DEC WANrouter 90/250

Management

Order Number: AA-Q7WNB-TE

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How to Use This Manual

This manual describes how to manage the DEC WANrouter 90/250.

Audience

This manual is intended for network managers.

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

- Local Area Networks (LANs)
- Wide Area Networks (WANs)
- X.25 (if using the CCITT X.25 protocols)
- OpenVMS™ (if using an OpenVMS load host)
- DEC OSF/1™ (if using a DEC OSF/1 load host)
- The Internet Protocol (IP)

Structure

This manual is divided into parts:

For information on...	See Part...
How to manage the system as a whole	I
Setting up and managing routing circuits, and using these circuits for routing the protocols that the DEC WANrouter supports	II
Managing the X.25 features of the DEC WANrouter	III
Managing dialup	IV
Reference material to support the tasks present in other parts of the manual	V

Associated Documentation

Product Documentation

- *DEC WANrouter 90/250 User's Guide.*

  This manual shows how to install, configure, and load the DEC WANrouter 90/250 software.

- *DEC WANrouter 90/250 Release Notes* (supplied on line).

  These contain release information about the software and/or documentation.

Related Documentation

- *DECnet/OSI Routing Overview*

  This manual introduces routing on DECnet™/OSI® networks, and defines the basic routing terminology and concepts. It may be useful to read this manual before using the DEC WANrouter.

- NCL online help

  This describes the NCL commands that you use to manage the DEC WANrouter.

- Network management documentation for the load-host operating system you are using.

- *Network Information* (supplied on line)

  This supplies profile information about all the public Packet Switching Data Networks that Digital supports.

- RFCs (for IP routing)

  RFCs are the working notes for the internet research and development community. These notes are available in a three-volume set, the *DDN Protocol Handbook*, which can be ordered from the following address:

  Network Solutions, Inc.
  Attn: InterNIC Registration Service
  505 Huntmar Park Drive
  Herndon, VA 22070, USA
  Tel. 1-800-444-4345 or 619-455-4600

Conventions

The following conventions are used in this manual:

Italics	This indicates variable information.
DEC WANrouter	This refers to the DEC WANrouter 90/250.
wanrouter	This indicates that you should substitute the node name of the DEC WANrouter. If you are using a naming service such as DECdns, enter the name registered in the naming service.
Prompts	The following prompts precede commands that you enter: For OpenVMS: `$` For DEC OSF/1: `#` For MS–DOS: `>` For NCL: `NCL>`

Returning Comments About this Documentation

We would like to know what you think about the DEC WANrouter 90/250 V1.3 documentation.

If you have any comments, or suggestions, please return them in any of the following ways:

- Send an electronic mail message to the Internet address: books@reo.mts.dec.com
- Send an electronic mail message to the X.400 address S=IDC BOOKS; O=digital; OU1=reo; P=digital; A=CWMail; C=gb
- Send a fax to (+44) 1734 206018

Part I

Managing the System

This part leads you through tasks that apply to all variants of the DEC WANrouter.

For information on...	See Chapter...
The tools you use to manage the DEC WANrouter	1
Loading the DEC WANrouter	2
Setting up event logging from the DEC WANrouter	3
Setting up system-level security	4
Setting up synchronous and LAN connections	5

1

Tools for Managing the DEC WANrouter

1.1 Overview

This chapter introduces you to management of the DEC WANrouter and the tools you use to manage the DEC WANrouter.

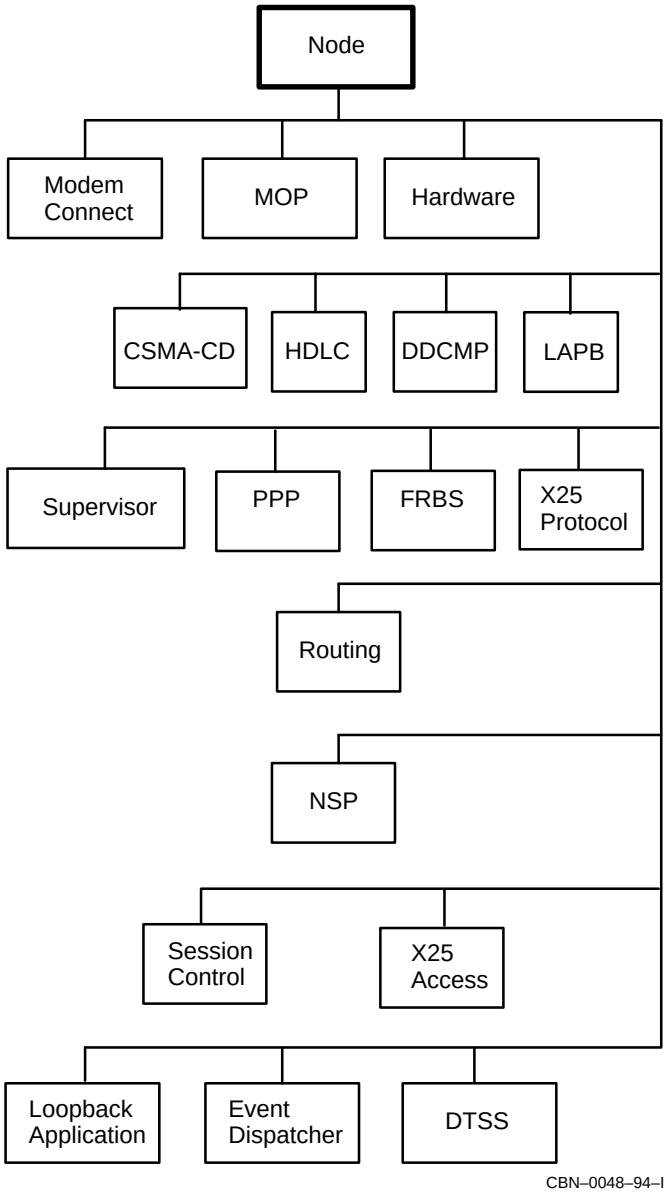
For information on...	See Section...
Modules and entities implemented in the DEC WANrouter	1.2
How to manage the DEC WANrouter	1.3
The tools you use to manage the DEC WANrouter	1.4

1.2 Modules and Entities Implemented in the DEC WANrouter

Figure 1–1 shows the management modules implemented in the DEC WANrouter.

For information on...	See Appendix...
The modules and associated entities used by the DEC WANrouter	A
Entity characteristics, as implemented in the DEC WANrouter	B

Figure 1–1 Management Modules Implemented in the DEC WANrouter



1.3 How to Manage the DEC WANrouter

To manage the DEC WANrouter:

1. Log on to a suitable host system.
2. Manipulate the management modules and entities and the configuration information they contain. To do this you use the management tools described in Section 1.4 and *DEC WANrouter 90/250 User's Guide* to:
   - Set up new modules and entities
   - Delete existing modules and entities
   - Change the characteristics of existing entities
   - Display the information for existing entities

1.3.1 Permanent and Temporary Changes

The tools you use to make changes to your configuration depend on whether the changes are permanent (they remain after the DEC WANrouter is rebooted) or temporary (they remain until the DEC WANrouter is rebooted).

To make changes that are...	You must...	And for information, see...
Permanent	Complete one of the following: • Run the configurator and reboot the DEC WANrouter • Edit the user NCL script files, compile the files, then reboot the DEC WANrouter	*DEC WANrouter 90/250 User's Guide*
Temporary	Use NCL commands	This manual

1.4 Tools

This section describes the tools available to manage the DEC WANrouter.

To...	Use...	See Section...
Set and change the configuration parameters	NCL	1.4.1
	or	
	DECmcc™	1.4.2
Monitor and test the modules and entities of the management model	DECmcc	1.4.2
Monitor the IP information and counters of the DEC WANrouter from an IP host system	SNMP	1.4.3

1.4.1 NCL

Issue NCL commands on a host system to manipulate directly the DEC WANrouter modules described in Appendix A.

Using NCL

To manage the DEC WANrouter using NCL, complete the following steps:

Step	Action	Details
1	Log on to a suitable system in the same network as the DEC WANrouter.	This is usually, but not necessarily, a load host.
2	Start NCL on the system.	The network management documentation for the operating system of the host you are using tells you how to start NCL.
3	Issue the required NCL commands.	The network management documentation for your load-host operating system provides information on most of the management modules described in Appendix A. The NCL online help provides more detailed information on some of these modules, and information on the modules not covered there.

Security

In each NCL command you issue for the DEC WANrouter, use the username and password you specified when you ran the configurator.

The only exception is the SHOW command; this does not require a username and password.

Using a Default Node and Default Security

If you wish to issue several NCL commands to the same DEC WANrouter:

1. Set default to the remote system, as follows:

   ```
   NCL> SET NCL DEFAULT ENTITY NODE wanrouter
   ```

   where *wanrouter* is the node name of the DEC WANrouter.

2. Set default security on the remote system, as follows:

   ```
   NCL> SET NCL DEFAULT ACCESS BY USER = username, PASSWORD = password
   ```

1.4.2 DECmcc

You can use DECmcc instead of NCL to enter the commands described in this manual.

In addition, other functions are available from DECmcc.

Further Information

Refer to the documentation for DECmcc for details of how to use DECmcc to manage the DEC WANrouter.

1.4.3 SNMP

SNMP (Simple Network Management Protocol) allows you to monitor the IP information and counters of the DEC WANrouter from an IP host system.

Requirement

To use SNMP, you need an application that implements SNMP network management software residing on an independent IP system on the same network as the DEC WANrouter.

Further Information

Section 9.13 describes the use of SNMP in more detail.

2

Controlling How the DEC WANrouter Loads

2.1 Overview

The DEC WANrouter can take its load from either the load host or, if it is available on your model of DEC WANrouter, flash memory.

This chapter shows how to use NCL to control the way in which the DEC WANrouter loads.

2.2 Procedure

The procedure that you follow depends on the protocol that the DEC WANrouter uses to communicate with the load host:

If the protocol is...	Then...
BOOTP/TFTP	Enter the following command: `NCL> SET HARDWARE NEXT LOAD IMAGE LOAD METHOD` *method* where *method* is either NETWORK or FLASH. NETWORK specifies that the next load is taken from the load host. FLASH specifies that the next load is taken from flash memory.
MOP	Enter the following command: `NCL> SET HARDWARE NEXT LOAD` *load* `LOAD METHOD` *method* where: *load* is either IMAGE or SCRIPT. IMAGE specifies that software image is loaded. SCRIPT specifies that the management load file is loaded. *method* is either NETWORK or FLASH. NETWORK specifies that the next load is taken from the load host. FLASH specifies that the next load is taken from flash memory. Note that you cannot load SCRIPT from flash if IMAGE is loaded from the network

Note that flash memory is only available on some models of the DEC WANrouter (for example, DECwanrouter 90EW). If you specify FLASH as the load method and flash memory is not available on your DEC WANrouter, the NCL SET HARDWARE commands fail.

For more information about using the configurator to control how the DEC WANrouter loads, refer to the *DEC WANrouter 90/250 User's Guide*.

3
Event Logging

3.1 Overview

This chapter describes how to use event logging on the DEC WANrouter.

The maximum number of Event Sinks supported by the WANrouter software is currently limited to two and hence only the first two event sinks defined in the NCL script will be valid.

The DEC WANrouter supports outbound event streams.

For instructions on...	See Section...
Setting up event sinks	3.2
Setting up event logging	3.3
Disconnecting the DEC WANrouter from the event sink	3.4
Reestablishing connection to the event sink	3.5
Disabling event streams	3.6
Setting the connection timers	3.7
Setting up event filtering	3.8
Removing event filters	3.9
Testing event streams and filters	3.10

3.2 Preparations: Event Sinks

Before you use event logging, complete the following tasks:

Task	See Section...
Set up the event sink on the sink node.	3.2.1
If the node name of the event sink has not been entered in the Known Towers database of the DEC WANrouter, specify the event sink as a tower set.	3.2.2
If you are using DECmcc as the event sink, specify the name of the event sink.	3.2.3

3.2.1 Setting Up Event Sinks

This section describes how to log events from the DEC WANrouter to a terminal at a host system.

Logging Events to a File

To log events to a file, see the relevant network management documentation for the sink node.

Setting Up an OpenVMS System as an Event Sink

To set up an OpenVMS system as an event sink, complete the following steps:

Step	Action
1	Log on to the host OpenVMS system, and start NCL.

2	Enter the following commands:
	`NCL> CREATE EVENT DISPATCHER`
	`NCL> ENABLE EVENT DISPATCHER`
	`NCL> CREATE EVENT DISPATCHER SINK` *`sink-name`*
	`NCL> SET EVENT DISPATCHER SINK` *`sink-name`* `END USER NUMBER = 82`
	`NCL> ENABLE EVENT DISPATCHER SINK` *`sink-name`*
	`NCL> EXIT`
	`$ REPLY/ENABLE`

Result: Events will now be logged to the network operator terminal of the OpenVMS system.

Setting Up a DEC OSF/1 System as an Event Sink

To set up a DEC OSF/1 system as an event sink, complete the following steps:

Step	Action
1	Log on to the host DEC OSF/1 system using the terminal to which you want events to be logged.
2	Discover the identity of the terminal by entering the following command: `# who am i` This returns the identity of the terminal, for example, tty10.
3	Start NCL on the system.

4	Enter the following NCL commands:
	`ncl> create event dispatcher`
	`ncl> enable event dispatcher`
	`ncl> create event dispatcher sink` *`sink-name`*
	`ncl> set event dispatcher sink` *`sink-name`* `client type device`
	`ncl> set event dispatcher sink` *`sink-name`* `-`
	`_ncl> /dev/`*`terminal-id`*
	where *terminal-id* is the identity of the terminal as returned in step 2, for example, tty10.
	`ncl> enable event dispatcher sink` *`sink-name`*

3.2.2 Structure of Tower Set for an Event Sink

For each event sink you need to set up, you must provide a complete specification of how the remote node can be reached. This is necessary even if the network is using DECdns or the Local naming service to translate node names into addressing information, since the DEC WANrouter does not have DECdns clerk software.

You must specify the event sink as a tower set.

A tower set consists of one or more towers. An event sink tower is:

```
([DNA_CMIP-MEN], [DNA_SESSIONCONTROLV3, NUMBER = 82],
[DNA_NSP], [DNA_OSINETWORK, NSAP-address])
```

where:

n	is 3 if the event sink is a DECnet/OSI node. is 2 if the event sink is a Phase IV node.
NSAP-address	is the NSAP address of the event sink.

Example

Suppose the DECnet/OSI node that is to act as the event sink for the DEC WANrouter has the following two NSAP addresses:

37:12345:00-2A:AA-00-04-00-2A-A8:20
37:12345:02-00:08-00-2B-03-34-F4:20

The tower set representing this event sink consists of two towers, as follows:

```
SET NODE wanrouter EVENT DISPATCHER -
OUTBOUND STREAM stream-name SINK ADDRESS -
{([DNA_CMIP-MEN], [DNA_SESSIONCONTROLV3, NUMBER = 82], -
[DNA_NSP], -
[DNA_OSINETWORK, 37:12345:00-2A:AA-00-04-00-2A-A8:20]), -
([DNA_CMIP-MEN], [DNA_SESSIONCONTROLV3, NUMBER = 82], -
[DNA_NSP], [DNA_OSINETWORK, 37:12345:02-00:08-00-2B-03-34-F4:20]) -
}
```

Section 3.3 shows how to set up an outbound event stream.

3.2.3 Using DECmcc as the Event Sink

To set up DECmcc as the event sink for the DEC WANrouter, create the tower as shown in the previous section, but specify NAME=MCC_EVL_SINK instead of NUMBER=82.

Example

Suppose the (DECnet/OSI) node running DECmcc that is to act as the event sink for the DEC WANrouter has the following NSAP address:

37:12345:02-00:08-00-2B-03-34-F4:20

The tower set representing this event sink consists of the following tower:

```
SET NODE wanrouter EVENT DISPATCHER -
OUTBOUND STREAM stream-name SINK ADDRESS -
{([DNA_CMIP-MEN], [DNA_SESSIONCONTROLV3, NAME=MCC_EVL_SINK], -
[DNA_NSP], -
[DNA_OSINETWORK, 37:12345:02-00:08-00-2B-03-34-F4:20])}
```

3.3 Setting Up Event Logging

To set up an outbound event stream on the DEC WANrouter, complete the following steps:

Step	Action

1	Ensure that the EVENT DISPATCHER entity exists and is enabled:
	`NCL> CREATE NODE` *`wanrouter`* `EVENT DISPATCHER`
	`NCL> ENABLE NODE` *`wanrouter`* `EVENT DISPATCHER`

2	Create the outbound event stream: `NCL> CREATE NODE` *`wanrouter`* `EVENT DISPATCHER -` `_NCL> OUTBOUND STREAM` *`stream-name`* where *stream-name* is the name of the outbound event stream.
3	Specify the sink to be used to log the events from this event stream. You can specify the sink as a node name, or as a tower set.

To specify the sink as a...	Enter the command:
Node name	`NCL> SET NODE` *`wanrouter`* `EVENT DISPATCHER -` `_NCL> OUTBOUND STREAM` *`stream-name`* `SINK NODE` *`sink-node`* where *sink-node* is the node name of the sink node as defined in the Known Towers database.

Tower set	`NCL> SET NODE` *`wanrouter`* `EVENT DISPATCHER -`
	`_NCL> OUTBOUND STREAM` *`stream-name`* `-`
	`_NCL> SINK ADDRESS {`*`(tower1), (tower2), ...`*`}`
	where *tower1* and *tower2* are towers that describe the protocols and NSAP addresses used to communicate with the event sink.

4	Enable the OUTBOUND STREAM entity: `NCL> ENABLE NODE` *`wanrouter`* `EVENT DISPATCHER -` `_NCL> OUTBOUND STREAM` *`stream-name`*

3.4 Disconnecting the DEC WANrouter from the Event Sink

3.4.1 Methods

There are two methods for breaking the connection between the outbound event stream and the event sink. The following sections describe these methods and their results.

3.4.2 Immediate Disconnection

Issue the following command to destroy immediately the connection between an outbound event stream and its event sink:

```
NCL> DISCONNECT NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM -
_NCL> stream-name
```

Results:

- The connection is broken immediately.
- Events in transit are lost.

When to Use Immediate Disconnection

Issue this command if you have problems with your sink node and wish to specify a new sink node.

3.4.3 Orderly Disconnection

Issue the following command to achieve an orderly shutdown of the connection between an outbound event stream and its event sink:

```
NCL> SHUTDOWN NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM stream-name
```

Result: The connection for the outbound stream is broken once all events in transit have been received.

Execution Time of Command

If the connection is faulty, the command may take a long time to execute.

3.5 Reestablishing Connection to the Event Sink

There are two ways in which the connection to the event sink becomes reestablished:

- The DEC WANrouter attempts to reestablish the connection automatically when the CONNECT RETRY TIMER expires (see Section 3.7).
- You can manually reestablish the connection by issuing the following command:

  ```
  NCL> CONNECT NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM stream-name
  ```

3.6 Disabling Event Streams

Disable an event stream to prevent any events from being sent from the event stream to the event sink.

Disabling an Event Stream

Issue the following command to disable an event stream:

```
NCL> DISABLE NODE wanrouter EVENT DISPATCHER -
_NCL> OUTBOUND STREAM stream-name METHOD = method
```

where *method* is one of the following:

ABORT	The connection is destroyed at once, and all events in transit are lost. This is similar to using the DISCONNECT command (see Section 3.4.2).
ORDERLY	This is the default method of disabling an event stream. It allows all events in transit to be received by the sink before the connection is broken (see the SHUTDOWN command in Section 3.4.3). However, this directive may take a very long time to execute, particularly if the event sink is faulty.

This command still allows the DEC WANrouter to send events to an event sink by using another event stream.

Disabling All Event Streams to an Event Sink

To prevent immediately the DEC WANrouter from sending any events to any event sink, use the following command:

```
NCL> DISABLE NODE wanrouter EVENT DISPATCHER -
_NCL> OUTBOUND STREAM * METHOD = ABORT
```

3.7 Setting the Connection Timers

The connection between the event source and the sink is controlled by two timers. The following sections describe these timers and how to set them.

3.7.1 Connect Retry Timer

What the Connect Retry Timer Does

The connect retry timer controls how often the outbound stream attempts to make connections to the sink.

Requirement

The CONNECT TIMER ENABLED characteristic of the OUTBOUND STREAM entity must be set to TRUE for this timer to operate. If it is set to FALSE, the outbound event stream will not make connection retries.

Setting the Connect Retry Timer

Set the connect retry timer as follows:

```
NCL> SET NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM stream-name -
_NCL> CONNECT RETRY TIMER n
```

where *n* is a decimal number between 1 and 65,535, and specifies the number of seconds to wait between attempts to create connections. The default is 120 seconds.

3.7.2 Disconnect Timer

What the Disconnect Timer Does

The disconnect timer controls the length of time to wait before disconnecting idle connections.

Setting the Disconnect Timer

Set the disconnect timer as follows:

```
NCL> SET NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM stream-name -
_NCL> DISCONNECT TIMER n
```

where *n* is a decimal number greater than or equal to 1. If no events are logged during this number of seconds, the connection is dropped. Disable this timer by using a value of 0; the connection will then not be dropped automatically.

3.8 Setting Up Event Filtering

3.8.1 Overview

This section describes how to set up event filtering.

For instructions on setting up an event filter that is...	See Section...
Specific	3.8.2
Global	3.8.3
Catchall	3.8.4

3.8.2 Specific

A specific filter passes or blocks events from a particular entity instance, for example, a particular routing circuit.

To set up a specific filter to...	Enter the command...
Block events	NCL> BLOCK NODE *wanrouter* EVENT DISPATCHER - _NCL> OUTBOUND STREAM *stream-name* - _NCL> SPECIFIC FILTER = ((*entity-instance*), *event*) where: *entity-instance* is the name of the entity from which events are to be blocked. *event* is the name of the event to be blocked.
Pass events	NCL> PASS NODE *wanrouter* EVENT DISPATCHER - _NCL> OUTBOUND STREAM *stream-name* - _NCL> SPECIFIC FILTER = ((*entity-instance*), *event*) where: *entity-instance* is the name of the entity from which events are to be passed. *event* is the name of the event to be passed.

Examples:

- To prevent the Circuit Change event on routing circuit Pepper from being sent to the sink, irrespective of any global or catchall filters, issue the following command:

```
NCL> BLOCK NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM -
_NCL> stream-name SPECIFIC FILTER = -
_NCL> ((NODE wanrouter ROUTING CIRCUIT pepper), circuit change)
```

- To allow the Circuit Change event on routing circuit Pepper to be sent to the sink, irrespective of any global or catchall filters, issue the following command:

```
NCL> PASS NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM -
_NCL> stream-name SPECIFIC FILTER = -
_NCL> ((NODE wanrouter ROUTING CIRCUIT pepper), circuit change)
```

3.8.3 Global

A global filter passes or blocks events from all instances of a particular entity class, for example, all routing circuits.

To set up a global filter to...	Enter the command...
Block events	NCL> BLOCK NODE *wanrouter* EVENT DISPATCHER - _NCL> OUTBOUND STREAM *stream-name* - _NCL> GLOBAL FILTER = ((*entity-class*), *event*) where: *entity-class* is the name of the entity class from which events are to be blocked. *event* is the name of the event to be blocked.
Pass events	NCL> PASS NODE *wanrouter* EVENT DISPATCHER - _NCL> OUTBOUND STREAM *stream-name* - _NCL> GLOBAL FILTER = ((*entity-class*), *event*) where: *entity-class* is the name of the entity class from which events are to be passed. *event* is the name of the event to be passed.

Examples

- To prevent the Circuit Change event on all routing circuits from being sent to the sink, irrespective of any catchall filter, issue the following command:

  ```
  NCL> BLOCK NODE wanrouter EVENT DISPATCHER -
  _NCL> OUTBOUND STREAM stream-name -
  _NCL> GLOBAL FILTER = ((NODE, ROUTING, CIRCUIT), circuit change)
  ```

  Circuit Change events are still logged for any routing circuits on which a specific filter is set to pass Circuit Change events.

- To allow the Circuit Change event on all routing circuits to be sent to the sink, irrespective of any catchall filter, issue the following command:

  ```
  NCL> PASS NODE wanrouter EVENT DISPATCHER -
  _NCL> OUTBOUND STREAM stream-name -
  _NCL> GLOBAL FILTER = ((NODE, ROUTING, CIRCUIT), circuit change)
  ```

  Circuit Change events are not logged for any routing circuits on which a specific filter is set to block Circuit Change events.

3.8.4 Catchall

A catchall filter passes or blocks all events from a particular outbound event stream.

To set up a catchall filter to...	Enter the command...
Block all events	NCL> SET NODE *wanrouter* EVENT DISPATCHER - _NCL> OUTBOUND STREAM *stream-name* - _NCL> CATCH ALL FILTER BLOCK where: *stream-name* is the name of the outbound event stream. Events are still logged if any specific or global filters are set to pass them.
Pass all events	NCL> SET NODE *wanrouter* EVENT DISPATCHER - _NCL> OUTBOUND STREAM *stream-name* CATCH ALL FILTER PASS where: *stream-name* is the name of the outbound event stream. Events are still blocked if any specific or global filters are set to block them.

3.9 Removing Event Filters

The IGNORE command removes specific or global event filters.

To remove a...	Enter the command...
Specific event filter	NCL> IGNORE NODE *wanrouter* EVENT DISPATCHER - _NCL> OUTBOUND STREAM *stream-name* - _NCL> SPECIFIC FILTER = ((*entity-instance*), *event*) where: *entity-instance* is the name of the entity specified in the filter. *event* is the name of the event specified in the filter.
Global event filter	NCL> IGNORE NODE *wanrouter* EVENT DISPATCHER - _NCL> OUTBOUND STREAM *stream-name* - _NCL> GLOBAL FILTER = ((*entity-class*), *event*) where: *entity-class* is the name of the entity class specified in the filter. *event* is the name of the event specified in the filter.

Examples

- If you have created a specific filter that blocks the Adjacency State Change event from routing circuit Pepper, use the following command to delete this specific filter:

  ```
  NCL> IGNORE NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM -
  _NCL> stream-name SPECIFIC FILTER = -
  _NCL> ((NODE wanrouter ROUTING CIRCUIT pepper), adjacency state change)
  ```

  Events from routing circuit Pepper will now be passed or blocked according to any global filtering for routing circuits.

- If you have created a global filter that blocks the Adjacency State Change event from all routing circuits, use the following command to delete this global filter:

  ```
  NCL> IGNORE NODE wanrouter EVENT DISPATCHER OUTBOUND STREAM -
  _NCL> stream-name GLOBAL FILTER = -
  _NCL> ((NODE, ROUTING, CIRCUIT), adjacency state change)
  ```

  Events from routing circuit Pepper will now be passed or blocked according to the catchall filter for this event stream, unless there is an appropriate specific filter.

  For example, if there is a specific filter that passes the Adjacency State Change event on routing circuit Pepper, this event will always be passed, irrespective of any global or catchall filtering.

3.10 Testing Event Streams and Filters

TESTEVENT Command

Use the TESTEVENT command to check whether a particular event from a particular entity will be passed or blocked, and to see the filter type used to pass or block it.

Command Structure

The TESTEVENT command is as follows:

```
NCL> TESTEVENT NODE wanrouter EVENT DISPATCHER -
_NCL> OUTBOUND STREAM stream-name EVENT = -
_NCL> ((entity-instance), event)
```

where:

wanrouter	is the name of the DEC WANrouter.
entity-instance	is the name of the entity to be tested.
event	is the name of the event to be tested.

Example

Issue the following command to check what happens to the Circuit Change event on routing circuit Pepper:

```
NCL> TESTEVENT NODE wanrouter EVENT DISPATCHER -
_NCL> OUTBOUND STREAM stream-name EVENT = -
_NCL> ((NODE wanrouter ROUTING CIRCUIT pepper), circuit change)
```

If this event is blocked by a specific filter, the command will return the following information:

```
Action = BLOCK
Type = SPECIFIC
```

4

System-Level Security

4.1 Overview

This chapter describes how to set up system-level security. The following table lists the contents of this chapter:

For information on security for...	See Section...
NCL	4.2
SNMP	4.3

4.2 NCL

4.2.1 Need for Security

Security for the use of NCL is required to prevent unauthorized changes to the DEC WANrouter.

4.2.2 NCL Security Mechanism

The use of NCL commands to alter the system configuration is restricted by creating a username and password on the management listener, CML.

Exception: SHOW Command

You cannot restrict the use of the NCL SHOW command.

Section 4.2.4 shows how to set the username and password.

4.2.3 Consequence of Setting the Username and Password

If you set a username and password on CML and then use the configurator to change the configuration of the system, the configurator will not be able to instruct the router to obtain its next load from the load host.

In this case, use the procedure in Chapter 2 to ensure that the router takes its next load from the load host.

4.2.4 Changing the Username and Password

To change a username and password, enter the following command:

```
NCL> SET NODE wanrouter SESSION CONTROL APPLICATION CML -
_NCL> USER NAME username, PASSWORD password
```

where *username* and *password* are the username and password that users must quote when they use NCL on the DEC WANrouter.

Result

To use NCL on the DEC WANrouter, users will need to quote the username and password in the usual way for their operating system.

4.2.5 Example

To create a CSMA/CD circuit called SALT on a node called ORG:.SOUTH.SALES, which has a username SMITH and password SECRET, enter the following commands:

- For an OpenVMS host:

```
NCL> CREATE NODE org:.south.sales"smith secret" ROUTING CIRCUIT -
_NCL> salt TYPE CSMA-CD
```

- For a DEC OSF/1 or MS–DOS host:

```
ncl> create node org:.south.sales/smith/secret routing circuit -
_ncl> salt type csma-cd
```

4.3 SNMP

The DEC WANrouter software does not accept SNMP Set commands. It does accept Get and GetNext commands.

For more information about using SNMP monitoring, refer to Section 9.13.

Recommendation: Community Name

The DEC WANrouter software does not use or validate the community name in this release. For consistency with other products, Digital recommends that you use the community name "public" in SNMP commands.

To set the community name to "public", add the following line to the user NCL script for SET commands:

```
SET ROUTING IP MANAGEMENT COMMUNITY "PUBLIC"
```

Note that the DEC WANrouter will accept this command only if it is included in an NCL script file; the DEC WANrouter does not accept this command if it is entered at the NCL prompt.

For more information about user NCL script files, refer to the *DEC WANrouter 90/250 User's Guide*.

5
Connections to the Network

5.1 Overview

This chapter describes how to create, modify and delete connections to your network.

X.25 DTEs, X.25 DTE classes, and X.25 Groups are described in Chapter 11.

For information on...	See Section...
Creating connections	5.2
Modifying connections	5.3
Deleting connections	5.4
Identifying management entities	5.5

5.1.1 NCL Commands

Assumption

All tasks performed using NCL commands assume that you have already:

- Logged on to a suitable host system on the network and started NCL
- Set default to the DEC WANrouter as follows:

  ```
  NCL> SET NCL DEFAULT ENTITY NODE wanrouter
  ```

Disabling Routing Circuits

For any tasks that require you to disable a routing circuit, ensure that you do not disable the routing circuit that you are using to manage the DEC WANrouter, unless there is an alternative route between the host on which you issue the NCL commands and the DEC WANrouter.

Restrictions for Enabling/Disabling Entities

You can disable various network management entities independently, but the DEC WANrouter 90/250 V1.3 software assumes a sequence for the Modem Connect, data link, and Routing Circuit entities.

If you use NCL to bring circuits up and down, you must follow the correct sequence for the ENABLE and DISABLE commands:

- When enabling, you must go bottom up. This means Modem Connect first, followed by data link, for example, HDLC LINK/LOGICAL STATION, and finally Routing Circuit.
- When disabling, you must go top down. This means Routing Circuit first, data link, for example, HDLC LINK/LOGICAL STATION, and finally Modem Connect.

5.2 Creating Connections

This section describes how you create connections for CSMA/CD, HDLC, DDCMP, and PPP data links. Chapter 11 deals with X.25 connections.

5.2.1 CSMA/CD

This section describes how to configure a CSMA/CD data link on a suitable hardware port.

To create a new CSMA/CD connection, complete the following steps:

Step	Action
1	Ensure that the CSMA-CD entity exists by entering the following command: `NCL> CREATE CSMA-CD` **Result:** A message will tell you if the CSMA-CD entity already exists; otherwise, it will be created.
2	Create a CSMA-CD STATION entity for the connection, and specify the hardware port on which the connection will exist. `NCL> CREATE CSMA-CD STATION` *`station-name`* `COMMUNICATION PORT` *`port-name`* where: *station-name* is a name to identify the CSMA-CD station. Each CSMA-CD station on the DEC WANrouter must have a unique name. *port-name* is the name of the hardware port.
3	Enable the CSMA-CD STATION entity: `NCL> ENABLE CSMA-CD STATION` *`station-name`*

5.2.2 HDLC

To create an HDLC data link, complete the following steps:

Step	Action
1	Create a synchronous line. Follow the procedures in Section 5.2.2.1.
2	Set up and configure the data link. Follow the procedures in Section 5.2.2.2.

5.2.2.1 Create a Synchronous Line

To create a synchronous line, complete the following steps:

Step	Action
1	Ensure that the MODEM CONNECT entity exists by entering the following command: `NCL> CREATE MODEM CONNECT`
2	Create a MODEM CONNECT LINE entity. The procedure you follow depends on the type of connection you are using:

If the connection is...	Then...

Dialup	Enter the following command:
	
	`NCL> CREATE MODEM CONNECT LINE` *line-name* `-`
	`_NCL> COMMUNICATIONS PORT` *port-name*`, -`
	`_NCL> CONNECTION TYPE SWITCHED`

Nonswitched	Complete the following steps:
	
	1. Enter the following command:
	
	`NCL> CREATE MODEM CONNECT LINE` *line-name* `-`
	`_NCL> COMMUNICATIONS PORT` *port-name*
	
	2. Set the MODEM CONTROL characteristic for the line:
	
	`NCL> SET MODEM CONNECT LINE` *line-name* `-`
	`_NCL> MODEM CONTROL` *control*
	
	where *control* is one of the following:
	
	FULL — The line takes note of the modem control signals. This is the normal setting.
	
	NONE — The line ignores all modem control signals (for example, during loopback testing).

Step	Action
3	Enable the MODEM CONNECT LINE entity: `NCL> ENABLE MODEM CONNECT LINE` *line-name*

5.2.2.2 Set Up and Configure an HDLC Data Link

To set up and configure an HDLC data link, complete the following steps:

Step	Action
1	Ensure that the HDLC entity exists: `NCL> CREATE HDLC`
2	Create an HDLC data link for the connection. The procedure you follow depends on the type of connection you are using:

If the connection is...	Then...

Dialup	Enter the following command:
	`NCL> CREATE HDLC LINK` *link-name* `ACCESS -`
	`_NCL> LINE TYPE SWITCHED`

Nonswitched	Complete the following steps: 1. Enter the following command: `NCL> CREATE HDLC LINK` *link-name* 2. Associate the line created earlier with this data link: `NCL> SET HDLC LINK` *link-name* `-` `_NCL> PHYSICAL LINE MODEM CONNECT LINE` *line-name*

where *link-name* is a name identifying the data link. You should make this the same as the communication port name.

3	Enable the data link: `NCL> ENABLE HDLC LINK` *link-name*
4	Create and enable a logical station for the link: `NCL> CREATE HDLC LINK` *link-name* `LOGICAL STATION` *station-name* `NCL> ENABLE HDLC LINK` *link-name* `-` `_NCL> LOGICAL STATION` *station-name* For simplicity, use the same name for the logical station as for the data link.

5.2.3 DDCMP

This section describes how to configure a DDCMP data link on a suitable serial hardware port.

To create a DDCMP data link, complete the following steps:

Step	Action
1	Create a line. Follow the procedures in Section 5.2.3.1.
2	Set up and configure the data link. Follow the procedures in Section 5.2.3.2.

5.2.3.1 Create a Line

Recommendation: Synchronous and Asynchronous Lines

You can set up synchronous and asynchronous lines as suited to the modems and remote stations. If you have a choice, synchronous mode will give you better line performance.

Procedure

To create a line, complete the following steps:

Table 5–1 Create a Line for a DDCMP Data Link

Step	Action
1	Ensure that the MODEM CONNECT entity exists by entering the following command: `NCL> CREATE MODEM CONNECT`

(continued on next page)

Table 5–1 (Cont.) Create a Line for a DDCMP Data Link

Step	Action
2	Create a MODEM CONNECT LINE entity for the connection. The procedure you follow depends on the type of connection you are using:

If the connection is...	Then...

Dialup	Enter the following command:
	`NCL> CREATE MODEM CONNECT LINE` *line-name* `-`
	`_NCL> COMMUNICATIONS PORT` *port-name*`, -`
	`_NCL> COMMUNICATIONS MODE` *mode*`, -`
	`_NCL> CONNECTION TYPE SWITCHED`

Nonswitched	Complete the following steps:
	1. Create the MODEM CONNECT LINE entity:
	`NCL> CREATE MODEM CONNECT LINE` *line-name* `-`
	`_NCL> COMMUNICATIONS PORT` *port-name*`, -`
	`_NCL> COMMUNICATIONS MODE` *mode*
	2. Set the MODEM CONTROL characteristic for the line:
	`NCL> SET MODEM CONNECT LINE` *line-name* `-`
	`_NCL> MODEM CONTROL` *control*

where:

port-name is the name of the hardware port used for the connection.

mode is either SYNCHRONOUS or ASYNCHRONOUS.

control is either FULL or NONE. FULL is the normal setting, and means that the line takes note of the modem control signals. Set it to NONE if the line is to ignore all modem control signals or if the modem or connection does not use them.

3 Set the SPEED characteristic for the line:

`NCL> SET MODEM CONNECT LINE` *line-name* `SPEED` *n*

where *n* is the speed required. The default value is 9600.

4 Enable the MODEM CONNECT LINE entity:

`NCL> ENABLE MODEM CONNECT LINE` *line-name*

5.2.3.2 Set Up and Configure the DDCMP Data Link

To set up and configure a DDCMP data link, complete the following steps:

Step	Action
1	Ensure that the DDCMP entity exists: `NCL> CREATE DDCMP`
2	Create a DDCMP data link for the connection. The procedure you follow depends on the type of connection you are using:

If the connection is...	Then...

Dialup	Enter the following command:
	`NCL> CREATE DDCMP LINK` *link-name* `PROTOCOL POINT -`
	`_NCL> ACCESS LINE TYPE SWITCHED`

Nonswitched	Complete the following steps:
	1. Enter the following command:
	`NCL> CREATE DDCMP LINK` *link-name* `PROTOCOL POINT`
	2. Associate the LINE created earlier with this data link:
	`NCL> SET DDCMP LINK` *link-name* `-`
	`_NCL> PHYSICAL LINE MODEM CONNECT LINE` *line-name*

where *link-name* is a name identifying the data link. You should make this the same as the communication port name. The PROTOCOL is POINT for DDCMP links.

4	Enable the data link: `NCL> ENABLE DDCMP LINK` *link-name*
5	Create and enable a logical station for the link: `NCL> CREATE DDCMP LINK` *link-name* `LOGICAL STATION` *station-name* `NCL> ENABLE DDCMP LINK` *link-name* `LOGICAL STATION` *station-name* For simplicity, use the same name for the logical station as for the data link.

5.2.4 PPP

To create a PPP data link, complete the following steps:

Step	Action
1	Create a synchronous line. Follow the procedures in Section 5.2.4.1.
2	Set up and configure the data link. Follow the procedures in Section 5.2.4.2.

5.2.4.1 Create a Synchronous Line

To create a synchronous line, complete the following steps:

Step	Action
1	Ensure that the MODEM CONNECT entity exists by entering the following command: `NCL> CREATE MODEM CONNECT`
2	Create a MODEM CONNECT LINE entity for the connection, specifying the hardware port on which the connection will exist. `NCL> CREATE MODEM CONNECT LINE` *`line-name`* `-` `_NCL> COMMUNICATION PORT` *`port-name`* where *port-name* is the name of the hardware port (see Section 5.5).
3	Set the MODEM CONTROL characteristic for the line: `NCL> SET MODEM CONNECT LINE` *`line-name`* `-` `_NCL> MODEM CONTROL` *`control`* where *control* is either FULL or NONE. FULL is the normal setting, and means that the line takes note of the modem control signals. Set it to NONE if the line is to ignore all modem control signals (for example, during loopback testing).
4	Enable the MODEM CONNECT LINE entity: `NCL> ENABLE MODEM CONNECT LINE` *`line-name`*

5.2.4.2 Set up and configure a PPP data link

To set up and configure a PPP data link, complete the following steps:

Step	Action
1	Ensure that the PPP entity exists: `NCL> CREATE PPP`
2	Create a PPP data link for the circuit, and specify its type: `NCL> CREATE PPP LINK` *`link-name`* where *link-name* is a name identifying the data link. You should make this the same as the communication port name.
3	Associate the LINE created earlier with this data link: `NCL> SET PPP LINK` *`link-name`* `-` `_NCL> LOWER LAYER ENTITY MODEM CONNECT LINE` *`line-name`*
4	Enable the data link: `NCL> ENABLE PPP LINK` *`link-name`*

5.2.5 PPP Over Frame Relay

This section describes how to configure a PPP data link over a frame relay network.

If you want to create a PPP link to a DEC WANrouter/Frame Relay 100/500, refer to Section 5.2.6.

Restrictions

The following restrictions apply to the frame relay implementation on the DEC WANrouter:

- The BECN bit is ignored.
- The DE bit is always set ineligible.
- No flow control or committed information rate support is provided other than FECN to DECnet/OSI congestion bit mapping.
- Neither BOOTP nor MOP is supported across frame relay.
- There is no CTF support.

Procedure

To create a PPP data link over a frame relay network, complete the following steps:

Step	Action
1	Create a synchronous line. Follow the procedures in Section 5.2.5.1.
2	Create an FRBS channel. Follow the procedures in Section 5.2.5.2.
3	Create a connection on the channel. Follow the procedures in Section 5.2.5.3.
4	Set up and configure the data link. Follow the procedures in Section 5.2.5.4.

5.2.5.1 Create a Synchronous Line

To create a synchronous line, complete the following steps:

Step	Action
1	Ensure that the MODEM CONNECT entity exists by entering the following command: `NCL> CREATE MODEM CONNECT`
2	Create a MODEM CONNECT LINE entity for the connection, specify the hardware port on which the connection will exist, and specify the profile to be used for the line. `NCL> CREATE MODEM CONNECT LINE` *`line-name`* `-` `_NCL> COMMUNICATION PORT` *`port-name`* where *port-name* is the name of the hardware port (see Section 5.5).
3	Set the MODEM CONTROL characteristic for the line: `NCL> SET MODEM CONNECT LINE` *`line-name`* `-` `_NCL> MODEM CONTROL` *`control`* where *control* is either FULL or NONE. FULL is the normal setting, and means that the line takes note of the modem control signals. Set it to NONE if the line is to ignore all modem control signals.
4	Enable the MODEM CONNECT LINE entity: `NCL> ENABLE MODEM CONNECT LINE` *`line-name`*

5.2.5.2 Create an FRBS Channel

To create an FRBS channel, complete the following steps:

Step	Action
1	Ensure that the FRBS entity for frame relay exists: `NCL> CREATE FRBS`
2	Create an FRBS channel for the connection, and specify the management protocol used by the frame relay device: `NCL> CREATE FRBS CHANNEL` *`channel-name`* `-` `_NCL> SPECIFICATION` *`specification`* where *specification* depends on the management protocol you use to send PVC management information, as follows:

To specify...	Enter...
Joint/LMI	JOINT
ANSI T1.618 Annex D	ANSI
CCITT Q.933 Annex A	CCITT
Without the need for a frame relay switch	NONE

Rule: The protocol you specify must be the same protocol used by the frame relay device.

Recommendation: For simplicity, Digital recommends that you make *channel-name* the same as *line-name*, created earlier.

3	Now associate the line with this channel: `NCL> SET FRBS CHANNEL` *`channel-name`* `-` `_NCL> PHYSICAL LINE MODEM CONNECT LINE` *`line-name`*
4	Enable the channel: `NCL> ENABLE FRBS CHANNEL` *`channel-name`*

5.2.5.3 Create a Connection on the Channel

To create a connection on the channel, complete the following steps:

Step	Action
1	Create a connection on the channel: `NCL> CREATE FRBS CHANNEL` *`channel-name`* `-` `_NCL> CONNECTION` *`connection-name`* Note that the name of the connection should *not* be the same as the channel name. You can create up to 8 connections on each channel.

2	To ensure that the connection is not randomly assigned to a PVC, set the DLCI for the connection with the following command:
	
	`NCL> SET FRBS CHANNEL` *`channel-name`* `-`
	`_NCL> CONNECTION` *`connection-name`* `-`
	`_NCL> PREFERRED DLCI` *`dlci`*
	
	where *dlci* is the 10-bit identifier that is assigned to the PVC by the frame relay network. The PREFERRED DLCI characteristic can be cleared by setting *dlci* to zero.

3	Enable the connection: `NCL> ENABLE FRBS CHANNEL` *`channel-name`* `-` `_NCL> CONNECTION` *`connection-name`*

5.2.5.4 Set Up and Configure the Data Link

To set up and configure the data link, complete the following steps:

Step	Action
1	Ensure that the PPP entity exists: `NCL> CREATE PPP`
2	Create a data link for the circuit, and specify its type: `NCL> CREATE PPP LINK` *`link-name`* where *link-name* is a name identifying the data link. You should make this the same as the FRBS *connection-name*.
3	Associate the frame relay connection created earlier with this data link: `NCL> SET PPP LINK` *`link-name`* `LOWER LAYER ENTITY FRBS -` `_NCL> CHANNEL` *`channel-name`* `CONNECTION` *`connection-name`*
4	Enable the data link: `NCL> ENABLE PPP LINK` *`link-name`*

5.2.6 Creating a PPP Connection to a DEC WANrouter/Frame Relay 100/500

Restrictions

The following restrictions apply when you create a PPP link across a frame relay network to a DEC WANrouter/Frame Relay 100/500 (DEC WANrouter /Frame Relay):

- The DEC WANrouter/Frame Relay 100/500 does not recognize PPP network control protocols used by the DEC WANrouter 90. The procedure below, describes how to set the REQUIRED CONTROL PROTOCOLS attribute for the PPP link so that the DEC WANrouter and the DEC WANrouter/Frame Relay 100/500 can interoperate.
- Only IP and OSI network layer packets can be sent over a PPP link to a DEC WANrouter/Frame Relay.

Procedure

To create a connection to a DEC WANrouter/Frame Relay, complete the following steps:

Step	Action
1	Create a frame relay connection and PPP link by completing tasks 1–4 in Section 5.2.5. Do not enable the data link.
2	Enter the following command: `NCL> SET PPP LINK` *`link-name`* `REQUIRED CONTROL PROTOCOLS { }` Note that there are no Required Control Protocols specified. This allows you to create a connection without network control protocol negotiation and IP and OSI network layer packets can be sent over the link.
3	Enable the data link: `NCL> ENABLE PPP LINK` *`link-name`*

5.3 Modifying Connections

5.3.1 HDLC: Acknowledge and Holdback Timers

Guidelines

Some guidelines for setting the timers are:

- **Value of Acknowledge Timer:** Decrease the value of the acknowledge timer from the default value (3000) if you are using a fast or noisy link. Increase this value if you are using a slow link.
- **Relationship Between Acknowledge Timer and Holdback Timer:** The values of the acknowledge timer and holdback timer should be related as follows:

  ```
  Acknowledge Timer >= (2 * maxfrm) + Holdback Timer
  ```

  where `maxfrm` is the time taken for a maximum-sized frame to be transmitted by the DEC WANrouter and received at the adjacent system, and `Holdback Timer` is the value of the holdback timer at the adjacent system.

Setting the Timers

The following table shows the NCL commands you use to set the acknowledge and holdback timers.

To set the...	Enter the command...
ACKNOWLEDGE TIMER	`NCL> SET HDLC LINK` *`link-name`* `ACKNOWLEDGE TIMER` *`n`* where *n* is a decimal number between 1 and 60,000, and specifies the time in milliseconds.
HOLDBACK TIMER	`NCL> SET HDLC LINK` *`link-name`* `HOLDBACK TIMER` *`n`* where *n* is a decimal number between 0 and 60,000, and specifies the time in milliseconds.

Changing a Running System

When you change the value of these timers on a running system, the timer is reset.

5.3.2 HDLC: Preferred Window Size

Guideline

Increase the value from the default (2) if there is a significant delay on the link.

Setting the Preferred Window Size

Set the PREFERRED WINDOW SIZE characteristic of the data link:

```
NCL> SET HDLC LINK link-name PREFERRED WINDOW SIZE n
```

where *n* is a decimal number between 1 and 127.

If Value Is Greater than 7

Note that if you set the PREFERRED WINDOW SIZE characteristic to a value greater than 7, you must set the SEQUENCE MODULUS characteristic of the link to 128.

5.3.3 DDCMP: Retransmit Timer

Guidelines

Decrease the value of the retransmit timer from the default value (3000) if you are using a fast or noisy link. Increase this value if you are using a slow link.

Setting the Retransmit Timer

To set the retransmit timer, enter the following command:

```
NCL> SET DDCMP LINK link-name RETRANSMIT TIMER n
```

where *n* is a decimal number between 1 and 65,535, and specifies the time in milliseconds.

Changing a Running System

When you change the value of the retransmit timer on a running system, the timer is reset.

5.4 Deleting Connections

5.4.1 Preparations

Before you disable and delete a connection, you must delete any higher layer entities (any routing or X.25 functions) using the connection.

For example, before disabling an HDLC link, you must first disable the ROUTING CIRCUIT using the link.

5.4.2 Disabling Connections

Use the DISABLE command if you want to temporarily prevent the DEC WANrouter from communicating with the network through a specific connection.

5.4.3 CSMA/CD

To delete a CSMA/CD connection, complete the following steps:

Step	Action
1	Disable the CSMA-CD STATION entity for the connection. See Section 5.5 if you do not know the name of the CSMA-CD STATION. `NCL> DISABLE CSMA-CD STATION` *`station-name`*
2	Delete the CSMA-CD STATION entity for the connection. `NCL> DELETE CSMA-CD STATION` *`station-name`*

5.4.4 HDLC

To delete an HDLC connection, complete the following steps:

Step	Action
1	Disable the logical station associated with the circuit: `NCL> DISABLE HDLC LINK` *link-name* `LOGICAL STATION` *station-name*
2	Delete this logical station: `NCL> DELETE HDLC LINK` *link-name* `LOGICAL STATION` *station-name*
3	Disable the HDLC link associated with this circuit: `NCL> DISABLE HDLC LINK` *link-name*
4	Delete this link: `NCL> DELETE HDLC LINK` *link-name*
5	Disable the MODEM CONNECT LINE entity for the connection. See Section 5.5 if you do not know the name of the line. `NCL> DISABLE MODEM CONNECT LINE` *line-name*
6	Delete the MODEM CONNECT LINE entity for the connection: `NCL> DELETE MODEM CONNECT LINE` *line-name*

5.4.5 DDCMP

To delete a DDCMP connection, complete the following steps:

Step	Action
1	Disable the logical station associated with the circuit: `NCL> DISABLE DDCMP LINK` *link-name* `LOGICAL STATION` *station-name*
2	Delete this logical station: `NCL> DELETE DDCMP LINK` *link-name* `LOGICAL STATION` *station-name*
3	Disable the DDCMP link associated with this circuit: `NCL> DISABLE DDCMP LINK` *link-name*
4	Delete this link: `NCL> DELETE DDCMP LINK` *link-name*
5	Disable the MODEM CONNECT LINE entity for the connection. See Section 5.5 if you do not know the name of the line. `NCL> DISABLE MODEM CONNECT LINE` *line-name*
6	Delete the MODEM CONNECT LINE entity for the connection: `NCL> DELETE MODEM CONNECT LINE` *line-name*

5.4.6 PPP

To delete the PPP connection, complete the following steps:

Step	Action
1	Disable the link associated with the circuit: `NCL> DISABLE PPP LINK` *link-name*
2	Delete this link: `NCL> DELETE PPP LINK` *link-name*

5.4.7 PPP over Frame Relay

To delete a PPP connection over frame relay, complete the following steps:

Step	Action
1	Delete the PPP link. Follow the procedures in Section 5.4.7.1.
2	Delete the FRBS connection. Follow the procedures in Section 5.4.7.2.

5.4.7.1 Delete PPP Link

To delete the PPP link, complete the following steps:

Step	Action
1	Disable the link associated with the circuit: `NCL> DISABLE PPP LINK` *`link-name`*
2	Delete this link: `NCL> DELETE PPP LINK` *`link-name`*

5.4.7.2 Delete FRBS Connection

To delete the FRBS connection, complete the following steps:

Step	Action
1	Disable all the connections associated with the channel: `NCL> DISABLE FRBS CHANNEL` *`channel-name`* `CONNECTION` *`connection-name`* Repeat step 1 for all connections on this FRBS channel.
2	Delete all the connections associated with the channel: `NCL> DELETE FRBS CHANNEL` *`channel-name`* `CONNECTION` *`connection-name`* Repeat step 2 for all connections on this FRBS channel.
3	Disable the FRBS channel associated with this connection: `NCL> DISABLE FRBS CHANNEL` *`channel-name`*
4	Delete this FRBS channel: `NCL> DELETE FRBS CHANNEL` *`channel-name`*
5	Disable the MODEM CONNECT LINE entity for the connection. See Section 5.5 if you do not know the name of the line. `NCL> DISABLE MODEM CONNECT LINE` *`line-name`*
6	Delete the MODEM CONNECT LINE entity for the connection: `NCL> DELETE MODEM CONNECT LINE` *`line-name`*

5.5 Identifying Management Entities

Table 5–2 describes how to find the names of the management entities, given that you know the hardware port name.

Table 5–2 Identifying Management Entities

To display the name of the entity...	Enter the command...
CSMA-CD STATION	NCL> SHOW CSMA-CD STATION * ALL IDENTIFIERS, - _NCL> WITH COMMUNICATION PORT = *port-name* where *port-name* is the name of the associated hardware port.
MODEM CONNECT LINE	NCL> SHOW MODEM CONNECT LINE * ALL IDENTIFIERS, - _NCL> WITH COMMUNICATION PORT = *port-name* where *port-name* is the name of the associated hardware port.
HDLC LINK	NCL> SHOW HDLC LINK * ALL IDENTIFIERS, - _NCL> WITH PHYSICAL LINE - _NCL> = MODEM CONNECT LINE *line-name* where *line-name* is the name of the associated line.
HDLC LINK LOGICAL STATION	NCL> SHOW HDLC LINK *link-name* - _NCL> LOGICAL STATION * ALL IDENTIFIERS where *link-name* is the name of the associated HDLC LINK.
DDCMP LINK	NCL> SHOW DDCMP LINK * ALL IDENTIFIERS, - _NCL> WITH PHYSICAL LINE - _NCL> = MODEM CONNECT LINE *line-name* where *line-name* is the name of the associated line.
DDCMP LINK LOGICAL STATION	NCL> SHOW DDCMP LINK *link-name* - _NCL> LOGICAL STATION * ALL IDENTIFIERS where *link-name* is the name of the associated HDLC LINK.

(continued on next page)

Table 5–2 (Cont.) Identifying Management Entities

To display the name of the entity...	Enter the command...

PPP LINK	If you **are not** using frame relay, issue the following command to display the name of the PPP LINK entity:
	`NCL> SHOW PPP LINK * ALL IDENTIFIERS, WITH LOWER LAYER -`
	`_NCL> ENTITY MODEM CONNECT LINE` *line-name*
	where *line-name* is the name of the associated line.
	If you **are** using frame relay, issue the following command to display the name of the PPP LINK entity:
	`NCL> SHOW PPP LINK * ALL IDENTIFIERS, WITH LOWER LAYER -`
	`_NCL> ENTITY = FRBS CHANNEL` *channel-name* `-`
	`_NCL> CONNECTION` *connection-name*
	where *channel-name* is the name of the associated channel, and *connection-name* is the name of the connection.

Part II

Managing Routing

This part contains information on managing routing on the DEC WANrouter.

The following table lists the information in Part II:

For information on how to...	See Chapter...
Set up routing circuits	6
Set up routing security	7
Use the DEC WANrouter for DECnet/OSI routing	8
Use the DEC WANrouter for IP routing	9
Use the DEC WANrouter for routing NetWare® IPX protocols	10

6

Managing Routing: General

6.1 Overview

This chapter describes how to manage those aspects of routing that are independent of the protocols being routed.

The following table lists the contents of this chapter:

For information on...	See Section...
Adding routing circuits	6.2
X.25 templates and filters	6.3
Modem Connect templates	6.4
Modifying characteristics of routing circuits	6.5
Deleting routing circuits	6.6
Monitoring routing circuits	6.7
Blocking traffic at routing Level 1	6.8
Using backup circuits	6.9

6.1.1 NCL Commands

Assumption

All tasks performed using NCL commands assume that you have already:

- Logged on to a suitable host system on the network and started NCL
- Set default to the DEC WANrouter as follows:

  ```
  NCL> SET NCL DEFAULT ENTITY NODE wanrouter
  ```

Disabling Routing Circuits

For any tasks that require you to disable a routing circuit, ensure that you do not disable the routing circuit that you are using to manage the DEC WANrouter, unless there is an alternative route between the host on which you issue the NCL commands and the DEC WANrouter.

Restrictions for Enabling

You can disable various network management entities independently, but the DEC WANrouter 90/250 V1.3 software assumes a sequence for the Modem Connect, data link, for example, HDLC, X25 PROTOCOL DTE, and Routing Circuit entities.

If you use NCL to bring circuits up and down, you must follow the correct sequence for the ENABLE and DISABLE commands:

- When enabling, you must go bottom up. This means Modem Connect first, followed by data link, for example, HDLC LINK/LOGICAL STATION, and finally Routing Circuit.
- When disabling, you must go top down. This means Routing Circuit first, data link, for example, HDLC LINK/LOGICAL STATION, and finally Modem Connect.

6.2 Adding Routing Circuits

This section describes how to create routing circuits.

6.2.1 CSMA/CD

To create a CSMA/CD routing circuit, complete the following steps:

Step	Action
1	Create a CSMA-CD STATION entity. Section 5.2.1 describes how to do this.

2	Create a routing circuit, specifying it as type CSMA-CD:
	`NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> TYPE CSMA-CD`

3	Specify the CSMA-CD STATION entity that the circuit will use as its data link:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> DATA LINK ENTITY CSMA-CD -`
	`_NCL> STATION` *`station-name`*

4	Enable the circuit: `NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`*

6.2.2 HDLC

To create an HDLC routing circuit, complete the following steps:

Step	Action
1	Create an HDLC data link. Section 5.2.2 describes how to do this.
2	Create a routing circuit, specifying its type: `NCL> CREATE ROUTING CIRCUIT` *circuit-name* `TYPE HDLC`

3	Specify the link and logical station that this circuit is to use as its data link:
	`NCL> SET ROUTING CIRCUIT` *circuit-name* `-`
	`_NCL> DATA LINK ENTITY HDLC LINK` *link-name* `-`
	`_NCL> LOGICAL STATION` *station-name*

4	Enable the circuit: `NCL> ENABLE ROUTING CIRCUIT` *circuit-name*

6.2.3 DDCMP

To create a DDCMP routing circuit, complete the following steps:

Step	Action
1	Create a DDCMP data link. Section 5.2.3 describes how to do this.

2	Create a routing circuit, specifying its type:
	`NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> TYPE DDCMP`

3	Specify the link and logical station that this circuit is to use as its data link:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> DATA LINK ENTITY DDCMP LINK` *`link-name`* `-`
	`_NCL> LOGICAL STATION` *`station-name`*

4	Enable the circuit: `NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`*

6.2.4 PPP

Procedure

To create a PPP routing circuit, complete the following steps:

Step	Action
1	Create a PPP data link. Sections 5.2.4 and 5.2.5 describe how to do this.
2	Create a new PPP routing circuit, specifying that it is of type PPP: `NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `TYPE PPP`
3	Specify the link that this circuit is to use as its data link: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> DATA LINK ENTITY PPP LINK` *`link-name`*

4	Specify the network protocols to run over the circuit.
	Rule: The remote system must support the protocols that you select.
	Recommendation—System Resources: Only set up required protocols on each circuit. If you define a circuit to route unused protocols, it could waste system resources.
	For example, on a circuit that is set up for the network protocol ISO8473, the DEC WANrouter and remote system continuously acknowledge each other by sending 'hello' packets using this protocol. Even if the remote system does not use ISO8473, this exchange still takes place. This means that unnecessary packets are being sent across the circuit.
	Command: To specify the network protocols, enter the following command:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> NETWORK PROTOCOLS {`*`protocol1, protocol2, protocol3`*`}`
	where *protocol1*, *protocol2*, and *protocol3* are the protocols that you require. The following table lists the protocols:

Use this protocol...	For...
IP	All IP data and IP routing control packets. For example, EGP and RIP.
ISO8473	All DECnet/OSI data and DECnet/OSI routing control packets. For example, integrated IS-IS (ISO 10589 /RFC 1195) and ES-IS (ISO 9542).
DECNET PHASE IV	All DECnet Phase IV data and DECnet Phase IV routing control packets.

(continued on next page)

Step	Action

continued from previous page ...

Example:

```
NCL> SET ROUTING CIRCUIT CIRCUIT-1 -
_NCL> CIRCUIT-1 NETWORK PROTOCOLS {IP, DECNET PHASE IV}
```

Default: If you do not specify a protocol, the DEC WANrouter uses the set of protocols defined against the routing module.

5 Enable the circuit:

```
NCL> ENABLE ROUTING CIRCUIT circuit-name
```

PPP Circuits and DECnet Phase IV

Note that for DECnet Phase IV routing between two DECnet/OSI systems, you need to specify both DECNET PHASE IV and ISO8473 as network protocols. This is because DECnet Phase IV data is translated to DECnet/OSI data before it is routed over the circuit between the two systems.

DECnet Phase IV Routing Over PPP: Interoperability with Other Vendors

If the DEC WANrouter receives a PPP frame containing a DECnet Phase I packet that does not entirely fill the data portion of the PPP frame (that is, there are padding octets between the end of the DECnet Phase IV packet and the end of the PPP frame), then the DEC WANrouter will discard the packet.

The DEC WANrouter always sends PPP frames containing a DECnet Phase IV packet that exactly fills the data portion of the PPP frame.

6.2.5 X.25

X.25 routing circuits use X.25 virtual circuits to exchange packets.

There are two main types of X.25 routing circuit, as described in Table 6–1.

Table 6–1 Types of X.25 Routing Circuit

Type	Description
Dynamically Assigned	An X.25 virtual circuit is only created when there is traffic to send or receive on the X.25 DA circuit. Adaptive routing information is not exchanged across these circuits. Only Level 2 routers can have X.25 DA circuits.
Static	Static X.25 circuits form permanent connections between two DECnet routers. Routing information is exchanged across these circuits. There are two types of X.25 static circuits:

Name	Description
Outgoing	The DEC WANrouter initiates the X.25 call to establish the connection.
Incoming	The DEC WANrouter accepts the X.25 call from the remote DECnet router.

6.2.6 X.25 Dynamically Assigned

Assumption

The procedure in this section assumes that a DTE already exists to send and receive the X.25 traffic.

Routing Level Requirement

The DEC WANrouter must be configured as a Level 2 router if it has any X.25 dynamically assigned circuits.

Procedure

To create an X.25 dynamically assigned routing circuit, complete the following steps:

Step	Action
1	Set up a filter for the circuit, to determine how incoming calls are handled: see Section 6.3.4. Note that if an X.25 dynamically assigned circuit is to be used for both DECnet /OSI and IP routing, you must set up a filter for each type of routing. This is because the call user data is different for DECnet/OSI and IP routing.
2	Set up a template for outgoing calls: see Section 6.3.2. The template specifies the DTE class to be used in making calls, and puts the correct call user data in the call packet. Note that if an X.25 dynamically assigned circuit is to be used for both DECnet /OSI and IP routing, you must set up a template for each type of routing.
3	Create a routing circuit, specifying the type of routing circuit required: `NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `TYPE X25 DA`
4	Specify the data link that this circuit will use. This is the X.25 Access module. `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `DATA LINK ENTITY X25 ACCESS`

5	Associate the circuit with the filter(s) created in step 1:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> X25 FILTERS {`*`filter-name1, filter-name2, ...`*`}`

(continued on next page)

Step	Action

continued from previous page ...

6 Associate the circuit with the template(s) created in step 2.

Use one or both of the following commands:

```
NCL> SET ROUTING CIRCUIT circuit-name TEMPLATE template-name
NCL> SET ROUTING CIRCUIT circuit-name IP TEMPLATE IP-template-name
```

where *template-name* is the name of a DECnet/OSI template, and *IP-template-name* is the name of an IP template. See Section 6.3.2.

7 Set up the manual routing required for this circuit: see Section 8.9. (All routing over X.25 dynamically assigned circuits is manual.)

8 Enable the circuit:

```
NCL>  ENABLE ROUTING CIRCUIT circuit-name
```

Once the TEMPLATE attribute is set for such a circuit, then the corresponding template must be created before the circuit can be enabled.

6.2.7 X.25 Static Outgoing

Assumption

The procedure in this section assumes that a DTE already exists to send and receive the X.25 traffic.

Procedure

To create an X.25 Static Outgoing routing circuit, complete the following steps:

Step	Action
1	Set up a template for outgoing calls: see Section 6.3.2. The template specifies the DTE class to be used in making calls, and puts the correct call user data in the call packet. It also specifies the remote DTE address.
2	Create a routing circuit, specifying the type: `NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `TYPE X25 STATIC OUTGOING`
3	Specify the data link that this circuit will use. This is the X.25 Access module. `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `DATA LINK ENTITY X25 ACCESS`
4	Associate the circuit with the template created in step 1: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `TEMPLATE` *`template-name`*
5	Enable the circuit: `NCL>  ENABLE ROUTING CIRCUIT` *`circuit-name`*

Once the TEMPLATE attribute is set for such a circuit, then the corresponding template must be created before the circuit is enabled.

6.2.8 X.25 Static Incoming

Assumption

The procedure in this section assumes that a DTE already exists to send and receive the X.25 traffic.

Procedure

To create an X.25 Static Incoming routing circuit, complete the following steps:

Step	Action
1	Set up a filter for the circuit, to determine how incoming calls are handled: see Section 6.3.4.
2	If required, set up a template for setting parameters during call negotiation: see Section 6.3.2.
3	Create a routing circuit, specifying the type: `NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `TYPE X25 STATIC INCOMING`
4	Specify the data link that this circuit will use. This is the X.25 Access module. `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `DATA LINK ENTITY X25 ACCESS`

5	Associate the circuit with the filter(s) created in step 1:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> X25 FILTERS {`*`filter-name1, filter-name2, ...`*`}`

6	If required, associate the circuit with the template created in step 2: `NCL> SET ROUTING CIRCUIT TEMPLATE` *`template-name`*
7	Enable the circuit: `NCL>  ENABLE ROUTING CIRCUIT` *`circuit-name`*

Once the FILTER or TEMPLATE attribute is set for such a circuit, then the corresponding filter or template must be created before the circuit can be enabled.

6.2.9 Modem Dynamically Assigned

Assumption

The procedure in this section assumes that a Modem Connect line of connection type SWITCHED already exists.

Routing Level Requirement

The DEC WANrouter must be configured as a Level 2 router if it has any modem dynamically assigned circuits.

Procedure

To create a modem dynamically assigned routing circuit, complete the following steps:

Step	Action
1	Set up a filter for the circuit, to determine how incoming calls are handled: see Section 6.3.4 and Section 12.3.2.
2	Set up a template for outgoing calls: see Section 6.4.2. The template specifies the LINE CLASS to be used in making calls, as well as characteristics of the call.

3	Create a routing circuit, specifying the type of routing circuit required:
	`NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `TYPE HDLC, -`
	`_NCL> ACCESS TYPE MODEM DA`
	For routing circuits with access type MODEM DA, the circuit type must be HDLC.

4	Specify the data link that this circuit will use: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> DATA LINK ENTITY HDLC LINK` *`link-name`* `LOGICAL STATION` *`station-name`*

5	Associate the circuit with the filter(s) created in step 1:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> ACCESS FILTERS {`*`filter-name1, filter-name2, ...`*`}`

6	Associate the circuit with the template(s) created in step 2: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `TEMPLATE` *`template-name`*
7	Set up the manual routing required for this circuit: see Section 8.9. (All routing over modem dynamically assigned circuits is manual.)
8	Enable the circuit: `NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`*

6.2.10 Modem Static Outgoing

Assumption

The procedure in this section assumes that a Modem Connect line of connection type SWITCHED already exists to send and receive modem traffic.

Procedure

To create a modem static outgoing routing circuit, complete the following steps:

Step 1 Create a data link with access line type SWITCHED.

To create a data link of type...	See Section...
HDLC	5.2.2
DDCMP	5.2.3

Step 2 Create a routing circuit specifying its type:

```
NCL> CREATE ROUTING CIRCUIT circuit-name -
NCL> TYPE circuit-type, -
_NCL> ACCESS TYPE MODEM STATIC OUTGOING
```

where *circuit-type* is HDLC or DDCMP.

Step 3 Set up a template for outgoing calls: see Section 6.4.2. The template specifies the LINE CLASS to be used in making calls as well as characteristics of the call.

Step 4 Associate the circuit with the template created in step 2:

```
NCL> SET ROUTING CIRCUIT circuit-name -
_NCL> TEMPLATE template-name
```

Step 5 Specify the link and logical station that this circuit is to use as its data link:

```
NCL> SET ROUTING CIRCUIT circuit-name -
_NCL> DATA LINK ENTITY data link-type -
_NCL> LINK link-name -
_NCL> LOGICAL STATION station-name
```

where *data link-type* is HDLC or DDCMP.

Step 6 Enable the circuit:

```
NCL> ENABLE ROUTING CIRCUIT circuit-name
```

If the TEMPLATE attribute is set for such a circuit, then the corresponding template must be created before the circuit is enabled.

6.2.11 Modem Static Incoming

Assumption

The procedure in this section assumes that a Modem Connect line of connection type SWITCHED already exists.

Procedure

To create a modem static incoming routing circuit, complete the following steps:

Step 1 Create a data link with access line type SWITCHED.

To create a data link of type...	See Section...
HDLC	5.2.2
DDCMP	5.2.3

Step 2 Create a routing circuit specifying its type:

```
NCL> CREATE ROUTING CIRCUIT circuit-name TYPE circuit-type, -
_NCL> ACCESS TYPE MODEM STATIC INCOMING
```

where *circuit-type* is HDLC or DDCMP.

Step 3 Set up one or more filters for incoming calls: see Section 12.3.2. The filter determines how the incoming calls are to be handled.

Step 4 Associate the circuit with the filter(s) created in step 2:

```
NCL> SET ROUTING CIRCUIT circuit-name -
_NCL> ACCESS FILTERS {filter-name-1,filter-name-2...}
```

Step 5 Specify the link and logical station that this circuit is to use as its data link:

```
NCL> SET ROUTING CIRCUIT circuit-name -
_NCL> DATA LINK ENTITY data link-type -
_NCL> LINK link-name -
_NCL> LOGICAL STATION station-name
```

where *data link-type* is HDLC or DDCMP.

Step 6 Enable the circuit:

```
NCL> ENABLE ROUTING CIRCUIT circuit-name
```

If the FILTER attribute is set for such a circuit, then the corresponding filter must be created before the circuit is enabled.

6.3 X.25 Templates and Filters

6.3.1 Overview

The following table lists the contents of this section:

For information on...	See Section...
How to create templates	6.3.2
How to delete templates	6.3.3
How to create filters	6.3.4
How to delete filters	6.3.5

6.3.2 Creating Templates

This section describes how to create a template and specify the characteristics of the outgoing calls that it will set.

Procedure

To create a template, complete the following steps:

Step	Action
1	Ensure that the X25 ACCESS entity exists: `NCL> CREATE X25 ACCESS`
2	Create a TEMPLATE entity: `NCL> CREATE X25 ACCESS TEMPLATE` *`template-name`*
3	Set the template characteristics that you require: `NCL> SET X25 ACCESS TEMPLATE` *`template-name characteristic`* The NCL online help lists all the characteristics of the TEMPLATE entity. Table 6–2 shows the template characteristics required for each type of X.25 routing circuit.

Table 6–2 Template Characteristics

Circuit Type	Template Characteristic	(R)equired or (O)ptional	Value
Dynamically Assigned	DTE CLASS	R	The name of the DTE class on the DEC WANrouter that contains the DTE(s) to be used to make calls on this circuit.
	CALL DATA	R	For DECnet/OSI templates, the first octet should be 81, for example, %X81FF11. For IP templates, the first octet should be CC, for example, %XCCFF11.
Static Outgoing	DTE CLASS	R	As above.
	CALL DATA	R	Although any value can be used, provided it is agreed with the remote system, Digital recommends that the first 14 octets are FF0000004445436E65742D444C4D, for example, %XFF0000004445436E65742D444C4D. By default, Digital routers (both Phase IV and DECnet/OSI) recognize calls with this call data as calls on static X.25 routing circuits.
	DESTINATION DTE ADDRESS	R	DTE address of the system to which the routing circuit is connected.
All	PACKET SIZE	O	Used in call negotiation: preferred size of packet used over this circuit.
	WINDOW SIZE	O	Used in call negotiation: preferred size of window used over this circuit.

6.3.3 Deleting Templates

To delete an X.25 template, complete the following steps:

Step	Action
1	Ensure that no X.25 routing circuit is associated with the template to be deleted.
2	Delete the TEMPLATE entity as follows: `NCL> DELETE X25 ACCESS TEMPLATE` *`template-name`*

6.3.4 Creating Filters

This section describes how to create a filter and specify the characteristics to match incoming calls. Table 6–3 shows the filter characteristics required for each type of X.25 routing circuit.

Note that X.25 Static Outgoing Circuits do not require filters.

Procedure

To create a filter, complete the following steps:

Step	Action
1	Ensure that the X25 ACCESS entity exists: `NCL> CREATE X25 ACCESS`
2	Create a FILTER entity: `NCL> CREATE X25 ACCESS FILTER` *`filter-name`*
3	Set the filter characteristics that you require: `NCL> SET X25 ACCESS FILTER` *`filter-name characteristic`* The NCL online help lists all the characteristics of the FILTER entity. Table 6–3 shows the filter characteristics for X.25 Routing Circuits.

Table 6–3 Filter Characteristics for X.25 Routing Circuits

Circuit Type	Template Characteristic	(R)equired or (O)ptional	Value
Dynamically Assigned	INBOUND DTE CLASS	O	The name of the DTE class on the DEC WANrouter that contains the DTE over which the calls will arrive
	CALL DATA VALUE	R	For DECnet/OSI traffic this value should be %X81. For IP traffic, this value should be %XCC. If the circuit is being used for both DECnet/OSI and IP traffic, two filters are required, one with %X81 and the other with %XCC.
	CALL DATA MASK	R	This should be set to %XFF
Static Incoming	INBOUND DTE CLASS	O	The name of the DTE class on the DEC WANrouter that contains the DTE over which the calls will arrive
	CALL DATA VALUE	R	Although any value can be used, provided it is agreed with the remote system, Digital recommends that the first 14 octets are FF0000004445436E65742D444C4D, for example, %XFF0000004445436E65742D444C4D. By default, Digital routers (both Phase IV and DECnet/OSI) make calls with this call data on static X.25 routing circuits.
	CALL DATA MASK	R	This should be set to: %XFFFFFFFFFFFFFFFFFFFFFFFFFFFF when the recommended value for the CALL DATA VALUE (above) is used. Otherwise it should be set to mask off all the valid digits of the chosen CALL DATA VALUE.
	SENDING DTE ADDRESS	O	This can be set to match calls with exactly one remote DTE if required

Note: X.25 Static Outgoing Circuits do not require filters

General Requirement

In general, a filter associated with a particular X.25 routing circuit needs to match the call characteristics of calls from the remote system to which the routing circuit is attached.

X.25 DA Circuits Used for Both IP and DECnet/OSI Traffic

You need to create two filters for each of these circuits, to match the two different sets of call user data expected.

- For DECnet/OSI traffic, a filter should be set to match on call user data that has a value of 81 in the first octet:

```
NCL> SET X25 ACCESS FILTER circ-1-osi CALL DATA MASK %XFF, -
_NCL> CALL DATA VALUE %X81
```

- For IP traffic, a filter should be set to match on call user data that has a value of CC in the first octet:

```
NCL> SET X25 ACCESS FILTER circ-1-ip CALL DATA MASK %XFF, -
_NCL> CALL DATA VALUE %XCC
```

6.3.5 Deleting Filters

To delete a filter, complete the following steps:

Step	Action
1	Ensure that no X.25 circuit is using this filter (the DELETE command will fail if this filter is in use).
2	Use the following command to delete the FILTER entity: `NCL> DELETE X25 ACCESS FILTER` *`filter-name`*

6.4 Modem Connect Templates

6.4.1 Overview

The following table lists the contents of this section:

For information on how to...	See Section...
Create templates	6.4.2
Delete templates	6.4.3

6.4.2 Creating Templates

This section describes how to create a template and specify the characteristics of the outgoing calls that it will set.

Procedure

To create a template, complete the following steps:

Step	Action
1	Ensure that the MODEM CONNECT entity exists: `NCL> CREATE MODEM CONNECT`
2	Create a TEMPLATE entity: `NCL> CREATE MODEM CONNECT TEMPLATE` *`template-name`*
3	Set the template characteristics that you require: `NCL> SET MODEM CONNECT TEMPLATE` *`template-name characteristic`* The NCL online help lists all the characteristics of the TEMPLATE entity. Table 6–4 shows the template characteristic required for a modem dynamically assigned or modem static outgoing circuit.

Table 6–4 Modem Connect Template Characteristic

Template Characteristic	Value
Line Class	The name of the line class entity used to make an outgoing call.

6.4.3 Deleting Templates

To delete a Modem Connect template, complete the following steps:

Step	Action
1	Ensure that there is no routing circuit using the template to reserve a line.
2	Delete the TEMPLATE entity as follows: `NCL> DELETE MODEM CONNECT TEMPLATE` *`template-name`*

6.5 Modifying Characteristics of Routing Circuits

6.5.1 Overview

This section describes how to modify the characteristics of routing circuits.

For information on modifying...	See Section...
Maximum data link message size	6.5.2
Recall timer	6.5.3
Access Recall Timer	6.5.4
Maximum SVC adjacencies	6.5.5
Idle timer	6.5.6
Initial minimum timer	6.5.7
Max Call Attempts	6.5.8
Phase IV Routing Vector Timer	6.5.9

6.5.2 Maximum Data Link Message Size

Circuits that Can Be Modified

You can set the maximum data link message size on the following routing circuits:

HDLC
DDCMP
X.25
PPP

Description

This section describes how to specify the largest data link message to be sent over a circuit. You may want to set this to a smaller value than the default (1492) if the circuit connects to an end system.

Procedure

To set the maximum data link message size for a routing circuit, complete the following steps:

Step	Action
1	Disable the routing circuit: `NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`*
2	Set the MANUAL DATA LINK SDU SIZE for the circuit: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> MANUAL DATA LINK SDU SIZE` *`n`* where *n* is a decimal number between 128 and 65,535.
3	Enable the routing circuit: `NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`*

6.5.3 Recall Timer

Circuits that Can Be Modified

You can set the recall timer on the following routing circuits:

HDLC
DDCMP
PPP
X.25 dynamically assigned
X.25 static outgoing

Description

The recall timer specifies the time that must elapse between a failed initialization attempt (for instance verification failure, X.25 call failure) and a subsequent retry.

Guideline

Specify a value that is high enough to allow subsequent retries a reasonable chance of success. For example, setting a value of 0 means that there is no delay (0 seconds) between a failure and the next retry.

Procedure

Set the recall timer for a routing circuit as follows:

```
NCL> SET ROUTING CIRCUIT circuit-name RECALL TIMER n
```

where *n* is a decimal number between 0 and 65,535.

Note that for X.25 dynamically assigned circuits, the lowest possible value for *n*, is 1 (not 0).

6.5.4 Access Recall Timer

Circuits that Can Be Modified

You can set the access recall timer on the following routing circuits:

HDLC with access type MODEM DA
HDLC with access type MODEM STATIC OUTGOING
DDCMP with access type MODEM STATIC OUTGOING

Description

The access recall timer specifies the time that must elapse between a failed call attempt by Modem Connect and a subsequent retry. In this case, the access call is an attempt to dial a particular remote system.

Guideline

Specify a value that is high enough to allow subsequent retries a reasonable chance of success. For example, setting a value of 0 means that there is no delay (0 seconds) between a failure and the next retry.

Procedure

Set the recall timer for a routing circuit as follows:

```
NCL> SET ROUTING CIRCUIT circuit-name ACCESS RECALL TIMER n
```

where *n* is a decimal number between 0 and 65,535.

6.5.5 Maximum SVC Adjacencies

Circuits that Can Be Modified

You can set the maximum SVC adjacencies for the following routing circuits:

X.25 dynamically assigned

Description

This specifies the maximum number of adjacencies allowed on this circuit; the number of SVCs plus the number of dormant adjacencies on the circuit cannot exceed the value of this characteristic.

Note that you can increase this value without disabling the circuit.

Procedure

Set the maximum SVC adjacencies for a routing circuit as follows:

```
NCL> DISABLE ROUTING CIRCUIT circuit-name
NCL> SET ROUTING CIRCUIT circuit-name MAXIMUM SVC ADJACENCIES n
NCL> ENABLE ROUTING CIRCUIT circuit-name
```

where *n* is a decimal number between 1 and 65,535.

6.5.6 Idle Timer

Circuits that Can Be Modified

You can set the idle timer on the following routing circuits:

HDLC with access type MODEM DA
DDCMP with access type MODEM DA
X.25 dynamically assigned

Description

The idle timer indicates the time, in seconds, for which data traffic on the circuit must be absent before the call is cleared.

Procedure

Set the idle timer for a routing circuit as follows:

```
NCL> SET ROUTING CIRCUIT circuit-name IDLE TIMER n
```

where *n* is a decimal number between 1 and 65,535.

6.5.7 Initial Minimum Timer

Circuits that Can Be Modified

You can set the initial minimum timer on the following routing circuits:

HDLC with access type MODEM DA
HDLC with access type MODEM STATIC OUTGOING
HDLC with access type MODEM STATIC INCOMING
DDCMP with access type MODEM STATIC OUTGOING
DDCMP with access type MODEM STATIC INCOMING
X.25 dynamically assigned
X.25 static outgoing
X.25 static incoming

Description

This indicates the minimum time, in seconds, that a call on a circuit will remain connected, irrespective of traffic.

Procedure

Set the initial minimum timer for a routing circuit as follows:

```
NCL> SET ROUTING CIRCUIT circuit-name INITIAL MINIMUM TIMER n
```

where *n* is a decimal number between 1 and 65,535.

6.5.8 Maximium Call Attempts

Circuits that Can Be Modified

You can set the maximum call attempts counter on the following routing circuits:

HDLC with access type MODEM STATIC OUTGOING
DDCMP with access type MODEM STATIC OUTGOING
X.25 static outgoing

Description

This indicates the maximum number of attempts that can be made to place a call before the circuit is automatically disabled.

Procedure

Set maximum number of call attempts for a routing circuit as follows:

```
NCL> SET ROUTING CIRCUIT circuit-name MAXIMUM CALL ATTEMPTS n
```

where *n* is a decimal number between 1 and 255 (default=10).

6.5.9 Phase IV Routing Vector Timer

Circuits that Can Be Modified

You can set the phase IV routing vector timer on the following routing circuits:

PPP

Description

This indicates the frequency of routing vector updates. It is set to 30 seconds by default.

It could, for instance, be useful to increase the update frequency on PPP circuits that have a high error rate.

Procedure

Set frequency of routing vector updates for a routing circuit as follows:

```
NCL> SET ROUTING CIRCUIT circuit-name PHASE IV ROUTING VECTOR TIMER n
```

where *n* is a decimal number between 1 and 65536 (default=30).

6.6 Deleting Routing Circuits

Delete a routing circuit if you want to prevent permanently the DEC WANrouter from communicating with the system(s) connected by that circuit. Use the DISABLE command if you want to prevent temporarily the DEC WANrouter from communicating with the system(s).

Procedure

To delete a routing circuit, complete the steps in Table 6–5.

Table 6–5 Deleting a Routing Circuit

Step	Action

1	Disable and delete any reachable addresses or IP reachable addresses of the ROUTING CIRCUIT entity:
	`NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`* `REACHABLE ADDRESS *`
	`NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`* `IP REACHABLE ADDRESS *`
	`NCL> DELETE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> REACHABLE ADDRESS *`
	`NCL> DELETE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> IP REACHABLE ADDRESS *`

2	Disable the routing circuit: `NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`*
3	Delete the routing circuit: `NCL> DELETE ROUTING CIRCUIT` *`circuit-name`*
4	If the circuit is an X.25 circuit, delete the items listed in the following table:

Delete...	Unless...	See Section...
Any templates associated with this routing circuit	They are being used by another routing circuit.	6.3.3
Any filters associated with this routing circuit	They will be used by another routing circuit.	
The DTE	It is required for any other functions.	6.3.5

Step	Action
5	If the circuit is a Modem Connect dynamically assigned circuit, delete the items listed in the following table:

Delete...	Unless...	See Section...
Any templates associated with this routing circuit	They are being used by another routing circuit.	6.4.3
Any filters associated with this routing circuit	They will be used by another routing circuit.	12.3.4

6.7 Monitoring a Routing Circuit

You can use the following commands to check how a routing circuit is functioning:

- To check if a circuit is enabled:

  ```
  NCL> SHOW ROUTING CIRCUIT circuit-name STATUS
  ```

- To check how a circuit is being used:

  ```
  NCL> SHOW ROUTING CIRCUIT circuit-name ALL COUNTERS
  ```

  See the NCL online help for a description of the counters displayed.

6.8 Blocking Traffic at Routing Level 1

This section describes how to prevent a routing circuit on a DEC WANrouter, running the link state routing algorithm at Level 2, from routing Level 1 traffic.

Procedure

To prevent a routing circuit from routing Level 1 traffic, complete the following steps:

Step	Action
1	Disable the routing circuit: `NCL> DISABLE ROUTING CIRCUIT` *circuit-name*
2	Set the MANUAL L2ONLY MODE characteristic of the routing circuit to TRUE: `NCL> SET ROUTING CIRCUIT` *circuit-name* `MANUAL L2ONLY MODE TRUE`
3	Enable the routing circuit: `NCL> ENABLE ROUTING CIRCUIT` *circuit-name*

Consequences of Changing from TRUE to FALSE

If you change the MANUAL L2ONLY MODE from TRUE to FALSE, set the L1 COST and L1 ROUTER PRIORITY characteristics for the circuit, as necessary (see Section 8.7 and Section 8.8, respectively).

6.9 Using Backup Circuits

6.9.1 Overview

The following table lists the contents of this section:

For information on...	See Section...
Failover and backup circuits	6.9.2
Setting up backup circuits	6.9.3
Modifying a group of backup circuits	6.9.4
Testing a secondary circuit	6.9.5

6.9.2 Failover and Backup Circuits

Failover is a facility that:

- Detects the failure of a leased circuit
- Establishes a backup circuit for the duration of the failure

Circuits that Support Failover (Primary Circuits)

Failover is applicable on circuits that run the following data link protocols:

HDLC
DDCMP
X.25 static outgoing
PPP

Dynamically assigned circuits can be used as secondary circuits, but not as primary ones. That is to say, failover is not possible *from* dynamically assigned circuits, but is possible *to* dynamically assigned circuits.

Backup Circuits (Secondary Circuits)

Backup circuits can be:

HDLC with access type MODEM STATIC OUTGOING
HDLC with access type MODEM DA
DDCMP with access type MODEM STATIC OUTGOING
X.25 static outgoing
X.25 dynamically assigned

Backup Group

A backup group consists of one primary circuit and one secondary circuit.

The DEC WANrouter 90/250 monitors primary circuits in a backup group to detect when they fail. When a primary circuit fails, the DEC WANrouter 90 /250 activates the designated secondary circuit in its backup group.

For failover, X.25 static outgoing circuits can be primary or secondary, but these are not available on DECrouter 250.

6.9.3 Setting Up Backup Circuits

Note that the Supervisor module provides management of backup circuits.

To set up backup circuits, complete the following steps:

Step	Action
1	Ensure that the SUPERVISOR entity exists: `NCL> CREATE SUPERVISOR`

2	Create a backup group. The backup group defines:
	• The circuit which has failover support (the primary circuit).
	• The circuit to be used when the primary circuit fails (the secondary circuit).
	`NCL> CREATE SUPERVISOR GROUP` *group-name* `FUNCTION BACKUP`
	`NCL> SET SUPERVISOR GROUP` *group-name* `-`
	`_NCL> PRIMARIES {ROUTING CIRCUIT` *primary-circuit*`}`
	`NCL> SET SUPERVISOR GROUP` *group-name* `-`
	`_NCL> SECONDARY ROUTING CIRCUIT` *secondary-circuit*

3	Enable the primary circuit: `NCL> ENABLE ROUTING CIRCUIT` *primary-circuit*
4	Enable the backup group: `NCL> ENABLE SUPERVISOR GROUP` *group-name*

Example

To create a backup circuit, HDLC-BACKUP, for the circuit HDLC-MAIN, with a backup group called BACKUP-1, enter the following commands:

```
NCL> CREATE SUPERVISOR
NCL> CREATE SUPERVISOR GROUP BACKUP-1 FUNCTION BACKUP
NCL> SET SUPERVISOR GROUP BACKUP-1 PRIMARIES {ROUTING CIRCUIT HDLC-MAIN}
NCL> SET SUPERVISOR GROUP BACKUP-1 SECONDARY ROUTING CIRCUIT HDLC-BACKUP
NCL> ENABLE ROUTING CIRCUIT HDLC-MAIN
NCL> ENABLE SUPERVISOR GROUP BACKUP-1
```

Limit: Number of Backup Groups

The number of backup groups you can create depends on your hardware.

If your hardware is...	The maximum number of groups is...
DECwanrouter 90EW	1
DECrouter 250	4

6.9.4 Modifying a Backup Group

The Invoke and Revoke Timers govern the behavior of the backup group:

This timer...	Defines the period the DEC WANrouter waits...	
	After...	**Before it...**
INVOKE TIMER	The primary circuit fails	Enables the secondary circuit.
REVOKE TIMER	The primary circuit recovers	Disables the secondary circuit.

To modify these timers, for example, to prevent a transient failure from causing unnecessary establishment of a secondary circuit, enter the following command:

```
NCL> SET SUPERVISOR GROUP group-name INVOKE TIMER n, REVOKE TIMER m
```

where *n* is the value of the INVOKE TIMER and *m* is the value of the REVOKE TIMER.

6.9.5 Testing a Secondary Circuit

To test if a secondary circuit is established, enter the command:

```
NCL> TEST SUPERVISOR GROUP group-name TIMER n
```

where *n* specifies the amount of time that the secondary circuit will remain enabled. If you omit TIMER, the DEC WANrouter uses the REVOKE TIMER for the group.

Result

The result depends on the state of the secondary circuit:

If the secondary circuit...	The test returns...	And...
Does not exist	An error.	–
Exists, but is not enabled	The NCL prompt	The Activation Failure counter increments and an event is generated.
Exists and is enabled	The NCL prompt.	–

6.9.6 Disabling Routing Circuits in a Backup Group

Care is needed if you want to manually disable all the routing circuits within a backup group.

If the WANrouter is operating with a group enabled, and a secondary circuit is active, you should disable the secondary circuit first. You can do that in NCL by disabling either the secondary routing circuit itself, or the supervisor group (backup group) containing the circuit.

Disabling the primary circuit alone will not disable the secondary circuit, which may remain active indefinitely with the primary circuit disabled.

7
Security

7.1 Overview

The following table lists the contents of this chapter:

For instructions on...	See Section...
Setting up circuit-level security	7.2.1
Setting up system-level security	7.2.2
Enabling the DEC WANrouter to send verifiers	7.2.3
Setting up PPP security	7.3

7.2 Setting Up Routing Security

The following sections describe how to secure the routing function of your DEC WANrouter to prevent an unauthorized adjacent system from setting up a circuit to connect with it.

Types of Routing Circuit

Routing security applies to HDLC, DDCMP, and X.25 static routing circuits.

7.2.1 Circuit-Level Security

This section describes how to set up a verifier (password) for a routing circuit. Any system that tries to use this routing circuit to communicate with your system must supply this verifier, irrespective of any system-level security on the DEC WANrouter.

Procedure

To set up routing security on a routing circuit, complete the following steps:

Step	Action
1	Set the verifier on the circuit as follows: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `RECEIVE VERIFIER` *`verifier-value`* where *verifier-value* is an octet string, which takes the form %x*n* (*n* is an even number of hexadecimal digits). An example verifier value is %x12AB. If the adjacent system is a DECnet Phase IV system, it specifies the verifier as a text string. In this case, you convert each letter in the text string to its ASCII value in hexadecimal, and enter this as the value of *n*. For example, the text string SECRET becomes %x534543524554.

2	Set the routing circuit to check for this verifier when the circuit is initialized:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> EXPLICIT RECEIVE VERIFICATION TRUE`

7.2.2 System-Level Security

When to Use System-Level Security

System-level security is useful if there are several systems that can reach your DEC WANrouter on the same circuit; for example, a dialup circuit.

Procedure

To set up routing security on the DEC WANrouter, complete the following steps:

Step	Action

1	Disable inbound circuit-level security on those circuits to which system-level security will apply by issuing the following command for each circuit:
	
	`NCL>  SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> EXPLICIT RECEIVE VERIFICATION FALSE`
	
	If you do not want to use any circuit-level security on the DEC WANrouter, issue the following command:
	
	`NCL>  SET ROUTING CIRCUIT * -`
	`_NCL> EXPLICIT RECEIVE VERIFICATION FALSE`

2	Create a PERMITTED NEIGHBOR entity for each system from which you want to accept connections: `NCL> CREATE ROUTING PERMITTED NEIGHBOR` *`neighbor-id`* `-` `_NCL> ID` *`remote-node-id`* where: *neighbor-id* — identifies the PERMITTED NEIGHBOR entity. The name you use should be based on the name of the remote system concerned. *remote-node-id* — specifies the system ID of the remote system that will have to supply a verifier.
3	Set the verifier that this remote system must use: `NCL> SET ROUTING PERMITTED NEIGHBOR -` `_NCL>` *`neighbor-id`* `VERIFIER` *`verifier-value`* where *verifier-value* is an octet string, which takes the form %x*n* (*n* is an even number of hexadecimal digits). An example verifier value is %x12AB. If the remote system is a DECnet Phase IV system, it specifies the verifier as a text string. In this case, you convert each letter in the text string to its hexadecimal value in ASCII, and enter this as the value of *n*. For example, the text string SECRET becomes %x534543524554.

7.2.3 Enabling the DEC WANrouter to Send Verifiers

To configure a routing circuit on the DEC WANrouter to send a verifier to an adjacent system, enter the command:

```
NCL> SET ROUTING CIRCUIT circuit-id TRANSMIT VERIFIER verifier-value
```

where *verifier-value* is an octet string, which takes the form %x*n* (*n* is an even number of hexadecimal digits). An example verifier value is %x12AB.

7.3 Security for PPP

PPP supports data link level checking and authentication. To set up security for PPP on the DEC WANrouter, complete the steps in Table 7–2 and Table 7–1.

Table 7–1 Security on the Local DEC WANrouter

Step	Action
1	Create a PPP PERMITTED NEIGHBOR entity for each system from which you want to accept connections: `NCL> CREATE PPP PERMITTED NEIGHBOR` *neighbor-id* `-` `_NCL> IDENTIFIER` *PPP-identifier* where: *neighbor-id* identifies the PERMITTED NEIGHBOR entity. The name you use should be based on the name of the remote system concerned. *PPP-identifier* specifies the system ID of the remote system that will have to supply a password (for instance, %X08002B123456).
2	Set the password that this remote system must use: `NCL> SET PPP PERMITTED NEIGHBOR` *neighbor-id* `PASSWORD` *password* where *password* is an octet string, which takes the form %x*n*. *n* is an even number of hexadecimal digits; an example password value is %x12AB.
3	Enable security on incoming PPP circuits, by entering the following password command: `NCL> SET PPP LINK` *link-name* `SEND AUTHENTICATION TYPES {PAP}`

Table 7–2 Security on the Remote Router

Step	Action
1	Now on each remote router (DEC WANrouter or DECNIS), enable sending of the verifier with the following command: `NCL> SET PPP` *`link-name`* `RECEIVE AUTHENTICATION TYPES {PAP}`
2	Set up the identifier and password the PPP link will use, (these should match the values configured against the PERMITTED NEIGHBOR configured on the local DEC WANrouter): `NCL> SET PPP LINK` *`link-name`* `TRANSMIT PAP IDENTIFIER` *`ppp-identifier`* `NCL> SET PPP LINK` *`link-name`* `TRANSMIT PAP PASSWORD` *`ppp-password`* where: *ppp-identifier* — is the identifier the PPP link will use and defaults to the ID of this node (for instance, %X08002B1234) *ppp-password* — is the password the PPP link will use (for instance, %X123ABC)

Note that it is essential to set up security on both the local and remote routers. You can configure both outgoing and incoming security over the same link, by completing the steps above, at both ends of the link.

The remote router can be a DEC WANrouter or a DECNIS.

8

DECnet/OSI Routing

8.1 Overview

The following table lists the contents of this chapter:

For information on...	See Section...
DEC WANrouter addressing	8.2
Changing Phase IV addresses and prefixes	8.3
Changing the Phase V area address	8.4
Changing the routing level	8.5
Routing algorithms	8.6
Changing circuit cost	8.7
Changing the circuit priority	8.8
Manual routing	8.9

Disabling Routing Circuits

For any tasks that require you to disable a routing circuit, ensure that you do not disable the routing circuit that you are using to manage the DEC WANrouter, unless there is an alternative route between the host on which you issue the NCL commands and the DEC WANrouter.

8.2 DEC WANrouter Addressing

Structure

The structure of a DEC WANrouter NSAP address is as follows:

Area_Address:*System_ID*:20

where the values of *Area_Address* and *System_ID* depend on whether the NSAP address is to be Phase IV-compatible.

DEC WANrouter Addresses and DECnet Phase IV Nodes

If the DEC WANrouter is in a network that has DECnet Phase IV nodes, one of its NSAP addresses must be in a Phase IV-compatible form.

The DEC WANrouter constructs its Phase IV-compatible NSAP address from information you supply during configuration.

To derive the Phase IV-compatible NSAP address, complete the following steps:

Step	Action
1	Derive the Area Address. Follow the procedures in Section 8.2.1.
2	Derive the System ID. Follow the procedures in Section 8.2.2.
3	Derive the NSAP address. Follow the procedures in Section 8.2.3.

8.2.1 Deriving the Area Address

To derive the Area Address, complete the following steps:

Step	Action
1	Convert the area part of the Phase IV address into hexadecimal. **Example:** If the Phase IV address is 13.7, convert the 13 to hexadecimal, giving 0D.
2	Derive the area address by combining the Phase IV prefix with the previous result as follows: *Area_Address = PhaseIV_prefix*00-*PhaseIV_area* **Example:** If the Phase IV prefix is 49::, the area address will be: 49::00-0D

8.2.2 Deriving the System ID

To derive the System ID, complete the following steps:

Step	Action
1	Given that the Phase IV address is *n.m*, enter the values for *n* and *m* in the following equation: $$(n * 1024) + m = total$$ Then convert the value *total* into hexadecimal. **Example:** $(13 * 1024) + 7 = 13319 = 00003407$ (hex)
2	Derive the system-ID using the following format: `AA-00-04-00-`*`xx-yy`* where *xx* represents the last two digits of the hexadecimal value *total* and *yy* represents the two digits previous to the last two digits of *total*. **Example:** `AA-00-04-00-07-34` Note that in the system-ID, the two pairs of digits from the value *total* are reversed in order.

8.2.3 Deriving the NSAP address

To derive the NSAP address, combine the area address and the system-ID as follows:

`PhaseIV_Area_Address``:`*`System_ID`*`:20`

Example: `49::00-0D:AA-00-04-00-07-34:20`

where 49::00-0D is the area address for the DEC WANrouter and AA-00-04-00-07-34 is the system-ID for the DEC WANrouter.

8.3 Changing Phase IV Addresses and Prefixes

To change Phase IV addresses and prefixes, use the configurator, following the instructions in *DEC WANrouter 90/250 User's Guide*.

8.4 Changing the Phase V Area Address

To change a Phase V area address of the DEC WANrouter, remove the old address and add the new one.

You can do this without rebooting the DEC WANrouter.

Procedure

To add and remove Phase V area addresses to the DEC WANrouter, complete the following steps:

Step	Action
1	Add addresses to the MANUAL AREA ADDRESSES characteristic of the ROUTING entity by using the ADD command: `NCL> ADD ROUTING MANUAL AREA ADDRESSES {`*`area-address`*`}`
2	Delete addresses from the MANUAL AREA ADDRESSES characteristic of the ROUTING entity by using the REMOVE command: `NCL> REMOVE ROUTING MANUAL AREA ADDRESSES {`*`area-address`*`}`

8.5 Changing the Routing Level of a DEC WANrouter

You can configure the DEC WANrouter to be either a Level 1 or a Level 2 router. However, you must use the configurator to change the routing level; you cannot change the level if the DEC WANrouter is running. See the *DEC WANrouter 90/250 User's Guide* for details.

8.6 Routing Algorithms

8.6.1 Deciding Which Algorithms to Run

Introduction

The DEC WANrouter can run one of two routing algorithms:

- DECnet/OSI link state
- DECnet Phase IV routing vector

If the DEC WANrouter is configured as a Level 2 router, it can run one routing algorithm at Level 1, and the other at Level 2.

Procedure

The *DECnet/OSI Routing Overview* describes how to choose the routing algorithm that the DEC WANrouter should use.

8.6.2 Changing the Routing Algorithms

Consequences of Changing the Routing Algorithms

Changing the routing algorithm at either Level 1 or Level 2 will have serious consequences for your configuration. In particular, the configurator will delete any IP route propagation you have entered.

If, as a result of your change, the DEC WANrouter is not running the link state routing algorithm at Level 1 or Level 2, any Phase V addresses will be deleted.

Other changes will depend on your particular configuration.

Procedure

To change the routing algorithm, you run the configurator and reboot the DEC WANrouter. For details, see *DEC WANrouter 90/250 User's Guide.*

8.7 Changing Circuit Cost

Restrictions

The following table describes some restrictions on circuit cost:

Restriction	Details
Different costs at each end of a circuit	It is possible for a circuit connecting two systems to have a different cost at each end: this will mean that traffic will be more likely to travel in one direction over the circuit than the other. This could cause difficulties when diagnosing problems on the network.
Maximum circuit cost	The maximum cost of a route, from source to destination, is 1023.

Procedure

To set the Level 1 and Level 2 circuit costs of a routing circuit, complete the following steps:

Step	Action
1	Set the Level 1 routing cost: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `L1 COST` *`n`* where *n* is a decimal number between 1 and 63.
2	Set the Level 2 routing cost: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `L2 COST` *`n`* where *n* is a decimal number between 1 and 63.

8.8 Changing the Circuit Priority

This section describes how to change the Level 1 and Level 2 priority of a routing circuit.

Rules

Follow the rules in the table below to set the circuit priority, depending on whether the DEC WANrouter is a Level 1 or Level 2 router.

If your DEC WANrouter is...	Then...
Not a Level 2 router	Do **not** set the Level 2 routing priority.
A Level 2 router but the routing circuit is set to disallow Level 1 traffic	You do not need to set the Level 1 routing priority.

Procedure

To set the Level 1 and Level 2 routing priority, complete the following steps:

Step	Action
1	Set the Level 1 routing priority: `NCL> SET ROUTING CIRCUIT` *circuit-name* `L1 ROUTER PRIORITY` *n* where *n* is a decimal number between 1 and 127.
2	Set the Level 2 routing priority: `NCL> SET ROUTING CIRCUIT` *circuit-name* `L2 ROUTER PRIORITY` *n* where *n* is a decimal number between 1 and 127.

8.9 Manual Routing

8.9.1 When to Use Manual Routing

There are some circumstances in which you must use manual routing.

If you have...	See Section...
Circuits connecting to foreign routing domains, including Dynamically Assigned circuits	8.9.2
Circuits on routers running the link state routing algorithm connecting at Level 2 to routers running the routing vector algorithm	8.9.3
CSMA/CD routing circuits connecting to end systems that do not support automatic configuration as defined by ISO 9542	8.9.4

8.9.2 Foreign Domains

Procedure

To allow a routing circuit to connect to a system in another domain, complete the steps in Table 8–1.

Table 8–1 DECnet/OSI Routing: Connecting to Foreign Domains

Step	Action
1	Disable the routing circuit: `NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`*
2	Set the DNA NEIGHBOR characteristic to FALSE (unless the routing circuit is of type X25 DA): `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `DNA NEIGHBOR FALSE` **Result:** This prevents DNA™ routing information from being sent over the circuit. In this way, even if the foreign domain is using DNA protocols, the two domains are kept separate.
3	Create a reachable address for each foreign domain to be reached by this circuit. Specify an address prefix for each reachable address. `NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> REACHABLE ADDRESS` *`reachable-address`* `ADDRESS PREFIX` *`prefix`* where *reachable-address* is a name to identify the reachable address, and *prefix* is sufficient leading digits of the NSAP address(es) of the system(s) in the foreign domain to uniquely identify them. **NSAP address format:** Enter *prefix* in Digital or OSI format.
4	Specify the cost of reaching systems in the foreign domain: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> REACHABLE ADDRESS` *`reachable-address`* `COST` *`n`* where *n* is a decimal number between 1 and 63.

5	If required, set the metric type of the reachable address to External (the default is Internal):
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> REACHABLE ADDRESS` *`reachable-address`* `METRIC TYPE EXTERNAL`
	Set the metric type to External if you want to prevent the reachable address being used to establish a path between two systems in your local routing domain.

(continued on next page)

Table 8–1 (Cont.) DECnet/OSI Routing: Connecting to Foreign Domains

Step	Action
6	Depending on the type of circuit being used, the Reachable Address may need to be configured with the address of the remote system. The form that the address takes depends upon the circuit type, as follows:

If the circuit type is...	Then...

X25 DA	Specify the remote DTE address(es) to be used to connect with an address specified by the address prefix of the reachable address:
	
	1. Specify that the remote DTE addresses are to be entered manually:
	
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> REACHABLE ADDRESS` *`reachable-address`* `-`
	`_NCL> MAPPING MANUAL`
	
	2. Enter the remote DTE addresses:
	
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`*
	`_NCL> REACHABLE ADDRESS` *`reachable-address`* `-`
	`_NCL> DTE ADDRESSES {`*`DTE-addresses`*`}`

CSMA-CD	Specify the LAN address to be used to connect with an address specified by the address prefix of the reachable address: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `_NCL> REACHABLE ADDRESS` *`reachable-address`* `-` `_NCL> LAN ADDRESS` *`XX-XX-XX-XX-XX-XX`*

MODEM DA	Specify the remote modem address to be used to connect with an address specified by the address prefix of the reachable address:
	
	1. Specify that the remote modem addresses are to be entered manually:
	
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> REACHABLE ADDRESS` *`reachable-addr`* `-`
	`_NCL> MAPPING MANUAL`
	
	2. Enter the remote modem addresses [1]:
	
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> REACHABLE ADDRESS` *`reachable-addr`* `-`
	`_NCL> MODEM ADDRESSES {`*`modem-addresses`*`}`

[1]This value is ignored, but must be specified (for example, set modem-address=0)

(continued on next page)

Table 8–1 (Cont.) DECnet/OSI Routing: Connecting to Foreign Domains

Step	Action
7	Enable the reachable address: `NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> REACHABLE ADDRESS` *`reachable-address`*
8	Enable the circuit: `NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`*

8.9.3 Connecting to Routers Running a Different Routing Algorithm

This section describes how to configure a DEC WANrouter that is running the link state routing algorithm at Level 2 to communicate with routers in another area that are running the routing vector routing algorithm at Level 2.

Requirement: Phase IV Area Numbers

The two areas connected by an interphase link must have different Phase IV area numbers.

Procedure

To set up an interphase link, complete the following steps:

Step	Action
1	Create an outbound reachable address for each area in the routing vector domain. Specify the information listed in the following table:

Item	Details
ADDRESS PREFIX for the reachable address	This is the Phase IV compatible area address.
Cost of the reachable address	This must be greater than or equal to the circuit cost.
Data format	This is PHASEIV, unless the receiving router is a DEC WANrouter or another DECnet/OSI router (running the routing vector algorithm).

2	Create an inbound reachable address for each area in the link state domain.

Example

In the configuration shown in Figure 8–1, the Level 2 routers in Area 1 and Area 2 communicate using the link state algorithm, and the Level 2 routers in Area 9 and Area 10 communicate using the routing vector algorithm.

In order to communicate between the link state domain (Area 1 and Area 2) and the routing vector domain (Area 9 and Area 10), you need to set up an interphase link between the DEC WANrouter and the DECnet Phase IV router.

Creating Outbound Reachable Addresses

Assume the name of the circuit is Salt, and the Phase IV prefix for the network is 49. Assume also that the router to which the DEC WANrouter is connected is a Phase IV router. You would set up a reachable address for Area 10 (but not for Area 9, since this is directly connected to the link state domain) as follows:

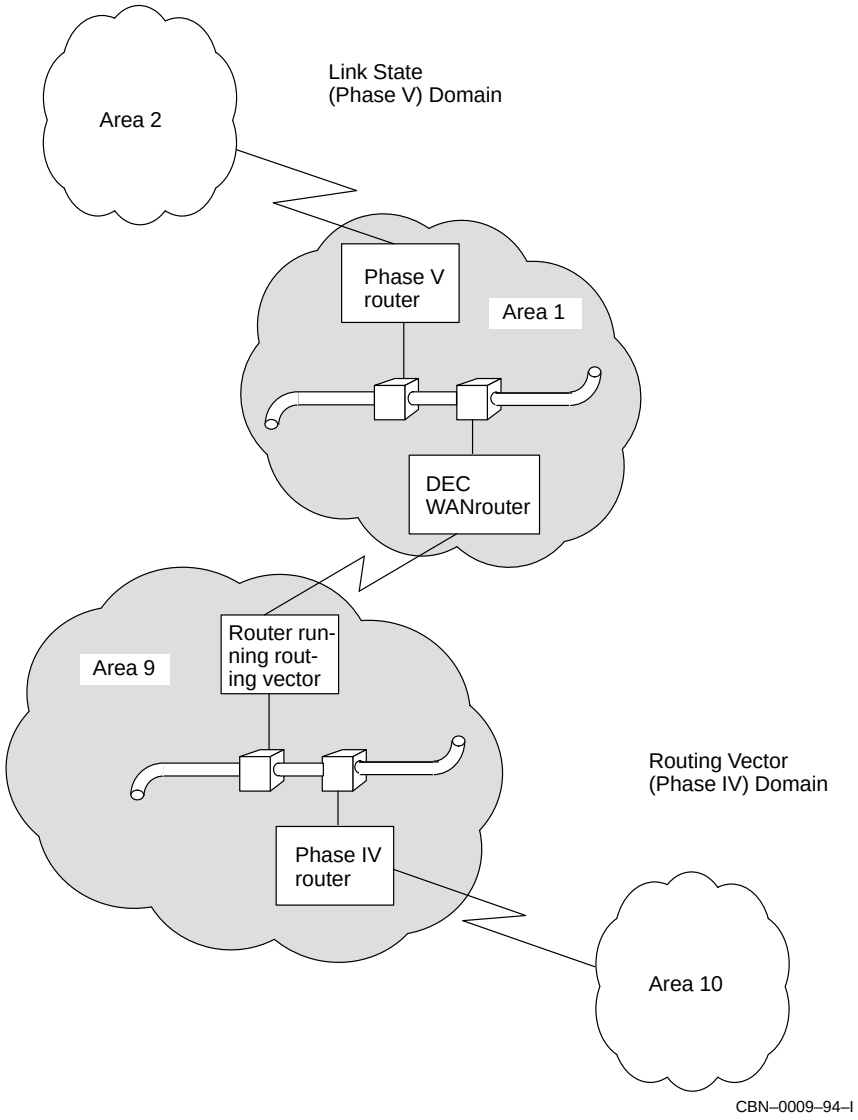
```
NCL> CREATE ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area0a -
_NCL> ADDRESS PREFIX 49::00-0A

NCL> SET ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area0a COST 20, -
_NCL> TYPE OUTBOUND, DATA FORMAT PHASEIV

NCL> ENABLE ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area0a
```

Creating Inbound Reachable Addresses

To set up a reachable address for Area 1 and Area 2 the commands are as follows:

```
NCL> CREATE ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area01 -
_NCL> ADDRESS PREFIX 49::00-01

NCL> SET ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area01 COST 20, -
_NCL> TYPE INBOUND

NCL> ENABLE ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area01


NCL> CREATE ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area02 -
_NCL> ADDRESS PREFIX 49::00-02

NCL> SET ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area02 COST 20, -
_NCL> TYPE INBOUND

NCL> ENABLE ROUTING CIRCUIT salt REACHABLE ADDRESS rtg$area02
```

Figure 8–1 Interphase Links



8.9.4 CSMA/CD End Systems that Do Not Support Automatic Configuration

You can configure a CSMA/CD routing circuit to communicate with end systems that are ISO 8473 compliant, but do not support automatic configuration as defined by ISO 9542.

There are two methods of doing this, depending on whether or not the DEC WANrouter is in the same area as the end system.

Connecting to End Systems in the Same Area as the DEC WANrouter

In this case, you create an ADJACENCY entity for each end system with which you want to communicate. Specify the address and system-ID(s) of the LAN end system with which you want to communicate:

```
NCL> CREATE ROUTING CIRCUIT circuit-name ADJACENCY adjacency-name -
_NCL> LAN ADDRESS LAN-address, ENDNODE IDS {system-IDs}
```

where:

adjacency-name	is a name to identify the ADJACENCY entity.
system-IDs	are explained in Section 8.2.
LAN-address	is the LAN hardware address for the end system.

Example

The NSAP of the DEC WANrouter is 37:1234:00-02:08-00-2B-65-43-21:00. The following command creates an adjacency to NODE_A, which has a LAN address of AA-00-04-00-01-08, and a system ID of 08-00-2B-12-34-56:

```
NCL> CREATE ROUTING CIRCUIT lan_circuit ADJACENCY node_a -
_NCL> LAN ADDRESS AA-00-04-00-01-08, ENDNODE IDS {08-00-2B-12-34-56}
```

The NSAP of the adjacency would be 37:1234:00-02:08-00-2B-12-34-56:00.

Connecting to End Systems in a Different Area from the DEC WANrouter

In this case, you must create a reachable address for the end system on the DEC WANrouter, by completing the following steps:

Step	Action
1	Create a reachable address for each end system to be reached by this circuit. Specify an address prefix for each reachable address. `NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> REACHABLE ADDRESS` *`reachable-address`* `ADDRESS PREFIX` *`prefix`* where *reachable-address* is a name to identify the reachable address, and *prefix* is the full NSAP address of the end system.
2	Specify the LAN address to be used to connect with an address specified by the address prefix of the reachable address: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `_NCL> REACHABLE ADDRESS` *`reachable-address`* `LAN ADDRESS` *`XX-XX-XX-XX-XX-XX`*
3	Enable the reachable address: `NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> REACHABLE ADDRESS` *`reachable-address`*

9
IP Routing

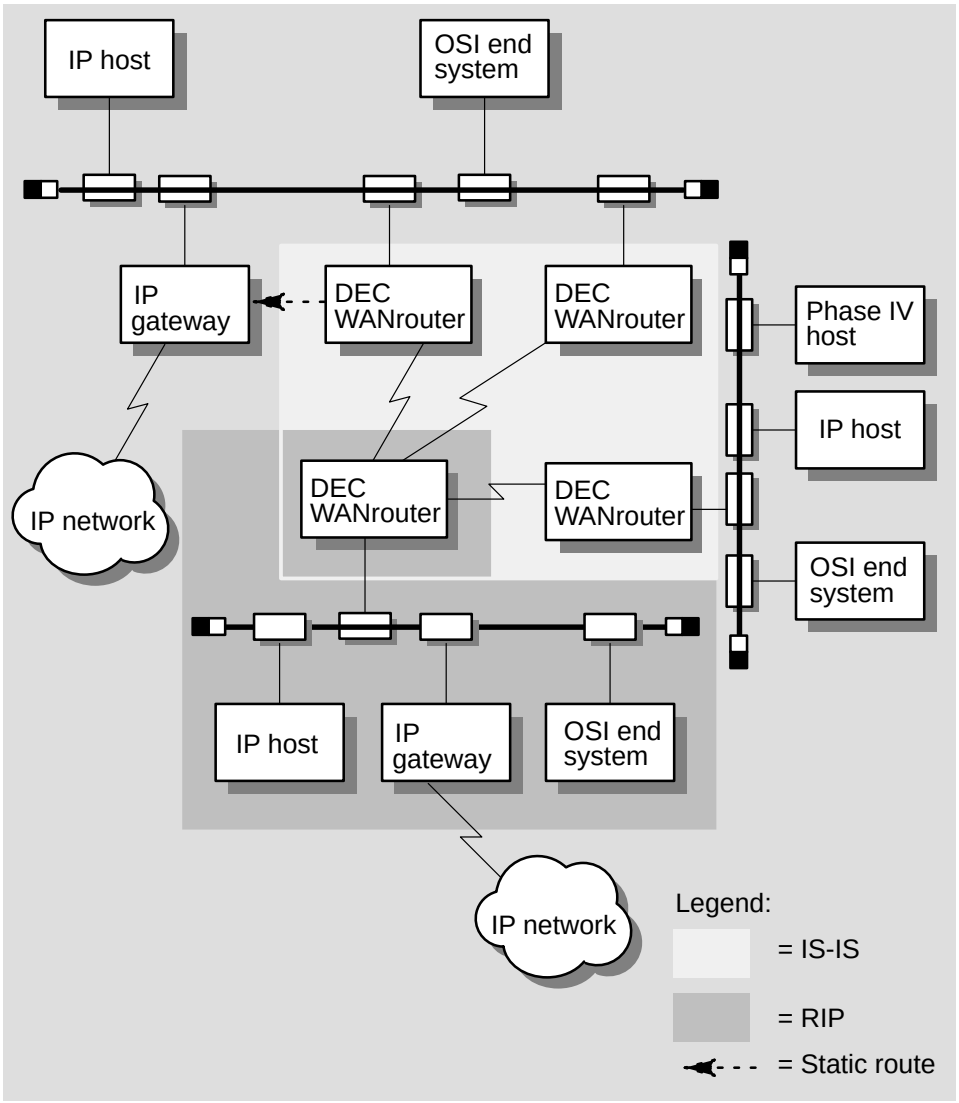
9.1 Overview

The following table lists the contents of this chapter:

For information on...	See Section...
Protocols supported by DEC WANrouter	9.2
Using RIP in an IP network	9.3
Using the IS–IS Protocol in a combined DECnet and IP network	9.4
Creating static routes	9.5
Creating a RIP and IS–IS routing environment	9.6
Creating default routes	9.7
Controlling propagation of RIP and EGP routes	9.8
Abbreviating IP routes	9.9
Creating an EGP routing environment	9.10
Enabling broadcast to all subnets	9.11
Connecting different subnets on a local area network	9.12
Using SNMP monitoring	9.13

Figure 9–1 illustrates an example configuration, which is used as a basis for other examples in this chapter.

Figure 9–1 Example IP Configuration



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9.2 Protocols Supported by the DEC WANrouter

The DEC WANrouter supports the following IP routing protocols:

- Interior Gateway Protocols:
  - RIP
  - Integrated IS-IS
- Exterior Gateway Protocol:
  - EGP

Generally, routers within an autonomous system use an interior gateway protocol. An autonomous system is a group of IP networks and routers controlled by a single administrative authority. An exterior gateway protocol is used to link autonomous systems.

9.3 Using RIP in an IP Network

To set up RIP on your DEC WANrouter, complete the steps in Table 9–1.

Table 9–1 IP Routing: Setting Up RIP

Step	Action
1	Disable the routing circuit on which the RIP interface is set up: `NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`*
2	The next step depends on the type of circuit you are using:

If the routing circuit is...	Then...

A CSMA-CD circuit	Set up a subnet address:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `SUBNET ADDRESS -`
	`_NCL> {ADDRESS=`*`address`*`, MASK=`*`address`*`}`

A point-to-point circuit	Set up circuit addressing in one of the following ways (A or B):
	A. Assign a subnet address to the point-to-point circuit (the remote system must be in the same subnet):
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> SUBNET ADDRESS {ADDRESS=`*`address`*`, MASK=`*`mask`*`}`
	NOTE, when assigning subnet addresses to circuits you must ensure that the address is unique.
	B. Set a Neighbor IP Address. This is the address of the system at the other end of the circuit. Enter the following command:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> NEIGHBOR IP ADDRESS=`*`address`*
	Note, do not set up both a subnet address and a Neighbor IP Address on the same circuit.

3	Specify the cost of the RIP routes announced over all RIP interfaces: `NCL> SET ROUTING RIP SEND LOCAL METRIC` *`metric`* The default value for *metric* is 1.

(continued on next page)

Table 9–1 (Cont.) IP Routing: Setting Up RIP

Step	Action
4	Specify whether RIP messages for the circuit are to be sent or received or both. Enter the following command: `NCL> SET ROUTING CIRCUIT` *circuit-name* `RIP STATE` *state* where *state* is one of the following: • SEND AND RECEIVE • SEND ONLY • RECEIVE ONLY
5	Specify whether RIP is to use poisoned reverse. By default, the DEC WANrouter operates RIP poisoned reverse. This means that RIP routes received by the DEC WANrouter are advertised back to the subnet from which they were received as "unreachable". If you do not want RIP to use poisoned reverse, issue the following command: `NCL> SET ROUTING IP ROUTING PROTOCOL RIP POISONED REVERSE FALSE` Note if you configure the DEC WANrouter so that it does not use poisoned reverse, it uses split horizons by default. This means that it does not advertise RIP routes back to the subnet system from which they were received.
6	Specify any IP sinks. By default, RIP messages are broadcast to all systems on a LAN subnet using the subnet broadcast address. You can specify that the DEC WANrouter additionally sends RIP messages to specific systems by specifying them as IP sinks. Enter the IP address of the specific systems in the following command: `NCL>SET ROUTING IP ROUTING PROTOCOL RIP SINKS {`*address*`,...}` where *address* is the IP address of the system to which the DEC WANrouter sends messages.

(continued on next page)

Table 9–1 (Cont.) IP Routing: Setting Up RIP

Step	Action
7	Specify the RIP SEND TYPE: `NCL> SET ROUTING IP ROUTING PROTOCOL RIP SEND TYPE` *mode* where *mode* is one of the following: • BROADCAST In broadcast mode, RIP advertisements are sent over each RIP-enabled circuit to either of the following (depending on the address defined in step 2): • Subnet broadcast address • Neighbor IP address In addition RIP advertisements are sent to any IP hosts specified as IP sinks. • POINT-TO-POINT If you set the RIP SEND TYPE to POINT-TO-POINT, RIP advertisements will be sent only to the IP hosts specified as IP sinks. By default, the RIP SEND TYPE attribute is set to BROADCAST.
8	Specify any IP sources. By default, the DEC WANrouter accepts RIP advertisements from any RIP router. You can specify that only RIP advertisements from specific routers will be accepted. You must set the specific routers as IP sources by entering the following command: `NCL> SET ROUTING IP ROUTING PROTOCOL RIP SOURCES {`*address*`,...}` where *address* is the IP address of the router from which advertisements will be received. Note that if you specify any IP sources as described above, the DEC WANrouter will only accept RIP advertisements from those sources. For example, if you have set up RIP sources, and the DEC WANrouter has point-to-point RIP circuits, it will not accept RIP advertisements from the remote systems on these circuits unless you have included their IP addresses in the set of IP sources.
9	Enable the routing circuit: `NCL> ENABLE ROUTING CIRCUIT` *circuit-name*

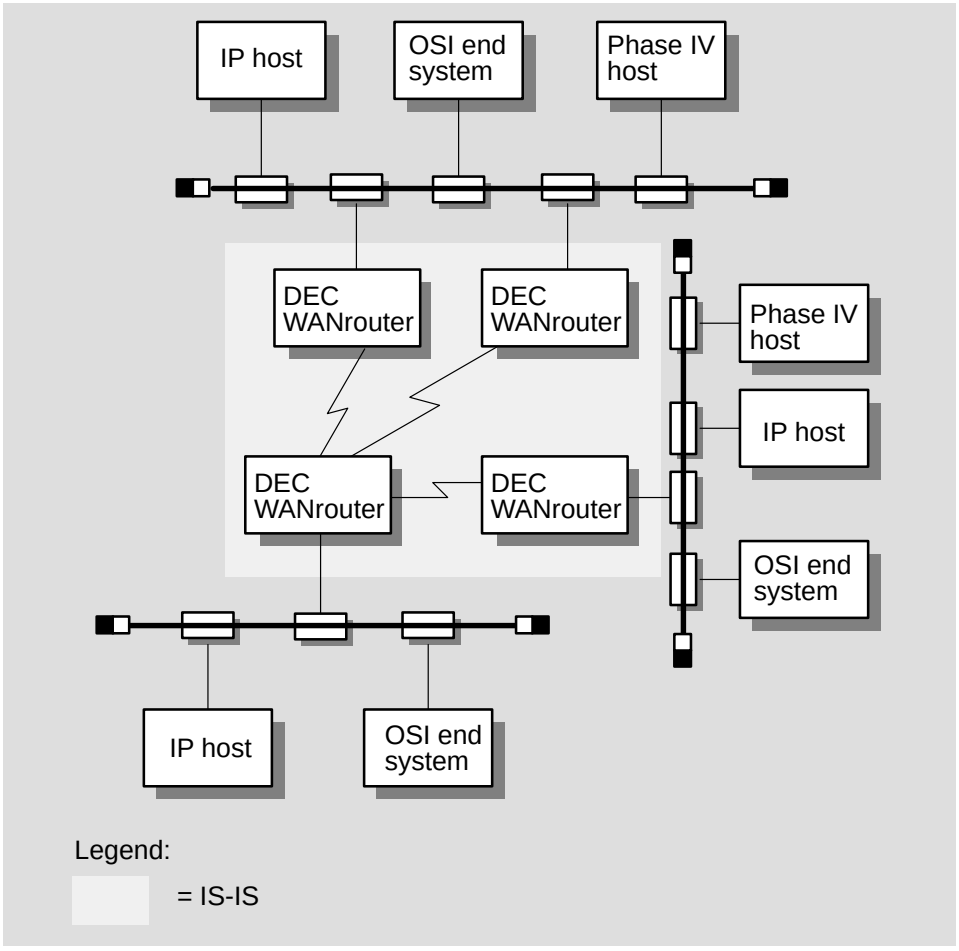
Example

```
NCL> DISABLE ROUTING CIRCUIT circuit-name
NCL> SET ROUTING SEND LOCAL METRIC 3
NCL> SET ROUTING CIRCUIT circuit-name SUBNET ADDRESS -
_NCL> {ADDRESS=22.34.2.1, MASK=255.0.0.0}
NCL> SET ROUTING CIRCUIT circuit-name RIP STATE SEND AND RECEIVE
NCL> SET ROUTING CIRCUIT circuit-name RIP SOURCES -
_NCL> {22.32.1.1, 22.38.2.1}
NCL> ENABLE ROUTING CIRCUIT circuit-name
```

9.4 Using the IS–IS Protocol in a Combined DECnet and IP Network

Figure 9–2 shows an example configuration with IP routing. In this example, the DEC WANrouters use IS–IS as the interior gateway protocol.

Figure 9–2 Using IS–IS in an IP Configuration



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Restriction: Level 1-Only Routing Circuits

You cannot use the IS–IS protocol on any Level 1-only routing circuit if the ROUTING MANUAL L1 ALGORITHM is ROUTING VECTOR.

Adding IS–IS

To add the IS–IS protocol to exchange IP routing information as shown in Figure 9–2, do the following:

1. Run link state routing (DECnet Phase V) at Level 2 and Level 1.

   A router that runs link state routing at Level 1 and/or Level 2 uses the IS–IS protocol at that level.

2. Assign IP addresses and masks to the interfaces indicated in the diagram.

   For a point-to-point link, do not assign addresses. However, assign IP addresses over all the circuits you expect to carry IP packets because this helps you diagnose problems.

3. If you are using subnets, use the same format of subnet address for all the circuits on all the DEC WANrouters that are attached to the same data link.

9.4.1 General Recommendations

- Set the ROUTING MANUAL IP ADDRESS characteristic of the Routing Module. This is particularly important when point-to-point links are configured using NEIGHBOR IP ADDRESS.

  ```
  NCL> SET ROUTING MANUAL IP ADDRESS address
  ```

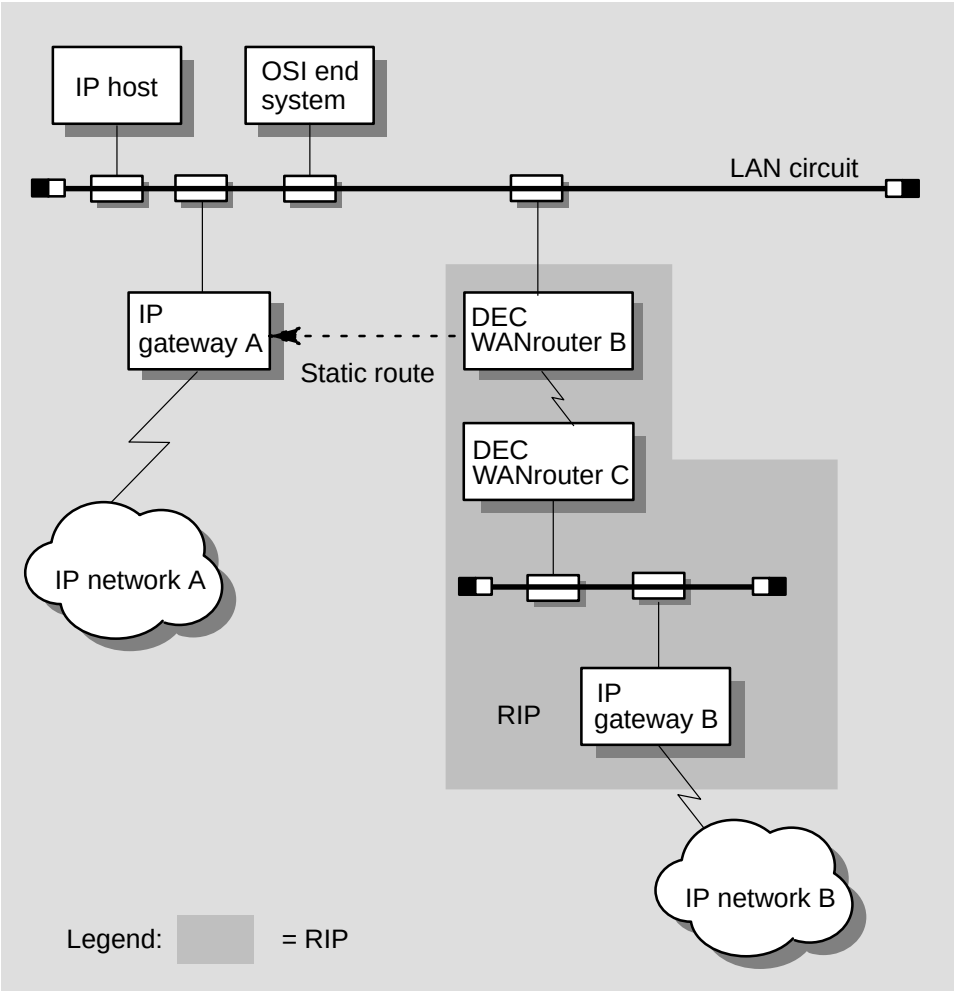
- Set the SUBNET ADDRESS characteristic of the Routing Circuit entity on those circuits that have RIP or EGP enabled.
- Set the NEIGHBOR IP ADDRESS on point-to-point links when using integrated IS-IS because it conserves the subnet address space.

It is required that only subnet addresses with mask 255.255.255.255 are allowed on X.25 dynamically assigned (DA) circuits. Note, however, that you can assign IP reachable addresses with any mask.

9.5 Creating Static Routes

A static route enables the DEC WANrouter to send data to an IP router with which it does not exchange routing information. It is defined by IP reachable addresses. Figure 9–3 shows an example configuration.

Figure 9–3 Setting Up a Static Route



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In the configuration shown in Figure 9–3, DEC WANrouter B runs RIP but IP gateway A does not. Therefore, if hosts or routers in IP network B want to send packets to IP network A, the DEC WANrouter must be informed explicitly about IP gateway A. This is done by setting up an IP reachable address on DEC WANrouter B.

Note that if you want to send packets from IP network A to IP network B, you must also set up a static route on IP gateway A. Refer to the documentation for IP gateway A for details of how to do this.

In this example, IP gateway A can be any IP router that supports TCP/IP.

Procedure

To set up the static route between DEC WANrouter B and IP gateway A, complete the following steps:

Step	Action
1	Create an IP reachable address entity on the LAN circuit on DEC WANrouter B.
2	Identify the IP address of the gateway through which you reach network A (in this case, IP gateway A). This address must be the IP address of IP gateway A's interface to the LAN circuit.
3	Identify the address of IP network A.

Example

Figure 9–4 shows an example configuration where:

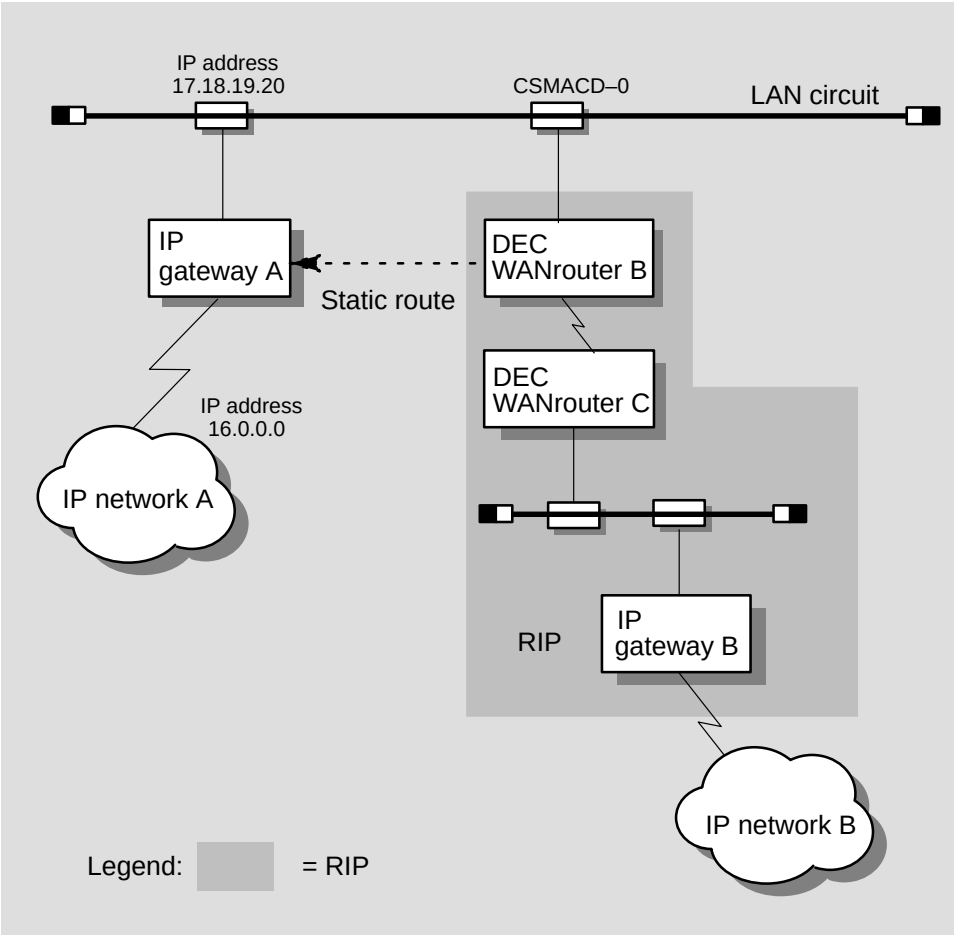
- IP gateway A has IP address 17.18.19.20 on the LAN circuit
- IP network A has network address 16.0.0.0 with a mask of 255.0.0.0
- LAN circuit on DEC WANrouter B is CSMACD-0

To set up a static route between DEC WANrouter B and IP network A, you issue the following NCL commands:

```
NCL> CREATE ROUTING CIRCUIT CSMACD-0 IP REACHABLE ADDRESS NETWORK-A -
_NCL> DESTINATION (ADDRESS=16.0.0.0, MASK=255.0.0.0)
NCL> SET ROUTING CIRCUIT CSMACD-0 IP REACHABLE ADDRESS NETWORK-A -
_NCL> NEXT HOP 17.18.19.20
NCL> ENABLE ROUTING CIRCUIT CSMACD-0 IP REACHABLE ADDRESS NETWORK-A
```

Note that in this example, the static route also enables IP network B to reach IP network A through DEC WANrouter B.

Figure 9–4 Example: Static Route



Static Routes and DEC WANrouters in Different OSI Routing Domains

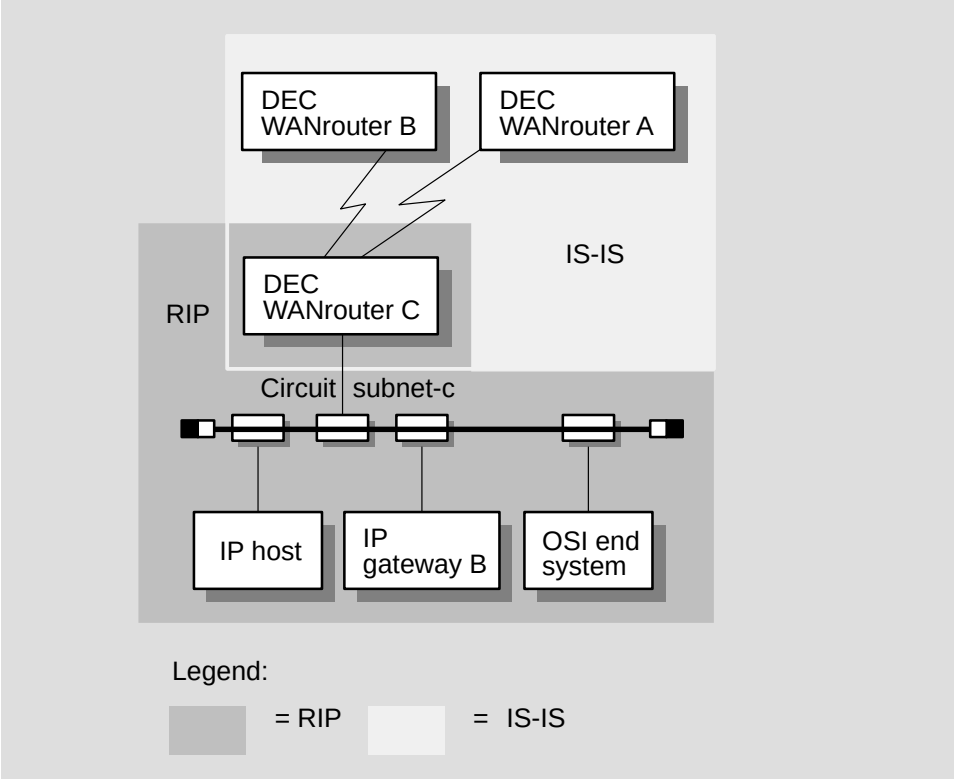
You can also use a static route between two DEC WANrouters in different OSI routing domains.

9.6 Creating a RIP and IS–IS Routing Environment

Figure 9–5 shows an example configuration where:

- DEC WANrouter A, DEC WANrouter B, and DEC WANrouter C are using the IS–IS protocol
- DEC WANrouter C is set up with RIP support on circuit subnet-c to exchange dynamic IP routing information with IP gateway B

Figure 9–5 Setting up a DEC WANrouter with RIP Support



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Procedure

To configure DEC WANrouter C to communicate between the IS–IS and RIP environments, complete the following steps:

Step	Action
1	Configure DEC WANrouter C to run IS–IS on the circuit connecting to the IS–IS environment.

2	Configure the DEC WANrouter to run RIP on circuit subnet-c. Use either of the following methods:
	• Run the Configurator. See the *DEC WANrouter 90/250 User's Guide*.
	• Edit the user NCL script file for SET commands to include the following commands:
	`NCL> SET ROUTING CIRCUIT SUBNET-C SUBNET ADDRESS -`
	`_NCL> {ADDRESS=`*`subnet-address`*`, MASK = `*`mask`*`}`
	`NCL> SET ROUTING CIRCUIT SUBNET-C RIP STATE SEND AND RECEIVE`
	`NCL> SET ROUTING ROUTE PROPAGATION {ISIS TO RIP, RIP TO ISIS}`
	Then compile the script file and reload the DEC WANrouter.
	For details of the location of the user NCL script files, see the *DEC WANrouter 90/250 User's Guide*.

9.7 Creating Default Routes

The RIP protocol includes a default route message. DEC WANrouter network management gives you the option of whether or not to:

- Listen to the default route
- Generate a default route

Default for the Default Route

If you do not specify how to use the default route, the default is:

- Listen to the default route
- Do not generate a default route

Do not configure the DEC WANrouter to generate and receive a default route simultaneously.

Creating a Default Route

If you do not expect to hear a default route through either IS–IS or RIP, you can generate one.

Example

In Figure 9–6, DEC WANrouter B:

- Does not propagate IS–IS routes into the RIP domain
- Provides the only path between the RIP routing domain and IP network A

Therefore, DEC WANrouter B can announce the default route in RIP messages sent to IP gateway B. To do this, you issue the following command:

```
NCL> SET ROUTING IP ROUTING PROTOCOL RIP GENERATE DEFAULT ROUTE TRUE
```

Default Metric Value

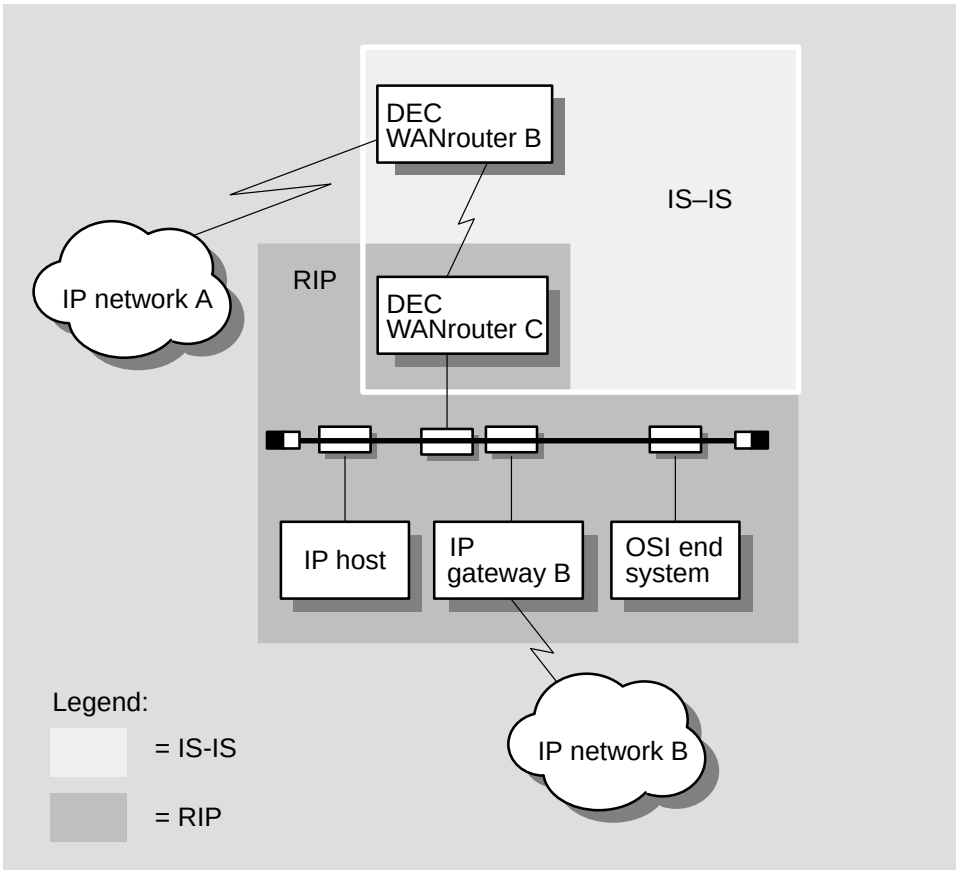
By default, the default route is announced with metric value 1. Change the metric value by setting the value of the routing circuit attribute RIP DEFAULT ROUTE METRIC. For example:

```
NCL> SET ROUTING IP ROUTING PROTOCOL RIP DEFAULT ROUTE METRIC 4
```

Effect of Using a Default Route

When you use a default route you imply that the DEC WANrouter knows about all the nodes in the network. Using a default route ensures that there is not another router advertising a better route.

Figure 9–6 Example RIP Default Route



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9.8 Controlling Propagation of RIP and EGP Routes

The DEC WANrouter allows you to control the metrics that are used to propagate routes between RIP, EGP, and IS–IS domains.

When to Set Up Route Propagation

Set up route propagation before routing is enabled.

9.8.1 Types of Route Propagation

The metrics that the RIP and EGP protocols use are not comparable with the metrics that IS–IS uses. The following table lists the types of route propagation you can set up:

This type of route propagation...	Allows...		Which enables...		See Section...
	Routes in this part of the IP network	To be propagated into:	This portion of the network	To send packets to:	
IS–IS to RIP	IS–IS	RIP	RIP	IS–IS	9.8.2
RIP to IS–IS	RIP	IS–IS	IS–IS	RIP	9.8.2
IS–IS to EGP	IS–IS	EGP	EGP	IS–IS	9.8.3
EGP to IS–IS	EGP	IS–IS	IS–IS	EGP	9.8.3
RIP to EGP	RIP	EGP	EGP	RIP	–
EGP to RIP	EGP	RIP	RIP	EGP	–

9.8.2 Propagating Routes Between RIP and IS–IS

To configure a DEC WANrouter to propagate RIP routes to IS–IS domains, enter the following command:

```
NCL> ADD ROUTING ROUTE PROPAGATION {RIP TO ISIS}
```

9.8.2.1 Routing Costs

Default

By default, the routing cost between a router running RIP and a router running IS–IS, when routes are being propagated from IS–IS into RIP, is the cost of the RIP part of the path plus a fixed value. However, this could give a value for the path cost that does not reflect the network configuration.

Changing the Routing Cost

To alter the fixed value that is added to the RIP path cost, adjust the RIP SEND REPLACEMENT METRIC characteristic of the ROUTING entity.

Taking Account of the IS–IS Portion of the Path

Force the DEC WANrouter to take account of the IS–IS portion of the path by changing the RIP METRIC CLASS characteristic of the ROUTING entity from EXTERNAL to INTERNAL.

Enter the following NCL command to set the RIP METRIC CLASS to INTERNAL:

```
NCL> SET ROUTING RIP METRIC CLASS INTERNAL
```

9.8.3 Propagating Routes Between EGP and IS–IS

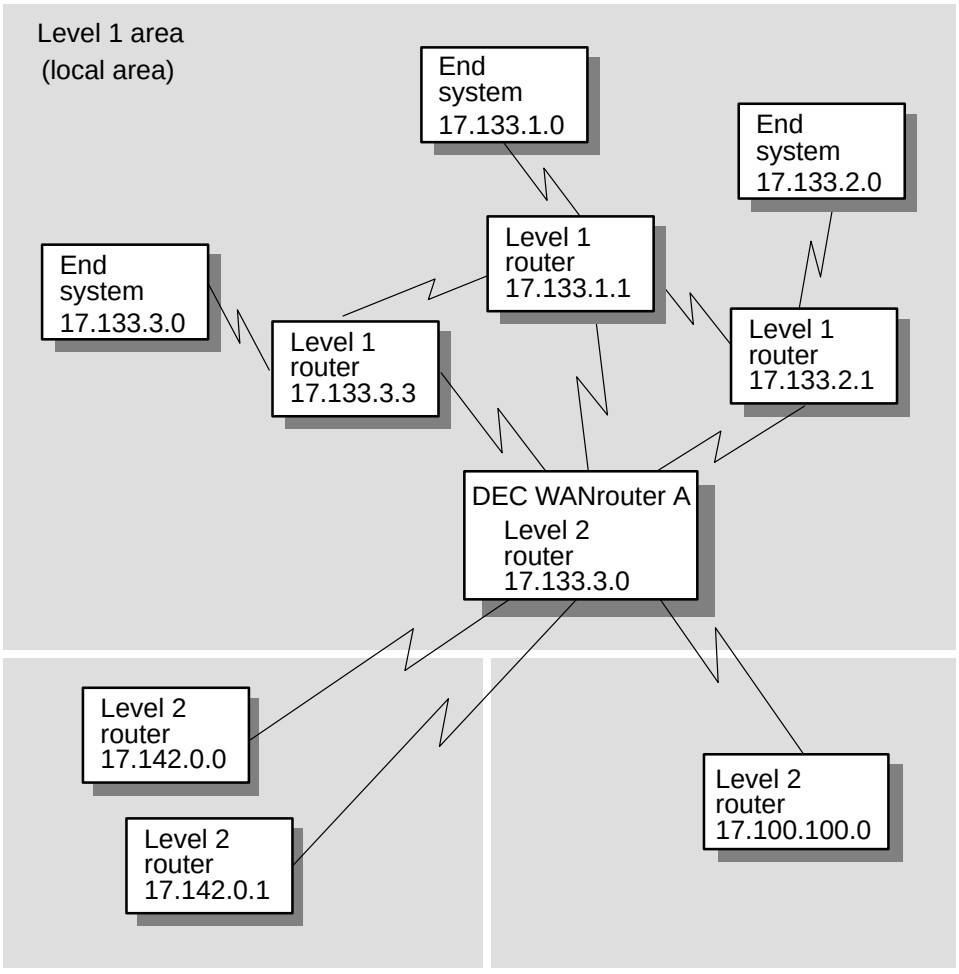
To configure a router to propagate EGP routes into an IS–IS domain and IS–IS routes to an EGP domain, set the ROUTE PROPAGATION characteristic on each router as follows:

```
NCL> ADD ROUTING ROUTE PROPAGATION {EGP TO ISIS, ISIS TO EGP}
```

9.9 Abbreviating IP Routes

By default, Level 1 IP routing information is propagated throughout the routing domain. However, you can abbreviate the Level 1 routing information into fewer, more general, routes. To do this, configure each Level 2 router with one or more summary addresses, each corresponding to IP addresses in the router's area (as shown in Figure 9–7).

Figure 9–7 Using Abbreviated Routes



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In Figure 9–7, the OSI and IP networks have been configured so that all the subnets of the form 17.133 are in one Level 1 area. Abbreviate the routing information that WANrouter A needs by issuing the following command:

```
NCL> ADD ROUTING SUMMARY ADDRESS -
_NCL> [SUBNET= [ADDRESS =17.133.0.0, MASK = 255.255.0.0], METRIC=5]
```

where METRIC is the metric advertised with the route at Level 2.

9.10 Creating an EGP Routing Environment

The EGP protocol is used to allow autonomous systems to communicate. To set up a DEC WANrouter to communicate with an autonomous system using EGP, complete the following steps:

Step	Action
1	Configure the DEC WANrouter as a Level 2 router to run EGP.
2	Assign an IP address and subnet mask to the EGP interface.
3	Create the EGP GROUP entity for the autonomous system: `NCL> CREATE ROUTING EGP GROUP` *group-name*
4	Specify the autonomous system number for the autonomous system: `NCL> SET ROUTING EGP GROUP` *group-name* `AUTONOMOUS SYSTEM NUMBER` *n*
5	Enable the EGP GROUP entity: `NCL> ENABLE ROUTING EGP GROUP` *group-name*
6	Create an EGP NEIGHBOR entity for each router in the autonomous system with which the router can communicate: `NCL> CREATE ROUTING EGP GROUP` *group-name* `EGP NEIGHBOR` *node-name* `-` `_NCL> IP ADDRESS` *ip-address*
7	Enable the EGP NEIGHBOR entity: `NCL> ENABLE ROUTING EGP GROUP` *group-name* `EGP NEIGHBOR` *node-name*

9.11 Enabling Broadcast to All Subnets

By default, if an IP interface on the DEC WANrouter receives an IP packet addressed to all the subnets in its IP network, it forwards them using rules defined by the Router Requirement Internet draft.

However, you can configure an interface on the DEC WANrouter to forward these broadcast packets by using rules defined by RFC 922. Digital recommends not using RFC 922–style forwarding unless it is needed because it can generate broadcast storms in a topology containing loops.

To enable a circuit, enter the command:

```
NCL> SET ROUTING CIRCUIT circuit-name ALL SUBNETS BROADCAST RFC922
```

To disable a circuit, enter the command:

```
NCL> SET ROUTING CIRCUIT circuit-name ALL SUBNETS BROADCAST OFF
```

9.12 Connecting Different Subnets on a Local Area Network

Normally ARP messages are sent between systems that are in the same subnet. If there are two or more subnets on the same LAN, the DEC WANrouter can be configured to route messages between them using alternative subnet addresses as follows:

```
NCL> ADD ROUTING CIRCUIT circuit-name ALTERNATIVE SUBNET ADDRESSES -
_NCL> {ADDRESS=subnet-address, MASK = subnet-mask}
```

Enter this command before enabling the ROUTING CIRCUIT entity.

9.13 Using SNMP Monitoring

The DEC WANrouter supports SNMP (Simple Network Management Protocol) to monitor its IP variables. To configure SNMP-displayed system attributes, add the following lines to the user NCL script for SET commands:

```
SET ROUTING IP MANAGEMENT CONTACT "contact"
SET ROUTING IP MANAGEMENT LOCATION "location"
SET ROUTING IP MANAGEMENT INTERNET DOMAIN NAME "domain-name"
```

Note that you must include the quotation marks ("").

The DEC WANrouter will accept these SET commands only if they are included in an NCL script file; the DEC WANrouter does not accept these commands if they are entered at the NCL prompt.

To set the community name, refer to Section 4.3.

For more information about user NCL script files, refer to the *DEC WANrouter 90/250 User's Guide*.

10

IPX Routing

10.1 Overview

This chapter describes how to use the DEC WANrouter for NetWare IPX routing. The following table lists the contents of this chapter:

For information on...	See Section...
Types of routing circuits	10.2
Setting up NetWare IPX routing on an existing LAN routing circuit	10.3
Tunnel circuits	10.4

10.2 Methods of Using the DEC WANrouter as a NetWare IPX Router

There are two methods of using the DEC WANrouter as a NetWare IPX router. The following table lists them:

Method	See Section...
Native IPX routing on CSMA/CD circuits. These circuits route IPX packets to and from IPX end nodes.	10.3
Tunnel circuits which encapsulate IPX packets in Internet Protocol (IP) packets. Tunnel circuits can use synchronous lines, as well as CSMA/CD circuits.	10.4

10.3 Setting Up NetWare IPX Routing on an Existing LAN Routing Circuit

This section describes how to set up NetWare IPX routing on a CSMA/CD routing circuit.

For instructions on...	See Section...
Configuring a LAN routing circuit to use NetWare IPX	10.3.1
Specifying frame types	10.3.2
Specifying the periodic routing protocol timer	10.3.3
Turning NetBIOS™ broadcast On and Off	10.3.4

10.3.1 Configuring a LAN Routing Circuit to Use NetWare IPX

To configure a LAN routing circuit to use NetWare IPX routing, complete the following steps:

Step	Action

1	Ensure that a NETWORK PROTOCOL entity of type NETWARE IPX exists:
	`NCL> CREATE ROUTING NETWORK PROTOCOL NETWARE IPX`
	`NCL> ENABLE ROUTING NETWORK PROTOCOL NETWARE IPX`
	You only need to do this once, irrespective of the number of routing circuits on the DEC WANrouter that will use IPX routing.

2	Create a NETWORK PROTOCOL of type NETWARE IPX for the LAN routing circuit on which you want to use IPX routing:
	`NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX`

3	Specify the NetWare address for this routing circuit:
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX -`
	`_NCL> NETWARE NETWORK NUMBER %X`*`n`*
	where *n* is a unique NetWare network number, which identifies a NetWare LAN. This number is assigned by the Novell® administrator by selecting an unused hexadecimal number between 1 and FFFFFFFF with a maximum length of 8 digits.

4	Enable the NETWORK PROTOCOL entity for the circuit:
	`NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX`

10.3.2 Specifying Frame Types

You must specify the frame type to be used by IPX on the LAN circuit.

Set the type of frame for IPX routing on a routing circuit as follows:

```
NCL> DISABLE ROUTING CIRCUIT circuit-name -
_NCL> NETWORK PROTOCOL NETWARE IPX
```

```
NCL> SET ROUTING CIRCUIT circuit-name -
_NCL> NETWORK PROTOCOL NETWARE IPX -
_NCL> NETWARE DATA LINK ENCAPSULATION type
```

```
NCL> ENABLE ROUTING CIRCUIT circuit-name -
_NCL> NETWORK PROTOCOL NETWARE IPX
```

Table 10–1 describes what frame type to use when using NetWare circuits on the DEC WANrouter.

Table 10–1 Frame Types

Digital Term	Novell Term	When to Use
Ethernet	Ethernet II	DECnet, TCP/IP LAN, other LANs using Ethernet
802.2	Ethernet 802.2	LANs using the IEEE 802.2 standard
SNAP	Ethernet SNAP	LANs using the IEEE 802.2 SNAP extension
Novell	Ethernet 802.3	Networks using only NetWare

You can use all frame types on CSMA/CD connections.

10.3.3 Specifying the Periodic Routing Protocol Timer

This is the number of seconds between periodic RIP and SAP updates on a circuit. The value is used by the DEC WANrouter to determine how often the DEC WANrouter should send NetWare RIP and SAP routing information updates on the circuit.

The value of this timer is a decimal number in the range 60–65535 seconds. Values are set in multiples of 60 seconds: the value you enter will be raised to the next multiple. For example, if you enter a value of 165, the timer will be given a value of 180 seconds. To disable regular updates, enter a value of 65535 and updates will only be sent if the routing information has changed.

The value used for this timer is also used for ageing routers known by the circuit. Routers are aged (removed from the routing table for the circuit) if information about them is not broadcast within a time limit of 3 times the value of the interval.

Procedure

Change the value of the periodic routing protocol timer by issuing the following commands:

```
NCL> DISABLE ROUTING CIRCUIT circuit-name -
_NCL> NETWORK PROTOCOL NETWARE IPX

NCL> SET ROUTING CIRCUIT circuit-name -
_NCL> NETWORK PROTOCOL NETWARE IPX -
_NCL> PERIODIC ROUTING PROTOCOL TIMER n

NCL> ENABLE ROUTING CIRCUIT circuit-name NETWORK-
_NCL> PROTOCOL NETWARE IPX
```

10.3.4 Turning NetBIOS Broadcast On and Off

NetBIOS is a separate protocol used by the IBM® Token Ring/PC Network Interconnect Program to transmit messages between stations in a Token Ring network. NetBIOS runs over NetWare IPX circuits. If used, NetBIOS broadcast packets are sent as type 20 NetWare IPX packets which are forwarded on all circuits except for the circuit on which they originated.

Procedure

Issue the following commands to turn NetBIOS broadcast on or off:

```
NCL> DISABLE ROUTING CIRCUIT circuit-name -
_NCL> NETWORK PROTOCOL NETWARE IPX
```

```
NCL> SET ROUTING CIRCUIT circuit-name -
_NCL> NETWORK PROTOCOL NETWARE IPX -
_NCL> NETWARE NETBIOS BROADCAST mode
```

```
NCL> ENABLE ROUTING CIRCUIT circuit-name NETWORK -
_NCL> PROTOCOL NETWARE IPX
```

where *mode* is ON or OFF.

10.4 Tunnel Circuits

10.4.1 Overview

The DEC WANrouter uses tunnel circuits to encapsulate NetWare IPX packets in IP packets and route them to one or more destination IP addresses. You can use tunnel circuits on the DEC WANrouter to:

- Forward PC LAN packets over its synchronous lines
- Forward a particular type of PC LAN packet to a router that does not support that PC LAN protocol

Tunnel circuits are virtual circuits. This means that a tunnel circuit is not associated with a physical line, but only with a destination IP address, or addresses. On the DEC WANrouter, tunneling for NetWare IPX packets is implemented according to RFC 1234.

Maximum Number of Tunnel Circuits

The maximum number of tunnel circuits on a DEC WANrouter is 8.

Destination Address for Tunnel Circuits

The destination IP address associated with a tunnel circuit is the system IP address of the remote router.

Source Address for Tunnel Circuits

The source address used in IP packets sent on tunnel circuits is always the system IP address (also known as the manual IP address) for the DEC WANrouter. You supply the system IP address either during load-host configuration (for BOOTP load hosts) or in the Routing section of the WANrouter configurator (for MOP-only load hosts).

Types of Tunnel Circuit

There are two types of tunnel circuit. The following table lists them:

Circuit Type	Description	See Section...
Point-to-point	A point-to-point tunnel circuit has one destination IP address.	10.4.2
Broadcast	A broadcast tunnel circuit can have up to five destination IP addresses.	10.4.3

10.4.2 Setting Up a Point-to-Point Tunnel Circuit for NetWare IPX Routing

To set up a point-to-point tunnel circuit, complete the following steps:

Step	Action

1	Create a tunnel circuit by issuing the following command:
	`NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> TYPE = VIRTUAL POINT TO POINT`

2	Set the destination IP address for the tunnel circuit: `NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-` `_NCL> ENCAPSULATION DESTINATION IP ADDRESS` *`a.b.c.d`*

3	Create a NETWORK PROTOCOL entity of type NETWARE IPX, and set a NetWare IPX address:
	`NCL> CREATE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX`
	`NCL> SET ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX -`
	`_NCL> NETWARE NETWORK NUMBER %X`*`n`*
	where *n* is a unique NetWare network number assigned by the Novell administrator to identify a NetWare LAN.

4	Enable the routing circuit and the NETWORK PROTOCOL entity:
	`NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`*
	`NCL> ENABLE ROUTING CIRCUIT` *`circuit-name`* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX`

10.4.3 Setting Up a Broadcast Tunnel Circuit for NetWare IPX Routing

To set up a broadcast tunnel circuit, complete the following steps:

Step	Action

1	Create a tunnel circuit by issuing the following command:
	`NCL> CREATE ROUTING CIRCUIT` *circuit-name* `-`
	`_NCL> TYPE = VIRTUAL BROADCAST`

2	Create a NETWORK PROTOCOL entity of type NETWARE IPX:
	`NCL> CREATE ROUTING CIRCUIT` *circuit-name* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX`

3	Set the NetWare address of the circuit:
	`NCL> SET ROUTING CIRCUIT` *circuit-name* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX -`
	`_NCL> NETWARE NETWORK NUMBER %X`*n*
	where *n* is a unique NetWare network number, which identifies a NetWare LAN. This number is assigned by the Novell administrator by selecting an unused hexadecimal number between 1 and FFFFFFFF with a maximum length of 8 digits.

4	For each remote IP address for this circuit, create an adjacency and specify its IP address:
	`NCL> CREATE ROUTING CIRCUIT` *circuit-name* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX ADJACENCY` *adjacency-name*
	`NCL> SET ROUTING CIRCUIT` *circuit-name* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX ADJACENCY` *adjacency-name* `-`
	`_NCL> ENCAPSULATION IP ADDRESS` *a.b.c.d*

5	Enable the routing circuit, the NETWORK PROTOCOL entity, and the adjacencies:
	`NCL> ENABLE ROUTING CIRCUIT` *circuit-name*
	`NCL> ENABLE ROUTING CIRCUIT` *circuit-name* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX`
	`NCL> ENABLE ROUTING CIRCUIT` *circuit-name* `-`
	`_NCL> NETWORK PROTOCOL NETWARE IPX ADJACENCY` *adjacency-name*

Part III

Managing X.25

This part contains information on managing the X.25 software on your system. The following table lists the information in Part III:

For information on how to...	See Chapter...
Set up and manage DTEs, and use X.25 features of the DEC WANrouter	11

11

X.25 Connections

11.1 Overview

The following table lists the contents of this chapter:

For information on ...	See Section...
Creating DTEs	11.2
Modifying DTEs	11.3
Deleting DTEs	11.4
Monitoring DTEs	11.5
DTE classes	11.6
DTE groups	11.7

For information about X.25 templates and X.25 filters, see Section 6.3.

11.1.1 NCL Commands

Assumption

All tasks performed using NCL commands assume that you have already:

- Logged on to a suitable host system on the network and started NCL
- Set default to the DEC WANrouter as follows:

  ```
  NCL> SET NCL DEFAULT ENTITY NODE wanrouter
  ```

Disabling Routing Circuits

For any tasks that require you to disable a routing circuit, ensure that you do not disable the routing circuit that you are using to manage the DEC WANrouter, unless there is an alternative route between the host on which you issue the NCL commands and the DEC WANrouter.

Restrictions for Enabling/Disabling Entities

You can disable various network management entities independently, but the DEC WANrouter 90/250 V1.3 software assumes a sequence for the Modem Connect, data link, X25 PROTOCOL DTE, and Routing Circuit entities.

If you use NCL to bring DTEs up and down, you must follow the correct sequence for the ENABLE and DISABLE commands:

- When enabling, you must go bottom up. This means Modem Connect first, followed by data link, LAPB LINK/LOGICAL STATION, and finally the X25 PROTOCOL DTE.
- When disabling, you must go top down. This means X25 PROTOCOL DTE first, then LAPB LINK/LOGICAL STATION, and finally Modem Connect.

11.2 Creating X.25 DTEs

In order to set up X.25 routing circuits on a line, you must create a DTE on that line.

Restrictions

When creating the first DTE on the DEC WANrouter, you **must** create the DTE in your permanent configuration, as described in Section 11.2.1. You cannot create the first DTE on a running DEC WANrouter.

Note that you must create a DTE in the permanent configuration for each X.25 network profile that you will use.

11.2.1 Creating the First DTE

To create the first DTE on a DEC WANrouter, complete the following steps:

Step	Action
1	Do either of the following: • Create a DTE in the Lines section of the DEC WANrouter configurator. • Enter the NCL commands in Section 11.2.3 in the DEC WANrouter NCL script.
2	If you wish to set up another DTE with a different network profile, repeat step 1.
3	When you have completed your configuration, compile the NCL script, as described in the *DEC WANrouter 90/250 User's Guide.*
4	Load the DEC WANrouter, as described in the *DEC WANrouter 90/250 User's Guide.*

11.2.2 Requirements for Creating a DTE on a Running System

You can only create a DTE on a running DEC WANrouter if both of the following are true:

- You have already created a DTE in the permanent configuration, as described in Section 11.2.1.
- The DTE (or DTEs) created on the running DEC WANrouter will use the same network profile as the one created in the permanent configuration.

11.2.3 Adding a DTE on a Running System

To add a DTE on a running system, complete the following steps:

Step	Action
1	Create and enable a MODEM CONNECT LINE. Follow the procedures in Section 11.2.3.1.
2	Create and enable a LAPB data link. Follow the procedures in Section 11.2.3.2.
3	Create and enable the DTE. Follow the procedures in Section 11.2.3.3.

11.2.3.1 Create and Enable a MODEM CONNECT LINE

To create and enable a MODEM CONNECT LINE, complete the following steps:

Step	Action

1	Ensure that the MODEM CONNECT entity exists and is enabled by entering the following commands:
	`NCL> CREATE MODEM CONNECT`
	`NCL> ENABLE MODEM CONNECT`
	A message will tell you if the MODEM CONNECT entity already exists; otherwise, it will be created.

2	Create a MODEM CONNECT LINE entity for the connection, specify the hardware port on which the connection will exist, and specify the profile to be used for the line. `NCL> CREATE MODEM CONNECT LINE` *`line-name`* `-` `_NCL> COMMUNICATION PORT` *`port-name`*`, PROFILE` *`line-profile`* where *line-profile* is either "NORMAL" or "DATEXP". The profile specifies the default value and permitted range for certain timers on the line. See the NCL online help for details of these timers.
3	Set the MODEM CONTROL characteristic for the line: `NCL> SET MODEM CONNECT LINE` *`line-name`* `MODEM CONTROL` *`control`* where *control* is either FULL or NONE. FULL is the normal setting, and means that the line takes note of the modem control signals. Set it to NONE if the line is to ignore all modem control signals (for example, during loopback testing).
4	Enable the line: `NCL> ENABLE MODEM CONNECT LINE` *`line-name`*

11.2.3.2 Create and Enable a LAPB Data Link

To create and enable a LAPB data link, complete the following steps:

Step	Action
1	Ensure that the LAPB entity exists: `NCL> CREATE LAPB`
2	Create a LAPB data link for the circuit, and specify the profile that the link will use: `NCL> CREATE LAPB LINK` *`link-name`* `PROFILE` *`profile-name`* where: *link-name* is a name identifying the data link. You should make this the same as the communication port name. *profile-name* is the name of the profile to use for this link. This must be the same profile as that specified for the DTE set up in the permanent configuration. The name is determined by the PSDN to which the circuit will connect: the online *Network Information* provides the profile name for each public PSDN that the DEC WANrouter supports.
3	Set the following for the link: • Acknowledge timer • Holdback timer • Window size • Maximum data size For details of these characteristics, see Section B.8.2.
4	Associate the MODEM CONNECT LINE with this data link: `NCL> SET LAPB LINK` *`link-name`* `-` `_NCL> PHYSICAL LINE MODEM CONNECT LINE` *`line-name`*
5	Enable the LAPB data link: `NCL> ENABLE LAPB LINK` *`link-name`*

11.2.3.3 Create and Enable the DTE

To create and Enable the DTE, complete the following steps:

Step	Action
1	To ensure that the X25 PROTOCOL entity exists, enter the following command: `NCL> CREATE X25 PROTOCOL`
2	Create the DTE entity and specify the profile it will use: `NCL> CREATE X25 PROTOCOL DTE` *`DTE-name`* `PROFILE` *`profile-name`* where *profile-name* is the name of the profile that this DTE will use. The name is determined by the PSDN to which the circuit will connect, or the type of point-to-point link. *Network Information* provides the profile name for each public PSDN that the DEC WANrouter supports. The profile you enter here must be the one you entered when you created the LAPB link. Note that you must include the quotation marks around the profile name.
3	Specify that the DTE is to use the LAPB link set up previously: `NCL> SET X25 PROTOCOL DTE` *`DTE-name`* `-` `_NCL> LINK SERVICE PROVIDER LAPB LINK` *`link-name`*
4	Specify the DTE address of this DTE (provided by the PSDN): `NCL> SET X25 PROTOCOL DTE` *`DTE-name`* `X25 ADDRESS` *`DTE-address`* where *DTE-address* is up to 15 decimal digits.
5	Specify the DTE class with which calls received on this DTE will be associated. `NCL> SET X25 PROTOCOL DTE` *`DTE-name`* `INBOUND DTE CLASS` *`DTE-class`* Usually, you should make *DTE-class* the same as the DTE class to which this DTE belongs (see Section 11.6). Note that, if it does not already exist, you must create a DTE class with this name: see Section 11.6.3.

Step	Action
6	Allocate channels for incoming and outgoing calls, according to the PSDN subscription information. **Example** Assume that a PSDN has allocated the following channels for use with this DTE: 1 to 32 both-way 49 to 64 outgoing only 65 to 512 incoming only To allocate channels for incoming and outgoing calls, follow these steps:

Step	Action

1	Specify those channels that are to be used for outgoing calls; include both-way channels:
	`NCL> SET X25 PROTOCOL DTE` *`DTE-name`* `-`
	`_NCL> OUTGOING LIST [[1..32],[49..64]]`

2	Specify those channels that are to be used for incoming calls; again, include both-way channels:
	`NCL> SET X25 PROTOCOL DTE` *`DTE-name`* `-`
	`_NCL> INCOMING LIST [[1..32],[65..512]]`

7	To add the DTE to a DTE class on your system, complete the steps in Section 11.6.4. The DTE class will usually be that specified in step 3.
8	To enable the DTE, enter the following command: `NCL> ENABLE X25 PROTOCOL DTE` *`DTE-name`*

11.3 Modifying DTEs

To modify a DTE, complete the following steps:

Step	Action
1	Disable the DTE
2	Enter the following command: `NCL> SET X25 PROTOCOL DTE` *`dte-name characteristics`*

The NCL online help lists all the characteristics of the DTE entity, and explains how to change them.

Example

To change the name of the LAPB LINK entity used by the DTE, enter the following command:

```
NCL> SET X25 PROTOCOL DTE dte-name -
_NCL> LINK SERVICE PROVIDER LAPB LINK lapb-link-name
```

11.4 Deleting DTEs

Delete a DTE if you want to prevent permanently the DEC WANrouter from communicating with the network through that DTE. Use the DISABLE command if you want to prevent temporarily the DEC WANrouter from communicating with the network through the DTE.

To delete a DTE, complete the following steps:

Step	Action
1	Disable and delete the DTE: `NCL> DISABLE X25 PROTOCOL DTE` *`DTE-name`* `NCL> DELETE X25 PROTOCOL DTE` *`DTE-name`*
2	Remove the name of the DTE from: • Any groups of which it is a member: see Section 11.7.3. • The DTE class of which it is a member: see Section 11.6.4.
3	Delete the DTE class, if it is now empty: See Section 11.6.5.
4	Disable and delete the LAPB link associated with this DTE: `NCL> DISABLE LAPB LINK` *`link-name`* `NCL> DELETE LAPB LINK` *`link-name`*

11.5 Monitoring DTEs

You can use the following commands to check how a DTE is functioning:

- To check the state of a DTE:

  ```
  NCL> SHOW X25 PROTOCOL DTE DTE-name STATE
  ```

  This shows the state of the DTE. See the NCL online help for a description of the states displayed.

- To check how a DTE is being used:

  ```
  NCL> SHOW X25 PROTOCOL DTE DTE-name ALL COUNTERS
  ```

  The counters will increment only when calls are attempted or accepted using this DTE.

  See the NCL online help for a description of the counters displayed.

11.5.1 X.25 Accounting

The X25 ACCESS entity generates an event called PORT TERMINATED. The arguments to this event provide basic accounting information, such as DTE class, call direction, and so on. (See the NCL online help for a full list of the arguments and their meanings.)

This information can be processed by a user-written application to provide X.25 accounting information.

11.6 DTE Classes

11.6.1 Overview

This section describes how to add, modify and delete DTE classes.

For information on...	See Section...
Rules that apply to DTE classes	11.6.2
Adding a DTE class	11.6.3
Modifying a DTE class	11.6.4
Deleting a DTE class	11.6.5

11.6.2 Rules

The following rules apply to DTE classes:

- Each DTE on the DEC WANrouter must be in a DTE class. A DTE class can have several DTEs, and a DTE can be in more than one DTE class.
- All DTEs in a DTE class should be connected to the same X.25 network.
- When a call is received at the DEC WANrouter, it acquires an INBOUND DTE CLASS attribute from the DTE at which it was received. Normally this should be the same as the DTE class to which the DTE belongs.

11.6.3 Adding DTE classes

To add a DTE class, complete the following steps:

Step	Action
1	Ensure that the X25 ACCESS entity exists: `NCL> CREATE X25 ACCESS`
2	Create the DTE class, specifying that it is of type LOCAL: `NCL> CREATE X25 ACCESS DTE CLASS` *`class-name`* `TYPE LOCAL`
3	Add the DTEs that this class is to contain: see Section 11.6.4.

11.6.4 Modifying DTE classes

To change the list of DTEs in a DTE class, complete the following steps:

Step	Action
1	Disable the DTE: `NCL> DISABLE X25 PROTOCOL DTE` *DTE-name*
2	Add a DTE to the DTE class: `NCL> ADD X25 ACCESS DTE CLASS` *class-name* `LOCAL DTES {`*DTE-name*`}`
3	Remove a DTE from a DTE class: `NCL> REMOVE X25 ACCESS DTE CLASS` *class-name* `LOCAL DTES {`*DTE-name*`}` Ensure that you do not remove all the DTEs from a DTE class. If you do, delete that DTE class.
4	Change the INBOUND DTE CLASS attribute of any DTEs that have moved from one DTE class to another: `NCL> SET X25 PROTOCOL DTE` *DTE-name* `-` `_NCL> INBOUND DTE CLASS` *DTE-class*
5	Finally, make the DTE available through the DTE class by reenabling the DTE: `NCL> ENABLE X25 PROTOCOL DTE` *DTE-name*

11.6.5 Deleting DTE Classes

Note that you cannot disable a DTE class. Delete a DTE class if you want to prevent permanently any client systems from using it to make outgoing calls:

Step	Action
1	Disable or delete the DTEs that are members of the DTE class (see Section 11.4), or put them in another DTE class (see Section 11.6.4).
2	Ensure that no enabled DTEs specify the DTE class as their INBOUND DTE CLASS characteristic: `NCL> SHOW X25 PROTOCOL DTE * WITH INBOUND DTE CLASS =` *DTE-class*
3	When the DTE class is empty, or all its member DTEs are disabled, delete the DTE CLASS entity: `NCL> DELETE X25 ACCESS DTE CLASS` *class-name*

11.7 DTE Groups

11.7.1 Overview

This section describes how to add, delete and modify groups of DTEs.

For information on...	See Section...
Adding a group	11.7.2
Modifying a group	11.7.3
Deleting a group	11.7.4

11.7.2 Adding DTE Groups

To add a DTE group, complete the following steps:

Step	Action
1	Create the GROUP entity: `NCL> CREATE X25 PROTOCOL GROUP` *group-name* where *group-name* is a name used by the DEC WANrouter to identify the group.
2	Specify the type of group: `NCL> SET X25 PROTOCOL GROUP` *group-name* `TYPE` *group-type* where *group-type* is either CUG or BCUG:
3	• BCUG indicates a Bilateral Closed User Group, that is, one that has just one local DTE and one remote DTE. • CUG indicates a Closed User Group that can have more than two members.
4	Enter the local DTE(s) that are to be members of this group: see Section 11.7.3.
5	If the group type is BCUG, specify the DTE address of the remote member of the BCUG: `NCL> SET X25 PROTOCOL GROUP` *group-name* `-` `_NCL> REMOTE DTE ADDRESS` *DTE-address* where *DTE-address* is the DTE address of the other member of the BCUG. To use this group in an outbound call, it must be included as a SELECTED GROUP attribute in the X.25 ACCESS template with the following command: `NCL> SET X25 ACCESS TEMPLATE` *template_name* `SELECTED GROUP` *group_name* For more information about templates, see Section 6.3.

11.7.3 Modifying DTE Groups

This section describes how to:

- Add local DTEs to a group
- Remove local DTEs from a group
- Modify a group's type

Note that you do not specify the remote DTEs that are members of the group, the PSDN specifies this information.

Adding and Removing Local DTEs

To add local DTEs to a group, and remove local DTEs from a group: Add local DTE(s) to a group by specifying the name(s) of the DTE(s) to be added, together with the Group Number supplied by the PSDN for this DTE/Group:

```
NCL> ADD X25 PROTOCOL GROUP group-name MEMBERS = -
_NCL> {(DTE=DTE-name_1, INDEX=n1), (DTE=DTE-name_2, INDEX=n2), ...}
```

where:

DTE-name_1, *DTE-name_2*	are the names of the DTEs on the DEC WANrouter.
n1, *n2*	are decimal numbers, supplied by the PSDN, between 1 and 9999.

Removing Local DTEs

Remove local DTE(s) from this group by specifying the name(s) of the DTE(s) to be removed, together with the Group Number supplied by the PSDN for this DTE/Group:

```
NCL> REMOVE X25 PROTOCOL GROUP group-name -
_NCL> MEMBERS = {(DTE=DTE-name_1, INDEX=n1)}
```

Modifying a Group's Type

To modify the type of group, enter the following command:

```
NCL> SET X25 PROTOCOL GROUP group-name TYPE group-type
```

where *type* is either CUG or BCUG.

11.7.4 Deleting DTE Groups

Delete a group if you want to prevent permanently the DEC WANrouter from communicating with the network through that group. Note that you cannot disable groups.

To delete a DTE group, complete the following steps:

Step	Action
1	If the group contains local DTEs that are currently enabled, disable them first: `NCL> DISABLE X25 PROTOCOL DTE` *`DTE-name`*
2	Delete the GROUP entity: `NCL> DELETE X25 PROTOCOL GROUP` *`group-name`*

Part IV

Managing Switched MODEM CONNECT LINE

This part contains information on managing a switched MODEM CONNECT LINE on your system.

The following table lists the information in Part IV:

For information on...	See Chapter...
Managing switched MODEM CONNECT LINE	12

12

Managing Switched MODEM CONNECT LINE

12.1 Overview

The following table lists the contents of this chapter:

For information on managing...	See Section...
Line classes	12.2
Filters	12.3

For information on templates, see Section 6.4.

12.2 Line Classes

12.2.1 Overview

A line class specifies which set of lines may be used to make an outgoing call. A given line may be part of more than one line class. A line class may have several lines.

The following table shows the contents of this section:

For information on how to...	See Section...
Add a line class	12.2.2
Modify a line class	12.2.3
Delete a line class	12.2.4

12.2.2 Adding

To add a line class, complete the following tasks:

Step	Action
1	Ensure that the MODEM CONNECT entity exists: `NCL> CREATE MODEM CONNECT`
2	Create the line class: `NCL> CREATE MODEM CONNECT LINE CLASS` *line-class*

3	Add the lines that the line class is to contain:
	`NCL> SET MODEM CONNECT LINE CLASS` *line-class* `-`
	`_NCL> LINES {`*line-1, line-2...*`}`

12.2.3 Modifying

To change the list of lines in a line class, complete the following steps:

- To add a line to the line class, enter the command:

  `NCL> ADD MODEM CONNECT LINE CLASS` *line-class* `-`
  `_NCL> LINES {`*line-name*`}`

- To remove lines from the line class, complete the following steps:

Step	Action
1	Disable any lines you intend to remove that are currently enabled: `NCL> DISABLE MODEM CONNECT LINE` *line-name*

2	Delete the line(s):
	`NCL> REMOVE MODEM CONNECT LINE CLASS` *line-class* `-`
	`_NCL> LINES {`*line-1*`,...}`

If you remove all the lines from a line class, delete the line class. If you do not intend to delete the line class, ensure that at least one line remains in that line class.

12.2.4 Deleting

Delete a line class to prevent permanently any client application from using it to make outgoing calls. Line classes can be deleted but not disabled.

Note that you cannot delete a line class if it references an enabled line that is used by a Call Control (CC) port.

To delete a line class, complete the following steps:

Step	Action
1	Enter the following command to display any lines that are enabled and referenced by the line class: `NCL> SHOW MODEM CONNECT LINE CLASS` *`line-class`* `USABLE LINES`
2	Check that the displayed line(s) are not referenced by a CC port. Enter the following command for each line: `NCL> SHOW MODEM CONNECT CALL CONTROL PORT * WITH LINE =` *`line-name`* If a line is referenced by a CC port, disable the client (the routing circuit) associated with that CC port: `NCL> SHOW MODEM CONNECT CALL CONTROL PORT` *`port-name`* `CLIENT` `NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`* Disabling the client deletes the associated CC port.
3	Delete the line class as follows: `NCL> DELETE MODEM CONNECT LINE CLASS` *`line-class`*

12.3 Filters

12.3.1 Overview

The following table shows the contents of this section:

For information on how to...	See Section...
Add a filter	12.3.2
Modify a filter	12.3.3
Delete a filter	12.3.4

12.3.2 Adding

To add a filter, complete the following steps:

Step	Action
1	Ensure the MODEM CONNECT entity exists: `NCL> CREATE MODEM CONNECT`
2	Create the FILTER entity: `NCL> CREATE MODEM CONNECT FILTER` *`filter-name`*
3	Specify the line class to be associated with the call when it is received: `NCL> SET MODEM CONNECT FILTER` *`filter-name`* `-` `_NCL> INBOUND LINE CLASS` *`line-class`*

12.3.3 Modifying

You can change the line class specified in a filter. To change the line class, complete the following steps:

Step	Action

1	Ensure there are no active CC ports that reference the filter:
	`NCL> SHOW MODEM CONNECT FILTER` *`filter-name`* `-`
	`_NCL> CALL CONTROL PORTS`
	If an active CC port references the filter, disable the client (the routing circuit) associated with that CC port:
	`NCL> SHOW MODEM CONNECT CALL CONTROL PORT` *`port-name`* `CLIENT`
	`NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`*

2	Set the line class for the filter: `NCL> SET MODEM CONNECT FILTER` *`filter-name`* `-` `_NCL> INBOUND LINE CLASS` *`line-class`*
3	If you disabled the client (the routing circuit) in step 1, re-enable it.

12.3.4 Deleting

Delete a filter if you want to prevent permanently any calls from matching it. A filter can be deleted but not disabled. To delete a filter, complete the following steps:

Step	Action

1	Ensure there are no active CC ports that reference the filter:
	`NCL> SHOW MODEM CONNECT FILTER` *`filter-name`* `-`
	`_NCL> CALL CONTROL PORTS`
	If an active CC port references the filter, disable the client (routing circuit) associated with that CC port:
	`NCL> SHOW MODEM CONNECT CALL CONTROL PORT` *`port-name`* `CLIENT`
	`NCL> DISABLE ROUTING CIRCUIT` *`circuit-name`*
	Disabling the client deletes the active CC port.

1	Delete the filter: `NCL> DELETE MODEM CONNECT FILTER` *`filter-name`*

Part V
Appendixes

The following table lists the contents of this part:

For information on...	See Appendix...
Management modules used by the DEC WANrouter	A
Modules and entities used by the DEC WANrouter, together with the default values of their characteristics	B

A

Management Modules Used by the DEC WANrouter

A.1 Overview

This chapter describes the DECnet/OSI modules used by the DEC WANrouter. Your system may not use all of these modules, depending on your particular configuration.

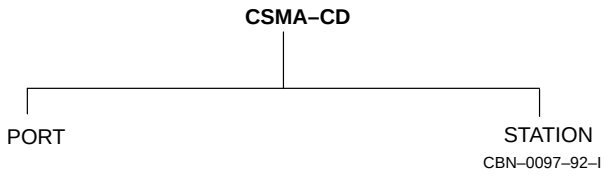
The following table lists the contents of this chapter:

For a description of this module...	See Section...
CSMA-CD	A.2
DDCMP	A.3
DTSS Clerk	A.4
Event Dispatcher	A.5
FRBS	A.6
Hardware	A.7
HDLC	A.8
LAPB	A.9
Modem Connect	A.10
NSP	A.11
PPP	A.12
Routing	A.13
Session Control	A.14
Supervisor	A.15
X25 Access	A.16
X25 Protocol	A.17

A.2 CSMA-CD Module

Carrier Sense, Multiple Access with Collision Detect is the Data Link protocol used by the Ethernet and ISO 8802-3 LANs.

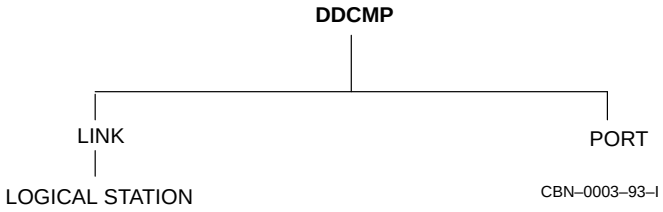
Figure A–1 CSMA-CD Module



A.3 DDCMP Module

The Digital Data Communications Protocol is a Digital proprietary data link protocol. The DDCMP module provides management of this protocol.

Figure A–2 DDCMP Module



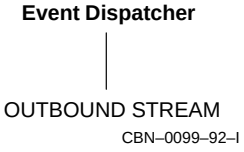
A.4 DTSS Clerk Module

The DTSS Clerk collates and synchronizes the times recorded by DTSS Servers. This module has no entities.

A.5 Event Dispatcher Module

This controls the logging of network events.

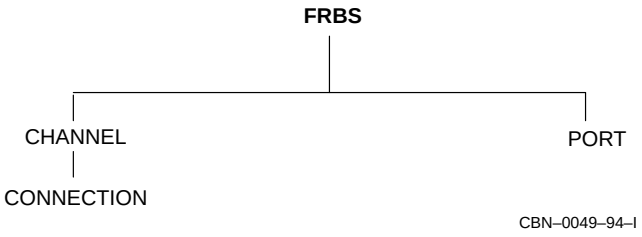
Figure A–3 Event Dispatcher Module



A.6 FRBS Module

The FRBS (Frame Relay Bearer Service) module implements management of the frame relay functions of the DEC WANrouter.

Figure A–4 FRBS Module



A.7 Hardware Module

The Hardware module provides hardware-related management of the DEC WANrouter.

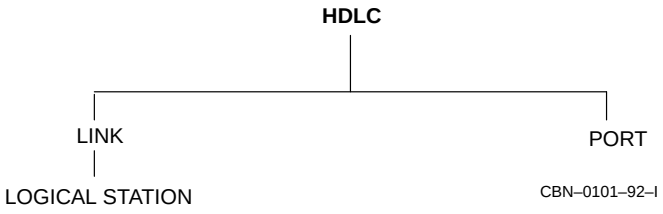
Figure A–5 Hardware Module

CBN–0050–94–I

A.8 HDLC Module

High-level Data Link Control is the preferred protocol for providing error-free communications over low-delay, high-loss, point-to-point links.

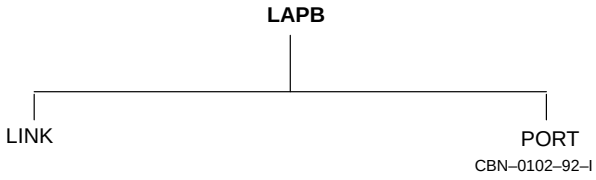
Figure A–6 HDLC Module



A.9 LAPB Module

The Link Access Procedure Balanced module defines the X.25 Level 2 protocol that is used to exchange frames between a DTE and a DCE.

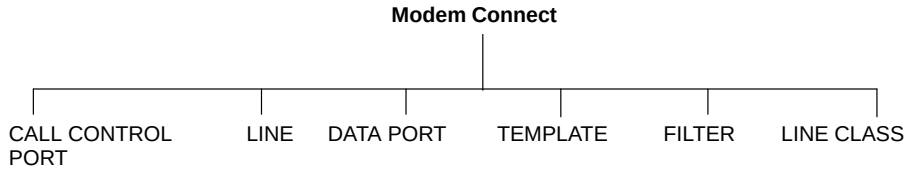
Figure A–7 LAPB Module



A.10 Modem Connect Module

This module defines the physical lines connecting two systems.

Figure A–8 Modem Connect Module

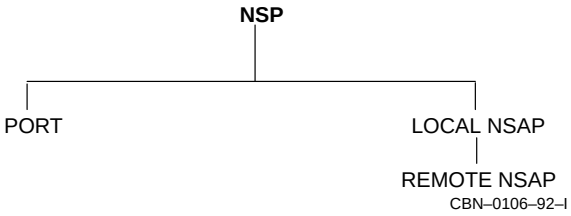


CBN–0026–94–I

A.11 NSP Module

The Network Services Protocol is responsible for the creation and deletion of communications channels, flow control, end-to-end error control, and segmentation and reassembly of messages. NSP is a proprietary DNA protocol at the Transport layer.

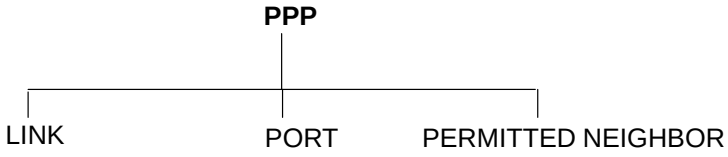
Figure A–9 NSP Module



A.12 PPP Module

The Point-to-Point Protocol is the preferred protocol for low-loss, high-delay links, for example, satellite links. It provides a negotiable, multiplexed facility, which enables packets from various network layer protocols to be transferred over the link at any one time. This allows systems from different vendors to interoperate over the link.

Figure A–10 PPP Module

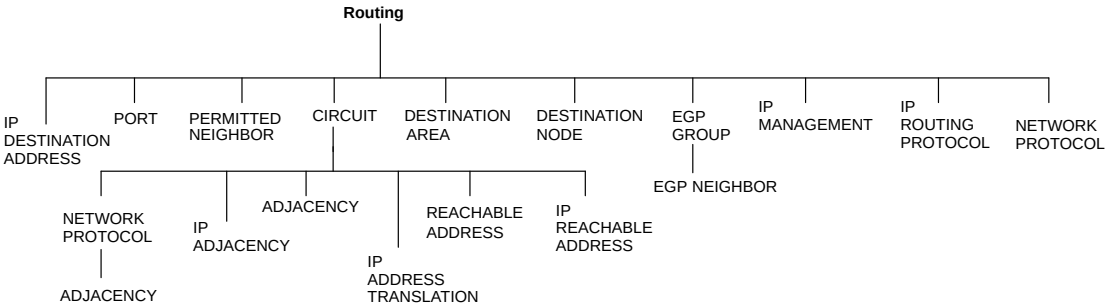


CBN–0051–94–I

A.13 Routing Module

This module is responsible for providing the Network layer functions. It is compatible with ISO 8473, ISO 9542, and ISO 10589, and the relevant TCP/IP RFCs.

Figure A–11 Routing Module

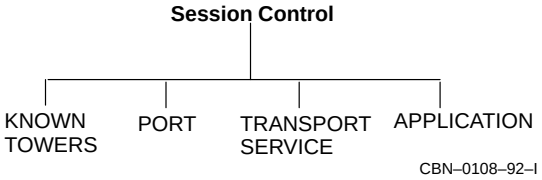


CBN–0027–94–I

A.14 Session Control Module

This defines the applications that receive incoming calls and make outgoing calls.

Figure A–12 Session Control Module



A.15 Supervisor Module

The Supervisor module provides management of backup circuits for the DEC WANrouter.

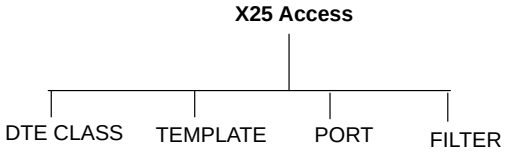
Figure A–13 Supervisor Module

CBN–0052–94–I

A.16 X25 Access Module

This defines the interface between X.25 protocols and applications.

Figure A–14 X25 Access Module

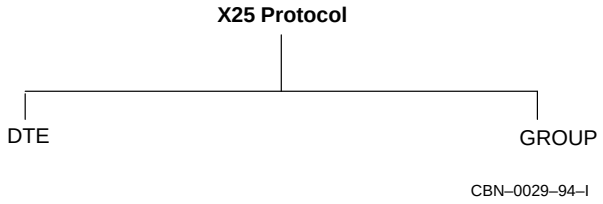


CBN–0028–94–I

A.17 X25 Protocol Module

This defines the X.25 Level 3 protocol that is used to exchange packets between a DTE and a DCE. It defines the DTEs and CUGs recognized by an X.25 system.

Figure A–15 X25 Protocol Module



B

Supported Characteristic Attributes

B.1 Overview

This appendix lists the entities used with the DEC WANrouter and provides information on their characteristic values, as implemented in the DEC WANrouter. Note that the DEC WANrouter implementation of certain characteristics may be more restricted than described in the generic NCL documentation. For example, the DEC WANrouter implements some characteristics as read-only, even though these are specified as settable in the generic NCL documentation.

For detailed descriptions of the routing characteristics, refer to the *DECnet /OSI Routing Overview*. For descriptions of the other characteristics, refer to the NCL online help and the NCL documentation for your host operating system.

The appendix is divided alphabetically into sections by module name. Each section is further divided by entity and child entity. Each table gives information on such issues as keyword, class, syntax and default value for each characteristic.

The keyword gives the name of the attribute or characteristic.

The classes specified are as follows:

S	Can be set at any time. Can also be read.
S/D	Can be set only when the entity is disabled.
R	Read-only: cannot be set.
W	Write-only: cannot be read.

The syntax states how the characteristic is specified.

For details for the NCL commands used with each module, refer to the NCL online help and the NCL documentation for your host operating system.

B.2 CSMA-CD

This section refers to the CSMA-CD module.

B.2.1 CSMA-CD Characteristics

Table B–1 shows the CSMA-CD characteristics.

Table B–1 CSMA-CD Characteristics

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.2.2 CSMA-CD STATION Characteristics

Table B–2 shows the CSMA-CD STATION characteristics.

Table B–2 CSMA-CD STATION Characteristics

Keyword	Class	Syntax	Default Value
STATION BUFFERS	R	Range 1–64	0

B.3 DDCMP

This section refers to the DDCMP module.

B.3.1 DDCMP Characteristics

Table B–3 shows the DDCMP characteristics

Table B–3 DDCMP Characteristics

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.3.2 DDCMP LINK Characteristics

Table B–4 shows the DDCMP LINK characteristics.

Table B–4 DDCMP LINK Characteristics

Keyword	Class	Syntax	Default Value
PHYSICAL LINE	S/D	Local entity name	–
PROTOCOL	R	Protocol mode	Point
RETRANSMIT TIMER	S	Range 1–65535	3000
RECEIVE BUFFERS	S/D	Range 30–60	30
ACCESS LINE TYPE	R	Nonswitched or Switched	Nonswitched

B.3.3 DDCMP LINK LOGICAL STATION Characteristics

Table B–5 shows the DDCMP LINK LOGICAL STATION characteristics.

Table B–5 DDCMP LINK LOGICAL STATION Characteristics

Keyword	Class	Syntax	Default Value
ADDRESS	S/D	Range 1–255	1
HOLDBACK TIMER	S	Range 0–13000	0

B.4 Event Dispatcher

This section refers to the Event Dispatcher module.

B.4.1 EVENT DISPATCHER Characteristics

Table B–6 shows the EVENT DISPATCHER characteristics.

Table B–6 EVENT DISPATCHER Characteristics

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.4.2 EVENT DISPATCHER OUTBOUND STREAM Characteristics

Table B–7 shows the EVENT DISPATCHER OUTBOUND STREAM characteristics.

Table B–7 EVENT DISPATCHER OUTBOUND STREAM Characteristics

Keyword	Class	Syntax	Default Value
CONNECT RETRY TIMER	S	Range 1–65535	120
DISCONNECT TIMER	S	Range 0–4000 million	0
CATCHALL FILTER	S	Filter Action	Pass
CONNECT TIMER ENABLED	S	TRUE/FALSE	TRUE
GLOBAL FILTER	R	Filter Action	See [1]
SINK ADDRESS	S	Tower Set	{ }
SPECIFIC FILTER	R	Filter Action	See [2]

[1]The default for GLOBAL FILTER is:

Pass events of the EVENT DISPATCHER entity
Block events of the EVENT DISPATCHER OUTBOUND STREAM entity

[2]The default for SPECIFIC FILTER is to pass events of the EVENT DISPATCHER OUTBOUND STREAM entity.

B.5 FRBS

This section refers to the FRBS module, which implements the frame relay capabilities of the DEC WANrouter.

B.5.1 FRBS Characteristics

Table B–8 shows the FRBS characteristic.

Table B–8 FRBS Characteristic

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.5.2 FRBS CHANNEL Characteristics

Table B–9 shows the FRBS CHANNEL characteristics.

Table B–9 FRBS CHANNEL Characteristics

Keyword	Class	Syntax	Default Value
CRC TYPE	R	–	16 bit
ERROR THRESHOLD	S	Range 1–10	3
FULL ENQUIRY INTERVAL	S	Range 1–255	6
INTERFACE DESCRIPTION	R	Text string	–
MAXIMUM CONNECTIONS	R	–	8
MAXIMUM DATA SIZE	S	Range 1–65535	1600
MONITORED EVENTS	S	Range 1–10	4
PHYSICAL LINE	S	Local entity name	–
POLLING INTERVAL	S	Range 5–30	10
SPECIFICATION	R	One of: JOINT ANSI CCITT or NONE	–

B.5.3 FRBS CHANNEL CONNECTION Characteristic

Table B–10 shows the FRBS CHANNEL CONNECTION characteristic.

Table B–10 FRBS CHANNEL CONNECTION Characteristic

Keyword	Class	Syntax	Default Value
PREFERRED DLCI	S/D	Range 0–1023	0

B.6 Hardware

This section refers to the Hardware module.

B.6.1 HARDWARE Characteristics

The HARDWARE entity has no characteristic attributes.

B.6.2 HARDWARE NEXT LOAD Characteristics

Table B–11 shows the HARDWARE NEXT LOAD characteristics.

Table B–11 HARDWARE NEXT LOAD Characteristics

Keyword	Class	Syntax	Default Value
LOAD METHOD	S	FLASH NETWORK ALL	FLASH
FILE TYPE	R	Management script System image	–

B.7 HDLC

This section refers to the HDLC module.

B.7.1 HDLC Characteristic

Table B–12 shows the HDLC characteristic.

Table B–12 HDLC Characteristic

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.7.2 HDLC LINK Characteristics

Table B–13 shows the HDLC LINK characteristics.

Table B–13 HDLC LINK Characteristics

Keyword	Class	Syntax	Default Value
ACKNOWLEDGE TIMER	S	Range 1–60000	3000
HOLDBACK TIMER	S/D	Range 1–60000	24
LINK TYPE	R	Operational mode of HDLC link	Balanced
MAXIMUM UNSEQUENCED PDUS	S	Range 1–127	1
MAXIMUM DATA SIZE	S/D	Range 262–65532	1501
MINIMUM DATA SIZE	S/D	Range 262–65532	576
PREFERRED CRC TYPE	S/D	16-bit, 32-bit, Either	16-bit
PREFERRED MAXIMUM DATA SIZE	S/D	Range 262–65532	1501
PREFERRED WINDOW SIZE	S	Range 1–127	2
PREFERRED LOCAL STATION ADDRESS	S/D	Range 2–253	2
PROFILE	R	Latin1string	–
PHYSICAL LINE	S/D	Local Entity Name	–
RETRY MAXIMUM	S/D	Range 1–255	10
SEQUENCE MODULUS	S	8 or 128	128
ACCESS LINE TYPE	R	Nonswitched or Switched	Nonswitched

B.8 LAPB

This section refers to the LAPB module.

B.8.1 LAPB Characteristics

Table B–14 shows the LAPB characteristic.

Table B–14 LAPB Characteristic

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.8.2 LAPB LINK Characteristics

Table B–15 shows the LAPB LINK characteristics.

Table B–15 LAPB LINK Characteristics

Keyword	Class	Syntax	Default Value
ACKNOWLEDGE TIMER	S/D	Range 1–60000	See Note
HOLDBACK TIMER	S/D	Range 0–60000	See Note
INTERFACE TYPE	S/D	DTE, DCE	See Note
MAXIMUM DATA SIZE	S/D	Range 1–65532	See Note
PHYSICAL LINE	S/D	Local Entity Name	–
POLL TIMER	S/D	Range 1–600	See Note
PROFILE	R	Profile name	–
RETRY MAXIMUM	S/D	Range 1–255	See Note
SEQUENCE MODULUS	S/D	8, 128	See Note
WINDOW SIZE	S/D	Range 1–127	See Note

Note

The default values for the LAPB LINK characteristics are dependent on the profile for the network you are using. For details, refer to the *Network Information* manual (on line).

B.9 Modem Connect

This section refers to the Modem Connect module.

B.9.1 MODEM CONNECT Characteristic

Table B–16 shows the MODEM CONNECT characteristic.

Table B–16 MODEM CONNECT Characteristic

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.9.2 MODEM CONNECT FILTER Characteristics

Table B–17 shows the MODEM CONNECT FILTER characteristics.

Table B–17 MODEM CONNECT FILTER Characteristics

Keyword	Class	Syntax	Default Value
INBOUND LINE CLASS	S	Name	""

B.9.3 MODEM CONNECT LINE Characteristics

Table B–18 shows the MODEM CONNECT LINE characteristics.

Table B–18 MODEM CONNECT LINE Characteristics

Keyword	Class	Syntax	Default Value
ALTERNATE SPEED	S/D	Range dependent on device	0
CALL ACCEPT TIMER	S	Range 0–60000	500
CARRIER LOSS TIMER	S	Range 0–60000	15000
CLOCK	S/D	EXTERNAL, INTERNAL, REFLECTED	EXTERNAL
COMMUNICATIONS MODE	R	Asynchronous or Synchronous	Synchronous
COMMUNICATIONS PORT	R	Simple name	–
CONNECTION TYPE	R	Nonswitched or Switched	Nonswitched
DUPLEX	R	Full or half	–
ENCODING	S/D	Normal or 1 NRZI	Normal
INITIAL HOLD TIMER	S	Range 0–300	10
MAXIMUM CALL SETUP TIMER	S	Range 1–300	60
MAXIMUM DISABLE TRANSMIT TIMER	S	Range 0–60000	500
MAXIMUM DSR DEASSERTION TIMER	S	Range 0–60000	5000
MAXIMUM ENABLE TRANSMIT TIMER	S	Range 1–5000	2000
MINIMUM DTR DEASSERTION TIMER	S	Range 0–60000	1000
MODE	S	DRIVER, DEVICE, CONNECTOR, LOCAL, REMOTE, EXTERNAL	–
MODEM CONTROL	S/D	Full, None	Full

(continued on next page)

Table B–18 (Cont.) MODEM CONNECT LINE Characteristics

Keyword	Class	Syntax	Default Value
MODEM OPTIONS	S/D	Dialout, Direct, Rate Select	{ }
MODEM PROTOCOL FORMAT	S/D	Asynchronous, Synchronous, or HDLC	Depends on value of COMMUNICATIONS MODE characteristic
PROFILE	R	Profile name	–
RATE SELECT	S	High, Low	High
SPEED	S/D	Range dependent on device	0
SUCCESSFUL CALL INDICATION TIMER	S	Range 0–60	30
SUPPRESS TEST INDICATOR	S	TRUE/FALSE	FALSE
TRANSMIT HOLDOFF TIMER	S	Range 0–60000	0

B.9.4 MODEM CONNECT TEMPLATE Characteristics

Table B–19 shows the MODEM CONNECT TEMPLATE characteristics.

Table B–19 MODEM CONNECT TEMPLATE Characteristics

Keyword	Class	Syntax	Default Value
DIAL SEQUENCE	S	Character string	""
LINE CLASS	S	Name	""

B.9.5 MODEM CONNECT LINE CLASS Characteristics

Table B–20 shows the MODEM CONNECT LINE CLASS characteristics.

Table B–20 MODEM CONNECT LINE CLASS Characteristics

Keyword	Class	Syntax	Default Value
LINES	S	Set of names	{ }

B.10 NSP

This section refers to the NSP module.

B.10.1 NSP Characteristics

Table B–21 shows the NSP characteristics.

Table B–21 NSP Characteristics

Keyword	Class	Syntax	Default Value
ACKNOWLEDGMENT DELAY TIME	S	Range 0–65	3
CONGESTION AVOIDANCE	S	FALSE	FALSE
DELAY WEIGHT	S/D	Range 0–255	3
DELAY FACTOR	S/D	Range 2–15	2
DNA PROTOCOL VERSION	R	Version Number	–
KEEPALIVE TIMER	S/D	Range 1–65535	30
MAXIMUM RECEIVE BUFFERS	S/D	Range 1–65535	1
MAXIMUM REMOTE NSAPS	S/D	Range 0–65535	17
MAXIMUM TRANSPORT CONNECTIONS	S/D	Range 0–1023	31
MAXIMUM WINDOW	S/D	Range 1–2047	7
NSAP SELECTOR	R	Range 0–255	32
RETRANSMIT THRESHOLD	S/D	Range 1–65535	5

B.11 PPP

This section refers to the PPP module.

B.11.1 PPP Characteristics

Table B–22 shows the PPP entity characteristics.

Table B–22 PPP Characteristics

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.11.2 PPP LINK Characteristics

Table B–23 shows the PPP LINK entity characteristics.

Table B–23 PPP LINK Characteristics

Keyword	Class	Syntax	Default Value
LOWER LAYER ENTITY	S/D	Local entity name	No entity
MAXIMUM CONFIGURE TRANSMISSIONS	S	Range 1—255	10
MAXIMUM CONFIGURE NAK TRANSMISSIONS	S	Range 1—255	10
MAXIMUM TERMINATE TRANSMISSIONS	S	Range	2
MINIMUM SDU SIZE	S/D	Range 1—65535	578
PREFERRED CRC SIZE	R	16 bits	
PREFERRED MAXIMUM RECEIVE SDU SIZE	S/D	Range 1–65535	1500
PREFERRED RECEIVE CONTROL CHARACTERS TO MAP	S/D	Bitset	The set of all ASYNC characters
RECEIVE AUTHENTICATION TYPES	S/D	Either {PAP} or {}	{}
REQUIRED CONFIGURATION PROTOCOLS	S	One or more of: Internet Protocol OSI Network Layer DECnet Phase IV PDU	All these protocols
RETRANSMISSION TIMER	S	Range 1–255	3
SEND AUTHENTICATION TYPES	S/D	Either {PAP} or {}	{}
TRANSMIT PAP IDENTIFIER	S	File Specification	NODE ID
TRANSMIT PAP PASSWORD	W	File Specification	–
TYPE	R	Synchronous	–

B.11.3 PPP PERMITTED NEIGHBOR

Table B–24 shows the PPP PERMITTED NEIGHBOR characteristics.

Table B–24 PPP PERMITTED NEIGHBOR Characteristics

Keyword	Class	Syntax	Default Value
IDENTIFIER	R	File specification	""
PASSWORD	W	File specification	""

B.12 Routing

This section refers to the Routing module.

B.12.1 ROUTING Characteristics

Table B–25 shows the ROUTING entity characteristics.

Table B–25 ROUTING Characteristics

Keyword	Class	Syntax	Default Value
AUTONOMOUS SYSTEM NUMBER	S/D	Range 0–65535	0
GENERATE CHECKSUMS	S	TRUE/FALSE	FALSE
IP REASSEMBLY TIME	S	Range 1–255	10
LIFETIME	S	Range 2–255	63
MANUAL AREA ADDRESSES	S/D	Set of Area Address	{ }
MANUAL IP ADDRESS	S	IP address	{0.0.0.0}
MANUAL L1 ALGORITHM	S/D	Routing Vector, Link State	Routing Vector
MANUAL L2 ALGORITHM	S/D	Routing Vector, Link State	Routing Vector
MAXIMUM PATH SPLITS	S/D	Range 1–4	2
PHASEIV ADDRESS	S/D	Phase IV Address	0.0
PHASEIV AREA MAXIMUM COST	S	Range 1–1022	1022
PHASEIV AREA MAXIMUM HOPS	S	Range 1–30	30
PHASEIV BROADCAST ROUTING TIMER	S	Range 1–65535	10
PHASEIV BUFFER SIZE	S	Range 1–65535	576
PHASEIV MAXIMUM ADDRESS	S/D	Range 1–1023	1023
PHASEIV MAXIMUM AREA	S/D	Range 1–63	63
PHASEIV MAXIMUM COST	S	Range 1–1022	1022
PHASEIV MAXIMUM HOPS	S	Range 1–30	30
PHASEIV MAXIMUM VISITS	S	Range 1–63	63
PHASEIV PREFIX	S/D	Address Prefix	49

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Table B–25 (Cont.) ROUTING Characteristics

Keyword	Class	Syntax	Default Value
PROTOCOLS	R	One or more of: DECnet Phase IV IP ISO8473	–
QUEUE THRESHOLD	S	Range 1–63	0
REDIRECT HOLDING TIME	S/D	Range 1–65535	600
RIP METRIC CLASS	S	INTERNAL, EXTERNAL	EXTERNAL
RIP SEND LOCAL METRIC	S	Range 1–16	1
RIP SEND METRIC CLASSES	S	INTERNAL, EXTERNAL	INTERNAL
RIP SEND REPLACEMENT METRIC	S	Range 0–16	1
ROUTING PROTOCOLS SUPPORTED	R	One or more of: EGP ISIS RIP	–
ROUTE PROPAGATION	R	One or more of: EGP to ISIS EGP to RIP ISIS to EGP ISIS to RIP RIP to EGP RIP to ISIS	{ }
SEGMENT BUFFER SIZE	S	Range 0–65535	576
SEND SOURCE QUENCH	S	TRUE, FALSE	FALSE
SUMMARY ADDRESSES	S/D	Set of Summary Addresses	None
TIME TO LIVE	S	Range 1–255	35
TYPE	R	One of: L1ROUTER L2ROUTER	–
VERSION	R	Version number	–

B.12.2 ROUTING PERMITTED NEIGHBOR Characteristics

Table B–26 shows the ROUTING PERMITTED NEIGHBOR characteristics.

Table B–26 ROUTING PERMITTED NEIGHBOR Characteristics

Keyword	Class	Syntax	Default Value
ID	R	Node-ID	–
VERIFIER	W[1]	Octet string, length 0–38	No verifier

[1]You can set the VERIFIER at any time. However, a new setting does not take effect until the circuit is reenabled.

B.12.3 ROUTING CIRCUIT Characteristics

Table B–27 shows the ROUTING CIRCUIT characteristics.

Table B–27 ROUTING CIRCUIT Characteristics

Keyword	Class	Syntax	Default Value
ACCESS FILTER	S/D	Set of simple names	{ }
ACCESS RECALL TIMER	S/D	Range 0–65535	60
ACCESS TYPE	R	One of: None Modem Static Outgoing Modem Static Incoming Modem DA	None
ALTERNATIVE SUBNET ADDRESSES	S/D	Set of subnet addresses	{ }
ARP HOLDING TIME	S	Range 1–65535	600
ARP RESPONSE WAITING TIME	S	Range 1–5	3
DATA LINK ENTITY	S/D	Local Entity Name	–
DNA NEIGHBOR	S/D	TRUE/FALSE	TRUE
ENABLE PHASEIV ADDRESS	S/D	TRUE/FALSE	TRUE
ENCAPSULATION DESTINATION IP ADDRESS	S/D	IP address	0.0.0.0
EXPLICIT RECEIVE VERIFICATION	S	TRUE/FALSE	TRUE
HELLO TIMER	S	Range 1–32767	10
HOLDING MULTIPLIER	S/D	Range 2–63	3
IDLE TIMER	S/D	Range 1–65535	30
INITIAL MINIMUM TIMER	S/D	Range 1–65535	55
IP TEMPLATE	S/D	Simple name	""

(continued on next page)

Table B–27 (Cont.) ROUTING CIRCUIT Characteristics

Keyword	Class	Syntax	Default Value
ISIS HELLO TIMER	S	Range 1–32767	3
L1 COST	S	Range 1–255	20
L1 ROUTER PRIORITY	S	Range 1–127	64
L2 COST	S	Range 1–255	20
L2 ROUTER PRIORITY	S	Range 1–127	64
MANUAL DATA LINK SDU SIZE	S/D	Range[1] 128–65535	1492
MANUAL IP DATA LINK SDU SIZE	S/D	Range[1] 128–65535	1500
MANUAL L2ONLY MODE	S/D	TRUE/FALSE	FALSE
MAXIMUM ARP RETRIES	S	Range 1–5	3
MAXIMUM CALL ATTEMPTS	S	Range 0–255	10
MAXIMUM SVC ADJACENCIES	S/D	Range 1–65535	1
NEIGHBOR IP ADDRESS	S	IP address	{0.0.0.0}
NETWORK PROTOCOLS	S/D	Set of Protocols	Protocols specified in the ROUTING characteristic PROTOCOLS
PHASE IV ROUTING VECTOR TIMER	S/D	Range 1–65536	30
PROXY ARP	S	On or Off	Off
RECALL TIMER	S/D	Range 0–65535	60
RECEIVE VERIFIER	W[2]	Hex string	Null string
RIP STATE	S/D	OFF, RECEIVE ONLY, SEND AND RECEIVE, SEND ONLY	OFF

[1]If the DEC WANrouter is connected to a DECnet/OSI router which is running as a link state router, this characteristic must be set to at least 1492.

[2]You can set this characteristic at any time. However, the new setting does not take effect until the circuit is reenabled.

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Table B–27 (Cont.) ROUTING CIRCUIT Characteristics

Keyword	Class	Syntax	Default Value
SUBNET ADDRESS	S/D	Subnet Address	{0.0.0.0, 0.0.0.0}
TEMPLATE	S/D	Simple Name	No name
TRANSMIT VERIFIER	W[2]	Octet String (0–38 characters)	Null string
TYPE	R	One of: CSMA-CD DDCMP HDLC PPP X25DA X25 STATIC IN X25 STATIC OUT	–
X25 FILTERS	S/D	Set of Simple Names	{Phase V routing, Phase IV routing}

[2]You can set this characteristic at any time. However, the new setting does not take effect until the circuit is reenabled.

B.12.4 ROUTING CIRCUIT REACHABLE ADDRESS Characteristics

Table B–28 shows the ROUTING CIRCUIT REACHABLE ADDRESS characteristics.

Table B–28 ROUTING CIRCUIT REACHABLE ADDRESS Characteristics

Keyword	Class	Syntax	Default Value
ADDRESS PREFIX	R	NSAP address	No address
COST	S/D	Range 1–1023	20
DATA FORMAT	S/D	Phase V, Phase IV	Phase V
DTE ADDRESSES	S/D	Set of DTE Addresses	{ }
LAN ADDRESS	S/D	ID	00-00-00-00-00-00
MAPPING	S/D	E.164, Manual, or X.121	X.121
MODEM ADDRESSES	S/D	Set of modem addresses	{ }
TYPE	S/D	Outbound, Inbound	Outbound

B.12.5 ROUTING CIRCUIT NETWORK PROTOCOL Characteristics

Table B–29 shows the ROUTING CIRCUIT NETWORK PROTOCOL characteristics.

Table B–29 ROUTING CIRCUIT NETWORK PROTOCOL Characteristics

Keyword	Class	Syntax	Default Value
NETWARE NETWORK NUMBER	S/D	Hex string	0
NETWARE DATA LINK ENCAPSULATION	S/D	One of: Ethernet 802.2 SNAP Novell	Ethernet
NETWARE NETBIOS BROADCAST	S/D	ON/OFF	OFF
PERIODIC ROUTING PROTOCOL TIMER	S/D	Range 0–64000	30

B.12.6 ROUTING CIRCUIT NETWORK PROTOCOL ADJACENCY Characteristics

Table B–30 shows the ROUTING CIRCUIT NETWORK PROTOCOL ADJACENCY characteristics.

Table B–30 ROUTING CIRCUIT NETWORK PROTOCOL ADJACENCY Characteristics

Keyword	Class	Syntax	Default Value
ENCAPSULATION IP ADDRESS	S/D	IP address	0.0.0.0

B.12.7 ROUTING EGP GROUP Characteristics

Table B–31 shows the ROUTING EGP GROUP characteristics.

Table B–31 ROUTING EGP GROUP Characteristics

Keyword	Class	Syntax	Default Value
AUTONOMOUS SYSTEM NUMBER	S/D	Range 0–65535	0
MAXIMUM ACTIVE NEIGHBORS	S/D	Range 0–255	1
SEND METRIC CLASSES	S/D	Set of {INTERNAL, EXTERNAL}	{INTERNAL}
SEND REPLACEMENT METRIC	S/D	Range 1–255	1

B.12.8 ROUTING EGP GROUP EGP NEIGHBOR Characteristics

Table B–32 shows the ROUTING EGP GROUP EGP NEIGHBOR characteristics.

Table B–32 ROUTING EGP GROUP EGP NEIGHBOR Characteristics

Keyword	Class	Syntax	Default Value
CIRCUIT	R	Simple name	No circuit
IP ADDRESS	R	IP address	No address
SOURCE NETWORK	S	IP address	{0.0.0.0}

B.12.9 ROUTING CIRCUIT IP REACHABLE ADDRESS Characteristics

Table B–33 shows the ROUTING IP REACHABLE ADDRESS characteristics.

Table B–33 ROUTING CIRCUIT IP REACHABLE ADDRESS Characteristics

Keyword	Class	Syntax	Default Value
DESTINATION	R	IP address	–
DTE ADDRESSES	S/D	Set of DTE addresses	{ }
METRIC	S/D	Range 1–Maximum link cost	20
CLASS	S/D	INTERNAL, EXTERNAL	EXTERNAL
MODEM ADDRESSES	S/D	Set of modem addresses	{ }
NEXT HOP	S/D	IP Address	0.0.0.0

B.12.10 ROUTING IP ROUTING PROTOCOL Characteristics

Table B–34 shows the ROUTING IP ROUTING PROTOCOL characteristics.

Table B–34 ROUTING IP ROUTING PROTOCOL Characteristics

Keyword	Class	Syntax	Default Value
RIP SEND TYPE	S	BROADCAST, POINT-TO-POINT	BROADCAST
RIP SOURCES	S	Set of IP addresses	{ }
RIP SINKS	S	Set of IP addresses	{ }
RIP POISONED REVERSE	S	TRUE, FALSE	TRUE
RIP GENERATE DEFAULT ROUTE	S	TRUE, FALSE	FALSE
RIP DEFAULT ROUTE METRIC	S	Range 1–255	1
RIP RECEIVE DEFAULT ROUTE	S	TRUE, FALSE	TRUE
ROUTING PROTOCOLS SUPPORTED	R	Routing protocols	–

B.13 Session Control

This section refers to the Session Control module.

B.13.1 SESSION CONTROL Characteristics

Table B–35 shows the SESSION CONTROL characteristics.

Table B–35 SESSION CONTROL Characteristics

Keyword	Class	Syntax	Default Value
INCOMING TIMER	S	Range 0–65535	45
OUTGOING TIMER	S	Range 0–65535	60
VERSION	R	Version number	–

B.14 Supervisor

This section refers to the Supervisor module.

B.14.1 SUPERVISOR Characteristics

Table B–36 shows the SUPERVISOR characteristics.

Table B–36 SUPERVISOR Characteristics

Keyword	Class	Syntax	Default Value
FUNCTION	R	BACKUP OVERFLOW TIMER	–
PRIMARIES	S/D	Set of local entity names	{ }
SECONDARY	S/D	Local entity name	NULL
INVOKE TIMER	S	Range 0–65535	5
REVOKE TIMER	S	Range 0–65535	30

B.15 X25 Access

This section refers to the X25 Access module. This section lists the characteristics that are set for the X25 Access module. Many of the characteristics for the X25 Access module are dependent on the profile of the network you are using. For details of these characteristics, refer to the online *Network Information*.

B.15.1 X25 ACCESS Characteristics

Table B–37 shows the X25 ACCESS characteristics.

Table B–37 X25 ACCESS Characteristics

Keyword	Class	Syntax	Default Value
MAXIMUM ACTIVE CIRCUITS	R	Decimal number	–
VERSION	R	Version number	–

B.15.2 X25 ACCESS DTE CLASS Characteristics

Table B–38 shows the X25 ACCESS DTE CLASS characteristics.

Table B–38 X25 ACCESS DTE CLASS Characteristics

Keyword	Class	Syntax	Default Value
DNIC	S	DTE address	–
INTERNATIONAL PREFIX	S	DTE address	–
LOCAL DTES	S	Set of simple names	–
PROFILE	R	String	–
STRIP DNIC	S	TRUE, FALSE	FALSE
TYPE	R	LOCAL or REMOTE	–

B.15.3 X25 ACCESS FILTER Characteristics

Table B–39 shows the X25 ACCESS FILTER characteristics.

Table B–39 X25 ACCESS FILTER Characteristics

Keyword	Class	Syntax	Default Value
CALL DATA MASK	S	Octet String	Null string
CALL DATA VALUE	S	Octet String	Null string
CALLED ADDRESS EXTENSION MASK	S	Octet String	Null string
CALLED ADDRESS EXTENSION VALUE	S	Octet String	Null string
CALLED NSAP	S	NSAP address	Null string
GROUP	S	Simple name	–
INBOUND DTE CLASS	S	Simple name	–
INCOMING DTE ADDRESS	S	DTE address. Can include wildcard.	–
ORIGINALLY CALLED ADDRESS	S	DTE address	–
PRIORITY	S	Range 0–65535	1
RECEIVING DTE ADDRESS	S	DTE address	–
REDIRECT REASON	S	One of: Busy Not specified Out of order Systematic	Not specified
SENDING DTE ADDRESS	S	DTE address	–

B.15.4 X25 ACCESS TEMPLATE Characteristics

Table B–40 shows the X25 ACCESS TEMPLATE characteristics.

Table B–40 X25 ACCESS TEMPLATE Characteristics

Keyword	Class	Syntax	Default Value
CALL DATA	S	Octet String	–
CALLING ADDRESS EXTENSION	S	NSAP address	–
CHARGING INFORMATION	S	TRUE/FALSE	FALSE
DESTINATION DTE ADDRESS	S	DTE address	–
DTE CLASS	S	Simple name	–
END-TO-END DELAY	S	Range	0..0
EXPEDITED DATA	S	One of: Do not use Not specified Use	Not specified
FAST SELECT	S	One of: Fast select No fast select Not specified With response	Not specified
LOCAL FACILITIES	S	Octet String	–
LOCAL SUBADDRESS	S	DTE address	–
NETWORK USER IDENTITY	S	Octet String	–
NSAP MAPPING	S	TRUE/FALSE	FALSE
PACKET SIZE	S	Range 0–4096	–
REVERSE CHARGING	S	TRUE/FALSE	FALSE
RPOA SEQUENCE	S	Set of DTE addresses	–
SELECTED GROUP	S	Simple name	–
TARGET ADDRESS EXTENSION	S	NSAP address	–
THROUGHPUT CLASS REQUEST	S	Range	0..0
TRANSIT DELAY SELECTION	S	Range	0..0
WINDOW SIZE	S	Range 0–127	–

B.16 X25 Protocol

This section refers to the X25 Protocol module.

B.16.1 X25 PROTOCOL Characteristic

Table B–41 shows the X25 PROTOCOL characteristic.

Table B–41 X25 PROTOCOL Characteristic

Keyword	Class	Syntax	Default Value
VERSION	R	Version number	–

B.16.2 X25 PROTOCOL DTE Characteristics

Table B–42 shows the X25 PROTOCOL DTE characteristics.

Table B–42 X25 PROTOCOL DTE Characteristics

Keyword	Class	Syntax	Default Value
CALL TIMER	S/D	Range 0–255	Profile-dependent
CCITT VERSION	S/D	Range 1–9999	1984
CLEAR TIMER	S/D	Range 1–255	Profile-dependent
DEFAULT PACKET SIZE	S/D	Range 16–4096	Profile-dependent
DEFAULT WINDOW SIZE	S	Range 1–127	Profile-dependent
DESCRIPTION	R	Hardware details	–
EXTENDED PACKET SEQUENCING	S/D	TRUE/FALSE	FALSE
INBOUND DTE CLASS	S/D	Simple Name	–
INCOMING LIST	S/D	Set of ranges of logical channel numbers	{[1..4095]}
INTERFACE TYPE	S/D	DTE, DCE	DTE
INTERRUPT TIMER	S/D	Range 0–255	Profile-dependent

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Table B–42 (Cont.) X25 PROTOCOL DTE Characteristics

Keyword	Class	Syntax	Default Value
LINK SERVICE PROVIDER	S/D	Local entity name	–
MAXIMUM ACTIVE CIRCUITS	R	Range 1–4096	16
MAXIMUM CLEAR ATTEMPTS	S/D	Range 1–255	Profile-dependent
MAXIMUM PACKET SIZE	S/D	Range 16–4096	Profile-dependent
MAXIMUM RESET ATTEMPTS	S/D	Range 1–255	Profile-dependent
MAXIMUM RESTART ATTEMPTS	S/D	Range 1–255	Profile-dependent
MAXIMUM THROUGHPUT CLASSES	S/D	Integer	Profile-dependent
MAXIMUM WINDOW SIZE	S/D	Range 1–127	Profile-dependent
MINIMUM PACKET SIZE	S/D	Range 16–4096	Profile-dependent
MINIMUM THROUGHPUT CLASSES	S/D	Integer	Profile-dependent
MINIMUM WINDOW SIZE	S/D	Range 1–127	Profile-dependent
OUTGOING LIST	S/D	Set of ranges	{[1..4095]}
PROFILE	R	Profile name	–
RESET TIMER	S/D	Range 1–255	Profile-dependent
RESTART TIMER	S/D	Range 1–255	Profile-dependent
SEGMENT SIZE	S/D	Range 1–4096	64
X25 ADDRESS	S/D	DTE address	–

B.16.3 X25 PROTOCOL GROUP Characteristics

Table B–43 shows the X25 PROTOCOL GROUP characteristics.

Table B–43 X25 PROTOCOL GROUP Characteristics

Keyword	Class	Syntax	Default Value
MEMBERS	S	Set of records	–
REMOTE DTE ADDRESS	S	DTE address	–
TYPE	S	CUG, CUGOA or BCUG	BCUG

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