined, all NCP users can gain access to the router to change its database, view its database, and zero its counters.

For greater security, define either a privileged password or both a privileged password and a nonprivileged password. There are no default passwords.

If you define both of these passwords, every NCP command that executes at the router becomes a privileged operation. If you define only a privileged password, all privileged NCP commands, for example, SET commands, accessing the router become privileged operations.

To define a privileged password or both passwords, either run DRCP and issue the DRCP SET EXECUTOR command or execute the NCP SET EXECUTOR command. Digital suggests that you use DRCP and define passwords in the permanent database (see Volume II, Section 1.1.2, and the SET EXECUTOR command description in Volume II, Chapter 2) for the following reason. If, while specifying passwords in NCP, you make an unnoticed typing mistake, you will not know the passwords. You will not be able to access the router to clear the erroneous password. You will have to reload the router.

If you define passwords, there are two ways to specify them when you issue NCP commands to manage the router:

- Specify the privileged password on individual SET, CLEAR, ZERO, or LOOP command lines that start with the TELL prefix, for example:

  ```
  NCP> TELL THRUSH USER MEME PASSW WINGS SET CIR ASYNC-2 STATE OFF (RET)
  ```

  Specify either the privileged or the nonprivileged password on individual SHOW command lines that start with the TELL prefix, for example:

  ```
  NCP> TELL THRUSH USER MEME PASSW SWEETSONG SHOW KNOWN NODES (RET)
  ```

- Specify the privileged password on the SET EXECUTOR NODE command line, for example:

  ```
  NCP> SET EXECUTOR NODE THRUSH USER MEME PASSWORD WINGS (RET)
  NCP> SET CIR ASYNC-2 STATE OFF (RET)
  ```

  For as long as you keep the router as the executor node, subsequent commands do not require any passwords.

  Specify either the nonprivileged password or the privileged password on the SET EXECUTOR NODE command line. For as long as you keep the router as the executor node, subsequent SHOW commands do not require a password.

In addition to security offered by the router, NCP provides security with USER IDs (see Section 6.1.3.3).

6.1.3 Issuing NCP Commands That Execute at the Router

As router manager, you issue two kinds of NCP commands at a network management host to manage the router: commands that execute at the local node and commands that execute at the router. The management host is the **local node**. The location at which the NCP command executes is the **executor node**.

Issue NCP commands that execute remotely at the DECrouter 200 node to:

- View and modify the router's operational database
- View and reset the router's DECnet counters
- Perform loopback testing

To designate your router as the executor node, use one of these ways:

- Issue the separate SET EXECUTOR NODE command. This command sets the router as executor for future commands.
- Use the TELL prefix at the beginning of a SET, CLEAR, SHOW, ZERO, or LOOP command line. The TELL prefix specifies the executor for only one command.

If you plan to enter several commands for remote execution at the router, it is easier to issue the SET EXECUTOR NODE command. For executing one or two commands, it is easier to use the TELL prefix.

To designate the router as executor, you need to specify either the router's DECnet node name or DECnet node address. The name and address were recorded by the software installer on the *DECrouter 200 Identification Card.* They may also be recorded on the labels attached to the router's cables.

The NCP SET EXECUTOR NODE command sets the router as the executor node for all subsequent NCP commands until:

- You use the NCP CLEAR EXECUTOR NODE command to reset the management host as the executor.
- You issue another SET EXECUTOR NODE command and specify another node.
- You exit from NCP, which automatically resets the local node as the executor.

The following example from a VAX/VMS management host first sets router ROBIN to be the executor and then changes the cost of ROBIN's Ethernet circuit to 8.

```
NCP> SET EXECUTOR NODE ROBIN (RET)
NCP> SET CIRCUIT ETHER-1 COST 8 (RET)
```

Figure 6-1 shows the SET EXECUTOR NODE command issued at management host HOST1 to designate router ROBIN as the executor. Further NCP commands that you issue at HOST1 will execute at ROBIN. For example, the SHOW NODE QUAIL STATUS command displays information from ROBIN's routing database. The display shows the status of the path from ROBIN to QUAIL. This display informs you that QUAIL is adjacent to ROBIN, and it identifies the line connecting the two nodes as ASYNC-3. To look at the counters for that circuit, execute the SHOW CIRCUIT ASYNC-3 COUNTERS command.

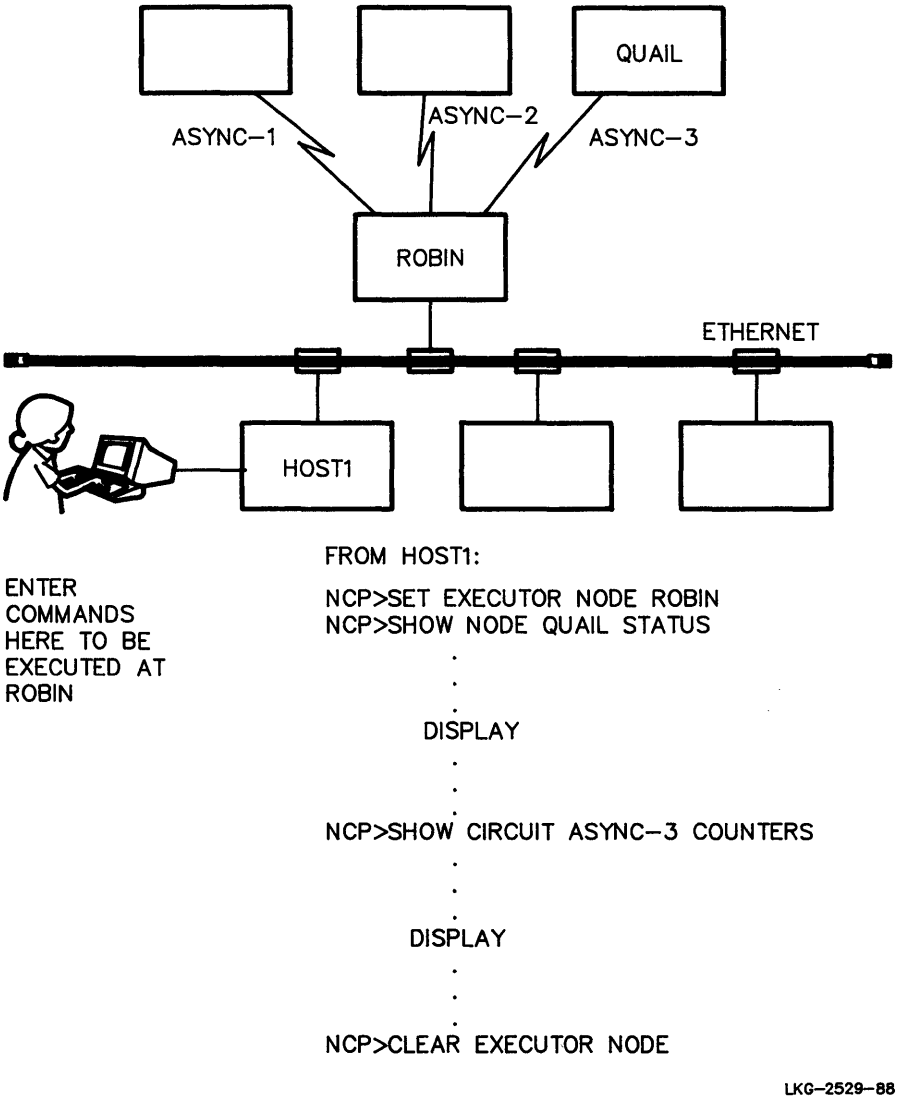


Figure 6–1: Using NCP to Execute Commands at the Router

6.1.3.1 The NCP TELL Prefix — The TELL prefix sets the executor for only one command. Use the TELL prefix at the beginning of a SET, CLEAR, SHOW, ZERO, or LOOP command line. This example from a DECnet-VAX host uses the TELL prefix to set the executor to ROBIN for 1 command and sets the cost of ROBIN's Ethernet circuit to 8.

```
NCP> TELL ROBIN SET CIRCUIT ETHER-1 COST 8 (RET)
```

6.1.3.2 Access Control Information — Access control information can include security information needed by the router.

- NCP access control requirements

  For some host operating systems, NCP requires the keyword USER, followed by a user ID of the designated executor node, on the SET EXECUTOR NODE command line and on command lines that begin with the TELL prefix. You must type USER *user-id* along with PASSWORD *password* for the router's password to reach the router. Omit the USER keyword if no router passwords are defined.

  See the network management documentation of the management host system for details about access control information with privileged NCP commands.

- Router passwords

  If you defined both a network privileged password and a network nonprivileged passowrd or if you defined only a privileged password (see Section 6.1.2), you usually must specify access control information when you type NCP commands that execute at the router. Access control information includes the name of the applicable password.

Use this syntax with the SET EXECUTOR NODE command and with the TELL prefix:

SET EXECUTOR NODE *rtr-node-id* [USER *user-id* PASSWORD { *nonpriv-password* / *priv-password* }]

or

SET EXECUTOR NODE *rtr-node-id* ["*user-id* { *nonpriv-password* / *priv-password* }"]

TELL *rtr-node-id* [USER *user-id* PASSWORD { *nonpriv-password* / *priv-password* }] *command*

or

TELL *rtr-node-id* ["*user-id* { *nonpriv-password* / *priv-password* }"] *command*

where

command

is an NCP command you want to execute at the router.

PASSWORD *nonpriv-password*
PASSWORD *priv-password*

identifies one of your router's executor passwords — either the network privileged password or the network nonprivileged password.

If you defined these passwords (there are no defaults), specify the privileged password if you plan to use SET, CLEAR, or ZERO commands that will execute at the router. Specify the nonprivileged password in order to issue SHOW commands that will execute at the router. Both the privileged and nonprivileged passwords let you use SHOW commands.

rtr-node-id

is either the DECnet node name or node address of the router at which you want the command to be executed.

USER

identifies your user ID for access control verification.

NOTE

Although the DECrouter 200 requires no user ID access control information (only a password if passwords are defined), some DECnet systems, in order to send the password access control information, require that USER *user-id* is included.

For some DECnet systems, there are two ways to specify USER on the SET EXECUTOR NODE command line. See the network management documentation for your DECnet system.

Note that some DECnet systems let you turn off echoing of passwords as you type them.

The following VAX/VMS examples show how to specify access control information.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
```

or

```
NCP> SET EXECUTOR NODE ROBIN"MEME BIRDY" (RET)

NCP> TELL ROBIN USER MEME PASSWORD BIRDY CLEAR KNOWN NODES (RET)
```

or

```
NCP> TELL ROBIN"MEME BIRDY" CLEAR KNOWN NODES (RET)
```

NOTE

The information in this section is explained in more detail in the network management documentation for the management host.

6.1.4 Getting On-Line Help

NCP offers on-line help with the HELP command. Typing HELP displays the commands and topics for which information is available. Typing HELP plus a specific command displays information about that command.

The NCP HELP command and how you use it may vary depending on the network management host. See the appropriate DECnet documentation.

6.1.5 Making Changes Permanent

Your changes to the router's operational database stay in effect only until you make more changes or until the next down-line load. Note that a down-line load happens quickly and unexpectedly if there is a power loss or the router experiences a failure. Therefore, if you need to make a quick change on the running router that you want to keep "permanently," duplicate the change as soon as possible:

1. Run DRCP on a load host to modify the router's software image.
2. Issue the appropriate DRCP commands.

Upon the next reload, your changes are "permanent." See Volume II, Chapter 1, for complete information about making changes to the permanent database by customizing the router's software image.

6.2 Overview of NCP Commands for the DECrouter 200 Manager

This section outlines the NCP commands that you use to manage the running router. See Section 9.3 for guidelines to entering NCP commands, Section 9.4 for a summary of the NCP commands discussed in this guide, and Section 9.5 for complete command descriptions.

There are several types of NCP commands you may need to use:

- On-line help

  The HELP command gives information about NCP commands.

- Remote execution

  The SET EXECUTOR NODE command and the TELL prefix direct your NCP commands to execute at the router.

- Parameter display

  The SHOW CIRCUIT, SHOW EXECUTOR, SHOW LINE, SHOW LOGGING, and SHOW NODE commands display the router's operational parameters.

- Parameter Modification

  The SET CIRCUIT, SET EXECUTOR, SET LINE, SET LOGGING, SET NODE, CLEAR EXECUTOR, CLEAR LOGGING, and CLEAR NODE commands modify parameters.

- Counters Control

  The SHOW CIRCUIT COUNTERS, SHOW EXECUTOR COUNTERS, SHOW LINE COUNTERS, SHOW NODE COUNTERS, ZERO CIRCUIT COUNTERS, ZERO EXECUTOR COUNTERS, ZERO LINE COUNTERS, and ZERO NODE COUNTERS commands display and reset the router's DECnet counters.

- Down-line loading

  The LOAD and TRIGGER commands down-line load the router's software image from a load host to the router. See Chapter 5 for details.

- Troubleshooting

  The LOOP commands troubleshoot possible operating problems. See Chapters 7 and 8 for details.

- Management of the load host's DECnet databases

  The DEFINE/SET NODE commands modify a load host's DECnet databases. See Chapter 4 for details.

- Exiting

  For the command to exit NCP on your management host, see the *DECrouter 200 Software Installation Guide* for that operating system or the NCP documentation of the management host.

See Chapter 9 for complete command descriptions showing command format, use, parameters, and examples. For parameter definitions, including what to consider when you are deciding on parameter values, see Volume II, Section 1.1.

6.3 Displaying Parameters

To display parameters in the router's operational database and information about the current state of the router, use NCP SHOW commands. Depending on your management host, NCP SHOW commands may display all the router's parameters or only a partial list.

NCP SHOW commands help you manage and troubleshoot the router by letting you dynamically monitor network operations. A change in the state of one circuit or one line, for example, may also change the network configuration. Various nodes may show a new status of reachable or unreachable.

You can choose the components for which you want information displayed, such as the DECrouter 200 node itself, other nodes or areas known to the router, or circuits and lines connected to the router. These NCP SHOW commands display parameters in the router's operational database:

- SHOW CIRCUIT
- SHOW EXECUTOR
- SHOW LINE
- SHOW LOGGING
- SHOW NODE

In addition, SHOW COUNTERS commands display the router's DECnet counters.

For each component, you can also specify the type of information you want to see. For example, you can display routing parameters, or you can see information reflecting the current network operations for the network, such as the current operational state of all reachable and unreachable nodes.

For further information about issuing NCP SHOW commands, see:

- Chapter 9 for complete command descriptions with syntax information, all command options, examples of command lines, and example illustrations of the displays
- The DECnet documentation for the network management host system for further information about these displays
- Appendix A for the syntax of NCP SHOW commands

6.3.1 Specifying Components

SHOW commands display information about these router components:

- Circuits
- Executor
- Lines
- Logging
- Nodes

You can usually specify either one entity or multiple entities. For example, to display information about one node, use:

SHOW NODE *node-id*

To display information about a group of nodes, you can use either of these commands:

SHOW ACTIVE NODES

or

SHOW KNOWN NODES

The ACTIVE keyword displays the nodes that currently have active links with the router. The KNOWN keyword displays information for all nodes known to the router. Note that the SHOW KNOWN NODES display can be long if you have a large network.

6.3.2 Specifying Display Types

You can specify the type of information you want displayed. Table 6-2 summarizes the contents of each display type.

Table 6–2: Types of Informational Displays

Display Type	Description
CHARACTERISTICS	Displays values for parameters that you or the network manager can change with SET commands, for example, the router's node name, host, maximum address, and maximum area.
COUNTERS	Displays the values of DECnet counters for circuits, lines, areas, and nodes, including the DECrouter 200 node, since you last reset the counters to zero.
EVENTS	Displays information about events currently being logged. Valid only for the SHOW LOGGING command.

(Continued)

Table 6–2 (Cont.): Types of Informational Displays

Display Type	Description
STATUS	Displays dynamic information usually reflecting network operations, such as the operational state of network components.
SUMMARY	Displays a brief summary of information derived from both static and dynamic sources. This information is usually an abbreviated display of the CHARACTERISTICS and STATUS displays.

If you do not specify a display type on a SHOW command line, the display type defaults to SUMMARY.

The following examples request various display types of information for router ROBIN on a VAX/VMS management host (see the SHOW command descriptions in Chapter 9 for illustrations of the displays):

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD WINGS (RET)
NCP> SHOW EXECUTOR CHARACTERISTICS (RET)

...display...

NCP> SHOW CIRCUIT ASYNC-2 STATUS (RET)

...display...

NCP> SHOW KNOWN LOGGING KNOWN EVENTS (RET)

...display...

NCP> SHOW LINE ETHER-1 COUNTERS (RET)

...display...

NCP>
```

The format of the NCP SHOW displays may differ slightly on different operating systems. See the latest version of the management host's DECnet documentation for descriptions and examples of displays.

6.3.3 Directing the SHOW Information to a Text File

Depending on the management host, most NCP SHOW commands let you direct the information to a text file. Use the TO keyword followed by the name of the file, such as in the following VAX/VMS example:

```
NCP> TELL ROBIN USER MEME PASSWORD WINGS SHOW KNOWN CIRCUITS TO NET.LOG (RET)
```

This command creates the file NET.LOG on the management host at which you issued the command. The file has summary information for all circuits known to router ROBIN. If the file you specify already exists, NCP appends the display information to that file.

6.4 Monitoring Operations

Two network management tools for monitoring the router's network activity are NCP SHOW COUNTERS commands and DECnet event logging. These tools help you manage and troubleshoot the router.

6.4.1 Displaying Counters

The router maintains performance and error statistics, known as DECnet counters. This information may include, for example, the number of data packets sent, received, and lost over an Ethernet line, and the number of messages sent to and received from a remote node. Counter statistics can be useful either alone or together with logging information to measure and evaluate the performance for your router and to detect errors.

Use NCP SHOW COUNTERS commands to display counter information and ZERO COUNTERS commands to clear counters periodically. For example, to display the counters for router ROBIN's Ethernet line on a VAX/VMS management host, issue:

```
NCP> TELL ROBIN USER MEME PASSWORD WINGS SHOW LINE ETHER-1 COUNTERS (RET)
```

For an example of the display, see the command description of SHOW LINE in Chapter 9.

Use the information about these counters to evaluate how buffers and other resources are being used, for example, ensuring that buffers are available and not overflowing. Or use it to monitor the communications line to ensure that data is transmitted with a minimal number of errors; for example, noise on the Ethernet can cause a large number of errors.

Note that some counters may be qualified by information indicating the condition that contributed to an error.

Each counter has a maximum value. When this value is exceeded, that is, when the counter overflows, the counter locks until you reset it (see the following section). In SHOW COUNTERS displays, a counter that has overflowed is indicated with this symbol preceding the count:

">"

For example, if the "Seconds since last zeroed" counter overflows, you might see:

```
>65534  Seconds since last zeroed
```

NOTE

If there is a power problem or the router experiences an unexpected failure, its counter values are lost because they are in the operational database.

Several counters in the SHOW LINE display correspond to logging events. The events and event descriptions may provide additional information about the event. Refer to Appendix B for a complete description of all possible logging events.

For a detailed discussion of DECnet counters and the software design and algorithms they represent, see the various DECnet architectural specifications.

6.4.2 Zeroing Counters

Zero the router's counters periodically so that they do not overflow. Digital suggests that you reset the counters to zero at least once a day. Whenever the router is running, you can zero its counters.

Use the privileged NCP ZERO command to reset counters. The ZERO commands to reset the router's counters are:

- ZERO CIRCUIT
- ZERO EXECUTOR
- ZERO LINE
- ZERO NODE

When you reset the counters, DECnet sends an event message to the router's logging host. The message indicates the value of the counters before they were zeroed.

For each component, there is a "Seconds since last zeroed" counter. This counter clears each time you issue the ZERO command. When this counter overflows — exceeds 65,535 seconds — it remains fixed until you clear it.

You can include the ZERO commands in your log-in command file. On a VAX/VMS management host, for example, to zero the counters for the Ethernet circuit ETHER-1 on router ROBIN, issue:

```
NCP> TELL ROBIN USER MEME PASSWORD BIRDY ZERO CIRCUIT ETHER-1 COUNTERS (RET)
```

For further information about issuing NCP ZERO commands, see:

- Chapter 9 for complete command descriptions with syntax information, all command options, and examples of command lines
- The DECnet documentation for the network management host system for further information about DECnet counters
- Appendix A for the syntax of NCP ZERO commands

6.4.3 Using DECnet Event Logging

Use the DECnet event-logging facility to record router activities, known as local events, automatically on an ongoing basis. Appendix B shows and explains all the event messages that the router may generate. See this appendix to learn the kind of information you can get from DECnet event logging to help you monitor router operations.

These parameters control the recording of DECnet event messages generated by the router:

- In the router's permanent database, all the logging parameters (see Volume II, Section 1.1.4) and one executor parameter, LOGGING HOST (see Volume II, Section 1.1.2)
- In the router's operational database, all the logging parameters

  To display the event-logging parameters in the router's operational database, issue the NCP SHOW LOGGING command. To modify these parameters, use the NCP SET LOGGING and CLEAR LOGGING commands.
- Some of the load host's logging parameters (see Sections 5.4.1 and 5.7)
- Some of the logging host's (sink node's) logging parameters

For information about issuing commands related to DECnet event logging that is more detailed than the remainder of Section 6.4.3, see:

- Volume II, Section 1.1.4, for a description of the router's logging parameters
- Volume II, Chapter 2, for complete command descriptions of DRCP SHOW LOGGING, DRCP SET LOGGING, and DRCP CLEAR LOGGING with syntax information, all command options, examples of command lines, and example illustrations of SHOW LOGGING displays
- Chapter 9 for complete command descriptions of NCP SHOW LOGGING, NCP SET LOGGING, and NCP CLEAR LOGGING with syntax information, all command options, examples of command lines, and example illustrations of SHOW LOGGING displays
- Volume II, Appendix A, for a summary of the syntax of DRCP SHOW LOGGING, DRCP SET LOGGING, and DRCP CLEAR LOGGING commands
- Appendix A in this volume for a summary of the syntax of NCP SHOW LOGGING, NCP SET LOGGING, and NCP CLEAR LOGGING commands
- The DECnet documentation for the network management host system for further information about event logging

6.4.3.1 Specifying One Logging Host — Down-line load messages appear at the load host and all other activity is logged at the router's logging host, also known as the sink node. The default logging host is the last load host that loaded the router.

Whenever the router is reloaded, however, the load host may change if there are alternate load hosts set up, as Digital strongly recommends. As a result, various event messages could be logged at several different nodes.

To identify the router's current load host — the load host that last loaded the router — you can use the NCP SHOW EXECUTOR CHARACTERISTICS command (see Chapter 9) or the router's Monitor (see Section 7.3).

For efficiency, convenience, and ease of management, Digital suggests that you specify a permanent logging host for all of the messages generated by the router. To set a logging host in the router's operational database, issue the SET KNOWN LOGGING command. The SINK NODE keywords define the logging host. Execute the command at the router, specifying the router's privileged password.

The following VAX/VMS example specifies node TBIRD as the new logging host for router ROBIN. The command executes at the router. ROBIN's privileged password is BIRDY.

```
NCP> TELL ROBIN USER MEME PASSW BIRDY SET KNO LOG KNO EVENTS SINK NOD TBIRD (RET)
```

For information about assigning a logging host in the router's permanent database, see Volume II, Section 1.1.2, and the DRCP SET EXECUTOR command description in Volume II, Chapter 2.

6.4.3.2 Displaying the Logging Host's Logging Parameters — To check that logging is enabled at the logging host, issue the SHOW KNOWN LOGGING STATUS command. This NCP command executes at the node that is the logging host.

This example is issued at the logging host node, a VAX/VMS node. The command is executed locally, not at the router. The display shows that event logging is enabled.

```
NCP> SHOW KNOWN LOGGING STATUS (RET)

Known Logging Volatile Status as of  16-Jan-1989 15:19:26

Logging sink type = monitor

State                    = on
```

6.4.3.3 Enabling and Disabling Event Logging on the Logging Host — Since event-logging messages can be important troubleshooting aids, Digital suggests that you keep event logging enabled at the router's designated logging host.

To enable and disable event logging, use the SET LOGGING and CLEAR LOGGING commands. These are privileged NCP commands that execute at the node that is the logging host. The commands in this example are issued at a VAX/VMS logging host node. They execute locally, not at the router.

```
NCP> SET LOGGING MONITOR KNOWN EVENTS (RET)
NCP> SET LOGGING MONITOR STATE ON (RET)
NCP>
```

or

```
NCP> CLEAR LOGGING MONITOR KNOWN EVENTS (RET)
NCP> SET LOGGING MONITOR STATE OFF (RET)
NCP>
```

For more information and for examples of enabling and disabling event logging on other DECnet nodes, see the *DECnet System Manager's Guide* for the host.

The above examples affect all possible types of events. You can enable and disable the logging of specific events only in the router's permanent database (see Volume II, Section 1.1.4, and the DRCP SET LOGGING command description in Volume II, Chapter 2).

6.4.3.4 Specifying Specific Sink Devices — By default, if logging is enabled on the logging host, the router sends events to all three sink devices — CONSOLE, MONITOR, and FILE. If the default was changed and logging is now disabled, you can enable it to a specific sink device. Use the SET LOGGING command, executing the command at the router and specifying the router's privileged password.

Specifying one sink device to receive events does not disable other sinks already defined in the operational database. If you specify a sink device when another device is already enabled, both sinks will receive event messages.

The following example at a VAX/VMS management host enables the logging of events generated by router ROBIN at the logging host's console. The command executes at the router. ROBIN's privileged password is BIRDY.

```
NCP> TELL ROBIN USER MEME PASSWORD BIRDY SET LOGGING CONSOLE (RET)
```

If you wish, you can disable logging to one, two, or all three sink devices.

To disable logging to a specific sink, use the CLEAR LOGGING command. Execute the command at the router, specifying the router's privileged password. The following example from a VAX/VMS management host disables the logging of all events generated by router ROBIN from the logging host's monitor. ROBIN's privileged password is BIRDY.

```
NCP> TELL ROBIN USER MEME PASSWORD BIRDY CLEAR LOGGING MONITOR KNOWN EVENTS (RET)
```

NOTE

If you change the logging host, all sink devices active for the previous logging host remain active for the new logging host, even if you specify only one logging sink with the command.

If you want to disable one or two sinks on the new logging host, first issue a CLEAR LOGGING command and then issue a SET LOGGING command to direct event logging to the specific sink device or devices.

To disable logging to all three sink devices so that the router no longer generates any messages, use the CLEAR KNOWN LOGGING command, for example:

```
NCP> TELL ROBIN USER MEME PASSWORD BIRDY CLEAR KNOWN LOGGING KNOWN EVENTS (RET)
```

6.5 Modifying Parameters

Unlike the router's permanent database, where you can modify every router parameter, you can modify only some parameter values in the operational database. This restriction is partly to ensure security, for example, in defining DTE addresses. In addition, you cannot make dynamic changes that could disrupt routing and network operations and possibly cause the router and other nodes to fail.

Modify operational parameters with NCP SET and CLEAR commands. Table 6-3 shows the router's parameters that you can change in the operational database. Most of these parameters are also in the permanent database. The table notes whether or not these are only operational parameters.

Table 6–3: Router Parameters You Can Modify in Operational Database

Component	Parameter	Modify in Operational Database Only
SET		
CIRCUIT ASYNC-*n*	COST	
	STATE	
	VERIFICATION	
CIRCUIT ETHER-1	COST	
	ROUTER PRIORITY*	
	STATE OFF	

*Same parameter as DRCP ROUTING PRIORITY.

(Continued)

Table 6–3 (Cont.): Router Parameters You Can Modify in Operational Database

Component	Parameter	Modify in Operational Database Only
EXECUTOR	LOOP COUNT	Yes
	LOOP HELP	Yes
	LOOP LENGTH	Yes
	LOOP WITH	Yes
	NONPRIVILEGED PASSWORD	
	PRIVILEGED PASSWORD	
LINE	CONTROLLER	Yes
LOGGING	CONSOLE	
	FILE	
	MONITOR	
	KNOWN EVENTS	
	SINK NODE**	
NODE	INBOUND TYPE	
	NAME	
	RECEIVE PASSWORD	
	TRANSMIT PASSWORD	
CLEAR		
EXECUTOR	NONPRIVILEGED PASSWORD	
	PRIVILEGED PASSWORD	
LOGGING	CONSOLE	
	FILE	
	KNOWN EVENTS	
	MONITOR	
	SINK NODE**	
KNOWN LOGGING		
NODE *node-id*	ALL	
	INBOUND TYPE	
	NAME	
	RECEIVE PASSWORD	
	TRANSMIT PASSWORD	
KNOWN NODES	ALL	

**Same parameter as DRCP LOGGING HOST.

To modify parameters in the router's operational database, use these NCP SET and CLEAR commands:

- SET CIRCUIT

  Changes the operational cost or state of circuits. By changing the states or costs of DECrouter 200 circuits, you can control and redirect the flow of traffic through the network.

  On the Ethernet circuit, you can also change the routing priority.

- SET EXECUTOR and CLEAR EXECUTOR

  SET EXECUTOR changes the router's network passwords and sets parameters relating to loopback testing. Defining values for loopback parameters sets up defaults for future LOOP commands that test the router's operations.

  CLEAR EXECUTOR clears the router's network passwords.

- SET LINE

  Changes the controller type of the Ethernet line. For normal operations, the controller type is NORMAL. When a loopback connector is being used for testing purposes, the controller type must be set to LOOPBACK. Before you can change the controller type to LOOPBACK, the Ethernet circuit state must be OFF.

- SET LOGGING and CLEAR LOGGING

  Control the recording of DECnet events. You can specify and clear the types of events you want logged and the location of the logging sink.

- SET NODE and CLEAR NODE

  SET NODE adds node names to the router's operational database or changes node names. This command also defines or changes other node parameters.

  CLEAR NODE clears node names and other node parameters.

For more information about using NCP SET and CLEAR commands, see:

- Section 1.4.1 for a list of the the differences between changing parameters in the operational database of the running router with NCP commands contrasted with changing parameters in the permanent database on the load host with DRCP commands.

  Some router parameters can be changed in both the operational and permanent databases, some in only the permanent database, and a few in only the operational database (see Table 6-3).

- Volume II, Table 1-1, for a list of the router's parameters. For each parameter, the table shows its default and range of valid values.

- Chapter 9 for NCP command descriptions with syntax information, all command options, and examples of command lines.
- Appendix A for a summary of the syntax of NCP SET and CLEAR commands.
- The *Routing and Networking Overview*. This manual fully explains how to configure networks and customize the router's software image for optimal performance.

  One of your tasks as router manager is evaluating routing and networking considerations when you define and modify parameters.

6.6 Other NCP Commands for DECrouter 200 Management

In addition to SHOW, SET, CLEAR, and ZERO commands and DECnet event logging, NCP offers other commands that can help with router management:

- The LOAD and TRIGGER commands for down-line loading the router's software image. See Chapter 5.
- The LOOP CIRCUIT, LOOP EXECUTOR, and LOOP NODE commands for testing DECrouter 200 and network components. You can execute these test commands either locally at the management host or remotely at the router. See Chapters 7 and 8.
- The DEFINE/SET NODE commands for manually modifying a load host's DECnet database. See Chapter 4.

6.7 Other Tools for DECrouter 200 Management

The router also has its own tools for monitoring, maintenance, and troubleshooting. In addition to NCP utilities, use these DECrouter 200 tools to help you manage your unit:

- The Monitor utility, including the Remote Monitor

  You can use the Monitor utility at a terminal attached to the first DECrouter 200 port (J1), or you can run the Remote Monitor program at a load host or a management host. See Section 7.3.
- LED displays on the control panel of the DECrouter 200 unit

  During initialization, these messages report status at a terminal attached to the first DECrouter 200 port (J1). See Section 8.1.
- The 900-series diagnostic messages

  During initialization, these messages report diagnostics at a terminal attached to the first DECrouter 200 port (J1). See Section 8.1.1.

7
Using DECrouter 200 Management Tools for Problem Analysis

This chapter describes the DECrouter 200 management tools you can use to test the router and analyze problems. These tools for problem analysis are:

- The router's hardware self-test
- The router's Monitor utility
- NCP loopback tests
- Up-line dumps
- The router's DECnet counters

NOTE

Digital offers additional tools, which are optional, that you can use for problem analysis and testing. Contact your Digital representative for details.

The tests and the Monitor utility are easy to run. You can use them without help from hardware or software specialists. Dump files, however, must be analyzed by Digital software specialists.

By using the tools discussed in this chapter, you will be able to analyze, diagnose, and resolve most problems that may occur. The next chapter explains troubleshooting and includes suggestions. If you need additional help, Digital offers several levels of software support services. See the *DECrouter 200 Software Product Description* (SPD) for the warranty and software product services available, and for ordering information.

7.1 Introduction

Here is an outline of the router's tools, their functions, and the locations where you use them:

- The hardware self-test

  Start the hardware self-test at the DECrouter 200 hardware unit.

  Use this test to see if the hardware is working properly and if the line connections, including the Ethernet, are sound. Also use the self-test if the router does not come up after a down-line load and if the router experiences a failure. The LEDs on the hardware unit show errors, as do the 900-series messages displayed at a terminal attached to port J1. See Section 7.2 for details.

- The Monitor utility

  The Monitor utility consists of the Local Monitor and the Remote Monitor. Use the Local Monitor by viewing a terminal connected to the router's first port, port J1. See Section 7.3.1 for details.

  Use the Remote Monitor at a terminal connected to one of the router's load hosts. The Remote Monitor is software that is part of the DECrouter 200 software distribution kit. This utility resides in the directory for routers on the load host.

  The display is the same as that of the Local Monitor, but the advantages are that you do not have to take up one of the router's ports to run it and you do not have to be near the DECrouter 200 unit. See Section 7.3.2 for details.

  Whenever the router is loaded, check the Monitor display to verify that the router is running and that the configuration is correct. In addition, view the Monitor display periodically to examine router performance and to help detect potential problems. When problems develop, check the display for an apparent cause. See Section 7.3.4 for details.

- NCP loopback tests

  Start the available loopback tests at a network management host with NCP LOOP commands. You can invoke some of the loopback tests for remote execution at the router, some for execution at the local node, and some for either remote or local execution.

  Loopback tests send data out and have it sent back to check that the data was transmitted without error. The node-level tests check the logical link capabilities of the DECrouter 200 node. The circuit-level tests check the connections between the router and the Ethernet cable. Error messages reveal the hardware or software components with problems.

To isolate a possible hardware problem, use loopback tests after invoking the hardware self-test. If the hardware unit is working properly, use loopback tests to check node-level hardware and software, or circuit-level hardware. See Section 7.4 for details.

- Up-line dumping

  An up-line dump occurs automatically if the router experiences an unexpected failure.

  Use the up-line dump facility for saving information about problems that may have caused the router to fail. If the router fails, it automatically writes the contents of its memory to a dump file on one of its load hosts. You can contract with Digital to have the dump file analyzed by Digital software specialists. See Section 7.5 for details on up-line dumping.

- The router's DECnet counters

  To help you isolate problems, you can check the router's DECnet counters. See Sections 6.4.1 and 6.4.2 for details.

Table 7-1 lists the DECrouter 200 management tools, their uses, and the components they monitor.

Table 7–1: DECrouter 200 Management Tools for Problem Analysis

Tool	Uses	Components Affected
Hardware self-test	Tests hardware and isolates suspected problems in hardware	All hardware components, including Ethernet connections
Monitor	Monitors operations of the router, including buffer allocation, CPU and line utilization, routing performance, and the status of all connected circuits. Verifies correctness of the router configuration. Detects potential problems, isolates the cause of a current problem	Network and system software, CPU, circuits, and lines
Circuit-level loopback tests	(1) Test the Ethernet when the router and a node on the same Ethernet are not communicating properly	Ethernet cable and components. Checks physical links between components
	(2) Test asynchronous circuits when the router and an adjacent node on one of the asynchronous circuits are not communicating properly	Asynchronous circuits. Checks physical links between hardware components

(Continued)

Table 7–1 (Cont.): DECrouter 200 Management Tools for Problem Analysis

Tool	Uses	Components Affected
Node-level loopback tests	Test for higher-level problems, logical link problems between two nonadjacent nodes or between two adjacent nodes on Ethernet	Logical link capabilities (network software)
Up-line dumps	Analyze router failures	All software parameters
DECnet counters	Monitor router and network operations	Network software, system software, CPU, circuits, and lines

You can also use some of the network management facilities described in Chapters 5 and 6 to help you isolate problems. For example, you can review event-logging messages about down-line loading on the router's load host (see Sections 5.4.1 and 5.6.3), review event-logging messages about all other router activities on the router's logging host (see Section 6.4.3), check the NCP SHOW displays (see Section 6.3), and check the router's DECnet counters for the DECrouter 200 node and the Ethernet circuit (see Sections 6.4.1 and 6.4.2).

7.2 Hardware Self-Test

Run the hardware self-test to check for hardware faults. The self-test checks the DECrouter 200 central processing unit, memory, and the asynchronous ports. The test also checks the Ethernet port, verifying that the router's connection to the Ethernet is free of hardware faults.

Before you start the self-test:

1. Check that the hardware unit is connected to the Ethernet (the transceiver is connected properly).
2. Check that potential load hosts are running and are connected to the Ethernet.

To start the self-test, follow these steps:

1. Power off and power on the hardware unit. Unplug the power cord and then reinsert it.
2. Observe the LEDs on the hardware unit.

   The LEDs indicate the status of the router and any problems. (Table 8-1 summarizes all LED status and error indications.) Before the self-test begins, all four status LEDs illuminate for one second, telling you that they are working properly.

   After this lamp check, the top LED should stay on, showing that the hardware unit is powered on.

The self-test starts. It will last for about 20 to 30 seconds.

7.2.1 If the Hardware Is Fault-Free

If no serious hardware faults are detected, the second LED (D2) illuminates continuously.

The DECrouter 200 hardware unit sends a load request to the Ethernet multicast address. The first available node that responds, affirming that it is set up to down-line load the router's software image to the DECrouter 200 unit, loads the router.

The load takes up to two minutes, after which the third LED (D3) should illuminate. Thus, after a normal, error-free load, the LEDs appear as shown in Figure 7-1.

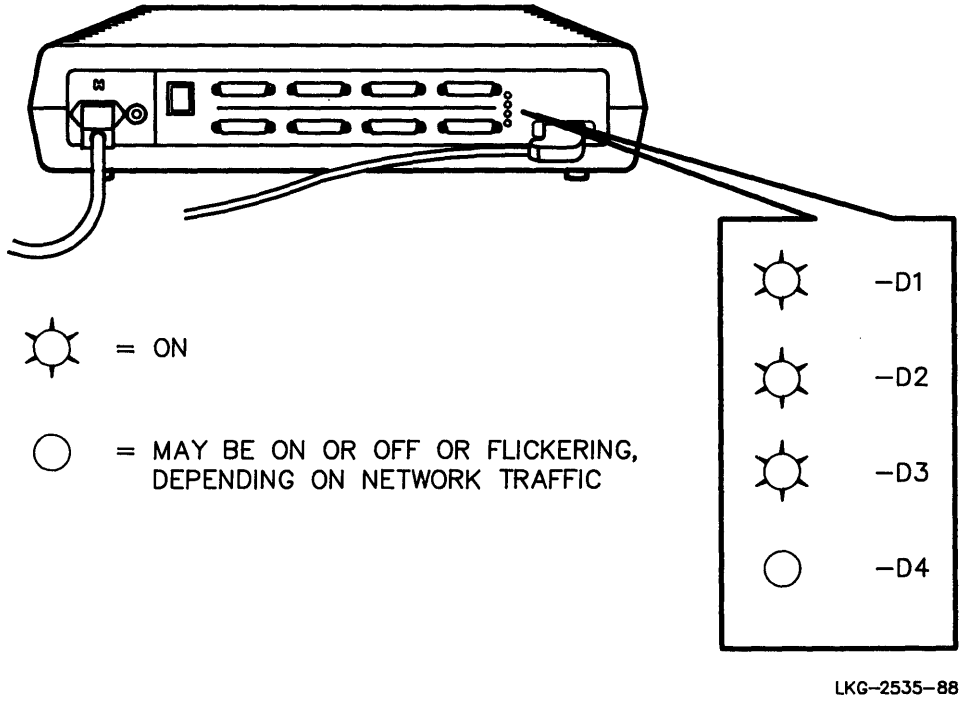


Figure 7–1: LEDs After Successful Test and Load

The fourth LED (D4) indicates activity on the Ethernet. Depending on the level of this activity, the LED is on, flickering, or off. Note that under certain conditions, even a light load on the Ethernet causes the D4 LED to stay on.

7.2.2 If Fault/Error Conditions Are Detected

If, after the self-test, LED D2 stays off or starts blinking, a hardware fault was detected. If the LED is off, a fatal error was detected and the load will not proceed. If the LED is blinking, a nonfatal error was detected; the load will still proceed. In either case, see Chapter 8 for troubleshooting instructions.

After the self-test, the third LED stays off while the software image is being down-line loaded. After two minutes, if this LED starts blinking, the down-line load failed after three load requests. The router continues to request a load at random intervals.

At all the router's assigned load hosts, check for any signs that may indicate the reason for the failure:

1. Look for event messages.

   If the reason for failure is shown, correct the faults and try loading again. If there are no event messages — you may see host-generated event messages that record attempts to load the DECrouter 200 node.

2. Check that event logging is enabled at the load hosts (see the appropriate *DECnet Management Guide*).

3. Check the network connectivity between the load hosts and the router.

   Use the NCP LOOP CIRCUIT command for execution at the load host and with the DECrouter 200 node as the destination (see Section 7.4.3.1). This test tells you if there are problems with the DECrouter 200's software.

If you cannot find any reasons for the failure, contact Digital. See Chapter 8 for troubleshooting instructions.

7.3 The DECrouter 200 Monitor Utility

The DECrouter 200 Monitor utility displays real-time status information on the router's operations, such as:

- The performance of the router
- The status of each circuit and the amount of traffic on each circuit
- The node identification and node type of the adjacent nodes connected by the asynchronous circuits
- The amount of buffers and available CPU on the router
- The node identification of the current load host and the designated router on the DECrouter 200's Ethernet

The Monitor runs both remotely and locally:

- The Local Monitor runs automatically on VT200- or VT100-series terminals directly connected to port J1 (ASYNC-1) on the DECrouter 200 unit. The Local Monitor display is updated every two seconds.
- You run the Remote Monitor at one of the router's load hosts. The Remote Monitor display is updated at 6-second intervals.

Figure 7-2 shows an example of a typical monitor display screen with a non-PTT software kit and Section 7.3.3 describes the display fields.

Use the Monitor to verify that your DECrouter 200 is running and also performing properly. Run the Local Monitor continuously so that you can periodically check the status of the router's components. This helps to detect potential problems. By observing the extent to which the router's resources — CPU, buffers, and lines — are being used, you can determine if the router is configured properly for the demands placed upon it.

7.3.1 Using the Local Monitor

After you follow a few preparatory steps, the Local Monitor runs automatically.

7.3.1.1 Preparing to Activate the Local Monitor — Before you activate the Local Monitor, run DRCP at a load host to set the circuit state for line ASYNC-1 to monitor mode. (The ASYNC-1 port is the only port that supports the local monitor.) Open your router's software image file and type:

```
DRCP>SET CIRCUIT ASYNC-1 STATE MONITOR (RET)
```

Using an EIA-232 cable, connect a VT100- or VT200-series terminal to port J1 and turn on the terminal. Using the set-up feature of the terminal, set the speed of the terminal to match the line speed of line ASYNC-1 (set in DRCP). Ensure that the Auto XOFF flow-control characteristic is disabled. For more details, see the documentation supplied with the terminal.

Digital recommends that you run the Local Monitor at a line speed of 9600 bps (the default for ASYNC-1). Diagnostic hardware displays messages at a terminal attached to the J1 port. The diagnostics assume a 9600-bps line speed.

NOTE

When the Local Monitor runs, port J1 does not run DDCMP as it normally does for connected lines; instead, it runs as a terminal port.

If you want to run port J1 as an asynchronous DDCMP line, then you must reconfigure the DECrouter 200 software image on the load host so that the monitor is disabled. Use either of the following DRCP commands to disable the Monitor utility, depending on whether you want the circuit to be operational or not:

SET CIRCUIT ASYNC-1 STATE ON

SET CIRCUIT ASYNC-1 STATE OFF

Then reload the image to make that line available as a DDCMP line.

7.3.1.2 Activating the Local Monitor — After you finish the required preparations, activate the Local Monitor by down-line loading the software image that you have modified. The display automatically appears on your terminal screen.

NOTE

If the Monitor display does not appear, the reason may be that the wrong system image was loaded. Check that the down-line load information in the load host's node database is correct.

7.3.1.3 Using the Display-Control Commands — Two commands let you control the Local Monitor display:

- **R**

  Typing "R" at your monitor terminal resets all fields that show low or high values. For example, the field that shows the highest throughput recorded for the router is reset to the value of the current throughput.

  One use of this feature is that you can then observe the new high or low values and determine whether the previously recorded lows or highs were unusual or not.

- **Space Bar**

  Pressing the space bar refreshes the display.

7.3.2 Using the Remote Monitor

To run the Remote Monitor, follow these steps:

1. To start the Remote Monitor, run the utility at a load host. For the name of the distribution file, see the *DECrouter 200 Software Installation Guide* for the appropriate operating system. On VAX/VMS load hosts, for example, the utility is called MON200.EXE. See the same software installation guide for the command to start the utility. On VAX/VMS load hosts, for example, the command is:

   ```
   $ RUN MON200.EXE (RET)
   ```

2. The utility prompts you for the name and password of the router you want to monitor:

   ```
   Router ? (node-id"user password") :
   ```

   For the router, you can specify either its DECnet node name or DECnet node address. On some management nodes, for example, DECnet–VAX nodes, you must specify both the USER and PASSWORD fields. Even though the DECrouter 200 node checks only the PASSWORD field, DECnet–VAX requires the USER field to correctly send the password to the router. Enter any ASCII characters in the USER field to satisfy this requirement, for example:

   ```
   Router ? (node-id"user password") : rtr-id"any-string rtr-password" (RET)
   ```

You need nonprivileged access rights to run the Remote Monitor:

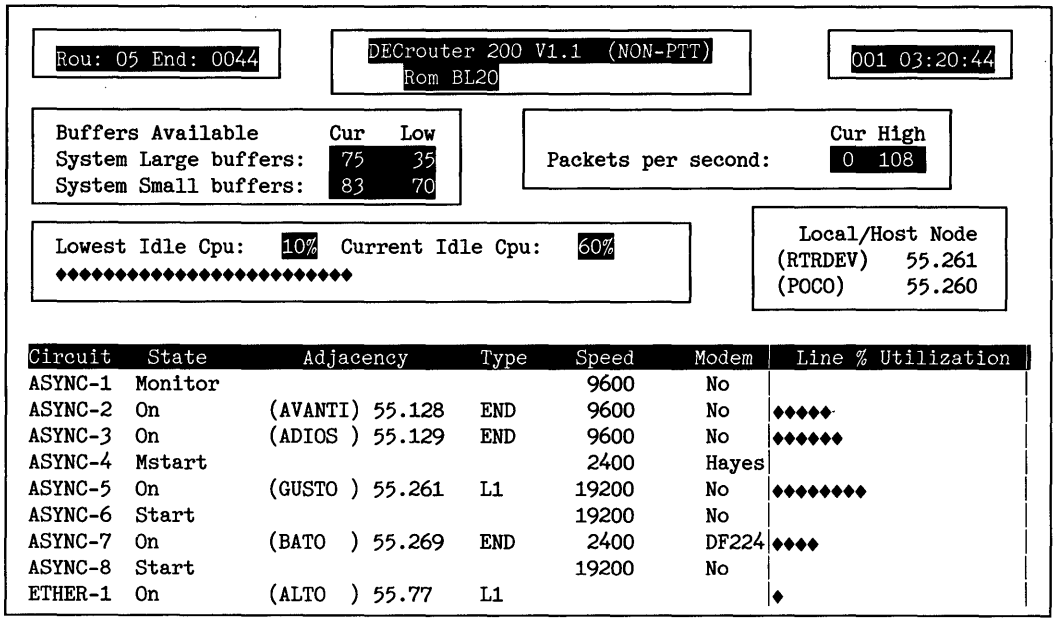
- If no nonprivileged password is set for the router, all users have access. After specifying the node id, type a RET.
- If a nonprivileged password is defined, you must specify a password to gain access. You can specify either the nonprivileged password or the privileged password. After specifying the router's node id, do not leave a space and type a quotation mark ("), an NCP user-id (see above), a space, a password (either the router's nonprivileged password or its privileged password), a quotation mark ("), and RET. In this example, the router's node address is 55.1, the USER string is USER3, and the router's nonprivileged password is WORMS:

  ```
  Router ? (node-id"user password") : 55.1"USER3 WORMS" RET
  ```

3. The utility checks the router you specified to see if it has a nonprivileged password. If not, you immediately get the Remote Monitor display. If so, the utility first performs password checking:
   - The program checks that the router's nonprivileged password matches the one you just typed. If they match, you get the Remote Monitor display.
   - If not, the utility then checks to see if the router's privileged password and the one you just typed match. If they match, you get the display.
   - If matching fails or if there is a problem establishing a connection, the Remote Monitor again prompts for the correct password. It gives you one more attempt to specify a valid password. If you do not match either the nonprivileged or privileged passwords, the utility aborts and returns you to the system prompt.
4. The display appears and automatically updates at your terminal screen.
5. To cancel the Remote Monitor display, type CTRL/Z. You are returned to the system prompt.

7.3.3 Display Field Descriptions

This section describes the Monitor's fields. Figure 7-2 shows a typical Monitor display with a non-PTT software kit.



LKG-2628-89

Figure 7-2: Typical Monitor Display (for Non-PTT Software Kit)

7.3.3.1 Ethernet Router and End Node Field — This field records the number of Ethernet routers and end nodes currently adjacent to the DECrouter 200, that is, connected to the same Ethernet segment as the DECrouter 200 and in the same area. The field does not count those adjacent nodes connected to the asynchronous ports. Use this field to help determine the proper values for the MAXIMUM BROADCAST ROUTERS, MAXIMUM BROADCAST NONROUTERS, and MAXIMUM ADDRESS parameters defined in the DECrouter 200's permanent database.

If the number of routers or end nodes shown in this field is zero, communication between the router and the Ethernet has failed. See Section 8.2 for troubleshooting hints.

7.3.3.2 DECrouter 200 Version Field — This field records the software and hardware version of the DECrouter 200. Use this field to verify that the expected software version of the DECrouter 200 is loaded.

7.3.3.3 The Up-Time Field — The upper-right corner of the display indicates the amount of time elapsed since the DECrouter 200 was last booted (loaded). The first three digits are the number of days, the next six digits indicate the number of hours, minutes, and seconds since last loaded.

Use this field to verify that the DECrouter 200 is running. If the time is not updating, the DECrouter 200 has stopped running, and you should reload it.

7.3.3.4 The Available Buffers Field — This field shows the current number of available large and small buffers in the DECrouter 200 system as well as the lowest number available for each size since the system was loaded or the field reset. This lets you see whether enough buffers are being allocated. (You can reset the lowest number of available buffers by typing "R" at the Monitor terminal.)

This field is used primarily by software specialists.

7.3.3.5 The Packets-per-Second Field — This field reports the current and highest throughput recorded for the DECrouter 200. The current value shows the current number of packets processed per second, including packets the DECrouter 200 is forwarding and packets targeted for the DECrouter 200 itself (such as routing update messages). This field also displays the highest number of packets per second recorded since the system was loaded or the field was reset.

Use this field to verify that the DECrouter 200 is performing as expected. Expected performance levels are given in the *DECrouter 200 Software Product Description.*

7.3.3.6 The Idle CPU Field — This field reports the percentage of CPU available. A graphic display consisting of a series of diamonds also represents the current available CPU. Each diamond equals 2.5%. The maximum amount of available CPU (100%) is 40 diamonds.

This field also displays the lowest amount of available CPU since the system was loaded or the field reset.

Use this field to determine the activity level on the DECrouter 200. If the percentage of idle time is low, then the DECrouter 200 is very busy. This field is used primarily by software specialists.

7.3.3.7 The Local/Host Node Field — This field displays the DECnet node name and node address of the DECrouter 200 (top line in the field) and the node that downline loaded the DECrouter 200 (bottom line). Use this field to verify the node address of the DECrouter 200, the area number, and the load host. If the load host is not as expected, check that the node database on the expected load host is correct. Refer to Section 8.1.1.4 for troubleshooting hints.

7.3.3.8 The Circuit Status and Characteristics Field — The bottom section of the display shows information about the asynchronous circuits (ports J1 to J8) and the Ethernet circuit. There are seven possible fields of information:

- **Circuit:** Identifies the circuit.
- **State:** Shows the status of the circuit. For the asynchronous circuits, the status can be OFF, ON, START (the circuit supports a non-modem INCOMING line and is in on-starting state), MSTART (the circuit supports a modem line and is in on-starting state), or BROKEN (the hardware self-test at boot found the port faulty). For ASYNC-1, the status can also be Monitor.

  For the Ethernet circuit, the status can be On or Off.
- **Adjacency:** For the asynchronous circuits, identifies the node that is directly connected; for the Ethernet, identifies the current designated router in the same area as the DECrouter 200 and on the same Ethernet. DECnet node names are also displayed if they have been defined in the router's database.

  Make sure the node addresses of the adjacent nodes are correct. The area numbers should all be the same as that of the DECrouter 200. Because the DECrouter 200 is a level 1 router, it cannot communicate directly with a node in another area. Therefore, this field can help you determine if a communication problem with one or more adjacent nodes is due to incorrect node addresses.
- **Type:** Identifies the type of node connected to the circuit. Valid types for this field are END, L1 (for a level 1 routing node), L2 (for a level 2 routing node), E3 (for a Phase III end node), and R3 (for a Phase III routing node).
- **Speed:** Shows the speed setting for the line.
- **Modem:** Shows whether the line is connected by a modem and, if dial-back, the kind of modem. If the line is hard-wired, NO is displayed. If a dial-back modem is connected, the type specified with the MODEM line parameter is displayed. If the line does not support dial-back, but has a modem, YES is displayed.
- **Line utilization:** Shows the percentage of the maximum available line bandwidth being consumed. The maximum bandwidth is based on the line speed. The percentage of bandwidth consumed is based on full-duplex traffic (the amount of transmitted and received packets). Each diamond displayed equals 5%.

  On the Ethernet, the maximum available bandwidth is based on a maximum of 1 Mbps. This maximum helps keep a reasonable scale.

  Use this field to determine how busy each line is. If a line is extremely busy, you may have to increase the line's speed.

7.3.4 Using Monitor Information from a DECrouter 200 Failure

If an unexpected failure occurs while the Monitor is running, the failure information is displayed. Immediately record this information and include it with a problem report (see Section 8.4). This information is displayed only for a short time.

7.4 Loopback Testing

Loopback tests analyze and test DECrouter 200 hardware and software. To perform loopback testing, issue these NCP LOOP commands at a network management host:

- NCP LOOP CIRCUIT

  Checks the router's Ethernet circuit connection or any of its asynchronous circuit connections. You can issue this command either for local execution at the management host or for remote execution at the router.

- LOOP EXECUTOR

  Checks the router's software and its ability to initiate and accept local logical links. Issue this command for remote execution at the router.

- NCP LOOP NODE

  Checks the router's routing software or its ability to create logical links to remote nodes. You can issue this command either for local execution at the management host or for remote execution at the router.

7.4.1 Overview of Loopback Testing

A loopback test sends out test data from a node, then returns the data to that node. If the component you are testing is working normally, the returned data is identical to the original data. The NCP prompt appears, indicating the test completed successfully.

If the component is not working normally, the returned data differs from the sent data. The loopback test detects the differences and displays at your terminal one or more error messages identifying the fault. See the DECnet documentation for your management host system for a list and explanation of all possible error messages generated by loopback tests.

Loopback tests can check these levels of the network:

- The router's circuit operation (LOOP CIRCUIT command)
- The router's software and local logical links capabilities (LOOP EXECUTOR command)
- The router's routing software and logical link capabilities (LOOP NODE command)

You can use all these levels when checking router and Ethernet components and when troubleshooting a communications problem.

If possible, issue the LOOP command for remote execution at the router, making it the initiator of the loopback test. However, the problem you are troubleshooting may be on the path from your local node to the router, in which case you may not be able to issue the command for execution at the router.

To see if you can issue the LOOP command for remote execution, first issue the NCP LOOP NODE command for execution at your local node:

- If the LOOP NODE test completes without error, a logical link can be created between your local node and the router. Therefore, you can issue LOOP commands for execution there.
- If the LOOP NODE test does not succeed, try the test from your local node to other nodes on the Ethernet. If the test succeeds, your local node is not at fault. The problem is probably with the router's connection to the Ethernet.
- If tests to other nodes fail, then your local node is probably at fault. Check its connection to the Ethernet.

When a loopback connector is attached for loopback testing to either end of the router's Ethernet transceiver cable, prepare the Ethernet controller with these steps:

1. Turn off the router's Ethernet circuit. Issue:

   TELL *rtr-node-id* USER *user-id* PASS *priv-password* SET CIR ETHER-1 STATE OFF

2. Change the controller type for the router's Ethernet line. Issue:

   TELL *rtr-node-id* USER *user-id* PASS *priv-password* SET LINE ETHER-1 CONTROLLER LOOPB

When you run the circuit loopback test over a connector with the LOOP CIRCUIT command, the router ignores the LENGTH parameter, if you specified it, and uses the maximum possible length.

After testing the Ethernet connection, follow these steps:

1. Remove the loopback connector.
2. Switch the Ethernet from loopback mode to normal mode. Issue:

   TELL *rtr-node-id* PASSW *priv-password* SET LINE ETHER-1 CONTROLLER NORM

3. Turn on the Ethernet circuit. Issue:

   TELL *rtr-node-id* PASSW *priv-password* SET CIR ETHER-1 STATE ON

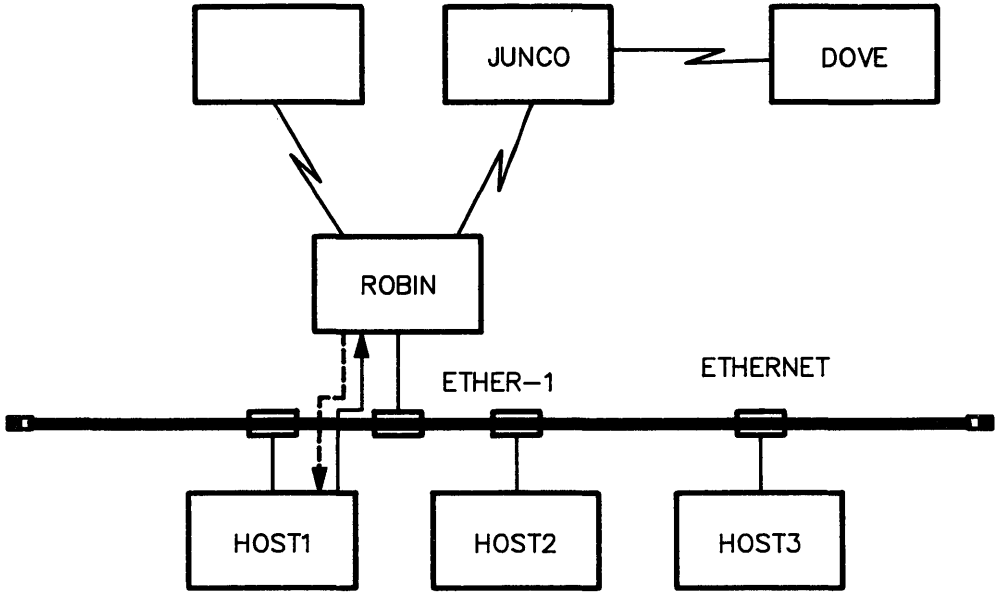
7.4.1.1 Checking Components — If you want to check that the router and the Ethernet components are working properly, first use the NCP LOOP NODE command to loop data from the router to other nodes in the network. This command checks the logical link capability of the router.

If the loopback test completes without error, then you do not have to run any circuit-level tests. (If there were problems at the circuit level, they would have shown up in the node-level tests.) If errors do occur, try circuit-level tests to isolate the source of the problem.

The following example, illustrated in Figure 7-3, assumes that you want to test the components of router ROBIN. You are sitting at HOST1, a VAX/VMS system. First check the connection from HOST1 to ROBIN by typing the following command, executed locally at HOST1:

```
NCP> LOOP NODE ROBIN (RET)
```

The solid arrow in the figure shows the path of the looped data from HOST1 to ROBIN. The dashed line shows the path of the data on the way back.



Executed at HOST1:

```
NCP> LOOP NODE ROBIN
```

LEGEND:

◄——— shows data being looped to destination node

◄- - - - - shows data being looped back to source node

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Figure 7–3: Node Loopback Test

If the test succeeds (the connection is sound), you can issue additional LOOP commands for execution remotely at the router. Set up the router as the executor node and issue LOOP commands to test the router's routing software. These commands test the router's ability to route to nodes JUNCO, HOST2, HOST3, and DOVE. ROBIN's privileged password is BIRDY.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> LOOP NODE JUNCO (RET)
NCP> LOOP NODE HOST2 (RET)
NCP> LOOP NODE HOST3 (RET)
NCP> LOOP NODE DOVE (RET)
```

To test the Ethernet circuit connection from ROBIN to HOST1, issue a LOOP CIRCUIT command, as illustrated in Figure 7-4. The command is issued at management host HOST2 and is executed remotely at the router. In this example from a VAX/VMS management host, ROBIN's privileged password is BIRDY.

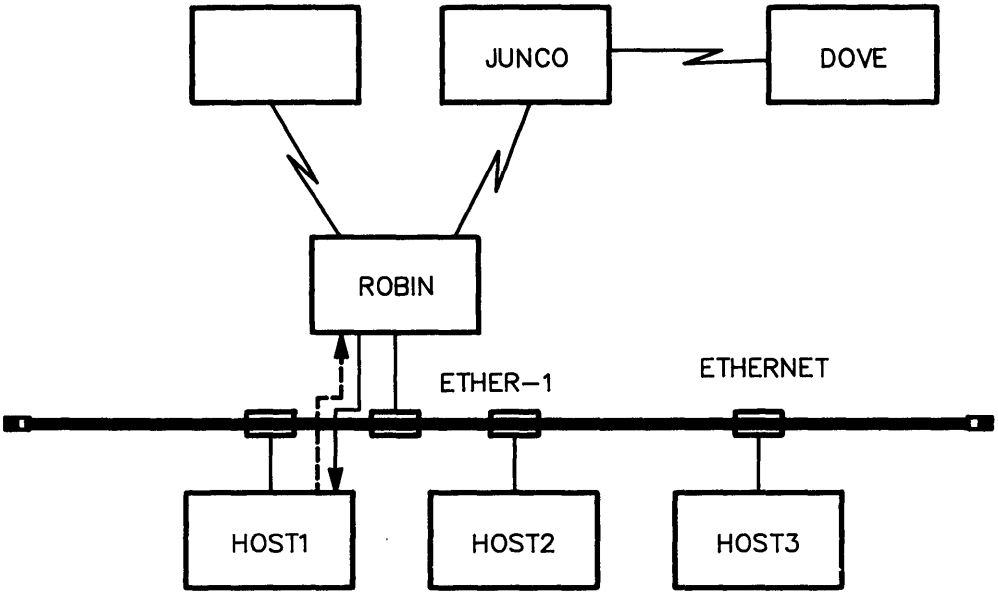
The solid arrow the figure shows the path of the looped data from HOST1 to ROBIN. The dashed line shows the path of the data on the way back.

```
NCP> TELL ROBIN USER MEME PASSWORD BIRDY LOOP CIRCUIT ETHER-1 NODE HOST1 (RET)
```

On DECnet–ULTRIX nodes, you can issue the **ncp loop circuit** command without including a specific destination node, for example:

```
ncp> loop circuit ether-1 (RET)
```

LOOP CIRCUIT ETHER-1 sends test data to the Ethernet multicast address. The first available node on the Ethernet to respond loops the data back to the router. An NCP message at your terminal identifies the node that responded.



Typed at node HOST2 for remote execution at ROBIN:

```
NCP>TELL ROBIN PASSWORD BIRDY LOOP CIRCUIT ETHER-1 NODE HOST1
```

LEGEND:

◄——— shows data being looped to destination node

◄------ shows data being looped back to source node

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Figure 7–4: Circuit Loopback Test

If you issue the LOOP CIRCUIT command to several destination nodes and the results are unsuccessful, use LOOP CIRCUIT ETHER-1 to see if there is any node on the Ethernet with which the router can communicate. To reset HOST1 as the executor, issue:

```
NCP> CLEAR EXECUTOR NODE (RET)
```

To test the router's ability to route between HOST1 and node JUNCO, issue this command for execution locally at HOST1:

```
NCP> LOOP NODE JUNCO (RET)
```

7.4.1.2 Troubleshooting — To isolate the cause of a communication problem, use the LOOP CIRCUIT command to determine if the problem lies in the affected circuit. If no faults are found, try the LOOP NODE command to see if the fault lies in the logical link capability of the router.

You can also use the LOOP CIRCUIT command to run a **loop assist test** on the Ethernet. This test checks the Ethernet circuit between two LAN nodes with the assistance of a third LAN node. This third node, the assistant node, relays test data to or from the destination node, or both ways.

Use the loop assist test when nodes are far apart on the LAN or when you want to find out whether the transmitting component or the receiving component on a transceiver is faulty. Loop assist tests are described in further detail in Section 7.4.3.1.

As a troubleshooting aid, loopback connectors diagnose problems with router ports. These connectors are supplied with the DECrouter 200 hardware unit. Chapter 8 explains how to use these devices for troubleshooting.

7.4.2 Testing Nodes

Use the NCP LOOP NODE command for node-level loopback testing. Node-level loopback tests check the router's ability to route messages to:

- Adjacent nodes on the Ethernet or connected by the DECrouter 200's asynchronous lines
- Nonadjacent nodes off the Ethernet LAN, which are connected indirectly, either through another routing node on the Ethernet or through a routing node on one of the router's asynchronous lines

In addition, if a network management command fails to execute at the router, use the NCP LOOP NODE command to check the router's ability to create logical links to a specific node.

In Figure 7-3, the DECrouter 200 node ROBIN has HOST1, HOST2, and HOST3 as adjacent Ethernet nodes. Node JUNCO is an adjacent node off the Ethernet. Node DOVE is a nonadjacent routing node.

You can also test the router's routing abilities by issuing the LOOP NODE command for execution at your local node. Specify as the destination of the loop test a node to which the looped data must be routed by the router. In Figure 7-3, for example, the LOOP NODE JUNCO command issued at HOST1 tests the ROBIN's ability to route messages to node JUNCO.

For a complete command description of the NCP LOOP NODE command with syntax information, all command options, and examples of command lines, see Chapter 9. See Appendix A for a summary of the command syntax.

7.4.3 Testing Circuits

Use circuit level loopback tests to check:

- The Ethernet circuit connections to the router and to all adjacent nodes on the Ethernet
- The asynchronous ports and circuits on the router

With the configuration shown in Figure 7-3, you can use a circuit-level loopback test to check the Ethernet circuit between node HOST1 and router ROBIN. Or, you can use a circuit-level test to check the point-to-point connection between ROBIN and node JUNCO.

For a complete command description of the NCP LOOP CIRCUIT command with syntax information, all command options, and examples of command lines, see Chapter 9. See Appendix A for a summary of the command syntax.

7.4.3.1 Testing the Ethernet Circuit — Ethernet circuit tests check the Ethernet cable and the Ethernet devices connecting the router and other nodes to the Ethernet LAN. Specify the node to which you want to loop the test data.

On most DECnet–ULTRIX nodes and some other DECnet management host systems, you can multicast the test data on the Ethernet instead of sending it to a specific destination node. In this case, the first available node on the LAN accepts the test data and loops it back. An NCP status message informs you which node on the Ethernet responds to loop the data back. Note that if the Ethernet circuit on a node is not service enabled, that node will not respond to the loop request.

NOTE

The DECrouter 200 system and any other dedicated communications servers on the Ethernet, such as terminal servers in the DECserver family, do not respond to multicast loop circuit requests initiated from another node.

You can also run circuit-level loop assist tests to check Ethernet circuits. Loop assist tests loop data between an initiating node and a destination node on the LAN, with the help of an assistant node on the LAN, which is located between the initiating and destination nodes. You can use the assistant node in one of three ways:

- To relay the test data on the way to the destination node
- To relay the test data on the way back from the destination node
- To relay the test data both on the way to and from the destination node

These options help to isolate the cause of a problem. For example, when communications between two nodes on the LAN are unsuccessful, the Ethernet transceiver of either node may not be working properly. Either the transmitting component is not transmitting strong enough signals to reach the receiving node, or the receiving component could not discriminate the signals sent by the transmitting node.

Some of the possible causes of the problem are:

- The cable has a kink.
- The **tap** is faulty (the entry point where the transceiver connects to the cable has a short). If the tap is faulty, refer to the hardware documentation for the tap.
- The signal is weak, or degraded, over the cable for some other reason.

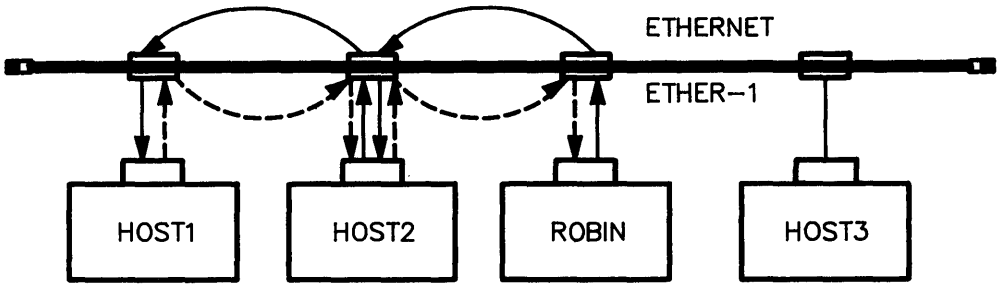
If communications to all nodes are impossible, then the Ethernet device may be faulty. To isolate the component causing the problem, you can run a series of loop assist tests, using different options for each test.

Figures 7-5, 7-6, and 7-7 show how you can use loop assist tests to find out which node in a configuration has faulty components. In these example figures, nodes ROBIN and HOST1 are unable to communicate with each other. The dashed lines indicate the flow of data being looped back to router ROBIN. From HOST3, follow these steps:

1. Using HOST2 as an assistant node, relay data to HOST1 from ROBIN, and back again (called a "full assist" from HOST2, as shown in Figure 7-5).
2. If HOST2 can communicate with HOST1, use HOST2 to relay data from HOST1 to ROBIN (called a "receive assist"), as shown in Figure 7-6.

   If this test fails, either the HOST1 receiver or router ROBIN's transmitter is at fault.
3. If the test in step 2 works, use HOST2 to relay data to HOST1 from ROBIN (called a "transmit assist"), as shown in Figure 7-7.

   If this test fails, either the HOST1 transmitter or router ROBIN's receiver is at fault.
4. Using other nodes on the LAN as assistant nodes, repeat loop assist tests until you isolate the cause of the problem.



At HOST3, type

```
NCP>SET EXECUTOR NODE ROBIN
NCP>LOOP CIRCUIT ETHER-1 NODE HOST1 ASSISTANT NODE HOST2 HELP FULL
```

LEGEND:

- ---→ shows data being looped back to ROBIN
- ——→ shows data being looped to destination node

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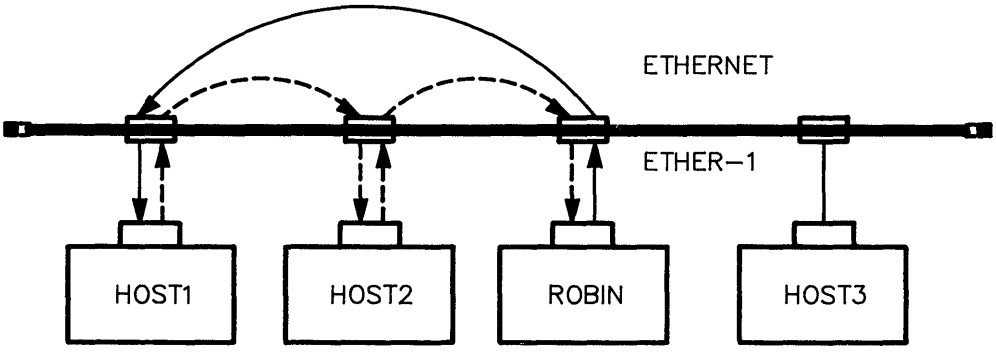
Figure 7–5: Loop Assist Circuit Test: Full Assist



At HOST3, type

NCP>SET EXECUTOR NODE ROBIN

NCP>LOOP CIRCUIT ETHER–1 NODE HOST1 ASSISTANT NODE HOST2 HELP RECEIVE

LEGEND:

---► shows data being looped back to ROBIN
——► shows data being looped to destination node

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Figure 7–6: Loop Assist Circuit Test: Receive Assist

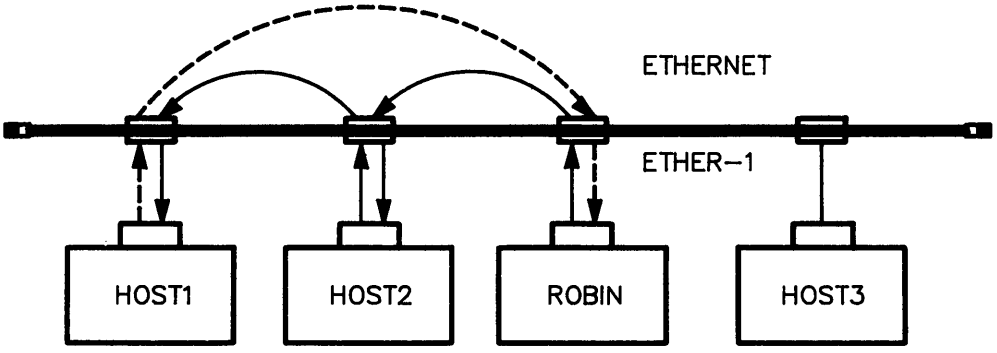

Figure 7–7: Loop Assist Circuit Test: Transmit Assist

7.4.3.2 Testing the Asynchronous Circuits — The tests for the asynchronous circuits check the physical lines and line devices between a node you specify and the router. Set up the router as the executor node to test asynchronous circuits.

7.4.4 Testing the Executor

Testing the router with the LOOP EXECUTOR command has the same effect as testing the router with the LOOP NODE command and specifying the router as the node to be tested.

The advantage of the LOOP EXECUTOR command is that no other system besides the router is involved in the test. LOOP EXECUTOR tests the software's ability to establish a logical link between the mirror and the looper.

7.5 Up-Line Dumping

The DECrouter 200 supports up-line dumping over the Ethernet. If the DECrouter 200 ever detects a fatal error, it automatically dumps its memory into a file on its load host.

You can have the dump file analyzed to determine the cause of the failure. Copy the dump to magnetic tape and send it along with a Software Problem Report (SPR) to Digital software specialists for analysis as appropriate. Send copies of the software image and any available information that can help in diagnosing the problem. Indicate the type of system that received the dump. See Section 8.4 for more details.

In each load host's ROUCONFIG.DAT file, part of your router's entry is the name of its dump file. Each router has a unique dump file name, RTR*node-name*.DMP. Here, *node-name* is the DECnet node name of the router. For example, a DECrouter 200 unit with the DECnet node name DOVE has the dump file name RTRDOVE.DMP.

When either you or the software installer runs ROUCONFIG (see Chapter 4), uses the Add option, and defines a new DECrouter 200 unit, ROUCONFIG assigns a name for the dump file. The Swap option also assigns *RTRnew-node-name*.DMP if you specify a new DECnet node name for the unit.

7.5.1 Prerequisites for Up-Line Dumping

There are two prerequisites for up-line dumping:

- The router can up-line dump its memory only if a properly configured load host exists on the Ethernet. Such a load host is a system that has the DECrouter 200 software image, several related files for customizing this image, and a node database with an entry for the router created with the ROUCONFIG command procedure. See Section 4.1.1 for a definition and discussion of the load host's node database.
- Before the DECrouter 200 can up-line dump its memory, the Ethernet circuit connecting the router to one of its load hosts must be ENABLED for service functions and be in the ON state.

  On most load hosts, the Ethernet circuit must be turned OFF before you can ENABLE it for service functions. For example, referring to the configuration shown in Figure 7-8, the following commands executed at a VAX/VMS load host, HOST1, prepare circuit UNA-0 for up-line dumping to HOST1. If a failure occurs on router RAVEN, its memory can be up-line dumped to HOST1.

```
NCP> SET LINE UNA-0 ALL (RET)
NCP> SET CIRCUIT UNA-0 STATE OFF (RET)
NCP> SET CIRCUIT UNA-0 SERVICE ENABLED STATE ON (RET)
```

7.5.2 How Up-Line Dumping Works

When the router software detects a fatal error, the router sends a MOP REQUEST PROGRAM message to its primary load host — the last load host to down-line load the software image. The router waits about 90 seconds for a response. If the primary load host responds, the router up-line dumps its data into its dump file in the router directory on the load host.

If this load host does not respond, the router multicasts the message to all DECnet hosts on the same Ethernet.

MOP dumps the data to a load host that has the router's dump file name in ROUCONFIG.DAT and that accepts the dump request. ROUCONFIG.DAT is in the router directory and MOP creates the file here. If the router dumps more than once, MOP creates a new version of that file.

After the dump is made, the DECrouter 200 hardware unit automatically multicasts a down-line load request.

Figure 7-8 shows router ROBIN up-line dumping its memory to HOST1.

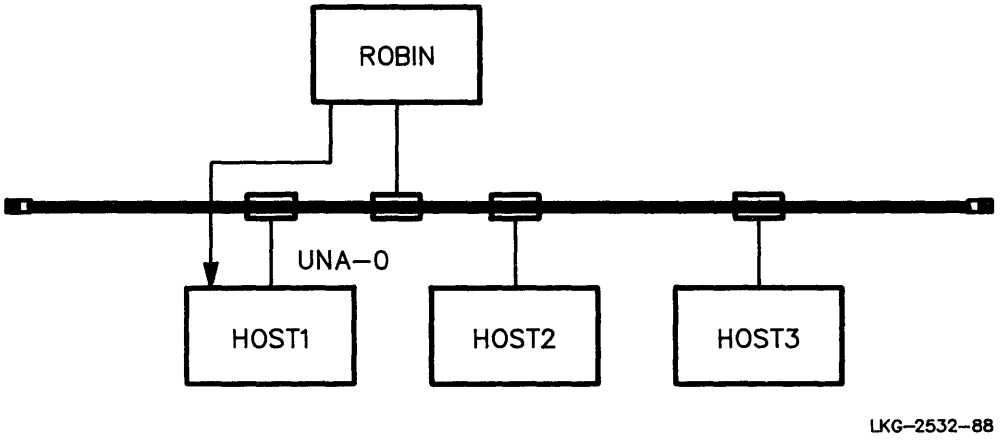

Figure 7–8: Up-Line Dump of DECrouter 200 Memory

To find out which load host received the dump, check each system's event-logging console or monitor for a type 0.3 event message that shows the dump was successful. If you know your router's primary load host, try this one first. You can also issue a command to display the date of the latest dump file. For example, on a VAX/VMS V4.6 load host, issue:

```
$ SET DEFAULT SYS$COMMON:[DECSERVER] RET
$ DIRECTORY/DATE RTRnode-name.DMP RET
```

The following example shows two event messages typically seen on a VAX/VMS load host. The load host is node FALCON and the router is node ROBIN.

```
 Event type 0.3, Automatic service
Occurred 10-NOV-86 14:12:23 on node 132 (FALCON)
Circuit UNA-0
Service type = Dump
Status = Requested
File = DL1:[1,6]RTRROBIN.DMP

 Event type 0.3, Automatic service
Occurred 10-NOV-86 14:13:20 on node 132 (FALCON)
Circuit UNA-0
Service type = Dump
Status = Successful
File = DL1:[1,6]RTRROBIN.DMP
```

7.6 DECnet Counters

To help you isolate problems, you can use NCP to check the router's DECnet counters for the DECrouter 200 node and the Ethernet circuit. Sections 6.4.1 and 6.4.2 discuss the DECnet counters.

8
Troubleshooting

This chapter helps you isolate the cause of problems with the DECrouter 200 hardware or software, including the Ethernet and asynchronous line connections. It assumes your DECrouter 200 hardware unit has been properly installed, the system image has been properly installed on your load host, and the DECrouter 200 is installed to operate within the network.

Problems addressed here fall into several broad categories:

- Hardware problems with the DECrouter 200 or associated hardware components
- Problems with loading the system image into the DECrouter 200 hardware from the load host
- Problems communicating between the DECrouter 200 and adjacent nodes
- Problems with dial-back lines
- Problems communicating between the DECrouter 200 and wider area DECnet nodes
- DECrouter 200 system crashes

If a problem exists in a hardware component other than the DECrouter 200 itself, or if the problem is in a node other than the DECrouter 200, this chapter will assist you in determining where the problem is. Final analysis of those types of problems will require you to refer to the troubleshooting instructions associated with the external hardware or node.

Troubleshooting the DECrouter 200 involves isolating DECrouter 200 internal problems from port device problems (Ethernet or asynchronous line connections). Some external components and parts are customer-replaceable. Most parts must be replaced by a qualified Digital service representative. For any hardware malfunction with the DECrouter 200 hardware unit or any of its cables, call Digital for replacements. For malfunctions related to the connected modem, call Digital or the appropriate vendor for resolution of the problem.

Several important tools you can use to help determine the cause of the problem include:

- The LED status displays on the DECrouter 200 hardware unit.
- The diagnostic messages generated by the DECrouter 200 hardware unit during its self-test at start up. This output is obtained by connecting a terminal to the J1 port of the DECrouter 200. The terminal must be configured to operate with a speed of 9600 bps and with a character size of 8 bits with no parity. (The diagnostic messages are generated before the system image is loaded. The ASYNC-1 circuit does not have to be set up for STATE MONITOR.)
- Event logging on the logging host system.
- The Network Control Program (NCP) status and error counters.
- The NCP loopback tests.

Before using these tools, be sure that the following conditions have been met:

- A terminal is available to connect to the DECrouter 200 J1 port to display diagnostic messages.
- Event logging is enabled at the load host system. Refer to that system's DECnet documentation for information on enabling event logging relating to down-line load requests and status information.
- Event logging is enabled and event filtering is disabled on the system selected to be the logging host for the DECrouter 200. Refer to that system's DECnet documentation for information on enabling event logging so as to log events received from remote nodes.
- Event logging is enabled and event filtering is disabled on the DECrouter 200.
- The host system from which you will diagnose the DECrouter 200 has the ability to issue NCP commands for remote execution (using the NCP TELL or SET EXECUTOR NODE command).
- The asynchronous port and Ethernet port loopback connectors which were shipped with the DECrouter 200 hardware unit are available for use.

8.1 Hardware Problems

To determine if the DECrouter 200 hardware unit is faulty, use the hardware self-test that runs automatically when you power on the hardware unit. The test uses the four LEDs on the hardware unit's control/indicator panel to indicate the status of the DECrouter 200 and any problems detected. Table 8-1 lists the four LEDs along with an explanation of their various states. Figure 8-1 illustrates the location of the four status LEDs on the DECrouter 200 control/indicator panel.

Table 8–1: Status/Error Indications on LEDs

LED Name	LED Definition	State	Indications
D1	Power ON/OFF	ON	The router's DC voltages are correct.
		OFF	The router's DC voltages are NOT correct.
D2	Diagnostic	ON	Self-test passed
		OFF	Fatal error or test-in-progress
		Blinking	Non-fatal error
D3	Software	ON	Software successfully loaded
		OFF	Down-line load in progress
		Blinking	Multiple load failure
D4	Network Activity	ON*	Indicates activity on the activity network

* May be ON, OFF, or flickering, depending on the amount of traffic on the network.

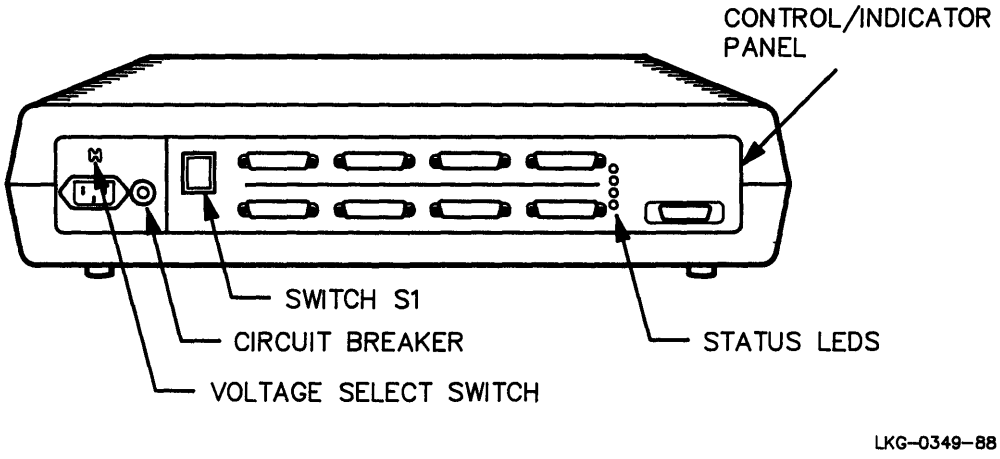

Figure 8–1: DECrouter 200 Control/Indicator Panel

8.1.1 Running the Self-Test

Start the hardware self-test by unplugging and replugging the hardware unit's power cord. The LEDs should all light for about 1 second after power is applied. This is a test to verify that all the LEDs are operational. If any of the LEDs do not light for this 1 second interval, the DECrouter 200 hardware unit should be replaced. If none of the LEDs illuminate, then power may not be reaching the DECrouter 200 unit. Diagnose this problem by following the instructions in Section 8.1.1.1.

- If LED D1 does NOT turn on, see Section 8.1.1.1.
- If LED D1 does turn on, then wait about 20 seconds for the self-test to complete. Observe LED D2.
- If LED D2 stays off, see Section 8.1.1.2.
- If LED D2 starts blinking, see Section 8.1.1.3.
- If LED D2 turns on, the self-test completed with no hardware faults being detected. The down-line load will proceed. Observe LED D3 for the status of the load. It will be off while the load is in progress. The load should take about two minutes.
- If LED D3 starts blinking, see Section 8.1.1.4.
- If LED D3 does NOT turn on, the down-line load is still in progress.
- If LED D3 does come on, then the DECrouter 200 is working properly.

8.1.1.1 Power LED D1 Off — No DC Voltage — This indicates that power is not reaching the DECrouter 200 hardware unit.

Possible Causes and Remedies:

- The power cable is not connected securely

  Secure the power cable at the DECrouter 200 and at the wall outlet. Also, check the wall outlet by plugging another device into the outlet or by plugging the DECrouter 200 into another outlet. If the other device also does not work, or if the DECrouter 200's LED D1 illuminates when the DECrouter 200 is plugged into another outlet, then the original outlet is faulty. Have it repaired.

- Voltage-select switch set incorrectly

  Ensure that the voltage select switch is properly set. (See the *DECrouter 200 Hardware Installation/Owner's Guide.*)

- Voltage overload

  Check the circuit breaker on the control/indicator panel of the DECrouter 200. If the white center of the circuit breaker is protruding, a voltage overload has occurred. Reset the breaker by pressing the white center in.

  Caution

  If the circuit breaker trips, do NOT attempt to reset it more than once. Contact Digital Field Service or return the unit to Digital for repair.

  The circuit breaker may have tripped because of a faulty Ethernet interface. Disconnect the transceiver cable and attach theEthernet loopback connector. If LED D1 now illuminates at power up, check the transceiver cable and transceiver for faults.

- Defective power cord

  Check for a defective power cord by using the power cord from another device (such as a VT200 terminal) as a temporary replacement.

If none of the above corrective measures works, then a hardware fault is likely. You may need to have your DECrouter 200 replaced (see Section 8.5.2).

8.1.1.2 Diagnostic LED D2 Off After 20 Seconds — If D2 remains off for more than 20 seconds after LED D1 illuminates, there is a fatal (hardware) error. You must return the DECrouter 200 unit to Digital for repair.

8.1.1.3 Diagnostic LED D2 Blinking — If D2 blinks after power-up, the DECrouter 200 has detected a nonfatal error during the self-test. Connect a terminal to the J1 port of the DECrouter 200. Note that the terminal must be configured as described at the beginning of this chapter, and that a null modem cable such as the BC22D or BC17D must be used to connect the terminal to the DECrouter 200. Reapply the power to the unit, and look for any error messages displayed on the terminal. If D2 blinks, but no messages appear, then either the J1 port is faulty, the terminal is configured improperly, or the terminal is faulty.

Possible error messages include:

- Local -922- Hardware Error on Port n

  The indicated port was found to be faulty by the diagnostic code. The DECrouter 200 should be returned for repair. Note that the DECrouter 200 system image will still attempt to load. The DECrouter 200 will disable the broken port. It is possible to run the DECrouter 200 with the broken port, by connecting the node or modem to a good port.

- Local -932- Hardware revision level checksum error

  This error indicates that the DECrouter 200's non-volatile memory is faulty. The DECrouter 200 should be returned for repair.

- Local -941- Transceiver loopback error

  This error indicates that a normal loopback test on the Ethernet port failed. Check that the cable connecting the DECrouter 200 to the Ethernet is securely installed.

  If the DECrouter 200 is connected to a standalone DELNI, be sure that theLocal/Global switch on the DELNI is set to Local mode. If your DECrouter 200 is connected to a two-tiered DELNI, the DELNI on the first tier should be set to Local mode.

  If the preceding checks fail to isolate the cause of the problem, then follow the procedures described in the *DECrouter 200 Hardware Installation/Owner's Guide* to isolate the fault.

8.1.1.4 Software LED D3 Blinking — D3 blinking indicates a failure to load the DECrouter 200's system image after three attempts were made. The DECrouter 200 will not be operating. Enable event logging for events 0.3 and 0.7 on all DECnet load hosts that may be loading the DECrouter 200.

Connect a terminal to the J1 port of the DECrouter 200. Note that the terminal must be configured as listed at the beginning of the chapter, and that a null modem cable such as the BC22D or BC17D must be used to connect between the DECrouter 200 and the terminal. Reapply the power to the unit and look for any error messages displayed on the terminal. The following discusses some down-line load problems that may cause LED D3 to blink:

Problem 1: The down-line load never starts

This condition is indicated by the following two messages (in order):

Local -902- Waiting for image load

Local -912- Load failure, timeout

This indicates that the DECrouter 200 sent a load request to the Ethernet, but no host responded.

Possible Causes and Remedies:

- No available load hosts are installed on the same Ethernet segment as the DECrouter 200.

  Be sure that the DECrouter 200 distribution software has been installed on the load host. If the software has been installed, be sure that the load host system is up and that the load host is located on the same Ethernet segment as the DECrouter 200. Be sure that the Ethernet controller of the load host has service enabled. To verify that the Ethernet controller is service enabled and that the DECrouter 200 and the load host are on the same Ethernet segment, go to the load host and issue the following NCP command:

  NCP LOOP CIRCUIT *circuit-id* PHYSICAL ADDRESS *E-address*

  where *circuit-id* identifies the load host's Ethernet controller connected to the same Ethernet segment as the DECrouter 200 (such as UNA-0), and *E-address* is the DECrouter 200's Ethernet address. The DECrouter 200's Ethernet address is located on a sticker just below the J8 port on the DECrouter 200's control/indicator panel.

  If the LOOP command does not complete successfully, then any of the following conditions may be indicated:

  - The DECrouter 200 and the load host are not on the same Ethernet segment.
  - The load host's Ethernet controller is not service enabled.
  - There is a hardware problem with the load host connection to the Ethernet.
  - There is a problem with some Ethernet hardware between the DECrouter 200 and the load host (for example, a broken or segmented DEREP repeater).

If the LOOP command completes successfully, then one of the following possibilities exists:

- The DECrouter 200's distribution software was not installed properly on the load host.

  To verify that the software was installed on the intended load host, run the ROUCONFIG procedure as described in the appropriate *DECrouter 200 Software Installation Guide.* If ROUCONFIG does not run, then the software has not been installed on the desired load host, or the software has been deleted from the load host.

  If ROUCONFIG does run, use the "List known DECrouters" option and verify the following:

  - That the identified service circuit is indeed the Ethernet controller on the load host connected to the same Ethernet segment as the DECrouter 200
  - That the listed Ethernet address is the same as the DECrouter 200's Ethernet address
  - That the listed load file exists on the load host and has not been accidentally deleted

  If the service circuit or Ethernet address is incorrect, then use the "Swap an existing DECrouter" option to enter the correct identifier of the service circuit or the correct Ethernet address.

  If the load file has been deleted, then use the "Delete an existing DECrouter" option to remove any DECrouter 200-related information from the ROUCONFIG database (ignore the error message that indicates the system image could not be deleted), and then use the "Add a DECrouter" option to redefine the DECrouter 200. Remember to reconfigure the new system image with DRCP before attempting to reload the DECrouter 200.

  If the software is installed properly and the required files are present, then consider the possible causes and remedies listed below.

- The down-line load information in the load host's node database is not correct.

  You can examine the down-line load information for the DECrouter 200 in the load host's node database by issuing an NCP SHOW NODE *rtr-node-id* CHARACTERISTICS command, where *rtr-node-id* is the DECnet node name of the DECrouter 200.

If you have previously verified that the ROUCONFIG database contains correct information about the load host's service circuit and the DECrouter 200's Ethernet address, and you have verified that the load file exists, then you should run ROUCONFIG and select the "Restore existing DECrouters" option to restore the correct down-line load information into the load host's node database.

Note that if the node database on the load host was ever deleted and then redefined, you must restore the DECrouter 200 down-line load information into the load host's node database after that database is redefined. Refer to the appropriate *DECrouter 200 Software Installation Guide* for instructions on how to do this.

- The load host's Ethernet controller has service disabled.

  The Ethernet controller (which connects the load host to the same Ethernet segment as the DECrouter 200) must have service enabled or it will not respond to requests for down-line loading. Issue an NCP SHOW CIRCUIT *circuit-id* CHARACTERISTICS command to display whether service is enabled for the Ethernet controller identified by *circuit-id*. If service is disabled, enable service on the Ethernet.

- Some other problem with the load host.

  If the troubleshooting procedures suggested thus far in this section fail to isolate the cause of the problem, you must work with the network manager responsible for the load host to determine why the load host is ignoring load requests from the DECrouter 200. Examine all event-logging messages generated by the load host.

Problem 2: Down-line load starts, then fails

This condition is indicated by the following three messages in order:

Local -902- Waiting for image load

Local -903- Loading from host *E-address*

Local -912- Load failure, timeout

Possible Causes and Remedies:

This indicates that the DECrouter 200 sent a load request to the Ethernet, that the host at Ethernet address *E-address* answered the request, but that the specified host did not complete the load.

To isolate the cause of this problem, first determine which host responded (that is, the node with the Ethernet address identified in the "Local -903-" error message, above).

Consider the following possibilities:

- The node attempting to load the DECrouter 200 is not a DECnet node.

  If the Ethernet address of the load host does not begin with "AA-00-04-00", then the host attempting to load the DECrouter 200 is not a DECnet node. The network manager should identify the host and prevent it from interfering again with the loading of the DECrouter 200.

  If the address does begin with "AA-00-04-00", then the remaining two sets of hexadecimal digits contain the DECnet node address of the node attempting to load the DECrouter 200.

  The procedure for extracting the DECnet node address from the Ethernet address is best demonstrated with an example. If the host Ethernet address displayed by the "Local -903-" message was "AA-00-04-00-F7-DF", then the trailing four hexadecimal digits ("F7-DF") contain the DECnet node address. To translate these digits into the DECnet node address, do the following:

  1. Reverse the two pairs: "F7-DF" becomes "DF-F7".
  2. Translate the hexadecimal number into its bit representation. The top 6 bits of these hexadecimal pairs contain the area number, and the lower 10 bits of the hexadecimal pair contain the node number within the area.

     In our example ("DF-F7"), the area is 55 (decimal) and the node number is 1015 (decimal). So, the DECnet node attempting to load the DECrouter 200 is the node with the DECnet node address 55.1015.

  Once you have determined the node address of the node that tried to load the DECrouter 200, consider the following possibilities and take the appropriate actions described:

- The node attempting to load the DECrouter 200 is not the intended load host.

  If the node attempting to load the DECrouter 200 is not the intended load host, then examine that node's node database to determine why it is responding to the load request from the DECrouter 200. First, issue an NCP SHOW NODE *rtr-node-id* CHARACTERISTICS command at the host node attempting to load the DECrouter 200 (*rtr-node-id* is the DECnet node name of the DECrouter 200).

  If the DECrouter 200 node is known to the host system, and if the NCP SHOW NODE display lists the correct Ethernet address of the DECrouter 200, then you must work with the network manager responsible for the node attempting to load the DECrouter 200. Any down-line load information associated with the DECrouter 200 should be removed from the node's node database.

- The DECrouter 200 is not known to the node attempting to load the DECrouter 200,

  or

- The DECrouter 200 is known but has no associated Ethernet address listed in the NCP SHOW NODE display,

  or

- The DECrouter 200 is known but the associated Ethernet address listed in the display is incorrect.

  If any of these conditions is evident after using the NCP SHOW NODE CHARACTERISTICS command on the node attempting to load the DECrouter 200, then some other node in the node database was inadvertently associated with the same Ethernet address as the DECrouter 200 (perhaps a typing error while entering the Ethernet address for a node).

  Locate the node entry which lists the same Ethernet address as the DECrouter 200 by examining node characteristics for all nodes known to the node attempting to load the DECrouter 200. One way to do this is to issue an NCP SHOW KNOWN NODES CHARACTERISTICS command and examine all entries which have an Ethernet address displayed. You might be able to save time by commanding NCP to direct the output to a file (use the "TO *filename*" extension with the SHOW command), and then using your favorite editor to search the output file for the Ethernet address of the DECrouter 200.

- Node attempting to load the host is the intended load host, but it has a problem.

  If the node identified by the Ethernet address displayed in the "Local -903-" message is the intended load host, then there is a problem with that host system which causes the down-line load to fail. Follow the instructions listed under the second possible cause for Problem 1 (above) to verify that the software installation is complete and correct.

8.2 Problems Communicating with Adjacent Nodes

The following types of communication problems may develop between the DECrouter 200 and adjacent nodes:

- Generic configuration problems
- Asynchronous port configuration problems
- Dial-back line problems
- Ethernet port configuration problems

Regardless of the type of port connecting the adjacent node, first verify that the problem is not one of the generic configuration problems described in Section 8.2.1.

8.2.1 Generic Configuration Problems

Many routing parameters affect the ability of the DECrouter 200 to communicate with adjacent nodes. Make sure that the following parameters are set appropriately. For most of these parameters, you can use the Monitor utility (see Section 8.3) to verify that they are set appropriately.

You can modify these parameters by using DRCP. For the new parameter values to take effect, you must reload the DECrouter 200.

- MAXIMUM ADDRESS parameter must not be set too low.

  If the MAXIMUM ADDRESS parameter is set too low, then the DECrouter 200 will not recognize or initialize with any node which has a node address greater than the specified maximum address.

  There is no significant tradeoff for setting this parameter to the highest value possible for the DECrouter 200 (that is, it will not trade off additional memory or decrease performance), but if the value is too high, bandwidth on the Ethernet and asynchronous ports will be lost due to the transmission of unnecessarily large routing update messages.

  Also remember that even if the MAXIMUM ADDRESS parameter is set appropriately, Phase III nodes cannot talk to Phase IV nodes which have addresses larger than 255. (An "Address out of range" event message will be logged on the Phase III node when it tries to communicate with such a Phase IV node.)

- Area numbers must match.

  Because the DECrouter 200 is a level 1 router, it will initialize only with nodes in the same area. If the adjacent node is in a different area, then it must be connected to a level 2 router instead of the DECrouter 200, or its area number must be changed to match the DECrouter 200's area number.

- MAXIMUM BROADCAST NONROUTERS parameter must not be set too low.

  Setting this parameter too low can cause nodes to be intermittently unreachable. This parameter is used by the DECrouter 200 to determine the greatest number of end nodes (within the same area as the DECrouter 200 and on the same Ethernet LAN as the DECrouter 200) for which it will store routing information. Thus, if the DECrouter 200 is the only router on an Ethernet LAN, and if this parameter's value is set too low, then when the number of Ethernet end nodes exceeds this value, any remaining Ethernet end nodes will be marked as unreachable.

  If the value of the MAXIMUM BROADCAST NONROUTERS parameter is set too low, several conditions can occur that complicate troubleshooting and management. For example, if one node becomes unreachable, such as when the connecting line or system fails, this leaves an "opening" in the DECrouter 200's routing database. Therefore, another node which had once been marked as unreachable because the parameter's limit had been exceeded will now become reachable.

As another example, if this parameter is set too low on one Ethernet router in the area, but set large enough on another, then all routing traffic received by the former router and destined for those nodes which exceed the parameter's value will be forwarded an extra hop through the second router.

Set the parameter to a value that is high enough to avoid the above-mentioned problems. However, do not set the parameter any higher than is needed. (Some extra leeway can be given to accommodate future expansion of the network. This will save you from having to modify the permanent database and reload the DECrouter 200 every time an end node is added to the DECrouter 200's Ethernet LAN.) If the value of the parameter is too high, this will introduce additional processing requirements on the DECrouter 200 for handling the routing overhead.

The Monitor display shows the number of end nodes on the DECrouter 200's Ethernet. Use this number to determine the proper value for the MAXIMUM BROADCAST ROUTERS parameter.

- MAXIMUM BROADCAST ROUTERS parameter must not be set too low.

  Setting this parameter too low can cause nodes to be intermittently unreachable. This parameter is used by the DECrouter 200 to determine the number of level 2 routers (within the same area and on the same Ethernet LAN as the DECrouter 200) for which it will store routing information. If this value is set too low, then when the number of Ethernet routers exceeds this value, the lowest priority routers will be marked as unreachable, and information about them will be discarded from the DECrouter 200's routing database. Then, the DECrouter 200 cannot use these routers to access certain remote nodes but will have to access them using other routers.

  Set the value of the parameter so that it is large enough to avoid the above-mentioned problems. However, do not set the parameter any higher than is needed. (Some extra leeway can be given to accommodate future expansion of the network. This will save you from having to modify the permanent database and reload the DECrouter 200 every time a router is added to the DECrouter 200's Ethernet LAN.) If the value of the parameter is too high, this will introduce additional processing requirements on the DECrouter 200 for handling the routing overhead.

  The Monitor utility displays the number of routers on the same Ethernet as the DECrouter 200. Use this number to determine the proper value for the MAXIMUM BROADCAST ROUTERS parameter.

- MAXIMUM COST parameter must not be set too low.

  If the MAXIMUM COST parameter is set too low, then packets traveling long distances (over paths with high path costs) through the network will be discarded before they arrive at their destination. This problem will cause some nodes to be reachable only from nodes that are physically close to the DECrouter 200.

The parameter must be set appropriately. Note that if the parameter's value is set too high, the network will be exchanging more information and will take longer to reconfigure when a topology change occurs.

- MAXIMUM HOPS parameter must not be set too low.

  Set this parameter to the appropriate value.

  If the MAXIMUM HOPS parameter is set too low, then packets traveling long distances through the network will be discarded before they arrive at their destination. This problem will cause some nodes to be unreachable if they are physically distant.

  If the parameter is set too high, certain topology changes may cause an excess of traffic in the network, because packets that are looping through the network will be able to continue looping for longer times before being discarded. This will consume more resources on routing nodes.

- The value of the PATHSPLITS parameter must not exceed 1 unless all nodes that may be destinations for packets sent over the paths of equal costs support "out-of-order packet caching." If PATHSPLITS is set to a value other than 1 and certain nodes do not support out-of-order packet caching, this will cause problems in communications from and to those nodes.

8.2.2 Asynchronous Port Communication Problems

The following problems may occur when nodes connected to the DECrouter 200 by the asynchronous ports are unable to communicate with the DECrouter 200. It is assumed that you have already gone through the checks described in Section 8.2.1, and the suggested troubleshooting procedures did not resolve the problem.

Problem 1: Port cable improperly attached

Remedy: Verify that each port cable is secure at both the DECrouter and the adjacent node.

Problem 2: Circuit turned off

Verify that the circuit has not been turned off. To display the state of the circuit, refer to the Monitor display or type the NCP SHOW CIRCUIT command for remote execution at the DECrouter. If the circuit is off, use the NCP SET CIRCUIT command to turn it on.

Problem 3: Mismatch of line parameters and connected devices

Check for the following to remedy this problem:

1. Make sure the parameters defined for the DECrouter 200's asynchronous port match the devices connected to them:
   - Line speed must match that set for the connected device. The Monitor displays the speed of each line.
   - The device connected to the DECrouter 200 must be an asynchronous device (see the *DECrouter 200 Software Product Description (SPD)* for supported communications options).
   - The system/device connected to the DECrouter 200 must be running DDCMP as the data link protocol between the DECrouter 200 and that system (see the *DECrouter 200 Software Product Description* for supported systems/devices).
   - Modem Control must be enabled via DRCP if the attached device is a modem, a modem replacement device, or if it requires modem control signals (see the cable discussion below). The Monitor displays whether the line is connected by a modem.
   - Modem Control must be disabled via DRCP if the attached device is not a modem or a modem replacement device, or if it does not desire modem control signals.
   - The connected device must be operating full-duplex.
   - The connected device must be set to 8-bit character size with no parity.
   - If verification is enabled on the circuit, and if the adjacent node was entered in the DECrouter 200 node database (via DRCP) along with a receive password, then the transmit password on the adjacent node must match that receive password.
   - If verification is enabled on the circuit, and if the adjacent node was entered in the DECrouter 200 node database (via DRCP) with a transmit password, then the receive password on the adjacent node must match that transmit password.
2. Make sure that the appropriate cable is being used for the type of device connected to the DECrouter 200. Possible cable types are:
   - BC22D or BC17D null modem cables: used to attach directly to devices that DO NOT require modem control signals.

- BC17D null modem cable: used to attach directly to devices that DO require modem control signals.
- BC22E or BC22F straight through cables: used to attach directly to modems or modem replacement devices (that is, null modem boxes, short haul modems, etc.).

3. If the line connected between the DECrouter 200 and the adjacent node is being run at an excessively high speed, then communications between the DECrouter 200 and the adjacent node may not be possible because too much data is being lost. Type the NCP SHOW KNOWN CIRCUITS COUNTERS command for execution at the DECrouter and check the following counters:

   - Data Errors Inbound
   - Data Errors Outbound
   - Remote Reply Timeouts

   If any of these counters display an appreciable error rate, especially if the error rates indicate NAKs (negative acknowledgments) due to CRC (cyclic redundancy check) failures, then the speed may be too high for the line, or it may be too high for the adjacent node. Try reducing the line speed and retrying the connection. Note that what is an "appreciable error rate" depends on the situation. You must monitor these circuits over a significant time to become familiar with what is a normal error rate for each line. Over a given duration, consider (1) the number of inbound errors relative to the total number of packets received and (2) the number of outbound errors relative to the total number of packets sent. If any of these percentages is abnormally high, then the line speed may be inappropriate.

4. The last possible cause of the problem to investigate is a hardware failure. The following set of loopback tests should be followed using the guidelines supplied in Section 7.4:

   - Attach the asynchronous port loopback connector (supplied with the DECrouter 200 hardware unit) directly to the DECrouter 200 port which is having the problem. Use the NCP LOOP CIRCUIT command to test that port. (Issue the command for execution at the DECrouter 200.)

     If the test does not complete successfully, then there is a problem with the port on the DECrouter 200. You should have the DECrouter replaced. Note that you can still use the DECrouter 200. Do not use the faulty port; use a different one until the DECrouter is replaced.

If the loopback test completes successfully, then this hardware port is not faulty. Try the following test:

- If the asynchronous port on the DECrouter 200 is not faulty, reconnect the appropriate cable to that port, ensuring that the cable is firmly attached. Connect the loopback connector to the other end of the cable (at the adjacent node that is connected by the cable) and rerun the same LOOP CIRCUIT test just performed.

  If the test fails, then the cable or the cable connections at the adjacent node are faulty.

  If the test completes successfully, both the DECrouter 200 port and the cable are operational. If the cable terminates directly into another node (that is, without a modem), then that node's connectivity should be tested, using the test procedures recommended for that node.

- If the cable terminates at a modem, and if that modem supports local loopback tests, then switch the modem into local loopback mode and rerun the same LOOP CIRCUIT test.

  If the test fails, then either the DECrouter 200's line parameters and the modem do not match (see the first step under Problem 3, above), or the modem is faulty.

  If the modem does not support local loopback mode, then see the documentation supplied with the modem for procedures to test the modem.

- If the modem local loopback test completes successfully, switch the local modem back out of local loopback mode. If the remote modem supports remote loopback tests, then switch the remote modem into loopback mode and rerun the same LOOP CIRCUIT test.

  If the test fails, or if the remote loopback test cannot be run, then either the configuration of the two modems does not match, or one of the modems is faulty. See the documentation supplied with the modems for procedures to test the modems.

  If the remote loopback test succeeds, then the DECrouter 200 port, the cable between the DECrouter 200 and the local modem, the local modem, and the remote modem are not at fault.

- At this point, similar tests should be run from the node connected to the asynchronous port to diagnose possible problems with that node or with the modem connected to that node. Remember that in most cases initialization problems are caused by incompatible configuration, meaning that parameter values are not set appropriately to match the network configuration.

8.2.3 Dial-Back Problems

The following troubleshooting steps help isolate problems that may exist when dial-back failure occurs. These steps verify that both the router and the attached modem are configured for automatic dialing to a remote node.

1. At one of the router's load hosts, run DRCP.
2. Issue the SHOW LINE command and check that:
   - The line being dialed has CONNECTION TYPE DIALBACK set.
   - The MODEM type is correctly set. These are the valid values for the MODEM parameter according to the kind of software distribution kit you have:

Software Kit	Values for MODEM
Non – PTT	DF03 DF112 DF224 CODEX HAYES
PTT	V25BIS

   - The line's IDENTIFICATION NUMBER parameter is set correctly, if you have a PTT kit.
   - The baud rate set for the modem and LINE SPEED for the router's line are compatible.
   - The baud rate set for the remote line and LINE SPEED for the router's line are compatible.
3. Issue the SHOW NODE command and check that the DTEADDRESS (phone number) for the remote node is defined correctly.
4. Issue the SHOW CIRCUIT command to verify that the circuit STATE is ON.

After the router's modem answers the remote node's modem, the remote node's modem should be switched to data mode (autoanswer). The remote modem must be in this state waiting for the router to dial back. However, if the remote node's modem is not switched to autoanswer after the initial answer from the router, dial-back fails.

When a call failure occurs, the response from the router and what you can do depends on the type of kit you have:

- **Non-PTT kit**. The router attempts to redial according to the line values you specified for CALL ATTEMPTS and RECALL TIMER. If dial-back continues to fail, follow these steps:
  - Check that the router's modem switches are set correctly. See Appendix D for the correct settings.
  - If the modem is a DF03, check that it has the DF03-AC option (board M7177).
  - If the modem is either a Hayes Smartmodem 2400 or a Codex 2233, reinitialize the modem to the factory defaults and then reset it. Attach an asynchronous terminal to the modem and at the keyboard type:

    ```
    AT&F (RET)
    ATS0=2&D2E0V0&C1&S1&M0&W (RET)
    ```

  - If the modem is a Codex 2260, reinitialize the modem to the factory defaults and then reset it. Attach an asynchronous terminal to the modem and at the keyboard type:

    ```
    AT&F (RET)
    AT*AA2&D2E0V0&C1*MR0&M0&W0 (RET)
    ```

  If these steps fail, call the appropriate software specialist or Field Service.
- **PTT kit**. The router does not attempt to redial the number. Follow these steps to try to identify a problem:
  1. Check that the modem is V.25 *bis* compatible.
  2. Check that the modem is set to: 7 bit; even parity; 1 stop unit element.

If these steps fail, call the appropriate software specialist or Field Service.

8.2.4 Ethernet Port Configuration Problems

The following troubleshooting tests help isolate problems that may occur when nodes attached to the Ethernet are unable to communicate with the DECrouter 200. The tests check connections between the DECrouter 200 and nodes on the Ethernet, beginning with the connections on and nearest to the DECrouter 200 and proceeding toward the Ethernet nodes. This section assumes you have already referred to Section 8.2.1 and the problem has not been isolated by the suggested procedures.

NOTE

If communication problems exist between the DECrouter 200 and the Ethernet, it may be necessary to diagnose the problem from a node attached to an asynchronous port or a node that can reach the DECrouter 200 via routing over an asynchronous port.

8.2.4.1 Testing the Ethernet Port and Ethernet Connections — To test the Ethernet port and Ethernet connections, do the following:

- Verify that the DECrouter 200 Ethernet transceiver cable is secure at both the DECrouter and the Ethernet transceiver.
- Verify that the Ethernet circuit has not been turned off. To display the state of the circuit, type the NCP SHOW CIRCUIT ETHER-1 command for remote execution at the DECrouter. If the circuit is off, type the NCP SET CIRCUIT ETHER-1 STATE ON command for remote execution at the DECrouter.
- Issue an NCP LOOP CIRCUIT ETHER-1 command for remote execution at the DECrouter. Issue the command from a node connected by one of the DECrouter 200's asynchronous ports. Do not specify the NODE or PHYSICAL ADDRESS parameter. This will cause a multicast loop-request to be generated so that any available host on the Ethernet will respond.

  If the test completes successfully, then the DECrouter 200 Ethernet port, transceiver cable, and transceiver are not at fault. Communications can be established with at least one other node on the Ethernet.

  Run similar tests from the node having problems communicating with the DECrouter over the Ethernet. Refer to the documentation associated with that node for procedures to test that node's ability to communicate on the Ethernet.

  If the test fails, proceed to the next section, which explains how to verify the DECrouter 200's Ethernet port.

8.2.4.2 Verifying Power on the Ethernet Port — Disconnect the transceiver cable from the Ethernet port on the DECrouter 200, and attach the Ethernet loopback connector (supplied with the DECrouter 200 hardware unit).

Note that the green LED on the Ethernet loopback connector should be illuminated, indicating that power is available at the Ethernet port on the DECrouter 200. The green LED only indicates power; it does not indicate that data can be transmitted or received properly.

If the green LED does not illuminate, then try the loopback connector on other systems to be sure the LED is not defective. If the LED illuminates on other systems, but not on the DECrouter 200, then the DECrouter 200's Ethernet port is not supplying power to run the transceiver. The DECrouter 200 needs replacing.

If the green LED does illuminate when the connector is attached to the DECrouter 200, then proceed to the next section, which explains how to verify that the DECrouter 200's Ethernet port is working correctly.

8.2.4.3 Verifying Operation of the Ethernet Port — If you have firmly connected the Ethernet loopback connector and the green LED illuminates, issue the following NCP commands for remote execution at the DECrouter 200. Issue the commands at a node connected by one of the DECrouter 200's asynchronous ports.

SET CIRCUIT ETHER-1 STATE OFF

SET LINE ETHER-1 CONTROLLER LOOPBACK

These commands prepare the DECrouter 200's Ethernet controller for loopback testing.

Now, run a circuit loopback test over the Ethernet connection by issuing the following command for remote execution:

LOOP CIRCUIT ETHER-1

NOTE

If you specify the LENGTH parameter with this command, the DECrouter 200 will ignore it and use the maximum possible length for testing.

If the test fails, then the Ethernet port on the DECrouter 200 is faulty. The DECrouter 200 must be replaced.

If the test completes successfully, the Ethernet port on the DECrouter 200 is operating properly. Proceed to the next section, which explains how to verify that the DECrouter 200's Ethernet transceiver cable is working properly.

8.2.4.4 Verifying the Transceiver Cable — Given now that the Ethernet port is proven operational, reconnect the transceiver cable to the Ethernet port on the DECrouter 200. Attach the Ethernet loopback connector at the other end of the transceiver cable and rerun the same LOOP CIRCUIT ETHER-1 test.

If the test fails, then the transceiver cable or the cable connections are faulty. Check the connections and/or replace the cable.

If the test completes successfully, then the transceiver cable is operating properly.

Now, switch the Ethernet controller from loopback mode to normal mode and turn on the Ethernet circuit by issuing the following NCP commands for remote execution:

SET LINE ETHER-1 CONTROLLER NORMAL
SET CIRCUIT ETHER-1 STATE ON

Proceed to the next section, which explains how to verify the Ethernet transceiver.

8.2.4.5 Verifying the Ethernet Transceiver — The following explains how to verify an H4000 transceiver, a DESTA ThinWire adapter, and a DECOM broadband transceiver. If your DECrouter 200 connects to a DELNI, skip to the next page.

If the transceiver cable terminates at an H4000 transceiver, then the H4000 or the connector to the transceiver may be defective.

Reconnect the transceiver cable firmly to the H4000 and run the loopback test again. If the test fails, try connecting the transceiver cable to another H4000 known to be good and rerun the test. If the test succeeds, replace the H4000 or the connector.

If the transceiver cable terminates at a DESTA ThinWire adapter, then the DESTA or the connector to the DESTA may be defective.

Reconnect the transceiver cable firmly to the DESTA and rerun the loopback test. If the test fails, try connecting the transceiver cable to another DESTA known to be good and rerun the test. If the test succeeds, replace the DESTA or the connector.

If the transceiver cable terminates at a DECOM broadband transceiver, then the DECOM or the connector to the DECOM may be defective.

Reconnect the transceiver cable firmly to the DECOM and rerun the loopback test. If the test fails, try connecting the transceiver cable to another DECOM known to be good and rerun the test. If the test succeeds, then replace the DECOM or the connector.

8.2.4.6 Verifying the DELNI Local/Global Switch Setting — If the transceiver cable terminates at a DELNI, reconnect the transceiver cable firmly to the DELNI and try the following tests:

- If the DELNI is in a standalone configuration, be sure that the local/global switch is set to local. Figures C-2, C-3, and C-4 in Appendix C show these configurations and highlight the proper DELNI switch setting for each.

  If the local/global switch is set to global, and there is no device attached to the DELNI Ethernet port (the port to the right of port 8), communications over the Ethernet are not possible.

- If the DELNI is in a two-tiered arrangement, be sure that the local/global switch is set to global on all DELNIs except the first-tier (top) DELNI. The first-tier DELNI must be set to local and cannot be connected to any other type of Ethernet transceiver.

- If the DELNI is attached directly to an H4000, DESTA, or DECOM, then be sure that the local/global switch of the DELNI is set to global, or else communications with nodes other than those connected to the DELNI will not be possible.

If the switch is set correctly, and the problem persists, proceed to the next section, which explains how to verify that the DELNI Ethernet port is supplying power.

8.2.4.7 Verifying Power at the DELNI Ethernet Port — If the DELNI local/global switch is set correctly, connect the Ethernet loopback connector to the DELNI Ethernet port. Set the local/global switch to global.

If the green LED on the Ethernet loopback connector illuminates on other systems, but not on the DELNI, then the DELNI Ethernet port is not supplying power to run the transceiver. Replace the DELNI.

If the green LED illuminates when the connector is attached to the DELNI Ethernet port, then proceed to the next section, which explains how to verify the DELNI and its transceiver cable.

8.2.4.8 Verifying the DELNI and Its Transceiver Cable — If the green LED illuminates, then go to a node connected by one of the DECrouter 200's asynchronous ports and issue the following NCP commands for remote execution at the DECrouter 200:

```
SET CIRCUIT ETHER-1 STATE OFF
SET LINE ETHER-1 CONTROLLER LOOPBACK
```

This prepares the DECrouter 200's Ethernet controller for loopback testing.

Now, run the loopback test by issuing the following NCP command for remote execution at the DECrouter 200:

```
LOOP CIRCUIT ETHER-1
```

NOTE

> If you specify the LENGTH parameter with this command, the DECrouter 200 will ignore it and use the maximum possible length for testing.

If the test succeeds, then the DECrouter 200 Ethernet port, the transceiver cable between the DECrouter and the DELNI, and the DELNI are operating properly. Be sure to return the local/global switch to its correct position. The problem may be with the DELNI's Ethernet transceiver or the transceiver cable.

If the DECrouter 200's DELNI is connected to another DELNI in a two-tier arrangement, proceed to the next section, verifying connections between DELNI tiers.

If the LOOP CIRCUIT test fails, then the DELNI, the DELNI port that connects to the DECrouter 200, or the transceiver cable connector on the DELNI is defective.

Reconnect the transceiver cable(s) firmly to the DELNI (a poor connection could cause the problem). Prepare the DECrouter 200's Ethernet controller for normal use by issuing the following NCP commands for remote execution:

```
SET LINE ETHER-1 CONTROLLER NORMAL
SET CIRCUIT ETHER-1 STATE ON
```

Now, rerun the loopback test. If the test fails, try connecting the transceiver cable from the DECrouter 200 to another DELNI port known to be good and then rerun the test. If the test succeeds, then replace the DELNI. If the test still fails, the Ethernet transceiver or transceiver cable may be at fault. Have these checked.

If the DELNI is not in a two-tier arrangement, run the tests already described from the node having problems communicating with the DECrouter over the Ethernet. Refer to the documentation associated with that node for procedures to test that node's ability to communicate on the Ethernet.

If the DELNI is in a two-tier arrangement, and the loopback test succeeded, proceed to the next section, which explains how to verify the connections between the second-tier and first-tier DELNIs.

8.2.4.9 Verifying Connections Between DELNI Tiers — If the DECrouter 200's DELNI is connected to another DELNI in a two-tiered arrangement, and if the LOOP CIRCUIT test run in the preceding section succeeded, do the following:

- Firmly reconnect the transceiver cable that runs between the two DELNIs.
- Attach the Ethernet loopback connector to the far end of this transceiver cable.
- Prepare the Ethernet for loopback testing by setting the Ethernet circuit state to OFF and changing the controller type to LOOPBACK, as explained previously.
- Make sure the local/global switch on the DELNI attached to the DECrouter 200 is set to global.
- Rerun the NCP LOOP CIRCUIT ETHER-1 test.

If the test succeeds, then all components and connections between the DECrouter 200 and the first-tier DELNI are operating correctly. Proceed to the next section, which explains how to verify the connections between the first-tier DELNI and the Ethernet.

If the test fails, then either the output port of the second-tier DELNI (the port to which the DECrouter 200 is attached) is defective, or the transceiver cable between the two DELNIs is defective, or the transceiver cable connection on either DELNI is defective. Have these devices checked. (When you return the DECrouter 200 to normal use, switch the Ethernet controller from loopback mode to normal mode by using the SET LINE command described earlier, and then set the Ethernet circuit state to ON.)

8.2.4.10 Verifying the First-Tier DELNI — The last test for the two-tiered DELNI configuration requires the following:

- Reconnect all the transceiver cables to all the appropriate devices.
- Be sure the first-tier DELNI is set to global mode.
- Connect the Ethernet loopback connector to the Ethernet port on the second-tier DELNI.

- Prepare the DECrouter 200's Ethernet controller for loopback testing. (From a node connected by one of the DECrouter 200's asynchronous ports, issue the SET CIRCUIT ETHER-1 STATE OFF and SET LINE ETHER-1 CONTROLLER LOOPBACK commands for remote execution).
- Set the local/global switch on the first-tier DELNI to global.
- Rerun the NCP LOOP CIRCUIT ETHER-1 test.

If the test fails, then there is a problem with either the first-tier DELNI or the transceiver connection on the first-tier DELNI, which leads to the second-tier DELNI.

If the test succeeds, then the connection from the DECrouter 200 through the first- and second-tier DELNIs to the Ethernet is operating properly. Be sure to reset the first-tier DELNI's local/global switch to local and to switch the DECrouter 200's Ethernet controller from loopback mode to normal mode (SET LINE ETHER-1 CONTROLLER NORMAL) and to set the Ethernet circuit state to ON.

At this point, run similar tests from the node having problems communicating with the DECrouter over the Ethernet. Refer to the documentation associated with that node for procedures to test that node's ability to communicate on the Ethernet.

8.3 Problems Communicating with the Wider DECnet Network

Most problems encountered while communicating across a wide area network are caused by assigning inappropriate values to configuration parameters on the nodes. Since the DECrouter 200 and other routers form the backbone of the DECnet network, it is important to configure these routing nodes properly.

First, make sure that area numbers and the following parameters are set appropriately on each node (see Section 8.2.1):

- MAXIMUM ADDRESS
- MAXIMUM COST
- MAXIMUM HOPS
- PATHSPLITS

Also, make sure that the value of the BUFFER SIZE parameter is consistent throughout the network. Because the DECrouter forwards data sent from or destined for many other nodes, the DECrouter 200's buffer size must be large enough to accommodate the largest message that will be routed through the network.

If the DECrouter 200's buffer size is too small to accommodate any incoming data packets for forwarding across the network, then those packets will be discarded. In this case, applications that send small packets (such as remote terminal applications or most network management commands) will work fine, but applications that send large packets (such as file transfers) will hang. To avoid this problem, be sure that all routing nodes have buffer sizes greater than or equal to the network segment size.

Fortunately, there is a simple solution to this problem for the DECrouter 200. There is no significant tradeoff incurred by setting the BUFFER SIZE parameter to the maximum value. So, set the parameter to its maximum value. Note, however, that this procedure should not be followed on other systems where the memory used by routing buffers is traded off against other memory requirements. Refer to the *Routing and Networking Overview* manual for further information on routing problems.

8.4 DECrouter Failures

The DECrouter 200 system is designed to "bugcheck" and force a "crash" when severe and unrecoverable errors occur. When a crash occurs, the DECrouter 200 will up-line dump a copy of its memory to an available load host on the same Ethernet as the DECrouter 200. (The load host must be configured to support up-line dumps of the DECrouter 200.)

If a crash occurs, or if the conditions that caused the crash to occur can be reproduced, you can do several things to assist Digital in isolating the cause of the problem:

1. Most important, send a copy of a crash dump file. Digital specialists can analyze this file and diagnose the problem.
2. Send all the information you can about the conditions that caused the crash to occur. If the crash can be reproduced at will, clearly document the steps necessary to cause the crash.

   Provide **all** the information you can. Frequently, information that does not seem important can turn out to be very useful in helping specialists diagnose a problem.
3. Also useful is a description of the network configuration in which the DECrouter operates, including:
   - What devices were connected to the asynchronous ports
   - What types of DECnet software (and their versions) were operating through the DECrouter 200
   - What speeds the asynchronous ports were operating at
   - Which, if any, of the asynchronous ports were operating with modem control

- How the DECrouter was attached to the Ethernet (through an H4000, a DELNI, a DESTA, etc.)
- What other routers were operating in the same area as the DECrouter 200 (both level 1 and level 2; please include a hardware description of the other routers and what software and version they were running)

If an up-line dump of the DECrouter 200's memory is made, send the dump file to Digital. Copy the file to a 1600 bpi magtape, a TU58 cartridge, a TK50 cartridge, or an RX01 or RX02 diskette. Indicate the format of the copy (BACKUP, FLX, etc.) on the media. Forward the data to the address available from your Digital representative.

8.5 Digital Service

The hardware and software service options available from Digital are described in the *DECrouter 200 Hardware Installation/Owner's Guide.* One hardware option and one software option operate on a DECrouter 200 system. Contact your Digital sales representative for more information.

8.5.1 Before Contacting Digital

If you have to seek assistance from Digital for DECrouter problems, the following steps will help Digital resolve the problems most promptly:

1. Be sure you have used the procedures described in this chapter.
2. Record your DECrouter 200's serial number, its software version number, and the information on the ECO Status label.
3. If possible, record the symptoms when the DECrouter failed. Record the troubleshooting steps you took and the results of these steps.
4. Try reproducing the problem. While doing so, collect more environmental data by answering the following questions. The data can help you or Digital specialists to isolate the cause of the problem.
   - What is the network configuration and what is the application?
   - What are the version numbers of the affected software?
   - Describe the problem.
   - How long has the problem been observed?
   - What was happening when the problem occurred?
   - Can you reproduce the problem?
   - What must you do to reproduce the problem?

- What was expected to happen that did not happen?
- What event messages did you receive?
- When did the DECrouter last run correctly?
- What has changed since then?
- What effect does the problem have on the application?
- Did a crash occur and result in a dump?

8.5.2 Repackaging the DECrouter for Shipment

If you return the DECrouter 200 to Digital for repair or replacement, pack the unit carefully. If possible, you should use the original shipping carton and packaging material.

9
NCP Command Descriptions

This chapter describes all the NCP commands you can use to manage the running router, including the commands that display and change values in the DECrouter 200's operational database. Use this chapter as a reference when you are on a remote node that has Network Management, known as a **management host**.

NOTE

> Before using NCP commands to manage your router for the first time, read Chapter 6 to learn about monitoring and modifying the router's operational database. In addition, before modifying parameters that you defined in the router's software image file with DRCP, see Volume II, Chapter 1, for an explanation of the router's parameters and guidelines for choosing values.

You can make many parameter changes in both the router's permanent database and its operational database. It is a good idea to start modifying your router's databases only after you understand the differences between making changes in the permanent database versus the operational database. Section 1.4.1 explains these differences.

NOTE

In this chapter's discussion of network management, documentation conventions that apply to DECnet–VAX are generally used. If your management host is another supported DECnet node, for example, DECnet–ULTRIX, these conventions may not be appropriate. For example, type NCP commands in lowercase on DECnet–ULTRIX management hosts.

The execution of NCP commands sometimes produces a message. See the DECnet documentation of the management host for a list of NCP error and status messages and their meanings. In general, see this documentation for more detailed information about NCP.

NOTE

Depending on the operating system, some management hosts may not support all the NCP commands and displays discussed in this chapter. See the network management documentation of the management host.

This manual discusses five categories of NCP commands that you can use to manage your router. Table 9-1 shows these categories. This chapter contains all the command descriptions for these NCP commands.

Table 9–1: Summary of NCP Commands for the DECrouter 200 Manager

Commands	Use
SET, SHOW, CLEAR	Displaying and modifying the running router's operational database
ZERO	Resetting counters
DEFINE/SET NODE	Manually modifying a load host's DECnet database
LOAD, TRIGGER	Down-line loading
LOOP	Troubleshooting

9.1 Conventions Used for Command Descriptions

The format for each command follows the graphic conventions in the Preface. In addition, the command descriptions follow these conventions:

- The command descriptions are presented in alphabetical order.
- Each command description includes:
  - A short statement of the command's use
  - The complete command syntax

  - A description of each parameter, with values and defaults
  - Examples
- Each example of the SHOW commands includes a typical display.
- For each NCP command that executes at the router, the command description indicates the network management privilege level of the command:
  - PRIVILEGED — A privileged operation if the router has a privileged password set.
  - NONPRIVILEGED — A privileged operation if the router has a nonprivileged password set.
- Each command format indicates whether the parameters are required or optional.
- Command formats usually list the parameters alphabetically. The SHOW commands sometimes give a logical list instead.
- Each command format shows the default parameter and the default parameter values in bold type.
- The parameter definitions follow the command format alphabetically by parameter. Definitions include parameter values and defaults.
- The examples of command lines, prompts, messages, and displays are from VAX/VMS management hosts, unless noted otherwise.

NOTE

NCP operates slightly differently on the various DECnet systems that support DECrouter 200 management. See the DECnet documentation of the appropriate operating system for more information.

9.1.1 Specifying the Router as Executor

For all SET, SHOW, CLEAR, and ZERO commands, both ways to specify the router as the executor (the location at which the command executes) are valid. For demonstration, this chapter presents all the examples with both methods:

- The separate SET EXECUTOR NODE command and
- The alternate use of the TELL prefix on the actual SET, SHOW, CLEAR, or ZERO command line

The following examples show this convention:

Example 1

```
NCP> SET EXECUTOR NODE THRUSH USER MEME PASSWORD WINGS (RET)
NCP> SET CIRCUIT ASYNC-2 STATE OFF (RET)
```

or

```
NCP> TELL THRUSH USER MEME PASSW WINGS SET CIR ASYNC-2 STATE OFF (RET)
```

Example 2

```
NCP> SET EXECUTOR NODE THRUSH USER MEME PASSWORD SWEETSONG (RET)
NCP> SHOW KNOWN LOGGING (RET)
```

or

```
NCP> TELL THRUSH USER MEME PASSWORD SWEETSONG SHOW KNOWN LOGGING (RET)
```

NOTE

This chapter uses the convention of beginning examples with the separate SET EXECUTOR NODE command. However, once you actually set the executor node to be your router, you do not have to continue to issue separate SET EXECUTOR NODE commands (see the SET EXECUTOR NODE command description for details).

For guidelines on choosing the most efficient method to access the router's operational database, see Section 9.3.

9.1.2 Issuing Privileged Commands

To issue privileged commands that execute at the router, you need to specify access control information already defined on the router. For a discussion of access control information, see Section 6.1.3.3.

9.1.3 Example of Syntax Conventions

The following example reflects the graphic conventions of this manual as well as the command description format for this chapter and Volume II, Chapter 2.

SHOW { LINE *line-id* | ACTIVE LINES | KNOWN LINES } [CHARACTERISTICS | COUNTERS | STATUS | **SUMMARY**]

When issuing this command, you must specify one of these: LINE *line-id*, ACTIVE LINES, or KNOWN LINES. If you choose LINE, you must include the name of the line, represented by *line-id*.

If you wish, you can specify a type of display: CHARACTERISTICS, COUNTERS, STATUS, or SUMMARY. If you omit a display type, you get the default display SUMMARY.

9.2 Definitions of Common Variables

The NCP command descriptions in this chapter frequently use the following variables:

ASYNC-*n*	The number of an asynchronous circuit or asynchronous line: 1 through 8, corresponding to ports 1 through 8. The ports are labeled J1 through J8 on the DECrouter 200 hardware unit.
ETHER-1	The Ethernet circuit or Ethernet line running from the Ethernet port on the DECrouter 200 hardware unit.
hex-password	A string of from 1 to 16 hexadecimal digits (the characters 0 to 9 and A to F). Identifies the DECnet service password.
node-address	A DECnet node address. Each DECnet node address must be a unique decimal number from 1 to 1023. If your DECnet network is divided into areas, each DECnet node address takes the form *area.node-number*. Here, *area* is a decimal area number from 2 to 63, *node-number* is the node address, and the period distinguishes area from address. For example, 2.1003 is a valid node address.
node-id	A DECnet node name or a DECnet node address is valid.
node-name	A valid DECnet node name. DECnet node names must be from 1 to 6 alphanumeric characters. The first character must be a letter.
nonpriv-password	A string of from 1 to 39 alphanumeric characters that names a network management nonprivileged password for your router. Defining this password makes any future NCP SHOW command that executes at the router a privileged operation.
priv-password	A string of from 1 to 39 alphanumeric characters that names a network management privileged password for your router. Defining this password makes any future privileged NCP command that executes at the router a privileged operation.
SINK NODE *node-id*	The network management node for DECnet event logging. This node is also known as the logging host.
USER *user-id*	Used with the SET EXECUTOR NODE command and with commands starting with the TELL prefix, a string of letters that identifies your user ID for access control verification at a designated executor node (the router). This chapter uses the convention of USER MEME on syntax and example lines.

9.3 Guidelines for Entering NCP Commands

When you issue NCP commands, follow these guidelines:

- The command to start NCP differs slightly on the various operating systems with DECnet that support DECrouter 200 remote management. See the DECnet documentation of the appropriate operating system for more information. For a list of all these operating systems, see the *DECrouter 200 Software Product Description* (SPD).
- When you issue management commands, there are two ways to specify the router as the executor — the location at which the command executes:

  1. Begin each command line with the TELL prefix (see the TELL "command" description).
  2. Set the executor to be your router with the SET EXECUTOR NODE command before you issue management commands (see the SET EXECUTOR NODE command description).

  To enter one or two NCP commands for remote execution at your router, it is probably easier to use the TELL prefix than to issue the SET EXECUTOR NODE command.

- Privileged NCP commands that execute at the router are privileged operations if you defined a network management privileged password for your router. To issue privileged NCP commands, specify the router's privileged password. (If you did not define a network management privileged password for your router, "privileged" NCP commands that execute at the router are unprotected operations.)

  NCP SHOW commands that execute at the router are privileged operations if you defined a network management nonprivileged password for your router. To issue privileged NCP SHOW commands, specify either the privileged password or the nonprivileged password. (If you did not define a network management nonprivileged password for your router, NCP SHOW commands that execute at the router are unprotected operations.)

  You can specify one of these passwords on the SET EXECUTOR NODE command line, or you can specify it on a command line starting with the TELL prefix. Specifying the privileged password allows the execution of both privileged and nonprivileged commands.

- You can abbreviate command keywords to the smallest number of characters that distinguishes the keyword to NCP, usually three characters for each word.

  For example, the SET CIRCUIT command has a parameter called LEVEL 2 COST and this parameter has a range of valid values of 1 to 25. On VAX/VMS management hosts, you can enter this command as follows:

  ```
  NCP>SET CIR COS 1 (RET)
  ```

- If a command can take multiple parameters, you can enter several parameters on one command line in any order. Each command format lists the possible parameters alphabetically, but this order is presented only for easy look-up reference.

  On the command line, leave one space between each parameter.

- If a command requires at least one parameter, you can type the command's verb-noun combination and then simply press the RETURN key. NCP displays the possible parameters and asks you to enter one.

  If a parameter requires that you specify a value, you can type the verb-noun-parameter combination and then press the RETURN key. NCP displays the possible values and asks you to enter one.

  After the prompt, if you do not enter any data and press the RETURN key, there is no change.

NOTE

> At a remote node, when you issue NCP commands to display or change the router's operational database, the prompts with parameters and value ranges apply to that node and may not be appropriate for the router. Rely on the documentation presented in this chapter and in Volume II, Chapters 1 and 2, for information about router parameters and valid values.

- When you issue SHOW commands at some management host nodes, you can direct the information to a text file, rather than the terminal screen, with the TO keyword. In this case, you must specify a file name. Here is a DECnet–VAX example:

  NCP> SHOW LINE *line-id* CHAR TO *filename* (RET)

- For on-line information, type the HELP command. See the HELP command description.

9.4 NCP Command Summary

Table 9-2 summarizes the functions of the NCP commands for managing the DECrouter 200 system.

Table 9–2: Summary of NCP Command Functions

Command	Function
CLEAR EXECUTOR	Clears either the router's network privileged password or its network nonprivileged password.
CLEAR EXECUTOR NODE	Resets the default executor from your router to the local node, the management host.
CLEAR LOGGING	Clears the assignment of logging sinks or disables DECnet event logging from the router's operational database.
CLEAR NODE	Clears node names or their parameters from the router's operational database.
DEFINE/SET NODE	Manually enters your DECrouter 200 unit in the DECnet databases of one of its load hosts. DEFINE affects the permanent DECnet database and SET affects the volatile database.
EXIT	Exits NCP and returns you to the system prompt.
HELP	Displays information about NCP commands.
LOAD	Initiates a down-line load of the router's software image from a load host to the DECrouter 200 unit. The load host from which you issue the command performs the down-line load. See Section 5.2.2.
LOOP	Tests the router's lines, circuits, and ports.
SET CIRCUIT	Modifies circuit parameters in the router's operational database.
SET EXECUTOR	Defines and modifies executor parameters in the router's operational database.
SET EXECUTOR NODE	Sets the default executor to be your router.
SET LOGGING	Defines and modifies assigned DECnet logging sinks or the kinds of events you want logged in the router's operational database.
SET NODE	Defines and modifies node characteristics in the router's operational database.
SHOW CIRCUIT	Displays circuit parameters in the router's operational database.

(Continued)

Table 9–2 (Cont.): Summary of NCP Command Functions

Command	Function
SHOW EXECUTOR	Displays executor parameters in the router's operational database.
SHOW LINE	Displays line parameters in the router's operational database.
SHOW LOGGING	Displays assigned DECnet logging sinks and the kinds of events enabled for DECnet event logging in the router's operational database.
SHOW NODE	Displays nodes in the router's operational database and the operational state of these nodes.
TRIGGER	Initiates a down-line load of the router's software image from a load host to the DECrouter 200 unit. Any established load host may perform the down-line load. See Section 5.2.3.
ZERO CIRCUIT	Resets the router's circuit counters.
ZERO EXECUTOR	Resets the router's executor counters.
ZERO LINE	Resets the router's line counters.
ZERO NODE	Resets the router's node counters.

9.5 Complete Command Descriptions

The rest of this chapter presents complete descriptions of the NCP commands you use to manage your DECrouter 200 system.

Because these command descriptions are for reference, the parameter definitions here are quite brief. If you need more information about the router's parameters, see the detailed definitions in Volume II, Section 1.1. These detailed definitions include guidelines to help you choose the correct and, in some cases the most efficient, values.

On the other hand, if you are rather familiar with executing NCP commands, you may find that the only memory refresher you need is the summary of NCP command syntax (see Appendix A).

CLEAR EXECUTOR (Privileged)

This command clears the router's network privileged password or its network nonprivileged password previously defined with either the DRCP SET EXECUTOR command or the NCP SET EXECUTOR command. The result is that some NCP operations that were privileged are no longer protected.

Digital highly recommends that you do not completely clear your router's network management passwords. (If you want to change password definitions, use the SET EXECUTOR command.)

Format

CLEAR EXECUTOR {NONPRIVILEGED PASSWORD / PRIVILEGED PASSWORD}

where

NONPRIVILEGED PASSWORD

clears the router's network nonprivileged password.

PRIVILEGED PASSWORD

clears the router's network privileged password.

Example

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> CLEAR EXECUTOR NONPRIVILEGED PASSWORD (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSW BIRDY CLEAR EXEC NONPRIV PASSWORD (RET)
```

CLEAR EXECUTOR NODE

This command resets the default executor from your router to the local node, the management host.

This command executes at the local node and does not affect the running router's operational database. No password is required.

Format

CLEAR EXECUTOR NODE

Example

```
NCP> CLEAR EXECUTOR NODE (RET)
```

CLEAR LOGGING (Privileged)

This command clears logging parameters from the router's operational database. If these parameters are not the defaults, they were previously defined with either the DRCP SET LOGGING command or the NCP SET LOGGING command.

CLEAR LOGGING clears the assignment of individual sink components or completely deassigns the logging host.

Format

CLEAR { LOGGING CONSOLE / LOGGING MONITOR / LOGGING FILE / KNOWN LOGGING } { KNOWN EVENTS / [ALL] } [SINK NODE *node-id*]

where

CONSOLE

clears the host's console as the logging sink component.

FILE

clears the host's DECnet event logging file as the logging sink component.

KNOWN EVENTS

clears all possible DECnet events:

Event Layer		Events
Network Management	=	0.0, 0.4-0.7, 0.9
Session Control	=	2.0-1
End Communication	=	3.1-2
Routing	=	4.0-6, 4.8-12, 4.14-16, 4.18
Data Link	=	5.3-4, 5.14-15
Physical Link	=	6.0, 6.2

Clearing KNOWN EVENTS means that absolutely no DECnet events affecting the router will be logged.

MONITOR

clears the host's monitor as the logging sink component.

NAME

clears the name of the logging host's console, file, or monitor program.

SINK

deassigns the current logging host (sink node), which you must specify. You can display the name of this host by issuing the SHOW EXECUTOR CHARACTERISTICS command or by running the Monitor utility.

This host is either the last load host that down-line loaded the DECrouter 200 software image to the router, or a different logging host that you specified with the DRCP SET EXECUTOR command.

Specify the SINK as:

NODE *node-id*

where *node-id* is the DECnet node name or DECnet node address of the current sink node.

Example 1

This example disables the logging of router ROBIN's events to all three sinks of the assigned logging host, so that no DECnet events generated by this router will be logged. However, the assignment of the current logging host is not affected. ROBIN's privileged password is BIRDY.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> CLEAR KNOWN LOGGING KNOWN EVENTS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD BIRDY CLEAR KNO LOG KNO EVENTS (RET)
```

Example 2

Example 2 shows the command to deassign router ROBIN's current logging host, which is node 55.123, so that no DECnet events generated by this router will be logged ROBIN's privileged password is BIRDY.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> CLEAR KNOWN LOGGING SINK NODE 55.123 (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASS BIRDY CLEAR KNO LOG SINK NOD 55.123  (RET)
```

CLEAR NODE (Privileged)

This command clears parameters for remote nodes from the router's operational database. The parameters were previously defined with either the DRCP SET NODE command or the NCP SET NODE command.

Format

CLEAR NODE *node-id* { ALL | INBOUND TYPE | NAME | RECEIVE PASSWORD | TRANSMIT PASSWORD }

or

CLEAR KNOWN NODES [ALL]

where

ALL

clears the node's name and all its current parameters.

INBOUND TYPE

clears the INBOUND TYPE.

KNOWN NODES

clears all information for all nodes.

NAME

clears the name you defined for a specific node.

node-id

is the DECnet node name (if you defined one) or DECnet node address of the node for which you want to clear parameters.

RECEIVE PASSWORD

clears the receive password.

TRANSMIT PASSWORD

clears the transmit password.

Example 1

This example clears node name HAWK, with DECnet address 55.42, from the operational database of a router named ROBIN. Unless you assign a new name to node 55.42, you must specify this node by its DECnet node address in subsequent commands. ROBIN's privileged password is BIRDY.

```
NCP>SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP>CLEAR NODE HAWK NAME (RET)
```

or

```
NCP>TELL ROBIN USER MEME PASSWORD BIRDY CLEAR NODE HAWK NAME (RET)
```

Example 2

The following example clears all of node FINCH's current parameters from router ROBIN's operational database. ROBIN's privileged password is BIRDY.

```
NCP>SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP>CLEAR NODE FINCH ALL (RET)
```

or

```
NCP>TELL ROBIN USER MEME PASSWORD BIRDY CLEAR NODE FINCH ALL (RET)
```

DEFINE/SET NODE

This command enters your router in the DECnet database of one of its load hosts. DEFINE affects the permanent DECnet database and SET affects the volatile database.

The load host is the local node. This command executes at the local node and does not affect the running router's operational database. Some privileges are usually required to execute this command. See the load host system manager for the appropriate privileges.

A DECnet system must have an entry for your router in three databases (see Section 4.1.1) before it can function as a load host. However, Digital strongly suggests that you do not use the DEFINE NODE and SET NODE commands to manually manage a load host's DECnet databases for the router. Instead, use the automated procedure called ROUCONFIG (see Chapter 4).

NOTE

The ROUCONFIG procedure automatically keeps the load host's databases synchronized. If you issue individual NCP DEFINE NODE and SET NODE commands, the three databases can become unsynchronized. Use DEFINE NODE and SET NODE only to make temporary changes, perhaps for testing, or to load the router from a load host that does not have the automated procedure.

Format

{DEFINE / SET} NODE *rtr-node-id* { ADDRESS *DECnet-node-address* / DUMP FILE [*uic*]:RTR*node-name*.DMP / HARDWARE ADDRESS *E-address* / LOAD FILE [*uic*]:RTR*node-name*.SYS / NAME *DECnet-node-name* / SERVICE CIRCUIT *circuit-id* / SERVICE PASSWORD *hex-password* }

where

ADDRESS *DECnet-node-address*

identifies the DECnet node address of the router. Specify the address as *area.node-number*.

DUMP FILE [*uic*]:RTR*node-name*.DMP

identifies the name of the dump file into which the router up-line dumps data if it experiences an unexpected failure.

[*uic*] is the UIC where the file resides. For the name of this UIC, see the *DECrouter 200 Software Installation Guide* for the operating system of the load host. For example, on VAX/VMS load hosts, DECrouter 200 files reside in SYS$SYSROOT:[DECSERVER].

Specify *node-name* as the router's DECnet node name.

HARDWARE ADDRESS *E-address*

is the Ethernet hardware address of the DECrouter 200 unit.

LOAD FILE [*uic*]:RTR*node-name*.SYS

identifies the name of the router's software image file, known to the load host as the load file.

[*uic*] is the UIC where the file resides. For the name of this UIC, see the *DECrouter 200 Software Installation Guide* for the operating system of the load host. For example, on VAX/VMS load hosts, DECrouter 200 files reside in SYS$SYSROOT:[DECSERVER].

Specify *node-name* as the router's DECnet node name.

NAME *DECnet-node-name*

identifies the DECnet node name of the router. Specify the unique node name with a string of from 1 to 6 alphanumeric characters. At least one character must be a letter.

rtr-node-id

identifies the DECnet node name or DECnet node address of the DECrouter 200 node.

If you already defined a name for the router node on this load host, you can enter either the *node-name* or the *node-address* as the *node-id*. If you did not define a name, you must specify the router's DECnet node address.

Specify the address as *area.node-number*. Specify the unique node name with a string of from 1 to 6 alphanumeric characters. At least one character must be a letter.

SERVICE CIRCUIT *circuit-id*

is the load host's Ethernet circuit to be used for down-line loading and up-line dumping.

SERVICE PASSWORD *hex-password*

specifies the router's DECnet service password. Specify *hex-password* with 1 to 16 hexadecimal digits (the characters 0 to 9 and A to F).

WARNING

For effective security, Digital strongly suggests that you do not store your router's DECnet service password in the load host's DECnet databases.

Example

The following command on a VAX/VMS load host defines DECrouter 200 node 55.44 in the operational DECnet database of this load host. Line continuators (-) are used for continuing the long command line.

```
NCP>SET NODE 55.44 NAME JUNCO - (RET)
- DUMP FILE SYS$SYSROOT:[DECSERVER]RTRJUNCO.DMP - (RET)
- LOAD FILE SYS$SYSROOT:[DECSERVER]RTRJUNCO.SYS - (RET)
- HARDWARE ADDRESS 08-00-2B-00-00-86 SERVICE CIRCUIT UNA-0 (RET)
NCP>
```

HELP

This command provides on-line information about using NCP. HELP first displays a list of the NCP commands and you can then specify a command for which you want information.

NOTE

This command and how you use it may vary depending on the operating system of the management host/load host.

Format

HELP [*command*]

Format Notes

1. Typing HELP displays the commands and topics for which information is available.
2. Typing HELP plus a specific command displays information about that command.

Example 1

```
NCP> HELP (RET)

  Information available:

  CLEAR      Commands   CONNECT    COPY       DEFINE     DISCONNECT EVENTS
  EXIT       HELP       LIST       LOAD       LOOP       PARAMETERS Prompting
  PURGE      SET        SHOW       TELL       TRIGGER    ZERO

Topic?
```

Example 2

```
NCP> HELP SET (RET)

SET

  Use the SET command to create or modify parameters or components in
  the volatile database on the executor node.  Use the DEFINE command
  to create or modify parameters or components in the permanent database
  on the executor node.

  Additional information available:

  CIRCUIT    EXECUTOR   LINE       LOGGING    MODULE     NODE       OBJECT

SET Subtopic?
```

LOAD

This command initiates a down-line load of the router's software image from a load host to the DECrouter 200 unit. The load host from which you issue the command performs the down-line load.

The load host is the local node. This command executes at the local node but it does affect the router's operational database.

Use one of three command formats:

- Format 1

  If you or the software installer ran the ROUCONFIG configuration procedure as Digital strongly suggests (see Chapter 4 of this manual or the *DECrouter 200 Software Installation Guide*), use Format 1.

- Formats 2 and 3

  If, instead of running ROUCONFIG, you or the software installer manually defined the router in the appropriate DECnet databases (see the DEFINE/SET NODE command description), use Format 2 or 3.

- Formats 2 and 3

  If you wish to override the router's node parameters in the DECnet databases, use Format 2 or 3.

See Section 5.2.2 for more details about down-line loading with the LOAD command.

Format 1

LOAD NODE *rtr-node-id* [SERVICE PASSWORD *hex-password*]

Format 2

LOAD NODE *rtr-node-id* [FROM *rtr-image* | HOST *host-id* | SERVICE PASSWORD *hex-password*]

Format 3

LOAD VIA *circuit-id* PHYSICAL ADDRESS *E-address* [FROM *rtr-image* | HOST *host-id* | SERVICE PASSWORD *hex-password*]

where

circuit-id

is the Ethernet circuit over which the router's software image is to be loaded.

FROM *rtr-image*

Identifies the unique name of the router's software image file on the load host. Specify *rtr-image* as RTR*node-name*.SYS, where *node-name* is the DECnet node name of your router.

HOST *host-id*

is the assigned load host. This load host will receive up-line dumps and event messages (unless you specified another logging host). Specify *host-id* as the host's DECnet node name or DECnet node address.

PHYSICAL ADDRESS *E-address*

is the Ethernet hardware address of the DECrouter 200 unit.

rtr-node-id

is the DECnet node name or node address of the router you want to reload.

SERVICE PASSWORD *hex-password*

is the router's DECnet service password. This password must match the service password defined in the router's database.

Required if you defined a DECnet service password for the router, as Digital strongly recommends, and you do not also store this password in the load host's DECnet database, as Digital also strongly suggests.

Example

This command, executed at one of router ROBIN's assigned load hosts, initiates a down-line load of ROBIN's software image from that load host to the DECrouter 200 unit.

The router checks the service password FF44 to see if it matches the service password defined in its database.

```
NCP> LOAD NODE ROBIN SERVICE PASSWORD FF44 (RET)
```

LOOP CIRCUIT
(When executed at the router, Privileged)

This command tests:

- The Ethernet circuit connections to the router
- The Ethernet circuit connections to adjacent nodes
- The router's asynchronous ports and circuits

This command can execute either at the local node (the management host) or at the router, but it does not affect the running router's operational database. The DECnet service password of the node being tested is sometimes required.

Format Note

Use the ASSISTANT NODE, ASSISTANT PHYSICAL ADDRESS, and HELP parameters only for loop assist circuit tests.

Format

LOOP CIRCUIT *circuit-id* [ASSISTANT NODE *node-id* | ASSISTANT PHYSICAL ADDRESS *E-address* | COUNT *n* | HELP { **FULL** / RECEIVE / TRANSMIT } | LENGTH *n* | NODE *node-id* | PHYSICAL ADDRESS *E-address* | SERVICE PASSWORD *hex-password* | WITH { **MIXED** / ONES / ZEROS }]

where

ASSISTANT NODE *node-id*

specifies the DECnet node address or DECnet node name of the node that relays test data for a loop assist circuit test.

Use this parameter when DECnet software is running on the assistant node; otherwise, specify the ASSISTANT PHYSICAL ADDRESS parameter. The node should be located between the source node and destination node.

You must also specify the PHYSICAL ADDRESS parameter or the NODE parameter to run a loop assist test. Optionally, use the HELP parameter to specify how you want this node to assist in the loopback test.

ASSISTANT PHYSICAL ADDRESS *E-address*

specifies the 12-digit Ethernet address of the node, known as the assistant node, that relays the test data in a loop assist circuit test.

Specify the node's Ethernet DECnet address if the DECnet software is running or has been running. Specify the node's Ethernet hardware address if the DECnet software has not been brought up on the node. The node should be located between the source node and the destination node.

You must also specify the PHYSICAL ADDRESS parameter or the NODE parameter to run a loop assist test. Optionally, use the HELP parameter to specify how you want this node to assist in the loopback test.

circuit-id

specifies the circuit you want to test.

Specify any one of the router's asynchronous circuits (ASYNC-1 through ASYNC-8) or the Ethernet circuit (ETHER-1).

COUNT *count*

specifies the number of blocks to be looped over the circuit during the loopback test. Specify a decimal integer from 1 to 65535. The default value is 1, meaning that only one block is looped.

HELP *help-type*

specifies the way the assistant node relays the test data in a loop assist test.

Specify one of these values for *help-type*:

- FULL

  The assistant node relays the data from the initiating node to the destination node, and back again. This is the default.

- RECEIVE

  The initiating node sends the data directly to the destination node; then the assistant node relays the data back to the initiating node.

- TRANSMIT

  The assistant node relays the data from the initiating node to the destination node. The destination node then sends the data directly back to the initiating node.

LENGTH *block-length*

specifies the length in bytes of the blocks of test data to be sent during the loop-back test. Specify a decimal integer from 1 to 65535. The default value is 40 bytes.

NODE *node-id*

specifies the DECnet node address or DECnet node name of the destination node. Specify this parameter when DECnet software is running on the destination node; otherwise specify the PHYSICAL ADDRESS parameter.

PHYSICAL ADDRESS *E-address*

specifies the 12-digit Ethernet address of the destination node. This node loops the test data back to the source node.

Specify the node's Ethernet DECnet address when DECnet is running or has been running. Specify the node's Ethernet hardware address if the DECnet software has not been brought up on the node.

Use this parameter for both loop assist tests and for normal Ethernet circuit level tests. To run a loop assist test, also specify the ASSISTANT PHYSICAL ADDRESS or ASSISTANT NODE parameter.

SERVICE PASSWORD *hex-password*

identifies the DECnet service password of the node being tested.

WITH *data-type*

specifies the type of binary information to be sent during testing.

Specify one of these values for *data-type*:

- MIXED – a combination of ones and zeros (the default)
- ONES
- ZEROS

The default is MIXED.

Example 1

Using the configuration shown in Figure 7-6, the following NCP command executed locally at VAX/VMS node HOST1 starts a circuit-level loop assist test. The destination node is the DECrouter 200 node ROBIN. The assistant node is HOST2.

```
NCP>LOOP CIRCUIT UNA-0 NODE ROBIN ASSISTANT NODE HOST2 (RET)
```

Or, you can issue the equivalent command, using the physical address of ROBIN (AA-00-04-00-86-04) and of the assistant node (AA-00-04-00-82-04), as follows.

```
NCP>LOOP CIRCUIT UNA-0 PHYSICAL ADDRESS AA-00-04-00-86-04 - (RET)
- ASSISTANT PHYSICAL ADDRESS AA-00-04-00-82-04 (RET)
```

The hyphen (-) continues the long command to the second line.

In the commands above, the HELP, COUNT, LENGTH, and WITH parameters are omitted. This means that the assistant node relays data both to and from the destination node. The test consists of one block of 40 bytes of mixed binary data looped over the relevant circuits.

If no error messages appear, the test succeeded.

Example 2

The following **ncp** command issued from a DECnet–ULTRIX node multicasts a loop request from the DECrouter 200 RTRDEV to the Ethernet. The **ncp** status message shown indicates that node CENTER was the node that responded to the loop request and looped the data back to the DECrouter 200 node.

```
ncp>tell rtrdev loop circuit ether-1 (RET)
Loop succeeded
Physical address = AA-00-04-00-08-04, Node = 8 (CENTER)
```

The following is a sample event message logged at the DECrouter 200's logging host:

```
 Event type 0.6, Passive loopback
Occurred 10-NOV-86 11:43:12 on node 8 (CENTER)
Circuit ETHER-1
Operation Initiated
```

LOOP EXECUTOR
(When executed at the router, Privileged)

This command performs the same tests as the LOOP NODE command with the router itself specified as the node to be tested.

This command can execute either at the local node (the management host) or at the router, but it does not affect the running router's operational database. The router's DECnet service password is sometimes required.

Format

LOOP EXECUTOR [COUNT *n* | LENGTH *n* | WITH { **MIXED** / ONES / ZEROS }]

where

COUNT *count*

Specifies the number of blocks to be looped over the link during the loopback test.

Specify a decimal integer from 1 to 65535. The default value is 1, meaning that only one block will be looped over the line.

LENGTH *n*

Specifies the length in bytes of the blocks of test data to be sent during the loopback test.

Specify a decimal integer from 1 to 65535. The default value is 40 bytes.

WITH *data-type*

specifies the type of binary information to be sent during testing.

Specify one of these values for *data-type*:

- MIXED — a combination of ones and zeros (the default)
- ONES
- ZEROS

The default is MIXED.

Example

```
NCP> LOOP EXECUTOR COUNT 100 SIZE 50 WITH MIXED (RET)
```

LOOP NODE
(When executed at the router, Privileged)

This command tests the router's ability to:

- Route messages to adjacent nodes on its Ethernet line and on its asynchronous lines
- Route messages to nonadjacent nodes off the Ethernet LAN that are connected indirectly through another routing node on the router's Ethernet line
- Route messages to nonadjacent nodes off the Ethernet LAN that are connected indirectly through a routing node on one of the router's asynchronous lines
- Create logical links to a specific node

This command can execute either at the local node (the management host) or at the router, but it does not affect the running router's operational database. The router's DECnet service password is sometimes required.

Format

LOOP NODE *node-id* [COUNT *n* | LENGTH *n* | WITH { **MIXED** / ONES / ZEROS }]

where

COUNT *count*

Specifies the number of blocks to be looped over the link during the loopback test.

Specify a decimal integer from 1 to 65535. The default value is 1, meaning that only one block will be looped over the line.

LENGTH *n*

Specifies the length in bytes of the blocks of test data to be sent during the loopback test.

Specify a decimal integer from 1 to 65535. The default value is 40 bytes.

node-id

Identifies the node on the other end of the link that is being tested. The loopback test sends test data to this node, which then loops back the data.

Specify *node-id* as either the node's DECnet node name or DECnet node address.

WITH *data-type*

specifies the type of binary information to be sent during testing.

Specify one of these values for *data-type*:

- MIXED — a combination of ones and zeros (the default)
- ONES
- ZEROS

The default is MIXED.

Example

Using the configuration shown in Figure 7-3, the following command issued at node HOST1 tests whether ROBIN can route to adjacent node HOST2, located on the Ethernet.

```
NCP>TELL ROBIN LOOP NODE HOST2 COUNT 100 (RET)
```

The test sends 100 blocks of data. Because the LENGTH and WITH parameters are omitted, each block consists of 40 bytes of mixed binary data.

SET CIRCUIT (Privileged)

This command changes parameters for the router's eight asynchronous circuits and its Ethernet circuit in the operational database. SET CIRCUIT can turn off each circuit.

CAUTION

If you turn off the ETHER-1 circuit, the router is disconnected from the Ethernet. When this circuit is off, the router cannot route messages directly to and from the Ethernet. Turn off ETHER-1 only during a severe problem and only if there is another path to the router.

At least one circuit must be on. If all the circuits are off, your router is completely inaccessible. As a result, you cannot use the SET CIRCUIT command to turn the circuits on again.

If you turn off all the circuits by mistake, the only solution is to modify the permanent database, setting at least one circuit on (the default), and then down-line load.

Format

```
SET { CIRCUIT ASYNC-n  } { COST n                                  }
    { KNOWN CIRCUITS   } { STATE { OFF }                           }
                         {       { ON  }                           }
                         { VERIFICATION { DISABLED }                }
                         {              { ENABLED  }                }
                         {              { INBOUND  }                }
```

or

```
SET CIRCUIT ETHER-1 { COST n           }
                    { ROUTER PRIORITY n }
                    { STATE OFF         }
```

where

COST

specifies the routing cost of the circuit. Specify an integer from 1 to 25. The default is 1 for the Ethernet circuit and 4 for the asynchronous circuits.

KNOWN CIRCUITS

affects all the router's circuits, including the Ethernet circuit.

ROUTER PRIORITY

specifies the ETHER-1 circuit routing priority. Specify an integer from 1 to 128. The default is 64.

NOTE

This parameter is identical to ROUTING PRIORITY in the permanent database.

STATE

specifies the operational state of a DECrouter 200 circuit.

CAUTION

At least one circuit must be on. If the circuits are all off, your router is completely inaccessible. As a result, you cannot use the SET CIRCUIT command to turn the circuits on.

If you turn off all the circuits by mistake, the only solution is to modify the permanent database, setting at least one circuit on (the default), and then down-line load.

Specify one of these states:

- ON

  Applies only to the asynchronous circuits. Allows traffic over the circuit. This is the normal operational state allowing for complete route-through functions.

- OFF

  Prevents traffic over the circuit. The circuit is unavailable for network activity.

VERIFICATION

during the routing verification message, determines whether the router checks the receive password (defined with the SET NODE command) for an adjacent node that is requesting access. This checking is for adjacent nodes on one of the router's asynchronous circuits.

If you specify ENABLED, the requesting node must supply a password that matches the receive password you defined for this node or the router rejects the connection request.

Setting VERIFICATION INBOUND means that during the routing verification message, the requesting node must send its receive password before the router sends its transmit password. Note that only one of the two nodes establishing a connection can have VERIFICATION set to INBOUND at one time.

Specify one of these: ENABLED, DISABLED, INBOUND. The default is DISABLED.

Example 1

A router named ROBIN has the network privileged password BIRDY, which makes SET CIRCUIT a privileged operation. (You must specify the privileged password.) To turn off ROBIN's ASYNC-2 circuit, issue:

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> SET CIRCUIT ASYNC-2 STATE OFF (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD BIRDY SET CIR ASYNC-2 STA OFF (RET)
```

Example 2

This example changes the cost of router ROBIN's ASYNC-4 circuit to 2. ROBIN has the privileged password BIRDY, which makes SET CIRCUIT a privileged operation. (You must specify the privileged password.)

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> SET CIRCUIT ASYNC-4 COST 2 (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASS BIRDY SET CIR ASYNC-4 COST 2 (RET)
```

Example 3

Example 3 changes the routing priority of router ROBIN's ETHER-1 circuit to 1. ROBIN has the privileged password BIRDY, which makes SET CIRCUIT a privileged operation. (You must specify the privileged password.)

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> SET CIRCUIT ETHER-1 ROUTER PRI 1 (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASS BIRDY SET CIR ETHER-1 ROUTER PRIORITY 1 (RET)
```

SET EXECUTOR (Privileged)

This command sets the router's network management nonprivileged password and network management privileged password in the operational database. SET EXECUTOR also sets parameters related to loopback testing. Defining values for these parameters sets up defaults for future LOOP commands that test the router.

You can modify the loopback-related parameters only in the operational database. (When you issue a LOOP command, you can override these defaults by specifying different values on the command line.)

Except for the passwords, the parameter values you set with this command display when you issue NCP SHOW EXECUTOR CHARACTERISTICS while the router is the executor node.

Format

```
SET EXECUTOR [ LOOP COUNT n
               LOOP HELP { FULL }
                         { RECEIVE }
                         { TRANSMIT }
               LOOP LENGTH n
               LOOP WITH { MIXED }
                         { ONES }
                         { ZEROS }
               NONPRIVILEGED PASSWORD nonpriv-password
               PRIVILEGED PASSWORD priv-password ]
```

where

LOOP COUNT *count*

is the default number of blocks to be sent during loopback testing over one of the router's circuits.

Specify the number as a decimal integer from 1 through 65535. The default is 1.

LOOP HELP *help-type*

applies only to the router's Ethernet circuit. Indicates the amount of assistance to be provided during Ethernet loopback testing by the assistant node.

Specify one of these values for *help-type*:

- FULL

  The assistant node relays the request and the reply between the router and the destination node.

- RECEIVE

  The router sends the request directly to the destination node, which relays the reply to the assistant node for transmission to the router.

- TRANSMIT

  The assistant node relays the request to the destination node, which replies directly to the router.

The default is FULL.

LOOP LENGTH *n*

specifies the length, in bytes, of the blocks to be sent during loopback testing.

Specify the number as a decimal integer in the range of 1 through 65535. The default is 40.

NOTE

Specify less than 50 for the DMC-11 circuit operating in either controller loopback mode or cable loopback mode (a DMC-11 with an attached loopback cable).

LOOP WITH *data-type*

specifies the type of binary information to be sent during testing.

Specify one of these values for *data-type*:

- MIXED — a combination of ones and zeros
- ONES
- ZEROS

The default is MIXED.

NONPRIVILEGED PASSWORD *nonpriv-password*

defines a new network management nonprivileged password for the router or changes the old password. Specify a password that contains from 1 to 39 alphanumeric characters (use in conjunction with the privileged password). There is no default.

PRIVILEGED PASSWORD *priv-password*

defines a new network management privileged password for the router or changes the old password. Specify a password that contains from 1 to 39 alphanumeric characters. There is no default.

Example

This example changes router ROBIN's nonprivileged password to KOOKABURRA. ROBIN's current privileged password is BIRDY.

```
NCP>SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP>SET EXECUTOR NONPRIVILEGED PASSWORD KOOKABURRA (RET)
```

or

```
NCP>TELL ROBIN USER MEME PASSW BIRDY SET EXEC NONPRIV PASSW KOOKABURRA (RET)
```

SET EXECUTOR NODE

This command sets the DECrouter 200 node as the default executor, giving you access to the router's operational database. After issuing this command, you can use NCP commands that display or modify the router's database or that reset its counters.

This command executes at the management host and does not affect the running router's operational database. One of the router's network management passwords may be required, however, in order for you to next issue commands that affect the router.

Until you issue another SET EXECUTOR NODE command, issue a CLEAR EXECUTOR NODE command, or exit NCP, all future commands execute at the router.

To enter one or two commands that will execute at your router, use the TELL prefix instead of issuing the SET EXECUTOR NODE command (see the "command" description of the TELL prefix).

NOTE

If you set your router as the executor, do not use the TELL prefix in subsequent commands that will execute at the router.

Format

SET EXECUTOR NODE *rtr-node-id* [USER *user-id* PASSWORD { *nonpriv-password* / *priv-password* }]

or

SET EXECUTOR NODE *rtr-node-id* ["*user-id* { *nonpriv-password* / *priv-password* }"]

where

PASSWORD *nonpriv-password*
PASSWORD *priv-password*

identifies one of your router's executor passwords — either the network management privileged password or the network management nonprivileged password:

- Privileged password

  You must specify the privileged password if you previously defined one and you want to issue privileged NCP commands that will execute at the router.

- Nonprivileged password

  If you previously defined a nonprivileged password, you must specify either the privileged password or the nonprivileged password if you want to issue NCP SHOW commands that will execute at the router.

rtr-node-id

is the DECnet node name or node address of the router at which you want future NCP commands to be executed.

USER *user-id*

identifies your user ID for access control verification at the designated executor node (the router). See Section 6.1.3.3 for guidelines on specifying *user-id*.

For some DECnet systems, there are two ways to specify USER on the SET EXECUTOR NODE command line.

Some DECnet systems let you turn off echoing of passwords as you type them.

Example 1

The following command sets the DECrouter 200 node ROBIN as the default executor. ROBIN's defined network privileged password is BIRDY. The command line specifies ROBIN's privileged password so that you can subsequently issue all privileged commands that affect this router.

Note that because this is a VAX/VMS example, the string that follows the keyword USER can be any alphanumeric characters.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
```

or

```
NCP> SET EXECUTOR NODE ROBIN"MEME BIRDY" (RET)
```

SET LINE (Privileged)

This command changes the control type of one of the router's eight asynchronous lines or its Ethernet line. You can modify the CONTROLLER parameter only in the operational database.

NOTE

Before you change the control type of a line, you must first turn off the circuits on that line. For the appropriate circuit, issue this command: SET CIRCUIT *circuit-id* STATE OFF.

Format

SET LINE {ASYNC-*n* / ETHER-1} CONTROLLER {LOOPBACK / **NORMAL**}

where

CONTROLLER

identifies the type of control that the line has. Specify the control type as one of these:

- LOOPBACK

  Specifies that the line is to be used for loopback testing.

- NORMAL

  Specifies that the line is to be used for normal network traffic. This is the default.

Example

This example shows the command to change one of the asynchronous lines from running normal operations to running loopback testing. The example line is ASYNC-8, the example router is named ROBIN, and ROBIN's privileged password is BIRDY, which makes SET LINE a privileged operation. (You must specify the privileged password.)

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> SET LINE ASYNC-8 CONTROLLER LOOPBACK (RET)
```

or

```
NCP> TEL ROBIN USER MEME PASSW BIRDY SET LIN ASYNC-8 CONT LOOP (RET)
```

SET LOGGING (Privileged)

This command changes the router's logging parameters in the operational database. If these parameters are not the defaults, they were previously defined with either the DRCP SET LOGGING command or another NCP SET LOGGING command, or modified with the NCP CLEAR LOGGING command.

SET LOGGING can also assign a new logging host node for the DECnet events generated by your router.

Events are logged at the assigned logging host or the default logging host. The default logging host is the last load host that performed a down-line load. For more information about logging hosts (also known as sink nodes), such as the name of the logging file, see the logging host's DECnet documentation.

All event types are affected; KNOWN EVENTS is the unchangeable default.

Format

SET LOGGING { CONSOLE / FILE / MONITOR } KNOWN EVENTS [SINK NODE *node-id*]

or

SET KNOWN LOGGING KNOWN EVENTS [SINK NODE *node-id*]

where

CONSOLE

specifies the host's console as the logging sink component. By default, logging is enabled at all three components: console, file, and monitor.

FILE

specifies the host's DECnet event logging file as the logging sink component. By default, logging is enabled at all three components: console, file, and monitor.

KNOWN EVENTS

refers to all possible DECnet events:

Event Layer		Events
Network Management	=	0.0, 0.4-0.7, 0.9
Session Control	=	2.0-1
End Communication	=	3.1-2
Routing	=	4.0-6, 4.8-12, 4.14-16, 4.18
Data Link	=	5.3-4, 5.14-15
Physical Link	=	6.0, 6.2

KNOWN EVENTS is the unchangeable default.

KNOWN LOGGING

affects parameter changes for all three sink components: console, file, and monitor.

MONITOR

specifies the host's monitor as the logging sink component. By default, logging is enabled at all three components: console, file, and monitor.

SINK

identifies a new logging host (sink node). Specify either the DECnet node name (if this name is defined in the router's database) or the DECnet node address of the logging host.

You can display the name of the current sink node by issuing the SHOW EXECUTOR CHARACTERISTICS command or by running the Monitor utility.

Specify the SINK as:

NODE *node-id*

where *node-id* is the DECnet node name or DECnet node address of the node you want to assign as the logging host.

Example 1

Example 1 specifies node EAGLE as router ROBIN's new logging host. ROBIN's network privileged password is BIRDY.

Because the router logs events at only one logging host, this command disables logging at the current logging host. However, the current sink devices remain in effect for new logging host EAGLE.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> SET KNOWN LOGGING SINK NODE EAGLE (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASS BIRDY SET KNO LOG SINK NODE EAGLE (RET)
```

Example 2

If events are currently being logged to only the logging console on node EAGLE and you want them to be logged to a logging file as well, issue:

```
NCP> SET EXECUTOR NODE EAGLE USER MEME PASSWORD BIRDY (RET)
NCP> SET LOGGING FILE (RET)
```

or

```
NCP> TELL EAGLE USER MEME PASSWORD BIRDY SET LOGGING FILE (RET)
```

SET NODE

This command enters your router in the volatile DECnet database of one of its load hosts.

NOTE

Issue this command for execution at a load host.

See the command description for DEFINE/SET NODE.

SET NODE (Privileged)

This command defines and changes node parameters in the router's operational database. These parameters are for the adjacent nodes connected by the router's asynchronous circuits. You can enter up to 1,023 node names in the database.

NOTE

The router recognizes all nodes by their DECnet node addresses. Specifying associated DECnet node names is not necessary. Define node names with the SET NODE command only if you find it more convenient to specify nodes by name rather than by address when you issue commands.

Format

SET NODE *node-id* [INBOUND TYPE { ENDNODE / ROUTER }] { NAME *DECnet-node-name* / RECEIVE PASSWORD *password* / TRANSMIT PASSWORD *password* }

where

INBOUND TYPE

specifies a type identifier for the node. The router requires this identifier from the node in the routing initialization message before the router establishes a connection.

Specify ENDNODE or ROUTER. There is no default.

NAME

is the DECnet node name for the node.

Node names are not necessary for the DECrouter 200's routing function. On the routing level, the router recognizes remote nodes solely by their DECnet node address.

However, names are convenient. You can specify them instead of DECnet node addresses when you issue further DRCP SET NODE commands and the DRCP SHOW NODE and CLEAR NODE commands. If you define a NAME for a node, you can also specify this name with network management NCP commands that require node IDs, such as the NCP SHOW NODE command.

Specify the name with a string of from 1 to 6 alphanumeric characters. At least one character must be a letter. You can enter up to 1,023 node names in the database. No node names are defined by default.

node-id

identifies the DECnet node name or DECnet node address of the node. When you redefine a NAME, you can enter either the *node-name* or the *node-address* as the *node-id*. However, if you are defining, for the first time, a NAME for a node, identify the node only by its DECnet node address.

Specify the address as *area.node-number*. Specify the unique node name with a string of from 1 to 6 alphanumeric characters. At least one character must be a letter. No nodes are defined by default.

A DECnet node name must be unique. The node name must consist of from 1 to 6 alphanumeric characters. At least one character must be a letter.

RECEIVE PASSWORD

defines a receive password for the node or changes the old password. Specify the password as a string of from 1 to 8 alphanumeric characters. You can define as many as 100 receive passwords.

TRANSMIT PASSWORD

defines a transmit password for the node or changes the old password. Specify the password as a string of from 1 to 8 alphanumeric characters. You can define as many as 100 transmit passwords.

Example

The following command sets the node name of node 55.143 to WREN in router ROBIN's operational database. ROBIN's network privileged password is BIRDY.

Note that if the name WREN has already been defined for another node, you must first issue the CLEAR NODE *node-address* NAME command for the other node.

```
NCP> SET EXECUTOR ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> SET NODE 55.143 NAME WREN (RET)
```

or

```
NCP> TEL ROBIN USER MEME PASSW BIRDY SET NOD 55.143 NAM WREN (RET)
```

SHOW CIRCUIT (Nonprivileged)

This command displays circuit parameters in the router's operational database. These values were previously set with DRCP SET CIRCUIT and SET EXECUTOR commands or with NCP SET CIRCUIT commands.

Format

SHOW { CIRCUIT *circuit-id* | ACTIVE CIRCUITS | KNOWN CIRCUITS } [CHARACTERISTICS | COUNTERS | STATUS | **SUMMARY**]

where

ACTIVE CIRCUITS

specifies all the circuits known to the router that are in the ON state.

CHARACTERISTICS

displays circuit characteristics, such as cost, maximum broadcast routers, hello timer, and type of circuit. See Figures 9-1 and 9-2 for examples of the complete displays.

circuit-id

identifies information about a specific circuit.

COUNTERS

displays circuit counters, for example, terminating packets received, originating packets sent, transit packets received, transit packets sent, data errors inbound, data errors outbound, reply timeouts, and buffer errors. See Figure 9-3 for an example of the complete display.

KNOWN CIRCUITS

specifies all the circuits known to the router, whether currently ON or OFF.

STATUS

displays circuit status: operating state, loopback name, adjacent node, block size, listen timer. See Figure 9-4 for an example of the complete display.

SUMMARY

displays one line of summary information for each circuit. See Figure 9-5 for an example of the complete display. SUMMARY is the default display.

Example 1

Figure 9-1 shows the command you use to display circuit characteristics and a typical **show circuit characteristics** display for one of the router's asynchronous circuits. The example illustrates the command and display at a DECnet–ULTRIX management host. Circuit information is displayed for a router named ROBIN, with nonprivileged password worms.

```
ncp>tell robin pass worms show circuit async-2 char (RET)

Circuit Volatile Characteristics as of 20-SEP-1988 13:48:13

Circuit  = ASYNC-2

Originating queue limit          = 15
Cost                             = 1
Hello timer                      = 30
Verification                     = Enabled
Type                             = DDCMP Point

ncp>
```

Figure 9–1: ncp show circuit characteristics Display for an Asynchronous Circuit

Example 2

Figure 9-2 shows the command you use to display circuit characteristics and a typical **show circuit characteristics** display for the router's Ethernet circuit. The example illustrates the command and display at a DECnet–ULTRIX management host. Circuit information is displayed for a router named ROBIN, with nonprivileged password worms.

NOTE

The field "Router priority" is the same as the "Routing Priority" field in the DRCP SHOW CIRCUIT ETHER-1 command (see Volume II, Chapter 2).

The display field "Maximum routers" shows the current value of the MAXIMUM BROADCAST ROUTERS parameter, which you can set with the DRCP SET EXECUTOR command and display in DRCP with the SHOW EXECUTOR command (see Volume II, Chapter 2).

```
ncp> tell robin password worms show cir ether-1 char (RET)

Circuit Volatile Characteristics as of  3-SEP-1987 11:45:04

Circuit  =  ETHER-1

Designated router                = 55.67 (DR200)
Originating queue limit          = 15
Cost                             = 1
Maximum routers                  = 32
Router priority                  = 125
Hello timer                      = 30
Verification                     = Enabled
Type                             = Ethernet

ncp>
```

Figure 9–2: ncp show circuit characteristics Display for the Ethernet Circuit

Example 3

Figure 9-3 shows the command you use to display circuit counters and a typical SHOW CIRCUIT COUNTERS display for an asynchronous circuit and the Ethernet circuit. The example illustrates the commands and displays at a VAX/VMS management host. Circuit information is displayed for a router named ROBIN, with nonprivileged password WORMS.

For an explanation of the display fields, see the DECnet documentation of the management host.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)

NCP> SHOW CIRCUIT ASYNC-2 COUNTERS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW CIR ASYNC-2 COUNT (RET)
```

(Continued)

Figure 9–3: NCP SHOW CIRCUIT COUNTERS Display

```
Circuit Counters as of  2-SEP-1987 14:11:10

Circuit = ASYNC-2

      >65534  Seconds since last zeroed
          44  Terminating packets received
          66  Originating packets sent
           0  Terminating congestion loss
         978  Transit packets received
        1629  Transit packets sent
           0  Transit congestion loss
           2  Circuit down
           0  Initialization failure
         351  Adjacency down
         174  Peak adjacency
       38179  Bytes received
      174753  Bytes sent
        4223  Data blocks received
        8185  Data blocks sent
           2  Data errors inbound, including:
                NAKs sent, data field block check error
                NAKs sent, REP response
           1  Data errors outbound, including:
                NAKs received, REP response
           0  Remote reply timeouts
                Local reply timeouts
           0  Remote buffer errors
           0  Local buffer errors
           0  Selection intervals elapsed
           0  Selection timeouts
```

(Continued)

Figure 9–3 (Cont.): NCP SHOW CIRCUIT COUNTERS Display

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW CIR ETHER-1 COUNT (RET)

Circuit Counters as of  3-SEP-1987 12:23:57

Circuit = ETHER-1

      >65534  Seconds since last zeroed
        4446  Terminating packets received
        2541  Originating packets sent
           0  Terminating congestion loss
     5330081  Transit packets received
     5324122  Transit packets sent
           0  Transit congestion loss
           0  Circuit down
           0  Initialization failure
         321  Adjacency down
         174  Peak adjacencies
   823282119  Bytes received
   367087857  Bytes sent
    10344602  Data blocks received
     5387790  Data blocks sent
           0  User buffer unavailable

NCP>
```

Figure 9–3 (Cont.): NCP SHOW CIRCUIT COUNTERS Display

Example 4

Figure 9-4 shows the command you use to display circuit status and a typical SHOW CIRCUIT STATUS display. The example illustrates the display for all circuits known to the router. The display is at a VAX/VMS management host. Circuit information is displayed for a router named ROBIN, with nonprivileged password WORMS.

The display for this command may show substates for lines showing internal network activity, such as loopback testing or line initialization. For more information on these substates and for an explanation of the display fields, see the DECnet documentation of the management host.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW KNOWN CIRCUITS STATUS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW KNO CIR STATUS (RET)
```

(Continued)

Figure 9–4: NCP SHOW CIRCUIT STATUS Display

```
Known Circuit Volatile Status as of  26-NOV-1986 12:19:24

   Circuit          State          Loopback      Adjacent      Block
                                     Name          Node         Size

  ASYNC-1           cleared                                       0
Listen timer            =     0
  ASYNC-2           on                          55.1012 (AVANTI)  1484
Listen timer            =    30
  ASYNC-3           on                          55.1013           1484
Listen timer            =    30
  ASYNC-4           on                          55.1016 (BLAZE)   1484
Listen timer            =    30
  ASYNC-5           on                          55.1021 (PRO02)   1484
Listen timer            =    30
  ASYNC-6           on                          55.1024 (RTRVAX)   576
Listen timer            =    30
  ASYNC-7           on                          55.1030 (PRO01)   1484
Listen timer            =    30
  ASYNC-8           on                          55.1049 (PRO04)   1484
Listen timer            =    30
  ETHER-1           on
Block size              =  1484
Listen timer            =    30


NCP>
```

Figure 9–4 (Cont.): NCP SHOW CIRCUIT STATUS Display

Example 5

Figure 9-5 shows the command you use to display summary information for circuits and a typical SHOW CIRCUIT SUMMARY display. The example illustrates the display at a VAX/VMS management host. Circuit information is displayed for a router named ROBIN, with nonprivileged password WORMS.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW KNOWN CIRCUITS SUMMARY (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW KNOWN CIRCUITS SUMMARY (RET)
```

(Continued)

Figure 9–5: NCP SHOW CIRCUIT SUMMARY Display

```
Known Circuit Volatile Summary as of  3-SEP-1987 12:48:36

   Circuit          State                    Loopback      Adjacent
                                               Name      Routing Node
  ASYNC-1           on       -starting
  ASYNC-2           on                                    55.281
  ASYNC-3           on       -starting
  ASYNC-4           on                                    55.57
  ASYNC-5           on       -starting
  ASYNC-6           on       -starting
  ASYNC-7           on       -starting
  ASYNC-8           on       -starting
  ETHER-1           on                                     4.77
  ETHER-1           on                                    55.78
  ETHER-1           on                                     4.47
  ETHER-1           on                                    55.231
  ETHER-1           on                                    55.44
  ETHER-1           on                                     4.332
  ETHER-1           on                                     4.1
  ETHER-1           on                                     4.378
  ETHER-1           on                                     4.42
  ETHER-1           on                                    55.77
  ETHER-1           on                                    55.152
  ETHER-1           on                                    55.85
  ETHER-1           on                                    55.227
  ETHER-1           on                                    55.311
  ETHER-1           on                                    55.260
  ETHER-1           on                                    55.295
  ETHER-1           on                                    55.263
  ETHER-1           on                                    55.103
  ETHER-1           on                                    55.268
  ETHER-1           on                                    55.110

NCP>
```

Figure 9–5 (Cont.): NCP SHOW CIRCUIT SUMMARY Display

SHOW EXECUTOR (Nonprivileged)

This command displays executor parameters in the router's operational database.

SHOW EXECUTOR CHARACTERISTICS displays the values that you previously set with either the DRCP SET EXECUTOR command or the NCP SET EXECUTOR command (or the defaults). This display also shows LOOP parameter values that you previously set with the NCP SET EXECUTOR command (or the defaults).

Format

SHOW EXECUTOR [CHARACTERISTICS | COUNTERS | STATUS | **SUMMARY**]

where

CHARACTERISTICS

displays the executor characteristics of the router, such as the last load host that performed a down-line load of the router's software image, loop count, loop length, inactivity timer, routing timer, broadcast routing timer, and buffer size. See Figure 9-6 for an example of the complete display.

COUNTERS

displays the executor counters, for example, the maximum active logical links, aged packet loss, and packet loss. See Figure 9-7 for an example of the complete display.

STATUS

displays the router's operating state and its Ethernet physical address. See Figure 9-8 for an example of the complete display.

SUMMARY

displays the router's operating state and its product name, and the version number of the operating software. See Figure 9-9 for an example of the complete display. SUMMARY is the default display.

Example 1

Figure 9-6 shows the command you use to display executor characteristics and a typical SHOW EXECUTOR CHARACTERISTICS display when a router node is the executor. The example illustrates the display of routing parameters and other database information at a VAX/VMS management host. Executor information is displayed for a router named ROBIN, running non-PTT software, with nonprivileged password WORMS, which makes SHOW EXECUTOR a privileged operation. (You could specify either the privileged password or the nonprivileged password.)

For an explanation of the display fields, see the command description of the DRCP SET EXECUTOR command in Volume II, Chapter 2, of this guide and the DECnet documentation of the management host.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW EXECUTOR CHARACTERISTICS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW EXEC CHAR (RET)
```

(Continued)

Figure 9-6: NCP SHOW EXECUTOR CHARACTERISTICS Display

```
Node Volatile Characteristics as of  2-SEP-1987 09:35:18

Executor node = 55.261 (ROBIN)

Identification            = DECrouter 200 V1.1  (NON-PTT)
Management version        = V4.2.0
Host                      = 55.264 (EAGLE)
Loop count                = 1
Loop length               = 40
Loop Data type            = mixed
Loop help type            = full
Incoming timer            = 60
Outgoing timer            = 45
NSP version               = V4.1.0
Maximum links             = 7
Delay factor              = 64
Delay weight              = 3
Inactivity timer          = 30
Retransmit factor         = 5
Routing version           = V2.1.0
Type                      = routing IV
Routing timer             = 300
Broadcast routing timer   = 30
Maximum address           = 1023
Maximum cost              = 1022
Maximum hops              = 30
Maximum visits            = 45
Maximum area              = 63
Max broadcast nonrouters  = 1022
Max broadcast routers     = 32
Maximum path splits       = 1
Buffer size               = 576

NCP>
```

Figure 9–6 (Cont.): NCP SHOW EXECUTOR CHARACTERISTICS Display

Example 2

Figure 9-7 shows the command you use to display executor counters and a typical SHOW EXECUTOR COUNTERS display when a router node is the executor. The example illustrates the display at a VAX/VMS management host. Executor information is displayed for a router named ROBIN, with nonprivileged password WORMS, which makes SHOW EXECUTOR a privileged operation. (You could specify either the privileged password or the nonprivileged password.)

For an explanation of the display fields, see the DECnet documentation of the management host.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW EXECUTOR COUNTERS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW EXECUTOR COUNTERS (RET)


Node Counters as of  2-SEP-1987 09:35:08

Executor node = 55.261 (ROBIN)

          2  Maximum logical links active
          0  Rejects sent, no resources
       >254  Aged packet loss
        678  Node unreachable packet loss
          0  Node out-of-range packet loss
          1  Oversized packet loss
         34  Packet format error
          0  Partial routing update loss
          0  Verification reject


NCP>
```

Figure 9–7: NCP SHOW EXECUTOR COUNTERS Display

Example 3

Figure 9-8 shows the command you use to display executor status and a typical SHOW EXECUTOR STATUS display when a router node is the executor. The example illustrates the display at a VAX/VMS management host. Executor information is displayed for a router named ROBIN, with nonprivileged password WORMS, which makes SHOW EXECUTOR a privileged operation. (You could specify either the privileged password or the nonprivileged password.)

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW EXECUTOR STATUS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW EXECUTOR STATUS (RET)
```

(Continued)

Figure 9–8: NCP SHOW EXECUTOR STATUS Display

```
Node Volatile Status as of  2-SEP-1987 09:34:26

Executor node = 55.261 (ROBIN)

State                     = on
Physical address          = AA-00-04-00-05-DD


NCP>
```

Figure 9–8 (Cont.): NCP SHOW EXECUTOR STATUS Display

Example 4

Figure 9-9 shows the command you use to display executor summary information and a typical SHOW EXECUTOR SUMMARY display on a non-PTT software kit when a router node is the executor. The example illustrates the display at a VAX/VMS management host. Information is displayed for a router named ROBIN, running non-PTT software, with nonprivileged password WORMS, which makes SHOW EXECUTOR a privileged operation. (You could specify either the privileged password or the nonprivileged password.)

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW EXECUTOR SUMMARY (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW EXECUTOR SUMMARY (RET)


Node Volatile Summary as of  2-SEP-1987 09:34:41

Executor node = 55.261 (ROBIN)

State                     = on
Identification            = DECrouter 200 V1.1  (NON-PTT)


NCP>
```

Figure 9–9: NCP SHOW EXECUTOR SUMMARY Display

SHOW LINE (Nonprivileged)

This command displays some line parameters from the router's operational database. Because you cannot change most of the line parameters on the running router, some of them are not displayed.

Format

SHOW { LINE *line-id* | ACTIVE LINES | KNOWN LINES } [CHARACTERISTICS | COUNTERS | STATUS | **SUMMARY**]

where

ACTIVE LINES

specifies all the lines known to the router that are in the ON state.

CHARACTERISTICS

displays line characteristics, such as the controller state (normal or loopback), and the value of the retransmit timer. See Figure 9-10 for the complete display.

COUNTERS

displays line counters, for example, process errors for the asynchronous lines and multicast bytes received for the Ethernet line. See Figure 9-11 for examples of the complete displays.

KNOWN LINES

specifies all of the router's lines, whether currently ON or OFF. Note that ASYNC-1 is not a known line if you set its STATE to MONITOR in the permanent database.

line-id

identifies a specific line about which you want information.

STATUS

displays line operating status: ON or OFF. See Figure 9-12 for an example of the display.

SUMMARY

displays the same information as the STATUS display. SUMMARY is the default display.

Example 1

Figure 9-10 shows two commands that display characteristics for router lines. The figure illustrates the display at a DECnet–ULTRIX management host. Line information is displayed for a router named ROBIN, with nonprivileged password worms, which makes **show line** a privileged operation. (Specify either the privileged password or the nonprivileged password.)

For an explanation of the display fields, see the DECnet documentation of your management host.

```
ncp> tell robin password worms show line async-2 char (RET)

Line Volatile Characteristics as of Tue Sep 20 13:06:49 EDT 1988

Line  =  ASYNC-2

Device                          = ASYNC-2
Controller                      = Normal
Duplex                          = Full
Protocol                        = DDCMP Point
Clock                           = Internal
Line speed                      = 19200
Communication mode              = Asynchronous
Retransmit timer                = 750

ncp> tell robin password worms shown line ether-1 char (RET)

Line Volatile Characteristics as of Tue Sep 20 13:06:55 EDT 1988

Line = ETHER-1

Device                  = ETHER-1
Controller              = normal
Protocol                = Ethernet
Hardware address        = 08-00-2B-03-DB-1A


ncp>
```

Figure 9–10: ncp show line characteristics Display

Example 2

Figure 9-11 shows the command you use to display the router's line counters. The figure also illustrates the display for an asynchronous line and for the Ethernet line at a VAX/VMS management host. Line information is displayed for a router named ROBIN, with nonprivileged password WORMS, which makes SHOW LINE a privileged operation. (Specify either the privileged password or the nonprivileged password.)

For an explanation of the display fields, see the DECnet documentation of the management host.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW LINE ASYNC-8 COUNTERS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW LINE ASYNC-8 COUNT (RET)


Line Counters as of 21-SEP-1987 10:18:29

Line = ASYNC-8

      >65534  Seconds since last zeroed
           0  Remote process errors
           0  Local process errors
```

(Continued)

Figure 9–11: NCP SHOW LINE COUNTERS Display

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW LINE ETHER-1 COUNT (RET)

Line Counters as of 21-SEP-1987 10:18:33

Line = ETHER-1

      >65534  Seconds since last zeroed
   674565846  Bytes received
     7733316  Bytes sent
   672329407  Multicast bytes received
     7455723  Data blocks received
       46905  Data blocks sent
     7437570  Multicast blocks received
        6761  Blocks sent, initially deferred
         535  Blocks sent, single collision
         640  Blocks sent, multiple collision
           0  Send failure
          29  Collision detect check failure
           6  Receive failure, including:
                Block check error
                Framing error
      >65534  Unrecognized frame destination
           4  Data overrun
       19593  System buffer unavailable
           0  User buffer unavailable

NCP>
```

Figure 9-11 (Cont.): NCP SHOW LINE COUNTERS Display

Example 3

Figure 9-12 shows the command you use to display the status of the router's lines. The figure also illustrates the display for all the lines at a VAX/VMS management host. Line information is displayed for a router named ROBIN, with nonprivileged password WORMS, which makes SHOW LINE a privileged operation. (You could specify either the privileged password or the nonprivileged password.) For an explanation of the display fields, see the DECnet documentation of the management host.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW KNOWN LINES STATUS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW KNOWN LINES STATUS (RET)


Known Line Volatile Status as of 25-JAN-1989 10:25:09

   Line              State

  ASYNC-1            on
  ASYNC-2            on
  ASYNC-3            on
  ASYNC-4            on
  ASYNC-5            on
  ASYNC-6            on
  ASYNC-7            on
  ASYNC-8            on
  ETHER-1            on

NCP>
```

Figure 9–12: NCP SHOW LINE STATUS Display

SHOW LOGGING (Nonprivileged)

This command displays logging parameters and other logging information in the router's operational database.

Format

SHOW LOGGING { CONSOLE | FILE | MONITOR } [CHARACTERISTICS | EVENTS | STATUS | **SUMMARY**] [SINK NODE *node-id* | KNOWN SINKS]

or

SHOW KNOWN LOGGING [CHARACTERISTICS | EVENTS | STATUS | **SUMMARY**] [SINK NODE *node-id* | KNOWN SINKS]

where

CONSOLE

displays logging information about the logging sink console.

EVENTS

displays the address of the sink node and all the types of events to be logged.

FILE

displays logging information about logging sink file.

KNOWN LOGGING

displays logging information about the logging sink console, file, and monitor.

KNOWN SINKS

displays logging information about the logging sink console, file, and monitor for all assigned logging sink nodes.

MONITOR

displays logging information about the logging sink monitor.

SINK

displays logging information about the console, file, and monitor of the specified logging sink. Specify either the DECnet node name (if this name is defined in the router's database) or the DECnet node address of the logging host.

The default display is for the current logging host.

Specify the SINK as:

NODE *node-id*

where *node-id* is the DECnet node name or DECnet node address of the logging host about which you want information.

Examples

Figures 9-13 through 9-16 show the commands you use to display logging information about your router. These figures show the displays at a VAX/VMS management host. Logging information is displayed for a router named ROBIN, with assigned logging host 55.222. ROBIN's nonprivileged password is WORMS, which makes SHOW LOGGING a privileged operation. (You could specify either the privileged password or the nonprivileged password.)

See Appendix B for the meanings of the displayed event codes. For an explanation of the other display fields, see the DECnet documentation of the node with NCP.

Example 1

This example illustrates a typical SHOW LOGGING CHARACTERISTICS display.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW LOGGING CONSOLE CHARACTERISTICS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW LOG CONSOLE CHAR (RET)

Logging Volatile Characteristics as of 21-SEP-1987 11:46:15

Logging sink type = console

No information available

NCP>
```

Figure 9–13: NCP SHOW LOGGING CHARACTERISTICS Display

Example 2

This example illustrates a typical SHOW LOGGING EVENTS display.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW LOGGING CONSOLE EVENTS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASS WORMS SHOW LOG CONSOLE EVENTS (RET)


Known Logging Volatile Events as of 21-SEP-1987 11:06:23

Logging sink type = console

Sink node               = 55.222 (EAGLE)
Events                  =  (All sources) 0.0-9
Events                  =  (All sources) 2.0-1
Events                  =  (All sources) 3.0-2
Events                  =  (All sources) 4.0-19
Events                  =  (All sources) 5.0-18
Events                  =  (All sources) 6.0-5


NCP>
```

Figure 9-14: NCP SHOW LOGGING EVENTS Display

Example 3

This example illustrates a typical SHOW LOGGING STATUS display.

```
NCP> SET EXEC NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW LOGGING CONSOLE STATUS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW LOG CONSOLE STATUS (RET)


Logging Volatile Status as of 21-SEP-1987 11:46:31

Logging sink type = console

No information available


NCP>
```

Figure 9-15: NCP SHOW LOGGING STATUS Display

Example 4

This example illustrates a typical SHOW LOGGING SUMMARY display.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW LOGGING CONSOLE SUMMARY (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW LOGGING CONSOLE SUMMARY (RET)


Logging Volatile Summary as of 21-SEP-1987 11:46:37


 Logging sink type = console

    Sink Node        Source              Events   State Name

   55.222 (EAGLE)    (All sources)       0.0-9
                     (All sources)       2.0-1
                     (All sources)       3.0-2
                     (All sources)       4.0-19
                     (All sources)       5.0-18
                     (All sources)       6.0-5


NCP>
```

Figure 9–16: NCP SHOW LOGGING SUMMARY Display

SHOW NODE (Nonprivileged)

This command displays node names and other node parameters in the router's operational database. These values were previously set with DRCP SET NODE commands or with NCP SET NODE commands.

Format

SHOW { NODE *node-id* / ACTIVE NODES / ADJACENT NODES / KNOWN NODES } [CHARACTERISTICS / COUNTERS / STATUS / **SUMMARY**]

where

ACTIVE NODES

displays information about all currently reachable nodes.

ADJACENT NODES

displays information about all the nodes adjacent to the router — the nodes that are one hop away. All the nodes on the same Ethernet as the router and all the nodes connected by the router's asynchronous lines are adjacent nodes.

CHARACTERISTICS

displays characteristics for nodes. See Figure 9-17 for an example of the display.

COUNTERS

displays node counters. See Figure 9-18 for an example of the display.

KNOWN NODES

displays information about all the nodes in the routing database.

node-id

identifies a specific node about which you want information.

STATUS

displays node operating status, for example, state (reachable or unreachable), cost, hops, circuit. See Figure 9-19 for an example of the complete display.

SUMMARY

displays one line of summary information about nodes. SUMMARY is the default-display. See Figure 9-20 for an example of the display.

Examples

Figures 9-17 through 9-20 show the commands you use to display information about nodes in your router's database. These figures show the displays at a VAX/VMS management host. Node information is displayed for a router named ROBIN, with assigned logging host 55.222. ROBIN's nonprivileged password is WORMS, which makes SHOW NODE a privileged operation. (You could specify either the privileged password or the nonprivileged password.)

For an explanation of the display fields, see the DECnet documentation of the node with NCP.

Example 1

This example illustrates a typical SHOW NODE display.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW NODE QUAIL CHARACTERISTICS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW NODE QUAIL CHAR (RET)

Node Volatile Characteristics as of 21-SEP-1987 15:31:07

Remote node =   55.222 (QUAIL)

No information available

NCP>
```

Figure 9–17: SHOW NODE Display

Example 2

This example illustrates a typical SHOW NODE COUNTERS display.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW NODE QUAIL COUNTERS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW NODE QUAIL COUNTERS (RET)


Node Counters as of 21-SEP-1987 15:31:29

Remote node =   55.222 (QUAIL)

No information available


NCP>
```

Figure 9–18: SHOW NODE COUNTERS Display

Example 3

This example illustrates a typical SHOW NODE STATUS display.

```
NCP> SET EXECUTOR ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW NODE QUAIL STATUS (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW NODE QUAIL STATUS (RET)


Node Volatile Status as of 21-SEP-1987 15:31:48

    Node           State      Active  Delay  Type           Cost  Hops  Circuit
                              Links

55.222 (QUAIL)   reachable       0          routing IV        1     1  ETHER-1
Next node to destination = 55.241 (JUNCO)


NCP>
```

Figure 9–19: SHOW NODE STATUS Display

Example 4

This example illustrates a typical SHOW NODE SUMMARY display.

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD WORMS (RET)
NCP> SHOW NODE QUAIL SUMMARY (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW NODE QUAIL SUMMARY (RET)


Node Volatile Summary as of 21-SEP-1987 15:31:58

    Node            State       Active  Delay   Circuit      Next node
                                Links

55.222 (QUAIL)  reachable         0             ETHER-1       55.241 (JUNCO)


NCP>
```

Figure 9–20: SHOW NODE SUMMARY Display

TELL Prefix

The TELL prefix at the beginning of an NCP command line directs the command to execute at the router and accesses the router's operational database.

For privileged NCP commands (SET, CLEAR, ZERO, LOOP), you must include the router's network management privileged password, if you previously defined one. For nonprivileged NCP commands (SHOW), you must include either the router's nonprivileged password or privileged password, if you previously made SHOW a privileged operation by defining a network management nonprivileged password.

TELL names the DECrouter 200 node as the executor for one command only. After you issue a command with the TELL prefix, the default executor remains unchanged. To enter multiple commands for remote execution at your router, first issue the NCP SET EXECUTOR NODE command (see the command description).

NOTE

If you previously set your router as the default executor by using the NCP SET EXECUTOR NODE command, do not use the TELL prefix.

Format

TELL *rtr-node-id* [USER *user-id* PASSWORD { *nonpriv-password* / *priv-password* }] *command*

or

TELL *rtr-node-id* ["*user-id* { *nonpriv-password* / *priv-password* }"] *command*

where

command

is the command you want executed at the router.

PASSWORD *nonpriv-password*
PASSWORD *priv-password*

identifies one of your router's executor passwords — either the network management privileged password or the network management nonprivileged password:

- Privileged password

  You must specify the privileged password if you previously defined one and you are now issuing a privileged NCP command.

- Nonprivileged password

  If you previously defined a nonprivileged password, you must specify either the privileged password or the nonprivileged password if you are now issuing an NCP SHOW command.

rtr-node-id

is the DECnet node name or node address of the router where you want the command to be executed.

USER *user-id*

identifies your user ID for access control verification at the designated executor node (the router).

For some DECnet systems, there are two ways to specify USER on the SET EXECUTOR NODE command line.

Some DECnet systems let you turn off echoing of passwords as you type them.

Example

This example shows how to use the TELL prefix to send the SHOW EXECUTOR CHARACTERISTICS command to a router named ROBIN. ROBIN's nonprivileged password is WORMS, which makes SHOW EXECUTOR a privileged operation. (You could specify either the privileged password or the nonprivileged password.)

```
NCP> TELL ROBIN USER MEME PASSWORD WORMS SHOW EXEC CHAR (RET)
```

TRIGGER

This command initiates a down-line load of the router's software image from a load host to the DECrouter 200 unit. The first load host to respond to the router's multicast request for a load performs the down-line load.

You can issue this command from any DECnet node on the Ethernet. This command executes at the local node, but it does affect the router's operational database.

Use one of three command formats:

- Format 1

  If you or the software installer ran the ROUCONFIG configuration procedure as Digital strongly suggests (see Chapter 4 of this manual or the *DECrouter 200 Software Installation Guide*), use Format 1.

- Formats 2 and 3

  If, instead of running ROUCONFIG, you or the software installer manually defined the router in the appropriate DECnet databases (see the DEFINE/SET NODE command description), use Format 2 or 3.

  If you wish to override the router's node parameters in the DECnet databases, use Format 2 or 3.

Format 1

TRIGGER NODE *rtr-node-id* [SERVICE PASSWORD *hex-password*]

Format 2

TRIGGER NODE *rtr-node-id* [VIA *circuit-id* | PHYSICAL ADDRESS *E-address* | SERVICE PASSWORD *hex-password*]

Format 3

TRIGGER VIA *circuit-id* PHYSICAL ADDRESS *E-address* [SERVICE PASSWORD *hex-password*]

where

circuit-id

is the Ethernet circuit over which the router's software image is to be loaded.

PHYSICAL ADDRESS *E-address*

is the Ethernet hardware address of the DECrouter 200 unit.

rtr-node-id

is the DECnet node name or node address of the router you want to reload.

SERVICE PASSWORD *hex-password*

is the router's DECnet service password. This password must match the service password defined in the router's permanent database.

Required if you defined a DECnet service password for the router, as Digital strongly recommends (see the DRCP SET LINE command description), and you did not also store this password in the load host's DECnet database, as Digital also strongly recommends.

VIA *circuit-id*

identifies the Ethernet circuit over which the router's software image is to be loaded.

Example

This command, executed at any DECnet node, initiates a down-line load of ROBIN's software image from the first load host that responds to the DECrouter 200 unit.

The router checks the service password FF44 to see if it matches the service password defined in its permanent database.

```
NCP> TRIGGER NODE ROBIN SERVICE PASSWORD FF44 (RET)
```

ZERO CIRCUIT (Privileged)

This command resets the counters for the router's circuits to zero.

Format

ZERO CIRCUIT *circuit-id* [COUNTERS]

where

circuit-id

specifies the circuit for which you want the counters set to 0.

COUNTERS

resets the counters.

Example

This example resets the counters for router ROBIN's asynchronous circuit ASYNC-2. ROBIN's privileged password is BIRDY, which makes ZERO CIRCUIT a privileged operation. (You must specify the privileged password.)

```
NCP> SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP> ZERO CIRCUIT ASYNC-2 (RET)
```

or

```
NCP> TELL ROBIN USER MEME PASSWORD BIRDY ZERO CIRCUIT ASYNC-2 (RET)
```

ZERO EXECUTOR (Privileged)

This command resets the values of the router's executor parameters relating to loopback testing. The values are reset to zero.

Format

ZERO EXECUTOR [COUNTERS]

where

COUNTERS

resets the counters.

Example

This example resets router ROBIN's executor counters. ROBIN's privileged password is BIRDY, which makes ZERO EXECUTOR a privileged operation. (You must specify the privileged password.)

```
NCP>SET EXECUTOR NODE ROBIN USER MEME PASSWORD BIRDY (RET)
NCP>ZERO EXECUTOR (RET)
```

or

```
NCP>TELL ROBIN USER MEME PASSWORD BIRDY ZERO EXECUTOR (RET)
```

ZERO LINE (Privileged)

This command resets the counters for the router's lines to zero.

Format

ZERO LINE *line-id* [COUNTERS]

where

COUNTERS

resets the counters.

line-id

specifies the line for which you want the counters set to 0.

Example

This example resets router FINCH's Ethernet counters. FINCH's PRIVILEGED PASSWORD is MYBIRD, which makes ZERO LINE a privileged operation. (You must specify the privileged password.)

```
NCP>SET EXECUTOR NODE FINCH PASSWORD MYBIRD (RET)
NCP>ZERO LINE ETHER-1 (RET)
```

or

```
NCP>TELL FINCH USER MEME PASSWORD MYBIRD ZERO LINE ETHER-1 (RET)
```

ZERO NODE (Privileged)

This command resets the counters for the nodes in the router's database to zero.

Format

ZERO NODE { *node-id* | KNOWN NODES } [COUNTERS]

where

COUNTERS

resets the counters.

KNOWN NODES

resets the counters for all the nodes in the router's routing database.

node-id

identifies the DECnet node name or DECnet node address of the node for which you want the counters set to 0.

If you defined a name for this node, either with DRCP SET NODE or with NCP SET NODE, you can enter either the *node-name* or the *node-address* as the *node-id*. If you did not define a name for this node, you must specify the node's DECnet node address.

Specify the address as *area.node-number*. Specify the unique node name with a string of from 1 to 6 alphanumeric characters. The first character must be a letter.

Example

This example resets the counters for node 55.21 (defined as OWL with DRCP SET NODE) in router FINCH's operational database. FINCH's privileged password is MYBIRD, which makes ZERO NODE a privileged operation. (You must specify the privileged password.)

```
NCP> SET EXECUTOR NODE FINCH USER MEME PASSWORD MYBIRD (RET)
NCP> ZERO NODE OWL (RET)
```

or

```
NCP> TELL FINCH PASSWORD MYBIRD ZERO NODE OWL (RET)
```

A
NCP Command Syntax

This appendix gives the syntax of the NCP commands for the DECrouter 200 manager. See Chapter 9 for detailed command descriptions.

Table A-1 shows commands that execute at the router, Table A-2, commands that execute at the local node, and Table A-3, commands that can execute either at the router or at the local node. Each table groups the commands first by function and then in alphabetical order.

This appendix employs the graphic conventions outlined in the Preface.

Table A–1: NCP Command Syntax for Commands That Execute at the Router

Command, Parameters, Values
SET Commands
SET { CIRCUIT ASYNC-*n* / KNOWN CIRCUITS } { COST *n* / STATE { OFF / **ON** } / VERIFICATION { **DISABLED** / ENABLED / INBOUND } }
SET CIRCUIT ETHER-1 { COST *n* / ROUTER PRIORITY *n* / STATE OFF }

(Continued)

Table A–1 (Cont.): NCP Command Syntax for Commands That Execute at the Router

Command, Parameters, Values

SET EXECUTOR [LOOP COUNT *n* | LOOP HELP { **FULL** / RECEIVE / TRANSMIT } | LOOP LENGTH *n* | LOOP WITH { **MIXED** / ONES / ZEROS } | NONPRIVILEGED PASSWORD *nonpriv-password* | PRIVILEGED PASSWORD *priv-password*]

SET LINE { ASYNC-*n* / ETHER-1 } CONTROLLER { **NORMAL** / LOOPBACK }

SET [KNOWN LOGGING / LOGGING CONSOLE / LOGGING FILE / LOGGING MONITOR] KNOWN EVENTS [SINK NODE *node-id*]

SET NODE *node-id* [INBOUND TYPE { ENDNODE / ROUTER } | NAME *DECnet-node-name* | RECEIVE PASSWORD *password* | TRANSMIT PASSWORD *password*]

SHOW Commands

SHOW [CIRCUIT *circuit-id* / ACTIVE CIRCUITS / KNOWN CIRCUITS] [CHARACTERISTICS / COUNTERS / STATUS / **SUMMARY**]

SHOW EXECUTOR [CHARACTERISTICS / COUNTERS / STATUS / **SUMMARY**]

(Continued)

Table A–1 (Cont.): NCP Command Syntax for Commands That Execute at the Router

Command, Parameters, Values
SHOW { LINE *line-id* | ACTIVE LINES | KNOWN LINES } [CHARACTERISTICS | COUNTERS | STATUS | **SUMMARY**]
SHOW { KNOWN LOGGING | LOGGING CONSOLE | LOGGING FILE | LOGGING MONITOR } [CHARACTERISTICS | EVENTS | STATUS | **SUMMARY**] [SINK NODE *node-id* | KNOWN SINKS]
SHOW { NODE *node-id* | ACTIVE NODES | ADJACENT NODES | KNOWN NODES } [CHARACTERISTICS | COUNTERS | STATUS | **SUMMARY**]
CLEAR Commands
CLEAR EXECUTOR { NONPRIVILEGED PASSWORD | PRIVILEGED PASSWORD }
CLEAR { LOGGING CONSOLE | LOGGING MONITOR | LOGGING FILE | KNOWN LOGGING } { KNOWN EVENTS | ALL } [SINK NODE *node-id*]
CLEAR NODE *node-id* { ALL | INBOUND TYPE | NAME | RECEIVE PASSWORD | TRANSMIT PASSWORD }
CLEAR KNOWN NODES [ALL]
ZERO Commands
ZERO { CIRCUIT *circuit-id* | EXECUTOR | LINE *line-id* | NODE *node-id* | KNOWN NODES } [COUNTERS]

Table A–2: NCP Command Syntax: Commands That Execute at the Local Node (the Management Host)

Command, Parameters, Values
HELP Command
HELP [*command*]
EXECUTOR Commands, TELL Prefix
CLEAR EXECUTOR NODE
SET EXECUTOR NODE *rtr-node-id* [USER *user-id* PASSWORD { *nonpriv-password* / *priv-password* }]
SET EXECUTOR NODE *rtr-node-id* ["*user-id* { *nonpriv-password* / *priv-password* }"]
TELL *rtr-node-id* [USER *user-id* PASSWORD *priv-password*] { *SET command* / *CLEAR command* / *LOOP command* / *ZERO command* }
TELL *rtr-node-id* ["*user-id priv-password*"] { *SET command* / *CLEAR command* / *LOOP command* / *ZERO command* }
TELL *rtr-node-id* [USER *user-id* PASSWORD { *nonpriv-password* / *priv-password* }] *SHOW command*
TELL *rtr-node-id* ["*user-id* { *nonpriv-password* / *priv-password* }"] *SHOW command*
DECnet Database Commands
{ DEFINE / SET } NODE *rtr-node-id* { ADDRESS *DECnet-node-address* / DUMP FILE [*uic*]:RTR*node-name*.DMP / HARDWARE ADDRESS *E-address* / LOAD FILE [*uic*]:RTR*node-name*.SYS / NAME *DECnet-node-name* / SERVICE CIRCUIT *circuit-id* / SERVICE PASSWORD *hex-password** }

*For effective security, Digital strongly suggests that you do not store your router's DECnet service password in the load host's DECnet database.

(Continued)

Table A–2 (Cont.): NCP Command Syntax: Commands That Execute at the Local Node (the Management Host)

Command, Parameters, Values
Down-Line Loading Commands
LOAD NODE *rtr-node-id* [FROM *rtr-image* | HOST *host-id* | SERVICE PASSWORD *hex-password*]
LOAD VIA *circuit-id* PHYSICAL ADDRESS *E-address* [FROM *rtr-image* | HOST *host-id* | SERVICE PASSWORD *hex-password*]
TRIGGER NODE *rtr-node-id* [VIA *circuit-id* | PHYSICAL ADDRESS *E-address* | SERVICE PASSWORD *hex-password*]
TRIGGER VIA *circuit-id* PHYSICAL ADDRESS *hex-address* [SERVICE PASSWORD *hex-password*]

Table A–3: NCP Command Syntax for Commands That Can Execute at the Router or the Local Node (the Management Host)

Command, Parameters, Values
LOOP Commands
LOOP CIRCUIT *circuit-id* [ASSISTANT NODE *node-id* | ASSISTANT PHYSICAL ADDRESS *E-address* | COUNT *n* | HELP { **FULL** | RECEIVE | TRANSMIT } | LENGTH *n* | NODE *node-id* | PHYSICAL ADDRESS *E-address* | SERVICE PASSWORD *hex-password* | WITH { **MIXED** | ONES | ZEROS }]

(Continued)

Table A–3 (Cont.): NCP Command Syntax for Commands That Can Execute at the Router or the Local Node (the Management Host)

Command, Parameters, Values
LOOP EXECUTOR [COUNT *n* LENGTH *n* WITH { **MIXED** / ONES / ZEROS }]
LOOP NODE *node-id* [COUNT *n* LENGTH *n* WITH { **MIXED** / ONES / ZEROS }]

B
DECnet Event Logging: Status and Error Messages

This appendix lists and explains the DECnet event messages generated by the router, also known as **local events**. Table B-1 lists the event classes of these DECnet events.

Table B–1: Classes of Local Router DECnet Events

Event Class	Description
0	Network Management layer
2	Session Control layer
3	End Communications layer
4	Routing layer
5	Data Link layer
6	Physical Link layer

B.1 Introduction

This section introduces DECnet event logging and how to interpret logging messages. For more information about assigning logging hosts, see Volume II, Section 1.1.4. Section 6.4.3.3 of this volume shows how to enable event logging.

B.1.1 Logging Hosts (Sink Nodes)

DECnet logs the router's local events at the router's **logging host**, also known as the **sink node**. The default logging host is the last load host that performed a down-line load. If you wish, you can specify a different logging host in the router's software image. Use the DRCP SET EXECUTOR LOGGING HOST command.

NOTE

For information about the logging of down-line loading events, see Sections 5.4.1 and 5.6.3.

By default, events are logged to all three possible logging host sinks: file, console, and monitor. You can change designated sinks with the DRCP SET LOGGING command and the NCP SET LOGGING command.

Event logging must be enabled at the logging host. If the logging host system manager has not enabled logging, you can do it with NCP commands.

In addition, the logging host system must have the DECnet event-receiver object (26) installed and defined.

You can change the logging host, or sink node, and the three sinks — file, console, monitor — on the running router with the NCP SET LOGGING command.

B.1.2 Message Formats

The format of DECnet event messages varies among logging host operating systems. This section highlights the event message formats on VAX/VMS and ULTRIX-32 systems. Note that MS–DOS nodes cannot act as logging hosts.

This is the format for most event messages on VAX/VMS logging hosts:

```
DECnet event nnn.n. event-descriptor
From node address (node-name). date time
Event detail
```

On ULTRIX hosts, the format is:

```
 Event type nnn.n. event-descriptor
Occurred date time on node number (name)
Event detail
```

where

nnn.n	identifies the class and type of event
event-descriptor	is a description of the event (a title)
date	is the date the event occurred
time	is the time the event occurred
node number	is the DECnet node address of the router
name	is the DECnet node name of the router
event detail	gives further details about the event

The events listed in this appendix contain only the most distinguishing lines of the message, plus brief descriptions and, where applicable, other information.

B.1.3 Organization and Contents

The messages are grouped in sections by class. Within each section, the events are listed by event type. **Event classes** 0 through 6 correspond to the layers of the DECnet architecture and **event types** relate to specific events.

This appendix explains only the DECnet events generated by the router. The logging sink node may collect other events. In addition, the load host usually receives event messages that DECnet generates when the router is loaded. See the *DECrouter 200 Software Installation Guide* for all the event messages generated during a normal down-line load.

B.2 Network Management Layer Events: 0

0.0 Event records lost

Events occurred too rapidly for the event logger to buffer them. This message does not display any event qualifiers.

0.4 Line counters zeroed

The router has been instructed to clear the counters for the specified line.

0.5 Node counters zeroed

The router has been instructed to clear the counters for the specified node.

0.6 Passive Loopback

The router is responding to a remote request to perform a loopback test on an asynchronous circuit. The router is either starting or ending the response to the remote loop request.

The message displays the type of loopback operation.

0.7 Aborted service request

The router has abnormally terminated a service request on an asynchronous circuit.

The message indicates the reason for the abnormal termination and possibly other information associated with the service request, such as the requesting node and/or target Ethernet address.

The abnormal termination may happen when the remote node that initiated the service has terminated its connection to the router.

0.9 Counters zeroed

The router has been instructed to clear the counters for the specified circuit. The message displays the counters for the line before they are zeroed.

B.3 Session Control Layer Events: 2

2.0 Local node state change

The router's executor has changed state. This event is logged only during system startup, when the executor goes into the ON state.

The message contains the reason for the state change, as well as the old and new states.

2.1 Access control reject

The router rejected a logical-link connection from a remote node based upon the access control information supplied in the connect.

The message contains the node name and process identifier of the node that originated the connection, the destination task attempting to connect to the router, and the password that was rejected.

B.4 End Communications Layer Events: 3

3.1 Invalid flow control

The router received an invalid credit flow control value from a remote node that requested message or segment flow control.

3.2 Node database reused

The router received a connection request from, or tried to initiate an outgoing connect to, a node for which there is no counter block (database entry).

This is not an error message. It indicates that all of the router's node counter blocks have been previously used, that is, they are already filled with counter information. To make a block available for this new node, the router allocated one of the previously used blocks. The router also removed the counters for the node formerly represented in this block.

This message displays:

- The DECnet node address of the node for which the counter block was formerly used
- The DECnet node name of the node
- The counters for the node

B.5 Routing Layer Events: 4

4.0 Aged packet loss

A packet has been discarded because it visited too many nodes. This situation can be a normal occurrence when the network is reconfiguring its routing databases, or it can be a failure when the value for the MAXIMUM HOPS parameter (see Volume II, Section 1.1.2) is too small.

The value for MAXIMUM VISITS, set by the network manager, should be 1 1/2 times the value for MAXIMUM HOPS. The router automatically computes the value for MAXIMUM VISITS.

This message displays only the packet header, information from the beginning of the packet. The message consists of:

- A hexadecimal byte of flags
- The decimal destination node address
- The decimal source node address
- A hexadecimal byte of forwarding data

See the *DNA Routing Layer Functional Specification* for additional information.

4.1 Node unreachable packet loss

The router discarded a packet because the destination node was unreachable.

This message displays the packet header and the name of the circuit to which the event applies. The packet header is described under event 4.0.

4.2 Node out of range packet loss

The router discarded a packet because the destination node number was greater than the value of the router's MAXIMUM ADDRESS parameter (see Volume II, Section 1.1.2).

Normally, this situation results if the address of a new node exceeds this value and you have not increased the MAXIMUM ADDRESS as necessary to accommodate the new node.

This message displays the packet header and the name of the circuit to which the event applies. The packet header is described under event 4.0.

4.3 Oversized packet loss

The router discarded a packet because it was too large to forward to the appropriate adjacent node.

The source node sent a packet that was too large. If this is the problem, decrease either the buffer size or the segment size at the source node.

NOTE

Buffer sizes should be equal throughout the network.

This message displays the packet header and the name of the circuit over which the packet was to be forwarded. The packet header is described under event 4.0.

4.4 Packet format error

The router discarded a packet because of a format error in the packet header. Usually this condition results from a programming error in packet formatting by the adjacent node, but it could also arise from a circuit error not detected by circuit protocol.

This message displays a packet header and the name of the circuit to which the event applies. The message displays the first 6 bytes of the packet in hexadecimal.

4.5 Partial routing update loss

The router received a routing message containing node addresses greater than the router's highest reachable address, as defined by its MAXIMUM ADDRESS parameter (see Volume II, Section 1.1.2). The information on these nodes was lost.

This problem occurs when the value of MAXIMUM ADDRESS on an adjacent node is increased but you have not also increased the router's MAXIMUM ADDRESS.

This message displays:

- The name of the circuit over which the router received the message.
- The packet header. The packet header is described under event 4.0.
- The highest node address in the routing update that was lost.

4.6 Verification reject

Initialization with an adjacent node failed because the router received an invalid password. The receive password does not match the adjacent node's transmit password.

This message displays:

- The name of the circuit to which the event applies
- The address of the adjacent node that failed to initialize
- The name of the adjacent node

For the node to initialize, take one of these corrective actions:

- Modify the receive password in the router's database to match the adjacent node's transmit password.
- Modify the node's transmit password to match the router's receive password for that node.
- Disable verification on the circuit attached to the adjacent node.

4.8 Circuit down

A software error occurred on the circuit and the circuit was taken out of service. Two of the common causes of this event are:

- There is a hardware problem with the line and/or a device.
- The remote circuit has recycled. This situation can result because an adjacent node sent an incorrect password during initialization.

This message displays the name of the circuit to which the event applies and the adjacent node. Some of the possible reasons for this event are:

Adjacent node address change

The adjacent node changed addresses without going through the normal initialization sequence. This message is logged when an adjacent node attempts to initialize with the router but the adjacent node's address is not in the router's adjacency database (part of its routing database).

Adjacent node address out of range

The adjacent node's address is greater than the value of the MAXIMUM ADDRESS parameter (see Volume II, Section 1.1.2) defined for the router. This problem can be caused by an incorrectly defined node address or by a failure to increase the MAXIMUM ADDRESS parameter for the router when a new node was added.

Adjacent node block size too small

The line block size provided by an adjacent Phase III node is too small for normal network operation. The block size may be set incorrectly at the adjacent node. Increase the buffer size on the adjacent Phase III node to handle the largest possible routing update message. Use this formula:

Buffer Size = (MAXIMUM ADDRESS × 9) + 2

Adjacent node listener receive timeout

The router received no message over the data link within the time period defined for the Listen timer. (Use the NCP SHOW CIRCUIT *circuit-id* CHARACTERISTICS command to display this value.) Probably, the adjacent node is not running.

Adjacent node listener received invalid data

A test message sent by an adjacent node had invalid or corrupted data. This situation is usually caused by a hardware problem. Check the cabling and interface connection. To see if the connection is at fault, try a different connection.

Circuit synchronization lost

The adjacent node restarted or terminated the normal circuit protocol. Either a circuit exceeded an error threshold or network management initiated a circuit state change.

Routing update checksum error

A routing update packet failed its internal integrity test. This message signals a problem for which you should submit an SPR.

Verification receive timeout

The router did not receive, within the required response time of 30 seconds, a required verification packet from the adjacent node.

Either packets were lost on the circuit, or a failure occurred at the adjacent node. Check the transmit password of the adjacent node to ensure that it matches the router's receive password.

Version skew

The routing version of the adjacent node is not supported by the router. The operator may have installed incorrect software at the adjacent node. For example, the adjacent node may be a Phase II node.

4.9 Circuit down, operator initiated

Another user turned off the circuit. Someone may have issued the NCP SET CIRCUIT STATE command or perhaps another manager executed a LOOP CIRCUIT command at the router.

This message displays:

- The name of the circuit to which the event applies.
- The adjacent node address.
- The adjacent node name.

4.10 Circuit up

A remote node has been initialized on one of the circuits connected to the router.

This message displays the name of the circuit to which the event applies, as well as the name and address of the adjacent node.

NOTE

This event does not imply that the node is reachable. The event simply says that all basic initialization has been completed by the device.

4.11 Initialization failure – line fault

A remote node failed to initialize with the router due to a line error. If the remote node is on a dial-back line, the router failed at an attempt to call a security dial-back node. The call may have failed for one of these reasons:

- There are power problems with the telephone lines.
- The value for the node's DTEADDRESS in the router's database is not the node's correct telephone number. See the discussion of the DTEADDRESS node parameter in Volume II, Section 1.1.5.
- The kind of dialing you specified with special characters in the DTEADDRESS is not appropriate for the type of modem attached to the node's asynchronous line. See Appendix C for information on valid special characters in the DTEADDRESS according to modem type.

Here is an example of a 4.11 event message:

```
Decnet event 4.11, init failure, circuit fault
From node 55.1, 16-Jan-1989 03:30:30
Circuit async-3, Call failed
```

4.12 Initialization failure – software fault

A remote node failed to initialize with the router due to a software error. See the reasons listed for event 4.8.

4.14 Node reachability change

The reachability of a remote node changed from unreachable to reachable or from reachable to unreachable.

The message displays the current reachability status of the node.

4.15 Adjacency up

Initialization occurred either with another node on the Ethernet or on one of the asynchronous ports.

This message displays the adjacent node's address.

4.16 Adjacency rejected

Initialization was rejected either with a node on the Ethernet or on one of the asynchronous ports. This message displays the reason for the rejection, which is probably one of these situations:

- The number of actual end nodes exceeds the value of the router's MAXIMUM BROADCAST NONROUTERS parameter (see Volume II, Section 1.1.2).

  Because the parameter is exceeded, some end nodes on the Ethernet have been rendered unreachable. If you want all the end nodes to be reachable, increase the value of MAXIMUM BROADCAST NONROUTERS.

- The number of actual routing nodes exceeds the value of the router's MAXIMUM BROADCAST ROUTERS parameter (see Volume II, Section 1.1.2).

  The value of this parameter should be large enough to accommodate all the routers on the same Ethernet. In multiple area networks, the value should also be larger than the number of all the routers in the same area plus the number of level 2 routers in other areas.

  Increase the value of MAXIMUM BROADCAST ROUTERS.

4.18 Adjacency down

The remote node has recycled. This event can result from a remote node restart or from an invalid protocol message.

The message displays the reason that the adjacent node is down.

B.6 Data Link Layer Events: 5

5.3 Send error threshold

The number of consecutive failures from the router's attempts to transmit a packet exceeded 8. This event applies only to asynchronous circuits.

The message displays the current circuit counters for the circuit that had the failure. This event generally indicates a problem with either the communications line or the remote node. Examine the counters to determine which error threshold was exceeded.

If this error occurs infrequently, corrective action may not be necessary. Sometimes, reducing the speed (see Volume II, Section 1.1.3, on the LINE SPEED parameter) or length of the asynchronous line may reduce send failures on that line.

NOTE

Sometimes the counters are equal to zero, indicating that no errors occurred. Zero counters may mean:

- Nothing is connected to the opposite side of the circuit.
- The line is corrupted and the connected device cannot transmit across it.

5.4 Receive error threshold

The number of consecutive failures from the router's attempts to receive a packet exceeded 8. This event applies only to asynchronous circuits.

The message displays the current circuit counters for the circuit that had the failure. This event generally indicates a problem with either the communications line or the remote node. Examine the counters to determine which error threshold was exceeded. If this error occurs infrequently, corrective action may not be necessary. Sometimes, reducing the speed (see Volume II Section 1.1.3 on the LINE SPEED parameter) or length of the asynchronous line may reduce receive failures on that line.

NOTE

Sometimes the counters are equal to zero, indicating that no errors occurred. Zero counters may mean:

- Nothing is connected to the opposite side of the circuit.
- The line is corrupted and the connected device cannot transmit across it.

5.14 Send failed

An error occurred during a transmit operation over the Ethernet.

This message displays the reason for the failure. Some of the possible reasons for this event are:

Carrier check failed

The data link did not sense the receive signal that must accompany a transmit message. There is a failure in either the transmitting or the receiving hardware, possibly with the transceiver or its cable.

Excessive collisions

The maximum number of retransmissions due to collisions has been exceeded. This problem arises when too many systems on the Ethernet are trying to transmit at once.

Remote failure to defer

A remote system began transmitting after the allowable time for collisions had elapsed. This situation arises from a weak transmitter on the router or a problem with the remote carrier sense circuitry.

5.15 Receive failed

An error occurred during a receive operation over the Ethernet.

This message displays the reason for the failure. Some of the possible reasons for this event are:

Block check error

The received message failed the cyclic redundancy check (CRC). Some of the possible causes are electromagnetic interference, late collisions, and improperly set hardware parameters.

NOTE

A cyclic redundancy check (CRC) error (block check error) and a framing error (see below) may be logged back-to-back. This problem may mean that one or more bits were corrupted, making the message size incorrect.

Frame too long

The message was discarded because a remote system sent a message that exceeded the maximum allowable length (greater than the Ethernet maximum or the posted buffer size).

The event may be caused by "babble" errors, where the transmitting station does not stop transmitting. Packets will exceed the maximum size for the Ethernet. This failure may indicate a problem with the hardware on the transmitting station.

Framing error

The message did not contain a multiple of 8-bit bytes. Some of the possible causes are electromagnetic interference, late collisions, and improperly set hardware parameters.

Data overrun, Ethernet header = . . .

The router received data larger than the buffer space. The entire message is discarded. Note that this situation should not occur.

System buffer unavailable

Insufficient system memory was available to receive a packet from the Ethernet. The packet was dropped. This message indicates high traffic levels on the Ethernet.

B.7 Physical Link Layer Events: 6

The following two events are logged only when the state of the line goes from ON to OFF, such as when the line goes down because of an error on the line or because the remote end of the line disconnects.

6.0 Data set ready transition

The Data Set Ready (DSR) modem control signal changed state on a modem-controlled line.

This message displays the new state of the DSR. The message is generated whenever a modem connected to the router connects or disconnects from a remote modem.

6.2 Unexpected carrier transition

The carrier detect (CD) modem-control signal changed state on a modem-controlled line.

This message displays the new state of the CD. The message is generated whenever a modem connected to the router connects or disconnects from a remote modem.

C
Modem Control Characteristics

This appendix shows the valid control characteristics and dialing modifiers for each supported modem listed below. To set up the router's dial-back feature, configure your modems following the instructions in this appendix and in the documentation for the modem.

- DF03-AC
- DF03-RC
- DF112
- DF224
- Hayes Smartmodem 2400
- Codex 2233
- Codex 2260
- V.25 *bis* auto-dial modem

C.1 Setting the Control Characteristics

This section shows you what control characteristics to set for Digital and other supported modems.

C.1.1 Digital Modems

Set the modem control characteristics as shown in the following sections.

C.1.1.1 DF03-AC Modem (with any M7177) — With interface board (70-17298)

```
Switchpack 1          Switchpack 2
       S2 on                 S4 on
       S3 on
       S4 off
       S6 on
```

C.1.1.2 DF03-RC Modem (M7177 Rev. F or later) — With rack mount modem board

```
Switchpack 2
       S7  off
```

C.1.1.3 DF112 Modem — Use the factory settings.

C.1.1.4 DF224 Modem (Scholar)

```
Switchpack 1
       S1  off
       S3  off
```

C.1.2 Hayes Smartmodem 2400 and Codex 2233 Modems

To configure either the Hayes Smartmodem 2400 or the Codex 2233 modem, follow these steps:

1. Connect an asynch terminal to the modem. Set this terminal to:
   - The DECrouter 200 line speed you want
   - 8 bit characters
   - 1 stop bit
   - Parity disabled
2. At the terminal, issue two commands to set up the correct modem characteristics:

   ```
   AT&F (RET)
   ATS0=2&D2E0V0&C1&S1&M0&W (RET)
   ```

C.1.3 Codex 2260 Modem

To configure the Codex 2260 modem, follow these steps:

1. Connect an asynch terminal to the modem. Set this terminal to:
   - The DECrouter 200 line speed you want
   - 8 bit characters
   - 1 stop bit
   - Parity disabled
2. At the terminal, issue two commands to setup the correct modem characteristics:

```
AT&F (RET)
AT*AA2&D2E0V0&C1*MR0&M0&W0 (RET)
```

C.1.4 V.25 *bis* Auto-Dial Modem

To configure a V.25 *bis* auto-dial modem, set the modem to accept dialing command characters of 7 bits with one even parity bit and one stop unit element.

C.2 Setting the Dialing Modifiers

This section shows what dialing string modifier characters you can set for Digital and other supported modems.

C.2.1 Digital Modems

You can set the dialing string modifier characters shown in the following sections.

C.2.1.1 DF03 Modem

Character	Description
=	Waits for secondary dial tone

C.2.1.2 DF112 Modem

Character	Description
P	Pulse dials
T	Tone dials
=	Waits for secondary dial tone

C.2.1.3 DF224 Modem (Scholar)

Character	Description
P	Pulse dials
T	Tone dials
=	Waits for secondary dial tone
W	Waits five seconds and then dials ignoring dial tone presence

C.2.2 Hayes Smartmodem 2400, Codex 2233, and Codex 2260 Modems

Character	Description
P	Pulse dials
T	Tone dials
W	Waits the period of time you set on register S7 for a dial tone. Use this character for a PBX that needs a secondary dial tone.

D
DECrouter 200 Hardware LAN Configurations

This appendix describes several of the possible DECrouter 200 hardware LAN configurations, including:

- Applicable LAN environments for DECrouter 200 systems
- Required hardware components and connections
- Advantages and disadvantages of different LAN configurations
- Asynchronous line configurations supported by the router

See Chapter 2 for information about modifying DECrouter 200 parameters to match the hardware configuration. See the *DECrouter 200 Hardware Installation/Owner's Guide* for details about installing the DECrouter 200 hardware and attached devices. This guide also provides hardware configuration rules.

D.1 Connecting the DECrouter 200 Unit to the Network

The router supports both baseband and broadband networks. In baseband LAN configurations, the router connects to:

- A coaxial Ethernet LAN by means of an H4000 transceiver
- A Digital Ethernet Local Network Interconnect (DELNI), either stand-alone or connected to a baseband Ethernet backbone
- A ThinWire Ethernet cable by means of an Ethernet Station Adapter (DESTA)

In broadband configurations, the router connects to:

- A broadband cable by means of a DECOM transceiver
- A DELNI that is connected to a broadband cable

For connections to an Ethernet when a transceiver is not accessible, the DECrouter 200's transceiver cable can connect to another transceiver cable section secured in an Etherjack junction box. The *DECrouter 200 Hardware/Installation Owner's Guide* explains how to connect your DECrouter 200's transceiver cable to the Etherjack junction box.

The following sections discuss some basic hardware LAN configurations.

D.1.1 Connecting to an Ethernet Baseband Coaxial Cable

To connect the DECrouter 200 unit directly to an Ethernet baseband cable, you need an H4000 transceiver. Figure D-1 shows a DECrouter 200 unit connected to a baseband Ethernet cable.

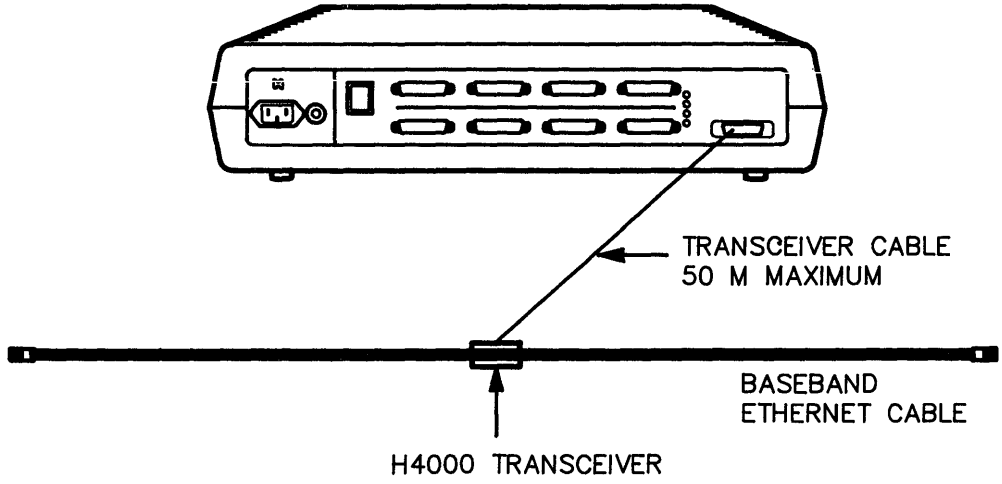

Figure D–1: DECrouter 200 Unit Connected to a Standard Ethernet Cable

The transceiver cable between the transceiver and the DECrouter 200 unit can be from 5 to 50 meters (16.4 to 164 feet) long. Office transceiver cables (BNE4x-xx) are limited to 12.5 meters (41 feet).

D.1.2 Connecting to a DELNI

The DELNI is a hardware device that contains eight transceiver ports. The router unit and other nodes connect to these ports.

You can use the DELNI in a stand-alone configuration (unconnected to an Ethernet cable), or you can connect it to an Ethernet coaxial cable. You must position the switch on the DELNI's front panel according to the way the DELNI is configured (see Figures D-2, D-3, and D-4). Set the switch to:

- Local mode when the DELNI is a stand-alone unit
- Global mode when the DELNI is connected to an Ethernet cable
- Global mode when the DELNI is configured on the second-tier of a hierarchical stand-alone configuration (see Section D.1.2.1).

See the *DELNI Installation/Owner's Manual* for installation and troubleshooting instructions.

D.1.2.1 DELNI Stand-Alone Configurations — In a stand-alone configuration, the DELNI supports up to eight processors using standard Ethernet transceiver cables, each up to 50 meters (164 feet) in length. The DELNI and its connected array of processors form a LAN of their own. Figure D-2 shows this configuration.

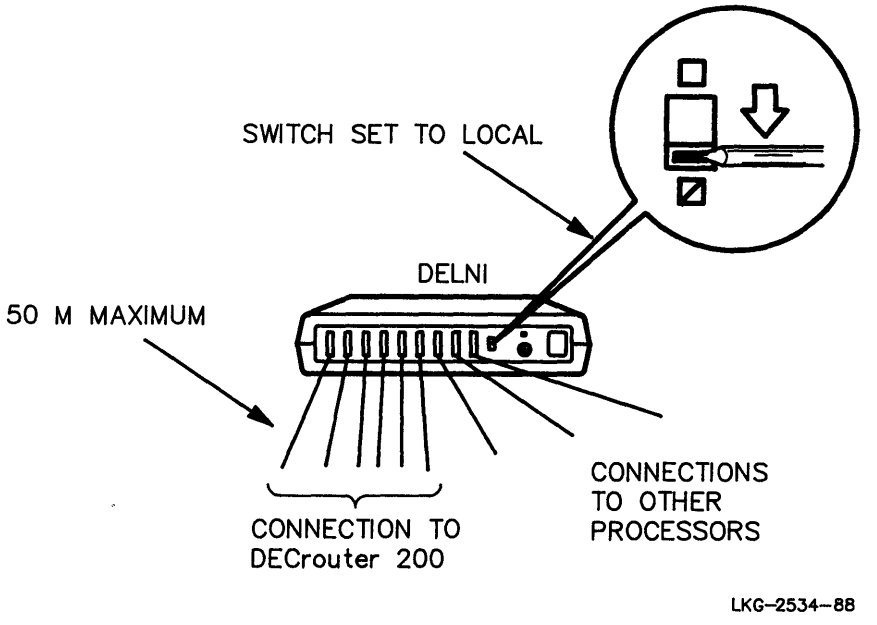

Figure D–2: DECrouter 200 Unit Connected to a Stand-alone DELNI LAN

These LANs are economical, since they eliminate the need for coaxial cables and H4000 transceivers. However, a LAN's size is limited to eight nodes within a small area.

For larger networks, you can connect several DELNIs to form a hierarchical stand-alone LAN, also called a two-tier DELNI configuration. Figure D-3 shows a router in this configuration. A single DELNI forms the first tier. Its switch is set to Local mode.

As many as eight other DELNIs, known as second-tier DELNIs, or processors can be connected to the first-tier DELNI. Switch each second-tier DELNI to global mode. Cables connecting these units to the first-tier DELNI can be up to 50 meters (164 feet) in length. If you connect eight DELNIs to the first-tier DELNI, you can economically configure a LAN of 64 nodes, with each second-tier DELNI having eight processors connected to it.

The maximum cable length for DECrouter 200 units connected to the DELNIs on either tier is 50 meters.

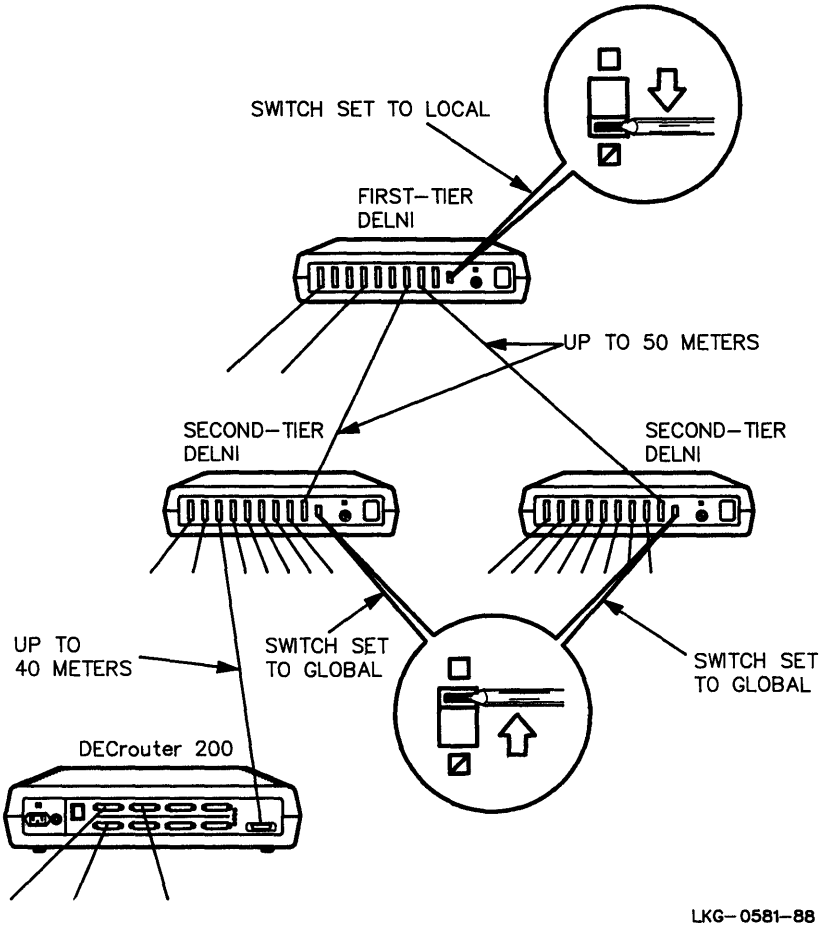

Figure D–3: DECrouter 200 Unit Connected to a Two-Tier DELNI LAN

D.1.2.2 DELNI-to-Ethernet Configurations — If your network needs are greater than what the stand-alone DELNIs can provide, or if your needs grow, you can implement a larger Ethernet LAN by connecting a DELNI to an Ethernet coaxial cable. The DELNI has a ninth port that can be connected to the Ethernet cable.

If you use such a connection, each of the nodes on the DELNI will appear to other Ethernet nodes as a fully independent operating entity. The DELNI, therefore, lets you connect eight nodes to the Ethernet for the price of one transceiver connection. Figure D-4 shows a DELNI indirectly connecting a router to a baseband Ethernet. The DELNI's switch is set to global mode.

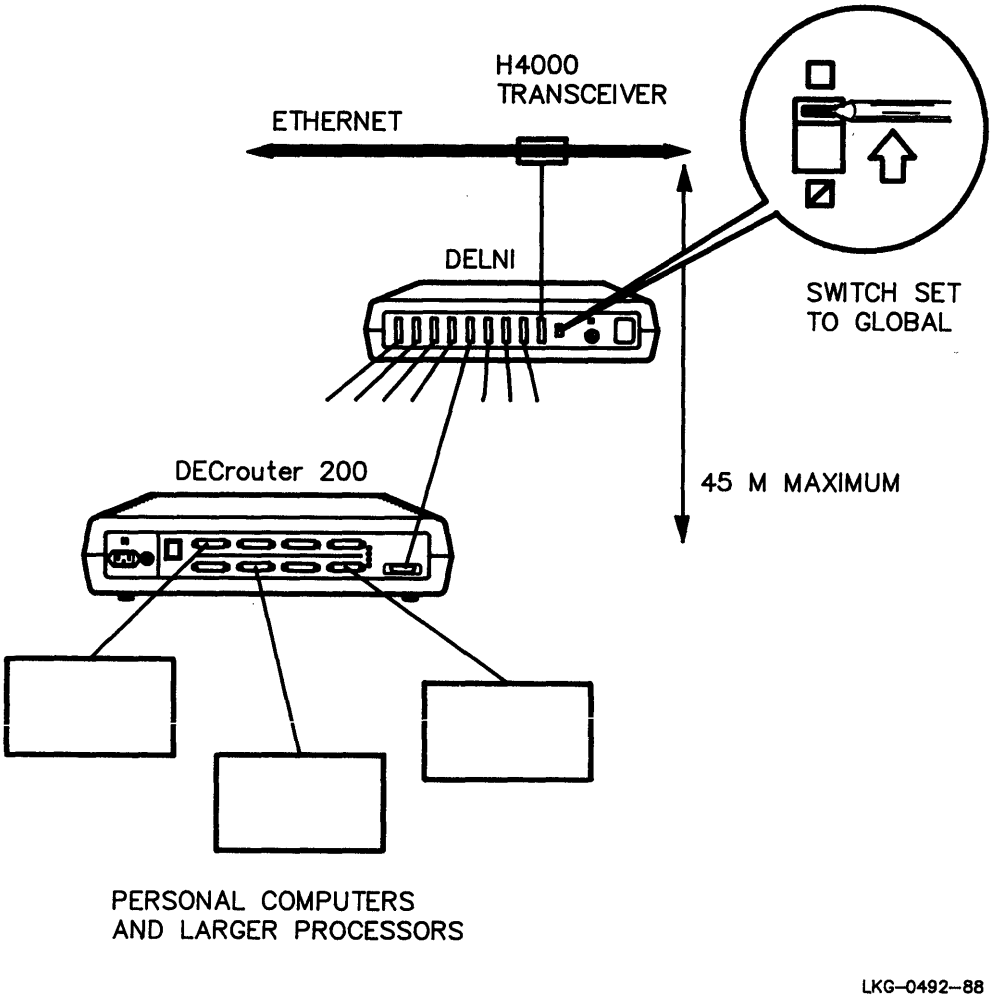

Figure D-4: Connecting a DECrouter 200 Unit to an Ethernet Through a DELNI

One drawback with this configuration is that all the nodes on the DELNI must be positioned within 40 meters (131.2 feet) of the transceiver through which the DELNI is connected to the Ethernet cable.

When connected to an Ethernet coaxial cable, a DELNI cannot be used in a hierarchical configuration.

D.1.3 Connecting to a ThinWire Ethernet

ThinWire Ethernet is a low-cost, flexible, easy-to-install baseband cable that can form a stand-alone network as an alternative to the standard Ethernet cabling. Or, you can connect a ThinWire Ethernet to a standard "backbone" Ethernet in local work areas. A ThinWire Ethernet provides full Ethernet capability in offices and other local work areas, allowing connections of up to 30 stations in one 185-meter (600 feet) segment.

You can connect the router to a ThinWire Ethernet through a transceiver known as a DESTA (Digital Ethernet Station Adapter). You can connect up to 30 stations to the ThinWire segment that comprises the LAN. Figure D-5 shows a DECrouter 200 unit connected to a ThinWire stand-alone LAN through a DESTA.

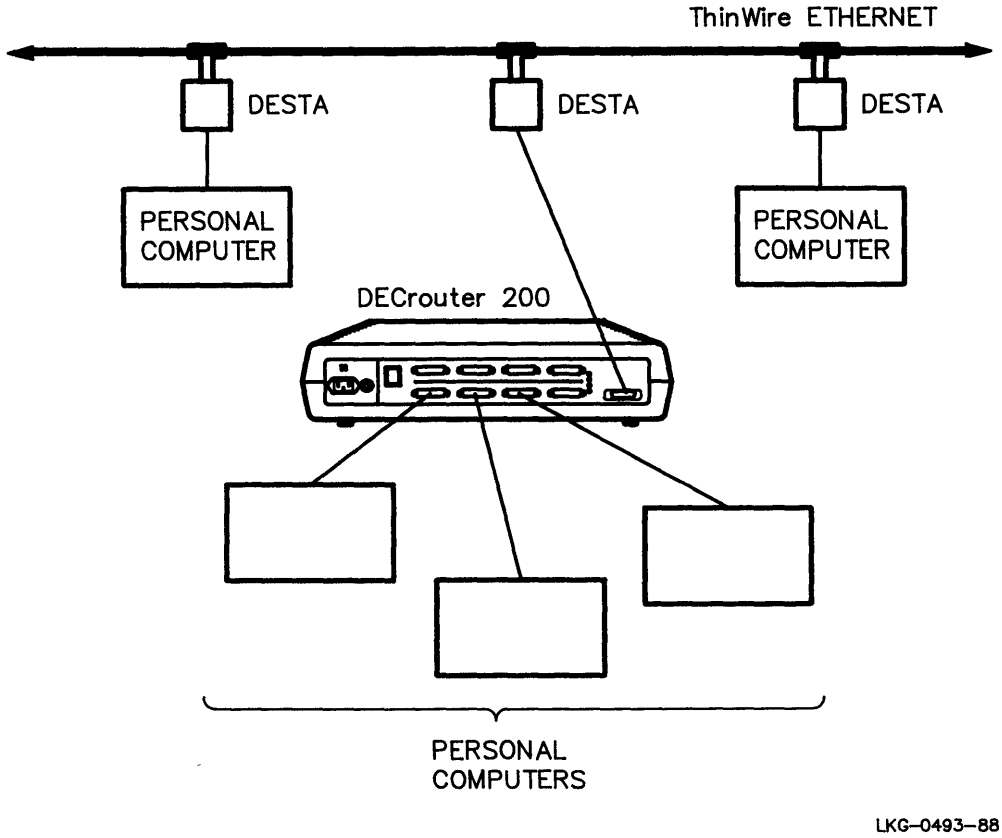

Figure D-5: Connecting to a ThinWire Ethernet Through a DESTA

For more information on ThinWire Ethernet configurations, see your Digital sales representative.

D.1.4 Connecting to an Ethernet Broadband Network

To connect your DECrouter 200 unit to a broadband Ethernet network, use a DECOM (Broadband Ethernet Transceiver). The DECOM transceiver uses the same transceiver cable as the H4000. While the longest distance between any two nodes on a baseband Ethernet is 2,800 meters (1.74 miles), the longest distance between any two nodes on a broadband Ethernet is 3,800 meters (about 2.4 miles).

Figure D-6 shows a DECrouter 200 connected to a broadband Ethernet through a DECOM.

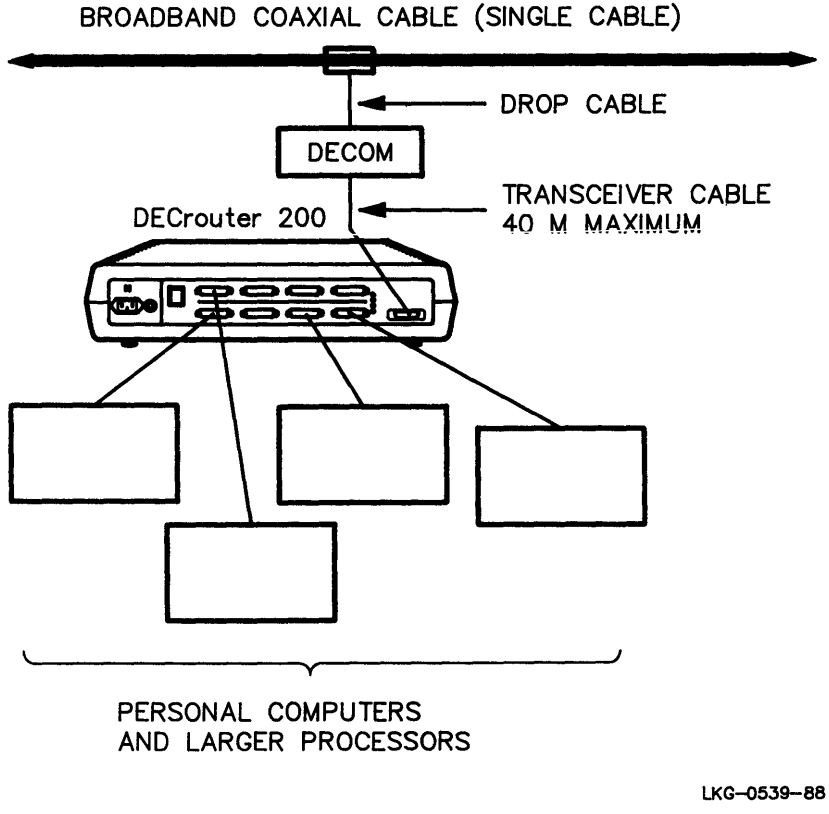

Figure D-6: DECrouter 200 Unit Connected to a Broadband Ethernet Cable

You can also connect the DECrouter 200 unit to a broadband through a DELNI. For more information on broadband Ethernet configurations, see your Digital sales representative.

D.1.5 Summary

There are many possible LAN configurations for the DECrouter 200 unit. Here are only a few examples:

- In small networks within a local work area, connect the DECrouter 200 unit to DELNI stand-alone LANs.
- In small networks within a local work area, connect the DECrouter 200 unit to a ThinWire Ethernet.
- In larger networks, connect the DECrouter 200 unit directly to baseband or broadband Ethernet LANs.
- In larger networks, connect the DECrouter 200 unit to DELNIs that are connected to Ethernet LANs.

Table D-1 lists the LAN configurations to which the DECrouter 200 unit can be connected. The table also includes the hardware components you need, the number of nodes you can configure in the LAN, and any restrictions on the position of the nodes.

Table D–1: LAN Configurations Applicable to DECrouter 200 Unit

Baseband	Components Needed	Size Limit	Distance Restrictions
Direct Connect to Ethernet	H4000 transceiver	n/a	Transceiver cable connecting DECrouter to Ethernet must be from 5 to 50 meters in length
DELNI Stand-alone (Single tier)	DELNI (directly connected)	8 nodes	DECrouter connected to DELNI must be within 50 meters (147.6 ft.) of DELNI
DELNI Stand-alone (Two tiers)	DELNI (directly connected)	64 nodes	DECrouter connected to DELNI must be within 50 meters of DELNI
Connected DELNI	DELNI plus H4000 transceiver for connecting DELNI to Ethernet	DECrouter and 7 other nodes directly connected to DELNI	DECrouter must be within 40 meters from Ethernet cable

(Continued)

Table D–1 (Cont.): LAN Configurations Applicable to DECrouter 200 Unit

Broadband	Components Needed	Size Limit	Distance Restrictions
Direct Connect to Ethernet	DECOM, drop cable, transceiver cable	n/a	Drop cable: 25 meter maximum (82 feet). Transceiver cable:5 to 40 meters in length.
Connected DELNI	DELNI, DECOM and cables for DELNI connection to Ethernet	DECrouter and 7 other nodes directly connected to DELNI	Maximum cable length from DECrouter to DECOM: 35 meters
ThinWire			
Work-area Configuration	DESTA	30 nodes directly connected to ThinWire	50 meters between DECrouter and DESTA

D.2 Connecting Processors to the DECrouter 200's Asynchronous Ports

The DECrouter 200 unit has eight ports for asynchronous connections with these supported devices:

- Digital personal computers
- IBM personal computers
- Other DECrouter 200 units
- VAX/VMS systems
- Any system running DECnet with asynchronous DDCMP

See the *DECrouter 200 Software Product Description* (SPD) for details on supported devices. Note that nodes connected to the router's asynchronous ports can be routing nodes, as well as personal computers and other end nodes.

You can set up the asynchronous ports in many ways, depending on the types of processors attached to the ports and the uses you plan for them. Connections can be direct or indirect:

- Indirect connections use a modem.
- Direct connections allow higher transmission speeds than modem connections but distances are limited.

The maximum supported cable length is 61 meters (200 feet), though the DECrouter 200 unit can perform over lengths exceeding this limit. (Even though the router can drive long lines, the device you connect the unit to may have more severe line-length limitations.) Direct connections are for processors within the immediate office environment that use standard twisted-pair office wiring. Figure D-7 shows a DECrouter 200 unit with three processors directly connected.

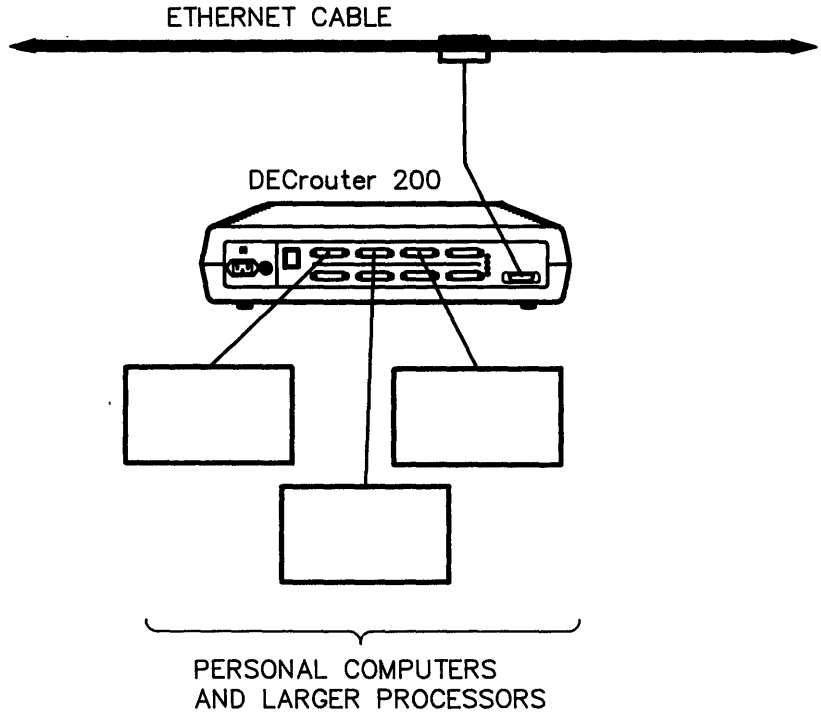

Figure D–7: DECrouter 200 Unit with Three Processors Directly Connected

The DECrouter 200 unit can support a direct connection of any EIA-232-D asynchronous processor operating at speeds of up to 19,200 bits per second (bps) and using the asynchronous DDCMP protocol. The unit supports aggregate line speeds of up to 76,800 bps for all connected processors: up to four lines at 19,200 bps each, eight lines at 9600 bps each, or less.

With modem connections, you can connect processors at remote sites. The DECrouter 200 system supports modem control and modem monitoring so that you can connect remote processors through dial-in or leased lines. You can use these lines to connect the DECrouter 200 unit to a remote network. The router supports full-duplex modems conforming to the EIA-232-D and CCITT V.24 standards. See the *DECrouter 200 SPD* for a complete list.

To connect your DECrouter 200 system over a dial-in or leased line, you need a modem cable and modem. You should be able to install each cable and modem using the appropriate installation/owner's manual.

Figure D-8 shows a DECrouter 200 unit with two processors directly connected and two processors connected with modems. Figure D-9 shows how to make modem and null modem connections.

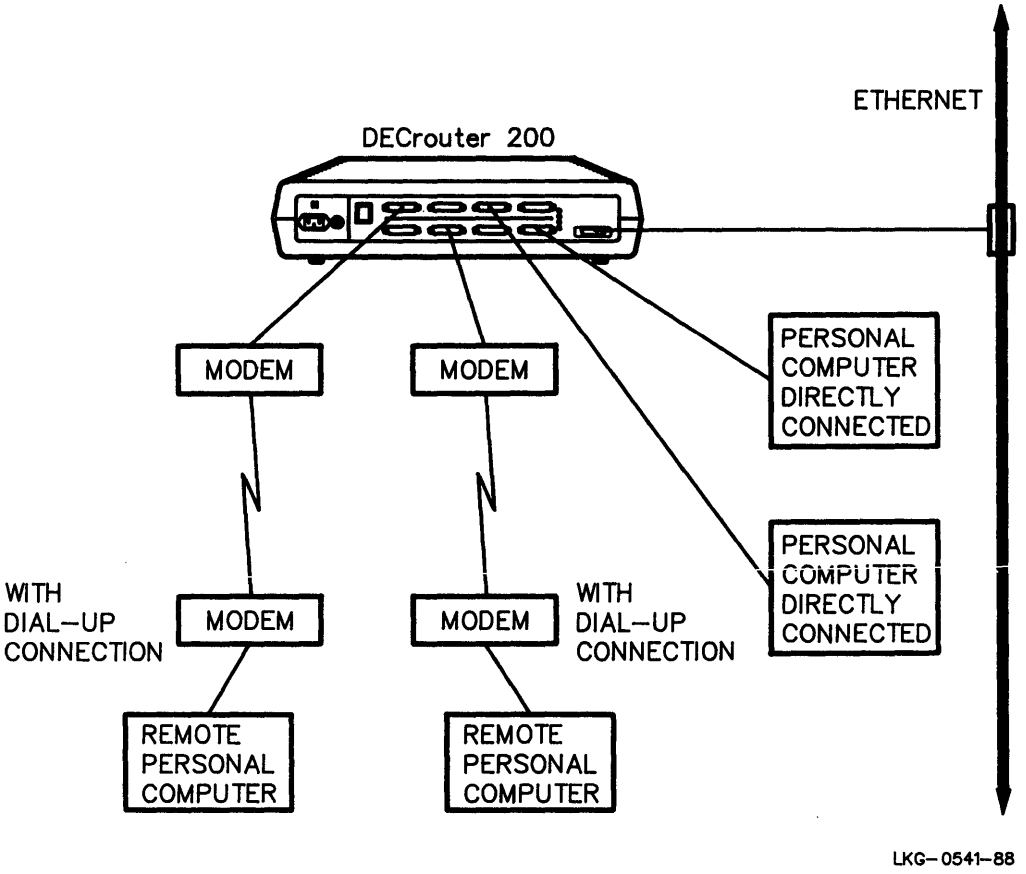

Figure D–8: DECrouter 200 Unit with Modem Connections

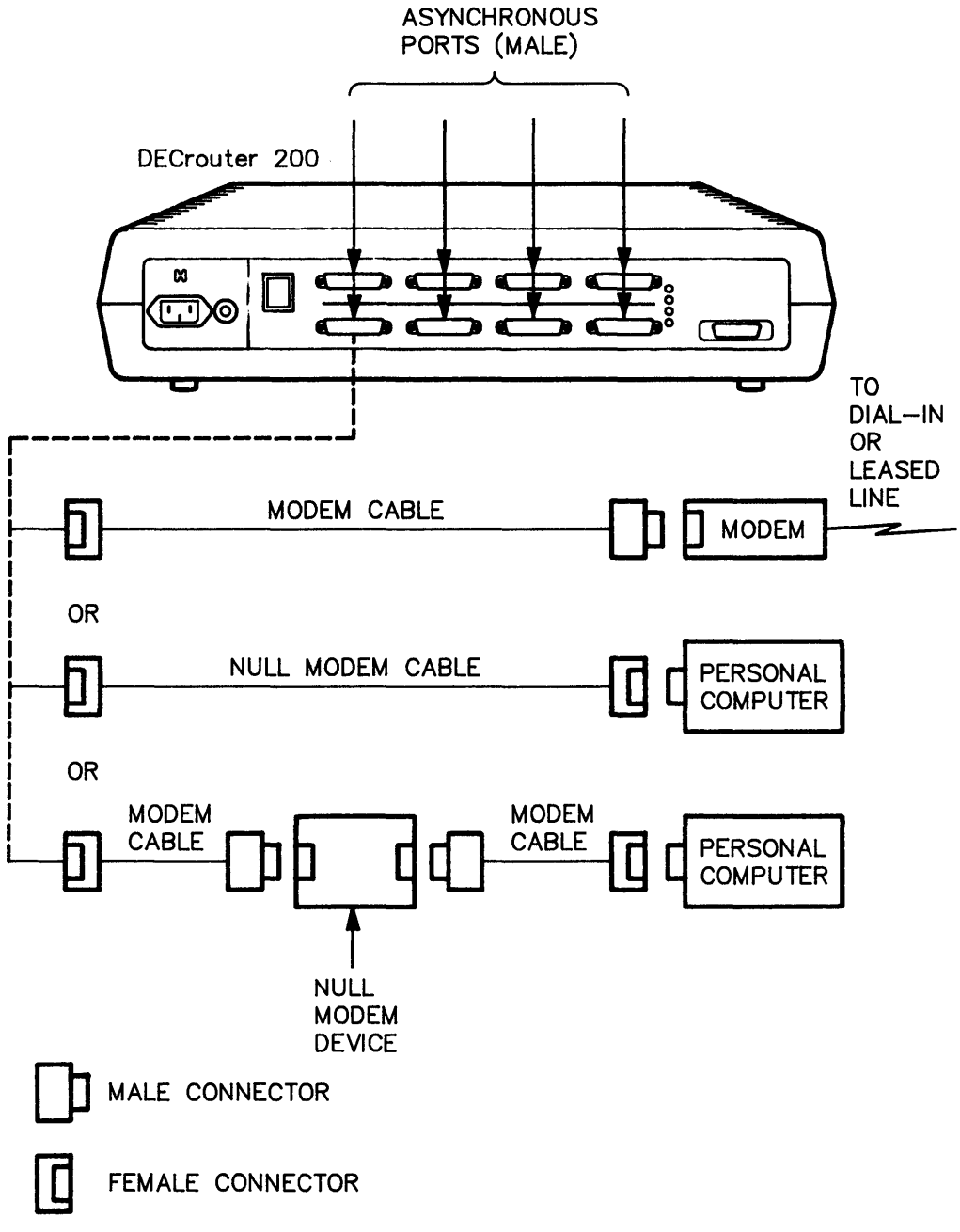

Figure D–9: Modem and Null Modem Connections

For more information on configuration and performance, see the *DECrouter 200 SPD*.

An EIA modem cable physically connects the router and the modem. With only EIA cables, null modems can connect two nodes, without those nodes using a switched or dedicated line.

Null modem cables can connect two systems directly to each other. These cables are single cables that perform the same function as two EIA cables connected to a null modem.

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